Hilti Anchor Channel HAC-C

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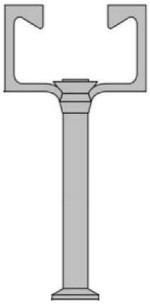
Anchor channel HAC-C

APPLICATIONS

- Fastening of curtain wall, external cladding bracket e.g wet zones, etc.
- Fastening of M&E services in outdoor or corrosive conditions

ADVANTAGES

- Special end caps with nail holes to ease installation of T-head bolts
- Dustless and noiseless fastening method
- Flexibility of use throughout the whole building life cycle



Technical data	
Base material	Concrete
Environmental conditions	Outdoor
Material composition	Steel, A4 stainless steel/ hot-dip galvanized

HAC-C (A4 stainless steel)

Ordering designation	T-head bolt size	Length, lch	Number of anchors	Anchor distance	Standard embedment depth, hef	Sales pack quantity	Item number
HAC-C 40/22-300-A4	40/22	300	3	100 mm	79 mm	1 pc	**2170266**[1)]
HAC-C 40/22-350-A4	40/22	350	3	150 mm	79 mm	1 pc	**2170267**
HAC-C 40/22-550-A4	40/22	550	3	250 mm	79 mm	1 pc	**2170360**[1)]
HAC-C 40/22-1550-A4	40/22	1550	7	250 mm	79 mm	1 pc	**2170364**[1)]
HAC-C 50/30-350-A4	50/30	350	3	150 mm	94 mm	1 pc	**2170396**
HAC-C 52/34-350-A4	50/30	350	3	150 mm	155 mm	1 pc	**2170257**

[1)] This is non-stock item. For detailed leadtime information, please contact your Hilti representative.

Please visit Hilti website for the latest item numbers and related products

HAC-C (Hot-dip galvanized)

Ordering designation	T-head bolt size	Length, lch	Number of anchors	Anchor distance	Standard embedment depth, hef	Sales pack quantity	Item number
HAC-C 40/22-300-F	40/22	300	3	100 mm	79 mm	1 pc	**2168472**[1)]
HAC-C 40/22-350-F	40/22	350	3	150 mm	79 mm	1 pc	**2168473**
HAC-C 40/22-550-F	40/22	550	3	250 mm	79 mm	1 pc	**2168476**[1)]
HAC-C 40/22-1550-F	40/22	1550	7	250 mm	79 mm	1 pc	**2168480**[1)]
HAC-C 50/30-350-F	50/30	350	3	150 mm	94 mm	1 pc	**2168525**
HAC-C 52/34-350-F	50/30	350	3	150 mm	155 mm	1 pc	**2168543**

[1)] This is non-stock item. For detailed leadtime information, please contact your Hilti representative.

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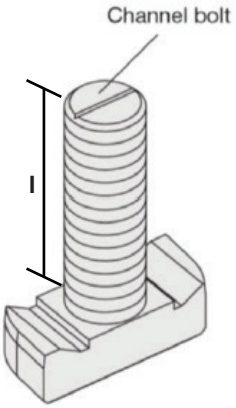
Customer Hotline: Hong Kong 8228 8118, Macau 00800 8228 8118 Email: hksales@hilti.com

T-head bolt HBC

APPLICATIONS

- For use with HAC-C anchor channels



ADVANTAGES

- European approval according to latest technical specifications
- Dustless and noiseless fastening method

Technical data	
Environmental conditions	Outdoor
Material composition	A4-70 stainless steel/ Hot-dip galvanized

HBC (A4 stainless steel)

Ordering designation	Anchor size	Usable thread length	Bolt length, l	Sales pack quantity	Item number
HBC 40/22-M12x60 A4-70	M12	36.7 mm	60 mm	50 pc	**2169081**
HBC 40/22-M12x80 A4-70	M12	56.7 mm	80 mm	25 pc	**2169082**[1)]
HBC 40/22-M16x60 A4-70	M16	32.2 mm	60 mm	25 pc	**2169084**
HBC 40/22-M16x80 A4-70	M16	52.2 mm	80 mm	25 pc	**2169085**
HBC 50/30-M16x60 A4-70	M16	30.2 mm / 26.7 mm	60 mm	50 pc	**2168809**
HBC 50/30-M16x80 A4-70	M16	50.2 mm / 46.7 mm	80 mm	50 pc	**2168810**
HBC 50/30-M20x60 A4-70	M20	45 mm / 41.5 mm	80 mm	50 pc	**2168814**[1)]

[1)] This is non-stock item. For detailed leadtime information, please contact your Hilti representative.
*Usable thread length measures the bolt length protruded after inserted the HBC into the HAC channel.

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HBC (Grade 8.8, hot-dip galvanized)

Ordering designation	Anchor size	Usable thread length	Bolt length, l	Sales pack quantity	Item number
HBC 40/22-M12x60 8.8F	M12	36.7 mm	60 mm	50 pc	**2169074**
HBC 40/22-M12x80 8.8F	M12	56.7 mm	80 mm	25 pc	**2169075**
HBC 40/22-M16x60 8.8F	M16	32.2 mm	60 mm	25 pc	**2169077**
HBC 40/22-M16x80 8.8F	M16	52.2 mm	80 mm	25 pc	**2169078**
HBC 50/30-M16x60 8.8F	M16	30.2 mm / 26.7 mm	60 mm	50 pc	**2168746**
HBC 50/30-M16x80 8.8F	M16	50.2 mm / 46.7 mm	80 mm	50 pc	**2168747**
HBC 50/30-M20x60 8.8F	M20	45 mm / 41.5 mm	80 mm	50 pc	**2168800**[1)]

[1)] This is non-stock item. For detailed leadtime information, please contact your Hilti representative.
*Usable thread length measures the bolt length protruded after inserted the HBC into the HAC channel.

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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-16/0929 of 27 February 2017

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 channels (HAC-C) with channel bolts (HBC)
Product family to which the construction product belongs	Anchor channels
Manufacturer	PEC Europe GmbH Obere Kaiserswerther Straße 56 47249 Duisburg DEUTSCHLAND
Manufacturing plant	
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	European Assessment Document (EAD) 330008-02-0601

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Specific Part

1 Technical description of the product

The anchor channels (HAC-C) with channel bolts (HBC) are a system consisting of C-shaped channel profile of carbon steel or stainless 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 (HBC) 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 resistances under static and quasi-static loads and displacements	See Annex C1 to C6

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 C7

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

In accordance with EAD No. 330008-02-0601, 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 EAD

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

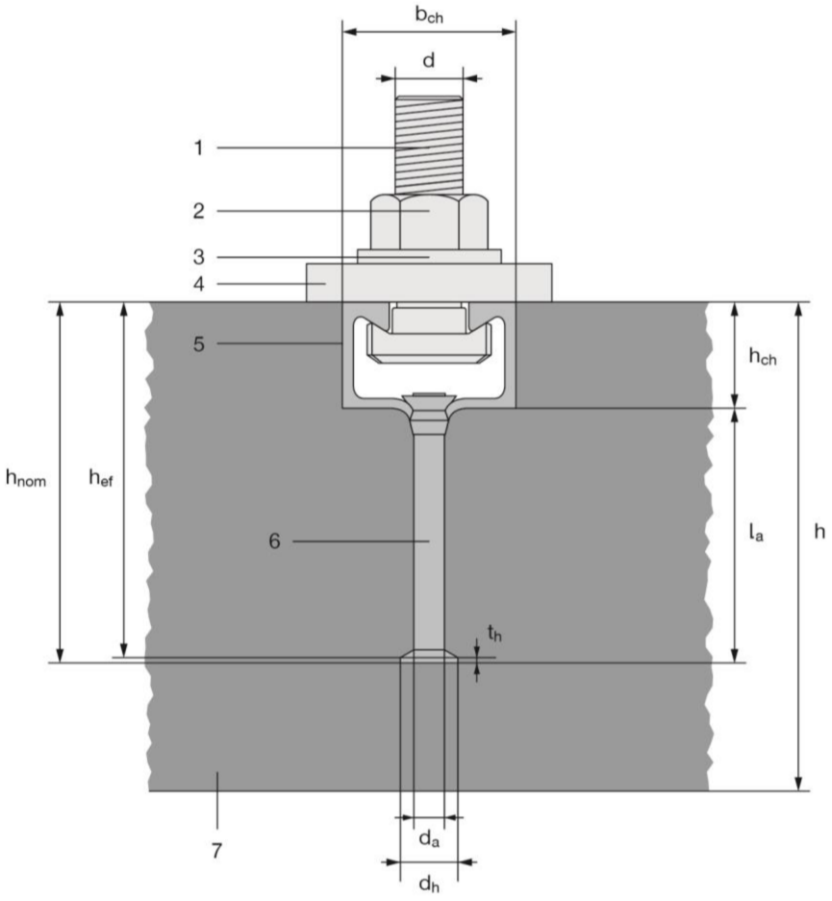
Issued in Berlin on 27 February 2017 by Deutsches Institut für Bautechnik

Andreas Kummerow
p. p. Head of Department

beglaubigt:
Müller

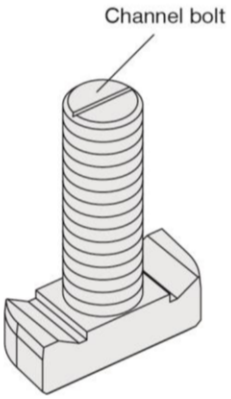
Deutsches Institut für Bautechnik DIBt

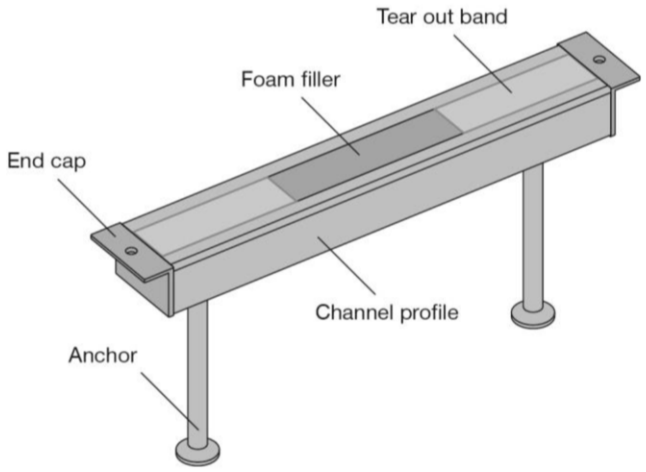
Product and installation condition



Key

1 channel bolt
2 hexagonal nut
3 washer
4 fixture
5 channel profile
6 anchor
7 concrete member





Anchor channels (HAC-C) with channel bolts (HBC)

Product Description
Installed condition

Annex A1

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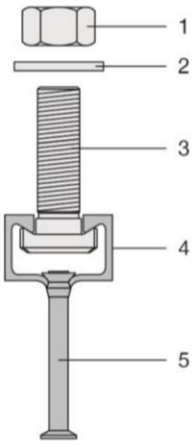
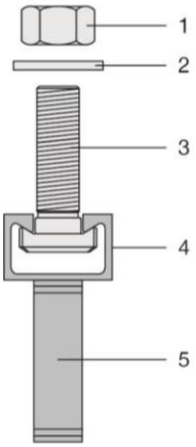
Anchor channel types

Hot-rolled channel profiles



Round anchor



I-anchor

Key

1 hexagonal nut
2 washer
3 channel bolt
4 channel profile
5 anchor

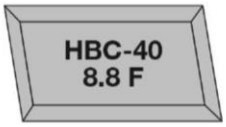
Marking of the anchor channels:
HAC-C(-I) XZ

(e.g. HAC-C 40/22F)

HAC-C	= Identifying mark of the manufacturer
I	= Additional marking for I-anchors (no marking in the case of round anchors)
X	= Size of the channel
Z	= Corrosion class / Material F = Hot-dip galvanized A4 = Stainless steel

40/22	= Anchor channel size 40/22
F	= Hot-dip galvanized

Marking of the channel bolt:
HBC-X YZ



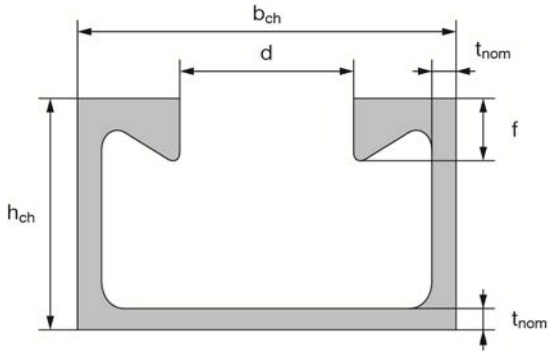
(e.g. HBC-40/22 8.8F)

HBC	= Identifying mark of the manufacturer
X	= Type of channel bolt
Y	= Steel grade (4.6, 8.8, 70)
Z	= Corrosion class / Material F = Hot-dip galvanized R = Stainless steel

40	= Channel bolt type in combination with HAC-C 40/22F
8.8	= Steel grade
F	= Hot-dip galvanized

Anchor channels (HAC-C) with channel bolts (HBC)	Annex A2
Product Description Anchor channel types and marking	

Anchor Channels



HAC-C 40/22, HAC-C 50/30, HAC-C 52/34

Table 1: Dimensions of channel profile

Anchor channel	b_{ch}	h_{ch}	t_{nom}	d	f	I_y
	[mm]					[mm^4]
40/22	39,5	23,0	2,3	18,0	6,0	19354
50/30	49,0	30,0	2,8	22,5	8,1	53537
52/34	52,5	34,0	4,0	22,5	11,5	95934

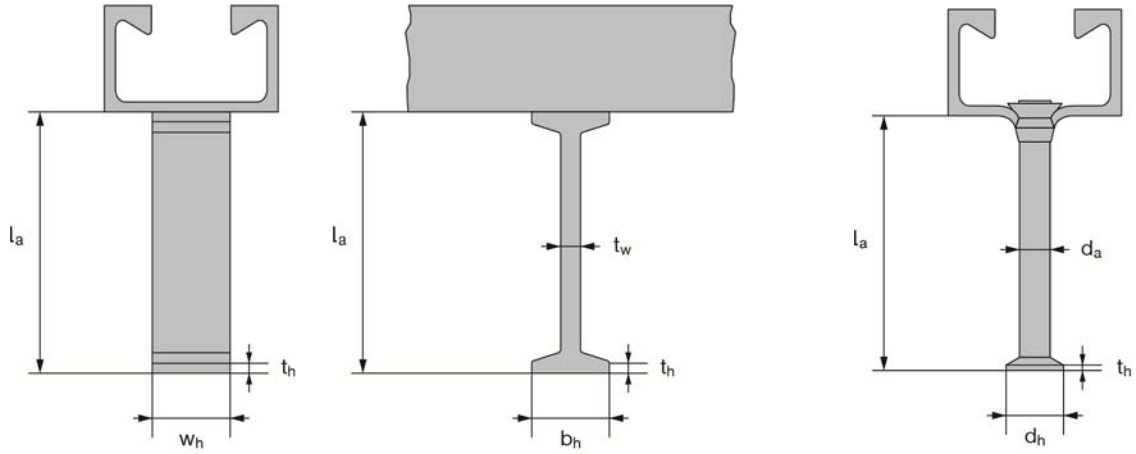


Table 2: Dimensions of anchor (welded I-anchor or round anchor)

Anchor channel	I-anchor					Round anchor			
	min l_a	t_w	b_h	t_h	w_h	min l_a	d_a	d_h	t_h
	[mm]								
40/22	62	5	20	5	20	58	8	16,0	2,0
50/30	69	5	20	5	25	66	10	20,0	2,2
52/34	125	5	20	5	40	124	11	24,3	2,5

Anchor channels (HAC-C) with channel bolts (HBC)

Product Description
Anchor channels (HAC-C)

