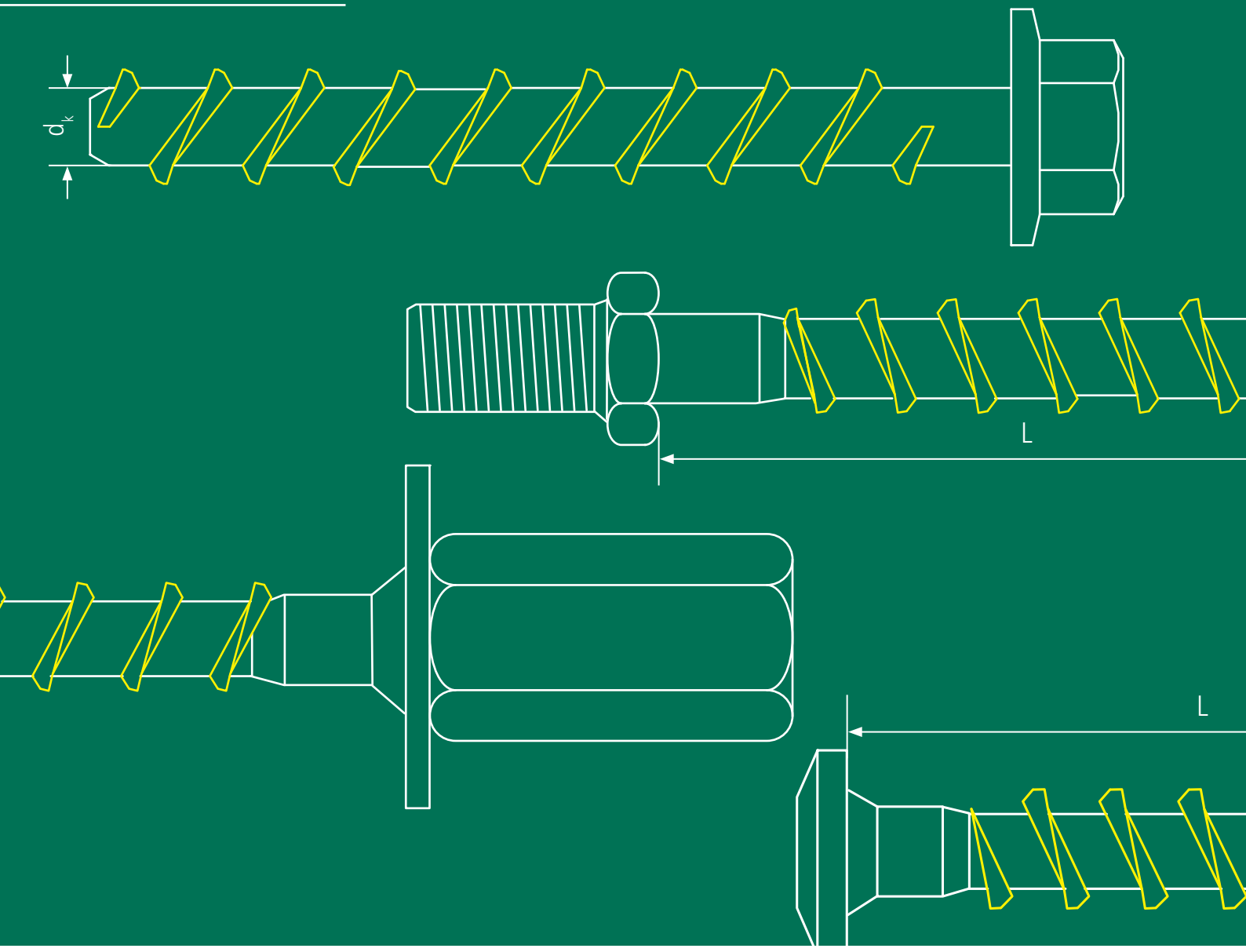
walraven

Approval



WCS1 Concrete Screw

ETA-16/0516

Deutsches Institut für Bautechnik

DIBt

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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-16/0516 of 1 October 2019

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	**Fasteners for use in concrete for redundant non-structural systems**
Manufacturer	**J. van Walraven Holding B.V. Industrieweg 5 3641 RK Mijdrecht NIEDERLANDE**
Manufacturing plant	**Walraven Factory A4**
This European Technical Assessment contains	**16 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	**EAD 330747-00-0601**
This version replaces	**ETA-16/0516 issued on 16 August 2016**

