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-20/0608 of 16 July 2021

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	Anchor channel DCR with channel bolts DCT
Product family to which the construction product belongs	Anchor channels
Manufacturer	PRUDENTIAL (Shanghai) International Trading Company Ltd No. 51, Nanheng Street, Jinshan District SHANGHAI CITY (201802) VOLKSREPUBLIK CHINA
Manufacturing plant	PRUDENTIAL (Shanghai) International Trading Company Ltd No. 51, Nanheng Street, Jinshan District SHANGHAI CITY (201802) VOLKSREPUBLIK CHINA
This European Technical Assessment contains	22 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 330008-03-0601 Edition 06/2021

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Specific Part

1 Technical description of the product

The anchor channels DCR with channel bolts DCT are a system consisting of C-shaped channel profile of carbon steel and at least two metal anchors non-detachably fixed to the channel back and channel bolts.

The anchor channel is embedded surface-flush in the concrete. Channel bolts DCT with appropriate hexagon nuts and washers are fixed to the channel.

The 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 channel 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 channel 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
Characteristic resistance under tension load (static and quasi-static load)	
- Resistance to steel failure of anchors, connection and channel lips	See Annex C1
- Resistance to steel failure of channel bolt	See Annex C4
- Resistance to steel failure by exceeding the bending strength of the channel	See Annex B3 and C1
- Max. installation torque	See Annex B4
- Resistance to pull-out failure of the anchor and to concrete cone failure	See Annex C2
- Min. edge distance, spacing and member thickness	See Annex B3
- Characteristic edge distance and spacing to avoid splitting of concrete under load	See Annex C2
- Resistance to blow-out failure – bearing area of anchor head	See Annex A4

Characteristic resistance under shear load (static and quasi-static load)	
- Resistance to steel failure of channel bolt	See Annex C4 and C5
- Resistance to steel failure of channel lips, anchor and connection (shear load perpendicular to longitudinal axis of channel)	See Annex C3
- Resistance to steel failure of channel lips, anchor and connection (shear load in direction of longitudinal axis of channel)	No performance assessed
- Resistance to concrete failure	See Annex C3
Characteristic resistance under combined tension and shear load (static and quasi-static load)	See Annex C4
Characteristic resistance under cyclic fatigue tension load	No performance assessed
Displacements (static and quasi-static load)	
- Displacement under tension load	See Annex C2
- Displacement under shear load perpendicular to longitudinal axis of channel	See Annex C3
- Displacement under shear load in direction of longitudinal axis of channel	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	**Performance**
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.3 Aspects of durabilty

Essential characteristic	**Performance**
Durability	See Annex B1

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

In accordance with EAD No. 330008-03-0601, the applicable European legal act is: [2000/273/EC].

The system to be applied is: 1

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 16 July 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Stiller

