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Designated according to Article 29 of Regulation (EU) No 305/2011

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European Technical Assessment

ETA 15/0714 – version 01 of 12/10/2015

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:	**Technický a skúšobný ústav stavebný, n. o.**
Trade name of the construction product	Ground Plate, Steel Clamp, Column Shoe, Heavy Supporting and Bracket
Product family to which the construction product belongs	Product area code: 20 Structural metallic products and ancillaries
Manufacturer	Hebei Minmetals Co. Ltd. No 337 Xinhua Road Shijiazhuang China http://www.chinawiremesh.com
Manufacturing plant	Haixing Shengyuan Hardware Products Co., Ltd. Liujiayuan, Zhaomaotao Town, Haixing City Hebei Province China
This European Technical Assessment contains	45 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	ETAG 015, edition 2012, used as European Assessment Document (EAD)
This version replaces	—

Specific part

1 Technical description of the product

The Ground Plates, Steel Clamps, Column Shoes, Heavy Supportings and Brackets are welded or non- welded steel connectors made of steel plates, ribbed bars, threaded rods, nuts and steel pipes.

Steel plates are made of hot rolled steel strip of steel grade S235JR according to EN 10025-2 with following minimum characteristics:

- yield strength of R_e = 235 N/mm²;
- tensile strength of R_m = 360 N/mm²;
- elongation failure A80 at least 19 %.

The thickness of steel plates are (1,8 ± 0,15) mm, (2,0 ± 0,2) mm, (2,5 ± 0,2) mm, (3,0 ± 0,3) mm, (3,5 ± 0,35) mm, (4,0 ± 0,5) mm, (5,0 ± 0,6) mm or (6,0 ± 0,6) mm.

The ribbed bars are hot rolled reinforcement bar according to EN 10080. The characteristic yield strength of ribbed bars is at least 335 N/mm^2. The grade of threaded rods is 4.8 according to ISO 4018 and the grade of nuts is 5 according to ISO 4034.

Wood or wood based components are fastened to steel connectors by bolts (S235) and screws (S235) according to EN 14592: 2012 (DIN 571 and thread according to DIN 7998). Connectors can be embedded into concrete or metal anchors to use in concrete shall be used to create timber to concrete connection. The penetration in to concrete of the embedded part of the connectors shall be at least 160 mm.

The surface of connectors is hot dipped galvanized according to EN ISO 1461. Standard zinc coating thickness is at least 55 µm.

Dimensions of Ground Plates, Steel Clamps, Column Shoes, Heavy Supportings and Brackets are shown in Annex 1. Connectors are specified in Annex 2.

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

2.1 Intended use

Ground Plate, Steel Clamp, Column Shoe, Heavy Supporting and Bracket are intended to support timber structures or wood-based structural members to their support, where requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106/EEC shall be fulfilled. Each connection shall be made with one connector.

The static and kinematic behaviour of the timber members or the connectors shall be as described in annexes.

The wood members can be made of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a strength characteristic at least C 24 according to EN 338 or better.

The connectors are primarily for use in timber structures subject to the dry, internal conditions defined by service class 1 and 2 according to EN 1995-1-1 and for connections subject to static or quasi-static loading. Connectors can be used in service class 3 only with fastener with necessary coating type and coating thickness according to EN 1995-1-1.

The concrete strength class should be at least C 25/30 in general. Connectors may be also used for connections between a timber member and a support made from concrete blocks.

2.2 Intended working life of the construction product

The assumed intended working life of the connectors for the intended use is 50 years, provided that they are subject to appropriate use and maintenance. The indication given on the working life cannot be interpreted as a guarantee given by the manufacturer or the Assessment Body, but are to be regarded only as a means for choosing the appropriate product in relation to the expected, economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

3.1.1 Joint strength

Joints strength characteristics for different load directions are given in Annex 3. Characteristic load-carrying capacities are based on test results according to EN 26891 and calculation methods according to EN 14358, EN 1993-1-1 and EN 1995-1-1 and relevant parts of EN 1992.

3.1.2 Joint stiffness

Initial slip v_i and slip modulus k_s of the specific connectors are given in Annex 3, Table 35.

3.1.3 Joint ductility

No performance determined.

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire of materials and components

Connectors are made of steel classified as class A1 in accordance with EN 13501-1 and EC Decision 96/603/EC, amended by EC Decision 2000/605/EC.

3.2.2 Resistance to fire

No performance determined.

3.3 Hygiene, health and environment (BWR 3)

3.3.1 Release of dangerous substances

The connectors comply with the provision of Guidance paper H[1] about dangerous substances taking in account Regulation (EC) No 1272/2008 and release scenarios according to EOTA TR 034[2]. Connectors do not contain dangerous materials. Manufacturer issued declaration about content of dangerous substances. In addition, each country may have national requirements (e.g. national legislation, regulations and provisions) applicable to the intended use that should be complied with.

[1] Guidance Paper H: A harmonised approach relating to dangerous substances under the Construction Products Directive, edition September 2002.

[2] EOTA TR 034: General ER 3 Checklist for ETAGs/CUAPs/ETAs – Content and/or release of dangerous substances in products/kits, edition March 2012.

3.4 Safety in use (BWR 4)

No performance determined. Parameters are not relevant.

3.5 Protection against noise (BWR 5)

No performance determined. Parameters are not relevant.

3.6 Energy economy and heat retention (BWR 6)

No performance determined. Parameters are not relevant.

3.7 Sustainable use of natural resources (BWR 7)

No performance determined.

3.8 General aspects relating to fitness o use

3.8.1 Resistance to corrosion and deterioration

The connector surfaces are hot dipped galvanized according to EN ISO 1461. Zinc coating thickness is at least 55 µm.

The connectors have been assessed to have satisfactory resistance to corrosion and deterioration when used in timber structures using the timber species described in EN 1995-1-1 and subject to the conditions defined by service class 1, 2 and 3. Manufacturer should check the zinc coating thickness according to EN ISO 2178 and control plan.

Fasteners should fulfil requirements to corrosion protection according to EN 1995-1-1 with regard to assumed service class.

3.8.2 Dimensional stability

Joints deformations and deflections are given in Annex 3, Table 35 as initial slip and slip modulus.

3.8.4 Identification

The identification parameters and references to products specification for identifying the materials and components are given in Annex 1 and 2.

The connectors are defined by CE marking according to 4.3.

4 Assessment and verification of conformity of the factory production control (hereinafter AVCP) system applied, with reference to its legal base

According to the European Commission Decision 99/455/EC[3], the AVCP system 2+ applies (further described in Annex V to Regulation (EU) No 305/2011).

The manufacturer shall draw up the declaration of performance and determine the product-type on the basis of the assessments and verifications of conformity of the factory production control carried out under the system 2+ on the basis of:

(a) The manufacturer shall carry out:

(1) Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;

(2) Factory production control;

(3) Testing of samples taken at the factory in accordance with the prescribed test plan;

[3] Official Journal of the European Communities L 178, 14.7.1999, p. 56.

(b) The notified product certification body shall decide on the issuing, restriction, suspension or withdrawal of the certificate of conformity of the factory production control on the basis of the outcome of the following assessments and verifications carried out by that body:

(4) Initial inspection of the manufacturing plant and of factory production control;

(5) Continuing surveillance, assessment and evaluation of factory production control.

4.1 Task of the manufacturer

4.1.1 General

The manufacturer is responsible for the conformity of the Ground Plate, Steel Clamp, Column Shoe, Heavy Supporting and Bracket with the ETA. The manufacturer shall exercise permanent internal control of production related to:

- the specification and verification of the raw materials, components and constituents;
- the description of the production and the internal control of the production;
- the test methods (when necessary) or control methods to be carried out during manufacture;
- the minimum frequency of controls.

4.1.2 Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;

Assessment tests and calculations conducted by Technical Assessment Body or under its responsibility should be used for the purpose of type testing apart from testing of the zinc coating thickness. Manufacturer is responsible for testing of the zinc coating thickness according to EN ISO 2178 for the purpose of type testing.

4.1.3 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. This production control system shall ensure that the product is in conformity with the European Technical Assessment (ETA).

A control plan[4], which is part of the factory production control, shall deal with the permanent internal control of the production to be exercised and documented by the manufacturer. Control plan has been agreed between the European Technical Assessment holder and TSÚS.

Deviations or non-conformities have to be documented as do the handling of them e.g. separating, corrective actions.

The manufacturer shall use only materials stated in the technical documentation[5] of this European Technical Assessment.

4.1.4 Further testing of samples taken at the manufacturing plant by the manufacturer in accordance with the prescribed control plan

No further testing of samples is needed according to prescribed control plan apart from continuous visual control, control of components dimensions and control of zinc coating thickness.

4.1.5 Declaration of performance

When all the criteria of assessments and verifications of constancy of performance are satisfied the manufacturer shall draw up a declaration of performance.

[4] The control plan has been deposited at the TSÚS and is only made available to the notified body involved in the assessment and verification of constancy of performance procedure.

[5] The technical documentation of this European Technical Assessment has been deposited at the TSÚS.

4.2 Task of the notified product certification body

4.2.1 Assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product

The results of the tests performed as part of the assessment for the European Technical Assessment may be used for determination of the product type unless there are changes in the manufacturing process or manufacturing plant. The necessary type testing has to be agreed between the TSÚS and involved notified product certification body in such cases.

4.2.2 Initial inspection of the manufacturing plant and factory production control

Initial inspection of the manufacturing plant and factory production control shall be in accordance with ETAG 015 (Edition 2012).

The notified product certification body shall ascertain that, in accordance with the control plans, the manufacturing plants, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the steel connectors according to the specifications given in this European Technical Assessment.

4.2.3 Continuing surveillance, assessment and evaluation of factory production control

Notified product certification body shall perform continuous inspection of the factory and the factory production control by normally visiting the manufacturer at least once per year. The purpose of the inspection is to check that the manufacturer has an updated control plan for the production and that the control plan is followed.

4.3 CE Marking and accompanying information

According to Council Directive 93/68/EEC[6], the CE marking consists of the letters “CE” in the form laid down in the Directive, followed by the identification number of the notified certification body. The manufacturer is responsible for the affixing of the CE marking.

The CE marking of the connectors shall contain the following information:

- identification number of the notified product certification body;
- the name and address of the producer (legal entity responsible for the manufacture);
- the last two digits of the year in which the CE marking was affixed;
- the number of the certificate of conformity of the factory production control;
- the number of the European Technical Assessment.

The full CE marking of the connectors will normally be accompanied by a specific documentation including assembling details, list of necessary fasteners and a table containing the characteristics and performances. The information is extracted from the ETA. The relevant characteristics of the connectors shall include mechanical resistance characteristics.

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

5.1 Manufacturing

The connectors are manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant and factory production control by the notified product certification body and laid down in the technical documentation.

[6] Official Journal of the European Communities L 220 of 30.8.1993.

5.2 Packaging, transport and storage

The manufacturer's manual for the packaging, transport and storage of the connectors shall be followed.

The connectors shall be protected from weather exposure and mechanical damage during transport and storage and cannot be lifted or stored in such a way that will cause damage or excessive deformation to them.

5.3 Installation

The execution of the connection shall be in accordance with the manufacturers installation guide.

Connection is deemed fit for its intended use provided:

- the forces shall act on the timber members as described in Annex 3;
- the support shall be restrained against rotation;
- nail or screw types and sizes shall be those mentioned in the tables of Annex 1 and 2;
- the screws with diameter ≤ 4 mm shall be inserted without pre-drilling of the holes;
- there shall be bolts and screws in the holes as prescribed in Annex 1;
- there shall be no gap between the connector and the timber member or the support, unless otherwise described;
- bolt holes should have diameter not larger than 1 mm than the bolt;
- the bolts shall have washers.

5.4 Use, maintenance, repair

Maintenance is not required during the assumed intended working life. Should repair prove necessary, it is normal to replace the steel connectors.

The connectors shall be regularly inspected and maintained in accordance with maintenance instructions if necessary.

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On behalf of the Technický a skúšobný ústav stavebný, n. o.
Bratislava, 12 October 2015

prof. Ing. Zuzana Sternová, PhD.
Head of Technical Assessment Body

Annexes

Annex 1 – Specification of Ground Plates, Steel Clamps, Column Shoes, Heavy Supports, Brackets

Annex 2 – Specifications of fasteners

Annex 3 – Characteristic load-carrying capacities

Annex 1

Specification of Ground Plates, Steel Clamps, Column Shoes, Heavy Supports, Brackets

Ground plate
Ground plates are welded from steel plates, and hot dip galvanized or powder coating after pressing and welding.

Table 1 – Ground plate type A

Type	Variant	Fasteners			Dimensions (mm)		
		Number of anchor for use in concrete	Screw	Bolt	A	B	C
Ground plate type A	51×51×150	4	–	2 × bolt M10	51	150	150
	61×61×150		–		61		
	71×71×150		–		71		
	75×75×150		–		75		
	81×81×150		–		81		
	91×91×150		–		91		
	95×95×150		–		95		
	101×101×150		–		101		
	105×105×150		–		105		