Annex A3

Channel bolts

Table 3: Dimensions of channel bolt

Anchor channel	Channel bolt type	Dimensions			
		b_1	b_2	k	d
		[mm]			
HAC-C 40/22	HBC-40/22	14,0	35,0	10,0	10
					12
		17,0	34,0	11,0	16
HAC-C 50/30 HAC-C 52/34	HBC-50/30	13,0	43,3	12,5	12
		17,0	42,7	14,5	16
		21,0	42,2	15,5	20

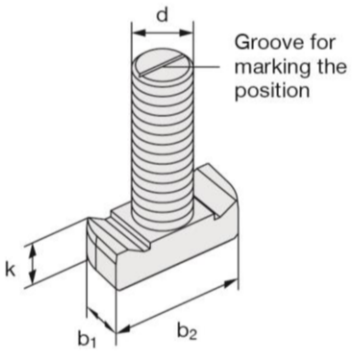


Table 4: Steel grade and corrosion class

Channel Bolt	Carbon steel [1]		Stainless steel [1]
Steel grade	4.6	8.8	A4-70
f_{uk} [N/mm²]	400	800 / 830 [2]	700
f_{yk} [N/mm²]	240	640 / 660 [2]	450
Corrosion class	G [3] F [4]		R

[1] Material properties according to Annex A5
[2] Material properties according to EN ISO 898-1
[3] Electroplated
[4] Hot-dip galvanized

Anchor channels (HAC-C) with channel bolts (HBC)

Product Description
Channel bolts (HBC)

Annex A4

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Table 5: Materials

Component	Carbon steel			Stainless steel
	Mechanical properties	Coating		Mechanical properties
1	2a	2b	2c	3
Channel Profile	1.0038, 1.0044 acc. to EN 10025 1.0976, 1.0979 acc. to EN 10149	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684		1.4362, 1.4401 1.4404, 1.4571 acc. to EN 10088
Anchor	1.0038, 1.0213, 1.0214 acc. to EN 10025 1.5523, 1.5535 acc. to EN 10263:2002-02			
Channel bolt	Steel grade 4.6 and 8.8 acc. to EN ISO 898-1	Electroplated acc. to EN ISO 4042	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684	Grade 70 acc. to EN ISO 3506
Plain washer [1] acc. to ISO 7089 and ISO 7093-1	Hardness class A ≥ 200 HV	Electroplated acc. to EN ISO 4042	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684	1.4401, 1.4404 1.4571, 1.4578 acc. to EN 10088
Hexagonal nut acc. to ISO 4032 or DIN 934 [2]	Property class 5 or 8 acc. to EN ISO 898-2	Electroplated acc. to EN ISO 4042	Hot dip galvanized ≥ 50 µm acc. to EN ISO 10684	Property class 50, 70 or 80 acc. to EN ISO 3506

[1] Not in the scope of delivery

[2] Hexagonal nuts according to DIN 934 for channel bolts made from carbon steel (4.6) and stainless steel

Anchor channels (HAC-C) with channel bolts (HBC)

Product Description
Materials

Annex A5

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.
- Fire exposure: only for concrete class C20/25 to C50/60.

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206.
- Strength classes C12/15 to C90/105 according to EN 206.
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (e.g. accommodations, bureaus, schools, hospitals, shops, exceptional internal conditions with usual humidity)
  (anchor channels and channel bolts according to Annex A5, Table 5, column 2 and 3).
- Structures subject to internal conditions with usual humidity (e.g. kitchen, bath and laundry in residential buildings, exceptional permanent damp conditions and application under water)
  (anchor channels and channel bolts according to Annex A5, Table 5, column 2c and 3).
- The stainless steel anchor channels (HAC-C) and channel bolts (HBC), washers and nuts may be used in structures subject to external atmospheric conditions (including industrial and marine environment) or exposure in permanently damp internal conditions, if no particular aggressive conditions (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. desulphurization plants or road tunnels where de-icing materials are used) exist
  (anchor channels and channel bolts according to Annex A5, Table 5, column 3).

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 as well as fire exposure the anchor channels are designed in accordance with EOTA TR 047 “Calculation Method for the Performance of Anchor Channels” or EN 1992-4.
- The characteristic resistances are calculated with the minimum effective embedment depth.

Anchor channels (HAC-C) with channel bolts (HBC)	Annex B1
Intended Use Specifications	

Installation:

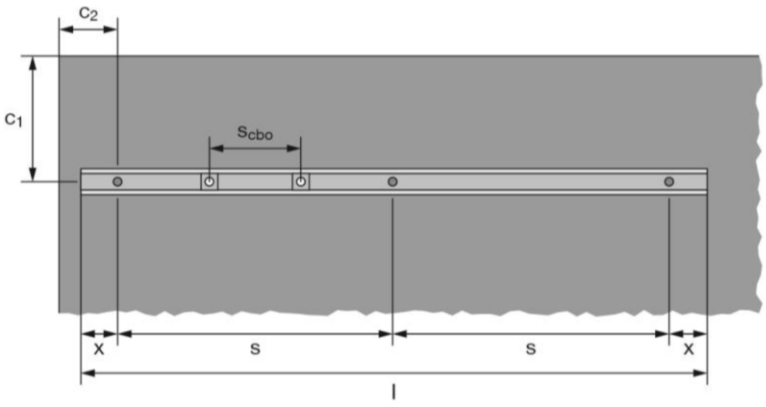
- The installation of anchor channels is carried out by appropriately qualified personnel under the supervision of the person responsible for the technical matters on site.
- Use of the anchor channels only as supplied by the manufacturer - without any manipulations, repositioning or exchanging of channel components.
- Cutting of anchor channels is allowed only if pieces according to Annex B3, Table 6 are generated including end spacing and minimum channel length and in case of hot-dip galvanised anchor channels only to be used in dry internal conditions.
- Installation in accordance with the manufacturer's specifications given in Annexes 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 around 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 A5 and provided separately by the user.
- Orientating the channel bolt (groove according to Annex B6) rectangular to the channel axis.
- The required installation torques given in Annex B4 must be applied and must not be exceeded.

Anchor channels (HAC-C) with channel bolts (HBC)	Annex B2
Intended Use Specifications	

Table 6: Installation parameters for anchor channel

Anchor channel HAC-C			**40/22**	**50/30**	**52/34**
Minimum effective embedment depth	$h_{ef,min}$	[mm]	79	94	155
Minimum spacing	s_{min}		100		
Maximum spacing	s_{max}		250		
End spacing	x		25 [1]		35 [2]
Minimum channel length	l_{min}		150		
Minimum edge distance	c_{min}		50	75	100
Minimum thickness of concrete member	h_{min}		100	110	160 [3]

[1] The end spacing may be increased from 25 mm to 35 mm
[2] x = 25 mm for welded I-anchors is allowed
[3] h_{min} = 157 mm for round anchors



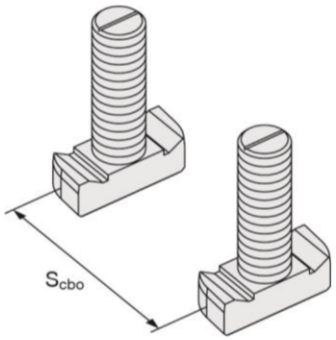


Table 7: Minimum spacing for channel bolts

Channel bolt			**M10**	**M12**	**M16**	**M20**
Minimum spacing between channel bolts	$s_{cbo,min}$	[mm]	50	60	80	100

s_{cbo} = center to center spacing between channel bolts ($s_{cbo,min}$ = 5d)

Anchor channels (HAC-C) with channel bolts (HBC)

Intended Use
Installation parameters for anchor channels (HAC-C)

Annex B3

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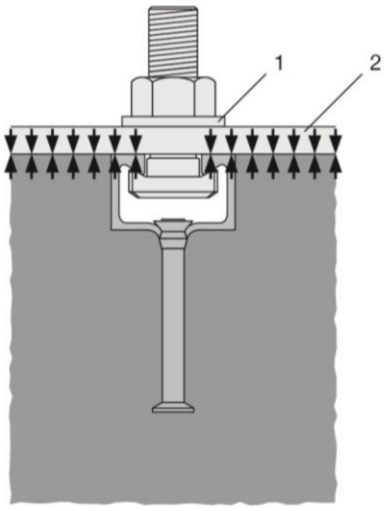
Table 8: Required installation torque T_{inst}

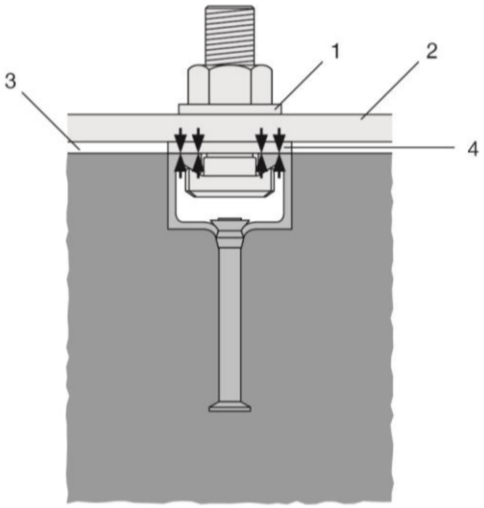
Channel bolt		T_{inst} [1] [Nm]			
		General	Steel - steel contact		
		4.6, 8.8, A4-70	4.6	8.8	A4-70
40/22	M10	15	15	-	40
	M12	25	-	70	70
	M16	30		120	70
50/30	M12	25		70	70
	M16	60		120	180
	M20	75		360	360

[1] T_{inst} must not be exceeded

General: The fixture is in contact with the channel profile and the concrete surface.



Steel-steel contact: The fixture is fastened to the anchor channel by suitable steel part (e.g. washer). Fixture is in contact with the channel profile only.



Key

1 waher
2 fixture
3 gap
4 suitable steel part

Anchor channels (HAC-C) with channel bolts (HBC)

Intended Use
Installation parameters for channel bolts (HBC)

Annex B4

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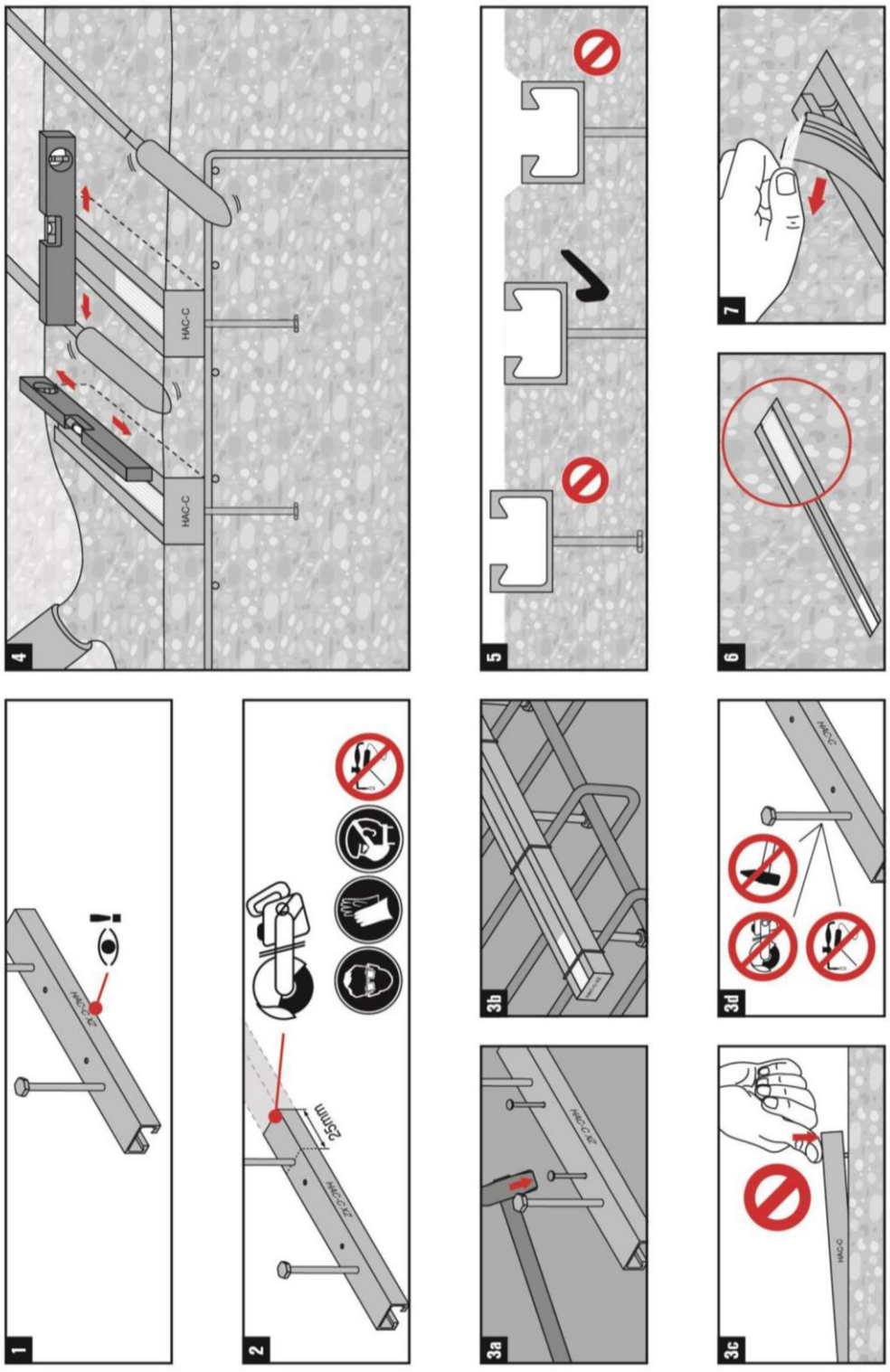
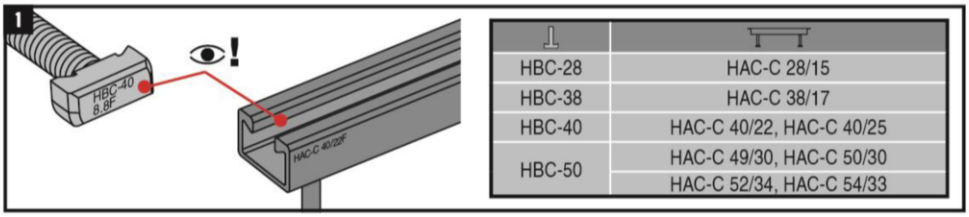


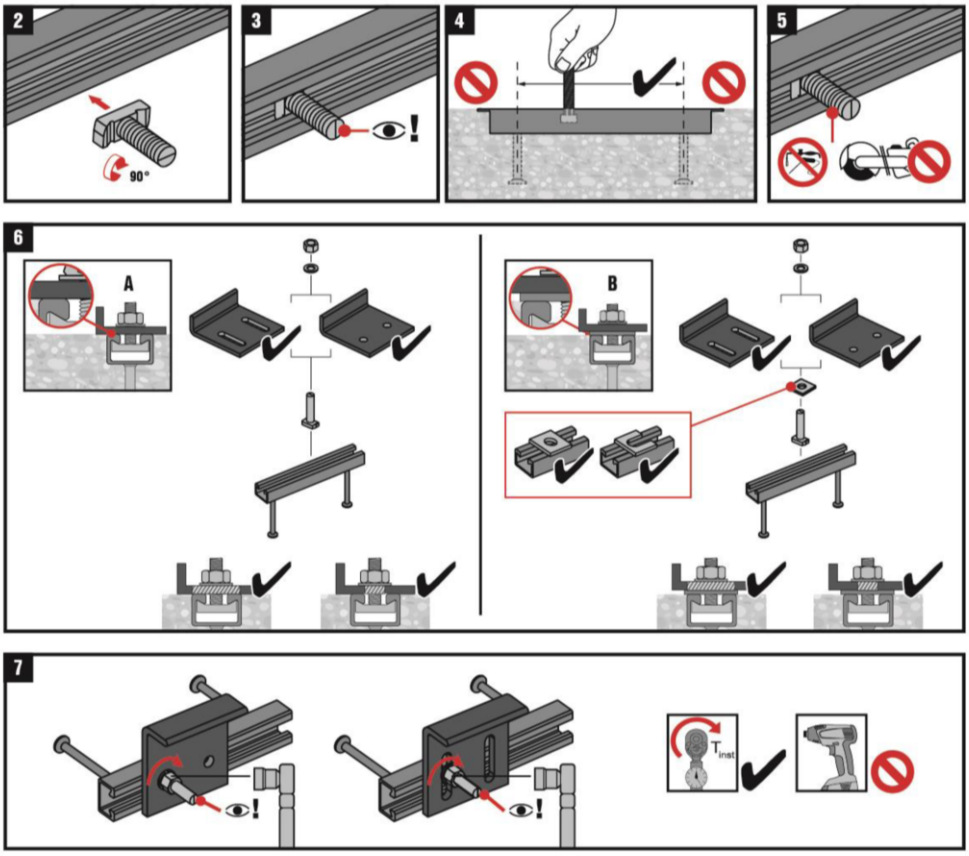
Anchor channels (HAC-C) with channel bolts (HBC)

