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

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-16/0516 of 16 August 2016

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	Walraven concrete screw WCS1
Product family to which the construction product belongs	Concrete screw of size 5 and 6 mm for multiple use for non-structural applications in concrete and in prestressed hollow core slabs
Manufacturer	J. van Walraven Holding B.V. Industrieweg 5 3641 RK Mijdrecht NIEDERLANDE
Manufacturing plant	Walraven Factory A4
This European Technical Assessment contains	15 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	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 6: "Anchors for multiple use for non-structural applications", August 2010, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The Walraven concrete screw WCS1 in sizes of 5 and 6 mm is an anchor made of galvanised steel respectively steel with zinc flake coating, made of stainless or high corrosion resistant steel. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

Product and product description is given in Annex A.

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

The performances given in Section 3 are only valid if the anchor 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 anchor 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)

The essential characteristics regarding mechanical resistance and stability are included under the Basic Works Requirement Safety in use.

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C 3

3.3 Safety in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance for tension and shear loads as well as bending moments in concrete	See Annex C 1 and C 2
Edge distances and spacing	See Annex C 1

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [97/161/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 at Deutsches Institut für Bautechnik.

Issued in Berlin on 16 August 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Tempel

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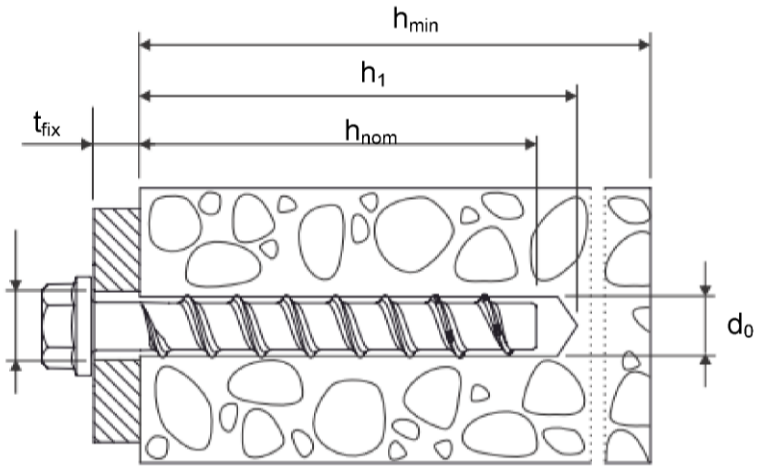
product and installed condition

Walraven concrete screw WCS1

carbon steel

stainless steel A4 (sst) and HCR



d_0	=	nominal drill bit diameter
h_{nom}	=	nominal anchorage depth
h_1	=	depth of the drill hole
h_{min}	=	minimum thickness of member
t_{fix}	=	thickness of fixture

Walraven concrete screw WCS1	**Annex A 1**
Product description Installed condition	