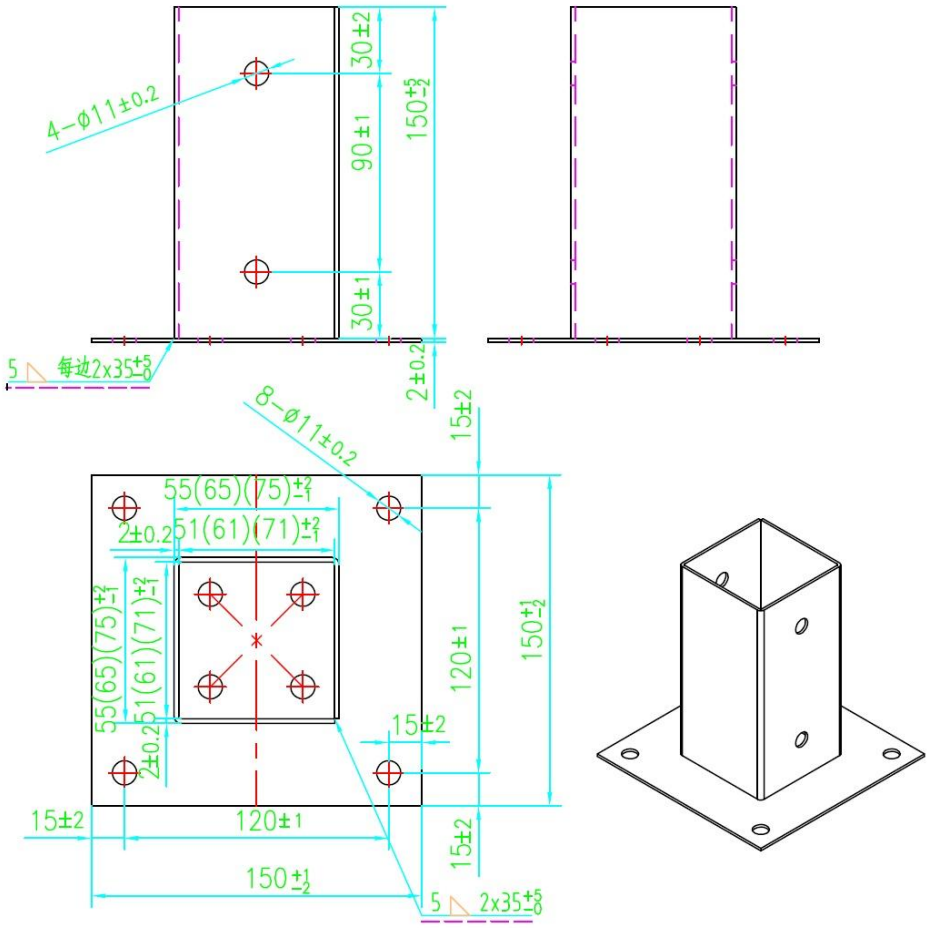

Figure 1 – Ground plate type A, 51×51×150, 61×61×150 and 71×71×150

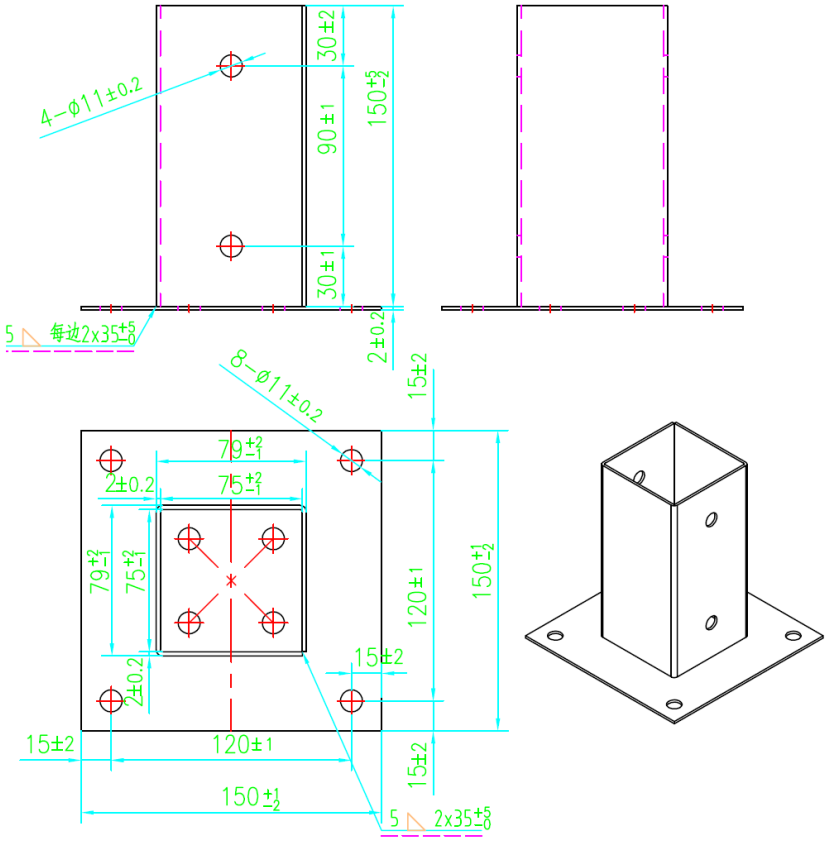

Figure 2 – Ground plate type A, 75×75×150

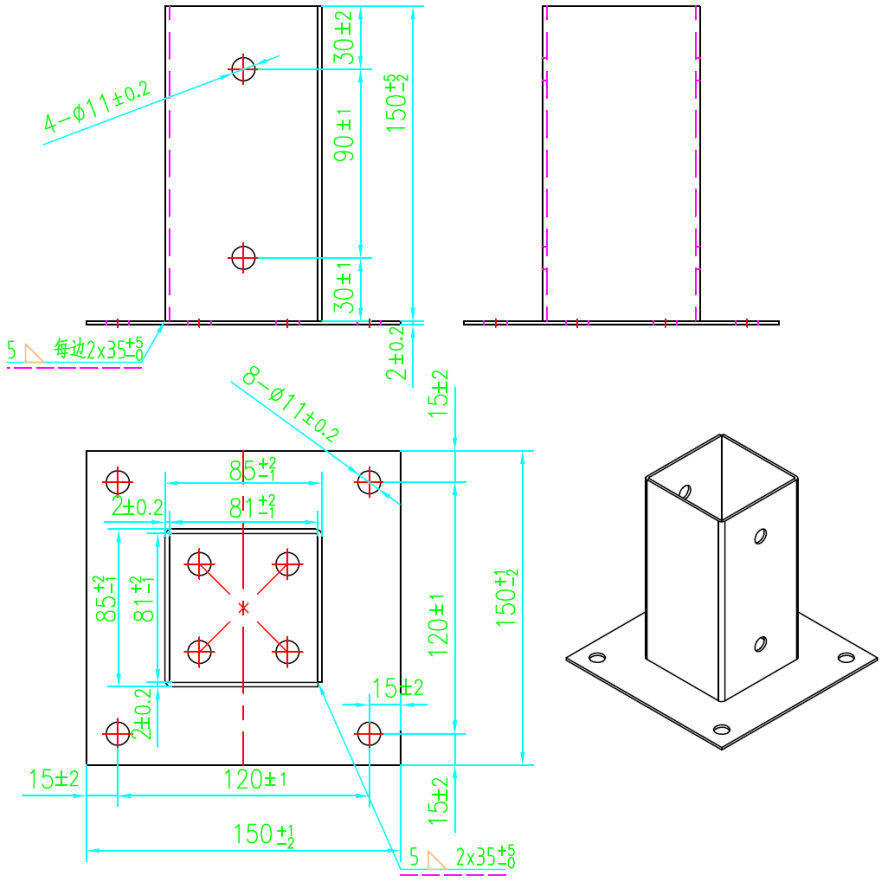

Figure 3 – Ground plate type A, 81×81×150

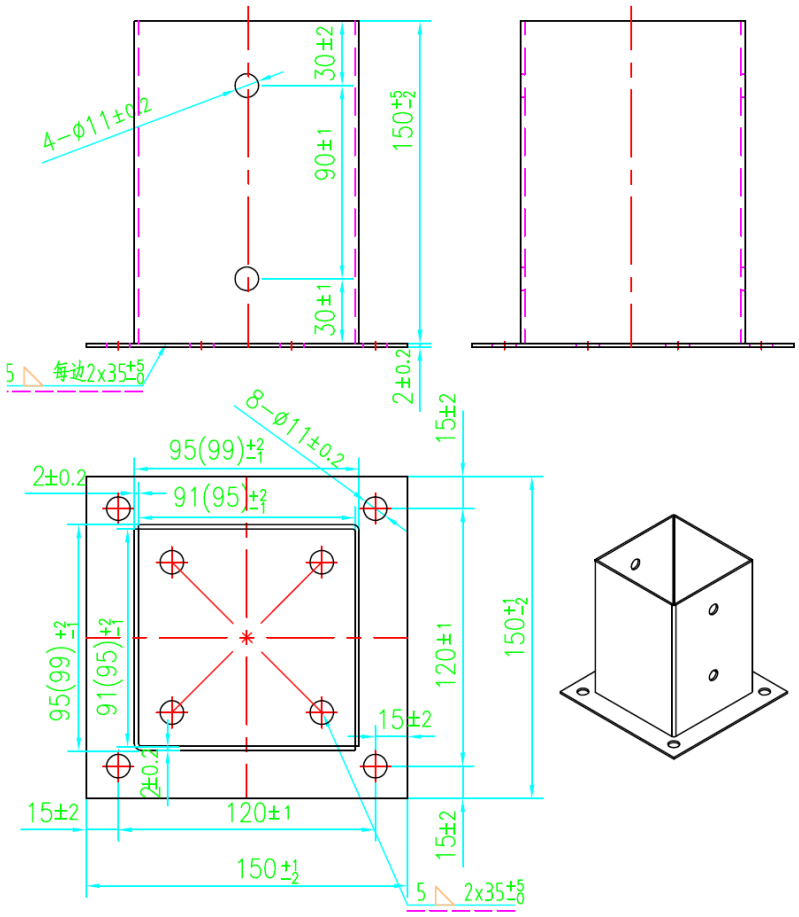

Figure 4 – Ground plate type A, 95×95×150

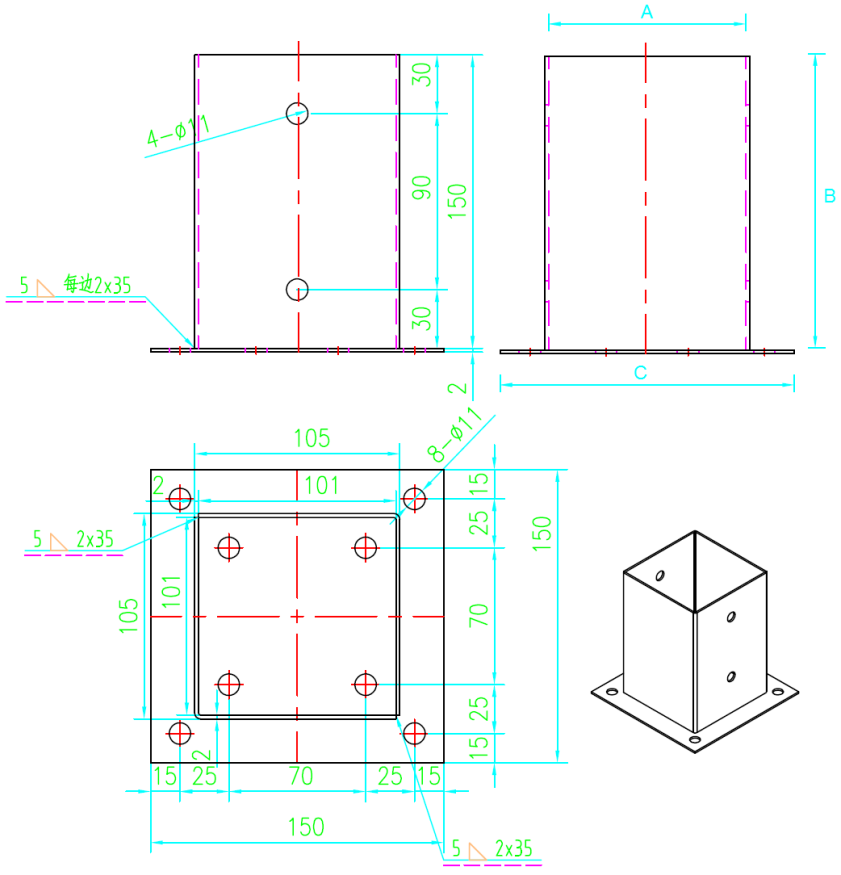

Figure 5 – Ground plate type A, 101×101×150

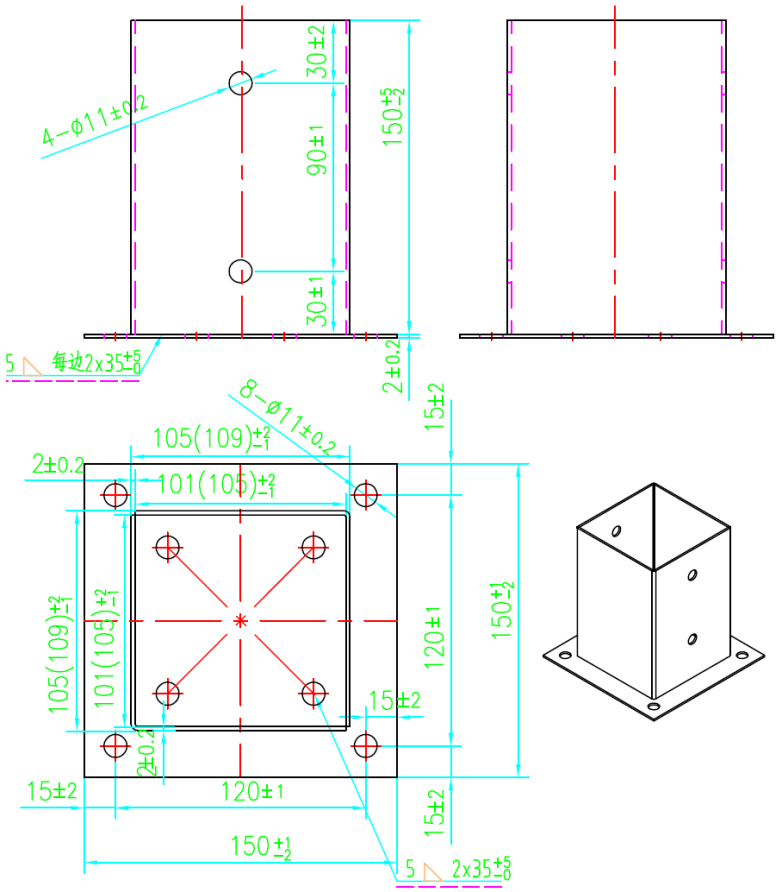

Figure 6 – Ground plate type A, 105×105×150

Table 2 – Ground plate type B

Type	Variant	Fasteners			Dimensions (mm)		
		Number of anchor for use in concrete	Screw	Bolt	A	B	C
Ground plate type B	71×71×150	4	–	2 × bolt M10	71	150	150
	91×91×150		–		91		

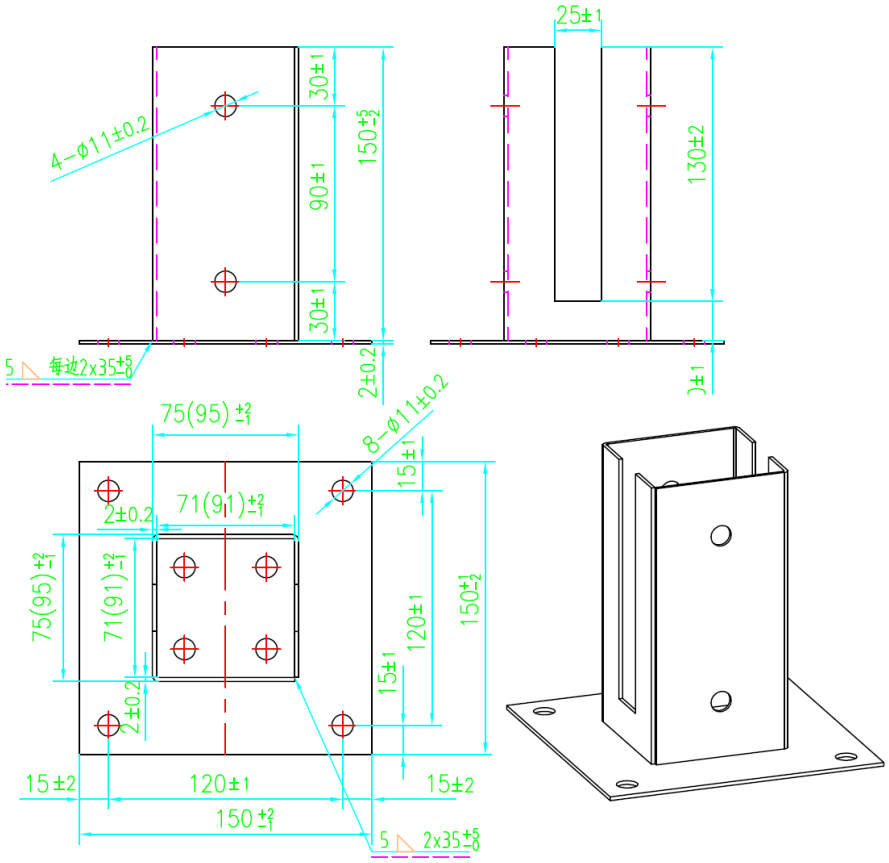

Figure 7 – Ground plate type B, 71×71×150 and 91×91×150

Table 3 – Ground plate type C

Type	Variant	Fasteners			Dimensions (mm)		
		Number of anchor for use in concrete	Screw	Bolt	A	B	C
Ground plate type C	51×51×150	4	–	–	51	150	150
	61×61×150		–	–	61		
	71×71×150		–	–	71		
	75×75×150		–	–	75		
	91×91×150		–	–	91		
	95×95×150		–	–	95		
	101×101×150		–	–	101		
	105×105×150		–	–	105		