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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 1 October 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

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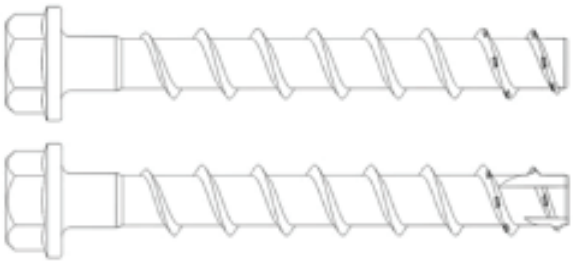
Product in installed condition

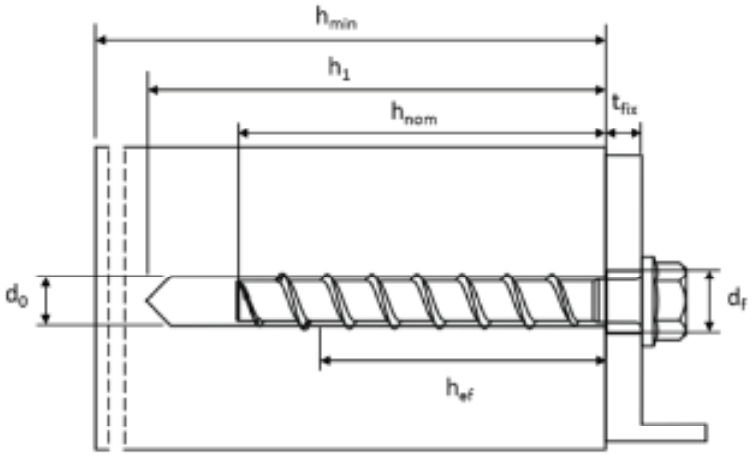
Walraven concrete screw WCS1

- Galvanized carbon steel
- Zinc flakes coated carbon steel



- Stainless steel A4
- Stainless steel HCR

e.g. Walraven concrete screw WCS1H with hexagon head and fixture



d_0 = nominal drill hole diameter
t_{fix} = thickness of fixture
d_f = clearance hole diameter

h_{min} = minimum thickness of member
h_{nom} = nominal embedment depth
h_1 = drill hole depth
h_{ef} = effective embedment depth

Walraven concrete screw WCS1	Annex A1
Product description Product in installed condition	

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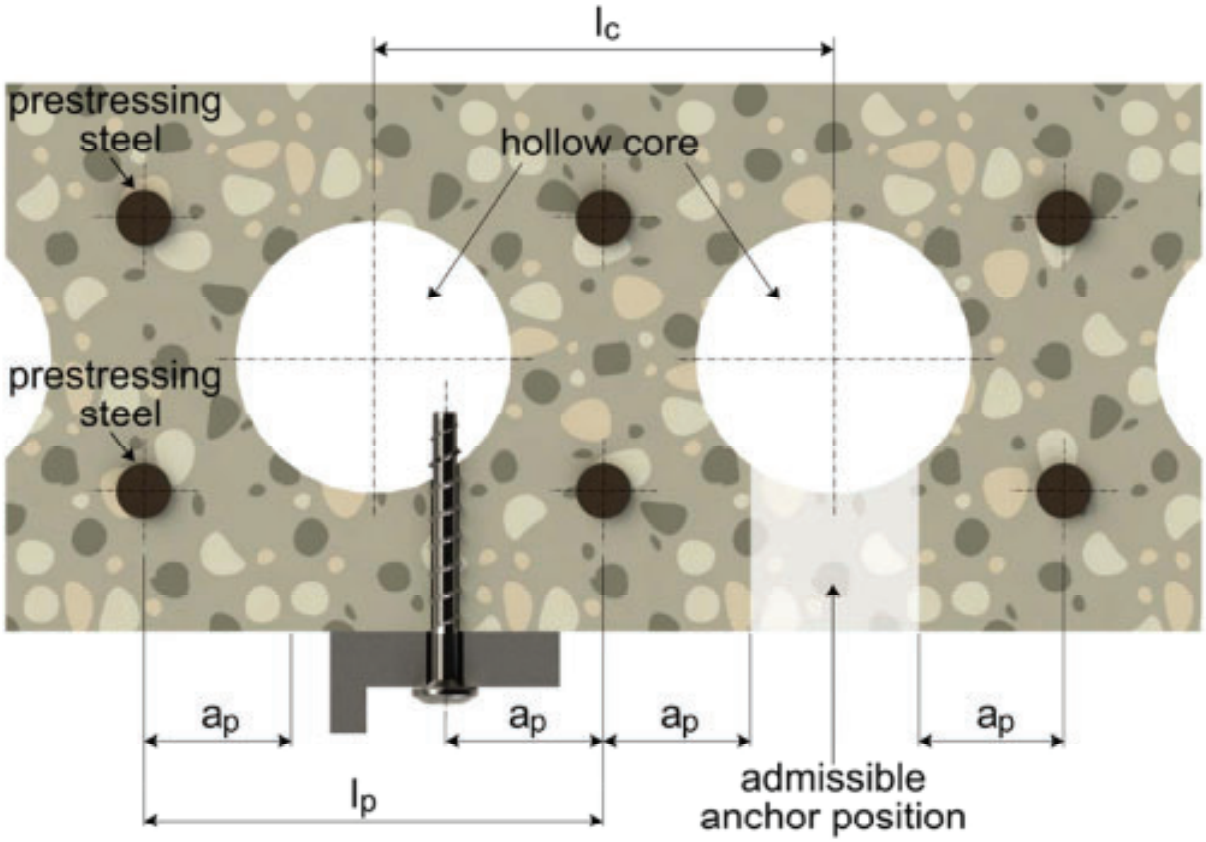
Installed condition in precast prestressed hollow core slabs



