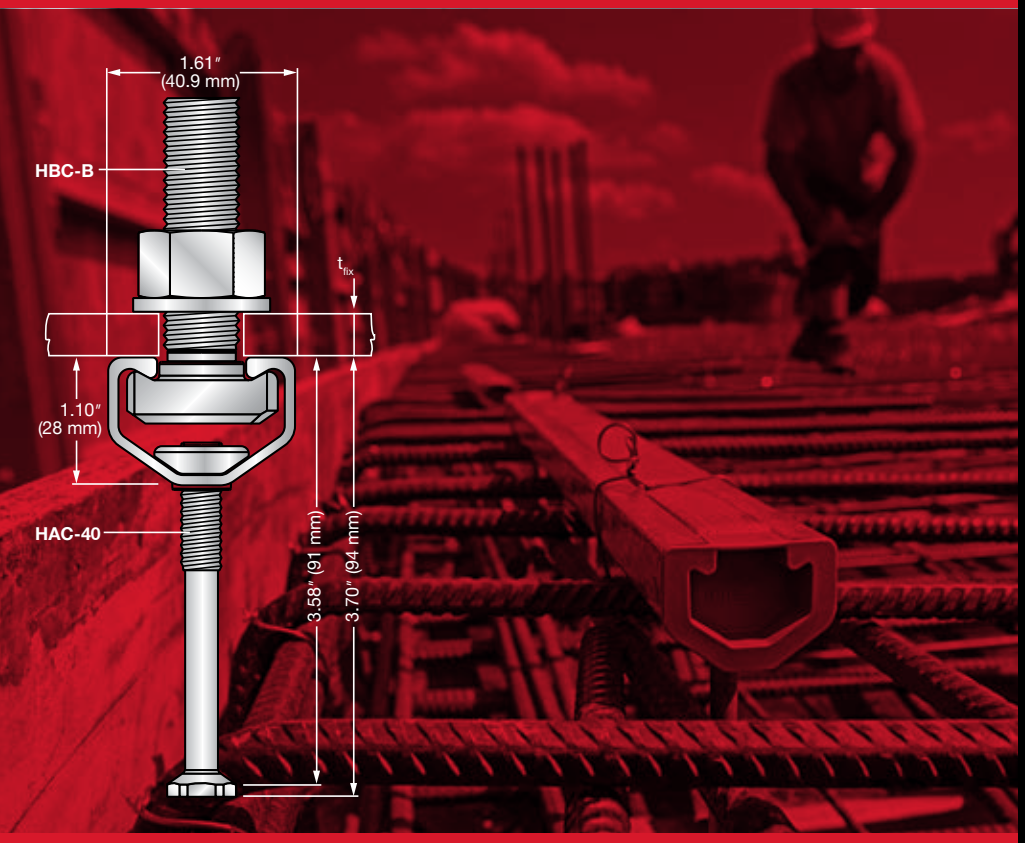
Hilti North American Product Technical Guide

Hilti Anchor Channel (HAC) Technical Guide



A guide to specification and installation

2014 Edition

Hilti.
Outperform.
Outlast.

Dear Customer,

We have extended our already extensive range of fastening products with the addition of an innovative, high-performance cast-in anchor channel system, the Hilti Anchor Channel (HAC).

The technical manual presented here is intended to help you design fastening points quickly and reliably, using anchor channels.

As your reliable partner, we constantly make every effort to further improve the products and services we offer. We would therefore be very pleased to receive your feedback and look forward to answering any questions you may have on the topic of anchor channels.

Hilti, Inc. (U.S.) 1-800-879-8000 **www.us.hilti.com** • en español 1-800-879-5000
Hilti (Canada) Corp. 1-800-363-4458 **www.hilti.ca**

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For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Hilti North American Technical Guide, or contact Hilti.

Hilti Anchor Channel overview

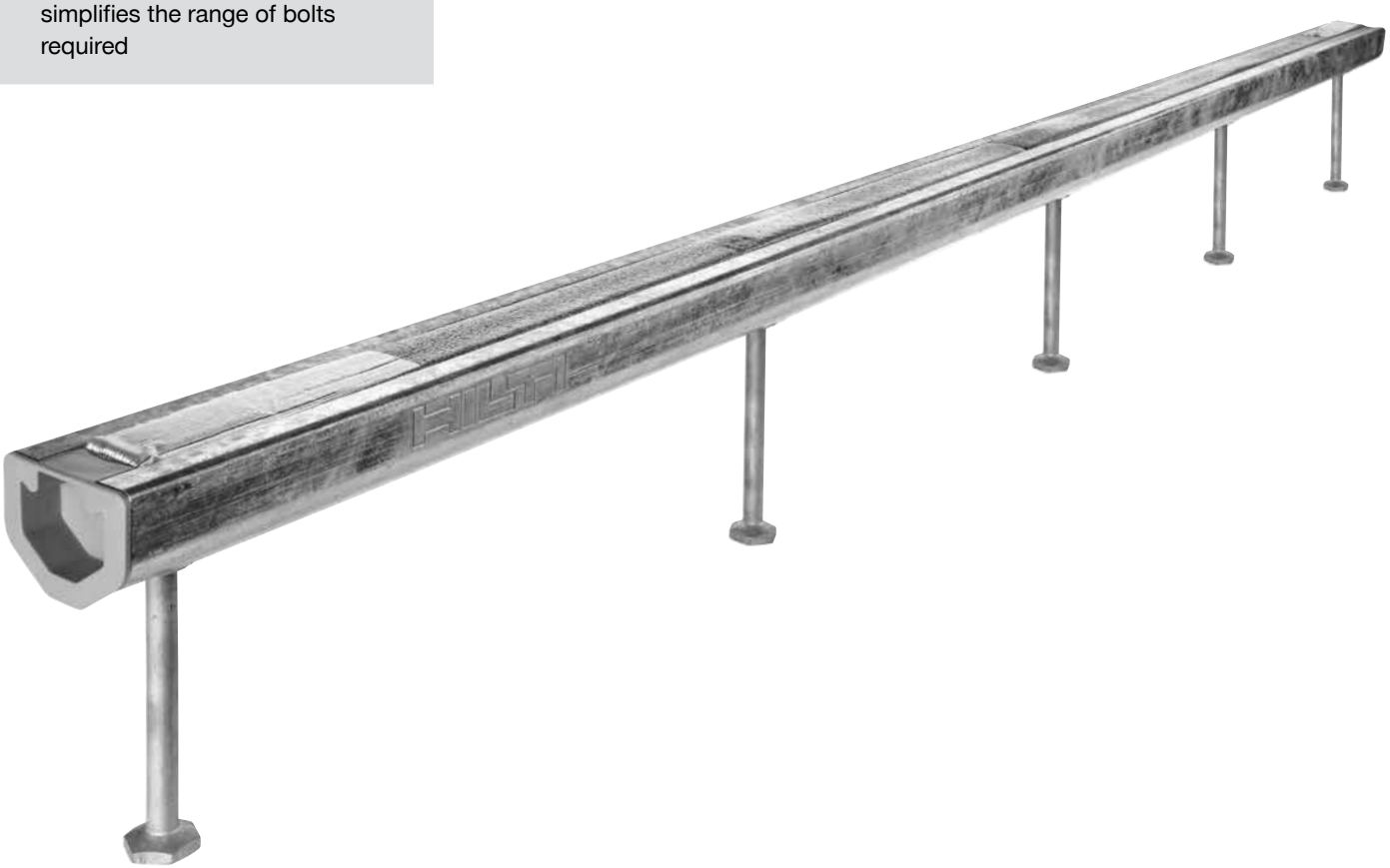
The new cast-in anchor channel generation.

Highlights

- **Innovative system**
  New V-form allows higher loads to be taken close to slab edges where shear loads occur
- **Well-sealed system**
  The foam filling strip and end caps helps prevent concrete slurry from finding its way into the channel
- **Time-saving system**
  Thanks to the new time-saving tear-out strip, the foam filling can be removed quickly and easily without leaving any remains
- **Optimized, matched system**
  Use of a single T-head bolt type for several channel sizes greatly simplifies the range of bolts required

HACs with V-form for outstanding performance.

With over 60 years of experience in fastening systems, Hilti is your reliable partner for secure anchor solutions. Now, we have further extended our range of products to include a new generation of cast-in anchor channels for reliable load transfer to concrete structures — the Hilti Anchor Channel (HAC).



Advantages of the new anchor channel system

Innovative V-form for high performance

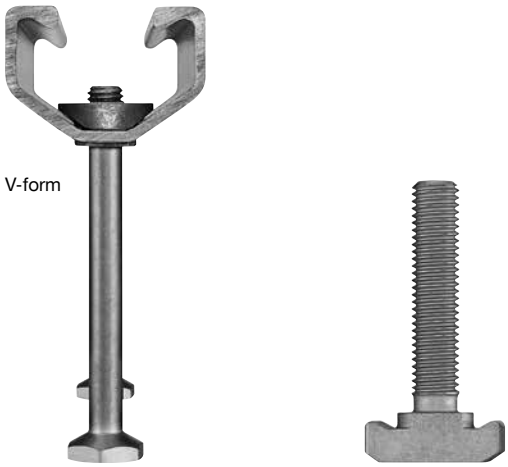
The classic anchor channel cross section has been optimized with the aid of advanced computer simulation and through intensive testing. The resulting innovative V-form takes higher loads and allows smaller edge distances at edge zones where shear loads occur.

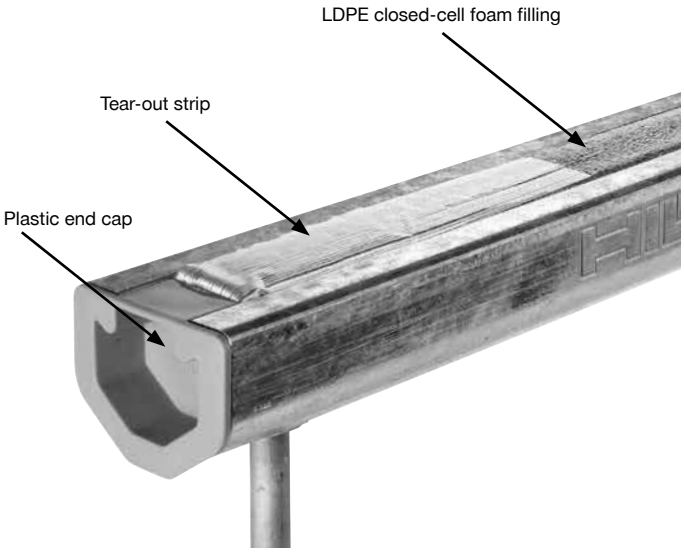
Matching, simplified portfolio

Only one anchor channel type for static and dynamic loads. Only three different bolt types are needed to cover the entire range of anchor channels. The HAC-30 channels are compatible with the familiar Hilti MQ channel system for general installation work. Hilti MQ installation system parts can be mounted directly on the anchor channels without the need for elaborate and costly adapters.