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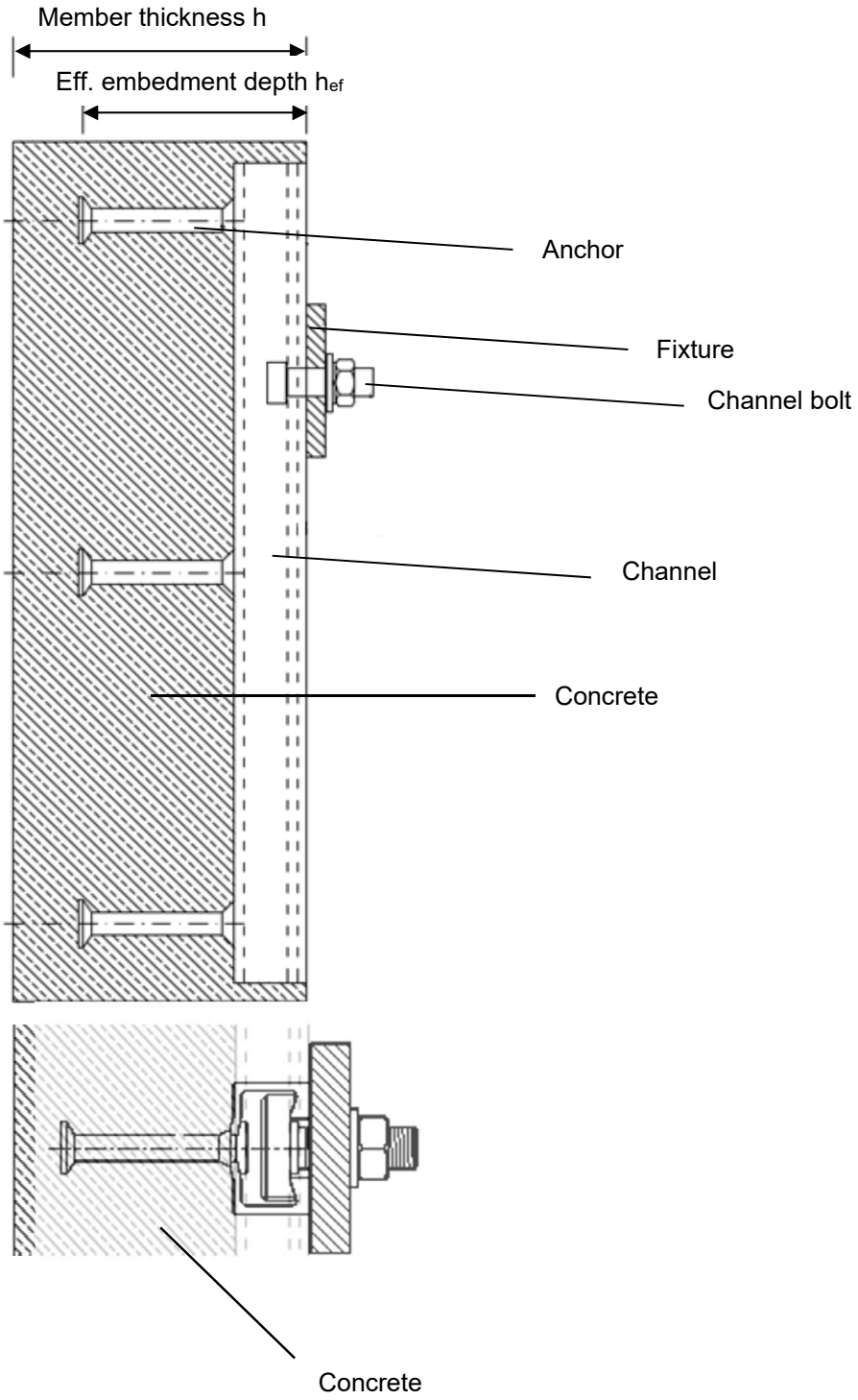
Product and installation condition



Anchor channel DCR with channel bolts DCT

Product Description
Installed condition

Annex A1

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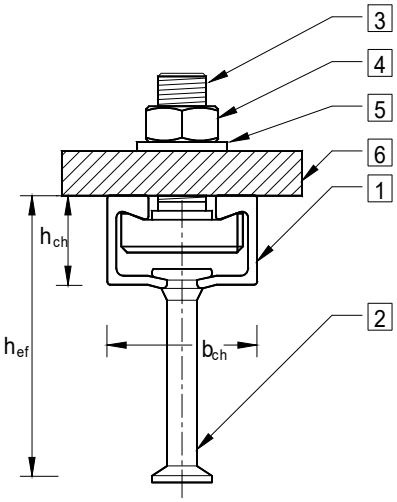
Anchor channel types

Hot-rolled channel profiles with round anchor



1	Channel profile
2	Anchor
3	Channel bolt
4	Hexagonal nut
5	Washer
6	Fixture

Marking of the anchor channels:

e.g. **Prudential 50/30 F**

Prudential	Identifying mark of the manufacturer
50/30	Anchor channel size (50/30, 52/34)
F	hot-dip-galvanized

printed on channel lips

Marking of the channel bolt:

e.g. 

8.8 F

	Identifying mark of the manufacturer (for anchor channel size 50/30)
LQ	Identifying mark of the manufacturer (for anchor channel size 52/34)
8.8	steel grade
G	electroplated
F	hot-dip galvanized