Important ratio: $\frac{w}{e} \leq 4,2$

w = core width

e = web thickness

l_c = core distance ≥ 100 mm

l_p = prestressing steel ≥ 100 mm

a_p = distance between anchor position and prestressing steel ≥ 50mm

Walraven concrete screw WCS1	
Product description Installed condition in precast prestressed hollow core slabs	**Annex A2**

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1. Configuration with metric connection threat and hexagon socket e.g. WCS1HS


2. Configuration with metric connection threat and hexagon drive e.g. WCS1HD

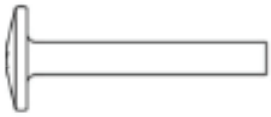

3. Configuration with washer and hexagon head e.g. WCS1H


4. Configuration with washer, hexagon head and TORX drive e.g. WCS1HT


5. Configuration with hexagon head e.g. WCS1HH


6. Configuration with countersunk head and TORX drive e.g. WCS1C

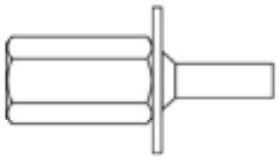

7. Configuration with pan head and TORX drive e.g. WCS1P




8. Configuration with large pan head and TORX drive e.g. WCS1PL


9. Configuration with countersunk head and connection thread e.g. WCS1MC


10. Configuration with hexagon drive and connection thread e.g. WCS1M




11. Configuration with internal thread and hexagon drive e.g. WCS1N

Walraven concrete screw WCS1	
Product description Screw types	**Annex A3**

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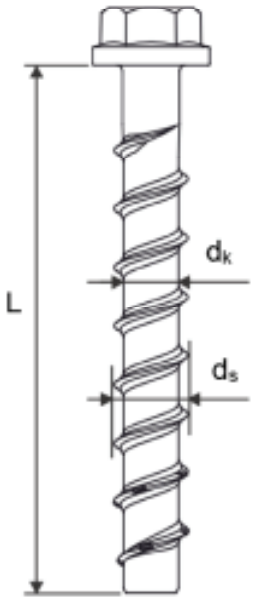
Table 1: Material

Part	Product name	Material
all types	WCS1 concrete screw	- Steel EN 10263-4:2017 galvanized acc. to EN ISO 4042:2018 - Zinc flake coating according to EN ISO 10683:2018 (≥5µm)
	WCS1 concrete screw A4	1.4401; 1.4404; 1.4571; 1.4578
	WCS1 concrete screw HCR	1.4529

Part	Product name	Nominal characteristic steel		Rupture elongation A_5 [%]
		Yield strength f_{yk} [N/mm²]	Ultimate strength f_{uk} [N/mm²]	
all types	WCS1 concrete screw	560	700	≤ 8
	WCS1 concrete screw A4			
	WCS1 concrete screw HCR			