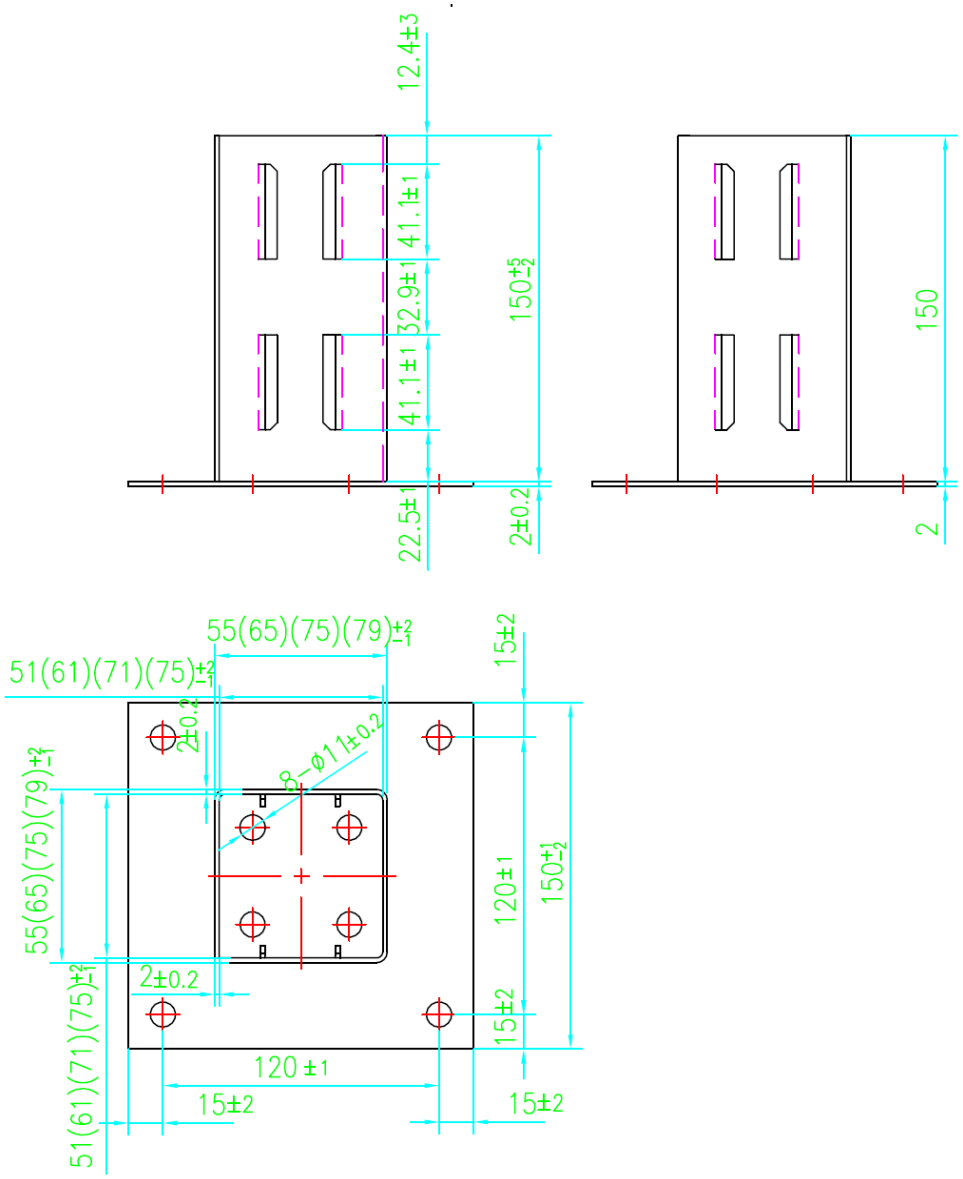

Figure 8 – Ground plate type C, 51×51×150, 61×61×150, 71×71×150 and 75×75×150

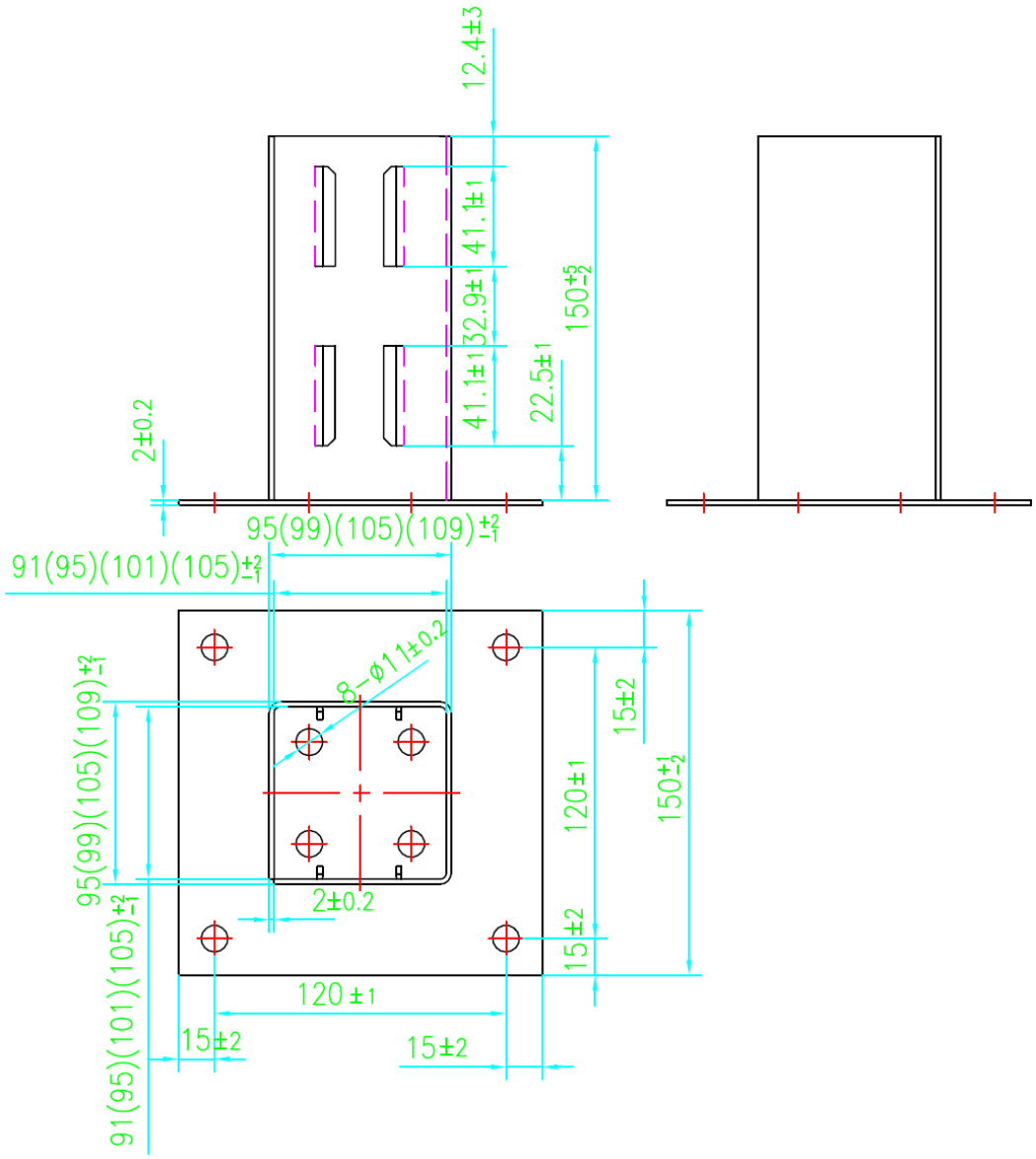

Figure 9 – Ground plate type C, 91×91×150, 95×95×150, 101×101×150 and 105×105×150

Steel clamp
Steel clamps are welded from steel plates, and hot dip galvanized or powder coating after pressing and welding.

Table 4 – Steel clamp type A

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Steel clamp type A	71×71×150×350	–	–	2 × bolt M10	71	71	150	350
	75×75×150×350	–	–		75	75		
	91×91×150×350	–	–		91	91		
	101×101×150×350	–	–		101	101		

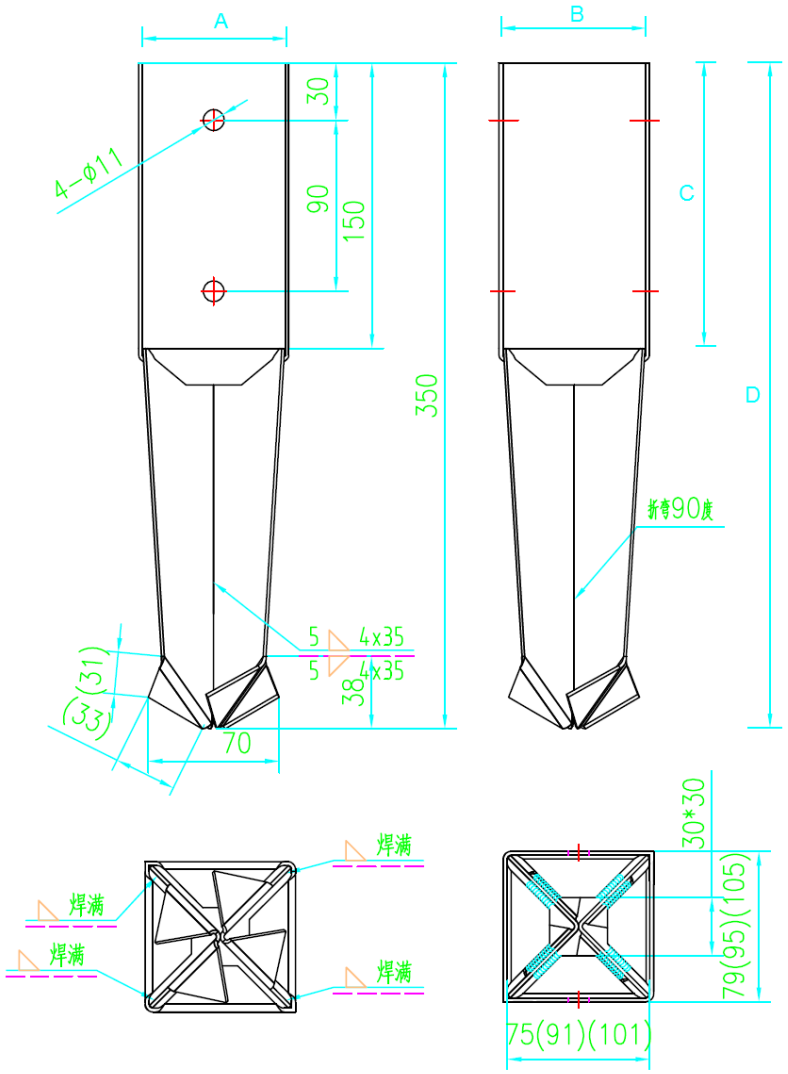

Figure 10 – Steel clamp type A, 71×71×150×350, 75×75×150×350, 91×91×150×350 and 101×101×150×350

Table 5 – Steel clamp type B

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Steel clamp type B	71×71×150×350	–	–	–	71	71	150	350
	75×75×150×350	–	–	–	75	75		
	91×91×150×350	–	–	–	91	91		
	101×101×150×350	–	–	–	101	101		

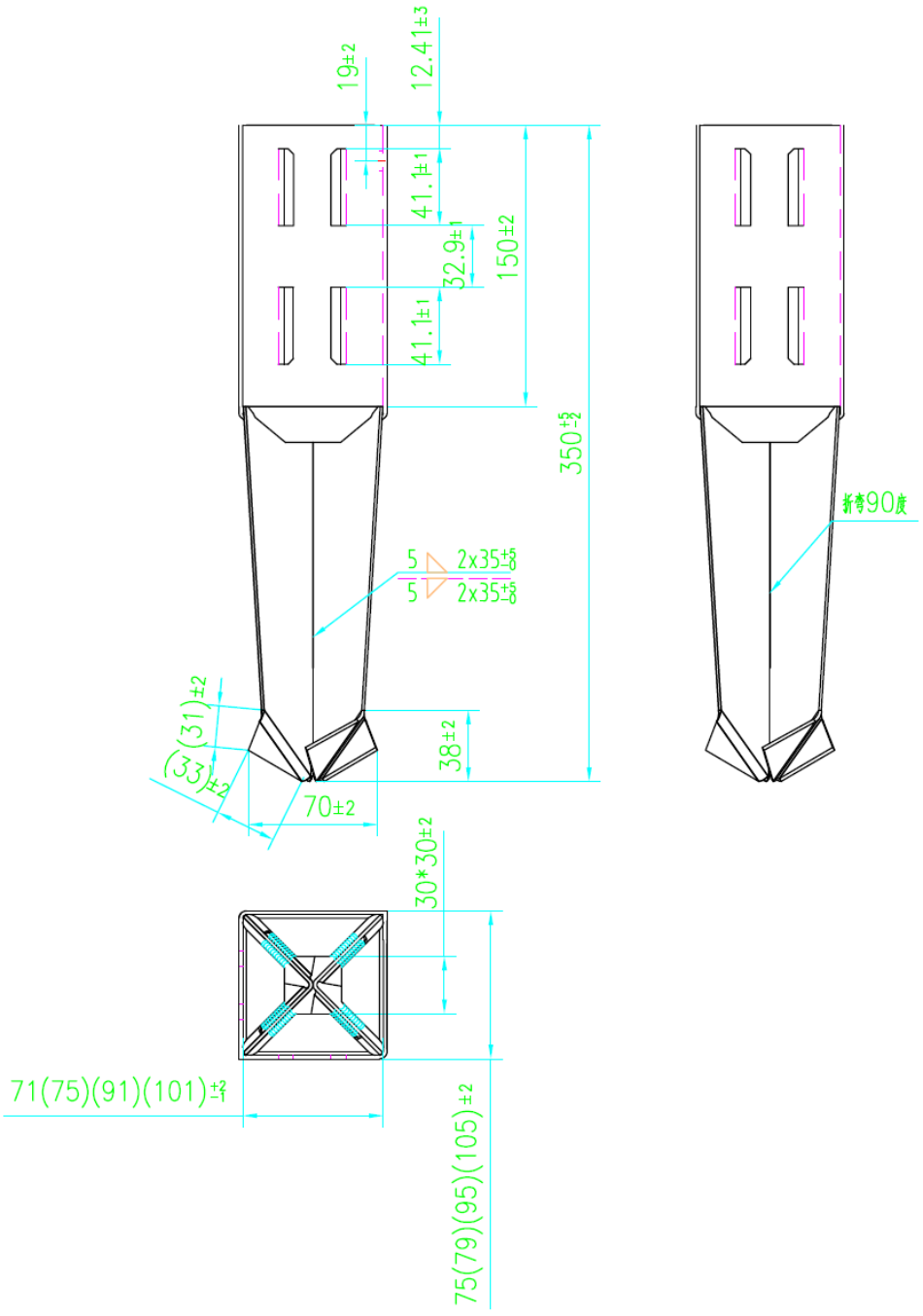

Figure 11 – Steel clamp type B, 71×71×150×350, 75×75×150×350, 91×91×150×350 and 101×101×150×350

Column shoe

Column Shoe type UA, Column Shoe type U, Column Shoe type UB, Column Shoe type LA, and Column Shoe type L are welded from pressed steel plates and ribbed reinforcement bars.

Table 6 – Column shoe type UA

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type UA	48×100×200×40	–	4 × screw Ø 8 mm	1 × bolt M10	48	100	200	40
	71×100×200×60	–			71	100	200	60
	75×90×200×60	–			75	90		
	81×100×200×60	–			81	100		
	91×100×200×60	–			91	100		
	100×90×200×60	–			100	90		
	101×100×200×60	–			101	100		
	121×100×200×60	–			121	100		

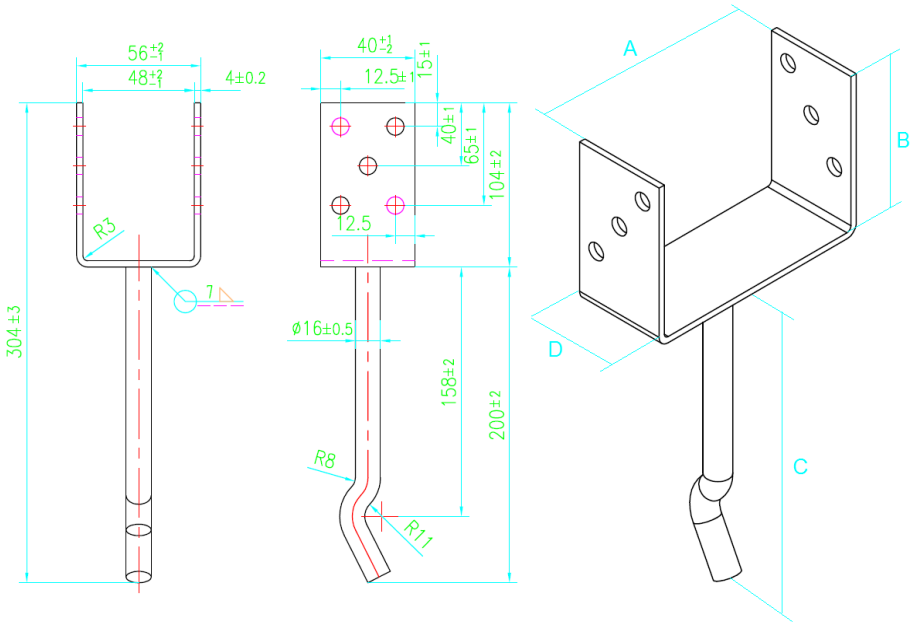

Figure 12 – Column shoe type UA, 48×100×200×40

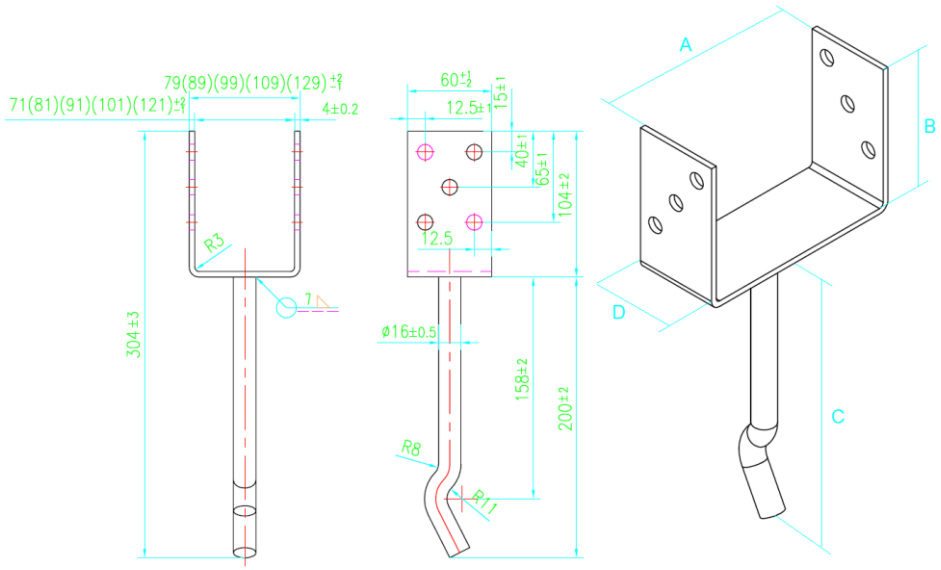

Figure 13 – Column shoe type UA, 71×100×200×60, 81×100×200×60, 91×100×200×60, 101×100×200×60 and 121×100×200×60

