

Baden-Württemberg
Regional Administrative Authority
Tübingen
Federal Office of Construction
Engineering

Date 29th July 2019
Name Willi Weidner
Telephone 0711 - 126 1996
Reference no. 27-19/2621.4-6-19.5

Type test report no. 03/30 (Extension to type test)

Applicant: Halfen GmbH

Subject of the type test: HALFEN HCC Column shoe

Valid: Extended until 31st July 2024

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Tübingen

The validity of the **type test document number 27-19/2621.4-6-12.4, certification no. 03/30** issued by the Federal office for building technology (Landesstelle für Bautechnik) on the 30th July 2014, is herewith extended by 5 years. The type documents listed therein as specification documents have not been re-stamped.

The following amendment was made to **section 3.3.2** of the aforementioned test report:

General building authority approval/ General type approval Z-21.5-1758 for the "HALFEN HAB MH Anchor bolt" issued on the 6th December 2018 by the German Institute of Construction Engineering (DIBt Deutsches Institut für Bautechnik), 7 pages and 7 annexes.

Office Konrad-Adenauer-Str. 20 • 72072 Tübingen • Phone 07071 757-0 • Fax 07071 757-3190
poststelle@rpt.bwl.de • www.baden-wuerttemberg.de • www.service-bw.de

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The following amendment was made to **section 3.3.3** of the aforementioned test report:

General building authority approval/ General type approval Z-21.5-1761 for the "HALFEN HAB H Anchor bolt" issued on the 6th December 2018 by the German Institute of construction Engineering, 6 pages and 7 annexes.

This notice of extension comprises 2 pages. It only applies in conjunction with the aforementioned type test. If the type test is amended, changed, or withdrawn, the same shall apply to this notice.

Federal office for building technology

Deputy Head of department

Consultant

Dipl.-Ing. S. Schneider

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Tübingen

Dipl.-Ing. W. Weidner

Baden-Württemberg
Regional Administrative Authority
Tübingen
Federal Office of Construction
Engineering

Date 8th June 2009
Name Willi Weidner
Telephone 0711 - 126 1996
Reference no. 27-19/2621.4-6-19.5

TEST REPORT (Type test)**Report no. 03/30**

Stamp
Regional Administrative Authority
Tübingen

Applicant: Halfen GmbH

Object of this type test: HALFEN HCC Column shoe

Relevant technical documents prepared by: H + P Ingenieure GmbH & Co. KG
Kackertstraße 10
52072 Aachen

Structural documents: This type test report and the documents specified in Section 3.1

Valid until: 31st July 2019

1. On the basis of § 68 section 1 of the federal state building regulations for Baden-Württemberg dated 16th July 2013 (GBL p. 209) in combination with the regulations of the Ministry of Economic Affairs on structural testing of structural systems (BauPrüfVO = Building Test Regulations) of 10th May 2010 (GBL p. 410), the Federal office for building technology, Regional Administration Authority, Tübingen, Germany (Regierungspräsidium Tübingen - Landesstelle für Bautechnik) evaluated the HALFEN Column shoe documents as a type test. The design complies with current applicable building regulations.

This type test report has 4 pages and the annexes as listed under section 3.1.

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2. Description of the elements

HALFEN Column shoes are made from welded steel plates and steel reinforcement bars. Column shoes are connection elements (cast-in fittings) for connection joints and foot connection of columns in prefabricated, steel reinforced concrete construction projects. HALFEN HCC Column shoes are used in combination with HALFEN HAB H or HAB MH Anchor bolts.

3. Documents for the type test

3.1 Type test documents for submission to the the federal building authority

Annex 1:	HALFEN HCC Column shoe, general information
Annex 2:	HALFEN HCC Column shoe, load capacity
Annex 3:	HALFEN HCC Column shoe, installation requirements, additional on-site reinforcement, notes
Annex 4:	HALFEN HCC Column shoe 16 - HCC 24, materials,dimensions
Annex 5:	HALFEN HCC Column shoe 30 - HCC 52, materials,dimensions
Annex 6:	HALFEN HCC Column shoe, Design variant with socket connection

Halfen GmbH, Liebigstraße 14, 40764 Langenfeld, Germany

3.2 Further test documents

Static calculation provided by H + P Ingenieure GmbH & Co. KG, Kackertstr. 10, 52072 Aachen, dated 18th October 2013, pages 1 to 39 with annex A (HALFEN HCC Calculation tables).

