Column Shoe PCC

European Technical Assessment
ETA-18/0785

PFEIFER

Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment ETA-18/0785 of 17 June 2020

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	PFEIFER-Column shoe PCC
Product family to which the construction product belongs	Column Shoe
Manufacturer	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 87700 Memmingen DEUTSCHLAND
Manufacturing plant	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 D-87700 Memmingen
This European Technical Assessment contains	13 pages including 4 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	EAD 200102-00-0302, Edition 06/2020

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Specific Part

1 Technical description of the product

The PFEIFER Column shoe PCC consists of a base plate and a side plate of steel, which are welded together. Anchor bars made of reinforcing steel are welded to the side plate.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The column shoes serve as connectors of e.g. between a reinforced concrete column and a foundation or between two reinforced concrete columns or between two reinforced concrete beams.

The performances given in Section 3 are only valid if the column shoe is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the column shoe of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Resistance to tension and shear loads	See Annex C1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire – steel temperature time table under fire exposure	See Annex C2

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

In accordance with the European Assessment Document EAD 200102-00-0302 the applicable European legal act is Commission Decision 2000/606/EC.

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 17 Jun 2020 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Baderschneider

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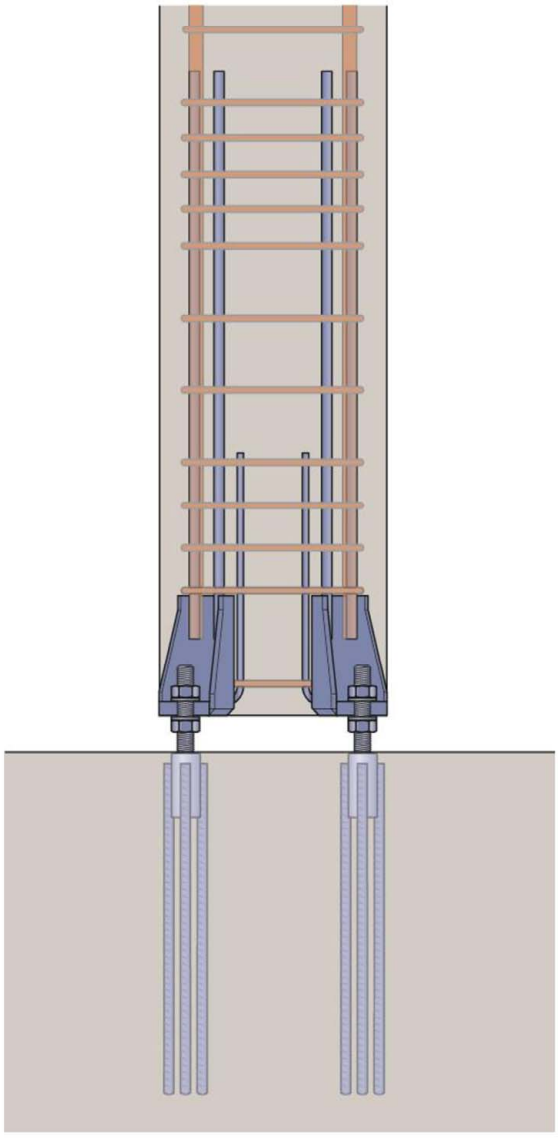

Fig. A1: Application example

Fig. A2: Column shoe

PFEIFER Column Shoe PCC	**Annex A1**
Product description Intended use, installed condition	