Time-saving, well sealed system

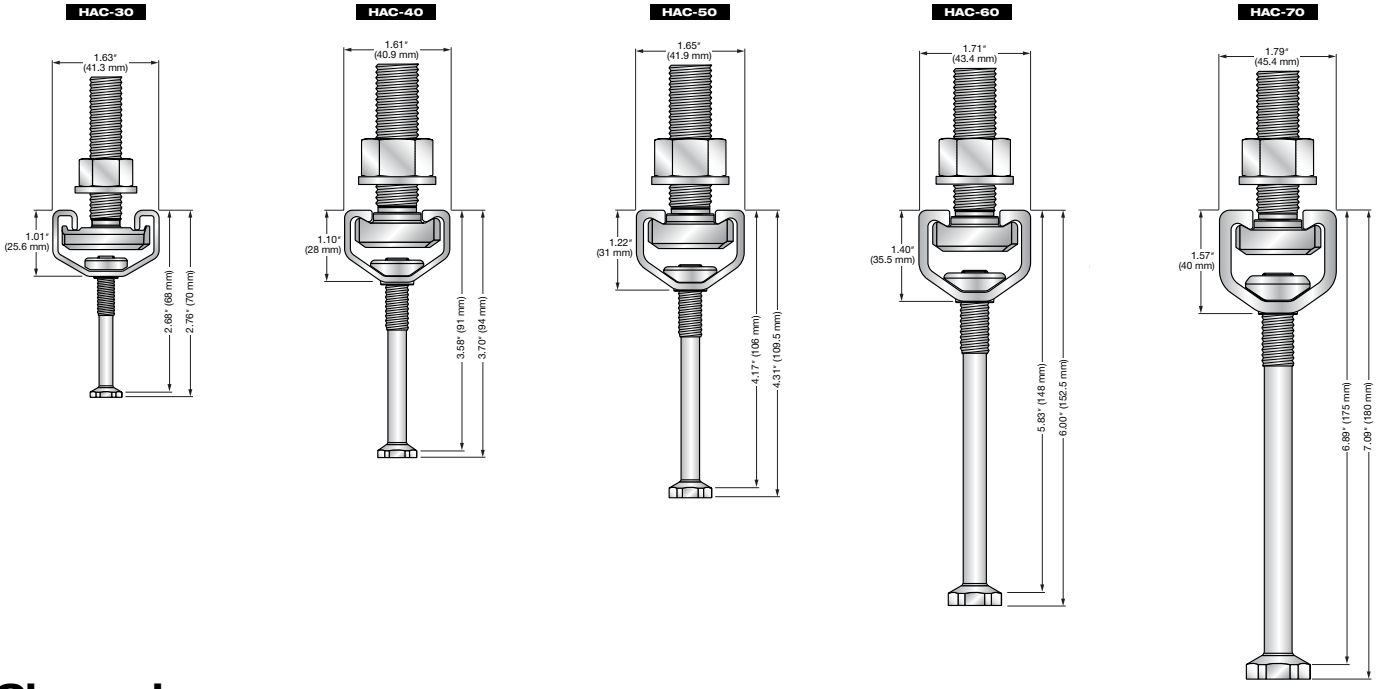
The new LDPE closed-cell foam filling equipped with a tear-out strip can be removed quickly, thus saving labor costs. Plastic end caps also help keep concrete slurry out of the channels. The tear out strip allows for quick and easy removal of the foam filling, even with some concrete coverage over the top of the channel.





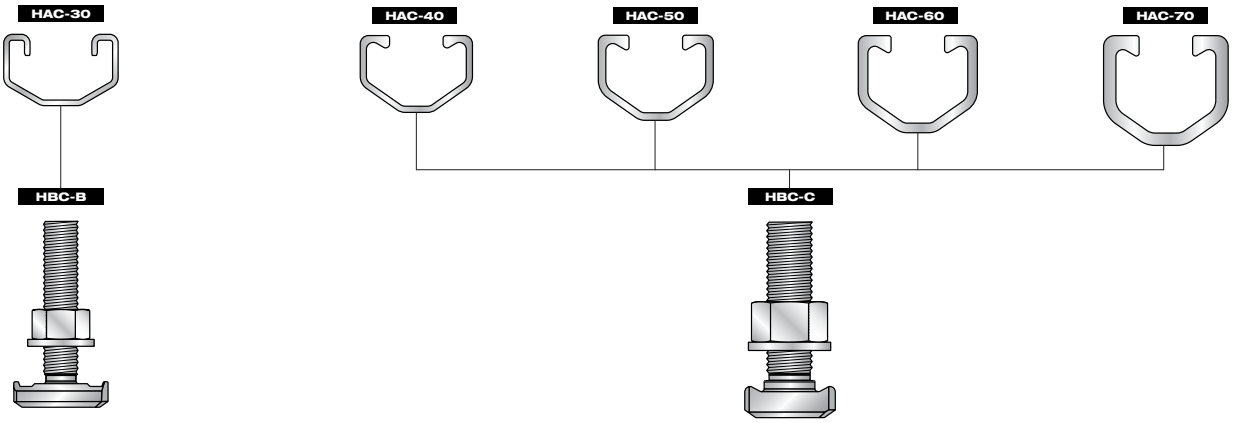
Hilti Anchor Channel portfolio

The new anchor channel generation for strong and reliable cast-in fastening.



Channels

The channels feature hot-dip galvanizing. Special, uncoated "black" channels with rectangular cross-sections are also available for use in applications where welded connections are required. Available in several different standard profiles in lengths between 100 mm (4 in.) and 5850 mm (19 ft 2 in.). Customer-specific lengths are available on request.



Bolts

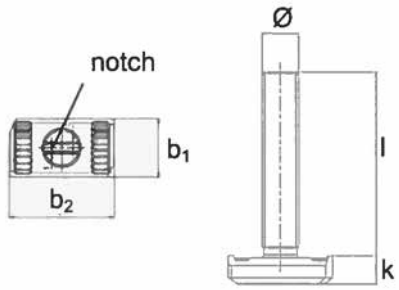
The T-head bolts are available in various lengths and diameters. Stainless steel, electro galvanized and hot-dip galvanized versions provide various levels of corrosion protection.

Hilti Anchor Channel portfolio

Dimensions special screw

Channel	Special screw type	Special screw dimensions				Length min l
		b_1	b_2	k	ø	
		[mm]				[mm]
HAC-30	HBC-B	18.0	34.0	7.0	8	15-150
					10	15-175
		19.0	34.0	9.2	12	20-200
HAC-40	HBC-C	14.0	33.0	8.5	10	20-200
HAC-50					12	20-200
HAC-60	HBC-C	18.5		9.5	16	20-300
HAC-70	HBC-C-N			12.0	20	20-300

Typical HBC-C T-bolt



Steel grade

Special screws	Carbon steel		Stainless steel
Property class	4.6	8.8	A4-50
f_{uk} [N/mm^2]	400	800	500
f_{yk} [N/mm2]	240	640	210
Coating	Hot-dip galvanized		-

Geometrical profile properties

Anchor channel	Dimensions						Material	I_y
	b_{ch}	h_{ch}	$t_{nom,b}$	$t_{nom,1}$	d	f		
	[mm]							[mm^4]
HAC-30	41.3	25.6	2.00	2.00	22.3	7.50	Steel	15349
HAC-40	40.9	28.0	2.25	2.25	19.5	4.50		21452
HAC-50	41.9	31.0	2.75	2.75	19.5	5.30		33125
HAC-60	43.4	35.5	3.50	3.50	19.5	6.30		57930
HAC-70	45.4	40.0	4.50	4.50	19.5	7.40		95456

Typical channel profile

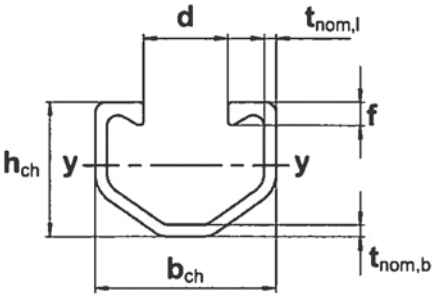
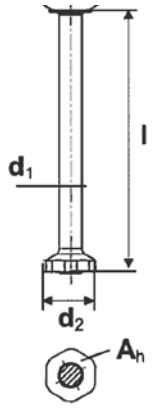


Table 3 — Dimensions of round mechanically attached channel anchors

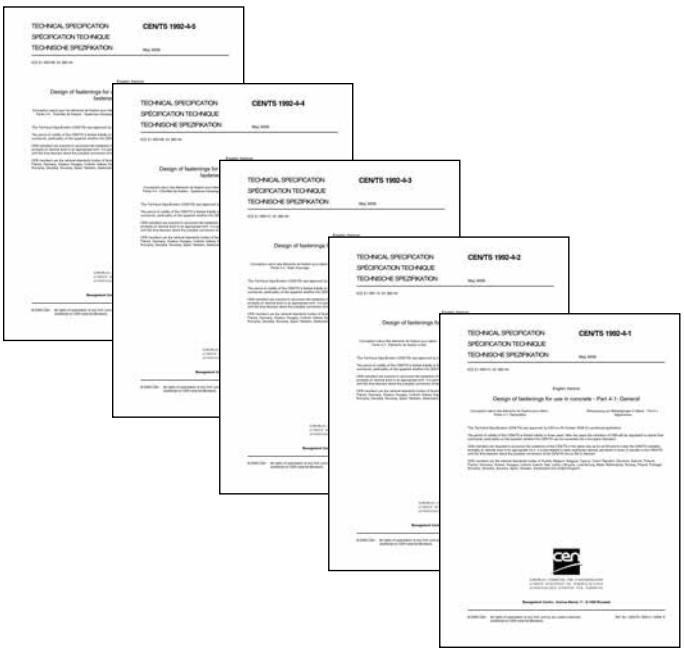
Channel	Shaft ø d_1	Head ø d_2	Head area min A_h	Length min l
	mm	mm	mm$_2$	mm
HAC-30	5.35	11.5	89	44.4
HAC-40	7.19	13.5	114	66.0
HAC-50	7.19	15.5	163	78.5
HAC-60	9.03	19.5	258	117.0
HAC-70	10.86	23.0	356	140.0

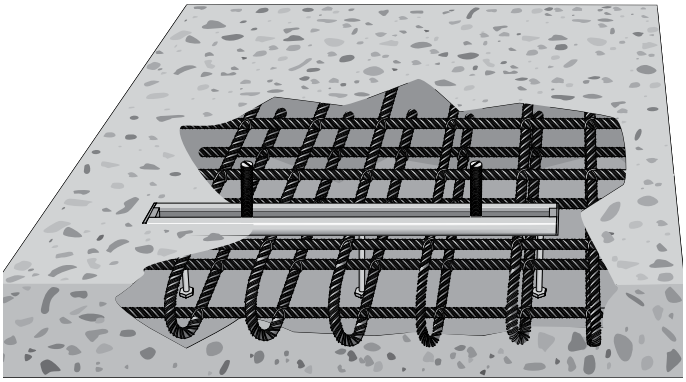


Design and approvals

State-of-the-art anchor channel design

The qualification and design of anchor channels have been developed based on a European Common Understanding of Assessment Procedure (CUAP) developed under EOTA. Three European technical approvals (ETA) have been issued for anchor channel systems in Europe. The issue of an ETA is conditioned on the successful completion of tests and assessments laid out in the CUAP by an independent and recognized laboratory. With the system ETA approved the design of the anchor channel is possible based on CEN/TS 1992-4:2009, “Design of fastenings for use in concrete”, Parts 1 and 3.





- Member thickness
- Concrete grade, cracked* / uncracked
- Edge / corner distance
- Load type / position
- Supplementary reinforcement

Strength design method for anchor channels

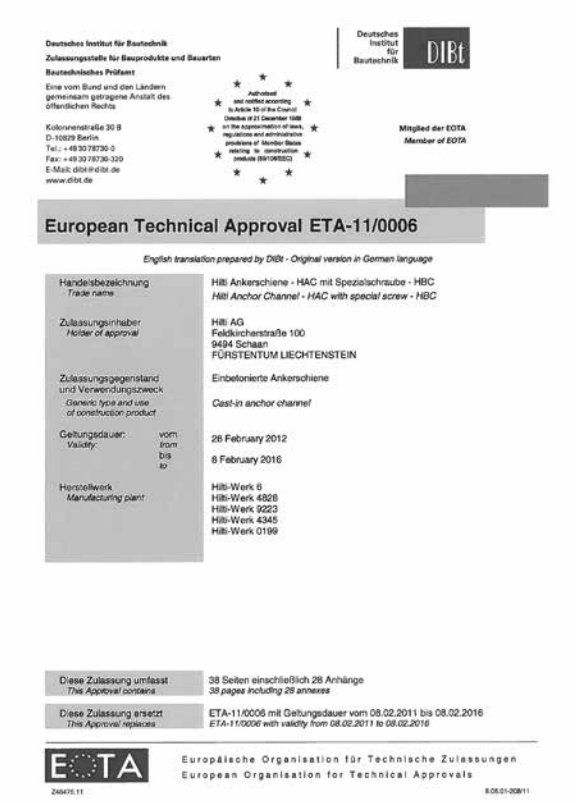
Several years ago the design of post-installed anchor fastenings with partial safety factors led to better utilization of each fastening point. Similar to the design of post-installed anchors, the design of cast-in anchor channels now uses a state of the art design method. Both cast-in anchor channels and post-installed anchors have been adapted to the European standards applicable in the field of construction.