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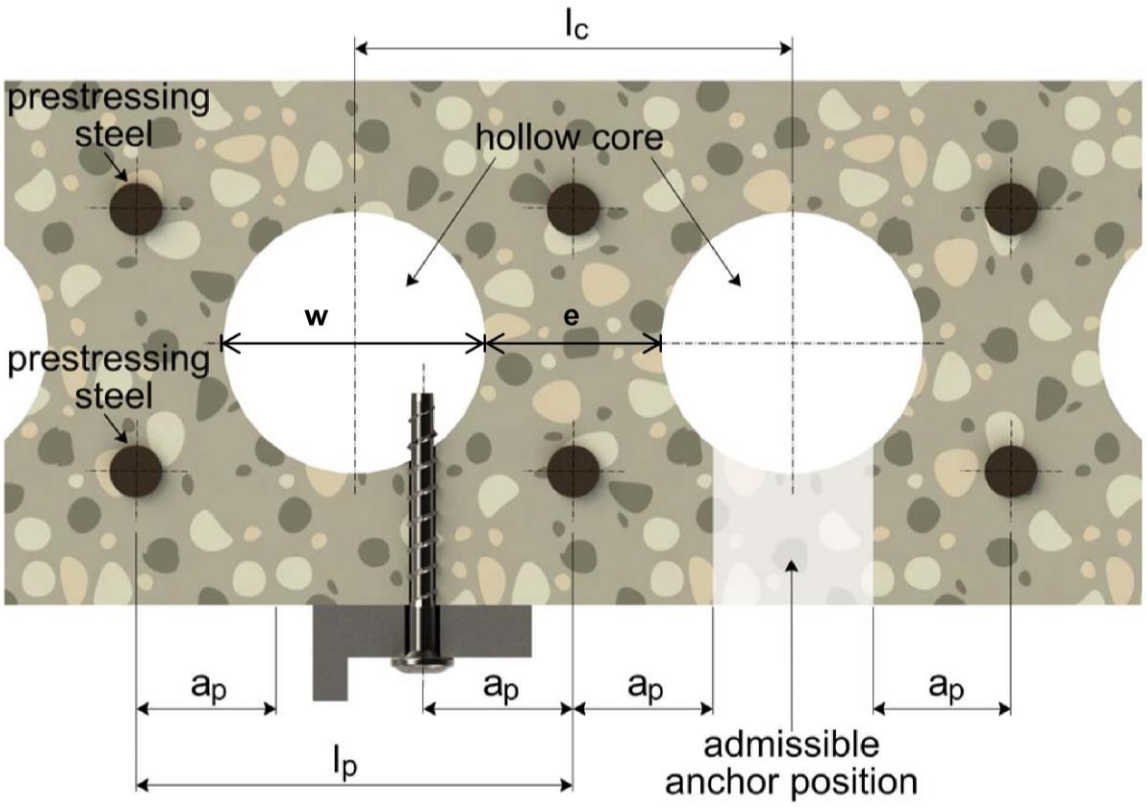
installed condition in precast prestressed hollow core slabs



w / e ≤ 4,2

w core width

e web thickness

core distance	l_c	≥ 100 mm
prestressing steel	l_p	≥ 100 mm
distance between anchor position and prestressing steel	a_p	≥ 50 mm

Walraven concrete screw WCS1

Product description

Installed condition

Annex A 2

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Table A1: Materials and variants

part	name	Material
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Concrete screw	WCS1: Steel EN 10263-4 galvanized acc. To EN ISO 4042 or zinc flake coating acc. To EN ISO 10683 (≥ 5µm) WCS1 A4 sst: 1.4401, 1.4404, 1.4571, 1.4578 WCS1 HCR: 1.4529

			WCS1 WCS1 A4 sst WCS1 HCR
characteristic steel yield strength	f_{yk}	[N/mm²]	560
characteristic steel ultimate strength	f_{uk}	[N/mm²]	700
elongation at rupture	A_5	[%]	≤ 8


1) Anchor version with connection thread and hexagon socket
e.g. WCS1HS 8x105/M10


2) Anchor version with connection thread and hexagon drive
e.g. WCS1HD 8x105/M10


3) Anchor version with washer, hexagon head and TORX
e.g. WCS1HT 8x80/35


4) Anchor version with washer and hexagon head
e.g. WCS1H 8x80/35


5) Anchor version with washer, hexagon head and
e.g. WCS1HH 8x80/35


6) Anchor version with countersunk head
e.g. WCS1C 8x80/35


7) Anchor version with pan head
e.g. WCS1P 6x40/5


8) Anchor version with large pan head
e.g. WCS1PL 8x80/35


9) Anchor version with countersunk head and connection thread
e.g. WCS1MC 6x55/M8


10) Anchor version with hexagon drive and connection thread
e.g. WCS1M 6x55 M8/M8


11) Anchor version with internal thread and hexagon drive
e.g. WCS1N 6x55/M8-10

Walraven concrete screw WCS1

Product descriptions

Materials and variants

Annex A 3

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Table A2: Dimensions and markings

Anchorsize WCS1			**5**	**6**
Length of the anchor	L ≤	[mm]	200	
Diameter of shaft	d_k	[mm]	4,0	5,1
Diameter of thread	d_s	[mm]	6,5	7,5

Marking:
WCS1
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100

WCS1 A4 sst
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100
Material: A4 sst

WCS1 HCR
Anchor type: TSM
Anchor size: 10
Length of the anchor: 100
Material: HCR

Marking "k" or "x" for anchors with connection thread and h_{nom} = 35 mm

Walraven concrete screw WCS1

Product descriptions

Dimensions and markings

Annex A 4

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Intended use

Anchorages subject to:

- static and quasi static loads
- Used only for multiple use for non structural application acc. to ETAG 001, Part 6: sizes 5 and 6
- Used for anchorages in prestressed hollow core slabs: size 6
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): size 6

Base materials:

- reinforced and unreinforced concrete according to EN 206-1:2000-12
- strength classes C20/25 to C50/60 according to EN 206-1:2000-12
- cracked and uncracked concrete

Use conditions (Environmental conditions):

- The anchor may only be used in dry internal conditions: All screw types
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition no particular aggressive conditions exits: screw types made of stainless steel with marking A4 sst
- Structural subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition if particular aggressive conditions exits: screw types made of stainless steel with marking HCR
  Note: Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used)

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages under static or quasi-static actions are designed for design method A in accordance with:
  - ETAG 001, Annex C, Edition August 2010
  - CEN/TS 1992-4:2009.
- Anchorages under fire exposure are designed in accordance with
  - EOTA Technical Report TR 020, Edition May 2004
  - CEN/TS 1992-4:2009, Annex D (it must be ensured that local spalling of the concrete cover does not occur).
- The design method according to ETAG 001, Annex C also applies for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.
- The design method according to CEN/TS 1992-4 applies for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.
- In CEN/TS 1992-4-1, section 5.2.3.1 the 3. indent will be replaced as follow: only the most unfavorable anchors of an anchor group take up shear loads, if diameter of the clearance hole d_f is larger than given in CEN/TS 1992-4-1, Table 1.
- The condition according to CEN / TS 1992-4-1, Section 5.2.3.3, no. 3) is also fulfilled for the specified diameter d_f of clearance hole in the fixture in Annex B2, Table B1.

Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- After installation further turning of the anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.

Walraven concrete screw WCS1	**Annex B 1**
Intended use Specifications	

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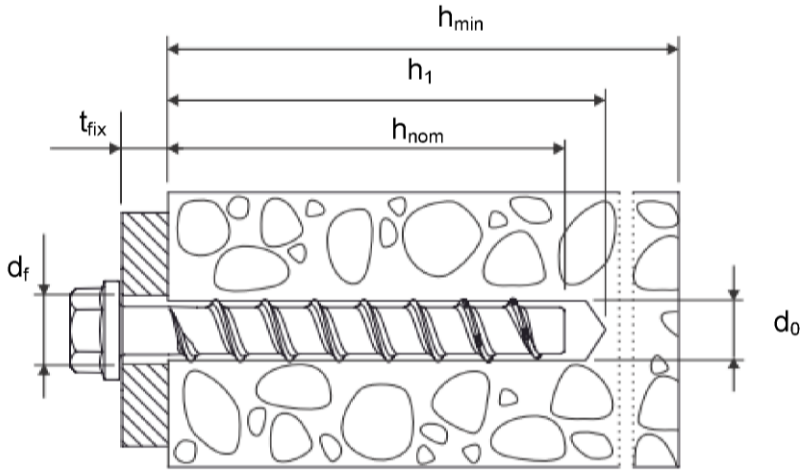
Table B1: Installation parameters

Anchorsize WCS1			**5**	**6**	
Nominal embedment depth			**h_{nom} = 35 mm**	**h_{nom} = 35 mm**	**h_{nom} = 55 mm**
nominal drill bit diameter	d_0	[mm]	5	6	
cutting diameter opf drill bit	$d_{cut} \leq$	[mm]	5,40	6,40	
depth of drill hole	$h_1 \geq$	[mm]	40	40	60
Nominal embedment depth	$h_{nom} \geq$	[mm]	35	35	55
diameter of clearing hole in the fixture	$d_f \leq$	[mm]	7	8	
Installation torque for Version with connection thread	$T_{inst} \leq$	Nm	8	10	
Impact screw driver		[Nm]	Max. torque according to manufacturer's instructions		
			140	160	

Table B2: Minimum thickness of member, minimum edge distance and minimum spacing

Anchorsize WCS1			**5**	**6**	
Nominal embedmenth depth			**h_{nom} = 35 mm**	**h_{nom} = 35 mm**	**h_{nom} = 55 mm**
minimum thickness of member	h_{min}	[mm]	80	80	100
minimum edge distance	c_{min}	[mm]	35	35	40
minimum spacing	s_{min}	[mm]	35	35	40