Anchor channel DCR with channel bolts DCT

Product Description
Marking

Annex A2

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Channel profiles

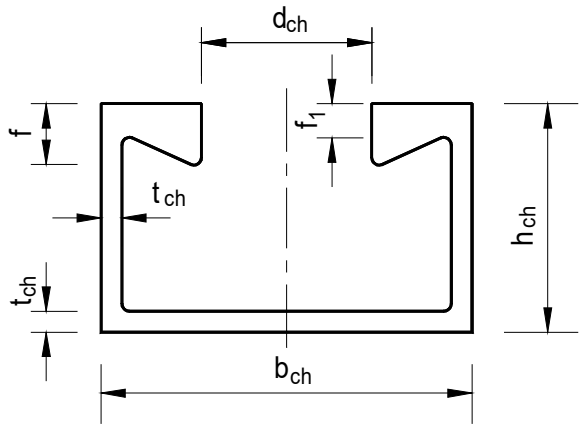

Figure 1: Anchor channel DCR-50/30

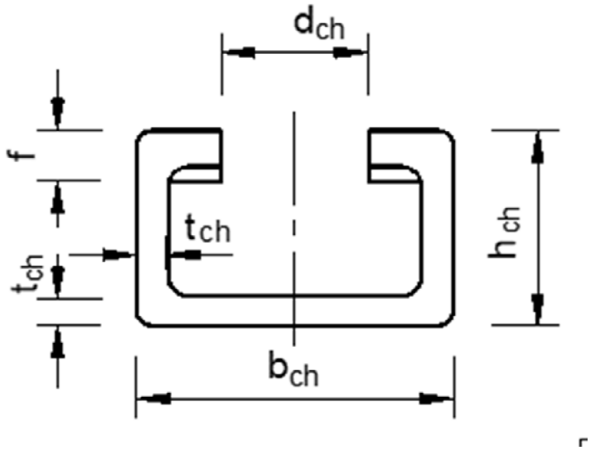

Figure 2: Anchor channel DCR-52/34 (serrated)

Table 1: Dimensions of hot-rolled channel profile

Channel profile	b_{ch}	h_{ch}	$t_{ch,nom}$	d_{ch}	f	f_1	I_y
	[mm]						[mm^4]
DCR-50/30	50	30	3,3	20	8,1	5	64875
DCR-52/34	52	34	4	22	11,5	-	97970

Anchor channel DCR with channel bolts DCT

Product Description
Profile dimensions

Annex A3

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Anchors

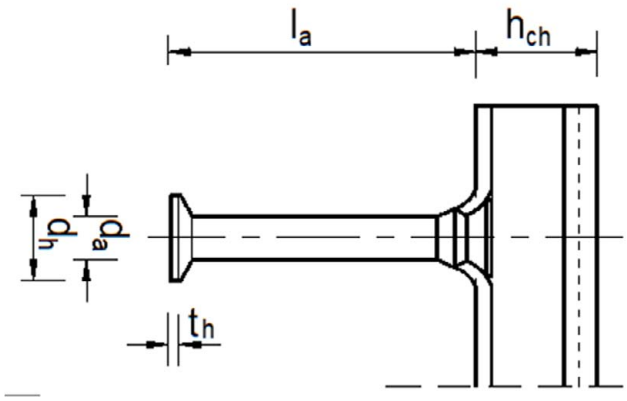

Figure 3: Round anchor for DCR

Table 2: Dimensions of anchor

Anchor channel DCR	min l_a	d_a	d_h	t_h	A_h
	[mm]				[mm²]
50/30	65	10	20	2,0	235,6
52/34	123	11	24	2,2	357,4

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Channel bolts

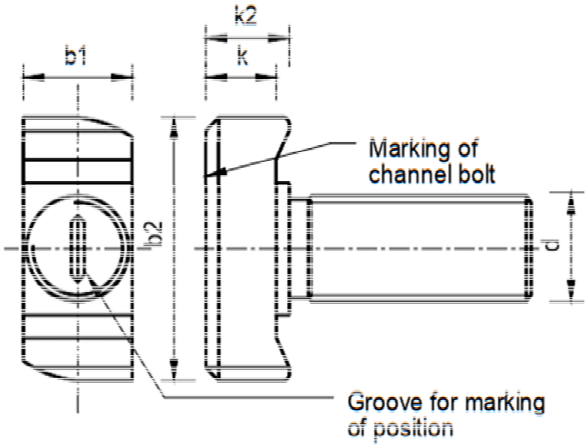

Figure 4: Channel bolt DTC-50/30

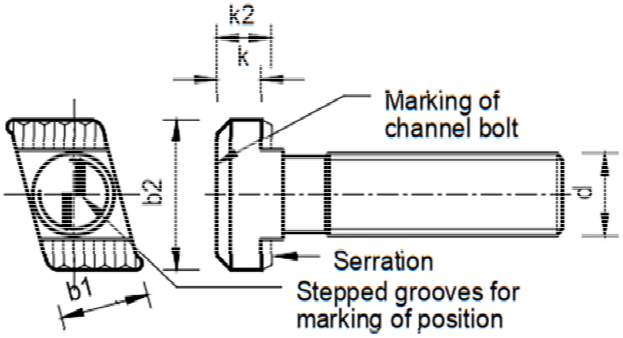

Figure 5: Channel bolt DTC-52/34

Table 3: Dimensions of channel bolts

Anchor channel	Channel bolt	d	b_1	b_2	k	k_2
		[mm]				
DCR-50/30	DTC-50/30	16	20	40	10	12
DCR-52/34	DTC-52/34	20	20,4	38	9,5	12