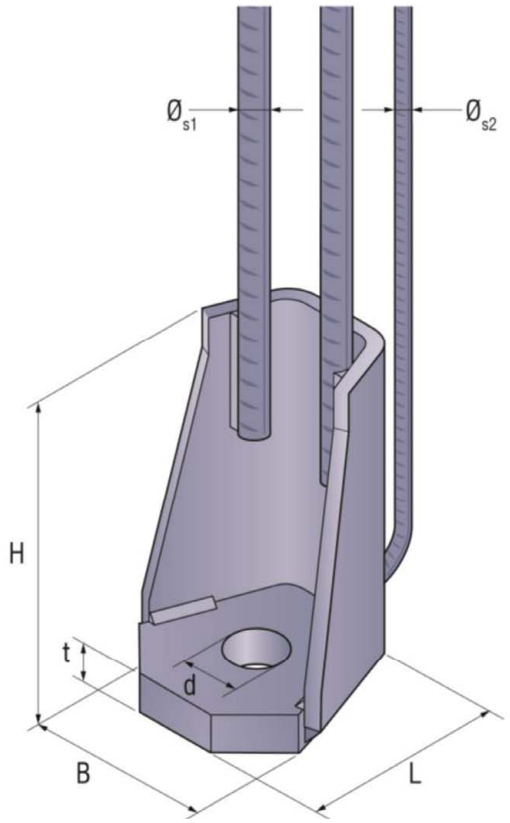

Fig. A3: Dimensions

Table A1: **Dimensions**

Column shoe PCC	**d**	**L**	**B**	**t**	**H**	**$Ø_{s1}$**	**$Ø_{s2}$**
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
16	28	90	89	15	145	12	8
20	30	95	97	20	170	14	8
24	35	100	100	25	190	16	10
30-1	40	112	119	30	230	20	12
30-2	45	121	119	35	250	25	16
36	53	119	132	40	285	28	20
39-1	55	125	136	35	285	28	14

PFEIFER Column Shoe PCC	**Annex A2**
Product description Dimensions	

Table A2: **Specifications, materials**

Reinforcing steel	Reinforcement B500B / B500C (heat-treaded from rolling heat) According to EN 1992-1-1:2004 + AC:2010, Annex C
Steel parts	S355 and S460 according to EN 10025-2:2004, EN 10025-3:2004 and EN 10025-4:2005

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Specifications of intended use

Loading

- static and quasi-static load
- tension loads, compression loads and shear loads or combination

Anchoring base material

- reinforced normal weight concrete of strength class C30/37 to C70/85 according to EN 1992-1-1:2004+AC:2010
- cracked or uncracked concrete

Use conditions (environmental conditions)

- without additional measures, column shoes made of blank steel and arranged flush with the concrete surface are intended to be used for dry internal conditions only
- EN 1992-1-1:2004+AC:2010, section 4 applies to column shoes, that are planned to be installed with concrete cover
- the lowest temperature in use is -20°C

Design

- the design of column shoes connections is carried out under the responsibility of an engineer experienced in the field of structural design and concrete constructions
- the design is based on the TR 068
- verifiable calculations and construction drawings are made considering the actions to be transferred
- the position of the column shoes including the additional reinforcement specified in this ETA is specified in the construction drawings
- the column shoe connections are used where the column is horizontally supported by foundation, columns, floor or a set of beams (sway frames included)
- laps with the welded reinforcing steel bars are designed according to EN 1992-1-1:2004+AC:2010
- the design of the connected concrete members is done according to the EN 1992-1-1:2004+AC:2010
- the load bearing capacity of the column shoes connections under fire is verified in accordance with the TR 068, considering the reduction factors according to Annex C2

PFEIFER Column Shoe PCC	**Annex B1**
Intended use Specifications	

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Installation

- Installation of the column shoes is carried out by appropriately qualified workers under the supervision of the person responsible for technical matters on site.
- Usage of the column shoes as supplied by the manufacturer without any manipulation and exchanging of the components.
- Installation of the column shoes in accordance with the manufacturer's specifications given in Annex B3.
- Column shoes have to be fixed to the formwork so that no movement occurs during the time of laying the reinforcement and of placing and compacting the concrete.
- Correct compaction of the concrete in the area of the column shoes.
- The column shoes have to be protected against penetration of concrete, water and oil.
- The spacing between column shoes must be selected so that concreting is possible.
- Examples of distances and arrangements are given in Fig. B1 and Table B1.
- The column shoes may be used in any cross-section form, for example: square, rectangle, L-form.