3.3 Structural basics

3.3.1 Currently valid applicable building regulations, in particular, DIN EN 1992-1-1:2011-01, DIN EN 1992-1-1/NA:2013-04, DIN EN 1993-1-1:2010-12, DIN EN 1993-1-1/NA 2010-12, DIN EN 1993-1-8:2010-12, DIN EN 1993 -1-8/NA:201 0-12 (DIN = German Industrial Standard)

3.3.2 General building authority approval no. Z-21.5-1758, HALFEN HAB MH Anchor bolts, issued by the German Institute of Construction Engineering* Berlin on the 23rd October 2013 (12 pages, 20 annexes)

3.3.3 General building authority approval no. Z-21.5-1761, HALFEN HAB H Anchor bolts, issued by the German Institute of Construction Engineering* Berlin on the 23rd October 2013 (11 pages, 19 annexes)

*German Institute of Construction Engineering = DIBt *Deutsches Institut für Bautechnik*

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4. Design loads

Results from the type statics, the normal force load capacities N_{Rd} according to Eurocode are provided for the components.

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5. Construction materials

Sheet steel:	S355 J2
Ribbed reinforcement steel	B500A, B500B and B500C (with abZ*)
U washers	S355 J0
Column concrete	Minimum concrete strength class C30/37

* General building authority approval = abZ, *Allgemeine bauaufsichtliche Zulassung*

6. General notes

- 6.1 The application range for HALFEN Column shoes applies only to structural elements subjected to predominantly static loads.
- 6.2 The installation instructions (see Section 3.1 of this test report) must be observed.
- 6.3 The type structural analysis for the column shoes was for a non-grouted situation (assembly state). The design loads or permitted loads in the documents can be transferred to both the non-grouted situation and in the cast-in state (final installed element).
- 6.4 The column shoes were tested for normal load transfer. The transfer of transverse loads is not covered by this type test. Any transverse loads must be verified separately (compare Type sheet annex 1. no. 5).
- 6.5 The introduction or transfer of loads into the column shoes, and particularly the anchors and overlapping connections to the column shoes, must be tested in both the assembly state and in the final installed element. The relevant general building authority approvals Z-21.5-1761 (Type HAB H) and Z-21.5-1758 (Type HAB MH) must be observed when using HALFEN HAB Anchor bolts with swaged anchor heads.
- 6.6 The specifications in DIN EN 1090-2, Technical Regulations for the Construction of Steel Structures, and DIN EN ISO 17660-1, Welding of Reinforcing Steel, must be observed in the production of column shoes.
- 6.7 To ensure protection from corrosion the recesses in the column shoe must be grouted with suitable non-shrink mortar. The suitability of the mortar, production control and the conditions for application must comply with the current applicable specifications of the German Committee for Structural Concrete's* code of practice "Grouting mortar code of practice for the use of factory-mixed grouting mortar".
- 6.8 Where applicable regulations require verification of the fire resistance class for the column shoes then this must be done for each individual application.

* German Committee for Structural Concrete = DAfStb, *Deutscher Ausschuss für Stahlbeton*

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7. General provisions

- 7.1 The test documents together with this type test report replace the individual static verifications for HALFEN HCC Column Shoes. The technical building authority need only verify that the design complies with the test documents and the conditions specified in this type test report. Each individual situation must be checked for stability if there is deviation from this test report or its annexes
- 7.2 The general certificate of approval does not replace the statutory approvals, permits and certificates required for construction projects.
- 7.3 The type sheets may only be used in their entirety and without any amendments and only together with the test report for building applications.
- 7.4 In case of doubt, the copy of the document deposited with the Federal office for building technology is decisive.
- 7.5 This type test is valid and limited to 5 years, in this case until the 31st July 2019. An application for extension of validity must be provided in sufficient time before the expiry of this period to the Federal office for building technology – Regional Administrative Authority, Tübingen (Regierungspräsidium Tübingen - Landesstelle für Bautechnik)
- 7.6 Should the documents on which the type test is based become invalid or are changed (standards and approvals) before the expiry of the period of validity, this must be reported to the Federal office for building technology who will then decide on further procedure.
- 7.7 However, the Federal office for building technology may revoke the type test if relevant conditions have been modified before the validity period expires or if new technical developments contradict the continued use of the type test documents. The documents can then be amended or supplemented and submitted for renewed type testing.
- 7.8 This type test is based on current knowledge and expertise. This does not imply any statement regarding an assessment of performance for the object of this type test.
- 7.9 The applicant and/or the contractor are responsible for complying with the provisions of this test report and the information contained in the documentation.