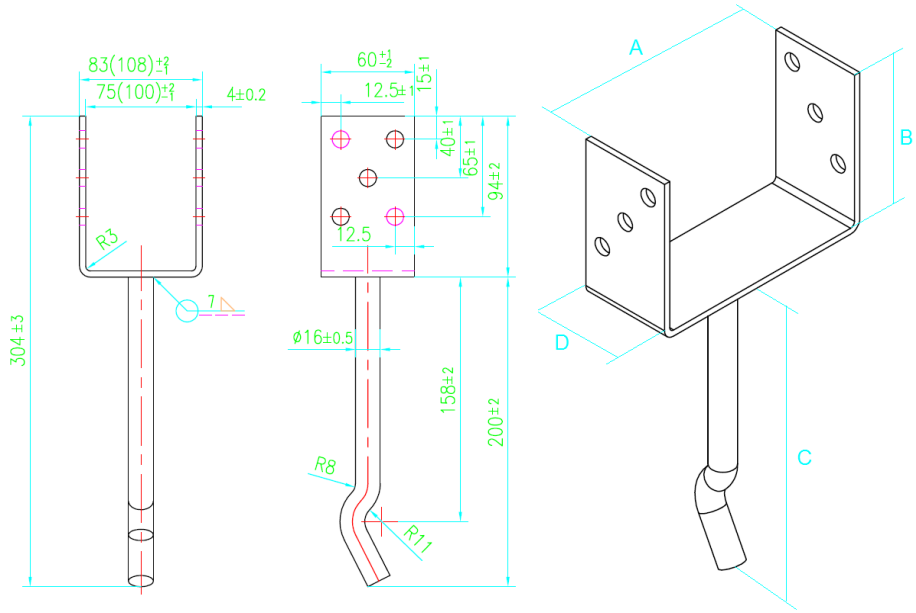

Figure 14 – Column shoe type UA, 75×90×200×60 and 100×90×200×60

Table 7 – Column shoe type U

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type U	48×100×200×40	–	4 × screw Ø 8 mm	1 × bolt M10	48	100	200	40
	71×100×200×60	–			71	100	200	60
	75×90×200×60	–			75	90		
	81×100×200×60	–			81	100		
	91×100×200×60	–			91	100		
	100×90×200×60	–			100	90		
	101×100×200×60	–			101	100		
	121×100×200×60	–			121	100		

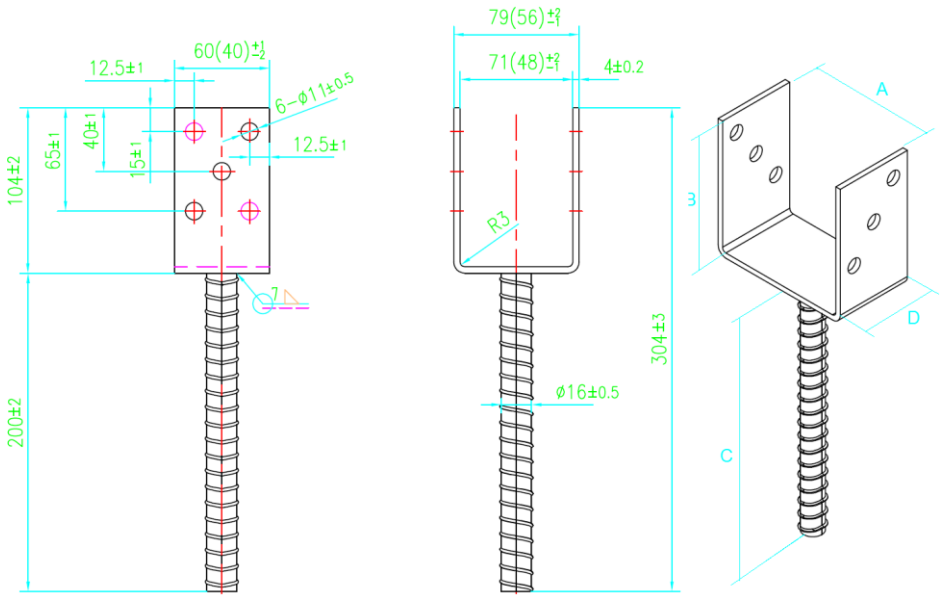

Figure 15 – Column shoe type U, 48×100×200×40, 71×100×200×60

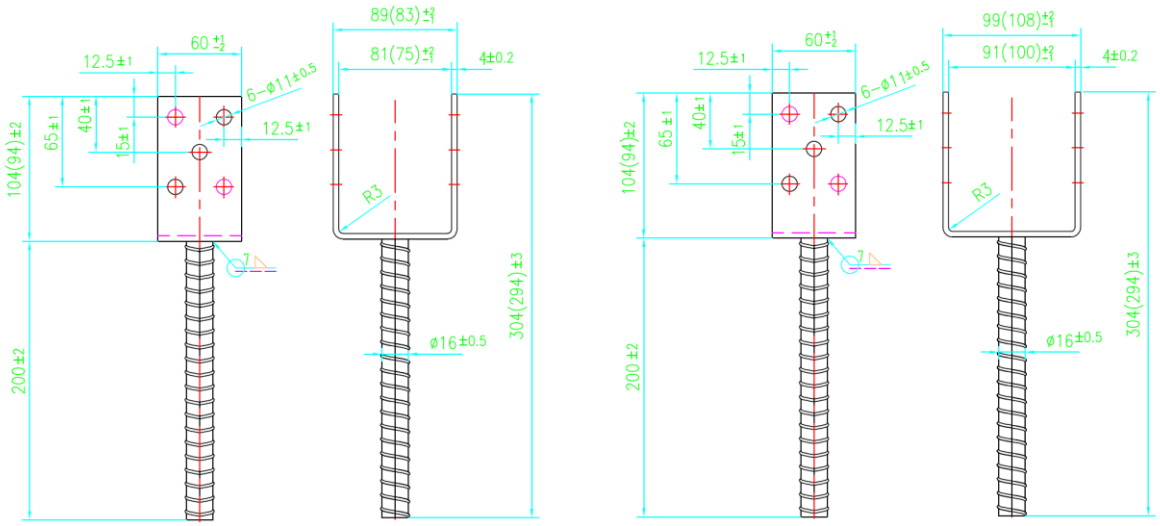

Figure 16 – Column shoe type U, 75×90×200×60, 81×100×200×60, 91×100×200×60 and 100×90×200×60

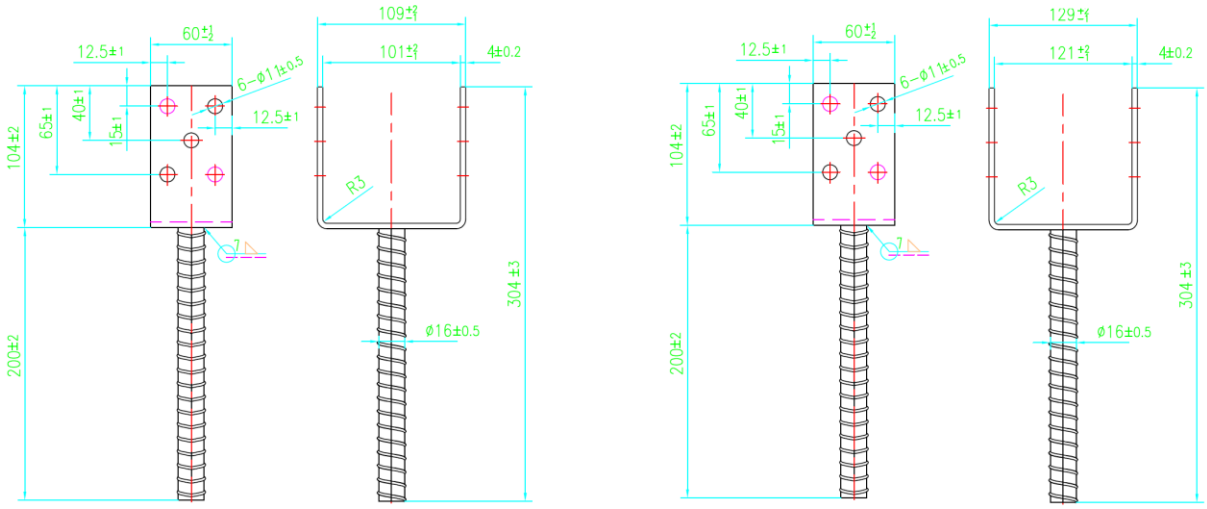

Figure 17 – Column shoe type U, 101×100×200×60 and 121×100×200×60

Table 8 – Column shoe type U

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type U	48×40×92×4.0×200×18	–	4 × screw Ø 4 mm	1 × bolt M10	48	40	92	200
	73×40×100×4.0×200×18	–			73	40	100	200
	98×50×100×4.0×200×18	–			98	50	100	200

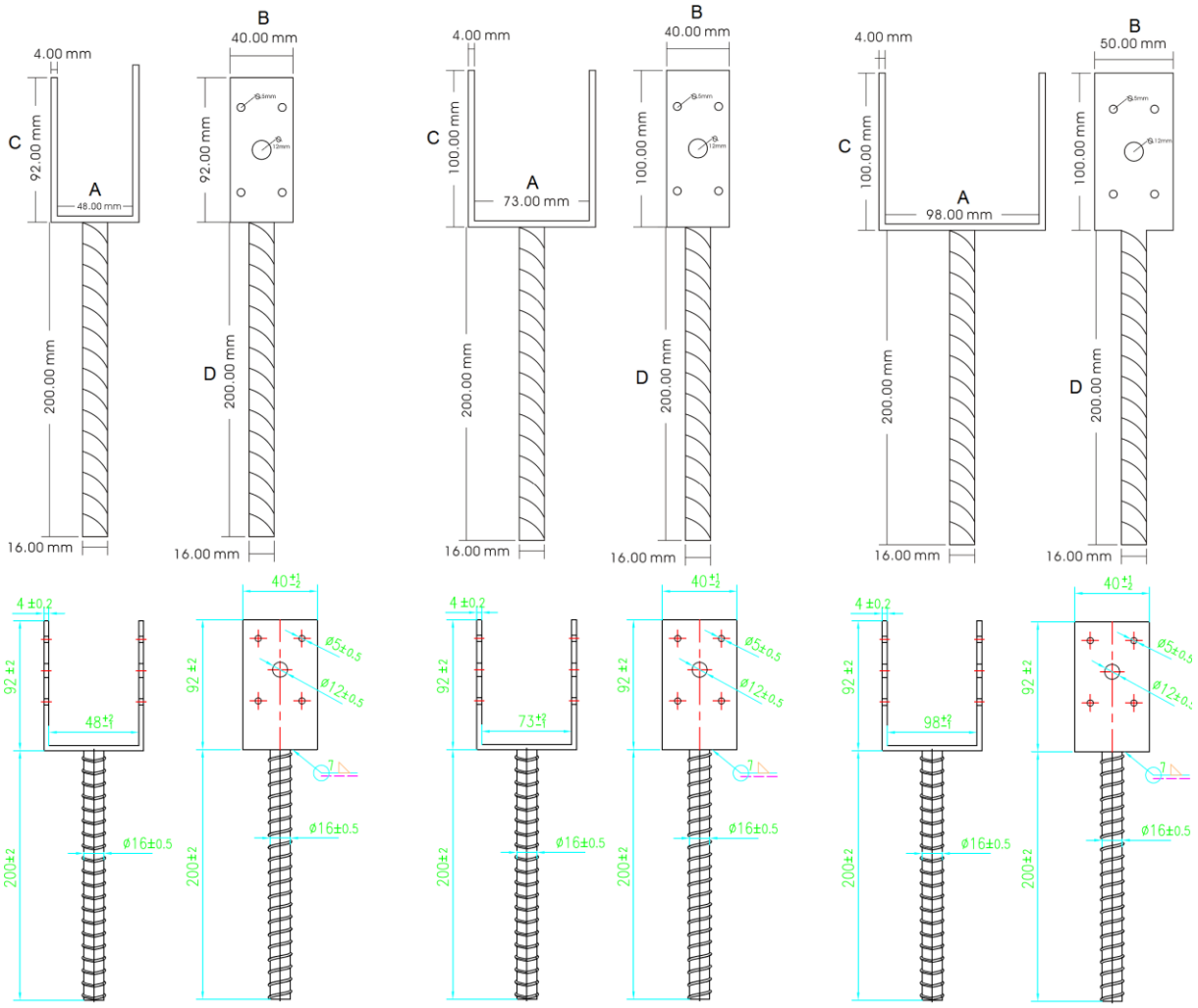

Figure 18 – Column shoe type U, 48×40×92×4.0×200×18, 73×40×100×4.0×200×18 and 98×50×100×4.0×200×18

Table 9 – Column shoe type UB

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type UB	71×200×200×50	–	–	2 × bolt M10	71	200	200	50
	81×200×200×50				81			
	91×200×200×50				91			
	101×200×200×50				101			

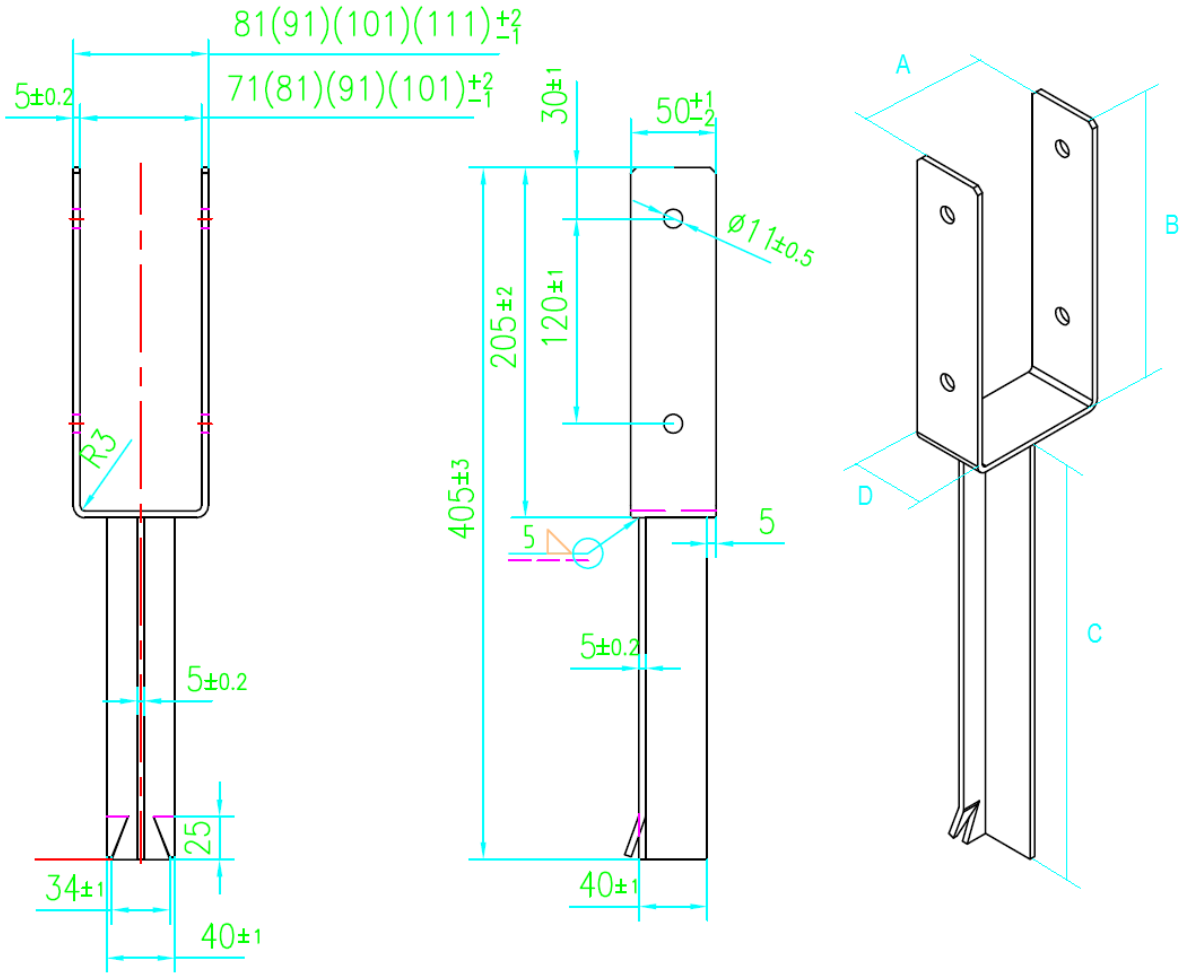

Figure 19 – Column shoe type UB, 71×200×200×50, 81×200×200×50, 91×200×200×50 and 101×200×200×50

Table 10 – Column shoe type LA and L

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type LA	80×100×200×60	–	2 × screw Ø 8 mm	1 × bolt M10	80	100	200	60
Column shoe type L	75×50×100×4.0×200×18	–	4 × screw Ø 4 mm		75	50	100	200
	80×100×200×60	–	2 × screw Ø 8 mm		80	100	200	60