- Design of fastening points for static and fatigue loads as well as loads occurring in the event of fire is state-of-the-art.

Hilti's ETA approval for anchor channels goes beyond the requirements

The Hilti Anchor Channel system was awarded the European approval ETA-11/0006 in February 2011. An updated version containing additional enhanced values was released on February 28, 2012. The new Hilti Anchor Channel system features:

- Excellent holding power due to its innovative V-shape
- A well-sealed system composed of an LDPE foam strip with tear-out band and end caps
- A simplified portfolio that significantly reduces the number of different items



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Deutsches Institut für Bautechnik
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Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-11/0006

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	Hilti Ankerschiene - HAC mit Spezialschraube - HBC *Hilti Anchor Channel - HAC with special screw - HBC*
Zulassungsinhaber *Holder of approval*	Hilti AG Feldkircherstraße 100 9494 Schaan FÜRSTENTUM LIECHTENSTEIN
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Einbetonierte Ankerschiene *Cast-in anchor channel*
Geltungsdauer: *Validity:*	vom / *from* 26 February 2012 bis / *to* 8 February 2016
Herstellwerk *Manufacturing plant*	Hilti-Werk 6 Hilti-Werk 4828 Hilti-Werk 9223 Hilti-Werk 4345 Hilti-Werk 0199

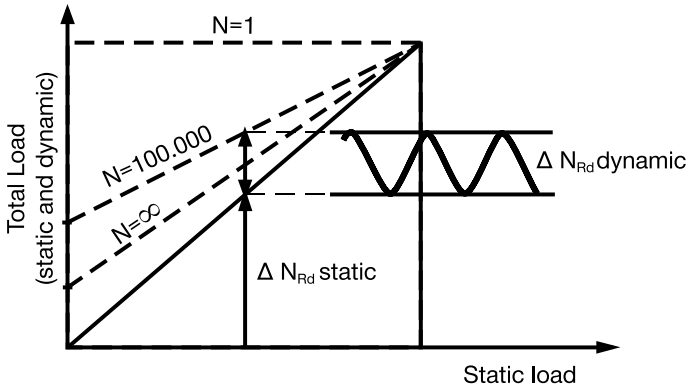
Diese Zulassung umfasst *This Approval contains*	38 Seiten einschließlich 28 Anhänge *38 pages including 28 annexes*
Diese Zulassung ersetzt *This Approval replaces*	ETA-11/0006 mit Geltungsdauer vom 08.02.2011 bis 08.02.2016 *ETA-11/0006 with validity from 08.02.2011 to 08.02.2016*

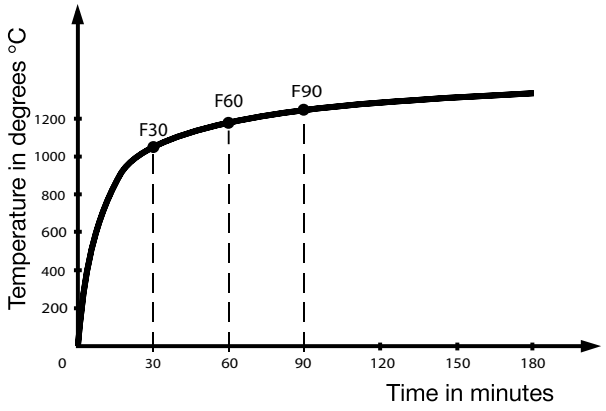
EOTA
Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

In addition to the provisions in CEN-TS 1992-4, the European Technical Approval awarded to Hilti covers design models for fatigue and for loads occurring in the event of fire.

The new design model for pulsating tensile stresses allows static preloading as well as the number of load cycles to be taken into account.

With this new design concept it is now possible to design anchor channels taking into account loads occurring during exposure to fire in accordance with the standard time temperature curve for pure tensile as well as shear loading.





Quality and service

Hilti product quality

Markings on Hilti Anchor Channels

Hilti anchor channels have distinct markings on the outside surface that allow correct identification before casting in concrete. The markings consist of the Hilti logo, the channel type designation and the type of corrosion protection. The channels also bear a unique production number that indicates the production lot.

Markings inside Hilti Anchor Channels

The same markings can be found inside the channel. These are visible after removal of the foam strip and allow identification after installation (i.e. after concrete casting is complete).

Markings on Hilti HBC bolts

Hilti bolts bear marks on the head indicating the bolt type, strength class, corrosion class and also include a manufacturing mark. The tip of the bolt features a distinct groove that provides a clear indication of bolt head alignment. Bolts with notched heads (notched bolts) can be identified after installation by the 2 grooves in the tip.

In accordance with the ETA concept, the Hilti Anchor Channel System is subject to ongoing quality checks by internal and certified external inspection agencies. Records are kept for all test data. Only the materials and processes listed in the approval are used in manufacturing. This helps ensure the quality of the Hilti Anchor Channel System remains consistently high. Hilti's processes are certified in accordance with ISO 9001, for lasting safety and reliability.

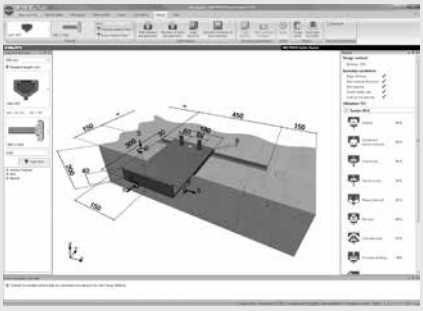
Hilti provides best-in-class customer support

Technical advice

Hilti offers a broad range of services to engineers worldwide. Close cooperation and coordination with engineers in the planning stage helps achieve optimum design of fastening points. Our advice during definition of the correct specifications helps ensure reliable, cost-effective fastenings.

Hilti technical specialists are pleased to offer their support in the office, on the jobsite, or by providing training on new design provisions or the introduction of new Hilti software solutions.

PROFIS Anchor Channel Software



The specification of anchor channels in accordance with CEN demands the use of flexible, up-to-date software that lets engineers work efficiently. PROFIS Anchor Channel, the new PC application from Hilti delivers a fast, flexible and user-friendly interface based on the proven PROFIS application platform.

Detailed, easy-to-follow calculation approach shown on the screen and on printed copies. Additionally, links to database of 2D and 3D models for integration in CAD drawings.

Global logistics to help keep your jobsite running

Our global logistics network is the key to having Hilti anchor channels and bolts on the site when they're needed. We aim to keep your jobsite running, even in the event of unplanned specification changes. In addition to our standard range, Hilti anchor channels are available in various other lengths on request. Please contact your Hilti representative for further information.

Installation and boundary conditions

Hilti HAC Anchor Channels can be quickly and effectively installed in a variety of anchoring applications.

1. Place anchor channel in the formwork and secure it in the proper position.

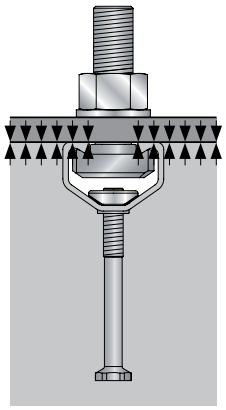
2. After concrete pour is complete and concrete has hardened, grab the tear-out strip and pull to easily remove the foam filler.

3. Insert the T-head bolt into the channel and turn 90° to set the bolt in the channel.

4. Position the bracket / fixture in the proper position and then tighten the hexagonal nut to the proper setting torque.

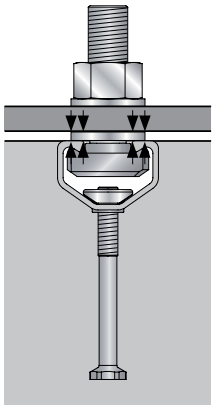
Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded on-line at www.us.hilti.com (USA) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

Select the required installation torque according to the attachment configuration



Standard situation

The fixture is in contact with the concrete and/or the anchor channel.



Steel to steel contact

The fixture is fastened to the anchor channel by way of a suitable washer (i.e., there is no torque-related tensioning of the channel/concrete connection).

The given torque is to be applied but must not be exceeded.

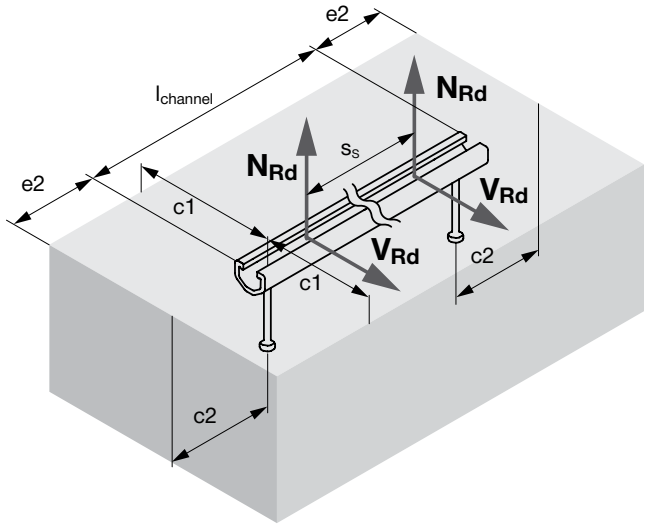
Anchor channel	T-bolt type	Bolt diameter (Nominal)		Minimum spacing $s_{min,s}$ between bolts		Setting torque T_{inst}					
						Standard		Steel to steel contact			
						T-bolt steel grade					
						4.6; 8.8; A4-50		4.6, A4-50		8.8	
		[in.]	[mm]	[in.]	[mm]	[ft-lb]	[Nm]	[ft-lb]	[Nm]	[ft-lb]	[Nm]
HAC-30	HBC-B	5/16	8	1-1/2	40	6	8	6	8	-	
		3/8	10	2	50	11	15	11	15		
		1/2	12	2-3/8	60	22	30	18	25		
HAC-40	HBC-C	3/8	10	2	50	11	15	11	15	35	48
		1/2	12	2-3/8	60	18	25	18	25	52	70
		5/8	16	3-1/8	80	44	60	44	60	148	200
		3/4	20	4	100	55	75	89	120	295	400
HAC-50		3/8	10	2	50	11	15	11	15	35	48
		1/2	12	2-3/8	60	18	25	18	25	52	70
		5/8	16	3-1/8	80	44	60	44	60	148	200
		3/4	20	4	100	89	120	89	120	295	400
HAC-60		3/8	10	2	50	11	15	11	15	35	48
		1/2	12	2-3/8	60	18	25	18	25	52	70
		5/8	16	3-1/8	80	44	60	44	60	148	200
		3/4	20	4	100	89	120	89	120	295	400
HAC-70		3/8	10	2	50	11	15	11	15	35	48
		1/2	12	2-3/8	60	18	25	18	25	52	70
		5/8	16	3-1/8	80	44	60	44	60	148	200
		3/4	20	4	100	89	120	89	120	295	400

