ICC-ES Listing Report

ELC-3187

Reissued May 2022

This listing is subject to renewal May 2023.

CSI: DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured products, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: Hilti HIT-HY 200 Adhesive Anchor System in Cracked and Uncracked Concrete

Listee: HILTI, INC.

Compliance with the following standard:

Annex D, Anchorage of CSA A23.3-14, Design of Concrete Structures, CSA Group.

Compliance with the following codes:

Hilti HIT-HY 200 adhesive anchor system in cracked and uncracked concrete, as described in this listing report, is in conformance with CSA A23.3-14, Annex D, as referenced in the applicable section of the following code editions:

- *National Building Code of Canada*® 2015 and 2010

  Applicable Section: Division B, Part 4, Section 4.3.3.

Description of adhesive anchor system:

The Hilti HIT-HY 200 Adhesive is an injectable two-component hybrid adhesive. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold. Hilti HIT-HY 200 is available in 11.1-ounce (330 mL) and 16.9-ounce (500 mL) foil packs. The manifold attached to each foil pack is stamped with the adhesive expiration date. The shelf life, as indicated by the expiration date, applies to an unopened foil pack stored in a dry, dark environment and in accordance with Figure 2.

Hilti HIT-HY 200 Adhesive is available in two options, Hilti HIT-HY 200-A and Hilti HIT-HY 200-R. Both options are subject to the same technical data as set forth in this report. Hilti HIT-HY 200-A will have shorter working times and curing times than Hilti HIT-HY 200-R. The packaging for each option employs a different color, which helps the user distinguish between the two adhesives.

Hole Cleaning Equipment:

Standard hole cleaning equipment, comprised of steel wire brushes and air nozzles, is described in Figure 2 of this listing report.

The Hilti Safe-Set™ with Hilti HIT-HY 200 consists of one of the following:

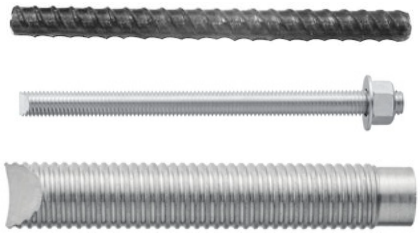
- For the anchor elements, Hilti threaded steel rods, steel reinforcing bars for use as anchors and Hilti HIS-N and HIS-RS inserts, the Hilti TE-CD or TE-YD hollow carbide drill bit with a carbide drilling head conforming to ANSI B212.15. Used in conjunction with a Hilti vacuum with a minimum value for the volumetric follow rate of 129 CFM (61 ℓ/s), the Hilti TE-CD or TE-YD drill bit will remove the drilling dust, automatically cleaning the hole.

- For the anchor elements, Hilti threaded steel rods, steel reinforcing bars for use as anchors, and Hilti HIS-N and HIS-RS inserts, the Hilti TE-YRT roughening tool with a carbide roughening head is used for hole preparation in conjunction with holes core drilled with a diamond core bit as illustrated in Figure 4.

Hilti HIT-HY 200 must be dispensed with manual or electric dispensers provided by Hilti.

HILTI HIT-HY 200 FOIL PACK AND MIXING NOZZLE

HILTI DISPENSER



ANCHORING ELEMENTS

HILTI TE-CD OR TE-YD HOLLOW CARBIDE DRILL BIT

HILTI TE-YRT ROUGHENING TOOL

FIGURE 1—HILTI HIT-HY 200 ANCHORING SYSTEM

Identification:

1. The Hilti HIT-HY 200 anchors are identified by packaging labeled with the manufacturer's name (Hilti Inc.) and address, product name, lot number, expiration date, listing number (ELC-3187), and the ICC-ES PMG certification mark. Threaded rods, nuts, washers, and deformed reinforcing bars are standard elements and must conform to applicable national or specifications as set forth in Tables 2-7 of this listing report or equivalent.

2. The report holder's contact information is the following:

   HILTI, INC.
   7250 DALLAS PARKWAY, SUITE 1000
   PLANO, TEXAS 75024
   (800) 879-8000
   www.us.hilti.com
   HiltiTechEng@us.hilti.com

Installation: The Installation parameters are illustrated in Figure 3. Installation must be in accordance with CSA A23.3-14 D.10 and D.10.2, as applicable. Anchor locations must comply with this listing report and the plans and specifications approved by the code official. Installation of the Hilti HIT-HY 200 Adhesive Anchor Systems must conform to the manufacturer's printed installation instructions (MPII) included in each unit package as provided in Figure 2 of this report. The MPII contains additional requirements for combinations of drill hole depth, diameter, drill bit type, and dispensing tools.

Hilti HIT-HY 200-A adhesive anchors and post-installed reinforcing bars may be used to resist tension and shear forces in floor, wall, and overhead installations only if installation is into concrete with a temperature between 14°F and 104°F (-10°C and 40°C) for threaded rods, rebar, and Hilti HIS-(R)N inserts. Overhead installations require the use of piston plugs (HIT-SZ, -IP) during injection, and the anchor or post-installed reinforcing bars must be supported until fully cured (i.e., with Hilti HIT-OHW wedges, or other suitable means). Installations in concrete temperatures below 32°F require the adhesive to be conditioned to a minimum temperature of 32°F.

Installation of anchors and post-installed reinforcing bars in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed by personnel certified by an applicable certification program in accordance with CSA A23.3-14 D.10.2.2 or D.10.2.3, as applicable.