Intended Use
Installation instructions for anchor channels (HAC-C)

Annex B5



HBC-28	HAC-C 28/15
HBC-38	HAC-C 38/17
HBC-40	HAC-C 40/22, HAC-C 40/25
HBC-50	HAC-C 49/30, HAC-C 50/30
	HAC-C 52/34, HAC-C 54/33



Required installation torque T_{inst} (General)

Strength grade	Anchor channel	T_{inst} [Nm]			
		M10	M12	M16	M20
4.6	40/22	15	25	30	-
8.8	50/30	-	25	60	75
A4-70	52/34	-	25	60	75

Required installation torque T_{inst} (Steel-to-steel contact)

Strength grade	T_{inst} [Nm]			
	M10	M12	M16	M20
4.6	15	-	-	-
8.8	-	70	120	360
A4-70	40	70	180 [1)]	360

[1)] For channel bolt 40/22 A4-70: T_{inst}=70 Nm

Anchor channels (HAC-C) with channel bolts (HBC)

Intended Use
Installation instructions for channel bolts (HBC)

Annex B6

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

Anchor channel HAC-C			**40/22**	**50/30**	**52/34**
Steel failure: Failure of anchor					
Characteristic resistance	$N_{Rk,s,a}$	[kN]	20	31	55
Partial safety factor	γ_{Ms} [1)]	[-]		1,8	
Steel failure: Failure of connection between anchor and channel					
Characteristic resistance	$N_{Rk,s,c}$	[kN]	20	31	55
Partial safety factor	$\gamma_{Ms,ca}$ [1)]	[-]		1,8	
Steel failure: Local failure by flexure of channel lips					
Characteristic spacing of the channel bolts for $N_{Rk,s,l}$	$s_{l,N}$	[mm]	79	98	105
Characteristic resistance	$N^0_{Rk,s,l}$	[kN]	35	36	65
Partial safety factor	$\gamma_{Ms,l}$ [1)]	[-]		1,8	

[1)] In absence of other national regulations

Table 10: Characteristic flexural resistance of channel under tension load

Anchor channel HAC-C			**40/22**	**50/30**	**52/34**
Steel failure: Failure by flexure of channel					
Characteristic flexural resistance of channel	$M_{Rk,s,flex}$	[Nm]	1013	2084	3435
Partial safety factor	$\gamma_{Ms,flex}$ [1)]	[-]		1,15	

[1)] In absence of other national regulations

Anchor channels (HAC-C) with channel bolts (HBC)

Performance Data
Characteristic resistances of anchor channels under tension load

Annex C1

Table 11: Characteristic resistances under tension load – concrete failure

Anchor channel HAC-C				**40/22**		**50/30**		**52/34**	
Type of anchor				**I**	**Round**	**I**	**Round**	**I**	**Round**
Pullout failure									
Characteristic resistance in cracked concrete C12/15		$N_{Rk,p}$	[kN]	27,0	13,5	33,8	21,2	54,0	33,1
Characteristic resistance in uncracked concrete C12/15				37,8	19,0	47,3	29,7	75,6	46,5
Amplification factor of $N_{Rk,p}$		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 safety factor		$\gamma_{Mp} = \gamma_{Mc}$ [1]	[-]	1,5					
Concrete cone failure									
Product factor k_1	cracked concrete	$k_{cr,N}$	[-]	7,9		8,1		8,7	
	uncracked concrete	$k_{ucr,N}$	[-]	11,2		11,5		12,4	
Partial safety factor		γ_{Mc} [1]	[-]	1,5					
Splitting									
Characteristic edge distance		$c_{cr,sp}$	[mm]	237		282		465	
Partial safety factor		$\gamma_{Msp} = \gamma_{Mc}$ [1]	[-]	1,5					

[1] In absence of other national regulations

Table 12: Displacements under tension load

Anchor channel HAC-C			**40/22**	**50/30**	**52/34**
Tension load	N	[kN]	13,9	14,3	25,8
Short time displacement [1]	δ_{N0}	[mm]	2,3	2,2	1,4
Long time displacement [1]	$\delta_{N\infty}$	[mm]	4,6	4,4	2,8

[1] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips, bending of the channel and slip of the anchor channel in concrete

Anchor channels (HAC-C) with channel bolts (HBC)

Performance Data
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 HAC-C			**40/22**	**50/30**	**52/34**
Steel failure: Failure of anchor					
Characteristic resistance	$V_{Rk,s,a}$	[kN]	26,0	40,3	71,5
Partial safety factor	γ_{Ms} 1)	[-]	1,5		
Steel failure: Failure of connection between anchor and channel					
Characteristic resistance	$V_{Rk,s,c}$	[kN]	26,0	40,3	71,5
Partial safety factor	$\gamma_{Ms,ca}$ 1)	[-]	1,8		
Steel failure: Local failure by flexure of channel lips					
Characteristic spacing of channel bolts for $V_{Rk,s,l}$	$s_{l,V}$	[mm]	79	98	105
Characteristic resistance	$V^0_{Rk,s,l}$	[kN]	26,0	40,3	71,5
Partial safety factor	$\gamma_{Ms,l}$ 1)	[-]	1,8		

1) In absence of other national regulations

Anchor channels (HAC-C) with channel bolts (HBC)

Performance Data
Characteristic resistances of anchor channels under shear load

Annex C3

Table 14: Characteristic resistances under shear load – concrete failure

Anchor channel HAC-C				**40/22**	**50/30**	**52/34**
Pry out failure						
Product factor		k_8	[-]	2,0		
Partial safety factor		γ_{Mc} [1)]	[-]	1,5		
Concrete edge failure						
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 HAC-C			**40/22**	**50/30**	**52/34**
Shear load	V	[kN]	10,3	16,0	28,4
Short time displacement [1)]	δ_{V0}	[mm]	2,1	2,6	3,7
Long time displacement [1)]	$\delta_{V\infty}$	[mm]	3,1	3,9	5,5

[1)] Displacements in midspan of the anchor channel, including slip of channel bolt, deformation of channel lips and slip of the anchor channel in concrete

Table 16: Characteristic resistances under combined tension and shear load

Anchor channel HAC-C			**40/22**	**50/30**	**52/34**
Steel failure: Local failure by flexure of channel lips and failure by flexure of channel					
Product factor	k_{13}	[-]	1,0 [1)]		
Steel failure: Failure of anchor and connection between anchor and channel					
Product factor	k_{14}	[-]	1,0 [2)]		

[1)] k_{13} can be taken as 2,0 if $V_{Rd,s,l}$ is limited to $N_{Rd,s,l}$

[2)] k_{14} can be taken as 2,0 if $\max(V_{Rd,s,a}; V_{Rd,s,c})$ is limited to $\min(N_{Rd,s,a}; N_{Rd,s,c})$

Anchor channels (HAC-C) with channel bolts (HBC)

Performance Data
Characteristic resistances of anchor channels and displacements under shear load
Characteristic resistances under combined tension and shear load

Annex C4

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

Channel bolt				**M10**	**M12**	**M16**	**M20**
Steel failure							
Characteristic tension resistance	$N_{Rk,s}$ [1]	[kN]	4.6	23,2	-		
			8.8	-	35,4	55,8	183,1
			A4-70 [2]	20,5	47,2 [3]	53,0 [4]	129,0
Partial safety factor	γ_{Ms} [5]	[-]	4.6	2,0			
			8.8	1,5			
			A4-70 [2]	1,87			
Characteristic shear resistance	$V_{Rk,s}$ [1]	[kN]	4.6	13,9	-	-	-
			8.8	-	33,7	62,8	98,0
			A4-70	24,4	35,4	65,9	102,9
Partial safety factor	γ_{Ms} [5]	[-]	4.6	1,67			
			8.8	1,25			
			A4-70	1,56			

[1] In conformity to EN ISO 898-1:1999
[2] Materials according to Table 5, Annex A5
[3] For 40/22 M12 A4-70 and 50/30 M12 A4-70: $N_{Rk,s}$ = 58,6 kN
[4] For 40/22 M16 A4-70: $N_{Rk,s}$ = 91,0 kN and
50/30 M16 A4-70: $N_{Rk,s}$ = 109,0 kN
[5] In absence of other national regulations

Anchor channels (HAC-C) with channel bolts (HBC)

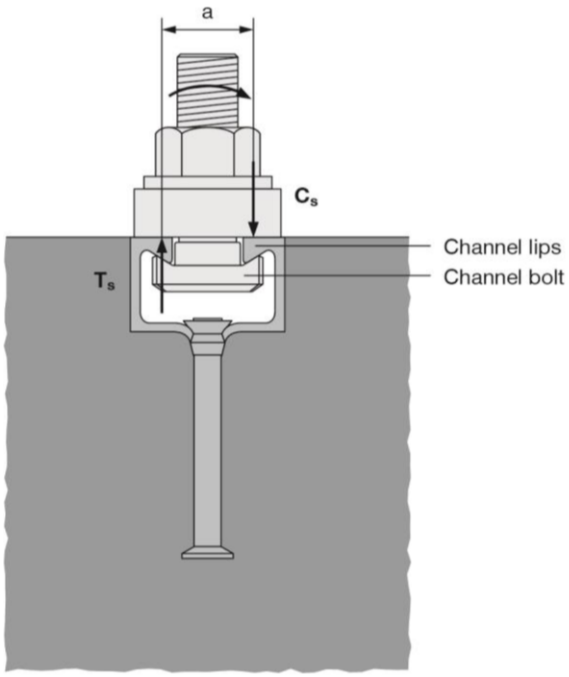
Performance Data
Characteristic resistances of channel bolts under tension and shear load

Annex C5

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

Channel bolt [2]					**M10**	**M12**	**M16**	**M20**
Steel failure								
Characteristic flexural resistance	$M^0_{Rk,s}$ [3]	[Nm]	HBC-40/22 HBC-50/30	4.6	29,9	-		
				8.8	-	104,8	266,4	519,3
				A4-70 [2]	52,3	91,7	233,1	454,4
Partial safety factor	γ_{Ms} [1]	[-]	HBC-40/22 HBC-50/30	4.6	1,67			
				8.8	1,25			
				A4-70 [2]	1,56			
Internal lever arm	a	[mm]	HBC-40/22	40/22	24,3	25,7	27,3	-
			HBC-50/30	50/30	-	29,9	31,7	33,9

[1] In absence of other national regulations
[2] Materials according to Table 5, Annex A5



[3] The characteristic flexure resistance according to Table 18 is limited as follows:

$M^0_{Rk,s} \le 0{,}5 \cdot N_{Rk,s,l} \cdot a$ ($N_{Rk,s,l}$ according to Table 9)

$M^0_{Rk,s} \le 0{,}5 \cdot N_{Rk,s} \cdot a$ ($N_{Rk,s}$ according to 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 channels (HAC-C) with channel bolts (HBC)

Performance Data
Characteristic flexural resistances of channel bolts under shear load

Annex C6

Deutsches Institut für Bautechnik DIBt

Table 19: Characteristic resistance $F_{Rd,s,fi}$ [kN] of anchor channels under fire exposure

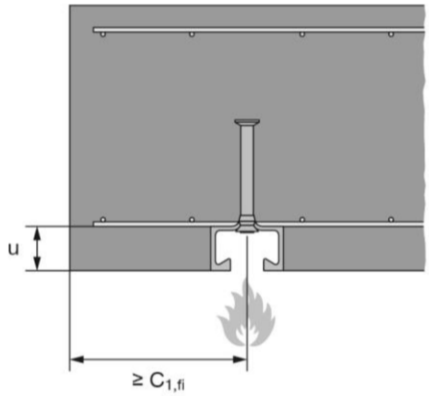
Channel bolt					**M10**	**M12**	**≥ M16**
Steel failure of anchor, connection between anchor and channel, local flexure of channel lip							
Characteristic resistance in uncracked concrete C20/25	HAC-C 40/22	R30	$N_{Rk,s,fi}$ = $V_{Rk,s,fi}$	[kN]	3,3	7,5	
		R60			1,7	3,5	
		R90			1,2	2,2	
		R120			0,9	1,5	
	HAC-C 50/30 HAC-C 52/34	R30			-	7,7	6,7
		R60				3,8	3,9
		R90				2,5	2,9
		R120				1,9	2,4
Partial safety factor			$\gamma_{Ms,fi}$ [1)]	[-]	1,0		

[1)] In absence of other national regulations

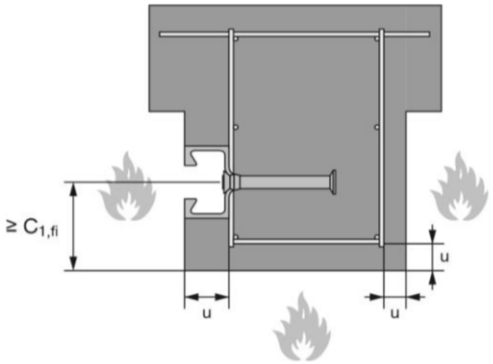
Table 20: Minimum concrete cover

Anchor channel HAC-C				**40/22**	**50/30**	**52/34**
Concrete cover	R30	u	[mm]	35	50	50
	R60					
	R90			45		
	R120			55	55	55

Fire exposure from one side only



Fire exposure from more than one side



Anchor channels (HAC-C) with channel bolts (HBC)

Performance Data
Characteristic resistances of anchor channels and channel bolts under fire exposure

Annex C7

GEOTECHNICS & CONCRETE ENGINEERING (H. K.) LTD.
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香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Tensile Proof Load Test on Anchor

Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" +

2 nos T-bolt "HBC-40/22 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

Date of Testing: 04-12-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

1.0 Information

(a) Manufacturer	:	Hilti (Hong Kong) Ltd
(b) Channel type	:	Cast-in Channel Hilti "HAC-C 40/22 A4 "
(c) Bolt type	:	T-Bolt HBC-40/22 M16 A4
(d) Channel width	:	39.5mm
(e) Channel height	:	23mm
(f) Embedment depth	:	79mm
(g) Mass concrete size	:	800mm x 800mm x 250mm
(h) Concrete grade	:	25/20D
(i) Bolt spacing	:	150 mm
(j) Applied torque	:	30 Nm
(k) Test standard	:	In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