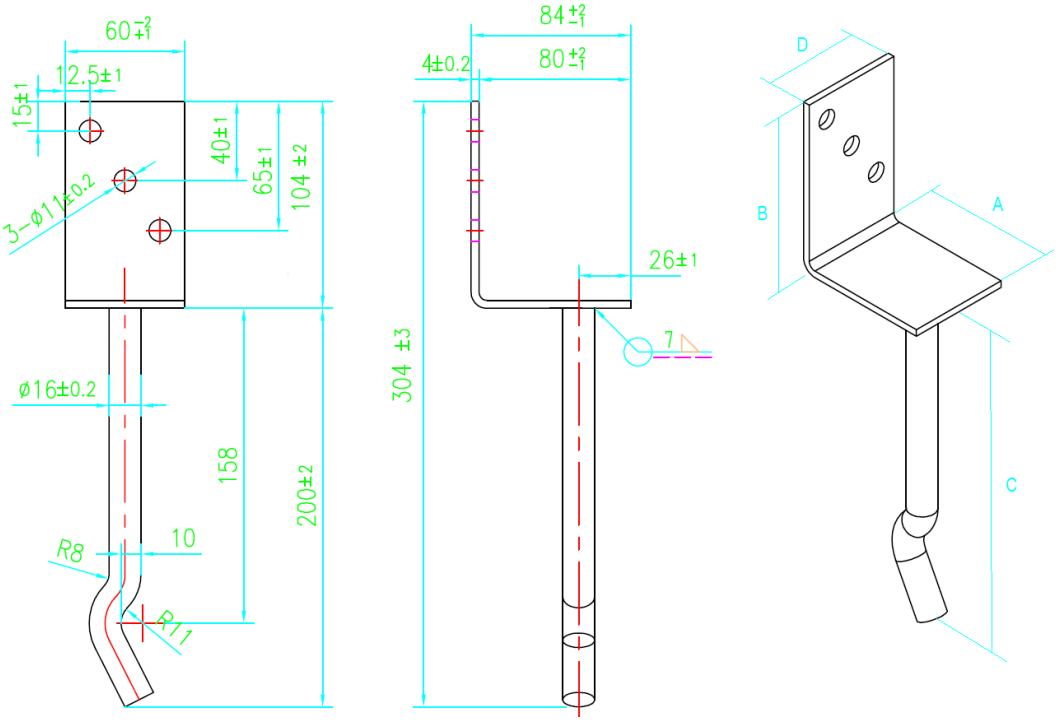

Figure 20 – Column shoe type LA, 80×100×200×60

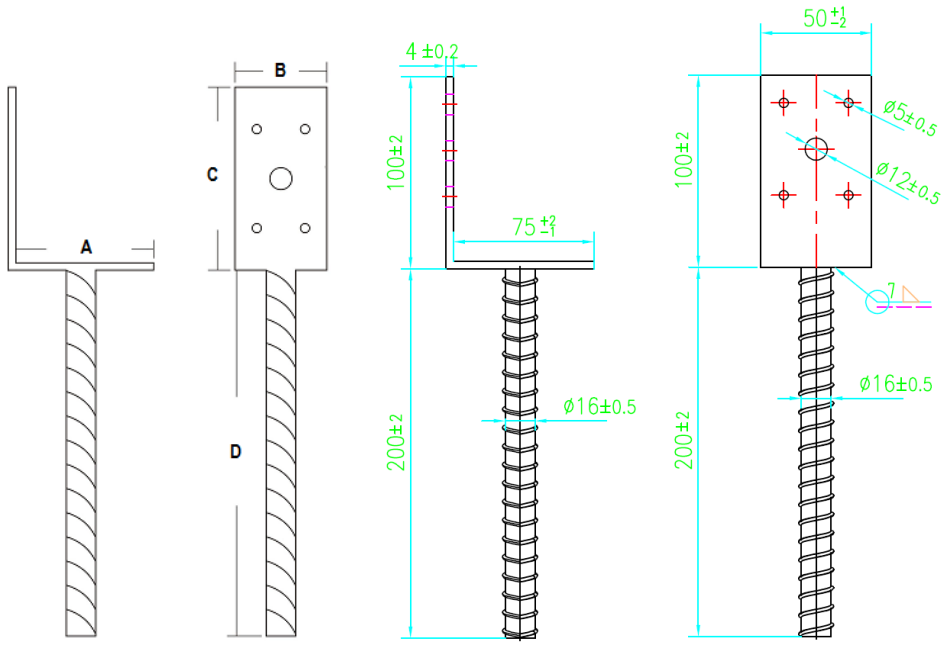

Figure 21 – Column shoe type L, 75×50×100×4.0×200×18

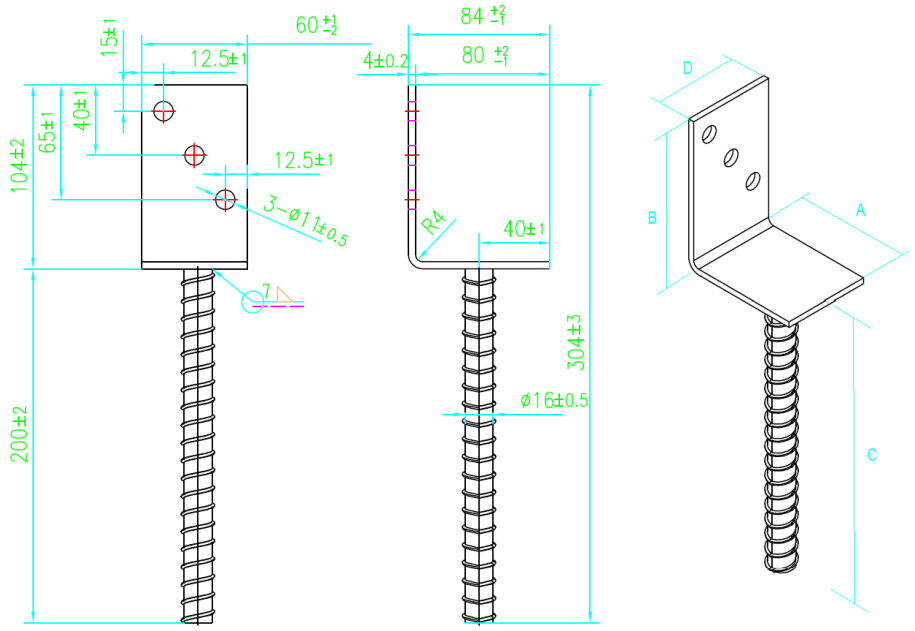

Figure 22 – Column shoe type L, 80×100×200×60

Heavy supporting shoe

Heavy supporting shoes are welded from steel plate, and hot dip galvanized or powder coating after pressing and welding

Table 11 – Heavy supporting shoe type TT

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Heavy supporting shoe type TT	71×200×60×50	3	–	2 × bolt M10	71	100	60	50
	81×200×60×50	3			81	100		
	91×200×60×50	3			91	90		
	101×200×60×50	3			101	100		

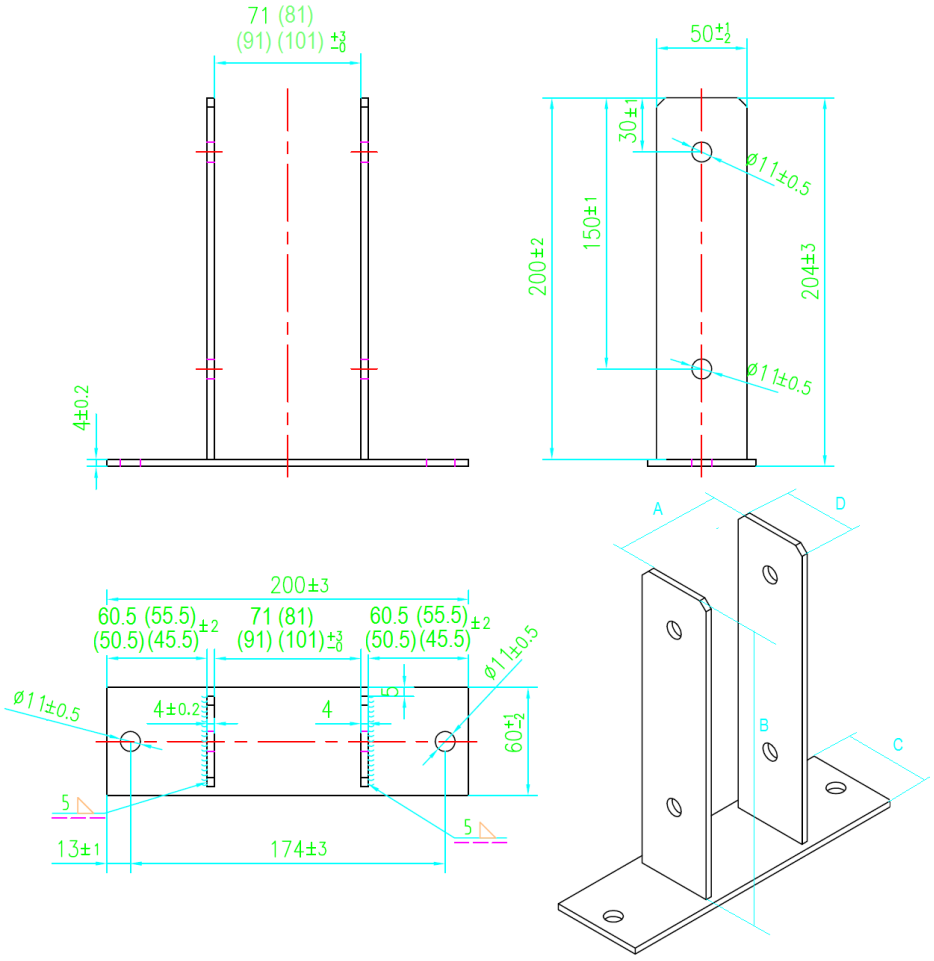

Figure 23 – Heavy supporting shoe type TT, 71×200×60×50, 81×200×60×50, 91×200×60×50 and 101×200×60×50

Table 12 – Heavy supporting shoe type H

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Heavy supporting shoe type H	71×300×600×60	–	–	2 × bolt M10	71	300	600	60
	81×300×600×60	–	–		81			
	91×300×600×60	–	–		91			
	101×300×600×60	–	–		101			
	115×300×600×60	–	–		115			
	121×300×600×60	–	–		121			
	141×300×600×60	–	–		141			

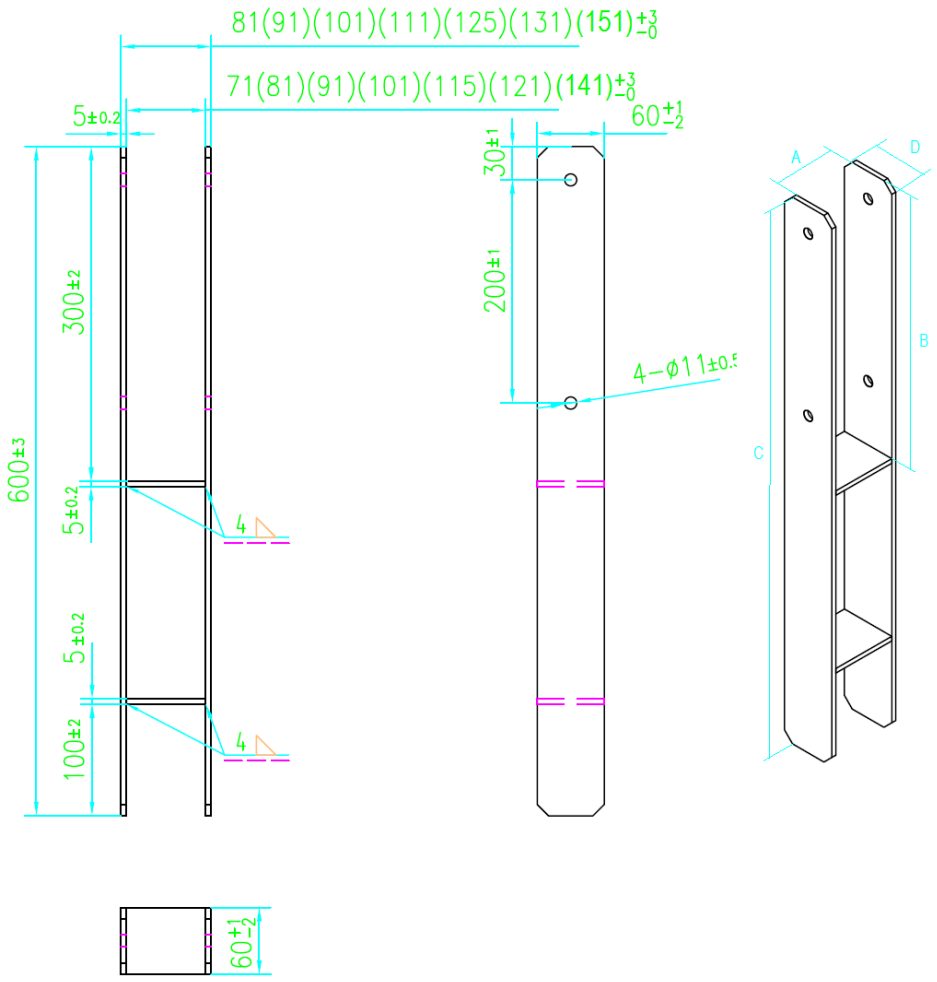

Figure 24 – Heavy supporting shoe type H, 71×300×600×60, 81×300×600×60, 91×300×600×60, 101×300×600×60, 115×300×600×60, 121×300×600×60 and 141×300×600×60

Column shoe type D

Column Shoe type D is one-piece non-welded three-dimensional nailing plates manufactured by pressing of raw steel.

Table 13 – Column shoe type D

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type D	71×150×100×60	3	4 × screw Ø 8 mm	1 × bolt M10	71	150	100	60
	81×150×100×60				81			
	91×150×100×60				91			
	101×150×100×60				101			

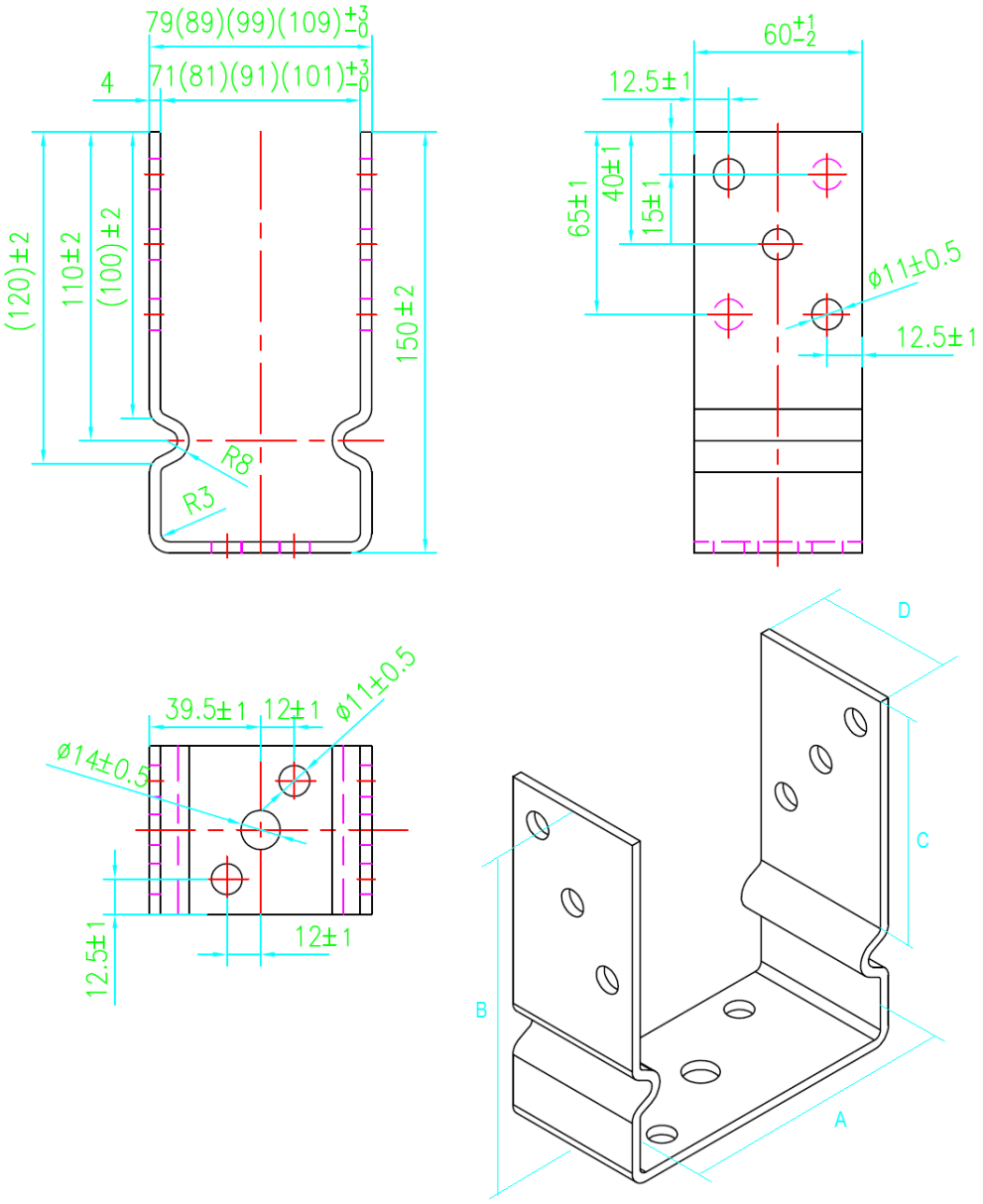

Figure 25 – Column shoe type D, 71×150×100×60, 81×150×100×60, 91×150×100×60 and 101×150×100×60

Adjustable column shoe
Adjustable column shoes are assembly from pressed steel plates, thread rods, nuts and steel pipes.