Walraven concrete screw WCS1

Intended use

Installation parameters

Annex B 2

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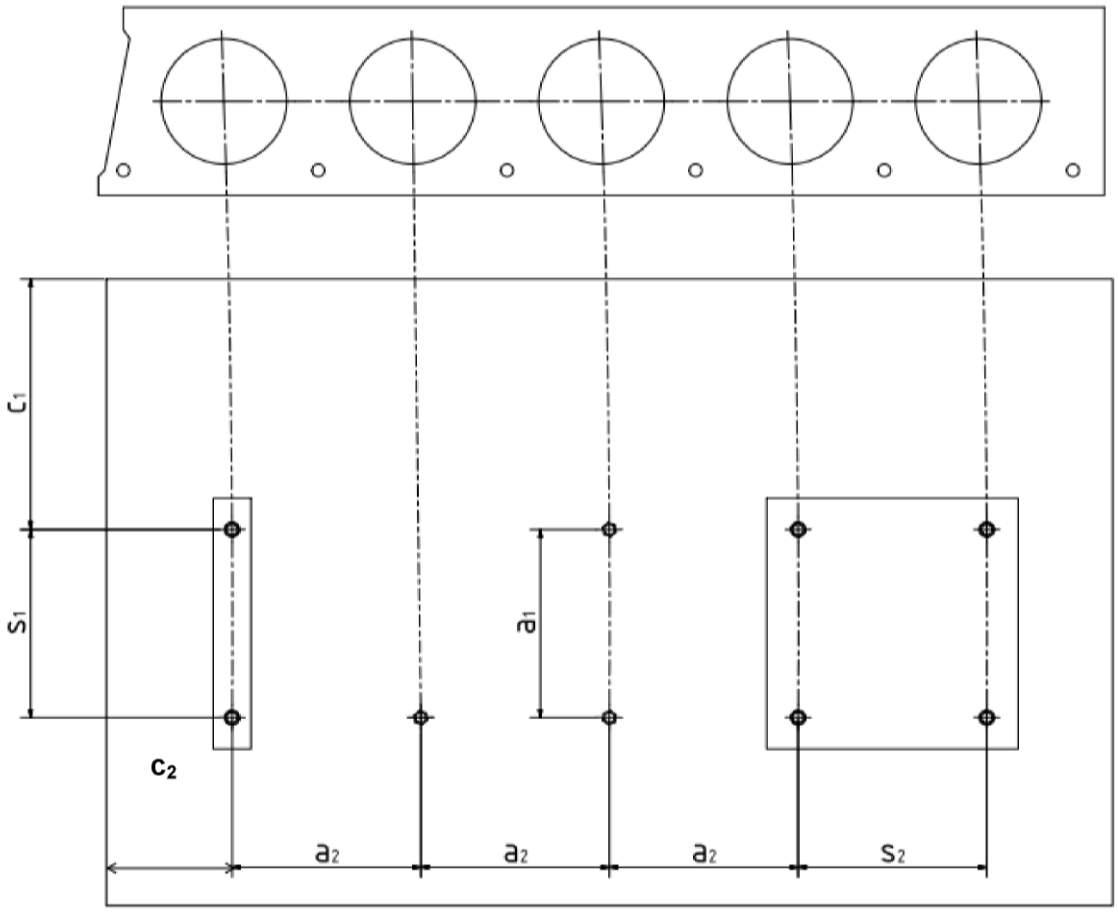
Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2 edge distance

s_1, s_2 anchor spacing

a_1, a_2 distance between anchor groups

Minimum edge distance	c_{min}	≥ 100 mm
Minimum anchor spacing	s_{min}	≥ 100 mm
Minimum distance between anchor groups	a_{min}	≥ 100 mm