2.0 Test results

Anchor Type	Cast-in channel Hilti "HAC –C 40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	88.0	90.5	89.5	91.0	83.5
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	88.5				
Standard deviation (kN)	3.02				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200666 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800x800x250	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.10	0.04	0.07	P	
4		21.0	0.5	21	0.26	0.21	0.24	P	
5		28.0	0.5	28	0.42	0.37	0.40	P	
6		35.0	0.5	35	0.59	0.57	0.58	P	
7		42.0	0.5	42	0.80	0.77	0.79	P	
8		49.0	0.5	49	0.96	0.95	0.96	P	
9		56.0	0.5	56	1.18	1.14	1.16	P	
10		63.0	0.5	63	1.39	1.32	1.36	P	
11		70.0	0.5	70	1.64	1.54	1.59	P	
12		77.0	0.5	77	1.93	1.82	1.88	P	
13		84.0	0.5	84	3.31	3.10	3.21	P	
14		91.0	0.5	88.0	4.17	4.05	4.11	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length (mm) 79 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200666 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800x800x250	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.44	0.32	0.38	P	
4		21.0	0.5	21	0.64	0.49	0.57	P	
5		28.0	0.5	28	0.84	0.68	0.76	P	
6		35.0	0.5	35	1.02	0.83	0.93	P	
7		42.0	0.5	42	1.14	0.97	1.06	P	
8		49.0	0.5	49	1.30	1.13	1.22	P	
9		56.0	0.5	56	1.49	1.29	1.39	P	
10		63.0	0.5	63	1.69	1.50	1.60	P	
11		70.0	0.5	70	2.04	1.83	1.94	P	
12		77.0	0.5	78	2.41	2.22	2.32	P	
13		84.0	0.5	84	2.95	2.86	2.91	P	
14		91.0	0.5	90.5	4.35	4.20	4.28	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length (mm) 79 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200666 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 3

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800x800x250	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
2		7.0	0.5	7	0.27	0.11	0.19	P	
3		14.0	0.5	14	0.49	0.32	0.41	P	
4		21.0	0.5	21	0.70	0.52	0.61	P	
5		28.0	0.5	28	0.91	0.73	0.82	P	
6		35.0	0.5	35	1.03	0.84	0.94	P	
7		42.0	0.5	42	1.18	1.00	1.09	P	
8		49.0	0.5	49	1.35	1.14	1.25	P	
9		56.0	0.5	56	1.44	1.24	1.34	P	
10		63.0	0.5	63	1.60	1.40	1.50	P	
11		70.0	0.5	70	1.76	1.55	1.66	P	
12		77.0	0.5	77	1.94	1.74	1.84	P	
13		84.0	0.5	84	2.58	2.33	2.46	P	
14		91.0	0.5	89.5	3.86	3.74	3.80	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length (mm) 79 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200666 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
GCE Reg. No. : GCE172451
Sample ID : Sample 4

Date Tested : 04-12-2017
Test Unit : MI17253

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800x800x250	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
2		7.0	0.5	7	0.10	0.00	0.05	P	
3		14.0	0.5	14	0.29	0.16	0.23	P	
4		21.0	0.5	21	0.48	0.39	0.44	P	
5		28.0	0.5	28	0.63	0.59	0.61	P	
6		35.0	0.5	35	0.80	0.83	0.82	P	
7		42.0	0.5	42	1.06	1.12	1.09	P	
8		49.0	0.5	49	1.29	1.39	1.34	P	
9		56.0	0.5	56	1.46	1.52	1.49	P	
10		63.0	0.5	63	1.63	1.80	1.72	P	
11		70.0	0.5	70	1.88	2.03	1.96	P	
12		77.0	0.5	78	1.96	2.21	2.09	P	
13		84.0	0.5	84	2.95	3.34	3.15	P	
14		91.0	0.5	91.0	4.02	4.56	4.29	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length (mm) 79 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200666 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800x800x250	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.09	0.16	0.13	P	
4		21.0	0.5	21	0.25	0.35	0.30	P	
5		28.0	0.5	28	0.49	0.72	0.61	P	
6		35.0	0.5	35	0.83	0.92	0.88	P	
7		42.0	0.5	42	1.16	1.32	1.24	P	
8		49.0	0.5	49	1.30	1.56	1.43	P	
9		56.0	0.5	56	1.59	1.76	1.68	P	
10		63.0	0.5	63	1.82	1.93	1.88	P	
11		70.0	0.5	70	2.01	2.25	2.13	P	
12		77.0	0.5	77	2.29	2.47	2.38	P	
13		84.0	0.5	84	3.11	3.25	3.18	P	
14		91.0	0.5	90.1	4.36	4.51	4.44	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length (mm) 79 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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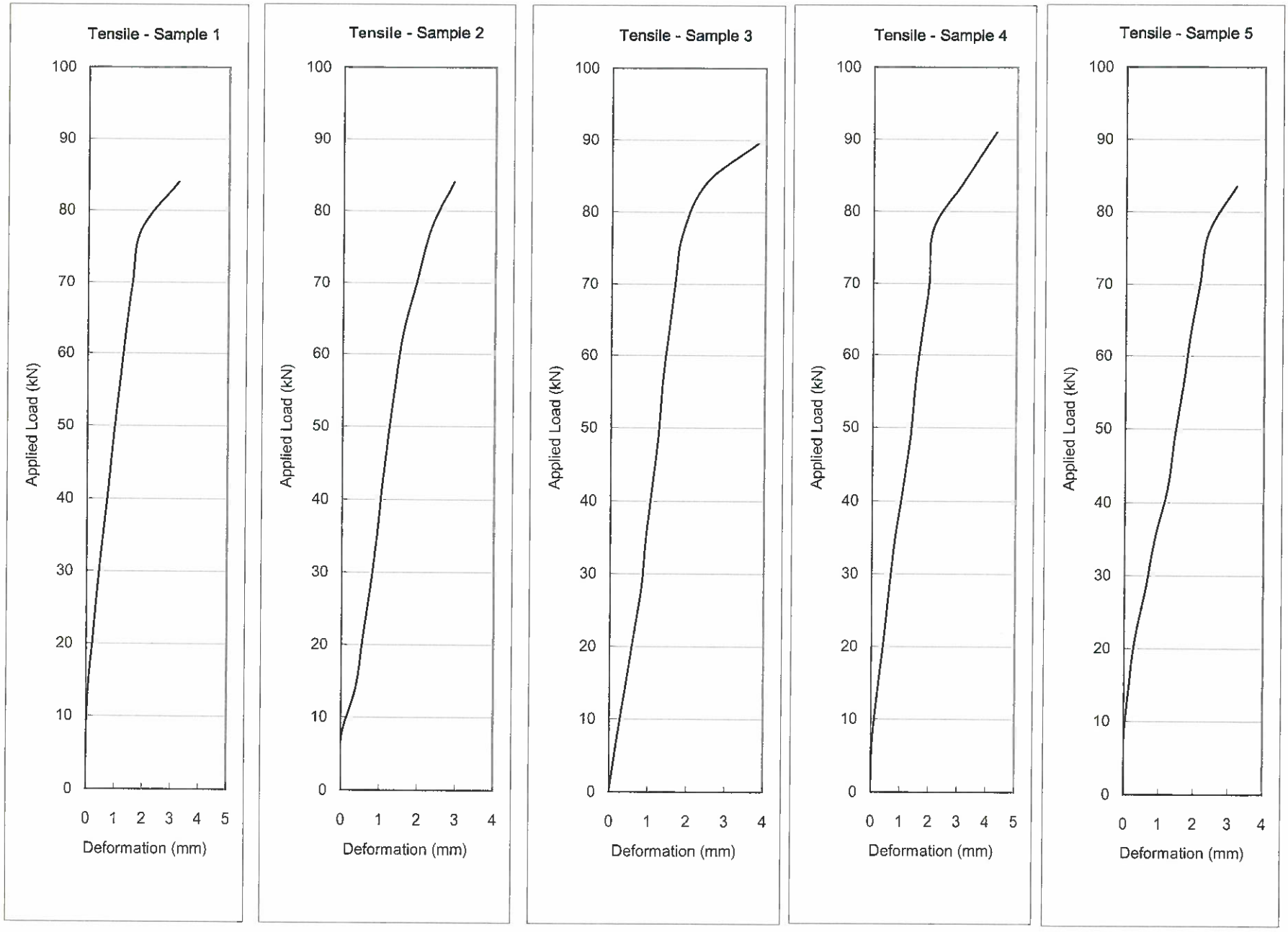
TEL.: 852-2365 9123
FAX NO.: 852-2765 8034

Cast-in channel Hilti "HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"



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香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Tensile Proof Load Test on Anchor

Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

Date of Testing: 04-12-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

1.0 Information

(a) Manufacturer	:	Hilti (Hong Kong) Ltd
(b) Channel type	:	Cast-in Channel Hilti "HAC-C 50/30 A4 "
(c) Bolt type	:	T-Bolt HBC-50/30 M16 A4
(d) Channel width	:	49mm
(e) Channel height	:	30mm
(f) Embedment depth	:	94mm
(g) Mass concrete size	:	800mm x 800mm x 250mm
(h) Concrete grade	:	25/20D
(i) Bolt spacing	:	150 mm
(j) Applied torque	:	60 Nm
(k) Test standard	:	In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

2.0 Test results

Anchor Type	Cast-in channel Hilti "HAC –C 50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	87.0	91.0	89.0	88.0	90.0
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	89.0				
Standard deviation (kN)	1.58				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200682 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
GCE Reg. No. : GCE172451
Sample ID : Sample 1

Date Tested : 04-12-2017
Test Unit : MI17253

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800 x 800 x 250mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.00	0.00	0.00	P	
4		21.0	0.5	21	0.21	0.09	0.15	P	
5		28.0	0.5	28	0.29	0.15	0.22	P	
6		35.0	0.5	35	0.38	0.27	0.33	P	
7		42.0	0.5	42	0.55	0.42	0.49	P	
8		49.0	0.5	49	0.86	0.51	0.69	P	
9		56.0	0.5	56	1.25	0.75	1.00	P	
10		63.0	0.5	63	1.94	1.05	1.50	P	
11		70.0	0.5	70	2.64	1.83	2.24	P	
12		77.0	0.5	77	3.06	2.42	2.74	P	
13		84.0	0.5	82	3.88	3.09	3.49	P	
14		87.0	0.5	87.0	4.22	3.82	4.02	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 94 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200682 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800 x 800 x 250mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.00	0.10	0.05	P	
4		21.0	0.5	21	0.18	0.06	0.12	P	
5		28.0	0.5	28	0.28	0.16	0.22	P	
6		35.0	0.5	35	0.29	0.30	0.30	P	
7		42.0	0.5	42	0.56	0.46	0.51	P	
8		49.0	0.5	49	0.71	0.58	0.65	P	
9		56.0	0.5	56	0.94	0.79	0.87	P	
10		63.0	0.5	63	1.10	0.93	1.02	P	
11		70.0	0.5	70	1.42	1.22	1.32	P	
12		77.0	0.5	77	1.56	1.35	1.46	P	
13		84.0	0.5	84	2.27	2.01	2.14	P	
14		91.0	0.5	91.0	3.85	3.52	3.69	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 94 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200682 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 3

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800 x 800 x 250mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		7.0	0.5	7	0.01	0.00	0.01	P	
3		14.0	0.5	14	0.03	0.00	0.02	P	
4		21.0	0.5	21	0.13	0.07	0.10	P	
5		28.0	0.5	28	0.28	0.21	0.25	P	
6		35.0	0.5	35	0.50	0.46	0.48	P	
7		42.0	0.5	42	0.82	0.80	0.81	P	
8		49.0	0.5	49	1.09	1.12	1.11	P	
9		56.0	0.5	56	1.46	1.50	1.48	P	
10		63.0	0.5	63	1.87	1.95	1.91	P	
11		70.0	0.5	70	2.35	2.50	2.43	P	
12		77.0	0.5	77	2.96	3.11	3.04	P	
13		84.0	0.5	84	3.72	3.96	3.84	P	
14		91.0	0.5	89.0	4.37	4.59	4.48	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 94 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200682 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 4

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800 x 800 x 250mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.12	0.16	0.14	P	
4		21.0	0.5	21	0.41	0.46	0.44	P	
5		28.0	0.5	28	0.58	0.66	0.62	P	
6		35.0	0.5	35	0.70	0.77	0.74	P	
7		42.0	0.5	42	0.84	0.94	0.89	P	
8		49.0	0.5	49	0.94	1.03	0.99	P	
9		56.0	0.5	56	1.08	1.17	1.13	P	
10		63.0	0.5	63	1.19	1.31	1.25	P	
11		70.0	0.5	70	1.37	1.51	1.44	P	
12		77.0	0.5	78	1.59	1.74	1.67	P	
13		84.0	0.5	84	2.30	2.46	2.38	P	
14		91.0	0.5	88.0	3.88	4.16	4.02	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 94 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200682 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 800 x 800 x 250mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		7.0	0.5	7	0.00	0.00	0.00	P	
3		14.0	0.5	14	0.19	0.07	0.13	P	
4		21.0	0.5	21	0.42	0.16	0.29	P	
5		28.0	0.5	28	0.63	0.34	0.49	P	
6		35.0	0.5	35	0.79	0.54	0.67	P	
7		42.0	0.5	42	0.93	0.74	0.84	P	
8		49.0	0.5	49	1.10	0.88	0.99	P	
9		56.0	0.5	56	1.36	1.07	1.22	P	
10		63.0	0.5	63	1.59	1.25	1.42	P	
11		70.0	0.5	70	1.69	1.52	1.61	P	
12		77.0	0.5	77	1.78	1.63	1.71	P	
13		84.0	0.5	84	2.88	2.65	2.77	P	
14		91.0	0.5	90.0	4.01	3.86	3.94	F4	
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 94 mm
H) Channel length (mm) 350 mm

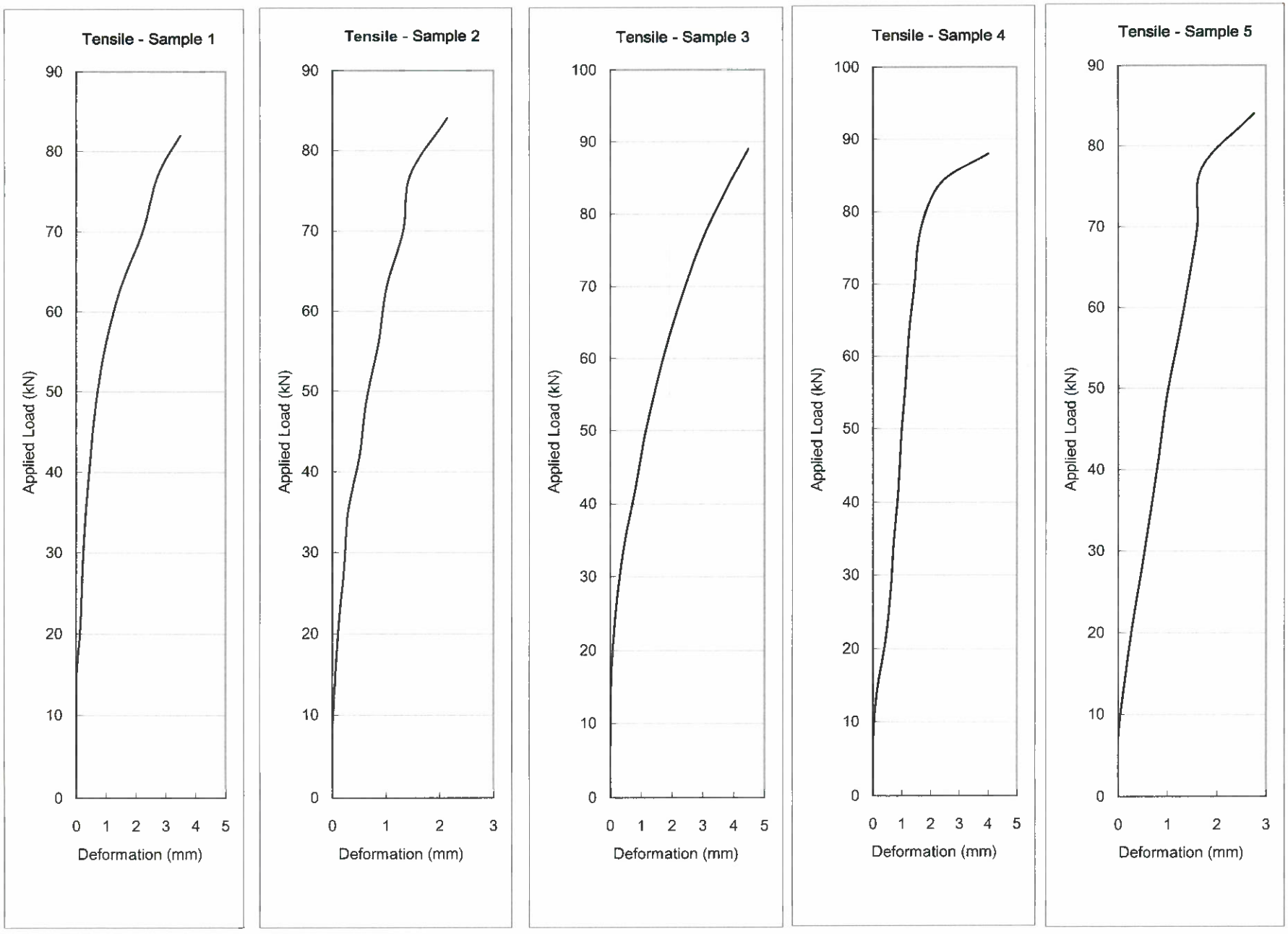
* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