Hilti HIT-HY 200-A / -R

en	Dry base material	Water saturated base material	Waterfilled bore-hole in concrete	Uncracked concrete	Cracked concrete	Grout-filled CMU

Threaded rod Threaded sleeve	Rebar

en	Hammer drilling	Hollow drill bit	Diamond coring	Roughening tool

en	Temperature of base material	cartridge temperature	Working time t_{work}	Curing time t_{cure}	Roughening time $t_{roughen}$	Blowing time $t_{blowing}$

Hilti HIT-HY 200-A / -R

Ø d_0 [inch]	HAS HIT-V	HIS-N	Rebar	HIT-RB	HIT-SZ	HIT-DL	HIT-OHC	TE-YRT
	d [inch]			[inch]	[inch]	[inch]	Art. No.	[inch]
7/16	3/8	–	–	7/16	–	–	387551	–
1/2	–	–	#3	1/2	1/2	1/2		–
9/16	1/2	–	10M	9/16	9/16	9/16		–
5/8	–	–	#4	5/8	5/8	9/16		–
11/16	–	3/8	–	11/16	11/16	11/16		–
3/4	5/8	–	15M #5	3/4	3/4	3/4		3/4
7/8	3/4	1/2	#6	7/8	7/8	7/8		7/8
1	7/8	–	20M #6 #7	1	1	1		1
1 1/8	1	5/8	#7 #8	1 1/8	1 1/8	1	387552	1 1/8
1 1/4	–	3/4	25M #8	1 1/4	1 1/4	1		–
1 3/8	1 1/4	–	#9	1 3/8	1 3/8	1 3/8		1 3/8
1 1/2	–	–	30M #10	1 1/2	1 1/2	1 3/8		–

HIT-DL: h_{ef} > 10" HIT-RB: h_{ef} > 20d

Hilti VC 150/300	HIT-RE-M		HIT-OHW
	Art. No.		Art. No.
min. 61 l/s	337111	HDM 330 HDM 500 HDE 500-A18	387550

Ø d_0 [inch]	h_{ef} [inch]	Art. No. 381215	
7/16"...1 1/8"	2 3/8"... 20"	✔	≥ 6 bar/90 psi @ 6 m³/h
1 1/4"...1 1/2"	4"... 25"	–	≥ 140 m³/h / ≥ 82 CFM

Hilti HIT-HY 200-A / -R

Ø d_0 [mm]	TE-CD TE-YD	HIT-V HAS	HIS-N	Rebar	HIT-RB	HIT-SZ	HIT-DL	HIT-OHC	TE-YRT
		d [mm]			[mm]	[mm]		Art. No.	[mm]
10	–	8	–	–	10	–	–	387551	–
12	12	10	–	8	12	12	12		–
14	14	12	8	10	14	14	14		–
16	16	–	–	12	16	16	16		–
18	18	16	10	14	18	18	18		18
20	20	–	–	16	20	20	20		20
22	22	20	12	18	22	22	20		22
25	25	–	–	20	25	25	25		25
28	28	24	16	22	28	28	25		28
30	30	27	–	–	30	30	25	387552	30
32	32	–	20	24/25	32	32	32		32
35	35	30	–	26/28	35	35	32		35
37	–	–	–	30	37	37	32		–
40	–	–	–	32	40	40	32		–

HIT-DL: h_{ef} > 250 mm HIT-RB: h_{ef} > 20d

Hilti VC 150/300	HIT-RE-M		HIT-OHW
	Art. No.		Art. No.
min. 61 l/s	337111	HDM 330 / 500 HDE 500-A18	387550

Ø d_0 [mm]	h_{ef} [mm]	Art. No. 381215	
10...32	60...500	✔	≥ 6 bar/90 psi
35...40	100...640	–	≥ 140 m³/h

FIGURE 2—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

HIT-HY 200-A

[°C]	[°F]	HIT-V, HAS / HIS-N / Rebar t_{work}	t_{cure}
-10…-5	14…23	1,5 h	7 h
-4…0	24…32	50 min	4 h
1…5	33…41	25 min	2 h
6…10	42…50	15 min	75 min
11…20	51…68	7 min	45 min
21…30	69…86	4 min	30 min
31…40	87…104	3 min	30 min

HIT-HY 200-R

[°C]	[°F]	HIT-V, HAS / HIS-N / Rebar t_{work}	t_{cure}
-10…-5	14…23	3 h	20 h
-4…0	24…32	2 h	8 h
1…5	33…41	1 h	4 h
6…10	42…50	40 min	2,5 h
11…20	51…68	15 min	1,5 h
21…30	69…86	9 min	1 h
31…40	87…104	6 min	1 h

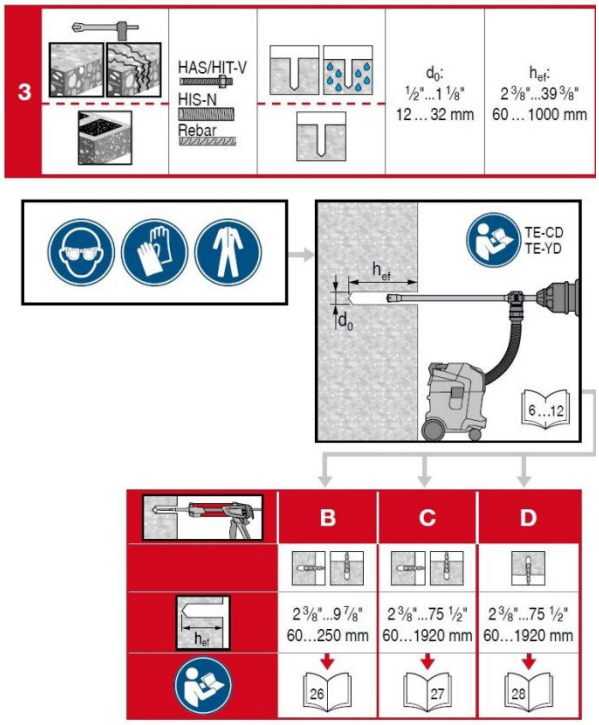
h_{ef} [mm]	$t_{roughen}$	$t_{blowing\ min}$
0 ... 100	10 sec	30 sec
101 ... 200	20 sec	40 sec
201 ... 300	30 sec	50 sec
301 ... 400	40 sec	60 sec
401 ... 500	50 sec	70 sec
501 ... 600	60 sec	80 sec