Table 2: Dimensions

WCS1 concrete screw size			5	6
Screw length	≤ L	[mm]	200	
Core diameter	d_k	[mm]	4,0	5,1
Thread outer diameter	d_s	[mm]	6,5	7,5



Marking:

WCS1
Code: TSM
Screw size: 10
Screw length: 100

WCS1 A4
Code: TSM
Screw size: 10
Screw length: 100
Material: A4

WCS1 HCR
Code: TSM
Screw size: 10
Screw length: 100
Material: HCR

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

Walraven concrete screw WCS1	Annex A4
Product description Material, Dimensions and markings	

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Specification of Intended use

Anchorages subject to:

- static and quasi static loads
- Used only for multiple use for non-structural application according to EN 1992-4:2018
- Used for anchorages with requirements related to resistance of fire (not for using in prestressed hollow core slabs): size 6
- Used for anchorages in prestressed hollow core slabs: size 6

Base materials:

- Reinforced and unreinforced concrete without fibers according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Cracked and uncracked concrete.

Use conditions (Environmental conditions):

- Concrete screws subject to 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.
- 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 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 to be designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are to be 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 are designed according to EN 1992-4:2018 and EOTA Technical Report TR 055.
- The design for shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters d_f of clearance hole in the fixture in Annex B2, Table 3.

Installation:

- Hammer drilling or hollow drilling.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- In case of aborted hole: new drilling must be drilled at a minimum distance of twice the depth of aborted hole or closer, if the aborted hole is filled with high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load.
- After installation further turning of the anchor must not be possible. The head of the anchor is supported in the fixture and is not damaged.

TOGE concrete screw TSM High Performance	
Intended use Specification	**Annex B1**

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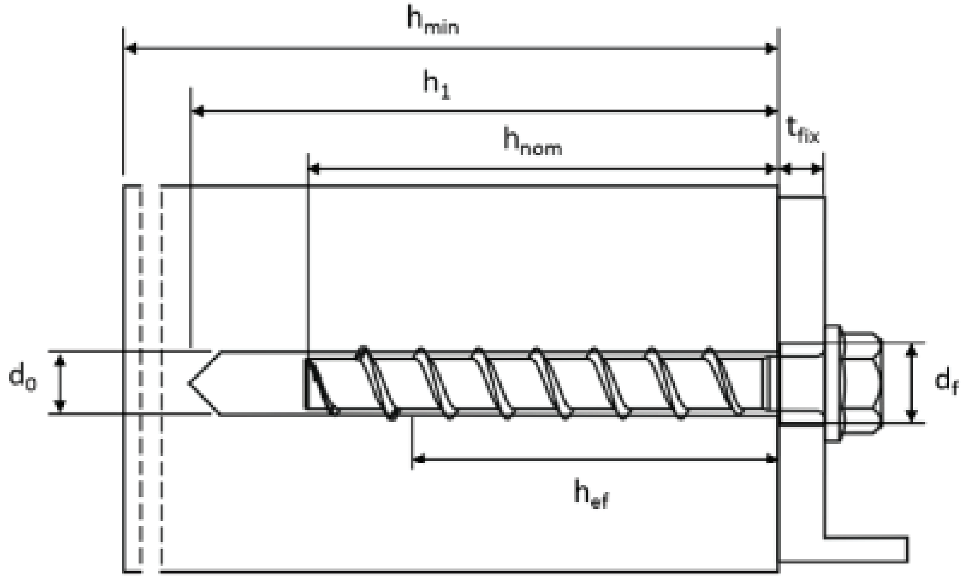
Table 3: Installation Parameters

WCS1 concrete screw size			5	6	
Nominal embedment depth		h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
Nominal drill hole diameter	d_0	[mm]	5	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	5,40	6,40	
Drill hole depth	$h_1 \geq$	[mm]	40	40	60
Clearance hole diameter	$d_f \leq$	[mm]	7	8	
Installation torque (version with connection thread)	$T_{inst} \leq$	[Nm]	8	10	
Recommended torque impact screw driver		[Nm]	Max. torque according to manufacturer's instructions		
			110	160	