Table 4: Steel grade

Channel bolt	Steel [1)]
Steel grade	8.8
f_{uk} [N/mm²]	800
f_{yk} [N/mm²]	640

1) Material properties acc. to Annex A6

Anchor channel DCR with channel bolts DCT

Product Description
Dimension and material of channel bolt

Annex A5

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Materials

Table 5: Materials and properties

Component	Steel		
	Mechanical properties	**Coating**	**Coating**
1	**2a**	**2b**	**2c**
Channel profile	1.0045 according to EN 10025:2019	Hot dip galvanized ≥ 70 µm acc. to EN ISO 10684:2004 + AC:2009	Hot dip galvanized ≥ 70 µm acc. to EN ISO 10684:2004 + AC:2009
Anchor	1.5535 according to EN 10263-4:2017		
Channel bolt	Steel grade 8.8 acc. to EN ISO 898-1:2013	Electroplated acc. to EN ISO 4042:2018	
Washer	Hardness class ≥ 200 HV acc. to EN ISO 7089:2000 and EN ISO 7093-1:2000		
Hexagonal nut	Steel grade 8.8 acc. to EN ISO 898-2:2012		

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Specifications of intended use

Anchor channels and channel bolts subject to:

- Static and quasi-static loads in tension and shear perpendicular to the longitudinal axis of the channel.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1+A1+A2:2000.
- Strength classes C12/15 to C60/75 according to EN 206-1+A1+A2:2000.
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions

  (anchor channels and channel bolts according to Annex A6, Table 5, column 2b)
- Structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundries in residential buildings, exceptional permanent damp conditions and application under water)

  (anchor channels and channel bolts according to Annex A6, Table 5, column 2c)

Design:

- Anchor channels 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 channel and channel bolts are indicated on the design drawings (e.g. position of the anchor channel relative to the reinforcement or to supports).
- For static and quasi-static loading the anchor channels are designed in accordance with EOTA TR 047 "Design of Anchor Channels", March 2018 or EN 1992-4:2018.
- The characteristic resistances are calculated with the minimum effective embedment depth.

Anchor channel DCR with channel bolts DCT	**Annex B1**
Intended Use Specifications	

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Installation:

- The installation of anchor channels is carried out by appropriately qualified personnel under the supervisions of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer – without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex B3, Table 6 are generated including end spacing x and minimum channel length l_{min} and only to be used in dry internal conditions.
- Installation in accordance with the installation instruction given in B5 and B6.
- The anchor channels are fixed on the formwork, reinforcement or auxiliary construction such that no movement of the channels will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The concrete under the head of the anchors are properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Washer may be chosen according to Annex A6, Table 5 and provided separately by the user.
- Orientating the channel bolt (groove according to Annex A5) rectangular to the channel axis.
- The required installation torques given in Annex B4, Table 8 shall not be exceeded.

Anchor channel DCR with channel bolts DCT	**Annex B2**
Intended Use Specifications	

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Table 6: Installation parameters

Anchor channel DCR-			50/30	52/34
Minimum effective embedment depth	$h_{ef,min}$	[mm]	95	154,8
Minimum spacing	s_{min}		150	150
Maximum spacing	s_{max}		150	150
End spacing	x		25	25
Minimum channel length	l_{min}		350	350
Minimum edge distance	c_{min}		75	100
Minimum thickness of concrete member	h_{min} [1)]		160	210

[1)] $h_{min} = h_{ef} + t_h + c_{nom}$; c_{nom} according to EN 1992-1-1:2004 + AC: 2010