$t_{roughen}$ [sec] = h_{ef} [mm] / 10

Rebar $h_{ef} \geq 20d$

			h_{ef}		
HIT-HY 200-A HIT-HY 200-R	HDM, HDE	≤ US #5 ≤ EU 16mm ≤ CAN 15M	12 1/2 ... 37 1/2 [inch] 320 ... 960 [mm] 320 ... 960 [mm]	14°F...104°F -10°C...40°C	50°F...86°F 10°C...30°C
HIT-HY 200-A HIT-HY 200-R	HDE	≤ US #5 ≤ EU 16mm ≤ CAN 15M	12 1/2 ... 37 1/2 [inch] 320 ... 960 [mm] 320 ... 960 [mm]	14°F...104°F -10°C...40°C	32°F...86°F 0°C...30°C
HIT-HY 200-R	HDE	≤ US #8 ≤ EU 25mm ≤ CAN 25M	20 ... 60 [inch] 500 ... 1500 [mm] 504 ... 1512 [mm]	32°F...104°F 0°C...40°C	32°F...86°F 0°C...30°C
HIT-HY 200-R	HDE	≤ US #10 ≤ EU 32mm ≤ CAN 30M	25 ... 75 [inch] 640 ... 1920 [mm] 598 ... 1794 [mm]	50°F...86°F 10°C...30°C	50°F...68°F 10°C...20°C

			h_{ef}		
HIT-HY 200-A HIT-HY 200-R	HDM, HDE	≤ US #5 ≤ EU 16mm ≤ CAN 15M	12 1/2 ... 37 1/2 [inch] 320 ... 960 [mm] 320 ... 960 [mm]	14°F...104°F -10°C...40°C	50°F...86°F 10°C...30°C
HIT-HY 200-A HIT-HY 200-R	HDE	≤ US #5 ≤ EU 16mm ≤ CAN 15M	12 1/2 ... 37 1/2 [inch] 320 ... 960 [mm] 320 ... 960 [mm]	14°F...104°F -10°C...40°C	32°F...86°F 0°C...30°C
HIT-HY 200-R	HDE	≤ US #8 ≤ EU 25mm ≤ CAN 25M	20 ... 39 3/8 [inch] 500 ... 1000 [mm] 504 ... 1000 [mm]	32°F...104°F 0°C...40°C	32°F...86°F 0°C...30°C



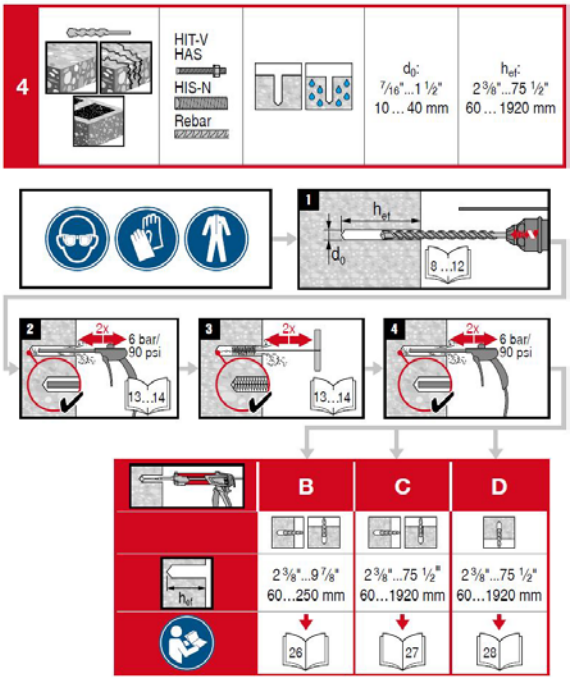


FIGURE 2—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

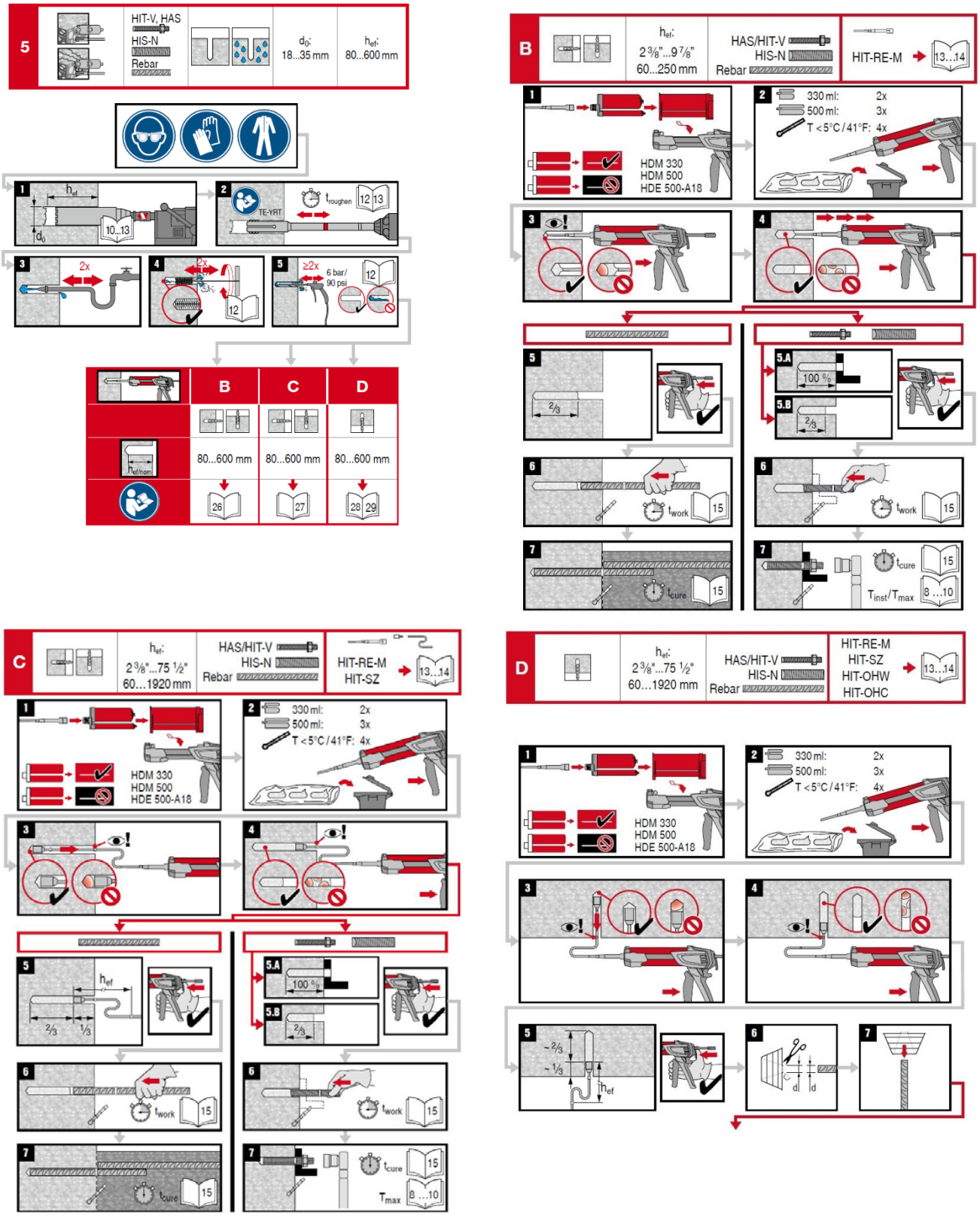
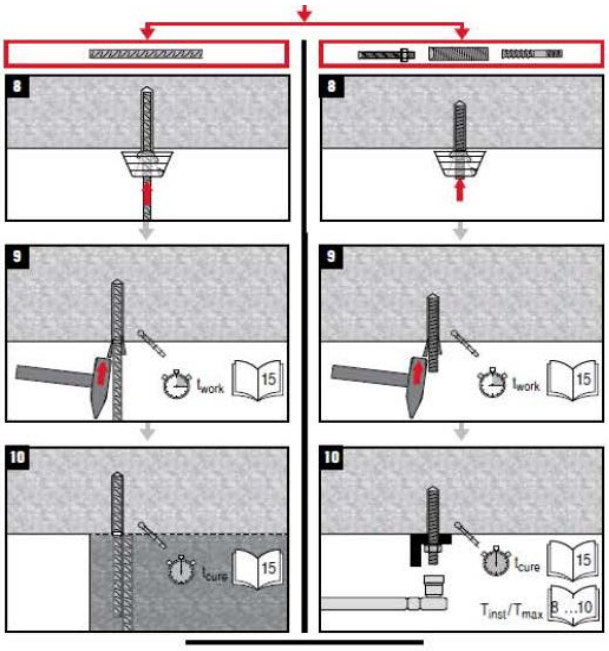