Cast-in channel Hilti "HAC-C-50/30 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"



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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Tensile Proof Load Test on Anchor

Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" +

2 nos T-bolt "HBC-50/30 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

Date of Testing: 04-12-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

1.0 Information

(a) Manufacturer : Hilti (Hong Kong) Ltd

(b) Channel type : Cast-in Channel Hilti "HAC-C 52/34 A4 "

(c) Bolt type : T-Bolt HBC-50/30 M16 A4

(d) Channel width : 52.5mm

(e) Channel height : 34.0mm

(f) Embedment depth : 155.0mm

(g) Mass concrete size : 900mm x 900mm x 350mm

(h) Concrete grade : 25/20D

(i) Bolt spacing : 150 mm

(j) Applied torque : 60 Nm

(k) Test standard : In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3

2.0 Test results

Anchor Type	Cast-in channel Hilti "HAC –C 52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	138.7	139.6	143.0	138.2	136.1
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	139.1				
Standard deviation (kN)	2.52				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200690 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 900 x 900 x 350mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		13.0	0.5	13	0.00	0.00	0.00	P	
3		26.0	0.5	26	0.00	0.10	0.05	P	
4		39.0	0.5	39	0.29	0.49	0.39	P	
5		52.0	0.5	52	0.66	0.81	0.74	P	
6		65.0	0.5	65	1.00	1.14	1.07	P	
7		78.0	0.5	78	1.36	1.48	1.42	P	
8		91.0	0.5	91	1.77	1.85	1.81	P	
9		104.0	0.5	104	2.37	2.34	2.36	P	
10		117.0	0.5	117	3.02	2.93	2.98	P	
11		130.0	0.5	130	3.76	3.62	3.69	P	
12		143.0	0.5	138.7	4.82	4.63	4.73	F4	
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days
B) Channel concreting date : 23 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 155 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200690 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 900 x 900 x 350mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		13.0	0.5	13	0.00	0.00	0.00	P	
3		26.0	0.5	26	0.10	0.14	0.12	P	
4		39.0	0.5	39	0.37	0.69	0.53	P	
5		52.0	0.5	52	0.65	1.00	0.83	P	
6		65.0	0.5	65	0.89	1.28	1.09	P	
7		78.0	0.5	78	1.21	1.78	1.50	P	
8		91.0	0.5	91	1.55	2.34	1.95	P	
9		104.0	0.5	104	2.02	3.08	2.55	P	
10		117.0	0.5	117	2.53	3.73	3.13	P	
11		130.0	0.5	130	3.07	4.44	3.76	P	
12		143.0	0.5	139.6	3.98	5.02	4.50	F4	
13	-								-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 155 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200690 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
GCE Reg. No. : GCE172451
Sample ID : Sample 3

Date Tested : 04-12-2017
Test Unit : MI17253

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 900 x 900 x 350mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		13.0	0.5	13	0.00	0.00	0.00	P	
3		26.0	0.5	26	0.00	0.09	0.05	P	
4		39.0	0.5	39	0.40	0.39	0.40	P	
5		52.0	0.5	52	0.72	0.86	0.79	P	
6		65.0	0.5	65	0.93	1.14	1.04	P	
7		78.0	0.5	78	1.31	1.60	1.46	P	
8		91.0	0.5	91	1.63	1.86	1.75	P	
9		104.0	0.5	104	2.22	2.54	2.38	P	
10		117.0	0.5	117	2.62	3.10	2.86	P	
11		130.0	0.5	130	3.23	3.96	3.60	P	
12		143.0	0.5	143.0	4.25	4.98	4.62	F4	
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 155 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200690 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 4

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 900 x 900 x 350mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		13.0	0.5	13	0.00	0.00	0.00	P	
3		26.0	0.5	26	0.27	0.53	0.40	P	
4		39.0	0.5	39	0.65	0.79	0.72	P	
5		52.0	0.5	52	1.10	1.24	1.17	P	
6		65.0	0.5	65	1.43	1.56	1.50	P	
7		78.0	0.5	78	1.84	1.95	1.90	P	
8		91.0	0.5	91	2.41	2.49	2.45	P	
9		104.0	0.5	104	3.00	2.96	2.98	P	
10		117.0	0.5	117	3.47	3.40	3.44	P	
11		130.0	0.5	130	3.75	3.70	3.73	P	
12		143.0	0.5	138.2	4.92	4.51	4.72	F4	
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 155 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

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REPORT ON IN-SITU TENSILE PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 1 : 1993 Cl. 6, 7.1.1 & 7.1.3 (Incremental Loads)

Report No. : GCD171200690 Date of Issue : 11-12-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4" Date Tested : 04-12-2017
GCE Reg. No. : GCE172451 Test Unit : MI17253
Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block 900 x 900 x 350mm	0.0	--	0	0.00	0.00	0.00	P	Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"
2		13.0	0.5	13	0.00	0.00	0.00	P	
3		26.0	0.5	26	0.16	0.00	0.08	P	
4		39.0	0.5	39	0.42	0.21	0.32	P	
5		52.0	0.5	52	0.85	0.70	0.78	P	
6		65.0	0.5	65	1.10	0.94	1.02	P	
7		78.0	0.5	78	1.57	1.40	1.49	P	
8		91.0	0.5	91	1.94	1.63	1.79	P	
9		104.0	0.5	104	2.42	2.20	2.31	P	
10		117.0	0.5	117	2.98	2.87	2.93	P	
11		130.0	0.5	130	3.53	3.34	3.44	P	
12		143.0	0.5	136.1	4.92	4.72	4.82	F4	
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 11 days

B) Channel concreting date : 23 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of any separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter (mm) 16 mm
E) Bolt spacing (mm) 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length (mm) 155 mm
H) Channel length (mm) 350 mm

* Information provided by customer

Tested By : K.K. Wong

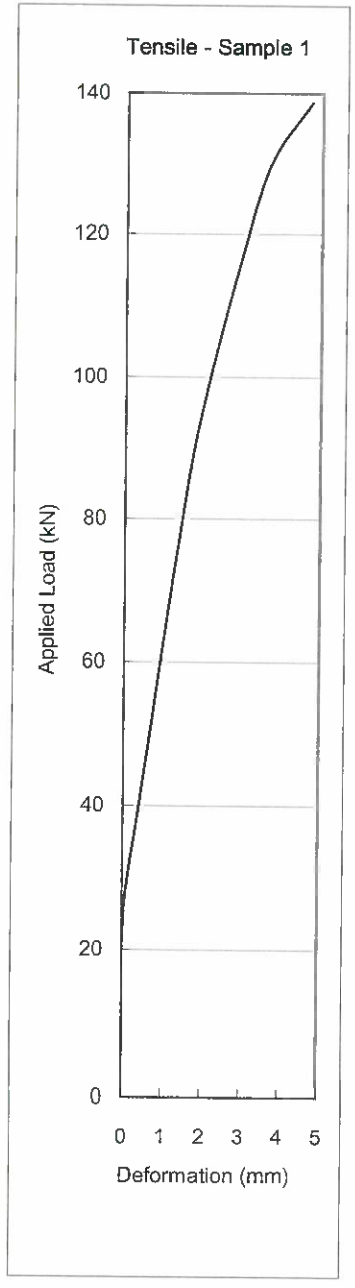
Checked By :

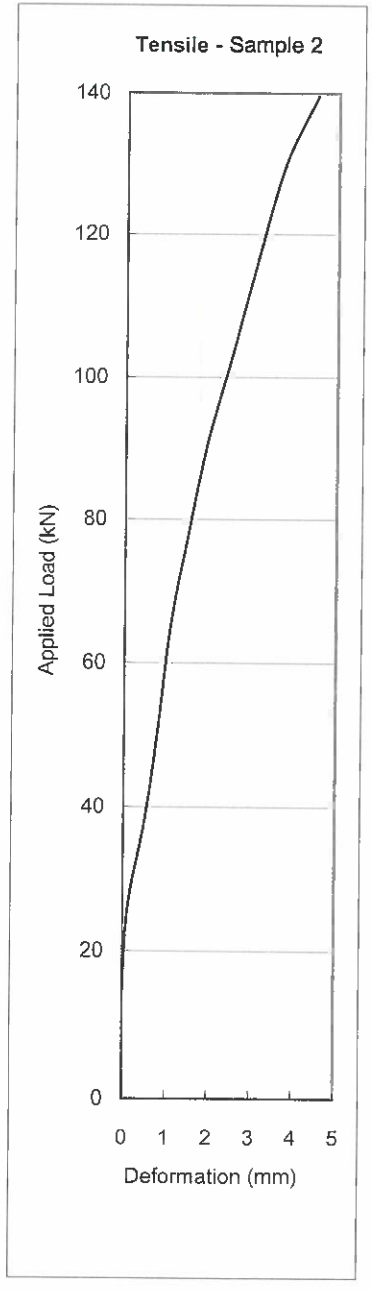
Approved Signatory :

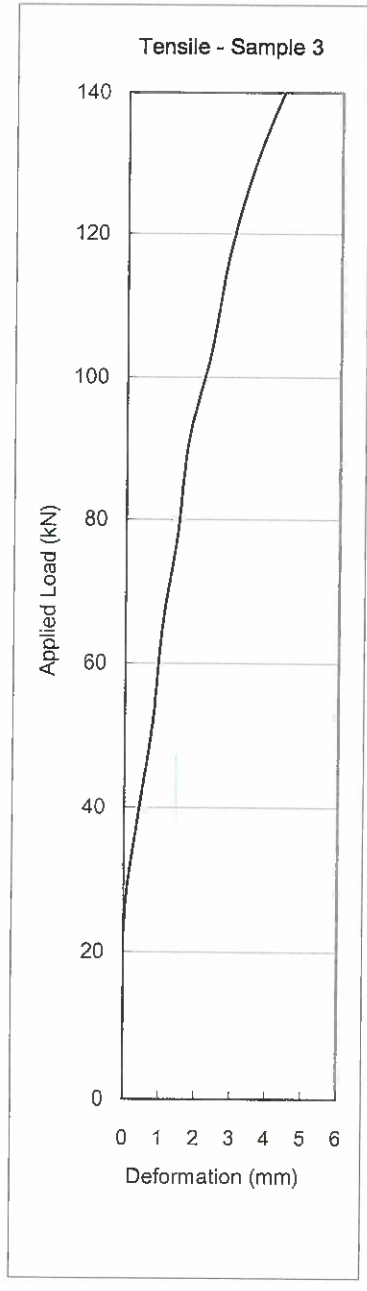
LAU SUN HUNG, IVAN

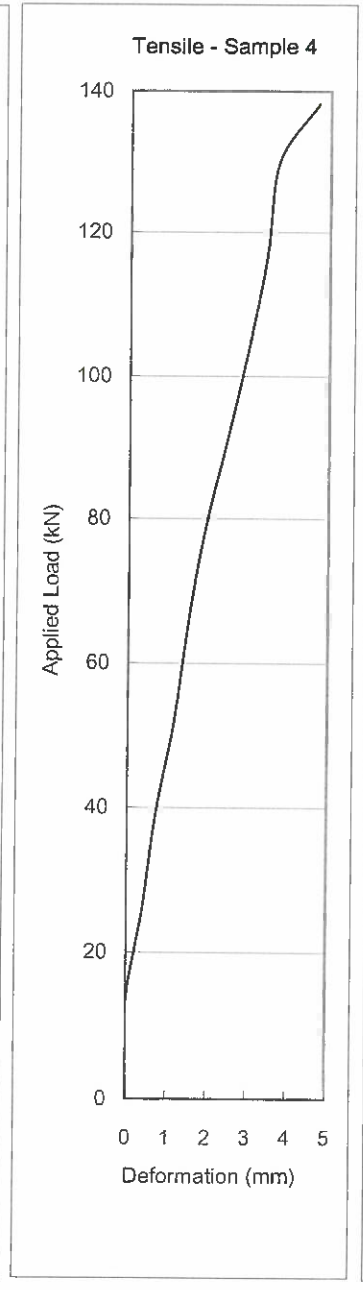
Post : Senior Testing Manager

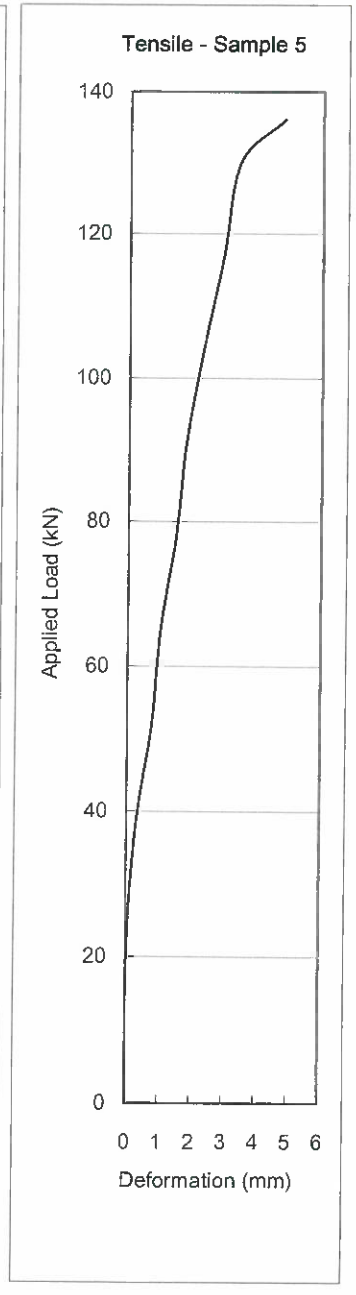
Cast-in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"











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TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Shear Proof Load Test on Anchor

Type : Cast in channel "Hilti HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 2 : 1986 Cl.7.0

Date of testing : 23-11-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

1.0 Information

(a) Manufacturer : Hilti (Hong Kong) Ltd

(b) Channel type : Cast in channel "HAC-C-40/22 A4"

(c) Bolt type : T-Bolt HBC-40/22 M16 A4

(d) width, b_{ch} : 39.5mm

(e) height, h_{ch} : 23.0mm

(f) embedment depth, h_{ef} : 79.0mm

(g) Mass concrete size : 800mm x 800mm x 250mm

(h) Concrete grade : 25/20D

(i) Bolt spacing : 150 mm

(j) Torque : 30 Nm

(k) Test standard : BS 5080 : Part 2 : 1986 cl 7.0

2.0 Test results

Anchor Type	Cast in channel "Hilti HAC-C-40/22 A4" + 2 nos T-bolt "HBC-40/22 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	77.1	77.5	79.0	77.7	78.1
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	77.88				
Standard deviation (kN)	0.72				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101498 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4"
2		7	0.5	7	1.24	--	1.24	P	
3		14	0.5	14	1.83	--	1.83	P	
4		21	0.5	21	2.20	--	2.20	P	
5		28	0.5	28	3.47	--	3.47	P	
6		35	0.5	35	3.78	--	3.78	P	
7		42	0.5	42	4.09	--	4.09	P	
8		49	0.5	49	4.42	--	4.42	P	
9		56	0.5	56	4.74	--	4.74	P	
10		63	0.5	63	5.13	--	5.13	P	
11		70	0.5	70	5.50	--	5.50	P	
12		77	--	77.1	6.85	--	6.85	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length 79 mm
H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