Table 4: Minimum thickness of member, minimum edge distance and minimum spacing

WCS1 concrete screw size			5	6	
Nominal embedment depth		h_{nom1}	h_{nom1}	h_{nom1}	h_{nom2}
		[mm]	35	35	55
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 B2

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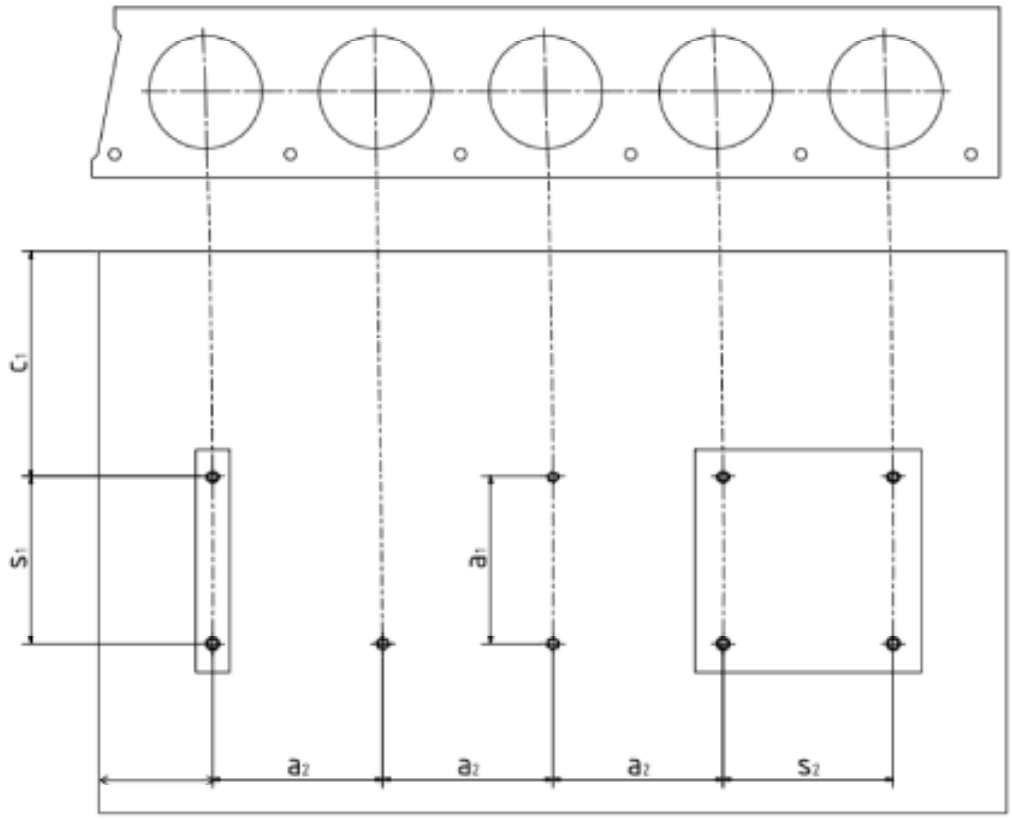
Installation parameters for anchorages in precast prestressed hollow core slabs



c_1, c_2 = edge distance
s_1, s_2 = anchor spacing
a_1, a_2 = distance between anchor groups
c_{min} = minimum edge distance ≥ 100 mm
s_{min} = minimum anchor spacing ≥ 100 mm
a_{min} = minimum distance between anchor groups ≥ 100 mm

Walraven concrete screw WCS1	Annex B3
Intended use Installation parameters for anchorages in precast prestressed hollow slabs	