FIGURE 2—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)



Adhesive anchoring system for rebar and anchor fastenings in concrete and masonry.

Hilti HIT-HY 200-A
Contains: Hydroxypropylmethacrylate (A), 1,4-Butanediol-dimethacrylate (A), Dibenzoylperoxide

Warning

H317	May cause an allergic skin reaction. (A, B)
H319	Causes serious eye irritation. (B)
H400	Very toxic to aquatic life. (B)
P262	Do not get in eyes, on skin or on clothing.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P333+313	If skin irritation or rash occurs: Get medical advice/attention.
P337+313	If eye irritation persists: Get medical advice/attention.

Disposal considerations

Empty packs:

► Leave the mixer attached and dispose of via the local Green Dot recovery system
► or EAK waste material code: 150102 plastic packaging

Full or partially emptied packs:

► Must be disposed of as special waste in accordance with official regulations.
– EAK waste material code: 08 04 09* waste adhesives and sealants containing organic solven other dangerous substances.
– or EAK waste material code: 20 01 27* paint, inks, adhesives and resins containing dangerou substances.

Content: 330 ml / 11.1 fl.oz. 500 ml / 16.9 fl. oz **Weight**: 590 g / 20.8 oz 890 g / 31.4

Failure to observe these installation instructions, use of non-Hilti anchors, poor or questionable b material conditions, or unique applications may affect the reliability or performance of the fastenir

Product information

– Always keep these instructions together with the product even when given to other persons.
– **Material Safety Data Sheet:** Review the SDS before use.
– **Check expiration date:** See imprint on foil pack manifold (month/year). Do not use expired product.
– **Foil pack temperature during usage:** 0 °C to 40 °C / 32 °F to 104 °F.
– **Base material temperature at time of installation:**
HAS/HIT-V, HIS, Rebar: between -10 °C and 40 °C / 14 °F and 104 °F.
HIT-Z: between +5°C and 40°C / 41°F and 104°F.
– **Conditions for transport and storage:** Keep in a cool, dry and dark place between 5 °C and 25 °C / 41 °F and 77 °F.
– For any application not covered by this document / beyond values specified, please contact Hilti
– **Partly used foil packs must remain in the cassette** and has to be used within **4 weeks**. Leave the mixer attached on the foil pack manifold and store within the cassette under the recommended storage conditions. If reused, attach a new mixer and discard the initial quantity of anchor adhesive

⚠ NOTICE

⚠ The surface of the HIT-Z anchor rod must not be altered in any way.

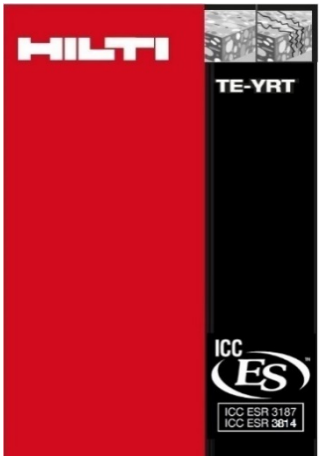
⚠ Improper handling may cause mortar splashes.
– Always wear safety glasses, gloves and protective clothes during installation.
– Never start dispensing without a mixer properly screwed on.
– Attach a new mixer prior to dispensing a new foil pack (ensure snug fit).
– Use only the type of mixer (HIT-RE-M) supplied with the adhesive. Do not modify the mixer in any way.
– Never use damaged foil packs and/or damaged or unclean foil pack holders (cassettes).

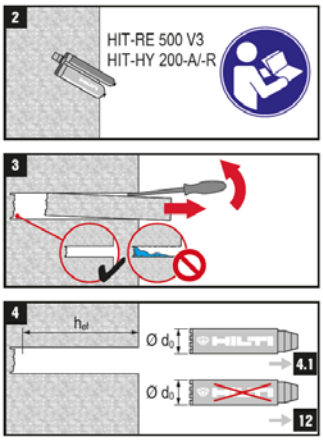
⚠ Poor load values / potential failure of fastening points due to inadequate borehole cleaning.
– The boreholes must be free of debris, dust, water, ice, oil, grease and other contaminants pric to adhesive injection.
– For blowing out the borehole – blow out with oil free air until return air stream is free of noticeable dust.
– For flushing the borehole – flush with water line pressure until water runs clear.
– For brushing the borehole – only use specified wire brush. The brush must resist insertion int the borehole – if not the brush is too small and must be replaced.

⚠ Ensure that boreholes are filled from the back of the borehole without forming air voids.
– If necessary use the accessories / extensions to reach the back of the borehole.
– For overhead applications use the overhead accessories HIT-SZ and take special care when inserting the fastening element. Excess adhesive may be forced out of the borehole. Make sure that no mortar drips onto the installer.