Walraven concrete screw WCS1

Intended use

Installation parameters for anchorages in precast prestressed hollow slabs

Annex B 3

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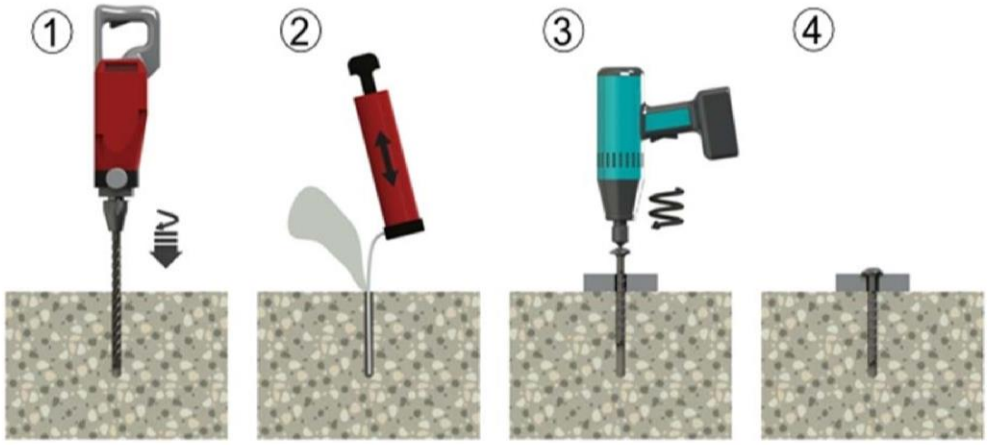
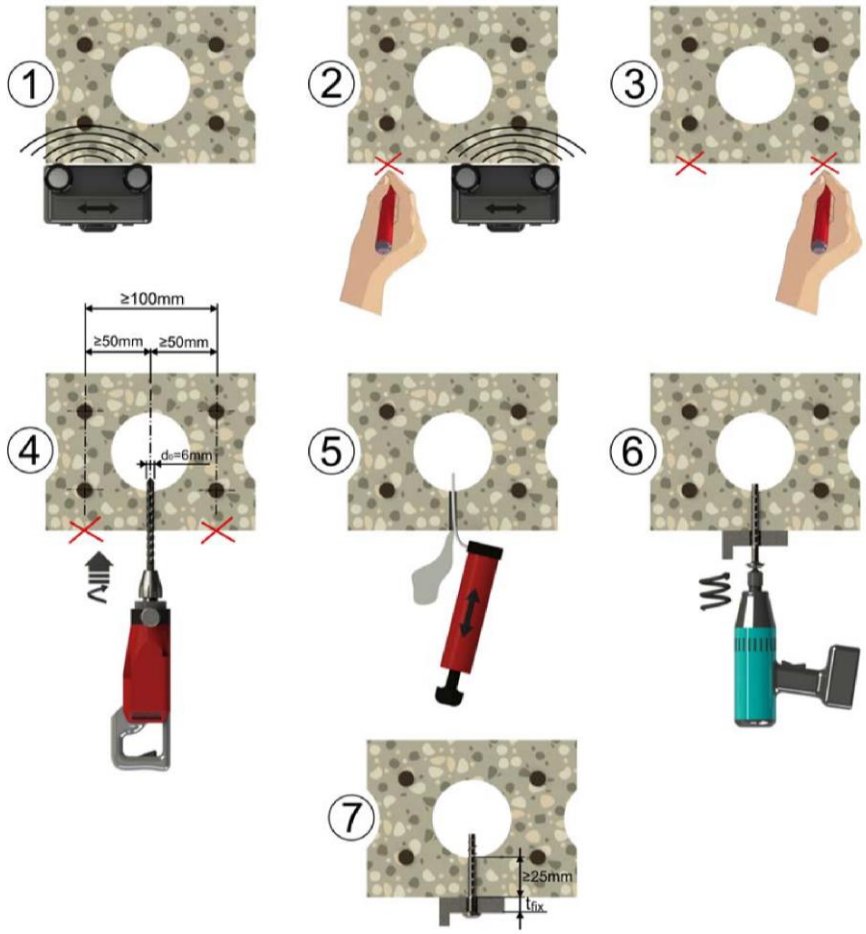
Installation instructions



Installation instructions for anchorages in prestressed hollow slabs



Walraven concrete screw WCS1

Intended use

Installation instructions

Annex B 4

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Table C1: Characteristic values for design method A according to ETAG 001, Annex C or CEN/TS 1992-4