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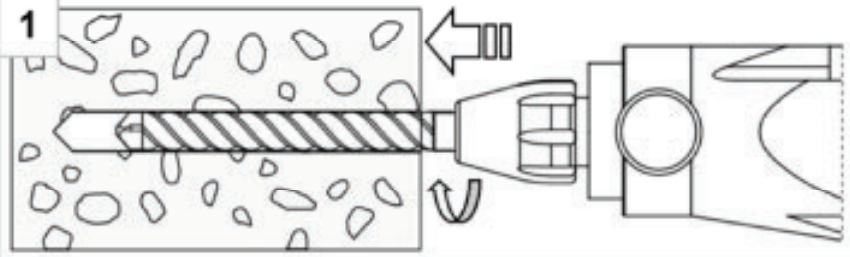
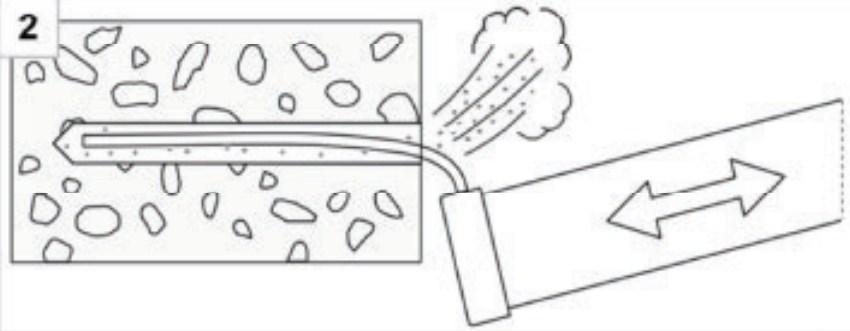
Installation Instructions

1



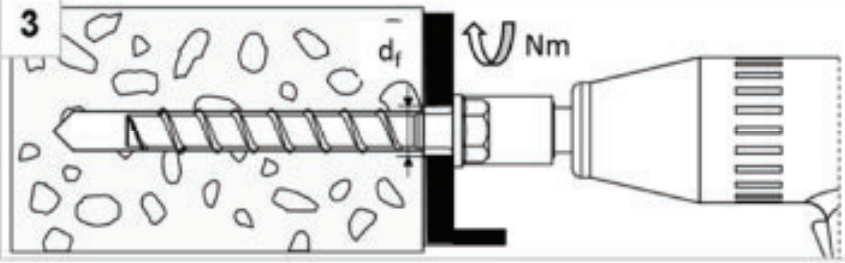
Create hammer drilled or hollow drilled borehole

2



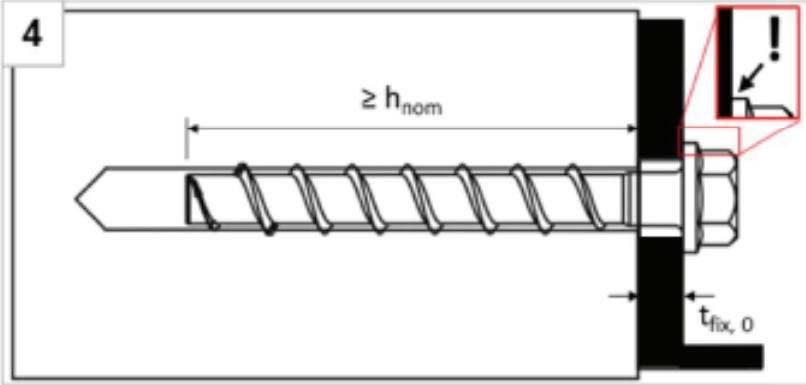
Remove drill dust by vacuuming or blowing of