Federal Office for building
technology:

Head of department:

Ltd. Dipl.- Ing. Wolfgang Weiß

Responsible engineer

Dipl.-Ing. Willy Weidner

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- 1 HALFEN HCC Column shoes are used as a bolt connection together with HALFEN HAB Anchor bolts to anchor steel-reinforced precast concrete columns.

The column shoes are installed in the corners or in the long edge, alternatively in round precast concrete columns while the anchor bolts are installed in previously prepared foundation elements or column heads. The connection comprises the column shoe and the anchor bolt and is suitable for constructing hinged and rigid connections.

With columns designed for hinged connection, tensile and compressive forces can be supported at each column shoe in the assembly state. Therefore bracing struts during ongoing construction are not required.

- 2 In assembly state (without grouted joints) the column shoes are force-locked to the anchor bolts using nuts/lock nuts and special washers. In this condition (state), the column shoes can be fully subjected to tensile and compressive loads as specified.
- 3 For the final state, the connection joint under the column and the recesses for the nut assembly must be grouted with non-shrinking mortar – the strength class of the grouting mortar must correspond at least that of the concrete in the column. After the grouting has cured, the concrete cross section can be determined according to the general calculation guidelines for steel-reinforced concrete construction.
- 4 The load-bearing capacity of the column shoes has been verified for predominantly static loading with compression and tension normal loads.
- 5 Verification of transverse loads is not covered by these type statics. Possible transverse loads must be determined case by case. Verification can be structurally solved using a concrete header, a shearing cleat or by friction.
- 6 The reinforcement overlap at the column shoe, the on-site column reinforcement and the load capacity of the on-site HAB Anchor bolts must be verified case by case for each application.

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Landesstelle für Bautechnik Baden-Württemberg
Tübingen 30th July 2014
Authorized editor Signature

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Annex 1
HALFEN HCC Column shoe
General information

HALFEN GmbH
Liebigstr. 14
D - 40764 Langenfeld
Phone: +49-2173-970-0
Fax: +49-2173-970-123

- 1 The load capacity of the HALFEN HCC Column shoes corresponds to the load capacity of the respective HAB Anchor bolts and in each case equally applies to the transfer of bolt tensile and compression loads.
- 2 The load capacity of the column shoes is calculated and verified in accordance with DIN EN 1992-1-1 with DIN EN 1992-1-1/NA, DIN EN 1993-1-1: with DIN EN 1993-1-1/NA, DIN EN1993-1-8:with DIN EN 1993-1-8/NA.
- 3 The concrete used for the column must be at least concrete grade C 30/37
- 4 HALFEN HCC Column shoes load capacities

Column shoe Type	Suitable anchor bolt Type	Load limit NR,d [kN]	Max. non-centricity assembly tolerance e [mm]
HCC16	HABH16/HABS16	± 61.7	± 5
HCC20	HAB H20 / HAB S20	± 96.3	± 5
HCC24	HAB H24 / HAB S24	±138.7	± 5
HCC30	HAB H30 / HAB S30	±220.4	± 5
HCC39	HAB H39 / HAB S39	±383.4	± 8
HCC M30	HAB MH36 / HAB MS36 *)	±299.2	± 4.5
HCC M36	HAB MH36 / HAB MS36	±436.7	± 9.5
HCC M39	HAB MH39 / HAB MS39	±520.6	± 8
HCC M45	HAB MH45 / HAB MS45	±696.6	± 10
HCC M52	HAB MH52 / HAB MS52	±937.3	± 9

*) Types HAB MH30 and HAB MS30 are in preparation.