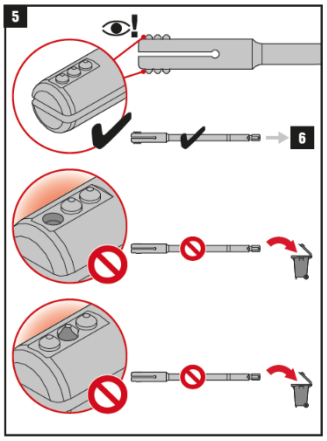
⚠ Not adhering to these setting instructions can result in failure of fastening points!

FIGURE 2—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

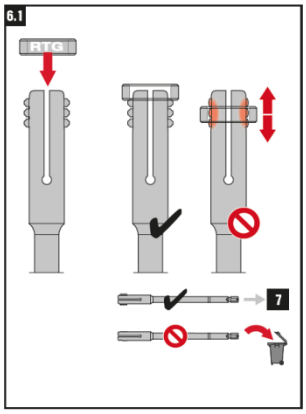


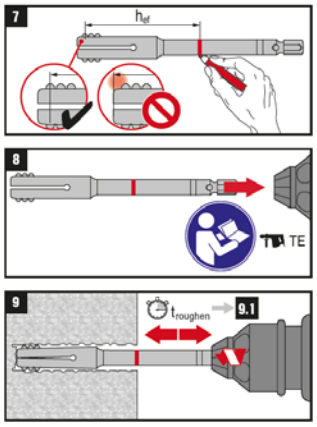


4.1 Ø d_0 [mm]	TE-YRT
18	TE-YRT 18/320
20	TE-YRT 20/320
22	TE-YRT 22/400
25	TE-YRT 25/400
28	TE-YRT 28/480
30	TE-YRT 30/540
32	TE-YRT 32/500
35	TE-YRT 35/600
Ø d_0 [inch]	TE-YRT
3/4"	TE-YRT 3/4" / 12 1/2"
7/8"	TE-YRT 7/8" / 15"
1"	TE-YRT 1" / 17 1/2"
1 1/8"	TE-YRT 1 1/8" / 20"
1 3/8"	TE-YRT 1 3/8" / 25"

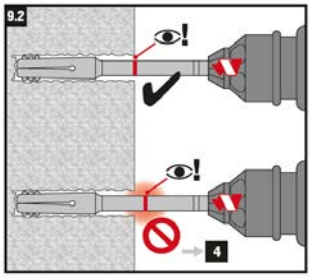


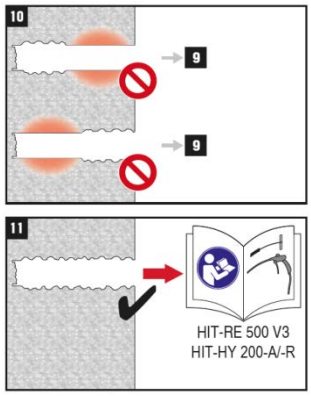
6 TE-YRT	RTG
TE-YRT 18/320	RTG 18
TE-YRT 20/320	RTG 20
TE-YRT 22/400	RTG 22
TE-YRT 25/400	RTG 25
TE-YRT 28/480	RTG 28
TE-YRT 30/540	RTG 30
TE-YRT 32/500	RTG 32
TE-YRT 35/600	RTG 35
TE-YRT	RTG
TE-YRT 3/4" / 12 1/2"	RTG 3/4"
TE-YRT 7/8" / 15"	RTG 7/8"
TE-YRT 1" / 17 1/2"	RTG 1"
TE-YRT 1 1/8" / 20"	RTG 1 1/8"
TE-YRT 1 3/8" / 25"	RTG 1 3/8"





9.1 h_{ef} [mm]	$t_{roughen}$ (= h_{ef} / 10)
0 ... 100	10 sec
101 ... 200	20 sec
201 ... 300	30 sec
301 ... 400	40 sec
401 ... 500	50 sec
501 ... 600	60 sec
h_{ef} [inch]	$t_{roughen}$ (= h_{ef} · 2.5)
0 ... 4	10 sec
4.01 ... 8	20 sec
8.01 ... 12	30 sec
12.01 ... 16	40 sec
16.01 ... 20	50 sec
20.01 ... 25	60 sec



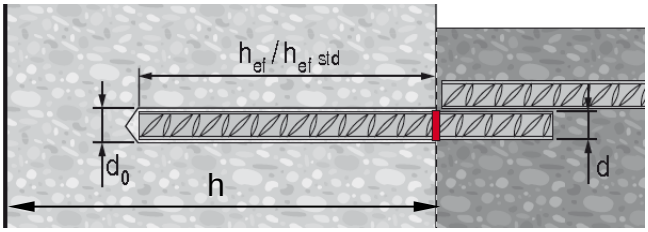


12 Ø d_0 [mm]	TE-YRT
17,9 ... 18,2	TE-YRT 18/320
19,9 ... 20,2	TE-YRT 20/320
21,9 ... 22,2	TE-YRT 22/400
24,9 ... 25,2	TE-YRT 25/400
27,9 ... 28,2	TE-YRT 28/480
29,9 ... 30,2	TE-YRT 30/540
31,9 ... 32,2	TE-YRT 32/500
34,9 ... 35,2	TE-YRT 35/600
Ø d_0 [inch]	TE-YRT
0.764 ... 0.776	TE-YRT 3/4" / 12 1/2"
0.862 ... 0.874	TE-YRT 7/8" / 15"
1.008 ... 1.020	TE-YRT 1" / 17 1/2"
1.146 ... 1.157	TE-YRT 1 1/8" / 20"
1.374 ... 1.386	TE-YRT 1 3/8" / 25"

FIGURE 2—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

Anchor setting information:

DEFORMED REINFORCMENT



US REBAR

d	Ø d_0 [inch]	$h_{ef\ std}$ [inch]	h_{ef} [inch]
#3	½	3⅜	2⅜…7½
#4	⅝	4½	2¾…10
#5	¾	5⅝	3⅛…12½
#6	⅞	6¾	3½…15
#7	1	7⅞	3½…17½
#8	1⅛	9	4…20
#9	1⅜	10⅛	4½…22½
#10	1½	11¼	5…25