Anchorsize WCS1				**5**	**6**	
Nominal embedment depth				h_{nom} = 35 mm	h_{nom} = 35 mm	h_{nom} = 55 mm
steel failure for tension- and shear load						
characteristic load		$N_{Rk,s}$	[kN]	8,7	14,0	
		$V_{Rk,s}$	[kN]	4,4	7,0	
		k_2 [1)]	[-]	0,8	0,8	
		$M^0_{Rk,s}$	[Nm]	5,3	10,9	
pull-out failure						
characteristic tension load in cracked and uncracked concrete C20/25		$N_{Rk,p}$	[kN]	1,5	1,5	7,5
increasing factor concrete for $N_{Rk,p}$		Ψ_C	C30/37	1,22		
			C40/50	1,41		
			C50/60	1,55		
concrete cone and splitting failure						
effective anchorage depth		h_{ef}	[mm]	27	27	44
factor for	cracked	k_{cr} [1)]	[-]	7,2		
	uncracked	k_{ucr} [1)]	[-]	10,1		
concrete cone failure	spacing	$s_{cr,N}$	[mm]	3 x h_{ef}		
	edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}		
splitting failure	spacing	$s_{cr,Sp}$	[mm]	120	120	160
	edge distance	$c_{cr,Sp}$	[mm]	60	60	80
installation safety factor		γ_2 [2)] = γ_{inst} [1)]	[-]	1,2	1,2	1,0
concrete pry out failure (pry-out)						
k-Factor		k [2)] = k_3 [1)]	[-]	1,0		
concrete edge failure						
effective length of anchor		$l_f = h_{ef}$	[mm]	27	27	44
outside diameter of anchor		d_{nom}	[-]	5	6	

[1)] Parameter relevant only for design according to CEN/TS 1992-4:2009

[2)] Parameter relevant only for design according to ETAG 001, Annex C

Walraven concrete screw WCS1

Performances

Characteristic values for design method A

Annex C 1

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Table C2: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

Anchorsize WCS1		**6**		
bottom flange thickness d_b	[mm]	≥ 25	≥ 30	≥ 35
characteristic resistance F^0_{Rk}	[kN]	1	2	3
installation safety factor γ_2 [1] = γ_{inst} [2]	[-]	1,2		

[1] Parameter relevant only for design according to ETAG 001, Annex C

[2] Parameter relevant only for design according to CEN/TS 1992-4:2009

Walraven concrete screw WCS1

Performances
Characteristic values for anchorages in precast prestressed hollow core slabs

Annex C 2

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Table C3: Characteristic values of resistance to fire exposure [1)]

Anchor size WCS1				**6**			
				WCS1		**WCS1 A4 sst/HCR**	
Nominal embedment depth				$h_{nom,1}$ = 35 mm	h_{nom2} = 55 mm	$h_{nom,2}$ = 35 mm	$h_{nom,2}$ = 55 mm
Steel failure for Tension- and shear load ($F_{Rk,s,fi}$ = $N_{Rk,s,fi}$ = $V_{Rk,s,fi}$)							
Fire resistance class							
R30	Characteristic resistance	$F_{Rk,s,fi30}$	[kN]	0,9		1,2	
R60		$F_{Rk,s,fi60}$	[kN]	0,8		1,2	
R90		$F_{Rk,s,fi90}$	[kN]	0,6		1,2	
R120		$F_{Rk,s,fi120}$	[kN]	0,4		0,8	
R30	Characteristic resistance	$M^0_{Rks,,fi30}$	[Nm]	0,7		0,9	
R60		$M^0_{Rk,s,fi60}$	[Nm]	0,6		0,9	
R90		$M^0_{Rk,s,fi90}$	[Nm]	0,5		0,9	
R120		$M^0_{Rks,,fi120}$	[Nm]	0,3		0,6	
Edge distance							
R30 bis R120		$c_{cr,\,fi}$	[mm]	2 x h_{ef}			
Spacing							
R30 bis R120		$s_{cr,\,fi}$	[mm]	4 x h_{ef}			

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure shall be calculated according to TR 020 or CEN/TS 1992-4.

[1)] Not for using in prestressed hollow core slabs

Walraven concrete screw WCS1

Performances
Characteristic values of resistance under fire exposure

Annex C 3