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Tübingen 30th July 2014

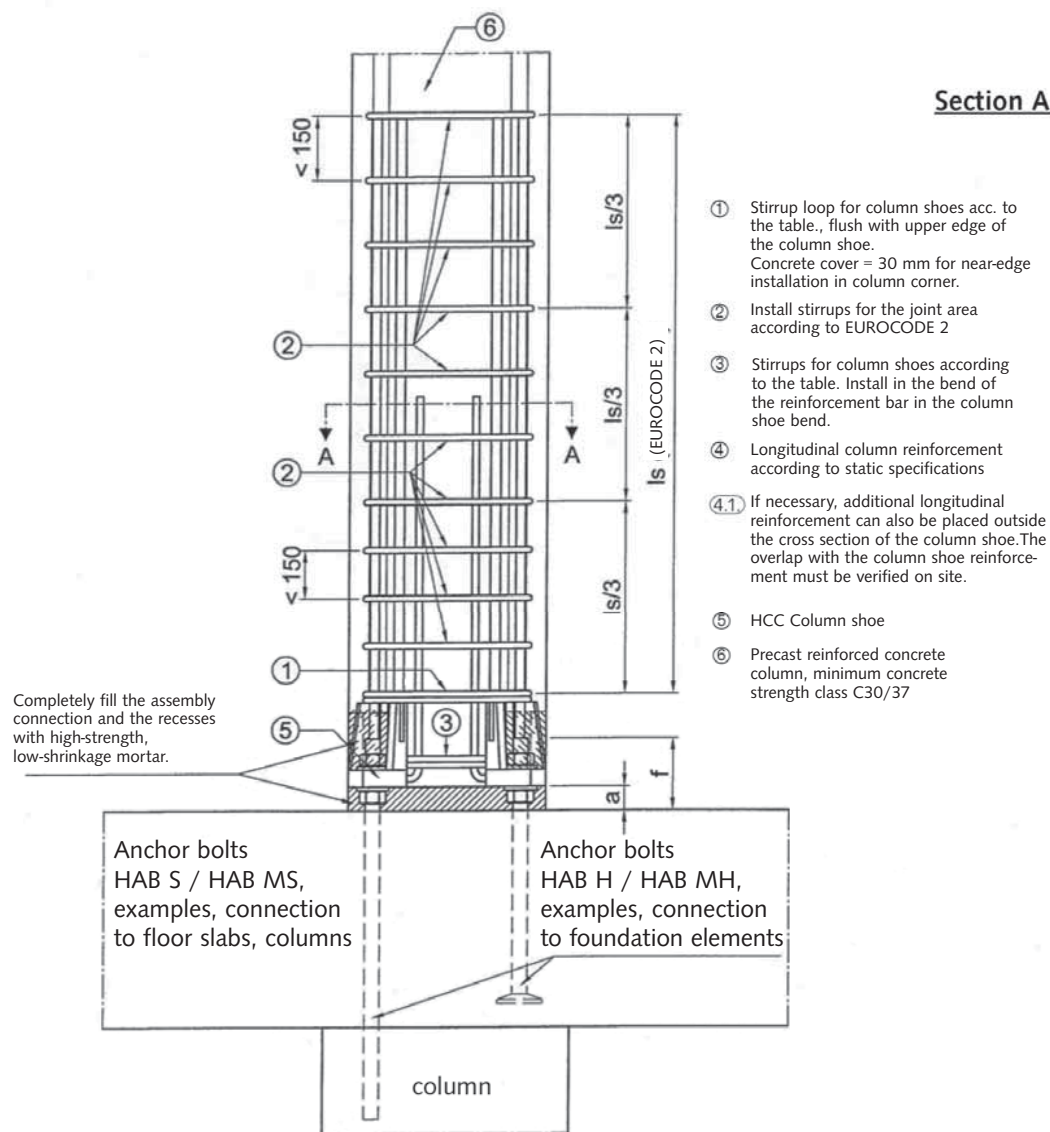
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Annex 2
HALFEN HCC Column shoe
Load capacities

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Column shoe	Anchor bolt	Joint height a [mm]	Bolt protrusion, f [mm]	①	②	③
HCC 16	HAB H16/ HAB S16	50	105	1 Ø 8	Ø 8	1 Ø 8
HCC 20	HAB H20/ HAB S20	50	115	1 Ø 10	Ø 10	1 Ø 10
HCC 24	HAB H24/ HAB S24	50	130	1 Ø 10	Ø 10	1 Ø 10
HCC 30	HAB H30/ HAB S30	50	150	1 Ø 12	Ø 12	1 Ø 12
HCC 39	HAB H39/ HAB S39	50	165	2 Ø 12	Ø 12	2 Ø 12
HCC M30	HAB MH36/ HAB MS36 *)	50	165	2 Ø 10	Ø 10	2 Ø 10
HCC M36	HAB MH36/ HAB MS36	55	165	2 Ø 12	Ø 12	2 Ø 12
HCC M39	HAB MH39/ HAB MS39	55	185	2 Ø 12	Ø 12	2 Ø 12
HCC M45	HAB MH45/ HAB MS45	65	195	3 Ø 12	Ø 12	3 Ø 12
HCC M52	HAB MH52/ HAB MS52	70	240	3 Ø 12	Ø 12	3 Ø 12