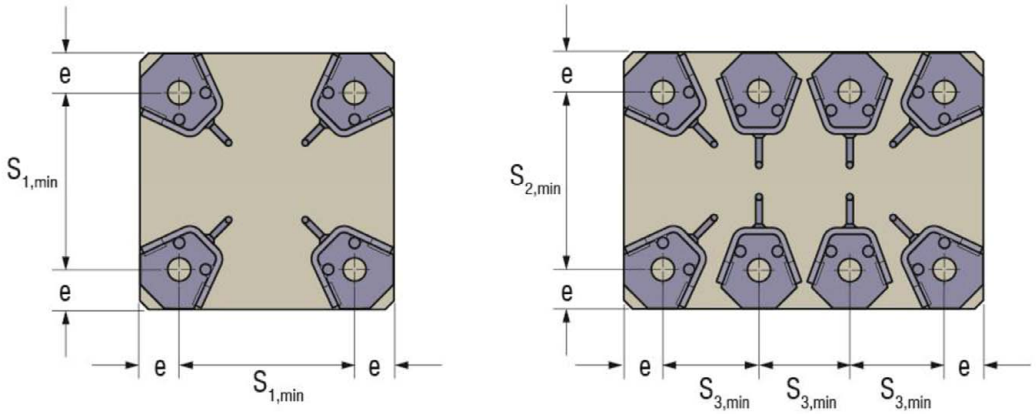

Fig. B1: **Example geometries – Minimum distances**

Table B1: **Minimum distances**

Column shoe PCC	e	$S_{1,min}$	$S_{2,min}$	$S_{3,min}$
	[mm]	[mm]	[mm]	[mm]
16	50	145	190	105
20	50	155	205	120
24	50	180	240	125
30-1	50	220	295	160
30-2	50	265	355	160
36	60	275	370	175
39-1	60	255	345	175

PFEIFER Column Shoe PCC	**Annex B2**
Intended use Specifications, installation parameters	

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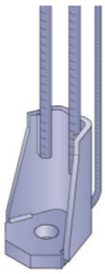
Installation instructions

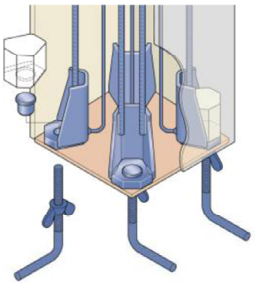
1. Components



Column Shoe PCC consisting of:

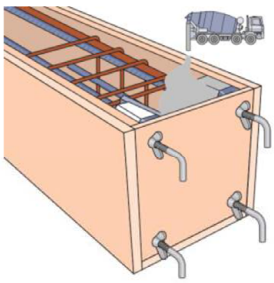
1. Base plate with side plate
2. Reinforcing steel bars

2. Positioning



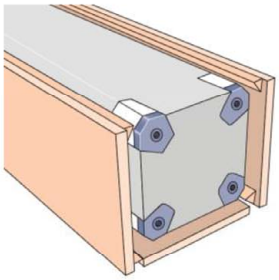
1. Securely fix the column shoes to the formwork
2. Fix the reinforcement of the column shoes to the existing reinforcement
3. Install the recess bodies

3. Pouring and compacting



1. Carefully pour in concrete paying attention to built-in parts
2. Compact concrete properly, avoid contact between vibrating device and column shoes
   → Do not move or damage columns shoes

4. Removal of formwork



1. Loosen the screws of the column shoes
2. Remove the formwork
3. Check the adjacent concrete for gravel pockets etc.
4. Remove the concrete slurry on the column shoes. Steel parts must be shiny metallic

PFEIFER Column Shoe PCC	**Annex B3**
Intended use Installation instructions	

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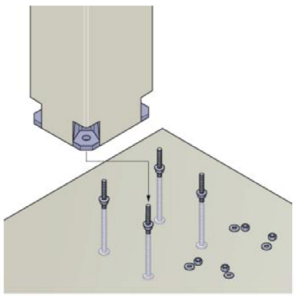
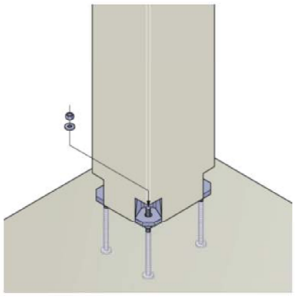
Installation instructions precast element (included column shoe)

5. Mount the column on the prepared bolts



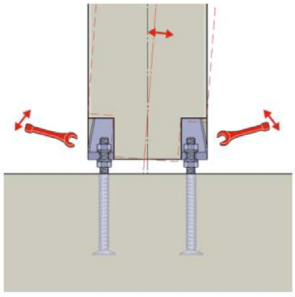
1. Provide bolts with nuts and washers
2. Set all the nuts at the same height
3. Lift the column on the bolts

6. Screw the column shoes to the bolts



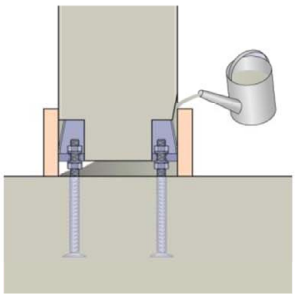
1. Screw the nuts and washers provided on the bolts in the mounting recess of the column base
2. Tighten the nuts hand-tight