Table 14 – Adjustable column shoe type L and Adjustable column shoe type U

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Column shoe type L	70×60×92	–	2 × screw Ø 4 mm	1 × bolt M10	70	60		60
Column shoe type U	46×40×92	–			46	40		
	71×40×92	–	2 × screw Ø 8 mm		71	40		
	96×60×92	–			96	60		

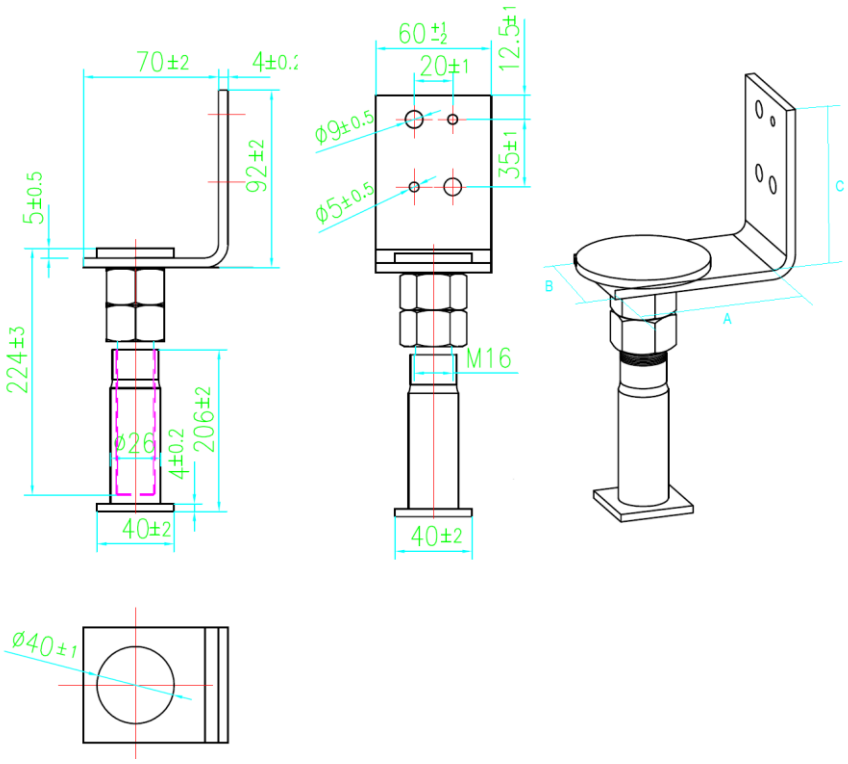

Figure 26 – Adjustable column shoe type L, 70×60×92

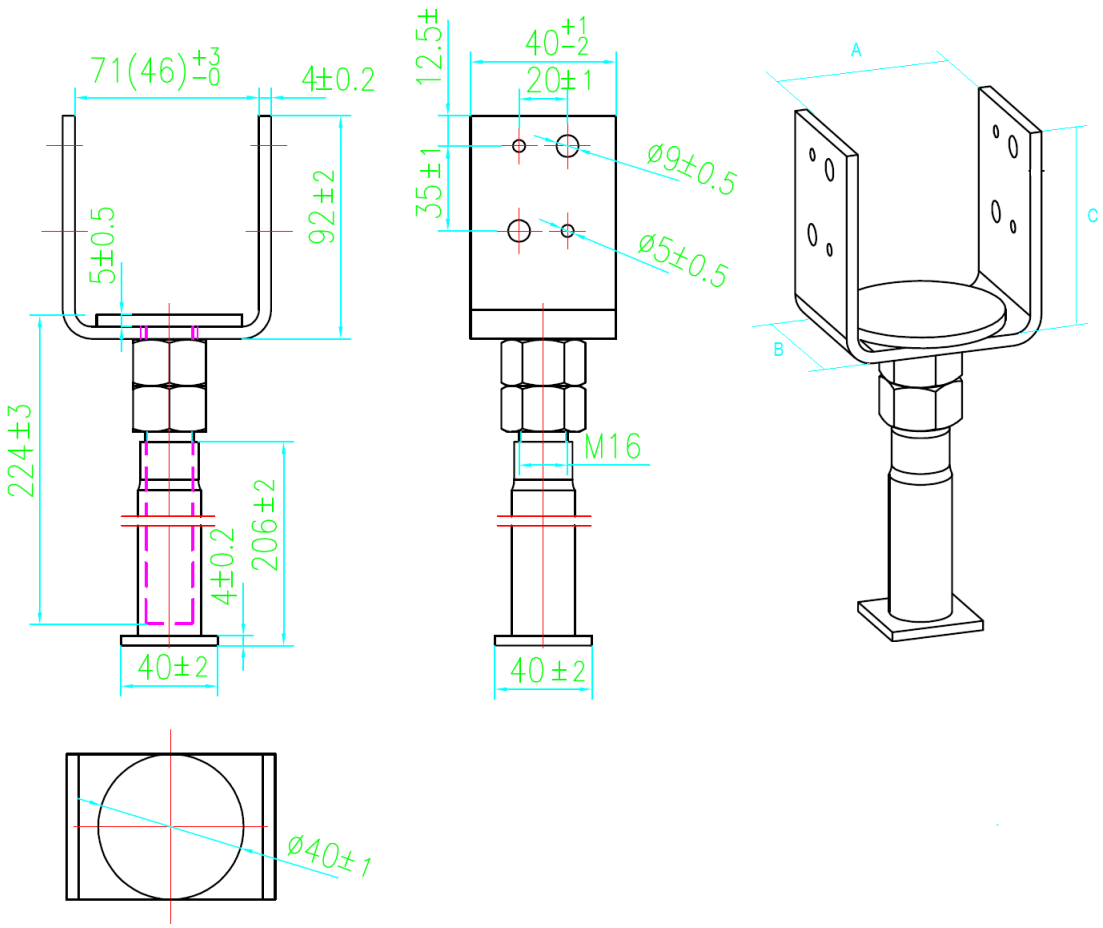

Figure 27 – Adjustable column shoe type U, 46×60×92 and 71×60×92

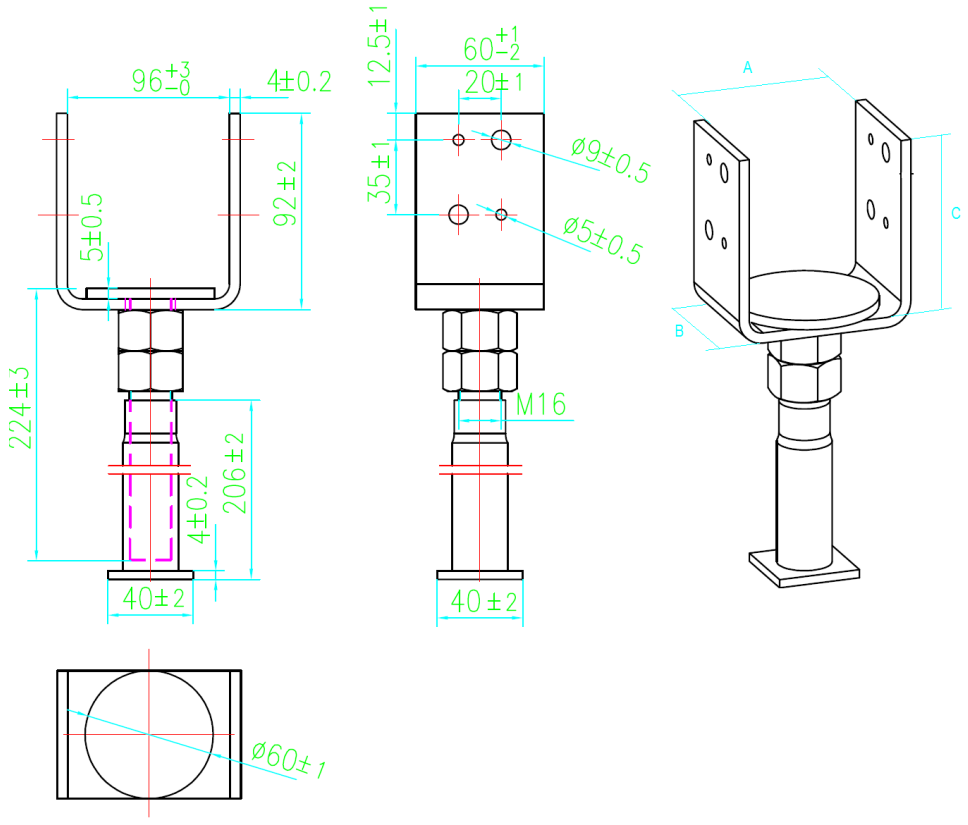

Figure 28 – Adjustable column shoe type U, 96×60×92

Bracket type A and bracket type B
Bracket type A and bracket type B are welded from steel plate, and hot dip galvanized with or powder coating after pressing and welding

Table 15 – Pole brackets type A and B

Type	Variant	Fasteners			Dimensions (mm)		
		Number of anchor for use in concrete	Screw	Bolt	A	B	C
Pole bracket type A	71×71×150	6	–	2 × bolt M10	71	71	150
	91×91×150		–		91	91	
Pole bracket type B	71×71×150		–		71	71	
	91×91×150		–		91	91	

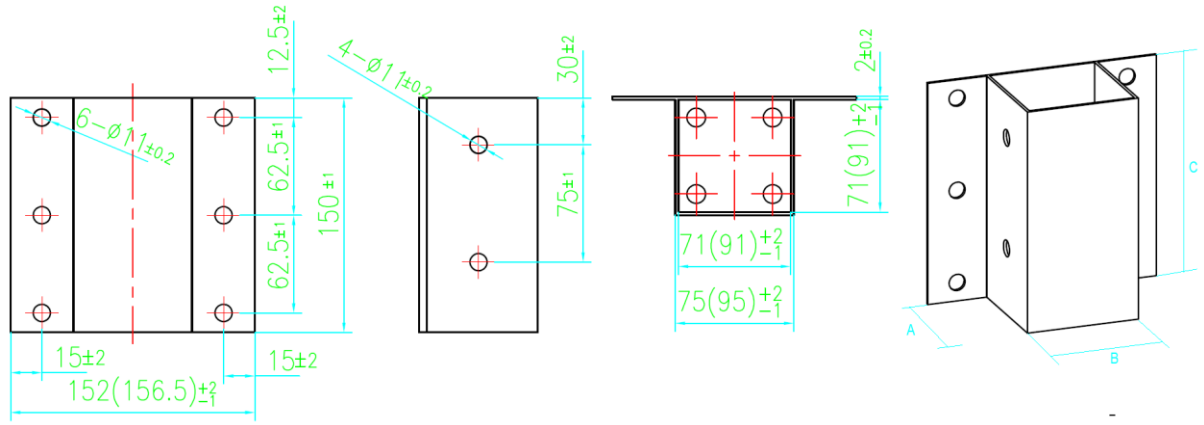

Figure 29 – Pole brackets type A, 71×71×150 and 91×91×150

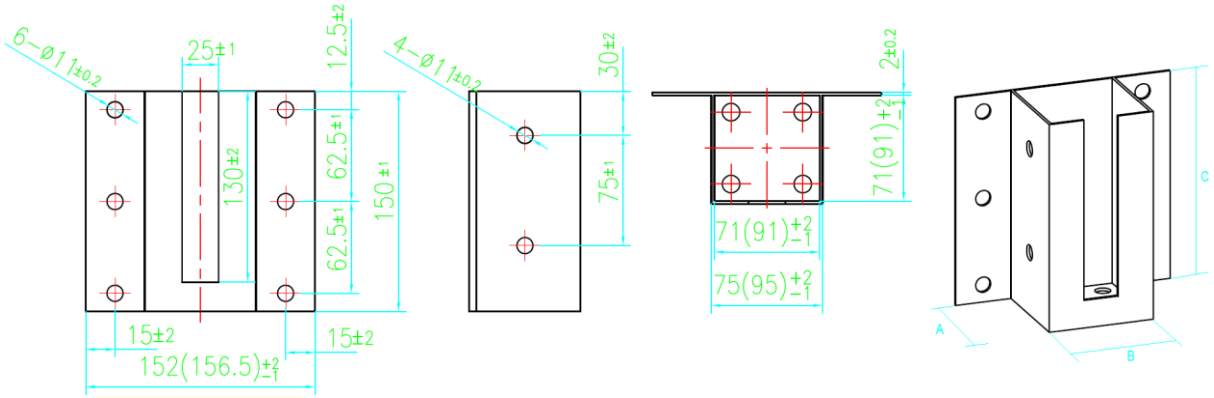

Figure 30 – Pole brackets type B, 71×71×150 and 91×91×150

Mini-L brackets
Mini-L brackets are assembly from pressed steel plates and screws

Table 16 – Mini-L bracket type A and B

Type	Variant	Fasteners			Dimensions (mm)			
		Number of anchor for use in concrete	Screw	Bolt	A	B	C	D
Mini-L bracket type A	83×33×30×37	–	2 × screw Ø 8 mm	–	83	33	30	37
Mini-L bracket type B	116×32×30×72	–	1 × screw Ø 8 mm 4 × screw Ø 4 mm	–	116	32	30	72

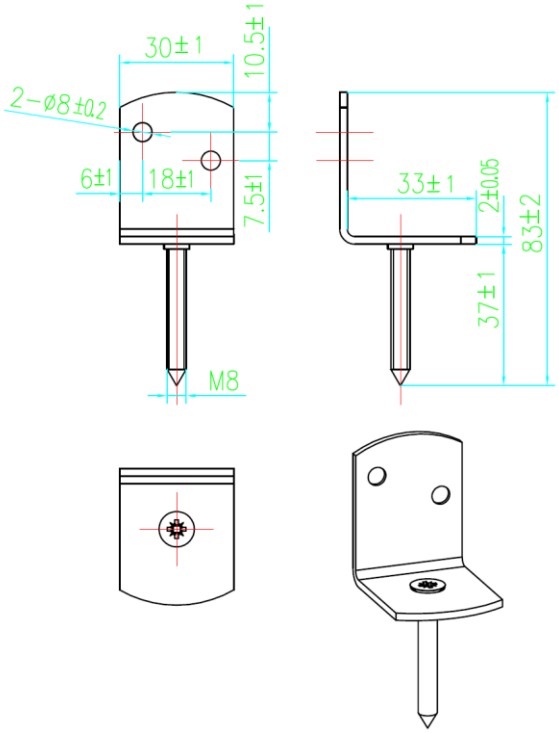

Figure 31 – Mini-L bracket type A, 83×33×30×37

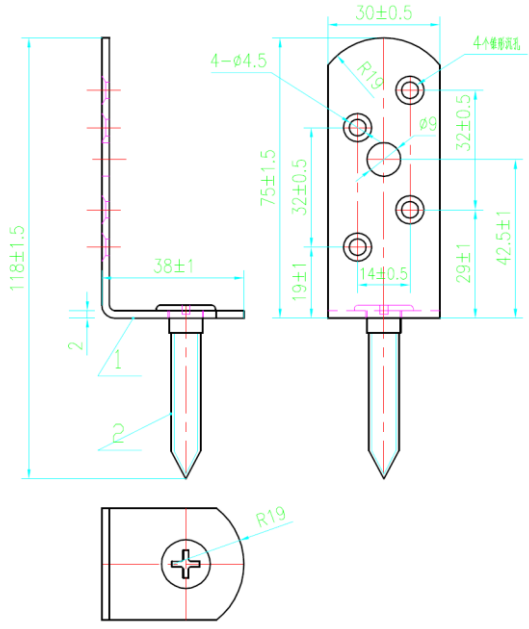

Figure 32 – Mini-L bracket type B, 116×32×30×72

Bracket type D and Column anchor strap

Bracket type D and Anchor Strap is one-piece non-welded three-dimensional nailing plates manufactured by pressing of raw steel.