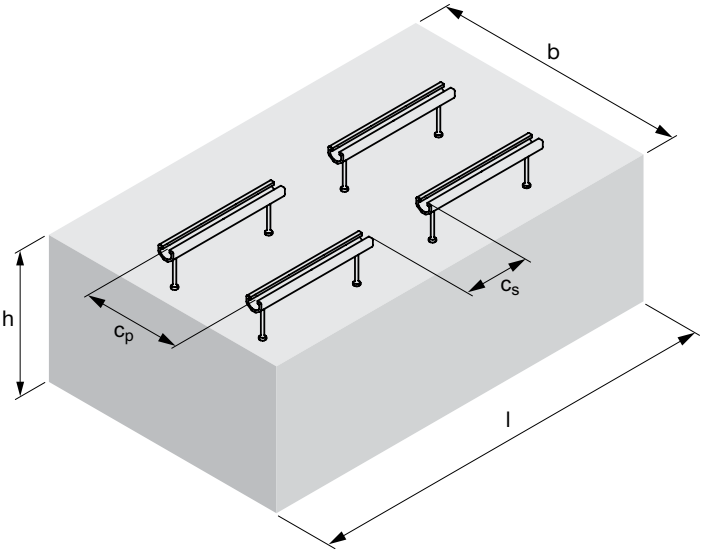
Installation and boundary conditions

Overview of minimum geometric boundary conditions

Anchor channel	Concrete member dimensions for a single channel					
	min. h		min. b		min. l	
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]
HAC-30	3.1	70	4.0	100	2.0 + $l_{channel}$	50 + $l_{channel}$
HAC-40	4.1	94	4.0	100	2.0 + $l_{channel}$	50 + $l_{channel}$
HAC-50	4.7	110	6.0	150	4.0 + $l_{channel}$	100 + $l_{channel}$
HAC-60	6.4	153	7.9	200	6.0 + $l_{channel}$	150 + $l_{channel}$
HAC-70	7.5	180	7.9	200	6.0 + $l_{channel}$	150 + $l_{channel}$

Anchor channel	Anchor channel spacings									
	min. c1		min. c2		min. e2		min. c_p		min. cs	
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]
HAC-30	2.0	50	2.0	50	1.0	25	4.0	100	2.0	50
HAC-40	2.0	50	2.0	50	1.0	25	4.0	100	2.0	50
HAC-50	3.0	75	3.0	75	2.0	50	6.0	150	4.0	100
HAC-60	4.0	100	4.0	100	3.0	75	7.9	200	6.0	150
HAC-70	4.0	100	4.0	100	3.0	75	7.9	200	6.0	150





Product markings

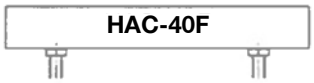
Hilti Anchor Channel (HAC) markings:

e.g. HAC-40F

HAC = Identifying mark of the manufacturer
Hilti **A**nchor **C**hannel

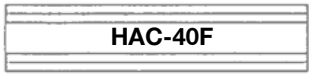
40 = Size

F = Corrosion class = hot-dip galvanized



Stamped on channel side

and



Stamped inside the channel bottom

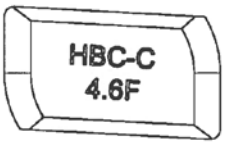
Hilti T-bolt marking:

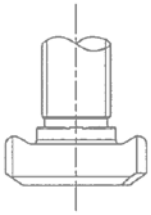
e.g. HBC-C 4.6F

HBC = Identifying mark of the manufacturer
Hilti **B**olt **C**hannel

C = Special screw type

4.6F = Strength grade / corrosion class





Material/steel grade T-bolt

4.6 = Steel grade 4.6

8.8 = Steel grade 8.8

A4-50 = Stainless steel

Corrosion class:

G = Electroplated

F = Hot-dip galvanized

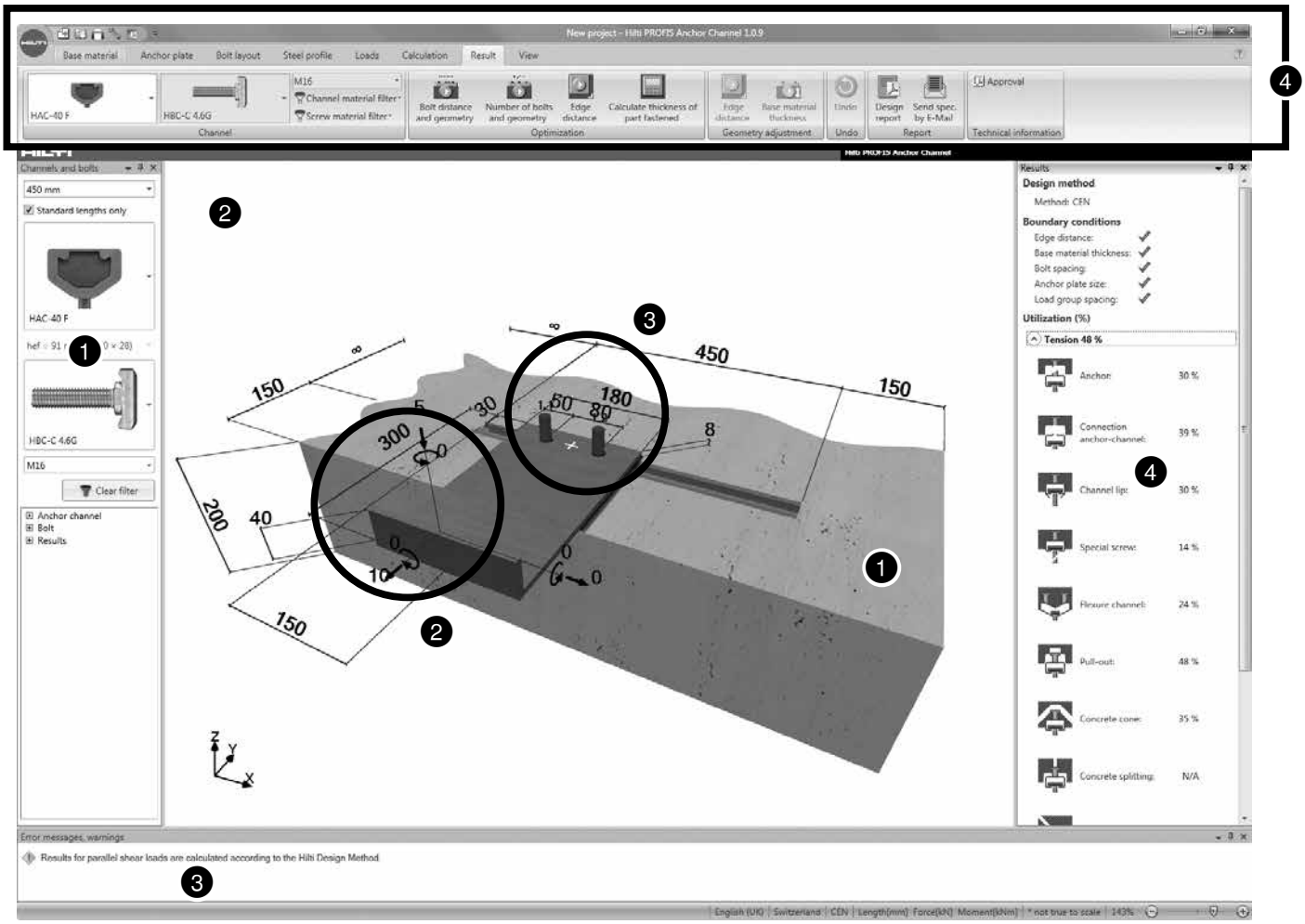
R = Stainless steel

Head configuration:

N = Notched for shear parable to channel

Design software and Strength Design tables

Hilti's PROFIS Anchor Channel — the design software for accurate, reliable planning



❶ Channel and bolt selector

❷ 3D graphics with interactive input of loads and dimensions

❸ Immediate messages and warnings guide the user towards the optimized design

❹ Direct indication of the utilization rate in total and per specific failure mode allows optimization of the fastening point.

Hilti PROFIS Anchor Channel is a free download from your local Hilti Online website www.us.hilti.com (USA), or www.ca.hilti.com (Canada).

The software allows you to accurately model your specific fastening application. A variety of base materials, supplementary reinforcement, and loads can be applied. Additionally, different types of base plates and pre-defined brackets can be modeled. Results can be easily optimized and PDF reports can be generated in detailed or brief form for easy to follow verification including design formulas.

How to use Strength Design “Quick Calculation” load tables

Example: HAC-40 anchor channel

The following example shows how to use Strength Design “Quick Calculation” tables. These tables are a quick reference to the design methodology below*. They are based on the following assumptions:

- 4,000 psi, cracked concrete
- Widely spaced reinforcement
- No shear reinforcement (un-reinforced conrete)
- T-Bolts spaced a minimum of 4" apart
- No end reductions (i..e, minimum end distances “e” are maintained)

Concrete
Tension Design Resistance (Load per bolt, lb)

HAC-40		Concrete thickness (inches)						Channel length (inches)
		4-3/4	6	7	❸ 8	10	12	
Edge distance (inches)	2	2695	2695	2695	2695	2695	2695	8 and 14
	3	2765	2765	2765	2765	2765	2765	
	4	2765	2765	2765	2765	2765	2765	
	5	2765	2765	2765	2765	2765	2765	
	6	2765	2765	2765	2765	2765	2765	
	≥8	2765	2765	2765	2765	2765	2765	
	2	2495	2495	2495	2495	2495	2495	10 and 18
	3	2495	2495	2495	2495	2495	2495	
	4	2495	2495	2495	2495	2495	2495	
	5	2495	2495	2495	2495	2495	2495	
	6	2495	2495	2495	2495	2495	2495	
	≥8	2495	2495	2495	2495	2495	2495	
	2	2315	2315	2315	2315	2315	2315	❶ 12 and ≥22
	3	2315	2315	2315	2315	2315	2315	
	4	2315	2315	2315	2315	2315	2315	
❷	5	2315	2315	2315	2315	2315	2315	
	6	2315	2315	2315	2315	2315	2315	
	≥8	2315	2315	2315	2315	2315	2315	

❶ Channel length: select preferred channel length
Example = 12" length anchor channel

❷ Edge distance
Example = 5" edge distance

❸ Concrete thickness
Slab = 8" thick

If a combined loading condition, check Shear Resistance table and then apply interaction equation.
Check the capacity of T-bolts in Table 11 (page 26).

* This design aid provides values based on given parameters according to ETA 11/0006 February 28, 2012 and CEN TS 1992-4 May 2009.