3



Install with torque impact screw driver or torque wrench

4



The head must be undamaged and in contact with the fixture

Walraven concrete screw WCS1	Annex B4
Intended use Installation instructions	

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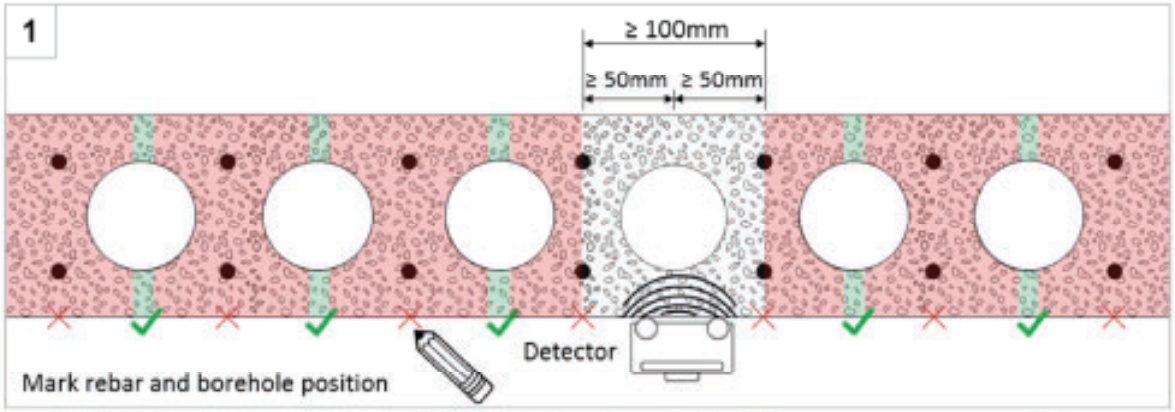
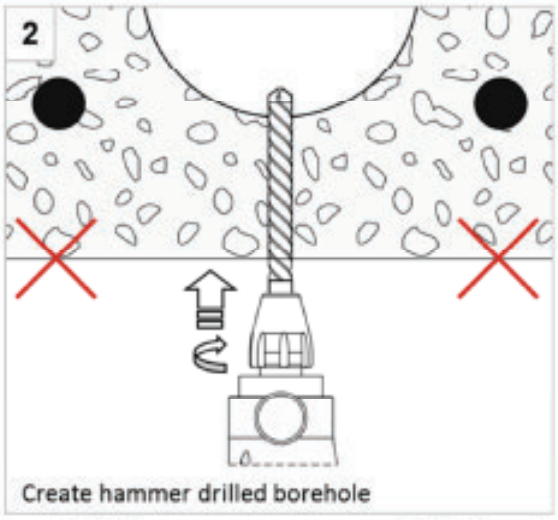
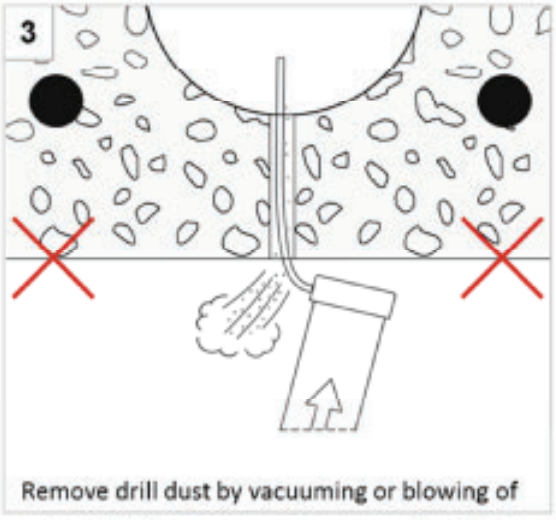
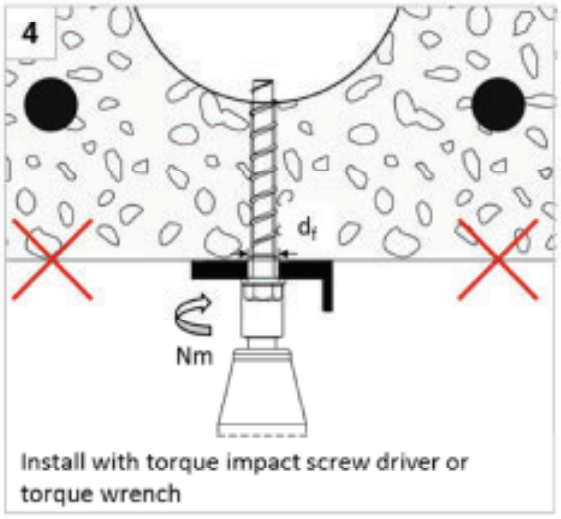
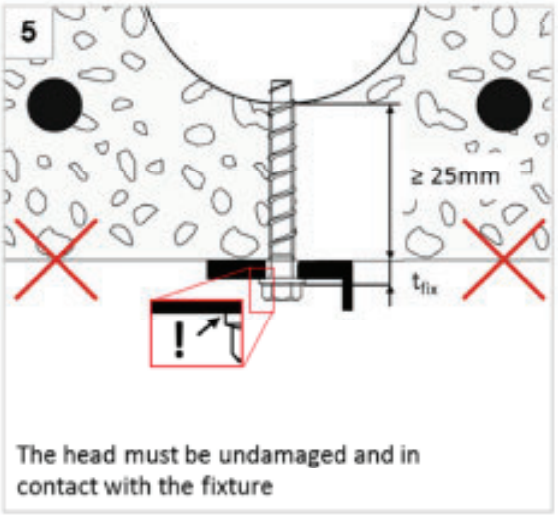
Installation Instructions for anchorages in prestressed hollow slabs