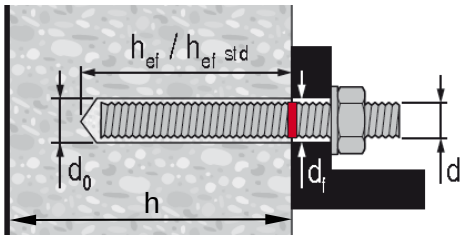
CANADIAN REBAR

d	Ø d_0 [inch]	$h_{ef\ std}$ [mm]	h_{ef} [mm]
10 M	9/16	115	70…226
15 M	¾	145	80…320
20 M	1	200	90…390
25 M	1¼	230	101…504
30 M	1½	260	120…598

EUROPEAN REBAR

Ø d [mm]	Ø d_0 [mm]	$h_{ef\ std}$ [mm]	h_{ef} [mm]
10	14	90	60…200
12	16	110	70…240
14	18	125	75…280
16	20	125	80…320
20	25	170	90…400
25	32	210	100…500
28	35	270	112…560
32	40	300	128…640

THREADED ROD



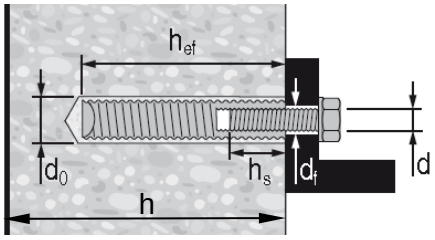
FRACTIONAL THREADED ROD

Ø d [inch]	Ø d_0 [inch]	$h_{ef\ std}$ [inch]	h_{ef} [inch]	T_{max} [ft-lb]	T_{max} [Nm]
⅜	7/16	3⅜	2⅜…7½	15	20
½	9/16	4½	2¾…10	30	41
⅝	¾	5⅝	3⅛…12½	60	81
¾	⅞	6¾	3½…15	100	136
⅞	1	7⅞	3½…17½	125	169
1	1⅛	9	4…20	150	203
1¼	1⅜	11¼	5…25	200	271

METRIC THREADED ROD

Ø d [mm]	Ø d_0 [mm]	$h_{ef\ std}$ [mm]	h_{ef} [mm]	T_{max} [Nm]
M10	12	90	60…200	20
M12	14	110	70…240	40
M16	18	125	80…320	80
M20	22	170	90…400	150
M24	28	210	96…480	200
M27	30	240	108…540	270
M30	35	270	120…600	300

HILTI HIS-N AND HIS-RN THREADED INSERTS



FRACTIONAL HILTI HIS-N AND HIS-RN THREADED INSERTS

Ø d [inch]	Ø d_0 [inch]	h_{ef} [inch]	Ø d_f [inch]	h_s [inch]	T_{max} [ft-lb]	T_{max} [Nm]
⅜	11/16	4⅜	7/16	⅜…15/16	15	20
½	⅞	5	9/16	½…1 3/16	30	41
⅝	1⅛	6¾	11/16	⅝…1½	60	81
¾	1¼	8⅛	13/16	¾…1⅞	100	136

METRIC HILTI HIS-N AND HIS-RN THREADED INSERTS

Ø d [mm]	Ø d_0 [mm]	h_{ef} [mm]	Ø d_f [mm]	h_s [mm]	T_{max} [Nm]
M8	14	90	9	8…20	10
M10	18	110	12	10…25	20
M12	22	125	14	12…30	40
M16	28	170	18	16…40	80
M20	32	205	22	20…50	150

FIGURE 3—INSTALLATION PARAMETERS FOR POST-INSTALLED ADHESIVE ANCHORS

INSTALLATION TORQUE SUBJECT TO EDGE DISTANCE:

For anchors that will be torqued during installation, the maximum torque, T_{max}, must be reduced for edge distances less than the values given in Tables 8, 12, 16, and 19 as applicable. For edge distances c_{ai} and anchor spacing s_{ai}, the maximum torque T_{max} shall comply with the following requirements:

REDUCED MAXIMUM INSTALLATION TORQUE $T_{max,red}$ FOR EDGE DISTANCES $c_{ai} < (5 \times d_a)$		
EDGE DISTANCE, c_{ai}	**MINIMUM ANCHOR SPACING, s_{ai}**	**MAXIMUM TORQUE, $T_{max,red}$**
1.75 in. (45 mm) ≤ c_{ai} < 5 x d_a	5 x d_a ≤ s_{ai} < 16 in.	0.3 x T_{max}
	s_{ai} ≥ 16 in. (406 mm)	0.5 x T_{max}

Ultimate Limit States Design:

Design resistance of anchors for compliance with the 2015 NBCC must be determined in accordance with CSA A23.3-14 Annex D, and this listing report.

Design table index is provided in Table 1 and design parameters are provided in Tables 2 through 20 of this listing report are based on the 2015 NBCC (CSA A23.3-14). The limit states design of anchors must comply with CSA A23.3-14 D.5.1, except as required in CSA A23.3-14 D.4.3.1.

Material resistance factors must be $\phi_c = 0.65$ and $\phi_s = 0.85$ in accordance with CSA A23.3-14 Sections 8.4.2 and 8.4.3, and resistance modification factor, R, as given in CSA A23.3-14 Section D.5.3, and noted in Tables 6 through 20 of this listing report, must be used for load combinations calculated in accordance with Division B, Part 4, Section 4.1.3 of the 2015 NBCC, or Annex C of CSA A23.3-14. The nominal strength, N_{sa} or V_{sa}, in Tables 6, 7, 11, 15, and 18 of this listing report must be multiplied by ϕ_s and R to determine the factored resistance, N_{sar} or V_{sar}. The nominal concrete breakout strength, N_{cb}, N_{cbg}, V_{cb}, and V_{cbg}, in Tables 8, 12, 16, and 19 of this listing report must be multiplied by ϕ_c and R to determine the factored resistance, N_{cbr}, N_{cbgr}, V_{cbr}, and V_{cbgr}.

The factored bond resistance, N_{bar}, must be multiplied by ϕ_c and the permissible installation condition factors for dry concrete, R_d, and water-saturated concrete, R_{ws}, for the corresponding installation conditions as given in Tables 10, 13, 14, 17 and 20.

For anchors to be installed in seismic regions described in NBCC 2015: The factored resistance shear strength, V_{sar}, must be adjusted by $\alpha_{V,seis}$ as given in Tables 6, 7, 11, 15 and 18 for the corresponding anchor steel. The nominal bond strength $\tau_{k,cr}$ must be adjusted by $\alpha_{N,seis}$ as given in Tables 10, 13, 14, 17 and 20.