For exact calculation with different parameters please use our PROFIS Anchor Channel design software which can be downloaded free of charge from www.us.hilti.com (USA) or www.ca.hilti.com (Canada)

Strength Design tables

Table 1 — Design tension loads for HAC-30 (pounds) [1,2,3,4,5,6,7,8,9,10]

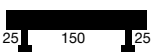
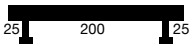
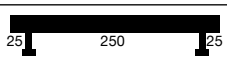
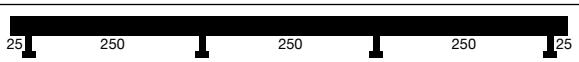
HAC-30		Concrete thickness (inches)						Channel length (inches)
		3-3/4	5	6	8	10	12	
Edge distance (inches)	2	1970	1970	1970	1970	1970	1970	8
	3	1980	1980	1980	1980	1980	1980	
	4	1980	1980	1980	1980	1980	1980	
	5	1980	1980	1980	1980	1980	1980	
	6	1980	1980	1980	1980	1980	1980	
	≥8	1980	1980	1980	1980	1980	1980	
	2	1800	1800	1800	1800	1800	1800	10
	3	1800	1800	1800	1800	1800	1800	
	4	1800	1800	1800	1800	1800	1800	
	5	1800	1800	1800	1800	1800	1800	
	6	1800	1800	1800	1800	1800	1800	
	≥8	1800	1800	1800	1800	1800	1800	
	2	1650	1650	1650	1650	1650	1650	12 and ≥22
	3	1650	1650	1650	1650	1650	1650	
	4	1650	1650	1650	1650	1650	1650	
	5	1650	1650	1650	1650	1650	1650	
	6	1650	1650	1650	1650	1650	1650	
	≥8	1650	1650	1650	1650	1650	1650	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi and the following reinforcing conditions:
   - Reinforcement widely spaced
   - Reinforcement to control splitting
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. T-bolts shall not be positioned within 1" of the end of the anchor channel.
3. Values above are the maximum applicable tension loads per T-bolt.
4. Values above are for anchor channels at specified edge distances without influence of corners. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips, channel flexure) all other values are controlled by concrete strength.
7. For concrete controlled failure modes only (non-highlighted values above), a 0.70 reduction factor shall be applied for cracked concrete conditions. For cracked concrete conditions, if reinforcement to control splitting is not present, verification for concrete splitting shall be performed.
8. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
9. When steel failure controls for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \leq 1.0$

   When other failure modes control, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \leq 1.0$ or $\beta_N + \beta_V \leq 1.2$

10. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

Anchor channel leg positioning

Channel length in. [mm]	Anchor spacing in. [mm]	Number of anchors [pcs]	
8 in. [200]	5.9 [150]	2	
10 in. [250]	8.9 [200]	2	
12 in. [300]	9.8 [250]	2	
22 in. [550]	9.8 [250]	3	
32 in. [800]	7.9 [250]	4	
41-228 in. [1050 - 5800]	9.8 [250]	n = 5 to 24	

Strength Design tables

Table 2 — Design shear loads perpendicular to channel profile for HAC-30 (pounds) [1,2,3,4,5,6,7,8,9,10,11,12]

HAC-30		Concrete thickness (inches)						Channel length (inches)
		3-3/4	5	6	8	10	12	
Edge distance (inches)	2	870	1005	1100	1100	1100	1100	8
	3	1255	1450	1585	1835	1835	1835	
	4	1650	1900	2085	2360	2360	2360	
	5	2025	2330	2360	2360	2360	2360	
	6	2360	2360	2360	2360	2360	2360	
	8	2360	2360	2360	2360	2360	2360	
	2	895	1040	1130	1145	1145	1145	10
	3	1290	1495	1640	1900	1900	1900	
	4	1700	1970	2150	2360	2360	2360	
	5	2085	2360	2360	2360	2360	2360	
	6	2360	2360	2360	2360	2360	2360	
	8	2360	2360	2360	2360	2360	2360	
	2	895	1020	1110	1130	1130	1130	≥ 12
	3	1290	1495	1650	1900	1900	1900	
	4	1700	1970	2175	2360	2360	2360	
	5	2085	2360	2360	2360	2360	2360	
	6	2360	2360	2360	2360	2360	2360	
	8	2360	2360	2360	2360	2360	2360	

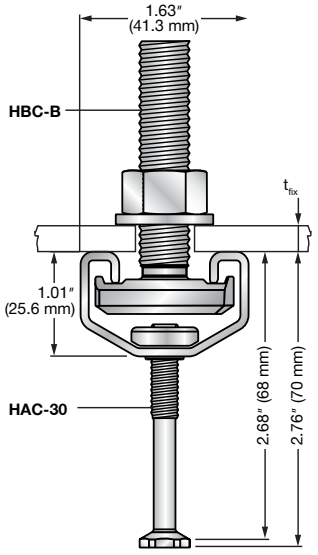
1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi.
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. Screws shall not be positioned within 1" of the end of the anchor channel.
3. Values above are for anchor channels at different edge distances without influence of corner distances. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
4. Values above are the maximum applicable shear loads without lever arm per special screw.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3.
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips). All other values are controlled by concrete strength. For concrete-controlled failure modes, the values above may be increased to account for higher concrete compressive strength up to 4,500 psi using the factor $\sqrt{\frac{f'_{c,\,required}}{4000}}$
7. For concrete-controlled failure modes, a 0.70 reduction factor shall be applied for cracked concrete conditions when no edge reinforcement is present.
8. For concrete-controlled failure modes, a 0.85 reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement is present.
9. For concrete-controlled failure modes, no reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement and stirrups are present.
10. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
11. When steel failure is decisive for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \le 1.0$

    When other failure modes are decisive, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \le 1.0$ or $\beta_N + \beta_V \le 1.2$

12. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

HBC-B Maximum thickness fastened

T-bolt diameter	Bolt length [mm]	t_{fix} [mm]	t_{fix} in.
M12	40	11	3/8
	50	31	1-1/4
	100	81	3-/14
M16	40	18	3/4
	60	38	1-1/2
	100	78	3-1/8
M20	40	15	5/8
	60	35	1-3/8
	80	55	2-1/8
	100	75	3
	150	125	4-7/8



Strength Design tables

Table 3 — Design tension loads for HAC-40 (pounds) [1,2,3,4,5,6,7,8,9,10]

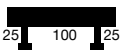
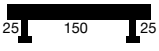
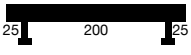
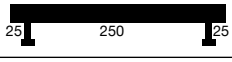
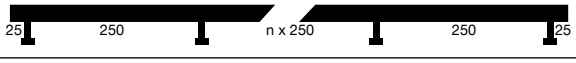
HAC-40		Concrete thickness (inches)						Channel length (inches)
		4-3/4	6	7	8	10	12	
Edge distance (inches)	2	2695	2695	2695	2695	2695	2695	8 and 14
	3	2765	2765	2765	2765	2765	2765	
	4	2765	2765	2765	2765	2765	2765	
	5	2765	2765	2765	2765	2765	2765	
	6	2765	2765	2765	2765	2765	2765	
	≥8	2765	2765	2765	2765	2765	2765	
	2	2495	2495	2495	2495	2495	2495	10 and 18
	3	2495	2495	2495	2495	2495	2495	
	4	2495	2495	2495	2495	2495	2495	
	5	2495	2495	2495	2495	2495	2495	
	6	2495	2495	2495	2495	2495	2495	
	≥8	2495	2495	2495	2495	2495	2495	
	2	2315	2315	2315	2315	2315	2315	12 and ≥22
	3	2315	2315	2315	2315	2315	2315	
	4	2315	2315	2315	2315	2315	2315	
	5	2315	2315	2315	2315	2315	2315	
	6	2315	2315	2315	2315	2315	2315	
	≥8	2315	2315	2315	2315	2315	2315	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi and the following reinforcing conditions:
   • Reinforcement widely spaced
   • Reinforcement to control splitting
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. T-bolts shall not be positioned within 1" of the end of the anchor channel.
3. Values above are the maximum applicable tension loads per T-bolt.
4. Values above are for anchor channels at specified edge distances without influence of corners. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips, channel flexure) all other values are controlled by concrete strength.
7. For concrete controlled failure modes only (non-highlighted values above), a 0.70 reduction factor shall be applied for cracked concrete conditions. For cracked concrete conditions, if reinforcement to control splitting is not present, verification for concrete splitting shall be performed.
8. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
9. When steel failure controls for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \leq 1.0$

   When other failure modes control, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \leq 1.0$ or $\beta_N + \beta_V \leq 1.2$

10. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

Anchor channel leg positioning

Channel length in. [mm]	Anchor spacing in. [mm]	Number of anchors [pcs]	
6 in. [150]	3.9 [100]	2	
8 in. [200]	5.9 [150]	2	
10 in. [250]	3.9 [100]	2	
12 in. [300]	9.8 [250]	3	
14 in. [350]	5.9 [150]	3	
18 in. [450]	5.9 [200]	3	
22-228 in. [550-5800]	9.8 [250]	n=1 to 21	

Strength Design tables

Table 4 — Design shear loads perpendicular to channel profile for HAC-40 (pounds) [1,2,3,4,5,6,7,8,9,10,11,12]

HAC-40		Concrete thickness (inches)						Channel length (inches)
		4-3/4	6	7	8	10	12	
Edge distance (inches)	2	1110	1245	1270	1270	1270	1270	8 and 14
	3	1605	1790	1945	2085	2085	2085	
	4	2105	2375	2560	2740	3055	3055	
	5	2605	2900	3145	3350	3760	4120	
	6	3080	3440	3710	3985	4340	4340	
	8	4050	4340	4340	4340	4340	4340	
	2	1130	1280	1300	1300	1300	1300	10 and 18
	3	1650	1855	2015	2150	2150	2150	
	4	2175	2445	2625	2805	3145	3145	
	5	2670	2965	3215	3440	3850	4210	
	6	3145	3510	3805	4075	4340	4340	
	8	4120	4340	4340	4340	4340	4340	
	2	1130	1280	1300	1300	1300	1300	12 and ≥22
	3	1675	1880	2015	2175	2175	2175	
	4	2195	2465	2650	2830	3170	3210	
	5	2695	3010	3260	3485	3895	1810	
	6	3170	3555	3850	4120	4340	4340	
	8	4165	4340	4340	4340	4340	4340	

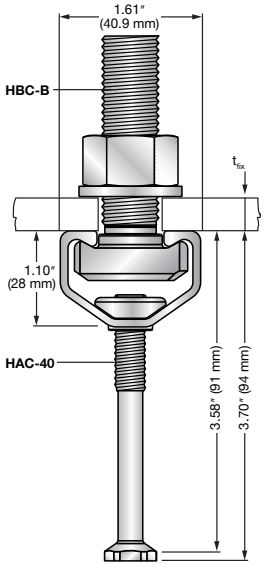
1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi.
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. Screws shall not be positioned within 1" of the end of the anchor channel.
3. Values above are for anchor channels at different edge distances without influence of corner distances. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
4. Values above are the maximum applicable shear loads without lever arm per special screw.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3.
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips). All other values are controlled by concrete strength. For concrete-controlled failure modes, the values above may be increased to account for higher concrete compressive strength up to 4,500 psi using the factor $\sqrt{\frac{f'_{c,\,required}}{4000}}$
7. For concrete-controlled failure modes, a 0.70 reduction factor shall be applied for cracked concrete conditions when no edge reinforcement is present.
8. For concrete-controlled failure modes, a 0.85 reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement is present.
9. For concrete-controlled failure modes, no reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement and stirrups are present.
10. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
11. When steel failure is decisive for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \le 1.0$

    When other failure modes are decisive, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \le 1.0$ or $\beta_N + \beta_V \le 1.2$

12. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

HBC-B Maximum thickness fastened

T-bolt diameter	Bolt length [mm]	t_{fix} [mm]	t_{fix} in.
M12	40	18	3/4
	50	28	1-1/8
	60	38	1-1/2
	80	58	2-1/4
	100	78	3-1/8
	125	103	4
	150	128	5
M16	40	13	1/2
	50	23	7/8
	60	33	1-1/4
	70	43	1-3/4
	80	53	2-1/8
	100	73	2-7/8
	125	98	3-7/8
	150	123	4-7/8
M20	60	23	1-1/8
	80	48	1-7/8
	100	68	2-5/8
	125	93	3-5/8
	150	118	4-5/8



Strength Design tables

Table 5 — Design tension loads for HAC-50 (pounds) [1,2,3,4,5,6,7,8,9,10]