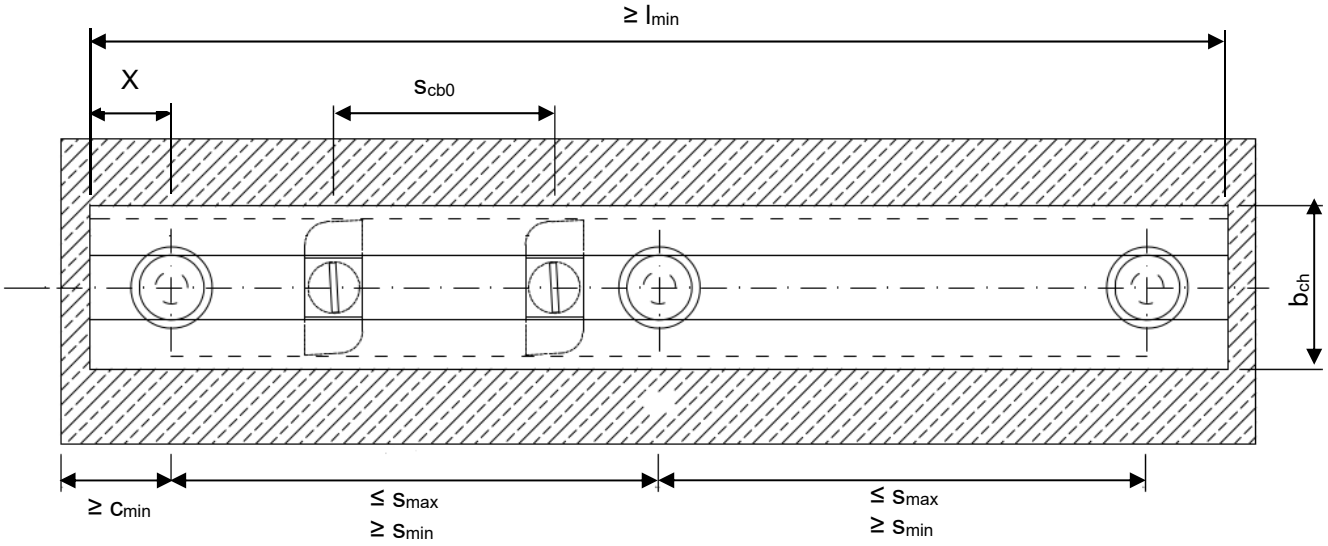

Table 7: Minimum spacing for channel bolts

Channel bolt DCT			50/30	52/34
Minimum spacing between channels bolts	$s_{cbo,min}$	[mm]	80	100

Anchor channel DCR with channel bolts DCT

Intended Use
Installation parameters

Annex B3

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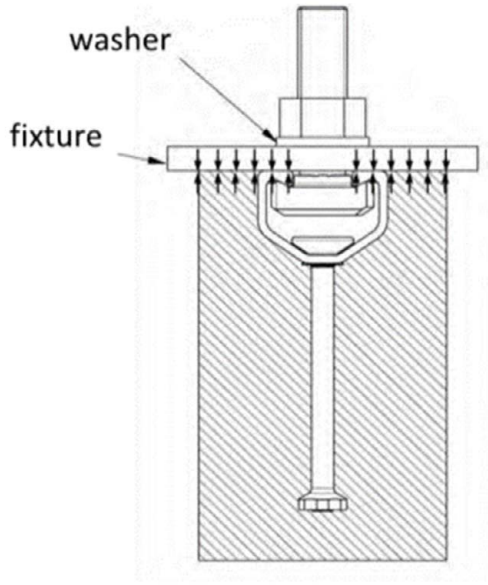
Table 8: Required installation torque moment T_{inst}

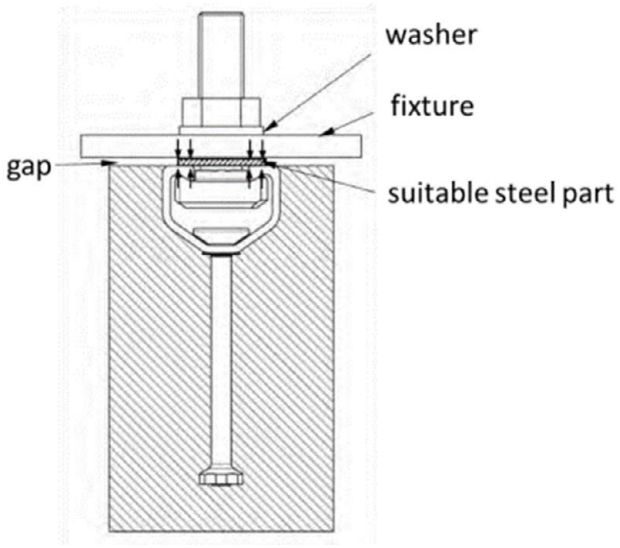
Anchor channel DCR	Channel Bolt DCT		General $T_{inst,g}$ [1)]	Steel - steel contact $T_{inst,s}$ [1)]
			[Nm]	[Nm]
50/30	50/30	M16	60	180
52/34	52/34	M20	120	360

1) T_{inst} shall not be exceeded

General:
The fixture is in contact with the channel profile and the concrete surface by tightening with $T_{inst,g}$.

Steel-steel contact:
The fixture is not in contact with the concrete surface. The fixture is fastened to the anchor channel by suitable steel part (e.g. washer) by tightening with $T_{inst,s}$ ($T_{inst,s} \geq T_{inst,g}$)