TABLE 1—DESIGN TABLE INDEX

Design Table		Fractional		Metric	
		Table	**Page**	**Table**	**Page**
Standard Threaded Rod 	Steel Strength - N_{sa}, V_{sa}	6	11	11	16
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	8	13	12	17
	Bond Strength - N_a, N_{ag}	10	15	14	19
Hilti HIS-N and HIS-RN Internally Threaded Insert 	Steel Strength - N_{sa}, V_{sa}	18	22	18	22
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	19	23	19	23
	Bond Strength - N_a, N_{ag}	20	24	20	24

Design Table		Fractional		EU Metric		Canadian	
		Table	**Page**	**Table**	**Page**	**Table**	**Page**
Steel Reinforcing Bars 	Steel Strength - N_{sa}, V_{sa}	7	12	11	16	15	20
	Concrete Breakout - N_{cb}, N_{cbg}, V_{cb}, V_{cbg}, V_{cp}, V_{cpg}	8	13	12	17	16	20
	Bond Strength - N_a, N_{ag}	9	14	13	18	17	21

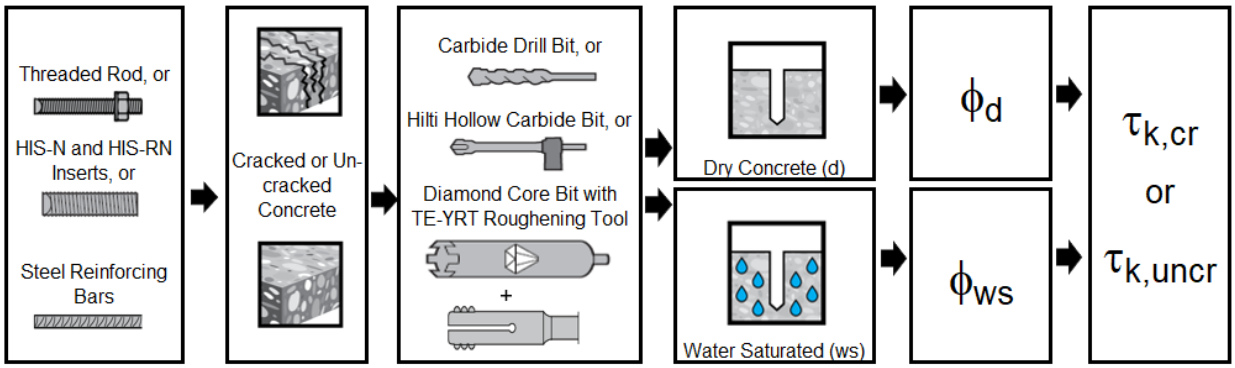


FIGURE 4—FLOWCHART FOR THE ESTABLISHMENT OF DESIGN BOND OR PULLOUT STRENGTH FOR POST-INSTALLED ADHESIVE ANCHORS

TABLE 2—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON CARBON AND STAINLESS STEEL THREADED ROD MATERIALS[1]

THREADED ROD SPECIFICATION			Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength 0.2 percent offset, f_{ya}	f_{uta}/f_{ya}	Elongation, min. percent[7]	Reduction of Area, min. percent	Specification for nuts[8]
CARBON STEEL	ASTM A193[2] Grade B7 ≤ 2½ in. (≤ 64 mm)	MPa	862	724	1.19	16	50	ASTM A563 Grade DH
	ASTM F568M[3] Class 5.8 M5 (¼ in.) to M24 (1 in.) (equivalent to ISO 898-1)	MPa	500	400	1.25	10	35	ASTM A563 Grade DH[9] DIN 934 (8-A2K)
	ISO 898-1[4] Class 5.8	MPa	500	400	1.25	22	-	DIN 934 Grade 6
	AST< F 1554, Grade 36[7]	MPa	400	248	1.61	23	40	ASTM A194 or ASTM A563
	ASTM F1554, Grade 55[7]	MPa	517	379	1.36	21	30	ASTM A194 or ASTM A563
	ASTM F1554, Grade 105[7]	MPa	862	724	1.19	15	45	ASTM A194 or ASTM A563
	ISO 898-1[4] Class 8.8	MPa	800	640	1.25	12	52	DIN 934 Grade 8
STAINLESS STEEL	ASTM F593[5] CW1 (316) ¼-in. to ⅝-in.	MPa	689	448	1.54	20	-	ASTM F594
	ASTM F593[5] CW2 (316) ¾-in. to 1½-in.	MPa	586	310	1.89	25	-	ASTM F594
	ASTM A193 Grade 8(M), Class 1[2] - 1 ¼-in.	MPa	517	207	2.50	30	50	ASTM F594
	ISO 3506-1[6] A4-70 M8 – M24	MPa	700	450	1.56	40	-	ISO 4032
	ISO 3506-1[6] A4-50 M27 – M30	MPa	500	210	2.38	40	-	ISO 4032

[1] Hilti HIT-HY 200 adhesive may be used in conjunction with all grades of continuously threaded carbon or stainless steel rod (all-thread) that comply with the code reference standards and that have thread characteristics comparable with ANSI B1.1 UNC Coarse Thread Series or ANSI B1.13M M Profile Metric Thread Series. Values for threaded rod types and associated nuts supplied by Hilti are provided here.
[2] *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*
[3] *Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners*
[4] *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs*
[5] *Standard Steel Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs*
[6] *Mechanical properties of corrosion-resistant stainless steel fasteners – Part 1: Bolts, screws and studs*
[7] Based on 2-in. (50 mm) gauge length except for A193, which are based on a gauge length of 4d and ISO 898, which is based on 5d.
[8] Nuts of other grades and styles having specified proof load stresses greater than the specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod.
[9] Nuts for fractional rods.