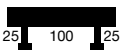
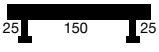
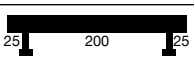
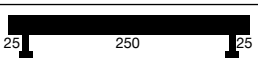
HAC-50		Concrete thickness (inches)						Channel length (inches)
		5-1/2	6	7	8	10	12	
Edge distance (inches)	3	3640	3640	3640	3640	3640	3640	8 and 14
	4	3640	3640	3640	3640	3640	3640	
	5	3640	3640	3640	3640	3640	3640	
	6	3640	3640	3640	3640	3640	3640	
	≥8	3640	3640	3640	3640	3640	3640	
	3	3325	3325	3325	3325	3325	3325	10 and 18
	4	3325	3325	3325	3325	3325	3325	
	5	3325	3325	3325	3325	3325	3325	
	6	3325	3325	3325	3325	3325	3325	
	≥8	3325	3325	3325	3325	3325	3325	
	3	3055	3055	3055	3055	3055	3055	12 and ≥22
	4	3055	3055	3055	3055	3055	3055	
	5	3055	3055	3055	3055	3055	3055	
	6	3055	3055	3055	3055	3055	3055	
	≥8	3055	3055	3055	3055	3055	3055	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi and the following reinforcing conditions:
   • Reinforcement widely spaced
   • Reinforcement to control splitting
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. T-bolts shall not be positioned within 1" of the end of the anchor channel.
3. Values above are the maximum applicable tension loads per T-bolt.
4. Values above are for anchor channels at specified edge distances without influence of corners. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips, channel flexure) all other values are controlled by concrete strength.
7. For concrete controlled failure modes only (non-highlighted values above), a 0.70 reduction factor shall be applied for cracked concrete conditions. For cracked concrete conditions, if reinforcement to control splitting is not present, verification for concrete splitting shall be performed.
8. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
9. When steel failure controls for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \leq 1.0$

   When other failure modes control, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \leq 1.0$ or $\beta_N + \beta_V \leq 1.2$

10. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

Anchor channel leg positioning

Channel length in. [mm]	Anchor spacing in. [mm]	Number of anchors [pcs]	
6 in. [150]	3.9 [100]	2	
8 in. [200]	5.9 [150]	2	
10 in. [250]	7.9 [200]	2	
12 in. [300]	9.8 [250]	2	
14 in. [350]	5.9 [150]	3	
18 in. [450]	7.9 [200]	3	
22-228 in. [550-5800]	9.8 [250]	n = 4 to 24	

Strength Design tables

Table 6 — Design shear loads perpendicular to channel profile for HAC-50 (pounds) [1,2,3,4,5,6,7,8,9,10,11,12]

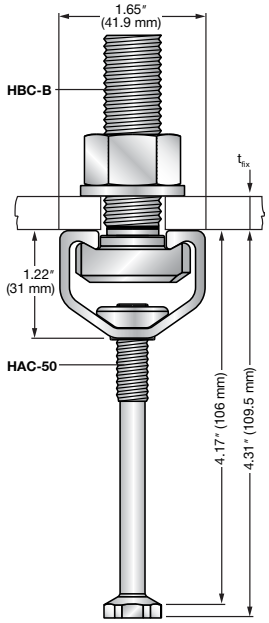
HAC-50		Concrete thickness (inches)						Channel length (inches)
		5-1/2	6	7	8	10	12	
Edge distance (inches)	3	1700	1765	1925	2035	2105	2105	8 and 14
	4	2240	2330	2535	2695	3010	3100	
	5	2760	2875	3125	3330	3710	4075	
	6	3280	3420	3690	3940	4415	4865	
	8	4325	4505	4865	5205	5820	6315	
	3	1765	1835	1990	2130	2175	2175	10 and 18
	4	2310	2400	2605	2785	3100	3190	
	5	2830	2945	3190	3420	3805	4190	
	6	3350	3485	3780	4030	4505	4955	
	8	4390	4595	4955	5295	5930	6315	
	3	1790	1855	2015	2150	2195	2195	12 and ≥22
	4	2355	2445	2650	2830	3170	3215	
	5	2875	2990	3235	3465	3850	4255	
	6	3395	3530	3825	4095	4575	5025	
	8	4435	4640	5025	5390	6000	6315	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi.
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. Screws shall not be positioned within 1" of the end of the anchor channel.
3. Values above are for anchor channels at different edge distances without influence of corner distances. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
4. Values above are the maximum applicable shear loads without lever arm per special screw.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3.
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips). All other values are controlled by concrete strength. For concrete-controlled failure modes, the values above may be increased to account for higher concrete compressive strength up to 4,500 psi using the factor $\sqrt{\frac{f'_{c,\,required}}{4000}}$
7. For concrete-controlled failure modes, a 0.70 reduction factor shall be applied for cracked concrete conditions when no edge reinforcement is present.
8. For concrete-controlled failure modes, a 0.85 reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement is present.
9. For concrete-controlled failure modes, no reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement and stirrups are present.
10. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
11. When steel failure is decisive for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \le 1.0$

    When other failure modes are decisive, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \le 1.0$ or $\beta_N + \beta_V \le 1.2$
12. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

HBC-B Maximum thickness fastened

T-bolt diameter	Bolt length [mm]	t_{fix} [mm]	t_{fix} in.
M12	40	18	3/4
	50	28	1-1/8
	60	38	1-1/2
	80	58	2-1/4
	100	78	3-1/8
	125	103	4
	150	128	5
M16	40	13	1/2
	50	23	7/8
	60	33	1-1/4
	70	43	1-3/4
	80	53	2-1/8
	100	73	2-7/8
	125	98	3-7/8
	150	123	4-7/8
M20	60	23	1-1/8
	80	48	1-7/8
	100	68	2-5/8
	125	93	3-5/8
	150	118	4-5/8



Strength Design tables

Table 7 — Design tension loads for HAC-60 (pounds) [1,2,3,4,5,6,7,8,9,10]

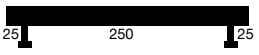
HAC-60		Concrete thickness (inches)				Channel length (inches)
		7	8	10	12	
Edge distance (inches)	4	6180	6180	6180	6180	14
	5	6180	6180	6180	6180	
	6	6180	6180	6180	6180	
	≥8	6180	6180	6180	6180	
	4	5395	5395	5395	5395	18
	5	5395	5395	5395	5395	
	6	5395	5395	5395	5395	
	≥8	5395	5395	5395	5395	
	4	4880	4880	4880	4880	12 and ≥22
	5	4880	4880	4880	4880	
	6	4880	4880	4880	4880	
	≥8	4880	4880	4880	4880	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi and the following reinforcing conditions:
   • Reinforcement widely spaced
   • Reinforcement to control splitting
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. T-bolts shall not be positioned within 1" of the end of the anchor channel.
3. Values above are the maximum applicable tension loads per T-bolt.
4. Values above are for anchor channels at specified edge distances without influence of corners. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips, channel flexure) all other values are controlled by concrete strength.
7. For concrete controlled failure modes only (non-highlighted values above), a 0.70 reduction factor shall be applied for cracked concrete conditions. For cracked concrete conditions, if reinforcement to control splitting is not present, verification for concrete splitting shall be performed.
8. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
9. When steel failure controls for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \leq 1.0$

   When other failure modes control, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \leq 1.0$ or $\beta_N + \beta_V \leq 1.2$

10. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

Anchor channel leg positioning

Channel length in. [mm]	Anchor spacing in. [mm]	Number of anchors [pcs]	
12 in. [300]	9.8 [250]	2	
14 in. [350]	5.9 [150]	3	
18 in. [450]	7.9 [200]	3	
22 in. [550]	9.8 [250]	3	
41-228 in. [1050-5800]	9.8 [250]	n = 5 - 24	

Strength Design tables

Table 8 — Design shear loads perpendicular to channel profile for HAC-60 (pounds) [1,2,3,4,5,6,7,8,9,10,11,12]

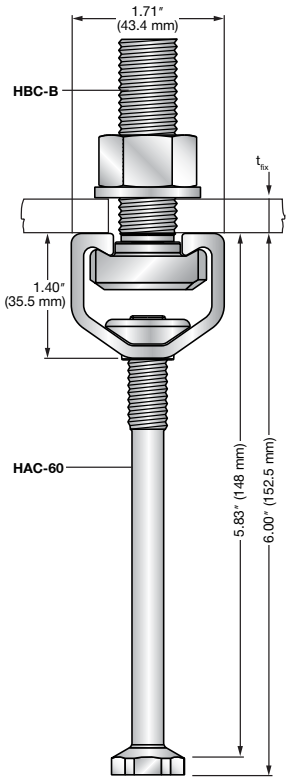
HAC-60		Concrete thickness (inches)				Channel length (inches)
		7	8	10	12	
Edge distance (inches)	4	2605	2760	3125	3235	14
	5	3215	3420	3825	4190	
	6	3805	4050	4525	4980	
	8	4980	5320	5930	6520	
	4	2625	2805	3125	3235	18
	5	3215	3440	3850	4210	
	6	3805	4050	4525	4980	
	8	4980	5320	5930	6520	
	4	2605	2760	3125	3235	12 and ≥22
	5	3215	3420	3825	4190	
	6	3805	4050	4525	4980	
	8	4980	5320	5930	6520	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi.
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. Screws shall not be positioned within 1" of the end of the anchor channel.
3. Values above are for anchor channels at different edge distances without influence of corner distances. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
4. Values above are the maximum applicable shear loads without lever arm per special screw.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3.
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips). All other values are controlled by concrete strength. For concrete-controlled failure modes, the values above may be increased to account for higher concrete compressive strength up to 4,500 psi using the factor $\sqrt{\frac{f'_{c,\,required}}{4000}}$
7. For concrete-controlled failure modes, a 0.70 reduction factor shall be applied for cracked concrete conditions when no edge reinforcement is present.
8. For concrete-controlled failure modes, a 0.85 reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement is present.
9. For concrete-controlled failure modes, no reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement and stirrups are present.
10. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
11. When steel failure is decisive for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \le 1.0$

    When other failure modes are decisive, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \le 1.0$ or $\beta_N + \beta_V \le 1.2$
12. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

HBC-B Maximum thickness fastened

T-bolt diameter	Bolt length [mm]	t_{fix} [mm]	t_{fix} in.
M12	40	18	3/4
	50	28	1-1/8
	60	38	1-1/2
	80	58	2-1/4
	100	78	3-1/8
	125	103	4
	150	128	5
M16	40	13	1/2
	50	23	7/8
	60	33	1-1/4
	70	43	1-3/4
	80	53	2-1/8
	100	73	2-7/8
	125	98	3-7/8
	150	123	4-7/8
M20	60	23	1-1/8
	80	48	1-7/8
	100	68	2-5/8
	125	93	3-5/8
	150	118	4-5/8



Strength Design tables

Table 9 — Design tension loads for HAC-70 (pounds) [1,2,3,4,5,6,7,8,9,10]

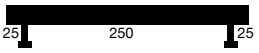
HAC-70		Concrete thickness (inches)			Channel length (inches)
		8-1/4	10	12	
Edge distance (inches)	4	8720	8720	8720	14
	5	8720	8720	8720	
	6	8720	8720	8720	
	≥8	8720	8720	8720	
	4	7645	7645	7645	18
	5	7645	7645	7645	
	6	7645	7645	7645	
	≥8	7645	7645	7645	
	4	6900	6900	6900	12 and ≥22
	5	6900	6900	6900	
	6	6900	6900	6900	
	≥8	6900	6900	6900	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi and the following reinforcing conditions:
   • Reinforcement widely spaced
   • Reinforcement to control splitting
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. T-bolts shall not be positioned within 1" of the end of the anchor channel.
3. Values above are the maximum applicable tension loads per T-bolt.
4. Values above are for anchor channels at specified edge distances without influence of corners. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips, channel flexure) all other values are controlled by concrete strength.
7. For concrete controlled failure modes only (non-highlighted values above), a 0.70 reduction factor shall be applied for cracked concrete conditions. For cracked concrete conditions, if reinforcement to control splitting is not present, verification for concrete splitting shall be performed.
8. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
9. When steel failure controls for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \leq 1.0$

   When other failure modes control, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \leq 1.0$ or $\beta_N + \beta_V \leq 1.2$

10. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

Anchor channel leg positioning

Channel length in. [mm]	Anchor spacing in. [mm]	Number of anchors [pcs]	
12 in. [300]	9.8 [250]	2	
14 in. [350]	5.9 [150]	3	
18 in. [450]	7.9 [200]	3	
22 in. [550]	9.8 [250]	3	
41-228 in. [1050-5800]	9.8 [250]	n = 5 to 24	

Strength Design tables

Table 10 — Design shear loads perpendicular to channel profile for HAC-70 (pounds) [1,2,3,4,5,6,7,8,9,10,11,12]

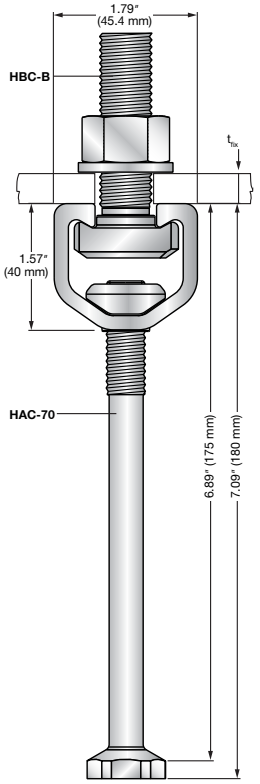
HAC-70		Concrete thickness (inches)			Channel length (inches)
		8-1/4	10	12	
Edge distance (inches)	4	2785	3080	3260	14
	5	3440	3780	4145	
	6	4075	4480	4890	
	8	5365	5885	6450	
	4	2805	3100	3280	18
	5	3465	3805	4165	
	6	4095	4525	4935	
	8	5365	5910	6495	
	4	2785	3080	3260	12 and ≥22
	5	3440	3780	4145	
	6	4075	4480	4910	
	8	5365	5885	6450	

1. Values are for anchor channels installed in normal weight, uncracked concrete with specified cylindrical compressive strength of 4,000 psi.
2. Design loads above are for anchor channels installed with two (2) T-bolts located anywhere along the length of the channel and spaced a minimum of 4 inches apart. Screws shall not be positioned within 1" of the end of the anchor channel.
3. Values above are for anchor channels at different edge distances without influence of corner distances. Edge distance is measured from the concrete edge to the center of the anchor channel and the anchors fixed to the channel profile.
4. Values above are the maximum applicable shear loads without lever arm per special screw.
5. Values are based on European Technical Approval ETA-11/0006 (February 28, 2012) and calculations according to CEN/TS 1992-4-3.
6. Highlighted values above are for ductile (steel) failures of the anchor channel (anchor, connection channel/anchor, channel lips). All other values are controlled by concrete strength. For concrete-controlled failure modes, the values above may be increased to account for higher concrete compressive strength up to 4,500 psi using the factor $\sqrt{\frac{f'_{c,\,required}}{4000}}$
7. For concrete-controlled failure modes, a 0.70 reduction factor shall be applied for cracked concrete conditions when no edge reinforcement is present.
8. For concrete-controlled failure modes, a 0.85 reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement is present.
9. For concrete-controlled failure modes, no reduction factor shall be applied for cracked concrete conditions when straight edge reinforcement and stirrups are present.
10. Design loads must be the lesser of the tabulated values above and the T-bolt values given in Table 11.
11. When steel failure is decisive for both tension and shear loads, the following interaction equation shall be satisfied: $\beta_N^2 + \beta_V^2 \le 1.0$

    When other failure modes are decisive, either of the following equations shall be satisfied: $\beta_N^{1.5} + \beta_V^{1.5} \le 1.0$ or $\beta_N + \beta_V \le 1.2$
12. The allowable tension load capacities (ASD) for any condition may be determined by applying a 2.8 strength reduction factor to the values above.

HBC-B Maximum thickness fastened

T-bolt diameter	Bolt length [mm]	t_{fix} [mm]	t_{fix} in.
M12	40	18	3/4
	50	28	1-1/8
	60	38	1-1/2
	80	58	2-1/4
	100	78	3-1/8
	125	103	4
	150	128	5
M16	40	13	1/2
	50	23	7/8
	60	33	1-1/4
	70	43	1-3/4
	80	53	2-1/8
	100	73	2-7/8
	125	98	3-7/8
	150	123	4-7/8
M20	60	23	1-1/8
	80	48	1-7/8
	100	68	2-5/8
	125	93	3-5/8
	150	118	4-5/8



Shear parallel to channel

Table 11 — Design loads for Hilti Special Bolt (pounds)

Tension						
Special Bolt		M8	M10	M12	M16	M20
Type	Grade					
HBC-B	4.6	1640	2610	-	-	-
HBC-C	4.6	-	2610	3790	7060	11015
HBC-C-E	8.8	-	6955	10100	18825	29375
HBC-C-N	A4-50	-	2280	3315	6170	9630

Shear (without lever arm i.e., not a stand-off application)						
Special Bolt		M8	M10	M12	M16	M20
Type	Grade					
HBC-B	4.6	980	1870	-	-	-
HBC-C	4.6	-	1870	2720	5060	7915
HBC-C-E	8.8	-	4170	6060	11275	17605
HBC-C-N	A4-50	-	1645	2390	4440	6935

Notched T-bolts

- Longitudinal forces can be supported with a notched T-bolt.
- HAC-40 to HAC-70 uses notched screw
- Sharp notches on bolt head digs into anchor channel to create slip capacity

T-bolt size (HBC-C-N)	Characteristic slip capacity $V_{Rk,s,l}$	Design slip capacity $V_{Rd,s,l}$	Tightening Torque (Nm)	Min Bolt spacing
M16 8.8	14.5 kN	8.0 kN (1800 lbs)	200 Nm	80 mm (3.15")
M20 8.8	22.0 kN	12.2 kN (2700 lbs)	400 Nm	100 mm (4.0")

Verification of rebar development length

Design of rebar development length for characteristic resistance of the anchor-channel connection NRK,s,c according to ETA -11/006 (Feb 28, 2012).

According to ACI 318:

$$l_d = \left(\frac{3}{40} \frac{f_y}{\lambda \sqrt{f'_c}} \frac{\psi_t \psi_e \psi_s}{\left(\frac{c_b + K_{tr}}{d_b} \right)} \right) d_b$$

With K_{tr} = 0 and $(c_b + K_{tr})/d_b \leq 2.5$

According to EC-2 (DIN EN 1992-1-1):

in C20/25 (characteristic cylinder concrete compressive strength $f_{ck,cyl}$ = 20 MPa)

Development length:
$l_{b,rqd} = (d_s / 4)^* \sigma_{sd} / f_{bd}$
$f_{bd} = 2.25 * \eta_1 * \eta_2 * f_{ctd}$ with $\eta_1 = \eta_2 = f_{ctd} = 1$; f_{bd} = 2.25 Mpa

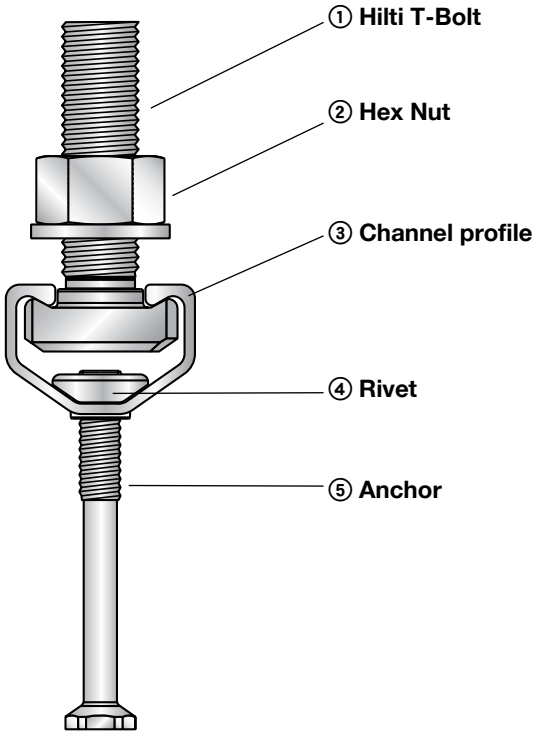
Minimal development length:
$l_{b,min} \geq$ max {0,3*$l_{b,rqd}$; 10*d_s; 100 mm}

Required development length:
$l_{b,d\,lb,d} = \alpha_2 * l_{b,rqd} > l_{b,min}$ with $\alpha_2 = 0.7$

According to the provisions in the codes the rebar must be covered with a sufficient concrete cover to ensure load introduction and corrosion protection.

Material properties

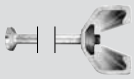
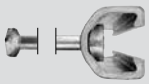
Hilti Anchor Channel System components



Item No.	Specification	Materials		
1	Hilti special bolt shaft and thread according to EN ISO 4018	Carbon steel, steel grade 4.6 / 8.8 in conformance with EN ISO 898-1[4] electroplated ≥ 8 µm[1]	Carbon steel, steel grade 4.6 / 8.8 in conformance with EN ISO 898-1[4] hot-dip galvanized ≥ 45 µm[1]	Stainless steel steel grade 50 1.4401 / 1.4404 / 1.4571 1.4362 / 1.4578 / 1.4439 EN ISA 3506-1 EN 10088-2
2	Hexagonal nuts DIN 934[5] EN ISO 4032	Carbon steel, class 5 / 8 EN 20898-2 electroplated ≥ 8 µm[1]	Carbon steel, class 5 / 8 EN 20898-2 hot-dip galvanized ≥ 45 µm[1]	Stainless steel class 70 1.4401 / 1.4404 / 1.4571 1.4362 / 1.4578 / 1.4439 EN ISA 3506-2 EN 10088-2
3	Channel profile[2]	EN 10025-2 hot-dip galvanized ≥ 55 µm (HAC-30 to HAC-50) EN 10025-2 hot-dip galvanized ≥ 70 µm (HAC-60 to HAC-70)		
4	Rivet[3]	Carbon steel, hot-dip galvanized ≥ 45 µm		
5	Anchor[3]	Carbon steel, hot-dip galvanized ≥ 45 µm		

1 Electroplated according to EN ISO 4042, A3K
2 Hot dip galvanized according to EN ISO 1461:2009-10 (Mean coating thickness (minimum))
3 Hot dip galvanized according to EN ISO 1461:1999 (Mean coating thickness (minimum))
4 Properties according to EN ISO 898-1 only in threaded part of screw
5 DIN 934 only for special screw grade 4.6 and stainless steel

Hilti Anchor Channel porfolio information

Length		Hilti Anchor Channel Profiles				
						
mm	**inches**	**HAC-30**	**HAC-40**	**HAC-50**	**HAC-60**	**HAC-70**
100	3.9					
150	5.9		□	□		
200	7.9	□	□	□		
250	9.8	□	□	□		
300	11.8	■	■	■	■	■
350	13.8		■	■	■	■
450	17.7		■	■	■	■
550	21.7	□	□	□	□	■
800	31.5	□	□	■		
1050	41.3	□	□	□	■	□
1300	51.2		□	□	□	
1550	61.0		□	□	□	□
1800	70.9		□			
2050	80.7			□		□
2250	88.6					
2300	90.6	□	□	□	□	□
3050	120	□				
5800	228	□	□	□	□	□

HAC is manufactured using a 100% robotic manufacturing process to provide high quality and rapid production. In fact, thousands of anchor channels can be produced in a single day to accommodate large project demands.

Standard sizes shown but custom lengths are also possible.