Anchor channel DCR with channel bolts DCT

Intended Use
Installation parameters

Annex B4

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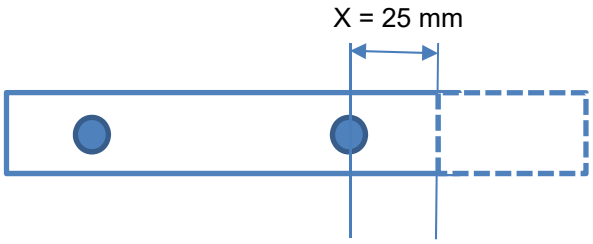
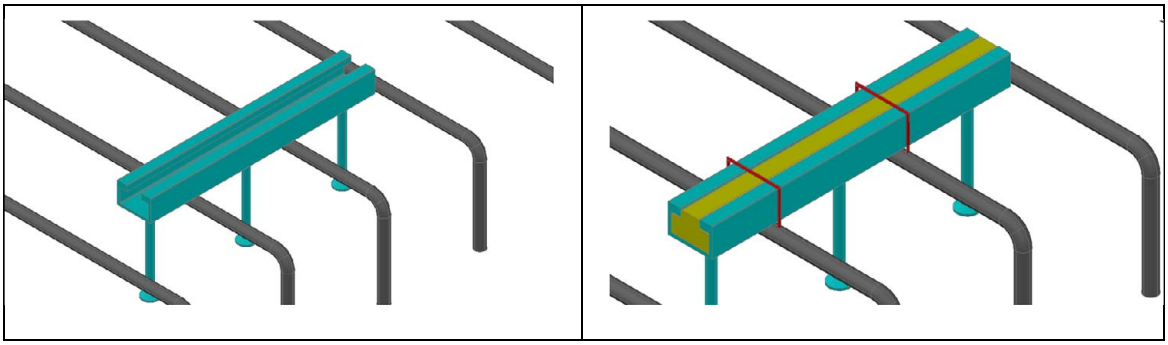
Installation instructions

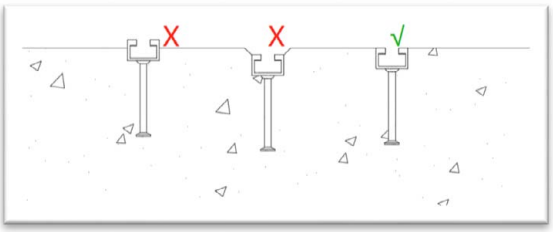
1. Correct selection of anchor channel in accordance with the design specification.
2. The end distance x shall be observed when cutting the anchor channel on the job site.



3. Position the anchor channel such that the channel lips will be flush with the surface of the concrete. The anchor channels are to be attached to the formwork, reinforcement or auxiliary structures in such a way that they do not move during the concreting process. Anchor channels shall not be installed on fresh concrete, bent or otherwise deformed.

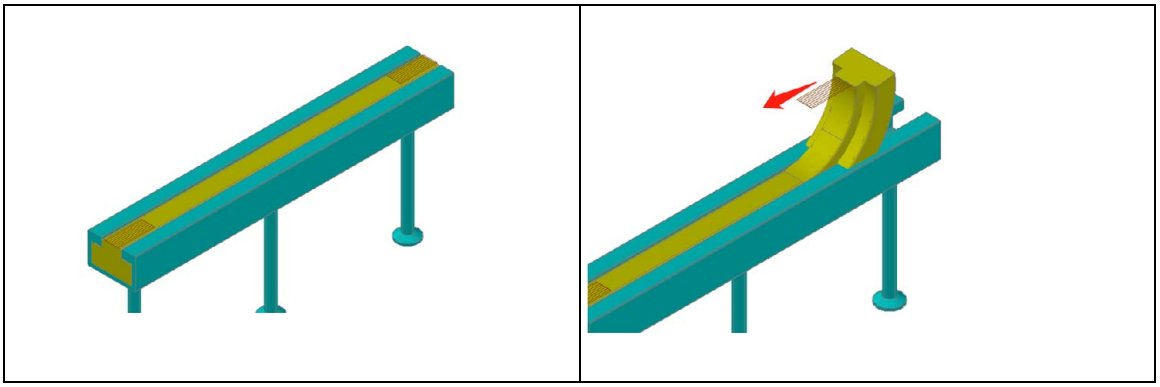


4. Installed anchor channels shall be flush with the

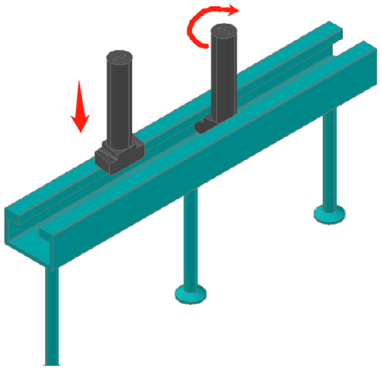


Anchor channel DCR with channel bolts DCT	**Annex B5**
Intended Use Installation instruction	

5. Remove the foam filler after concrete cured.



6. Select Prudential channel bolt type in accordance with the design specification.
7. Place the channel bolt in the channel and lock the channel bolt in the channel by turning it 90°.