*) Bolts type HAB MH30/ HAB MS30 are in preparation

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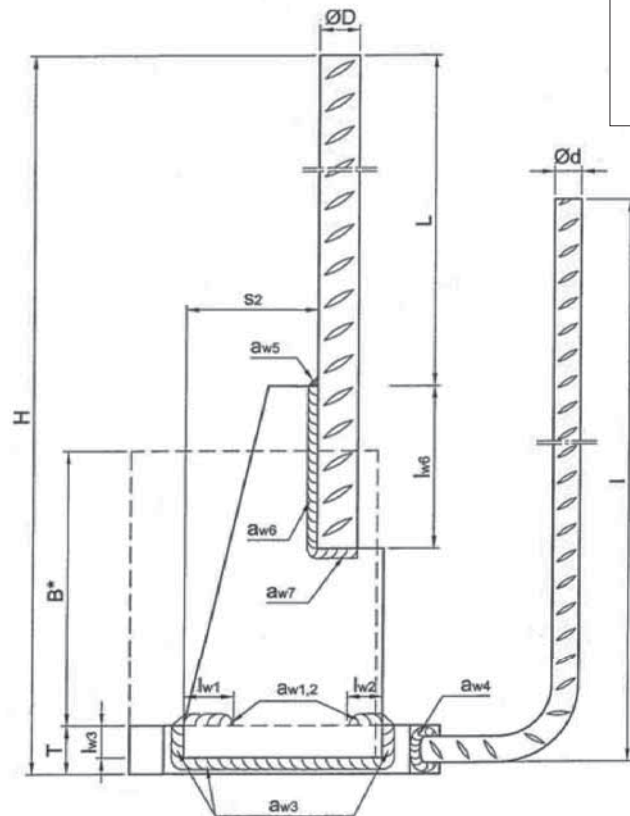


Annex 3

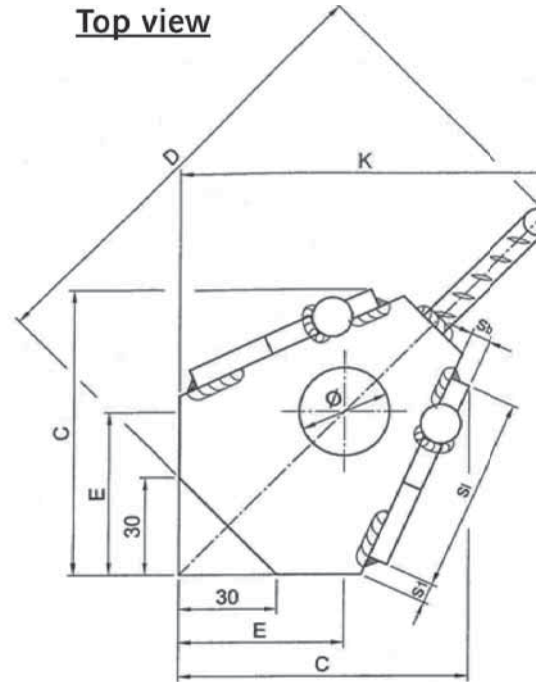
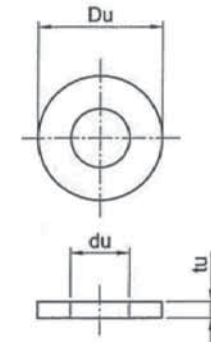
HALFEN HCC Column shoe

Installation scheme – Connecting reinforcement – Notes

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Lateral view

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Top view**U washers (special)**

Column shoe	Du [mm]	du [mm]	tu [mm]
HCC 16	38	18	5
HCC 20	46	22	6
HCC 24	55	25	6

Materials:

Bottom plate: S355J2
Side plates: S355J2
Concrete reinforcement steel: B500A, B or C
U- washer: S355J0