7. Align the support and tighten the nuts



1. Bring the column in the intended position
2. Tighten the nuts with hammer wrench (10 beats, 2 kg hammer weight)
3. Only now the component can be removed from the lifting device

8. Casting the connection



1. Form a support in the casting area
2. Fill with grout according to the manufacturer's instructions
   The grout must have the following properties:
   - Maximum grain size: 5 mm
   - Non-flammable A1
   - Swelling
   - Minimum strength ≥ Strength class of the column

PFEIFER Column Shoe PCC	**Annex B4**
Intended use Installation instructions	

Table C1: **Resistances to tension and shear loads under static and quasi-static loading**

Column shoe PCC			**16**	**20**	**24**	**30-1**	**30-2**	**36**	**39-1**
Steel failure									
Resistance	$N_{Rd,s}$	[kN]	68	97	139	220	299	436	384
Bending resistance factor	η_d	[-]	1,0						
Bending stiffness factor	k_L	[-]							
Shear resistance factor	k_s	[-]							

Note:
Laps with the welded reinforcing steel bars (Pos. S1 according to Annex A2) are designed according to EN 1992-1-1:2004+AC:2010

PFEIFER Column Shoe PCC	**Annex C1**
Performances Resistances to tension and shear loads under static and quasi-static loading	

Table C2: **Steel temperature time table under fire exposure - $T_{cr}(t_i)$ [°C]**

Typ	Bolt temperature respectively μ_{fi} [1] (ETK)					
	30 min	**60 min**	**90 min**	**120 min**	**180 min**	**240 min**
PCC 16 (minimum column cross-section: 245 mm × 245 mm)						
	190°C	**400°C**	**550°C**	**690°C**	**910°C**	**1070°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,62	0,25	0,06	0,03
$\mu_{fi,screw}$ [3] [-]	0,94	0,78	0,35	0,11	0,03	0,00
PCC 16, PCC 20 (minimum column cross-section: 255 mm × 255 mm)						
	190°C	**400°C**	**550°C**	**690°C**	**900°C**	**1070°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,62	0,25	0,06	0,03
$\mu_{fi,screw}$ [3] [-]	0,94	0,78	0,35	0,11	0,03	0,00
PCC 16 bis PCC 24 (minimum column cross-section: 280 mm × 280 mm)						
	190°C	**400°C**	**550°C**	**680°C**	**880°C**	**1040°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,62	0,27	0,07	0,04
$\mu_{fi,screw}$ [3] [-]	0,94	0,78	0,35	0,12	0,04	0,00
PCC 16 bis PCC 30-1 (minimum column cross-section: 320 mm × 320 mm)						
	180°C	**350°C**	**490°C**	**600°C**	**760°C**	**900°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,81	0,47	0,15	0,06
$\mu_{fi,screw}$ [3] [-]	0,94	0,85	0,57	0,22	0,08	0,03
PCC 16 bis PCC 30-2 (minimum column cross-section: 365 mm × 365 mm)						
	180°C	**340°C**	**480°C**	**560°C**	**710°C**	**840°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,84	0,59	0,22	0,08
$\mu_{fi,screw}$ [3] [-]	0,94	0,87	0,60	0,32	0,10	0,05
PCC 16 bis PCC 36 (minimum column cross-section: 395 mm × 395 mm)						
	140°C	**290°C**	**430°C**	**520°C**	**690°C**	**820°C**
$\mu_{fi,rreinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,96	0,72	0,25	0,09
$\mu_{fi,screw}$ [3] [-]	0,95	0,91	0,71	0,46	0,11	0,06
PCC 16 bis PCC 39-1 (minimum column cross-section: 395 mm × 395 mm)						
	140°C	**290°C**	**430°C**	**520°C**	**690°C**	**820°C**
$\mu_{fi,reinforcing\ steel\ anchor}$ [2] [-]	1,00	1,00	0,96	0,72	0,25	0,09
$\mu_{fi,screw}$ [3] [-]	0,95	0,91	0,71	0,46	0,11	0,06

1) μ_{fi} = reduction factor (hot loading capacity / cold loading capacity)
2) $\mu_{fi,reinfrocing\ steel\ anchor}$ nach 1992-1-2
3) $\mu_{fi,screw}$ nach 1993-1-2

PFEIFER Column Shoe PCC

Performances
Fire resistance – Temperature behaviour of column shoes

Annex C2

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