8. Verify alignment of the channel bolt with the groove. The groove on the shank end of the channel bolt shall be perpendicular to the longitudinal axis of the channel.
9. Verify that the channel bolt is not located outside the part of the channel bounded by the outermost anchors.
10. Do not cut channel bolts.
11. Apply the installation torque Tinst to the channel bolt with a calibrated torque wrench. Do not exceed the value Tinst, see Annex B4, Table 8.

Anchor channel DCR with channel bolts DCT	**Annex B6**
Intended Use Installation instruction	

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Table 9: Characteristic resistances under tension load - steel failure of anchor channel

Anchor channel DCR-			**50/30**	**52/34**
Steel failure: Anchor				
Characteristic resistance	$N_{Rk,s,a}$	[kN]	47	57
Partial factor	γ_{Ms} [1)]	[-]	1,5	
Steel failure: Connection between anchor and channel				
Characteristic resistance	$N_{Rk,s,c}$	[kN]	30	33
Partial factor	$\gamma_{Ms,ca}$ [1)]	[-]	1,8	
Steel failure: Local flexure of channel lips				
Characteristic spacing of channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	100	104
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	30	33
Partial factor	$\gamma_{Ms,l}$ [1)]	[-]	1,8	

1) In absence of other national regulations

Table 10: Characteristic flexure resistance of channel

Anchor channel DCR-			**50/30**	**52/34**
Steel failure: Flexure of channel				
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	2513	3729
Partial factor	$\gamma_{Ms,flex}$ [1)]	[-]	1,15	

1) In absence of other national regulations

Anchor channel DCR with channel bolts DCT

Performance
Characteristic resistances of anchor channels under tension load

Annex C1

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Table 11: Characteristic resistances under tension load – concrete failure

Anchor Channel DCR-				**50/30**	**52/34**
Concrete failure: Pull-out					
Characteristic resistance in cracked concrete C12/15		$N_{Rk,p}$	[kN]	21,2	32,2
Characteristic resistance in uncracked concrete C12/15		$N_{Rk,p}$	[kN]	29,7	45
Increasing factor for $N_{Rk,p} = N_{Rk,p}$ (C12/15) $\cdot \psi_c$	C16/20	ψ_c	[-]	1,33	
	C20/25			1,67	
	C25/30			2,08	
	C30/37			2,50	
	C35/45			2,92	
	C40/50			3,33	
	C45/55			3,75	
	C50/60			4,17	
	C55/67			4,58	
	C60/75			5,00	
Partial factor		$\gamma_{Mp} = \gamma_{Mc}$ [1)]	[-]	1,5	
Concrete failure: Concrete cone					
Product factor k1	Cracked concrete	$k_{cr,N}$	[-]	8,07	8,72
	Uncracked concrete	$k_{ucr,N}$		= 1,427*$k_{cr,N}$	
Partial factor		γ_{Mc} [1)]	[-]	1,5	
Concrete failure: Splitting					
Characteristic edge distance		$c_{cr,sp}$	[mm]	= 3*$h_{ef,min}$ [2)]	
Characteristic spacing		$s_{cr,sp}$	[mm]	= 6*$h_{ef,min}$ [2)]	
Partial factor		γ_{Msp} [1)]	[-]	1,5	

1) In absence of other national regulations
2) $h_{ef,min}$ according to Annex B3, Table 6

Table 12: Displacements under tension load

Anchor channel DCR-			**50/30**	**52/34**
Tension load	N	[kN]	11,9	13,1
Short-term displacement	δ_{N0}	[mm]	2,2	0,9
Long-term displacement	$\delta_{N\infty}$	[mm]	4,4	1,8

Anchor channel DCR with channel bolts DCT

Performance
Characteristic resistances of anchor channels and displacements under tension load

Annex C2

Deutsches Institut für Bautechnik DIBt

Table 13: Characteristic resistances under shear load - steel failure of anchor channel

Anchor channel DCR-				**50/30**	**52/34**
Steel failure: Anchor					
Characteristic resistance		$V_{Rk,s,a,y}$	[kN]	55	57
Partial factor		$\gamma_{Ms,a}$ [1)]	[-]	1,8	
Steel failure: Connection between anchor and channel					
Characteristic resistance		$V_{Rk,s,c,y}$	[kN]	55	57
Partial factor		$\gamma_{Ms,c}$ [1)]	[-]	1,8	
Steel failure: Local flexure of channel lips					
Characteristic spacing of channel bolts for $V_{Rk,s,l}$		$s_{l,V}$	[mm]	100	104
Characteristic resistance		$V^0_{Rk,s,l,y}$	[kN]	55	57
Partial factor		$\gamma_{Ms,l}$ [1)]	[-]	1,8	