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B* = Maximum height of recess former

1) Design for good (moderate) bonding conditions. zones VBI (VBII)

Column shoe	B* [mm]	C [mm]	D [mm]	E [mm]	H ¹⁾ [mm]	K [mm]	Ø [mm]	T [mm]	ØD [mm]	L ¹⁾ [mm]	Ød [mm]	l [mm]	a _{w1,2} [mm]	lw1 [mm]	lw2 [mm]	a _{w3} [mm]	lw3 [mm]	a _{w4} [mm]	a _{w5} [mm]	a _{w6} [mm]	lw6 [mm]	a _{w7} [mm]	sl [mm]	sb [mm]	s1 [mm]	s2 [mm]
HCC 16	85	88	136	50	760 (1015)	112	27	15	12	640 (895)	8	300	3	15	10	3	10	3	4	3	50	3	60	6	6	40
HCC 20	95	95	141	50	965 (1290)	117	30	20	14	830 (1155)	10	450	3	15	10	5	12	4	4	4	60	4	60	8	5	45
HCC 24	105	106	150	50	1055 (1410)	123	35	25	16	905 (1260)	12	550	4	15	15	8	12,5	5	4	4	80	0	70	12	5	41

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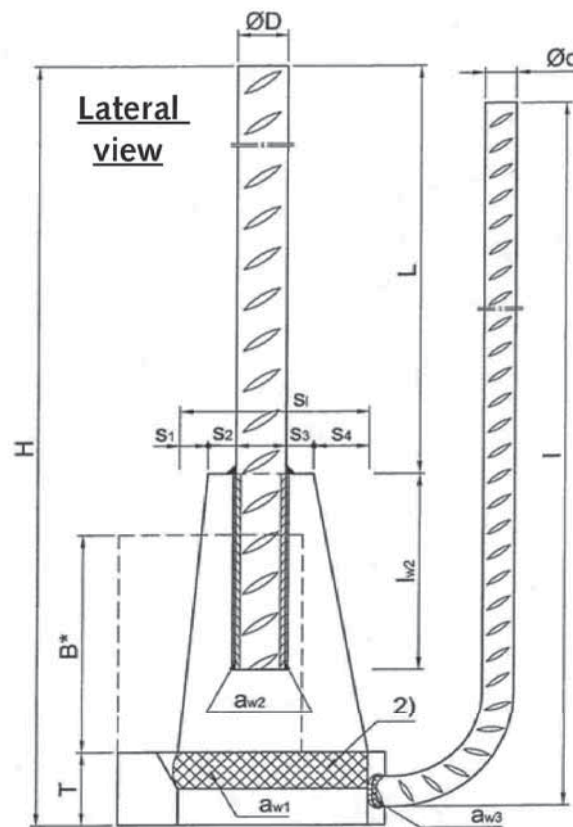
Annex 4
HALFEN HCC Column shoe
Materials — Dimensions

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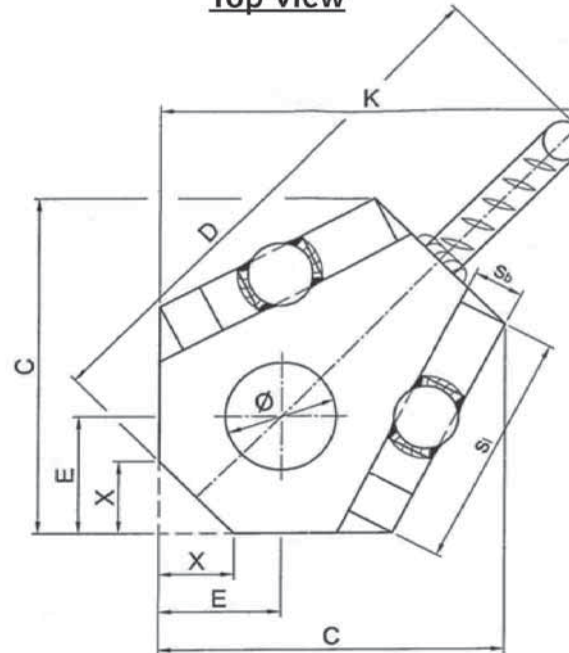
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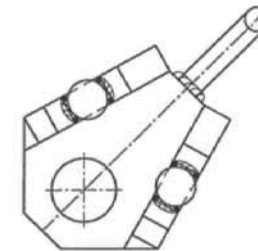