■ Standard products □ Special item manufactured upon request

Minimum order quantity of 1 piece

Minimum order quantity of 10 pieces

Hot dip galvanized T-head bolts										Stainless steel T-head bolts	
T-bolt type		**HBC-C-F (flat head)**						**HBC-C-F-N (notched)**		**HBC-C-R (flat head)**	
T-bolt diameter		**M12**		**M16**		**M20**		**M16**	**M20**	**M12**	**M16**
Steel grade		**4.6**	**8.8**	**4.6**	**8.8**	**4.6**	**8.8**	**8.8**	**8.8**	**A4-50**	**A4-50**
Thread Length	30 mm (1-1/4")	□								□	□
	40 mm (1-1/2")	□	□	□						□	□
	50 mm (2.0")	□	□	□	□	□		□		□	□
	60 mm (2-3/8")	■	■	□	■	□	□	■	□		□
	70 mm (2-3/4")			□							□ 1)
	80 mm (3-1/8")		■	□	■	□	□	■	■	□	□
	100 mm (4.0")	■	□	□	□	□	□	□	□	□	□
	125 mm (5.0")						□			□	□
	150 mm (6.0")				□	□	□	□	□		□

■ Standard items, reduced lead time □ Special item manufactured upon request

1) Special T-bolt length 2.56 inches (65 mm)

Sample specifications

Specification sample for anchor channels in concrete

Part 1 — General

1.01 Summary

A. Supply of anchor channels used to connect construction members.

1.02 Related requirements

	Section
A Concrete	03000
B. Concrete accessories	03150
C. Precast concrete	03400
D. Masonry accessories	04090
E. Stone	04400
F. Metal fabrication	05500
G. Curtain wall and glazed assemblies	08900
H. Tunnel construction	31740

1.03 References

A. American Concrete Institute (ACI)

B. American Institute of Steel Construction (AISC)

C. American Society of Civil Engineers (ASCE)

D. American Society for Testing and Materials (ASTM)

E. Cement Association of Canada (CAC)

F. Canadian Institute of Steel Construction (CISC)

G. Canadian Society for Civil Engineering (CSCE)

H. Canadian Standards Association (CSA)

I. International Building Code (IBC)

J. European Technical Approval (ETA)

1.04 Submittals

A. Product data: Submit size and strength capacity information for each anchor channel profile specified in the contract drawings

B. Shop drawings:

1. Placement drawings: Submit drawings showing the anchor channel layout and locations required.
2. Structural calculations: Manufacturer will provide technical manual and software based on internationally recognized design provisions such as IBC or ETA to support the Project Engineer in designing the anchor channels.

C. Test and Evaluation Reports: Provide applicable third party test and research reports

1.05 Quality assurance

A. Manufacturer must have experience in anchoring technology.

B. Manufacturer shall follow a recognized quality assurance program and be ISO 9001 and ISO 14001 certified.

C. Manufacturer's published anchor channel strengths to be confirmed by an independent third party testing agency.

1.06 Delivery, storage and handling

A. Anchor channels and accessories must be packaged appropriately to help prevent loss or damage during transport.

B. All materials received on the jobsite must be stored in a secure and dry location prior to installation.

1.07 Warranty

A. Manufacturer shall warrant that the anchor channels supplied to the jobsite are free from defects in workmanship.

B. Ordinary wear and tear, unusual abuse or neglect, and improper installation of anchor channels are not included in the warranty.

Part 2 — Products

2.01 Manufacturers

A) Anchor channels and accessories shall be manufactured by:

1) Hilti, Tulsa OK, phone (800) 879-6000.

2) Jordahl DKG and supplied in the US by Decon USA Inc. (707) 996-5954 and in Canada by Continental Decon Inc., (800) 363-3266.

3) Halfen Anchoring Systems, Converse, TX, phone (800) 323-6896, fax (866) 277-1695.

B) Products of other manufacturers must provide equal or greater material and connection strengths. The other manufacturers must have published material and connection strengths of alternate products that are proven by independent testing according to ACI 318.

C) The published data should include the factored material strengths available to resist a load or loads placed at any point on the anchor channel but not closer than 1" (25 mm) from the ends.

2.2 Materials

A) Anchor channels consist of either cold formed V-form profile or hot rolled steel channel profiles with round steel anchors mechanically attached to the back of the channel or "L shaped" anchors securely attached to the back of the channel with fillet welds are also acceptable. The cold formed profiles are made of carbon steel conforming to ASTM A283 Grade C with a minimum yield strength of 30,000psi. The hot rolled profiles conform to ASTM A1011 with a minimum yield strength of 33,000psi. The round anchors must conform to ASTM A108.

B) The anchor channels and T-bolts are protected by a hot dipped galvanized finish.

C) T-bolts are used to fasten a plate to the anchor channel. These bolts are shaped to fit the inside the profile of the channel and are designed to meet the manufacturer's published strengths. The T-bolt must show a mark on the screw indication proper engagement into the channel

D) Finishes:

1. Hot dipped galvanizing thickness of anchor channels must exceed 55 μm. or conforms to ASTM A123 or EN ISO 1461:2009-10.
2. Hot dipped galvanizing thickness of T-bolts must exceed 45 μm. or conforms to ASTM A153 or ISO 1461:1999.
3. Zinc electroplating thickness of T-bolts must exceed 8 μm. or to ASTM B633 or EN ISO 4042, A3K

E) End caps and a LDPE closed-cell foam filler with integrated tear-out strip is placed in the channel profile to prevent concrete from seeping into the channel.

F) Fabrication tolerances are ± 1/8" (3 mm) for lengths of 12" or less and ± 1/4" (6 mm) for lengths over 12".

G) Anchor channels and components may be produced according to different international standards if they meet or exceed the standards shown above.

Part 3 — Execution

3.1 Installation

A) The manufacturer's instructions must be followed to install the anchor channels properly on the formwork. Nail holes are provided in the channel profile to secure the anchor channel to the formwork.

B) Installer will fix anchor channels in required locations before concrete is poured. The appropriate T-bolt is used to connect a steel or concrete member to the anchor channel after the concrete is cured.

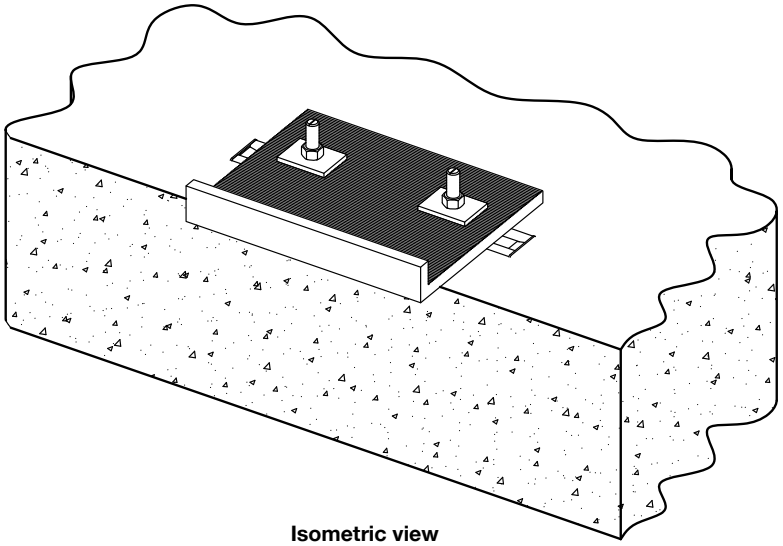
C) Only the correct type of T-bolts supplied by the manufacturer may be used to fasten a to the anchor channel. The T-bolts are designed to meet the strength limits published in the manufacturer's design manual. The setting mark must show proper T-bolt engagement in the channel

3.2 Protection

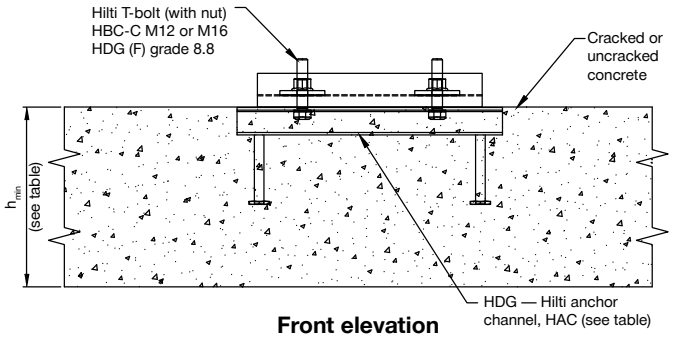
A) Installer shall protect anchor channel and accessories from damage.

System illustrations

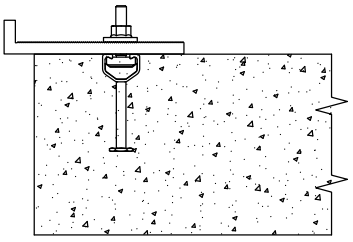
Typical details



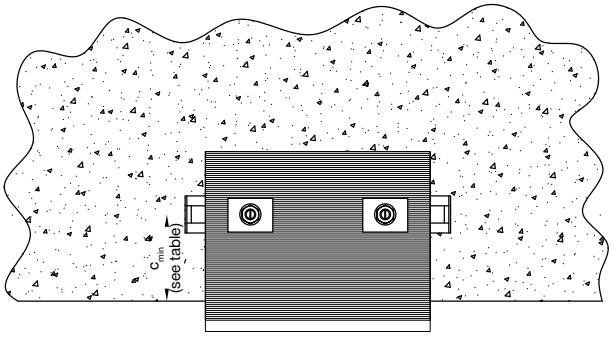
Isometric view



Front elevation



Side elevation



Plan view

T-bolt designation	Item No.	Thickness fastened maximum
HBC-C M12x60 8.8 F	00434403	35 mm (1-3/8")
HBC-C M12x80 8.8 F	02019732	55 mm (2-1/8")
HBC-C M16x60 8.8 F	00434405	30 mm (1-1/8")
HBC-C M16x80 8.8 F	00434406	50 mm (1-7/8")
*HBC-C M16x60 8.8 F	02019736	30 mm (1-1/8")
*HBC-C M16x80 8.8 F	00433479	50 mm (1-7/8")
*HBC-C M12x80 8.8 F	02019739	45 mm (1-3/4")

Anchor Channel designation	Item No.	**Mimimum concrete thickness, h_{min}	**Mimimum edge distance, c_{min}
HAC-40 91/300 F (12" nom. length)	00431908	120.5 mm (4-3/4")	50 mm (2")
HAC-40 91/350 F (14" nom. length)	00431909	120.5 mm (4-3/4")	50 mm (2")
HAC-40 91/450 F (18" nom. length)	00431910	120.5 mm (4-3/4")	50 mm (2")
HAC-50 106/300 F (12" nom. length)	00431837	136.5 mm (5-3/8")	75 mm (3")
HAC-50 106/350 F (14" nom. length)	00431838	136.5 mm (5-3/8")	75 mm (3")
HAC-50 106/450 F (18" nom. length)	00431839	136.5 mm (5-3/8")	75 mm (3")
HAC-50 106/800 F (32" nom. length)	00431841	136.5 mm (5-3/8")	75 mm (3")
HAC-60 148/300 F (12" nom. length)	00431850	181 mm (7-1/8")	100 mm (4")
HAC-60 148/350 F (14" nom. length)	00431851	181 mm (7-1/8")	100 mm (4")
HAC-60 148/450 F (18" nom. length)	00431852	181 mm (7-1/8")	100 mm (4")
HAC-60 148/1050 F (42" nom. length)	00431854	181 mm (7-1/8")	100 mm (4")
HAC-70 175/300 F (12" nom. length)	00431860	206.5 mm (8-1/8")	100 mm (4")
HAC-70 175/350 F (14" nom. length)	00431861	206.5 mm (8-1/8")	100 mm (4")
HAC-70 175/450 F (18" nom. length)	00431862	206.5 mm (8-1/8")	100 mm (4")

Note(s):
*1. Notched T-bolt for parallel shear force (shear force parallel to length of channel) applications.
**2. Thickness may increase depending on the level of exposure to weather, corrosive environment, and specific project criteria.

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