1) In absence of other national regulations

Table 14: Characteristic resistances under shear load – concrete failure

Anchor channel DCR-				**50/30**	**52/34**
Concrete Failure: Pry-out					
Product factor		k_8	[-]	2,0	
Partial safety factor		γ_{Mc} [1)]	[-]	1,5	
Concrete failure: Concrete edge					
Product factor k_{12}	Cracked concrete	$k_{cr,V}$	[-]	7,5	
	Uncracked concrete	$k_{ucr,V}$	[-]	10,5	
Partial safety factor		γ_{Mc} [1)]	[-]	1,5	

1) In absence of other national regulations

Table 15: Displacements under shear load

Anchor channel DCR-			**50/30**	**52/34**
Shear load	V_y	[kN]	23,8	34,5
Short-term displacement	$\delta_{v,y,0}$	[mm]	1,9	2,8
Long-term displacement	$\delta_{v,y,\infty}$	[mm]	2,9	4,2

Anchor channel DCR with channel bolts DCT

Performance
Characteristic resistances of anchor channel and displacement under shear load

Annex C3

Deutsches Institut für Bautechnik DIBt

Table 16: Characteristic resistances under combined tension and shear load

Anchor channel DCR-			**50/30**	**52/34**
Steel failure: Local failure by flexure of channel lips and failure by flexure of channel				
Product factor	k_{13}	[-]	according to EN 1992-4:2018, 7.4.3.1	
Steel failure: Failure of anchor and connection between anchor and channel				
Product factor	k_{14}	[-]	according to EN 1992-4:2018, 7.4.3.1	

Table 17: Characteristic resistances under tension and shear load – steel failure of channel bolts

Channel bolt DCT-			**50/30**	**52/34**
Channel bolt Ø			**M16**	**M20**
Steel failure: Channel bolt				
Characteristic tension resistance	$N_{Rk,s}$	[kN]	125	184
Partial factor	γ_{Ms} [1)]	[-]	1,5	
Steel failure: Channel bolt				
Characteristic shear resistance	$V_{Rk,s}$	[kN]	62,8	98
Partial factor	γ_{Ms} [1)]	[-]	1,25	

[1)] In absence of other national regulations

Anchor channel DCR with channel bolts DCT

Annex C4

Performance
Characteristic resistances of anchor channels under combined tension and shear load
Characteristic resistance of channel bolts under tension and shear load

Deutsches Institut für Bautechnik DIBt

Table 18: Characteristic resistance under shear load with lever arm – steel failure of channel bolts

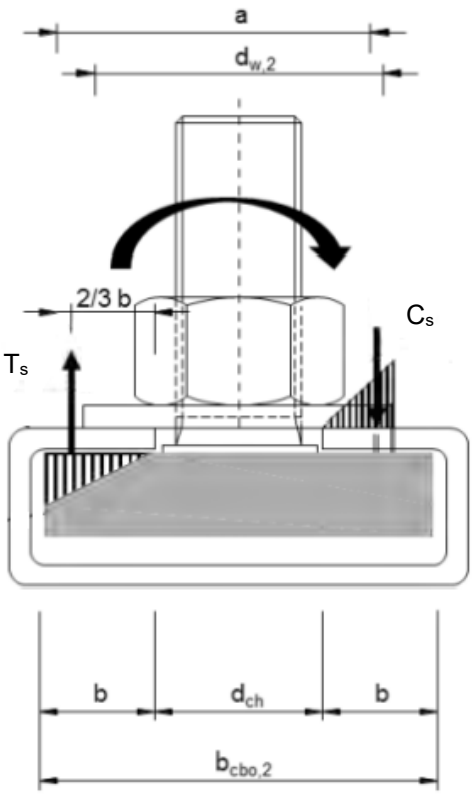
Channel bolt [2]			**M16**	**M20**
Steel failure: Channel bolt				
Characteristic bending resistance	$M^0_{Rk,s}$ [3]	[Nm]	266	519
Partial factor	γ_{Ms} [1]	[-]	1,25	
Internal lever arm	a	[mm]	30,5	33,7

1) In absence of other national regulations
2) Materials according to Table 5, annex A6
3) The characteristic bending resistance according to Table 18 is limited as follows:

$M^0_{Rk,s} \leq 0{,}5 * N^0_{Rk,s,l} * a$ ($N^0_{Rk,s,l}$ according to Annex C1, Table 9)

$M^0_{Rk,s} \leq 0{,}5 * N_{Rk,s} * a$ ($N_{Rk,s}$ according to Annex C4, Table 17)

a = internal lever arm according to Table 18



T_s = Tension force acting on the channel lips

C_s = Compression force acting on the channel lips

Anchor channel DCR with channel bolts DCT

Performance
Characteristic resistances of channel bolts under shear load with lever arm

Annex C5