CHAN TAT TUNG, TONY

Post : Testing Manager

Form No.: PHY/MTS/RF395r2

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101498 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4"
2		7	0.5	7	0.15	--	0.15	P	
3		14	0.5	14	0.46	--	0.46	P	
4		21	0.5	21	0.85	--	0.85	P	
5		28	0.5	28	1.18	--	1.18	P	
6		35	0.5	35	1.52	--	1.52	P	
7		42	0.5	42	1.91	--	1.91	P	
8		49	0.5	49	2.34	--	2.34	P	
9		56	0.5	56	3.69	--	3.69	P	
10		63	0.5	63	4.07	--	4.07	P	
11		70	0.5	70	4.97	--	4.97	P	
12		77	--	77.5	6.45	--	6.45	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length 79 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :

Approved Signatory :
CHAN TAT TUNG, TONY
Post : Testing Manager

Form No.: PHY/MTS/RF395r2

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101498 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd

Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon

Project : -

Test Location : 4A-1, Lin Tong Mei, Sheung Shui

Anchor Type : Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4" Date Tested : 23-Nov-17

GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4"
2		7	0.5	7	0.47	--	0.47	P	
3		14	0.5	14	0.95	--	0.95	P	
4		21	0.5	21	1.44	--	1.44	P	
5		28	0.5	28	1.89	--	1.89	P	
6		35	0.5	35	2.31	--	2.31	P	
7		42	0.5	42	2.72	--	2.72	P	
8		49	0.5	49	3.18	--	3.18	P	
9		56	0.5	56	3.58	--	3.58	P	
10		63	0.5	63	3.99	--	3.99	P	
11		70	0.5	70	4.48	--	4.48	P	
12		77	--	79.0	5.92	--	5.92	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 30 Nm

G) Embedment length 79 mm

H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

CHAN TAT TUNG, TONY

Post : Testing Manager

Form No.: PHY/MTS/RF395r2

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101498 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 4

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4"
2		7	0.5	7	0.78	--	0.78	P	
3		14	0.5	14	1.42	--	1.42	P	
4		21	0.5	21	2.05	--	2.05	P	
5		28	0.5	28	2.53	--	2.53	P	
6		35	0.5	35	2.91	--	2.91	P	
7		42	0.5	42	3.25	--	3.25	P	
8		49	0.5	49	3.65	--	3.65	P	
9		56	0.5	56	4.03	--	4.03	P	
10		63	0.5	63	4.41	--	4.41	P	
11		70	0.5	70	4.85	--	4.85	P	
12		77	--	77.7	5.86	--	5.86	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 30 Nm
G) Embedment length 79 mm
H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

CHAN TAT TUNG, TONY

Post : Testing Manager

Form No.: PHY/MTS/RF395r2

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101498 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd

Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon

Project : -

Test Location : 4A-1, Lin Tong Mei, Sheung Shui

Anchor Type : Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4" Date Tested : 23-Nov-17

GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Measured Results: Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 40/22 A4" + 2 nos T-bolt "HBC-C-40/22 M16 A4"
2		7	0.5	7	1.12	--	1.12	P	
3		14	0.5	14	1.90	--	1.90	P	
4		21	0.5	21	2.13	--	2.13	P	
5		28	0.5	28	2.51	--	2.51	P	
6		35	0.5	35	2.90	--	2.90	P	
7		42	0.5	42	3.27	--	3.27	P	
8		49	0.5	49	3.62	--	3.62	P	
9		56	0.5	56	3.98	--	3.98	P	
10		63	0.5	63	4.38	--	4.38	P	
11		70	0.5	70	5.07	--	5.07	P	
12		77	--	78.1	6.52	--	6.52	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 30 Nm

G) Embedment length 79 mm

H) Channel length 350 mm

Tested By : K.K. Wong

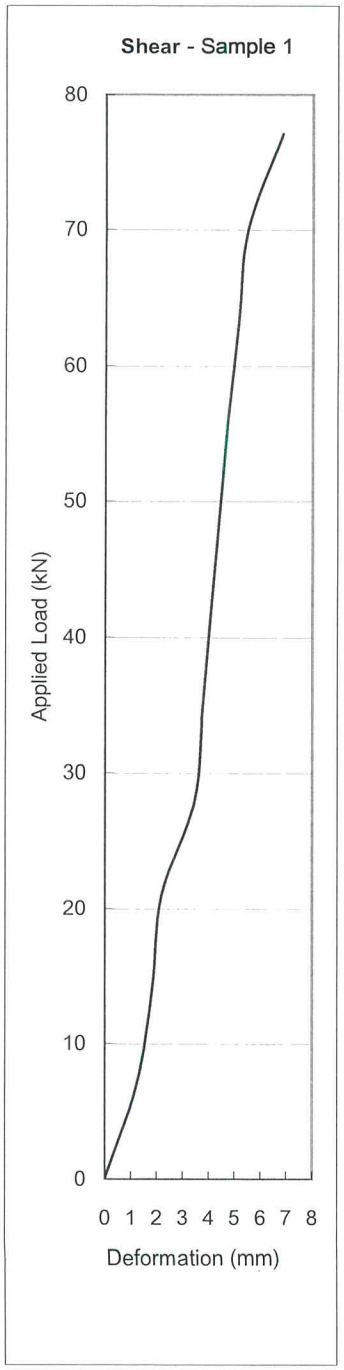
Checked By :

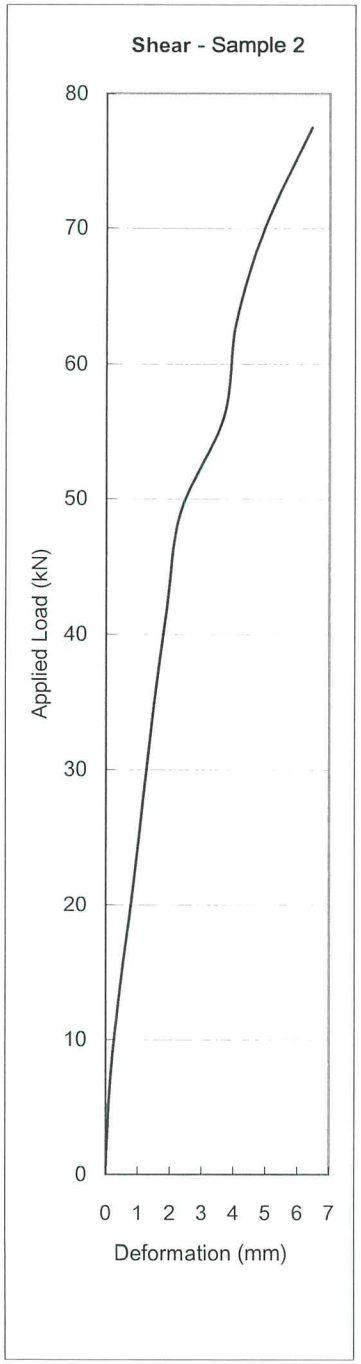
Approved Signatory :

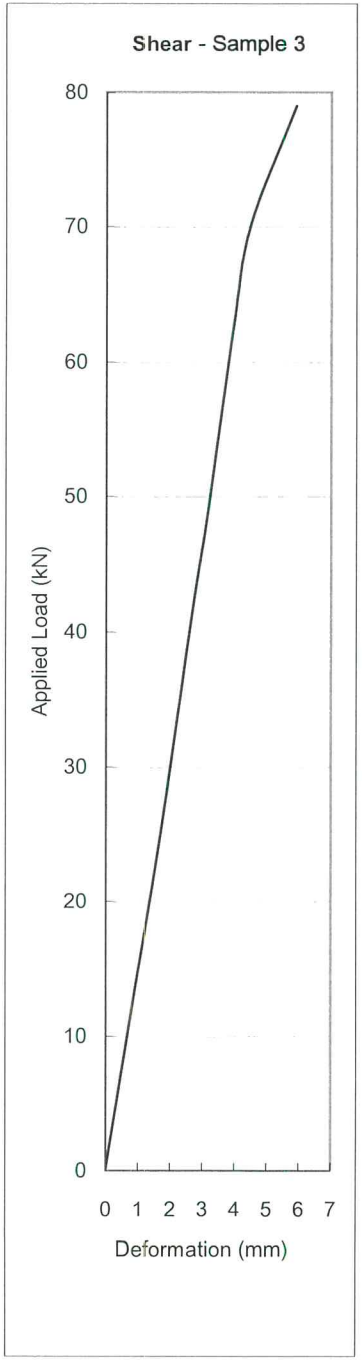
CHAN TAT TUNG, TONY

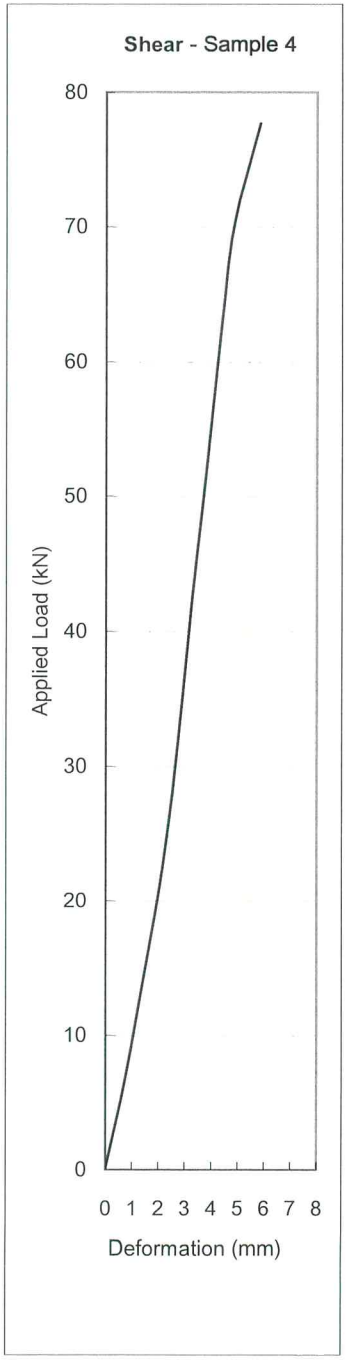
Post : Testing Manager

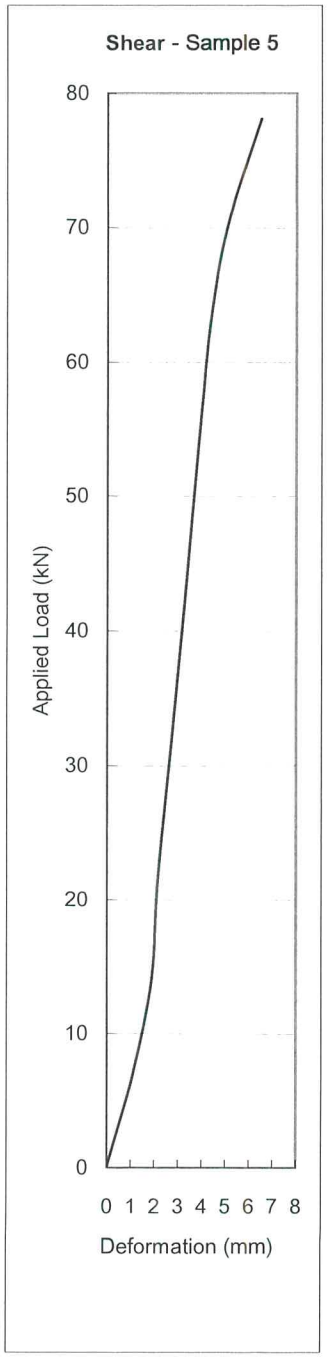
Form No.: PHY/MTS/RF395r2











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香港土力混凝土工程有限公司
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電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Shear Proof Load Test on Anchor

Type : Cast in channel "Hilti HAC-C-50/30 A4" +

2 nos T-Bolt "HBC-50/30 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 2 : 1986 Cl.7.0

Date of testing : 23-11-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

1.0 Information

(a) Manufacturer : Hilti (Hong Kong) Ltd

(b) Channel type : Cast in channel Hilti "HAC-C-50/30 A4"

(c) Bolt type : T-Bolt HBC-50/30 M16 A4

(d) width, b_{ch} : 49.0mm

(e) height, h_{ch} : 30.0mm

(f) embedment depth, h_{ef} : 94.0mm

(g) Mass concrete size : 800mm x 800mm x 250mm

(h) Concrete grade : 25/20D

(i) Bolt spacing : 150 mm

(j) Torque : 60 Nm

(k) Test standard : BS 5080 : Part 2 : 1986 cl 7.0

2.0 Test results

Anchor Type	Cast in channel "Hilti HAC-C-50/30 A4" + 2 nos T-Bolt "HBC-50/30 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	96.8	95.0	96.1	94.0	95.2
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	95.42				
Standard deviation (kN)	1.07				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101503 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		7	0.5	7	1.06	--	1.06	P	
3		14	0.5	14	1.45	--	1.45	P	
4		21	0.5	21	1.77	--	1.77	P	
5		28	0.5	28	2.07	--	2.07	P	
6		35	0.5	35	2.30	--	2.30	P	
7		42	0.5	42	2.56	--	2.56	P	
8		49	0.5	49	2.83	--	2.83	P	
9		56	0.5	56	3.12	--	3.12	P	
10		63	0.5	63	3.44	--	3.44	P	
11		70	0.5	70	3.75	--	3.75	P	
12		77	0.5	77	4.10	--	4.10	P	
13		84	0.5	84	4.56	--	4.56	P	
14		91	0.5	91	5.09	--	5.09	P	
15		98	--	96.8	6.45	--	6.45	F4	
16	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days
B) Anchor concreting date : 16 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 94 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101503 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Measured Results: Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		7	0.5	7	0.76	--	0.76	P	
3		14	0.5	14	1.97	--	1.97	P	
4		21	0.5	21	2.26	--	2.26	P	
5		28	0.5	28	2.54	--	2.54	P	
6		35	0.5	35	2.85	--	2.85	P	
7		42	0.5	42	3.16	--	3.16	P	
8		49	0.5	49	3.46	--	3.46	P	
9		56	0.5	56	3.76	--	3.76	P	
10		63	0.5	63	4.09	--	4.09	P	
11		70	0.5	70	4.47	--	4.47	P	
12		77	0.5	77	5.21	--	5.21	P	
13		84	0.5	84	5.79	--	5.79	P	
14		91	0.5	91	6.43	--	6.43	P	
15		98	--	95.0	7.25	--	7.25	F4	
16	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 60 Nm

G) Embedment length 94 mm

H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101503 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 3

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		7	0.5	7	0.04	--	0.04	P	
3		14	0.5	14	0.10	--	0.10	P	
4		21	0.5	21	0.37	--	0.37	P	
5		28	0.5	28	0.76	--	0.76	P	
6		35	0.5	35	1.19	--	1.19	P	
7		42	0.5	42	1.63	--	1.63	P	
8		49	0.5	49	2.04	--	2.04	P	
9		56	0.5	56	2.47	--	2.47	P	
10		63	0.5	63	3.50	--	3.50	P	
11		70	0.5	70	3.68	--	3.68	P	
12		77	0.5	77	4.43	--	4.43	P	
13		84	0.5	84	4.99	--	4.99	P	
14		91	0.5	91	5.67	--	5.67	P	
15		98	--	96.1	6.69	--	6.69	F4	
16	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days
B) Anchor concreting date : 16 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 94 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101503 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 4