Top view



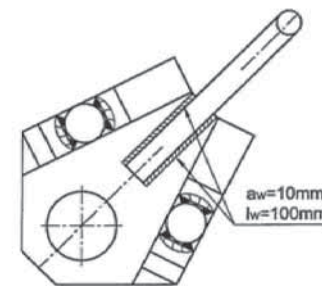
Version type HCC M 45

Bottom plate, Contoured rear edge

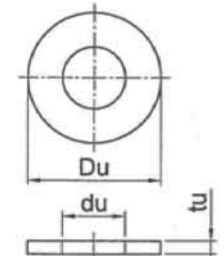


Version type HCC M 52

Centring bar in the bottom plate



U washers (special)



Column shoe	Du [mm]	du [mm]	tu [mm]
HCC 30	65	31	8
HCC 39	90	41	10
HCC M30	65	38	8
HCC M36	80	38	8
HCC M39	90	41	10
HCC M45	105	48	12
HCC M52	110	55	12

Materials:

Bottom plate: S355J2
 Side plates: S355J2
 Rebar steel: B500A, B or C
 U- washer: S355J0

1) Design for good (moderate) bonding conditions, zones VBI (VBII)

2) The metal plates require a bevel edge of 45°-55° to accommodate the weld seam. Prepare either only in the bottom plate or proportionally distributed between the bottom plate and side plates.

B* = Maximum height of recess former

**) see variant HCC M52

Column shoe	B* [mm]	C [mm]	D [mm]	E [mm]	H ¹⁾ [mm]	K [mm]	Ø [mm]	T [mm]	ØD [mm]	L ¹⁾ [mm]	Ød [mm]	I [mm]	aw1 ≥ [mm]	aw2 ≥ [mm]	lw2 [mm]	aw3 ≥ [mm]	Si [mm]	Sb [mm]	S1 [mm]	S2 [mm]	S3 [mm]	S4 [mm]	X [mm]
HCC 30	120	119	188	50	1275 (1645)	150	40	35	20	1100 (1470)	14	800	15	3	80	6	80	15	20	22	18	0	30
HCC 39	150	157	245	60	1675 (2395)	195	55	45	28	1450 (2170)	20	900	20	4	115	8	110	20	22	22	38	0	37
HCC M30	130	134	220	50	1395 (1985)	173	45	45	25	1200 (1790)	16	1050	20	5	80	7	90	20	18	22	25	0	30
HCC M36	160	157	245	60	1880 (2430)	195	55	50	28	1650 (2200)	20	1000	20	4	115	8	110	20	22	22	38	0	37
HCC M39	180	172	267	60	1955 (2765)	209	55	55	32	1650 (2460)	20	1000	25	5	130	8	120	25	22	22	44	0	37
HCC M45	180	207	317	60	2360 (3390)	246	65	60	40	2070 (3100)	25	1460	30	6	160	10	150	30	22	22	22	44	37
HCC M52	180	232	366	60	2735 (3745)	280	70	70	40	2290 (3300)	25	1450	40	8	160	**) 170	170	40	18	22	22	68	35

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Annex 5
 HALFEN HCC Column shoe
 Type HCC 30, HCC M52
 Materials — Dimensions

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 type tested design

Test no. 03/30

Landesstelle für Bautechnik Baden-Württemberg

Tübingen 30th July 2014

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 required by 31st July 2019

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Lateral view
1:5

Connection bar
HBS-05-A

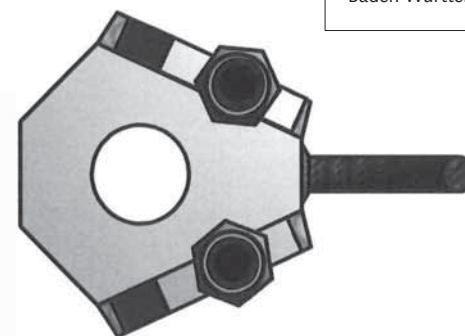
HBS-05-S Socket



Isometry
1:5



Top view
1:3



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Authority of
Baden-Württemberg

Socket connection with HALFEN Type HBS-05 Screw-in connection bar in accordance with general building authority approval no. z-1.5-189

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Annex 5

HALFEN HCC Column shoe
Type HCC 30, HCC M52

Application with a socket bar connection

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