Walraven concrete screw WCS1	
Intended use Installation instructions for anchorages in prepressed hollow slabs	**Annex B5**

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Table 5: Characteristic values for static and quasi-static loading

WCS1 concrete screw size				5	6	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom1}	h_{nom2}
			[mm]	35	35	55
Steel failure for tension and shear loading						
Characteristic tension load		$N_{Rk,s}$	[kN]	8,7	14,0	
Partial factor tension load		$\gamma_{Ms,N}$	[-]	1,5		
Characteristic shear load		$V_{Rk,s}$	[kN]	4,4	7,0	
Partial factor shear load		$\gamma_{Ms,V}$	[-]	1,25		
Ductility factor		k_7	[-]	0,8		
Characteristic bending load		$M^0_{Rk,s}$	[Nm]	5,3	10,9	
Pull-out failure						
Characteristic tension load C20/25	cracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
	uncracked	$N_{Rk,p}$	[kN]	1,5	3,0	7,5
Increasing factor for $N_{Rk,p}$	C20/25	Ψ_c	[-]	1,12		
	C30/37			1,22		
	C40/50			1,41		
	C50/60			1,58		
Concrete failure: Splitting failure, concrete cone failure and pry-out failure						
Effective embedment depth		h_{ef}	[mm]	27	27	44
k-factor	cracked	$k_1 = k_{cr}$	[-]	7,7		
	uncracked	$k_1 = k_{ucr}$	[-]	11,0		
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
Factor for pry-out failure		k_8	[-]	1,0		
Installation factor		γ_{inst}	[-]	1,2	1,0	1,0
Concrete edge failure						
Effective length in concrete		$l_f = h_{ef}$	[mm]	27	27	44
Nominal outer diameter of screw		d_{nom}	[mm]	5	6	

Walraven concrete screw WCS1

Performances
Characteristic values for static and quasi-static loading

Annex C1

Deutsches Institut für Bautechnik DIBt

Table 6: Characteristic values of resistance in precast prestressed hollow core slabs C30/37 to C50/60

WCS1 concrete screw size			6		
Bottom flange thickness	d_b	[mm]	≥ 25	≥ 30	≥ 35
Characteristic resistance	F^0_{Rk}	[kN]	1	2	3
Installation factor	γ_{inst}	[-]	1,0		

Table 7: Limiting distances for application in precast prestressed hollow core slabs

Distances for application in precast prestressed hollow core slabs			
Minimum edge distance	c_{min}	[mm]	≥ 100
Minimum anchor spacing	s_{min}	[mm]	≥ 100
Minimum distance between anchor groups	a_{min}	[mm]	≥ 100
Distance of core	l_c	[mm]	≥ 100
Distance of prestressing steel	l_p	[mm]	≥ 100
Distance between anchor position and prestressing steel	a_p	[mm]	≥ 50

Walraven concrete screw WCS1	Annex C2
Performances Characteristic values and limiting distances in precast prestressed hollow core slabs	

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Table 8: Fire exposure – characteristic values of resistance [1)]

WCS1 concrete screw size				6			
Material				WCS1		WCS1 A4/HCR	
Nominal embedment depth			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
			[mm]	35	55	35	55
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)							
Characteristic Resistance	R30	$F_{Rk,s,fi30}$	[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	$M^0_{Rk,s,fi30}$	[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	$M^0_{Rk,s,fi120}$	[Nm]	0,3		0,6	
Pull-out failure							
Characteristic Resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,75	1,875	0,75	1,875
	R120	$N_{Rk,p,fi}$	[kN]	0,6	1,5	0,6	1,5
Concrete cone failure							
Characteristic Resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,86	2,76	0,86	2,76
	R120	$N^0_{Rk,c,fi}$	[kN]	0,68	2,21	0,68	2,21
Edge distance							
R30 - R120		$c_{cr,fi}$	[mm]	2 x h_{ef}			
In case of fire attack from more than one side, the minimum edge distance shall be ≥300mm.							
Spacing							
R30 - R120		$s_{cr,fi}$	[mm]	4 x h_{ef}			
Pry-out failure							
R30 - R120		k_8	[-]	1,0			
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given value.							

1) Not for application in prestressed hollow core slabs

Walraven concrete screw WCS1	Annex C3
Performances Characteristic values under fire exposure	

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