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		7	0.5	7	0.44	--	0.44	P	
3		14	0.5	14	0.73	--	0.73	P	
4		21	0.5	21	1.27	--	1.27	P	
5		28	0.5	28	1.77	--	1.77	P	
6		35	0.5	35	2.15	--	2.15	P	
7		42	0.5	42	2.60	--	2.60	P	
8		49	0.5	49	3.01	--	3.01	P	
9		56	0.5	56	3.39	--	3.39	P	
10		63	0.5	63	3.73	--	3.73	P	
11		70	0.5	70	4.14	--	4.14	P	
12		77	0.5	77	4.61	--	4.61	P	
13		84	0.5	84	5.28	--	5.28	P	
14		91	0.5	91	6.07	--	6.07	P	
15		98	--	94.0	7.27	--	7.27	F4	
16	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days
B) Anchor concreting date : 16 Nov 2017
C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :
D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 94 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :
Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 C.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171101503 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd

Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon

Project : -

Test Location : 4A-1, Lin Tong Mei, Sheung Shui

Anchor Type : Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17

GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (800 x 800 x 250mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C 50/30 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		7	0.5	7	1.09	--	1.09	P	
3		14	0.5	14	1.51	--	1.51	P	
4		21	0.5	21	1.82	--	1.82	P	
5		28	0.5	28	2.17	--	2.17	P	
6		35	0.5	35	2.35	--	2.35	P	
7		42	0.5	42	2.49	--	2.49	P	
8		49	0.5	49	2.76	--	2.76	P	
9		56	0.5	56	3.01	--	3.01	P	
10		63	0.5	63	3.23	--	3.23	P	
11		70	0.5	70	3.65	--	3.65	P	
12		77	0.5	77	4.00	--	4.00	P	
13		84	0.5	84	4.43	--	4.43	P	
14		91	0.5	91	4.82	--	4.82	P	
15		98	--	95.2	5.91	--	5.91	F4	
16	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 60 Nm

G) Embedment length 94 mm

H) Channel length 350 mm

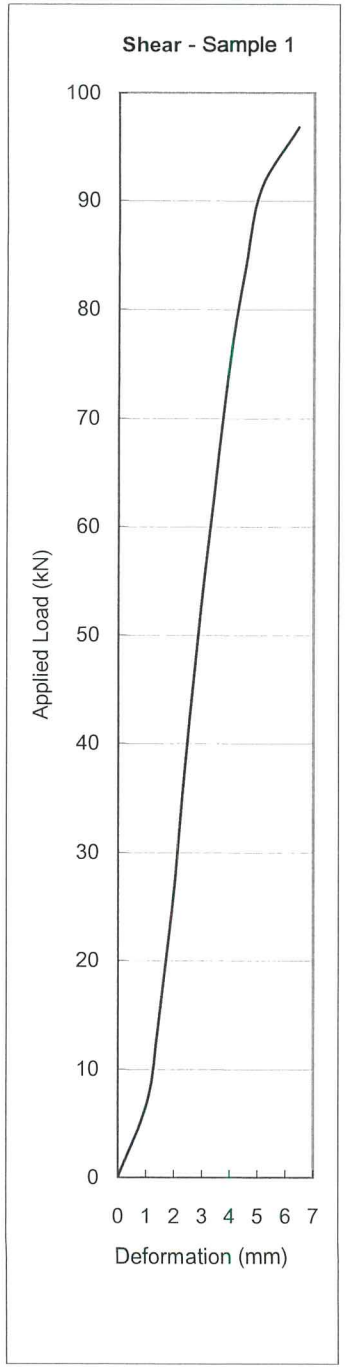
Tested By : K.K. Wong

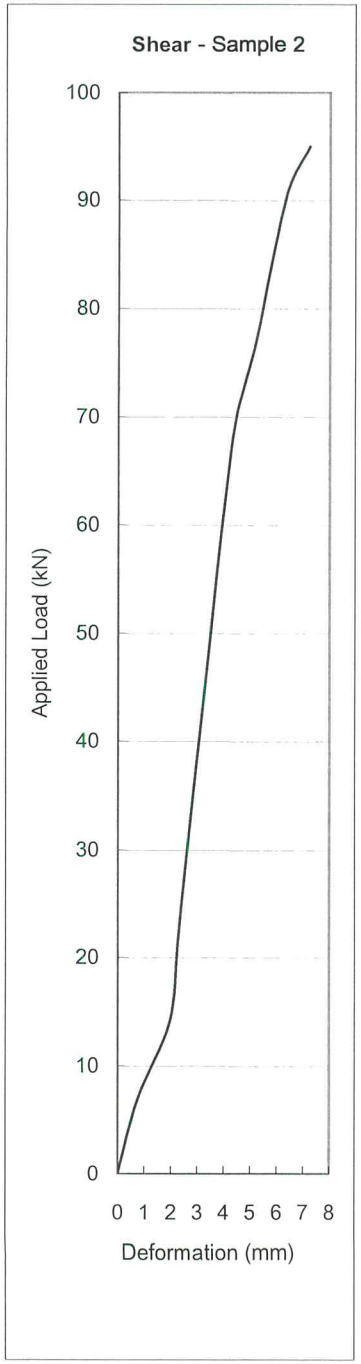
Checked By :

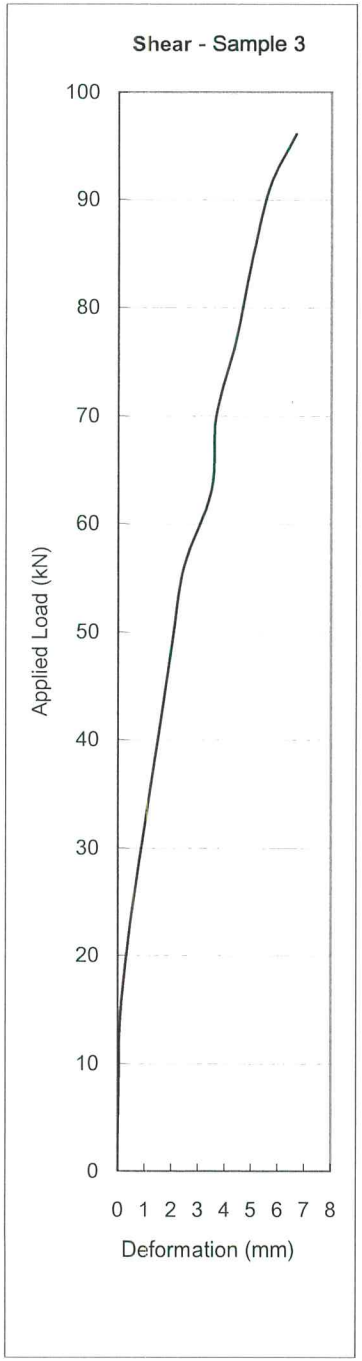
Approved Signatory :

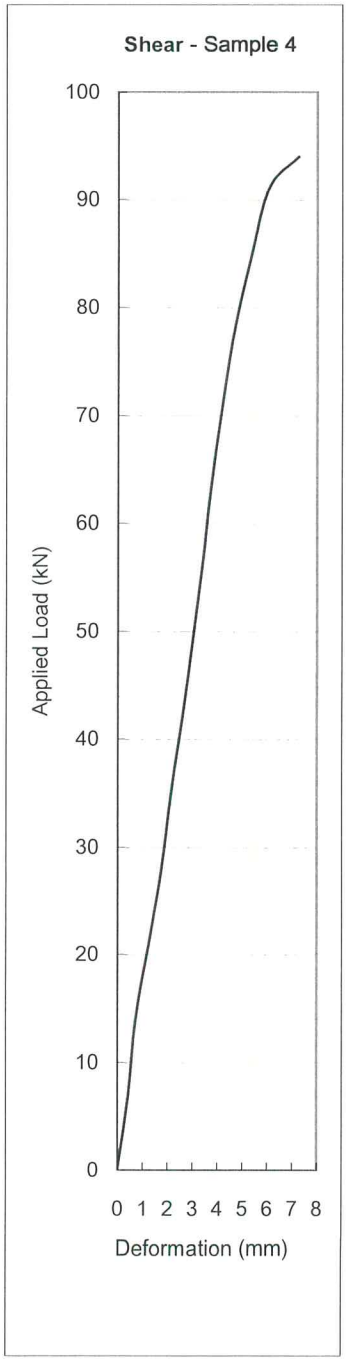
LAU SUN HUNG, IVAN

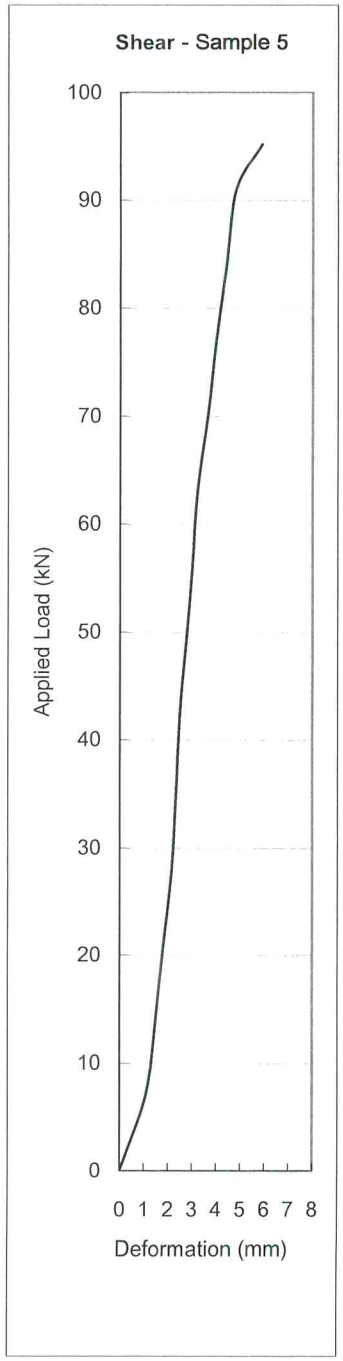
Post : Senior Testing Manager











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香港土力混凝土工程有限公司
九龍紅磡高山道六號地下
電話：852-2365 9123

TEST REPORT

HILTI (Hong Kong) Ltd

701-704, 7/F, Tower A, Manulife Financial Center,
223 Wai Yip Street, Kwun Tong, Kowloon

Shear Proof Load Test on Anchor

Type : Cast in channel "Hilti HAC-C-52/34 A4" +

2 nos T-Bolt "HBC-50/30 M16 A4"

(Sample 1 to Sample 5)

Ref. Standard : BS 5080 : Part 2 : 1986 Cl.7.0

Date of testing : 23-11-2017

Checked by: _____
Technical Officer

Approved Signatory: _____
LAU SUN HUNG, IVAN
Senior Testing Manager

1.0 Information

(a) Manufacturer : Hilti (Hong Kong) Ltd

(b) Channel type : Cast in channel Hilti "HAC-C-52/34 A4"

(c) Bolt type : T Bolt HBC-50/30 M16 A4

(d) width, b_{ch} : 52.5mm

(e) height, h_{ch} : 34.0mm

(f) embedment depth, h_{ef} : 155.0mm

(g) Mass concrete size : 900mm x 900mm x 350mm

(h) Concrete grade : 25/20D

(i) Bolt spacing : 150 mm

(j) Torque : 60 Nm

(k) Test standard : BS 5080 : Part 2 : 1986 cl 7.0

2.0 Test results

Anchor Type	Cast in channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-50/30 M16 A4"				
Sample ID	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Failure load (kN)	159.0	158.8	159.4	159.6	157.2
Failure mode	F4	F4	F4	F4	F4
Average failure load (kN)	158.8				
Standard deviation (kN)	0.94				

Failure mode

P = No sign of failure in channel/bolt and/or structural member

F1 = Breaking of bolt

F2 = Failure in structural member in a shear cone

F3 = Pull out of channel

F4 = Sign of any separation, plastic deformation or deleterious effect on channel/ bolt

F5 = Failure in structural member with crack radiates outward from channel

F6 = Other failure mode(s)

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 Cl.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171116613 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd

Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon

Project : -

Test Location : 4A-1, Lin Tong Mei, Sheung Shui

Anchor Type : Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17

GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 1

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (900 x 900 x 350mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		15	0.5	15	0.11	--	0.11	P	
3		30	0.5	30	0.20	--	0.20	P	
4		45	0.5	45	0.88	--	0.88	P	
5		60	0.5	60	1.31	--	1.31	P	
6		75	0.5	75	2.15	--	2.15	P	
7		90	0.5	90	2.85	--	2.85	P	
8		105	0.5	105	4.30	--	4.30	P	
9		120	0.5	120	5.58	--	5.58	P	
10		135	0.5	135	5.98	--	5.98	P	
11		150	0.5	150	6.77	--	6.77	P	
12		165	--	159.0	7.95	--	7.95	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 60 Nm

G) Embedment length 155 mm

H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

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In accordance with BS 5080 : Part 2 : 1986 Cl.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171116613 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd

Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon

Project : -

Test Location : 4A-1, Lin Tong Mei, Sheung Shui

Anchor Type : Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17

GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 2

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (900 x 900 x 350mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		15	0.5	15	0.16	--	0.16	P	
3		30	0.5	30	0.56	--	0.56	P	
4		45	0.5	45	0.99	--	0.99	P	
5		60	0.5	60	1.58	--	1.58	P	
6		75	0.5	75	2.53	--	2.53	P	
7		90	0.5	90	3.71	--	3.71	P	
8		105	0.5	105	4.86	--	4.86	P	
9		120	0.5	120	5.92	--	5.92	P	
10		135	0.5	135	6.82	--	6.82	P	
11		150	0.5	150	7.69	--	7.69	P	
12		165	--	158.8	8.98	--	8.98	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm

E) Bolt spacing 150 mm

F) Applied torque on bolt 60 Nm

G) Embedment length 155 mm

H) Channel length 350 mm

Tested By : K.K. Wong

Checked By :

Approved Signatory :

LAU SUN HUNG, IVAN

Post : Senior Testing Manager

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REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 Cl.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171116613 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 3

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Deformation Gauge 1 (mm)	Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (900 x 900 x 350mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		15	0.5	15	0.12	--	0.12	P	
3		30	0.5	30	0.26	--	0.26	P	
4		45	0.5	45	0.78	--	0.78	P	
5		60	0.5	60	1.09	--	1.09	P	
6		75	0.5	75	2.12	--	2.12	P	
7		90	0.5	90	3.87	--	3.87	P	
8		105	0.5	105	4.67	--	4.67	P	
9		120	0.5	120	5.55	--	5.55	P	
10		135	0.5	135	6.29	--	6.29	P	
11		150	0.5	150	7.52	--	7.52	P	
12		165	--	159.4	8.65	--	8.65	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 155 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

Form No. : PHY-MTS/RF395r2

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 Cl.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171116613 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 4

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (900 x 900 x 350mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		15	0.5	15	0.36	--	0.36	P	
3		30	0.5	30	0.59	--	0.59	P	
4		45	0.5	45	1.17	--	1.17	P	
5		60	0.5	60	2.11	--	2.11	P	
6		75	0.5	75	2.81	--	2.81	P	
7		90	0.5	90	3.57	--	3.57	P	
8		105	0.5	105	4.42	--	4.42	P	
9		120	0.5	120	5.36	--	5.36	P	
10		135	0.5	135	6.31	--	6.31	P	
11		150	0.5	150	7.22	--	7.22	P	
12		165	--	159.6	8.52	--	8.52	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 155 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

REPORT ON IN-SITU SHEAR PROOF LOAD TEST ON ANCHOR

In accordance with BS 5080 : Part 2 : 1986 Cl.7 (Amd. 7602) (Incremental Loads)

Report No. : GCD171116613 Date of Issue : 25-11-2017

Client : Hilti (Hong Kong) Ltd
Address : 701-704, 7/F, Tower A, Manulife Financial Center, 223, Wai Yip Street, Kwun Tong, Kowloon
Project : -
Test Location : 4A-1, Lin Tong Mei, Sheung Shui
Anchor Type : Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4" Date Tested : 23-Nov-17
GCE Reg. No. : GCE172272 Test Unit No.: MI17218