Table 17 – Bracket type C and D (fence making metal-works) and Column anchor strap

Type	Fasteners			Dimensions (mm)
	Number of anchor for use in concrete	Screw	Bolt	
Bracket type D	–	10 × screw Ø 4 mm	–	According to Figure 32
Column anchor strap	–	4 × screw Ø 4 mm		According to Figure 33

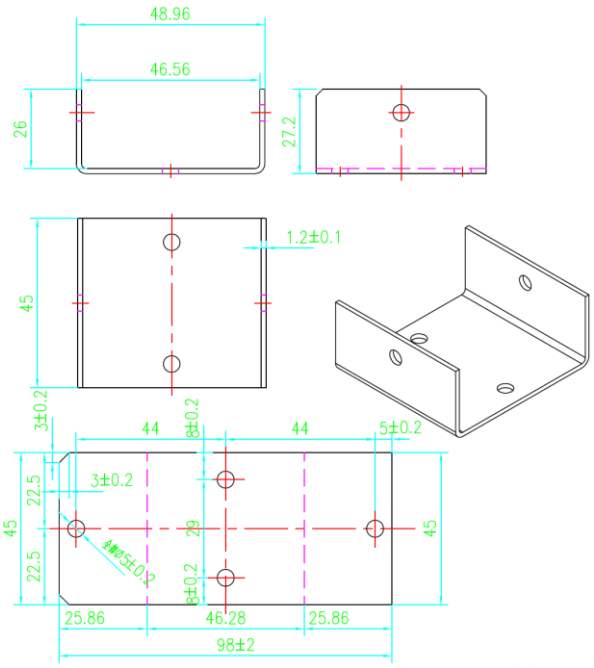

Figure 33 – Bracket type D

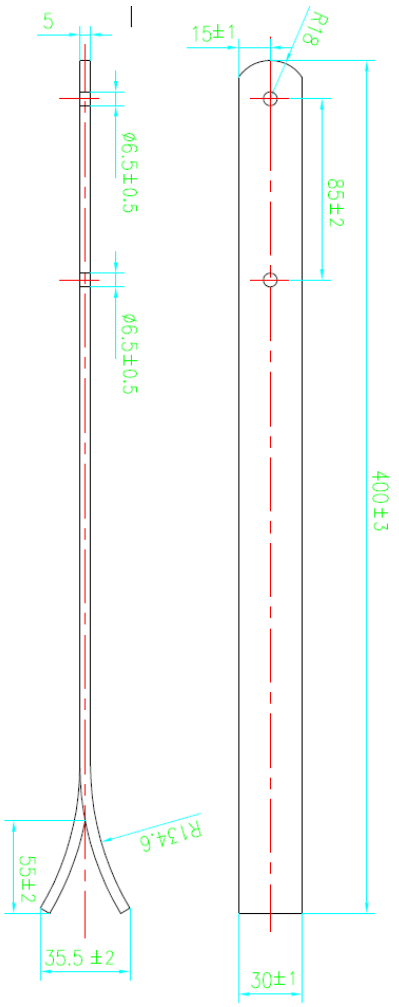

Figure 34 – Column anchor strap

Annex 2

Specification of fasteners

Fasteners used in service class 2 should have an electroplated zinc coating according to EN ISO 2081 at least of type and thickness Fe/Zn 12c, or they shall be hot dip zinc coated according to EN ISO 1461, thickness at least 39 µm.

Fasteners used in service class 3 should have an electroplated zinc coating according to EN ISO 2081 at least of type and thickness Fe/Zn 25c, or they shall be hot dip zinc coated according to EN ISO 1461, thickness at least 49 µm.

Bolts should have washers. Washers for wood constructions according to EN 14592 or DIN 440 should be used when in direct contact with wood or wood based member. Bolts can be replaced by screws with same diameter (metric thread) according to DIN 931 or DIN 933.

Table 18 – Specification of metal fasteners according to EN 14592 and DIN 571 and metal anchor to use in concrete

Fastener type	Size			Material
	Diameter Ø (mm)	**Length *L*** (mm)	**Threaded length L_t** (mm)	
Bolt M10	10	70 to 140	min. 40	$f_{u,k} \geq 360$ N/mm^2
Screw *)	10	50	35	
Screw *)	10	70	45	
Screw *)	10	100	60	
Screw *)	8	50	30	
Screw *)	8	90	60	
Screw	4	20	40	
Screw	4	40	40	
Anchor to use in concrete	Metal anchor ended with metric M10 thread, characteristic anchor tension resistance (pull out capacity form concrete) should be at least 17,5 kN, concrete class C 25/30.			
*) Fasteners according to DIN 571.				

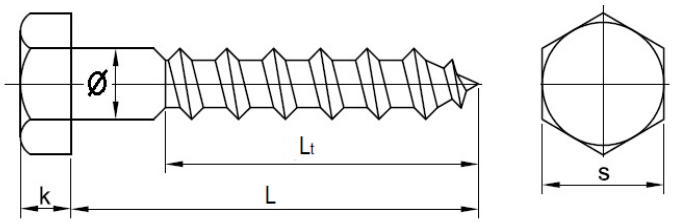

Figure 35 – Screw according to DIN 571

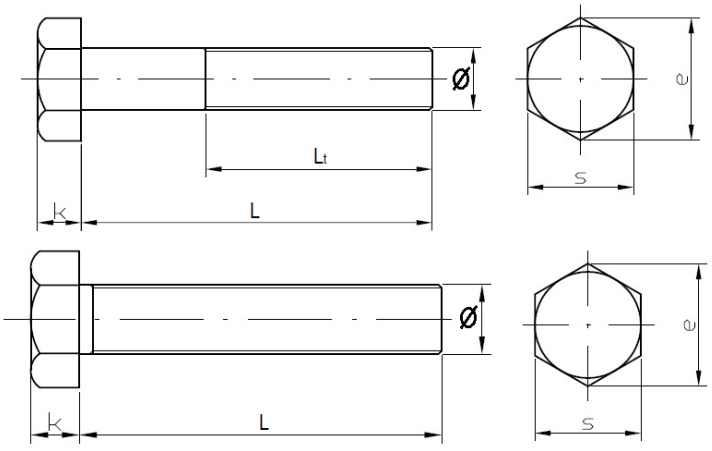

Figure 36 – Screw according to DIN 931 and DIN 933

Annex 3

Characteristic load-carrying capacities

Definition of forces and their directions

Compression load F_{Z1} and tensile load F_{Z2}
The axial force (tension or compression) acting along the central axis of the joint

Horizontal Load F_{H1}
Horizontal load is parallel to the side plates of the connector base and perpendicular to the fasteners. Force acting with the lever arm $e_{F,h}$ above the foundation.

Horizontal Load F_{H2}
Horizontal load is perpendicular to the side plates of the connector base and parallel to the fasteners. Force acting with the lever arm $e_{F,h}$ above the foundation.

Combination of loads
The following requirement shall be fulfilled if the forces from two different directions act at the same time:

$$\frac{F_{1(2),d}}{R_{1(2),d}} + \frac{F_{3/4(5/6),d}}{R_{3/4(5/6),d}} \leq 1$$

where
$F_{1(2),d}$ is design vertical force;
$R_{1(2),d}$ is design vertical resistance;
$F_{3/4(5/6),d}$ is design horizontal force;
$R_{3/4(5/6),d}$ is design horizontal resistance.

Characteristic load-carrying capacities, directions of acting forces and loads limitations due to fasteners placement

The characteristics given in following tables are based on calculation method supported by test result for timber class C 24, concrete class C 25/30, steel material characteristics given in clause 1 and fasteners defined in Annex 2.

Table 19 – Characteristic load-carrying capacities for Ground plate type A and type B

Type	Variant	F_1 **Compression** (kN)	F_2 [1] **Tension** (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	**Min. timber component cross-section** (mm × mm)
Ground plate type A	51×51×150	52,50	1,40	4,33	4,33	77	50 × 50
	61×61×150	75,60	1,60				60 × 60
	71×71×150	102,90	2,00				70 × 70
	75×75×150	114,96	2,20	6,54	6,54		74 × 74
	81×81×150	134,40	2,60				80 × 80
	91×91×150	170,10	3,40				90 ×90
	95×95×150	185,55	4,00				94 × 94
	101×101×150	210,00	4,40				100 × 100
	105×105×150	227,13	5,50	11,68	11,68		104 × 104
Ground plate type B	71×71×150	102,90	2,00	9,40	9,40	77	70 × 70
	91×91×150	170,10	3,40	15,61	15,61		90 × 90

[1] Only connectors according to Figure 37 can be installed in case of F_2.

Table 20 – Characteristic load-carrying capacities for Ground plate type C

Type	Variant	F_1 Compression (kN)	F_2 [1] Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Ground plate type C	51×51×150	52,50	NPD	4,33	4,33	77	50 × 50
	61×61×150	75,60					60 × 60
	71×71×150	102,90					70 × 70
	75×75×150	114,96		6,54	6,54		74 × 74
	91×91×150	170,10					90 × 90
	95×95×150	185,55					94 × 94
	101×101×150	210,00					100 × 100
	105×105×150	227,13		11,68	11,68		104 × 104

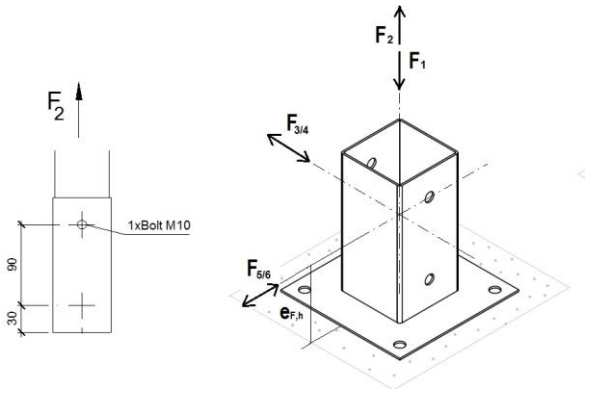

Figure 37 – Force directions for ground plate type A, type B, type C and allowed fasteners in case of application F_2

Table 21 – Characteristic load-carrying capacities for Steel clamp type A

Type	Variant	F_1 Compression (kN)	F_2 [1] Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Steel clamp type A	71×71×150×350	47,55	11,90	7,26	7,26	125	70 × 70
	75×75×150×350						74 × 74
	91×91×150×350	45,70					90 × 90
	101×101×150×350			12,18	12,18		100 × 100
[1] Only connectors according to Figure 38 can be installed in case of F_2							

Table 22 – Characteristic load-carrying capacities for Steel clamp type B

Type	Variant	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Steel clamp type B	71×71×150×350	64,23	NPD	7,18	7,18	125	70 × 70
	75×75×150×350	47,96					74 × 74
	91×91×150×350						90 × 90
	101×101×150×350			12,74	12,74		100 × 100

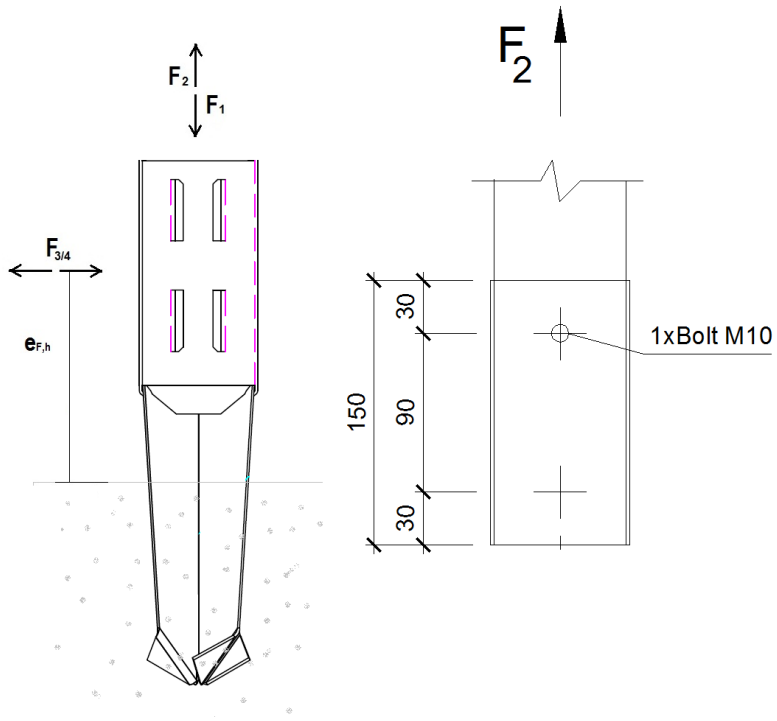

Figure 38 – Force directions for Steel clamp type A, type B and allowed fasteners in case of application F_2

Table 23 – Characteristic load-carrying capacities for Column shoe type UA

Type	Variant	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type UA	48×100×200×40	40,32	NPD	2,00	0,50	94	47 × 47
	71×100×200×60	62,00			0,75		70 × 70
	75×90×200×60						74 × 74
	81×100×200×60						80 × 80
	91×100×200×60						90 × 90
	100×90×200×60						99 × 99
	101×100×200×60						100 × 100
	121×100×200×60						120 × 120
NOTE The minimal thickness of concrete substructure should be 245 mm. Connector should be placed at least 200 mm from edges of the concrete substructure.							

Table 24 – Characteristic load-carrying capacities for Column shoe type U

Type	Variant	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type U	48×100×200×40	40,32	NPD	2,00	0,50	94	47 × 47
	71×100×200×60	62,00			0,75		70 × 70
	75×90×200×60						74 × 74
	81×100×200×60						80 × 80
	91×100×200×60						90 × 90
	100×90×200×60						99 × 99
	101×100×200×60						100 × 100
	121×100×200×60						120 × 120
NOTE The minimal thickness of concrete substructure should be 245 mm. Connector should be placed at least 200 mm from edges of the concrete substructure.							

Table 25 – Characteristic load-carrying capacities for Column shoe type U

Type	Variant	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type U	48×40×92×4.0×200×18	40,32	NPD	2,00	0,50	90	47 × 47
	73×40×100×4.0×200×18	61,32					72 × 72
	98×50×100×4.0×200×18	62,00					97 × 97
NOTE The minimal thickness of concrete substructure should be 245 mm. Connector should be placed at least 200 mm from edges of the concrete substructure.							

Table 26 – Characteristic load-carrying capacities for Column shoe type UB

Type	Variant	F_1 Compression (kN)	F_2 [1)] Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type UB	71×200×200×50	49,12	11,90	2,00	1,20	145	70 × 70
	81×200×200×50						80 × 80
	91×200×200×50						90 × 90
	101×200×200×50	52,95					100 × 100
NOTE The minimal thickness of concrete substructure should be 245 mm. Connector should be placed at least 200 mm from edges of the concrete substructure. [1)] Only connectors according to Figure 40 can be installed in case of F_2.							

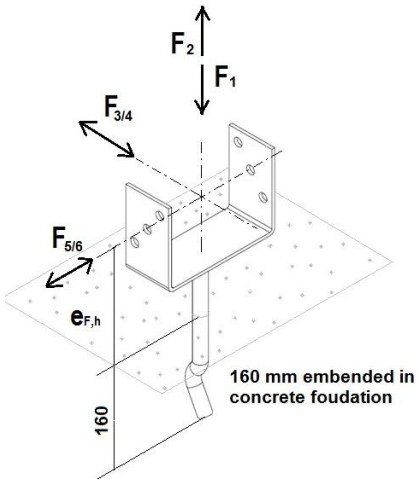

Figure 39 – Force directions for Column shoe type U, type UA and UB in general

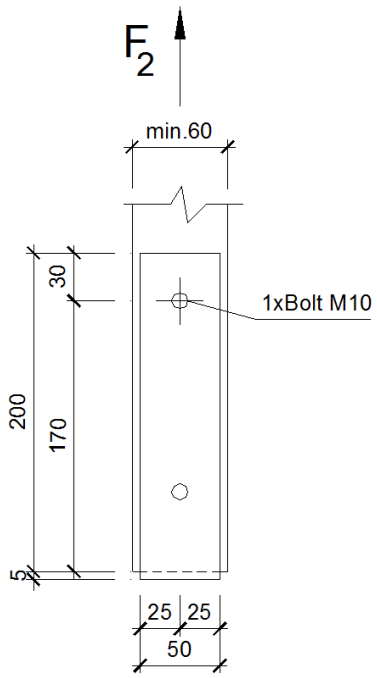

Figure 40 – Allowed fasteners for Column shoe type UB in case of application F_2

Table 27 – Characteristic load-carrying capacities for Column shoe type LA and L

Type	**Variant**	**F_1 Compression** (kN)	**F_2** [1] **Tension** (kN)	**$F_{3/4}$** (kN)	**$F_{5/6}$** (kN)	**$e_{F,h}$** (mm)	**Min. timber component cross-section** (mm × mm)
Column shoe type LA	80×100×200×60	62,00	NPD	2,00	NPD	94	80 × 80
Column shoe type L	75×50×100×4.0×200×18	55,38	1,77				75 × 75
	80×100×200×60	60,60	NPD				80 × 80

NOTE The minimal thickness of concrete substructure should be 245 mm. Connector should be placed at least 200 mm from edges of the concrete substructure.

[1] Only connectors according to Figure 41 can be installed in case of F_2.