Sample ID : Sample 5

Test Stage	Location Code	Specified Test Force (kN)	Force Holding Time (min)	Measured Results: Applied Forced (kN)	Measured Results: Deformation Gauge 1 (mm)	Measured Results: Deformation Gauge 2 (mm)	Relative Deformation (mm)	Failure Modes (see note C)	Type*
1	Concrete block (900 x 900 x 350mm)	0	--	0	0.00	--	0.00	P	Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"
2		15	0.5	15	0.76	--	0.76	P	
3		30	0.5	30	1.09	--	1.09	P	
4		45	0.5	45	1.71	--	1.71	P	
5		60	0.5	60	2.11	--	2.11	P	
6		75	0.5	75	2.98	--	2.98	P	
7		90	0.5	90	3.57	--	3.57	P	
8		105	0.5	105	4.42	--	4.42	P	
9		120	0.5	120	5.36	--	5.36	P	
10		135	0.5	135	6.61	--	6.61	P	
11		150	0.5	150	7.22	--	7.22	P	
12		165	--	157.2	8.76	--	8.76	F4	
13	--	--	--	--	--	--	--	--	--

Notes :

A) Structural member : 1. Grade : 25/20D 2. Age at test : 7 days

B) Anchor concreting date : 16 Nov 2017

C) Failure Modes : P = No sign of failure in bolt, channel and/or structural member
F1 = Breaking of bolt /channel
F2 = Failure in structural member in a shear cone
F3 = Pull out of channel
F4 = Sign of separation, plastic deformation or deleterious effect on channel / bolts
F5 = Failure in structural member with crack radiates outward from channel
F6 = Other failure mode(s) :

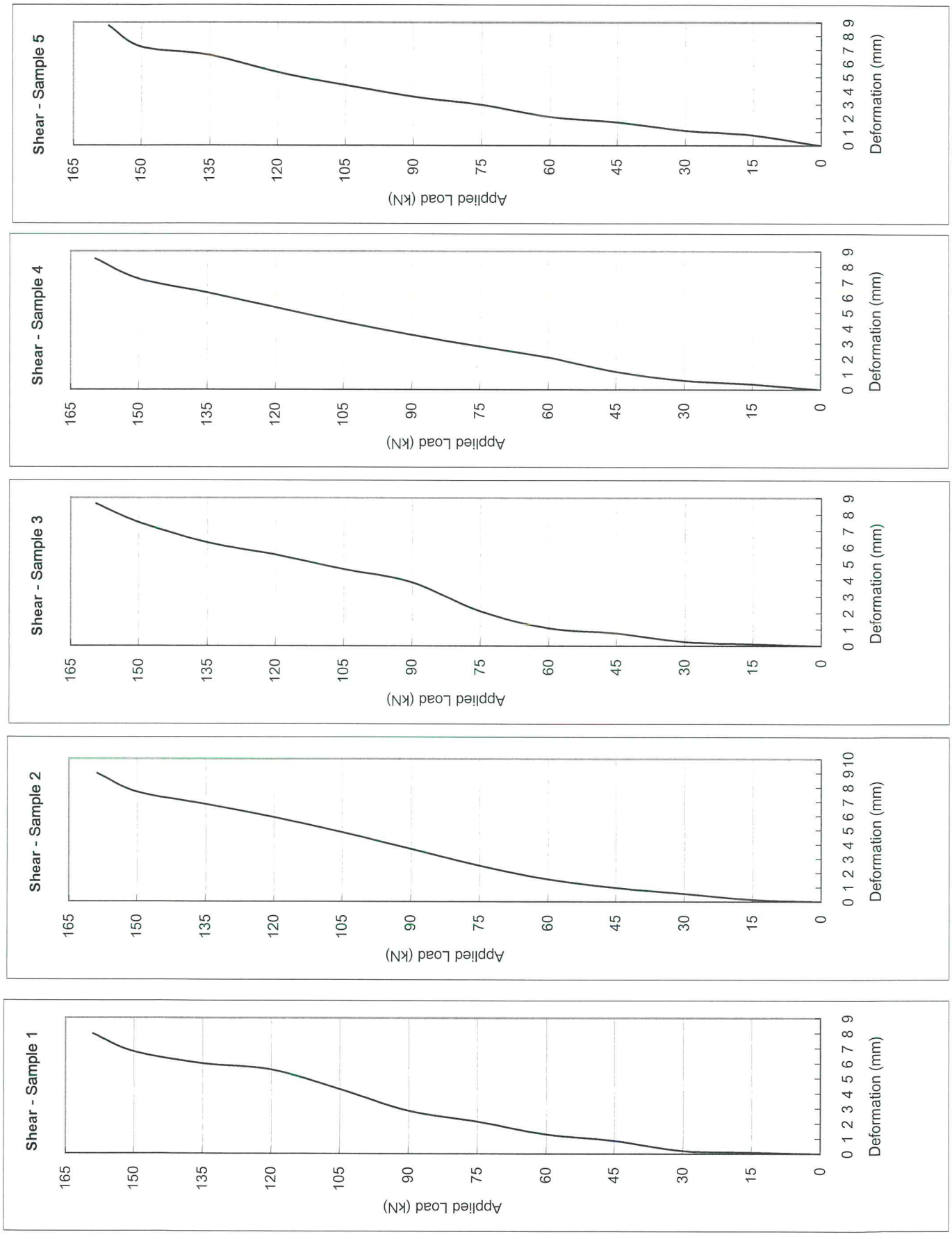
D) Bolt diameter 16 mm
E) Bolt spacing 150 mm
F) Applied torque on bolt 60 Nm
G) Embedment length 155 mm
H) Channel length 350 mm

Tested By : K.K. Wong
Checked By :

Approved Signatory :
LAU SUN HUNG, IVAN
Post : Senior Testing Manager

GEOTECHNICS & CONCRETE ENGINEERING (H.K.) LTD.
6 KO SHAN RD., GROUND FL., HUNG HOM, KOWLOON, HONG KONG.
TEL.: 852-2365 9123 FAX NO.: 852-2765 8034

Cast-in Channel Hilti "HAC-C-52/34 A4" + 2 nos T-bolt "HBC-C-50/30 M16 A4"



Issused Date: 25 Nov 2017

Report No.: GCD171116613

Attention: To whom it may concern

Date: 18 May 2017
Ref: 048/AI/TT/17

Subject: Country of Origin – Hilti HBC t-head bolt

Dear Sir / Madam,

Enclosed please find the information of Hilti HBC t-head bolt

Brand Name	:	Hilti
Model Name	:	Hilti HBC / HBC-C / HBC-C-N
Manufacturer	:	Hilti Corporation
Address of Manufacturer	:	FL-9494, Principality of Liechtenstein
Country of Origin	:	Taiwan
Supplier	:	Hilti (Hong Kong) Ltd.
Address of Supplier	:	701-704 & 708B, 7/F, Tower A, Manulife Finance Centre, 233 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

Should you have further questions, please do not hesitate to contact our Technical Representatives or Customer Service Hotline at 8228-8118.

Yours sincerely,

Terry Tsang
Product Manager

Attention: To whom it may concern

Date: 18 May 2017
Ref: 049/AI/TT/17

Subject: Country of Origin – Hilti HAC-C anchor channel

Dear Sir / Madam,

Enclosed please find the information of Hilti HAC-C anchor channel

Brand Name	:	Hilti
Model Name	:	Hilti HAC-C / HAC-C A4
Manufacturer	:	Hilti Corporation
Address of Manufacturer	:	FL-9494, Principality of Liechtenstein
Country of Origin	:	China
Supplier	:	Hilti (Hong Kong) Ltd.
Address of Supplier	:	701-704 & 708B, 7/F, Tower A, Manulife Finance Centre, 233 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

Should you have further questions, please do not hesitate to contact our Technical Representatives or Customer Service Hotline at 8228-8118.

Yours sincerely,

HILTI (HONG KONG) LTD. MKT

Terry Tsang
Product Manager

1. Job / Application Reference for HAC

Year	Project Name	Consultant / RSE	Application
2014	12 Oil Street, North Point Mixed Development (Ex-government Supplies Depot)	AECOM Asia Company Limited	Curtain wall
2014	2 Ng Fong Street Commercial Development	C M Wong & Associates Ltd	Curtain wall
2014	2, 6 & 8 Kennedy Road Residential Development	JMK Consulting Engineers	Curtain wall
2014	24 Po Shan Road Residential Development Central	Wong & Ouyang (Civil-Structural Engineering)	Curtain wall
2014	31 Conduit Road Residential Development	C M Wong & Associates Ltd	Curtain wall
2014	361-367 Portland Street Commercial and Residential Development	K C Wong & Associates Ltd	Curtain wall
2014	41 Heung Yip Road Commercial Development	Jacobs China Limited	Curtain wall
2014	53 Conduit Road Residential Development	AECOM Asia Company Limited	Curtain wall
2014	565-577 Fuk Wah Street Residential and Commercial Development	Stephen Cheng Consulting Engineers Ltd	Curtain wall
2014	7-12 Ying Wa Terrace Residential Development	Stephen Cheng Consulting Engineers Ltd	Curtain wall
2014	82-100 Tak Cheong Street & 2-4 Soy Street Hotel Development,tai Kok Tsui	AECOM Asia Company Limited	Curtain wall
2014	83 Hoi Bun Road Commercial Building	AECOM Asia Company Limited	Curtain wall
2014	Hong Kong Science Park: Phase 3c	Ove Arup & Partners HK Ltd	Curtain wall
2014	Junction of on Kwan Street and on Lai Street, Shek Mun, Sha Tin Commercial Development	C M Wong & Associates Ltd	Curtain wall
2014	Junction of on Yiu Street and on Kwan Street, Shek Mun (Sttl 463), Sha Tin , Sha Tin, New Territories	Siu Yin Wai & Associates Ltd	Curtain wall
2014	Residential Development 62 Begonia Road	Wong & Cheng Consulting Engineers Ltd	Curtain wall
2014	Shatin Area 56a, Kau to (Site a) , Sttl 525	AECOM Asia Company Limited	Curtain wall
2014	Yoho Town Commerical Residential Development Phase 3	Sun Hung Kai Architects & Engineers Limited	Curtain wall
2014	33 Seymour Road (Phase 2) Residential Development	C M Wong & Associates Ltd	Curtain wall
2014	Tseung Kwan O Area 66c1 (Tkotl 114), Tseung Kwan O	Sun Hung Kai Architects & Engineers Limited	Curtain wall
2015	(Tkotl 112) Area 65c1, Chi Shin Street, Tseung Kwan O	AECOM Asia Company Limited	Curtain wall
2015	10-12 Kimberley Street, Tsim Sha Tsui , Yau Tsim Mong	Greg Wong & Associates Ltd	Curtain wall
2015	180 Wai Yip Street Commercial Development	C M Wong & Associates Ltd	Curtain wall
2015	187-191 Portland Street Commercial Residential Development	T K Tsui & Associates Ltd	Curtain wall
2015	19-33 Shing on Street Commercial and Residential Development, Sai Wan Ho	Stephen Cheng Consulting Engineers Ltd	Curtain wall
2015	196-202 Ma Tau Wai Road Residential Development	façade consultant/ Inhabit Living Engineering Limited	Curtain wall
2015	2-12 Jones Street & 1-11 Lai Yin Street Residential Development	Siu Yin Wai & Associates Ltd	Curtain wall
2015	279 Prince Edward Road West Residential Development	Yung & Chan Associates Ltd	Curtain wall

1. Job / Application Reference for HAC

Year	Project Name	Consultant / RSE	Application
2015	3-7 Wing Hing Street, Tin Hau	T K Tsui & Associates Ltd	Curtain wall
2015	38-40a Hillwood Road Commercial Development	Siu Yin Wai & Associates Ltd	Curtain wall
2015	40-40a Kimberley Road & 22a Kimberley Street	AECOM Asia Company Limited	Curtain wall
2015	44 Stubbs Road , Happy Valley, Hong Kong Island	Wong Pak Lam & Associates Consulting Engineers & Architects Ltd	Curtain wall
2015	60-66 Jardine's Bazaar Hotel Development	T K Tsui & Associates Ltd	Curtain wall
2015	680 Castle Peak, Lai Chi Kok , Sham Shui Po District	Sun Hung Kai Architects & Engineers Limited	Curtain wall
2015	77 Peak Road Residential Development	C M Wong & Associates Ltd	Curtain wall
2015	78-88 Sai Yee Street Residential Development	Wong & Cheng Consulting Engineers Ltd	Curtain wall
2015	8-12 Deep Water Bay Drive (Rbl 1190), Shouson Hill , Southern District, Hong Kong Island	AECOM Asia Company Limited	Curtain wall
2015	Goldin Financial Global Centre	Ove Arup & Partners HK Ltd	Curtain wall
2015	Iplace, 301-305 Castle Peak Road, Kwai Chung Section, Kwai Chung , Kwai Tsing District	Siu Yin Wai & Associates Ltd	Curtain wall
2015	Isfa,no.1 Kong Sin Wan Road, Pok Fu Lam	Ove Arup & Partners HK Ltd	Curtain wall
2015	Junction of Sheung Lok Street and Sheung Shing Street, Ho Man Tin (Kil 11227) , Kowloon City District	Siu Yin Wai & Associates Ltd	Curtain wall
2015	Kau to Area 56a (Sttl 579), Lai Ping Road, Sha Tin	AECOM Asia Company Limited	Curtain wall
2015	Kensington Hill, 92-98 High Street & 39-45 Western Street Residential Development	JMK Consulting Engineers	Curtain wall
2015	Ocean Terminal, Canton Road , Tsim Sha Tsui, Kowloon	Ove Arup & Partners HK Ltd	Sliding door
2015	Redevelopment of Pak Tai Street/ Mok Cheong Street	C M Wong & Associates Ltd	Curtain wall
2015	Shangri-la Hotel, Kil 11205, Junction of Hung Luen Road and Wa Shun Street, Hung Hom	Ove Arup & Partners HK Ltd	Curtain wall
2015	Skypark,38 Sai Yee Street, Nelson Street and Fa Yuen Street, Mong Kok	C M Wong & Associates Ltd	Curtain wall
2015	Tmtl 423 Area 48, Castle Peak Road, So Kwun Wat	Meinhardt (HK) Ltd	Curtain wall
2015	Tmtl 427 Residential Development, So Kwun Wat Road, Area 56, Tuen Mun	C M Wong & Associates Ltd	Curtain wall
2015	Yoho Town Commerical Residential Development: Phase 3	Sun Hung Kai Architects & Engineers Limited	Curtain wall
2015	Goldin Financial Global Centre	Ove Arup & Partners HK Ltd	Curtain wall
2015	373 Queen's Road East Hotel Development	C M Wong & Associates Ltd	Curtain wall
2015	6-12 Maidstone Road Commercial and Residential Development	Yung & Chan Associates Ltd	Curtain wall
2015	China Unicom Chun Wang Street Date Centre	AECOM Asia Company Limited	Curtain wall
2016	Global Switch TKO Data Center	Meinhardt (HK) Ltd	E&M fixing
2016	Global Switch TKO Data Center	Meinhardt (HK) Ltd	E&M fixing

1. Job / Application Reference for HAC

Year	Project Name	Consultant / RSE	Application
2016	HKBCF - Passenger Clearance Building Culvert	Atkins	E&M fixing
2016	North Point Estate	Sun Hung Kai Architects & Engineers Limited	Curtain wall
2016	Tsuen Wan 5 Cityside	MTRC	Curtain wall
2016	Macao Lisboa Hotel	DLN	Curtain wall
2016	HKZMB Boundary Crossing Facilities	AECOM	Steel bracket fixing
2017	Kai Yuen Street	New World Development	Curtain wall
2017	Tai Kok Tsui Hotel	Greg Wong & Associates Ltd	Curtain wall
2017	Chicago School		Balustrade
2017	Tuen Mun 512	Gammon Construction	Curtain wall
2017	Wong Nan Chung Hotel	Chun Wo Construction	Curtain wall

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