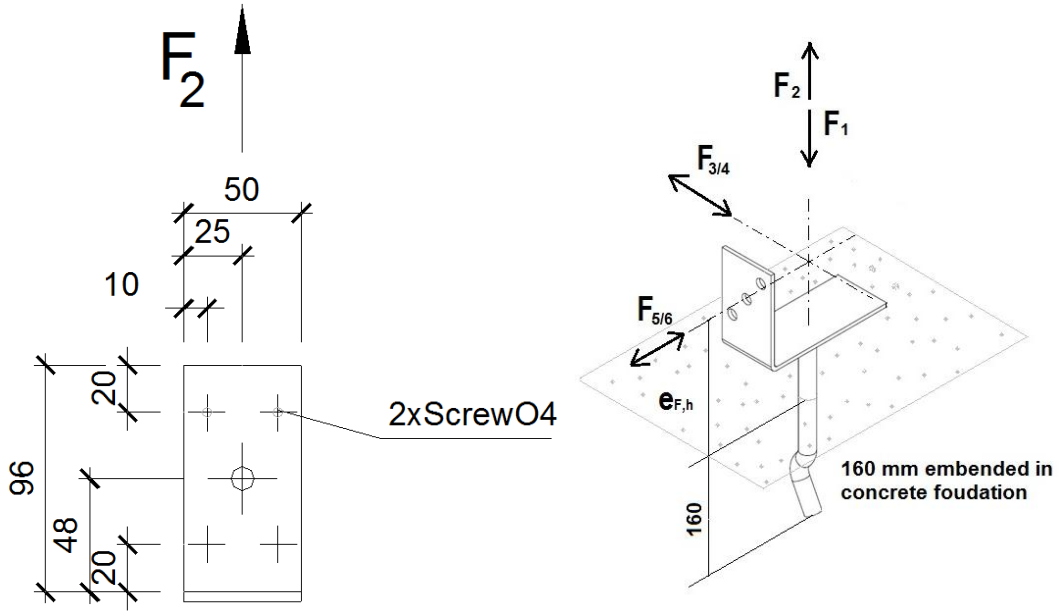

Figure 41 – Force directions for and allowed fasteners for Column shoe type L and type LA in case of application F_2

Table 28 – Characteristic load-carrying capacities for Heavy supporting shoe type TT

Type	**Variant**	**F_1 Compression** (kN)	**F_2** [1] **Tension** (kN)	**$F_{3/4}$** (kN)	**$F_{5/6}$** (kN)	**$e_{F,h}$** (mm)	**Min. timber component cross-section** (mm × mm)
Heavy supporting shoe type TT	71×200×60×50	83,40	1,50	4,18	1,20	104	70 × 70
	81×200×60×50		1,66				80 × 80
	91×200×60×50		1,90				90 × 90
	101×200×60×50	177,49	2,10	5,92			100 × 100

[1] Only connectors according to Figure 42 can be installed in case of F_2.

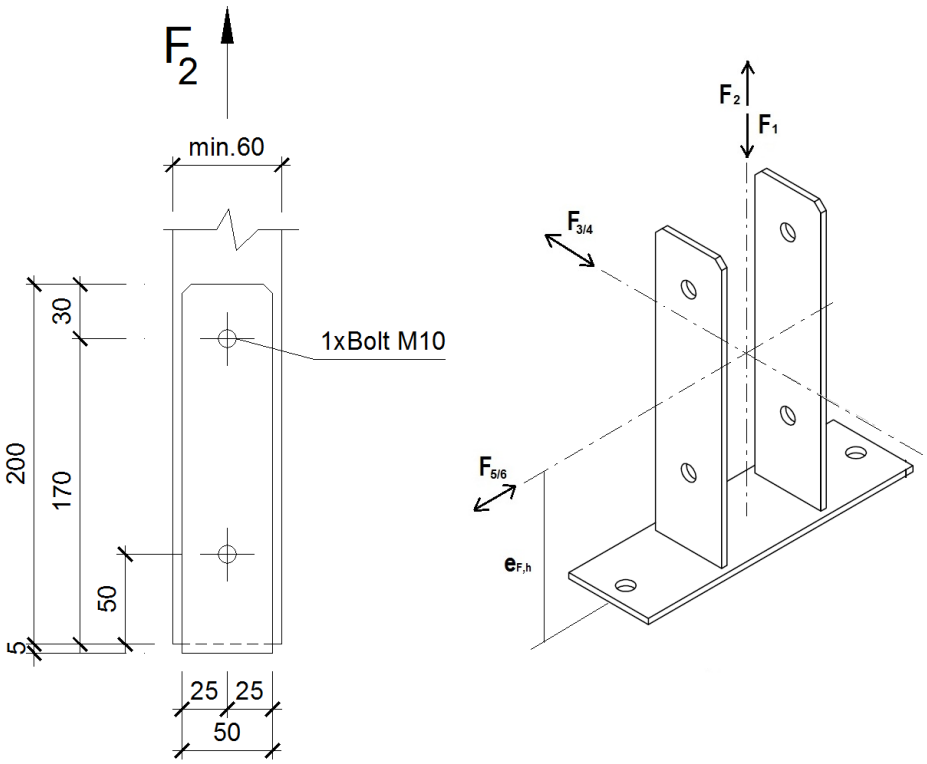

Figure 42 – Force directions and allowed fasteners for Heavy supporting shoe type TT in case of application F_2

Table 29 – Characteristic load-carrying capacities for Heavy supporting shoe type H

Type	**Variant**	F_1 **Compression** (kN)	F_2 [1] **Tension** (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	**Min. timber component cross-section** (mm × mm)
Heavy supporting shoe type H	71×300×600×60	31,32	11,90	7,62	0,76	320	70 × 70
	81×300×600×60						80 × 80
	91×300×600×60						90 × 90
	101×300×600×60	45,00		8,11			100 × 100
	115×300×600×60						114 × 114
	121×300×600×60						120 × 120
	141×300×600×60			8,52			140 × 140
[1] Only connectors according to Figure 43 can be installed in case of F_2.							

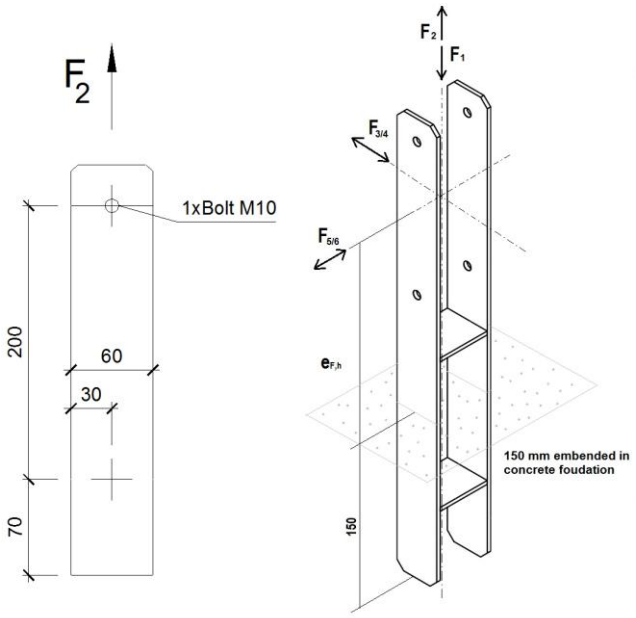

Figure 43 – Force directions and allowed fasteners for Heavy supporting shoe type H in case of application F_2

Table 30 – Characteristic load-carrying capacities for Column shoe type D

Type	Variant	F_1 Compression (kN)	F_2 [1] Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type D	71×150×100×60	58,08	NPD	5,42	0,37	110	70 × 70
	81×150×100×60						80 × 80
	91×150×100×60						90 × 90
	101×150×100×60						100 × 100
NOTE Force directions are given in Figure 42.							

Table 31 – Characteristic load-carrying capacities for Adjustable column shoe type L and Adjustable column shoe type U

Type	Variant	F_1 Compression (kN)	F_2 [1] Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Column shoe type L	70×60×92	19,41	NPD	1,35	NPD	max. 187	70 × 70
Column shoe type U	46×40×92				1,35		45 × 45
	71×40×92						70 × 70
	96×60×92						95 × 95
NOTE Force directions are given in Figure 39 and Figure 41.							

Table 32 – Characteristic load-carrying capacities for Pole brackets type A and B

Type	Variant	F_1 Compression (kN)	F_2 [1] Tension (kN)	F_3 (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Pole bracket type A	71×71×150	25,85	11,90	1,90	13,79	38	70 × 70
	91×91×150	46,51		2,80	14,61	48	90 × 90
Pole bracket type B	71×71×150	29,93		1,90	16,12	38	70 × 70
	91×91×150	42,58		2,80	30,31	48	90 × 90
[1] Only connectors according to Figure 44 can be installed in case of F_2							

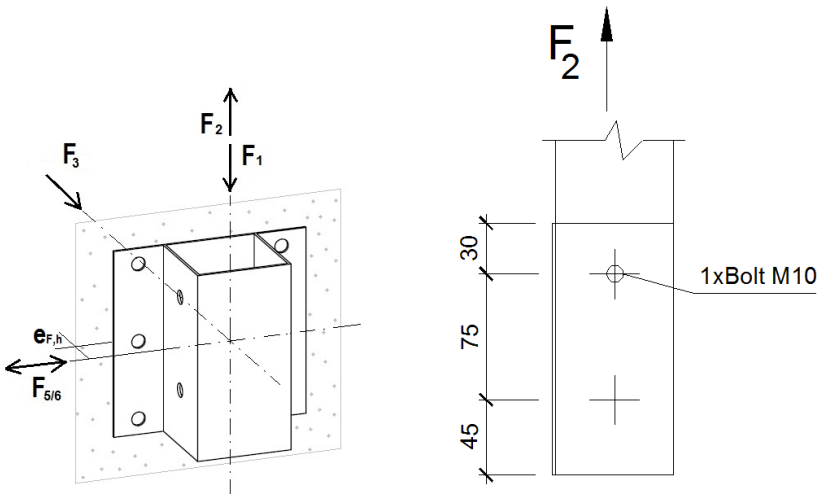

Figure 44 – Force directions and allowed fasteners for Pole brackets type A and type B in case of application F_2

Table 33 – Characteristic load-carrying capacities for Mini-L bracket type A and B

Type	Variant	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Mini-L bracket type A	83×33×30×37	NPD	NPD	1,23	1,52	23	45 × 45
Mini-L bracket type B	116×32×30×72			2,08	1,76	38	45 × 45

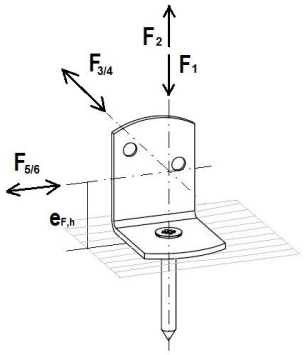

Figure 45 – Force directions for Mini-L bracket type A and type B

Table 34 – Characteristic load-carrying capacities Bracket type D and Column anchor strap

Type	F_1 Compression (kN)	F_2 Tension (kN)	$F_{3/4}$ (kN)	$F_{5/6}$ (kN)	$e_{F,h}$ (mm)	Min. timber component cross-section (mm × mm)
Bracket type D	NPD	NPD	1,77	1,85	14	45 × 45
Column anchor strap	11,99	NPD	3,09	NPD	180	45 × 45

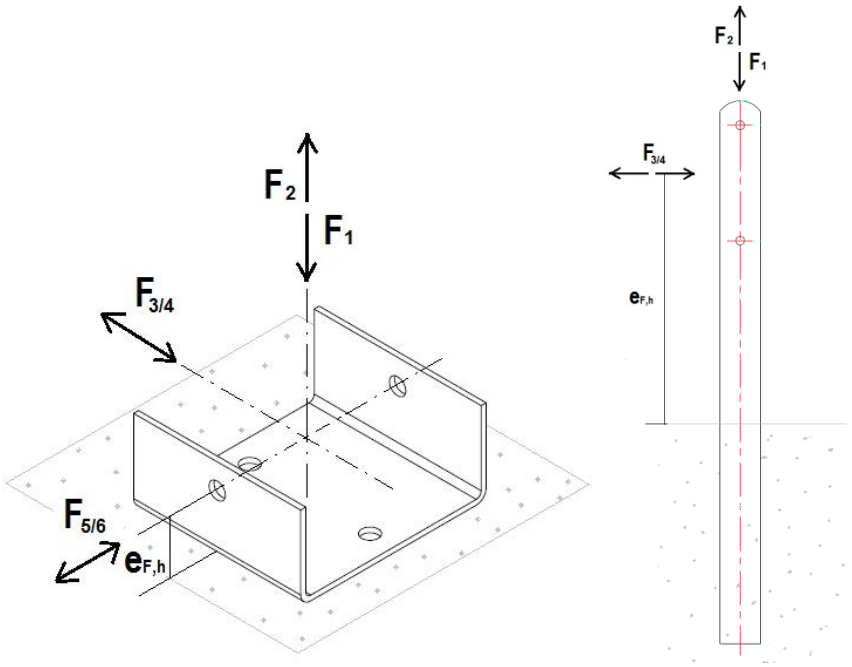

Figure 46 – Force directions for Bracket type D and Column anchor strap

Initial slip v_i and slip modulus k_s

Initial slip v_i and slip modulus k_s given in Table 35 are mean values of test results and calculations according to EN 26891. The given deformations have the same direction as acting forces.

Table 35 – Initial slip v_i and slip modulus k_s

Type	Variant	F_1 Compression		$F_{3/4}$		$F_{5/6}$	
		v_i (mm)	k_s (kN/mm)	v_i (mm)	k_s (kN/mm)	v_i (mm)	k_s (kN/mm)
Ground plate type A	51×51×150	2,63	15,45	3,31	1,27	3,31	1,27
	75×75×150	2,97	35,33	1,69	1,92	1,69	1,92
	105×105×150	5,20	41,37	1,81	3,62	1,81	3,62
Ground plate type B	71×71×150	1,30	33,1	2,17	1,98	2,17	1,98
	91×91×150	2,86	49,45	3,01	3,83	3,01	3,83
Ground plate type C	51×51×150	2,56	27,18	2,27	0,97	2,27	0,97
	75×75×150	2,45	41,08	1,62	2,19	1,62	2,19
	105×105×150	5,17	54,02	1,81	3,62	1,81	3,62
Steel clamp type A	71×71×150×350	3,30	7,35	1,71	2,08	1,71	2,08
	101×101×150×350	2,67	9,64	2,23	3,24	2,23	3,24
Steel clamp type B	71×71×150×350	1,80	12,48	1,99	2,09	1,99	2,09
	101×101×150×350	3,22	7,70	2,06	2,85	2,06	2,85
Column shoe type UA	48×100×200×40	2,23	7,72	2,36	0,89	–	–
	81×100×200×60	3,23	15,39	2,28	0,92	–	–
	121×100×200×60	4,05	11,41	2,66	0,79	–	–
Column shoe type U	48×100×200×40	1,27	28,14	2,50	0,67	–	–
	81×100×200×60	2,78	8,11	2,00	0,71	–	–
	121×100×200×60	3,50	8,73	2,01	0,73	–	–
Column shoe type U	48×40×92×4.0×200×18	1,15	10,46	2,34	0,69	–	–
	98×50×100×4.0×200×18	3,30	13,17	3,33	0,53	–	–
Column shoe type UB	71×200×200×50	2,49	9,94	2,32	0,70	–	–
	101×200×200×50	3,14	7,93	2,82	0,61	–	–
Column shoe type LA	80×100×200×60	2,67	15,40	2,94	0,67	–	–
Column shoe type L	75×50×100×4.0×200×18	2,94	21,95	3,02	0,51	–	–
	80×100×200×60	2,03	15,08	3,23	0,48	–	–
Heavy supporting shoe type TT	71×200×60×50	2,98	18,04	1,61	1,52	–	–
	101×200×60×50	3,42	37,52	1,60	1,63	–	–
Heavy supporting shoe type H	71×300×600×60	2,08	13,57	5,67	0,80	–	–
	101×300×600×60	2,36	11,11	4,82	0,89	–	–
	141×300×600×60	2,25	13,51	5,54	0,78	–	–
Column shoe type D	71×150×100×60	2,22	11,26	7,92	1,18	–	–
	101×150×100×60	3,40	8,48	3,91	1,05	–	–
Adjustable Column shoe type L	70×60×92	3,37	16,52	–	–	–	–
Adjustable Column shoe type U	46×40×92	2,06	9,40	–	–	–	–
	96×60×92	2,52	15,99	–	–	–	–
Pole bracket type A	71×71×150	1,57	7,45	4,92	1,38	–	–
	91×91×150	3,62	4,98	6,02	2,24	–	–
Pole bracket type B	71×71×150	3,64	5,03	2,64	4,76	–	–
	91×91×150	3,80	5,17	3,11	5,48	–	–
Mini-L bracket type A	83×33×30×37	2,02	0,59	4,23	0,20	–	–
Mini-L bracket type B	116×32×30×72	2,27	0,55	2,45	0,40	–	–
Bracket type D		2,18	0,45	3,51	0,30	–	–
Column anchor strap		1,20	5,22	2,45	0,61	–	–