TABLE 3—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON STEEL REINFORCING BARS

REINFORCING BAR SPECIFICATION 		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength, f_{ya}
ASTM A615[1] Gr. 60	MPa	620	414
ASTM A615[1] Gr. 40	MPa	414	276
ASTM A706[2] Gr. 60	MPa	550	414
DIN 488[3] BSt 500	MPa	550	500
CAN/CSA-G30.18[4] Gr. 400	MPa	540	400

[1] *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement*

[2] *Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement*

[3] *Reinforcing steel; reinforcing steel bars; dimensions and masses*

[4] *Billet-Steel Bars for Concrete Reinforcement*

TABLE 4—SPECIFICATIONS AND PHYSICAL PROPERTIES OF FRACTIONAL AND METRIC HIS-N AND HIS-RN INSERTS

HILTI HIS-N AND HIS-RN INSERTS 		Minimum specified ultimate strength, f_{uta}	Minimum specified yield strength, f_{ya}
Carbon Steel DIN EN 10277-3 11SMnPb30+c or DIN 1561 9SMnPb28K $^3/_8$-in. and M8 to M10	MPa	490	410
Carbon Steel DIN EN 10277-3 11SMnPb30+c or DIN 1561 9SMnPb28K $^1/_2$ to $^3/_4$-in. and M12 to M20	MPa	460	375
Stainless Steel EN 10088-3 X5CrNiMo 17-12-2	MPa	700	350

TABLE 5—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON BOLTS, CAP SCREWS AND STUDS FOR USE WITH HIS-N AND HIS-RN INSERTS[1,2]

BOLT, CAP SCREW OR STUD SPECIFICATION 		Minimum specified ultimate strength f_{uta}	Minimum specified yield strength 0.2 percent offset f_{ya}	f_{uta}/f_{ya}	Elongation, min.	Reduction of Area, min.	Specification for nuts[6]
SAE J429[3] Grade 5	MPa	828	634	1.30	14	35	SAE J995
ASTM A325[4] $^1/_2$ to 1-in.	MPa	828	634	1.30	14	35	A563 C, C3, D, DH, DH3 Heavy Hex
ASTM A193[5] Grade B8M (AISI 316) for use with HIS-RN	MPa	759	655	1.16	15	45	ASTM F594[7] Alloy Group 1, 2 or 3
ASTM A193[5] Grade B8T (AISI 321) for use with HIS-RN	MPa	862	690	1.25	12	35	ASTM F594[7] Alloy Group 1, 2 or 3

[1] Minimum Grade 5 bolts, cap screws or studs must be used with carbon steel HIS inserts.

[2] Only stainless steel bolts, cap screws or studs must be used with HIS-RN inserts.

[3] *Mechanical and Material Requirements for Externally Threaded Fasteners*

[4] *Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength*

[5] *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service*

[6] Nuts must have specified minimum proof load stress equal to or greater than the specified minimum full-size tensile strength of the specified stud.

[7] Nuts for stainless steel studs must be of the same alloy group as the specified bolt, cap screw, or stud.

Fractional Threaded Rod

Steel Strength

TABLE 6—STEEL DESIGN INFORMATION FOR FRACTIONAL THREADED ROD

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)[1]						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
Rod O.D.		*d*	in. (mm)	0.375 (9.5)	0.5 (12.7)	0.625 (15.9)	0.75 (19.1)	0.875 (22.2)	1 (25.4)	1.25 (31.8)
Rod effective cross-sectional area		A_{se}	in.^{2} (mm^2)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	0.4617 (298)	0.6057 (391)	0.9691 (625)
ISO 898-1 Class 5.8	Factored steel resistance as governed by steel strength	N_{sa}	kN	25.0	45.8	72.9	107.9	148.9	195.3	312.5
		V_{sa}	kN	15.0	27.5	43.7	64.7	89.3	117.2	187.5
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Resistance modification factor for tension[2]	*R*	-	0.70						
	Resistance modification factor for shear[2]	*R*	-	0.65						
ASTM A193 B7	Factored steel resistance strength as governed by steel strength	N_{sa}	kN	43.1	78.9	125.7	186.0	256.7	336.8	538.8
		V_{sa}	kN	25.9	47.3	75.4	111.6	154.0	202.1	323.3
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Resistance modification factor for tension[3]	*R*	-	0.80						
	Resistance modification factor for shear[3]	*R*	-	0.75						
ASTM F1554 Gr. 36	Factored steel resistance strength as governed by steel strength	N_{sa}	kN	-	36.6	58.3	86.3	119.1	156.3	250
		V_{sa}	kN	-	22.0	35.0	51.8	71.5	93.8	150.0
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.60						
	Resistance modification factor for tension[3]	*R*	-	0.80						
	Resistance modification factor for shear[3]	*R*	-	0.75						
ASTM F1554 Gr. 55	Factored steel resistance strength as governed by steel strength	N_{sa}	kN	-	47.4	75.4	111.6	154.0	202.1	323.3
		V_{sa}	kN	-	28.4	45.2	67.0	92.4	121.3	194.0
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Resistance modification factor for tension[3]	*R*	-	0.80						
	Resistance modification factor for shear[3]	*R*	-	0.75						
ASTM F1554 Gr. 105	Factored steel resistance strength as governed by steel strength	N_{sa}	kN	-	78.9	125.7	186.0	256.7	336.8	538.8
		V_{sa}	kN	-	47.3	75.4	111.6	154.0	202.1	323.3
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Resistance modification factor for tension[3]	*R*	-	0.80						
	Resistance modification factor for shear[3]	*R*	-	0.75						
ASTM F593, CW Stainless	Factored steel resistance as governed by steel strength	N_{sa}	kN	34.5	63.1	100.5	126.5	174.6	229.0	366.4
		V_{sa}	kN	20.7	37.9	60.3	75.9	104.7	137.4	219.8
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Resistance modification factor for tension[2]	*R*	-	0.70						
	Resistance modification factor for shear[2]	*R*	-	0.65						
ASTM A193, Gr. 8(M), Class 1 Stainless	Factored steel resistance as governed by steel strength	N_{sa}	kN	-						245.7
		V_{sa}	kN	-						147.4
	Reduction for seismic shear	$\alpha_{V,seis}$	-	-						0.60
	Resistance modification factor for tension[2]	*R*	-	-						0.80
	Resistance modification factor for shear[2]	*R*	-	-						0.75

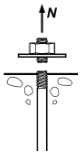
For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf

[1] Values provided for common rod material types are based on specified strengths and calculated in accordance with CSA A23.3-14 Eq. D.2 and Eq. D.31. Nuts and washers must be appropriate for the rod.

[2] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of the material resistance factors ϕ_c and ϕ_s, and the appropriate value of *R* must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a brittle steel element.

[3] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of the material resistance factors ϕ_c and ϕ_s, and the appropriate value of R must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a ductile steel element.

Fractional Reinforcing Bars



Steel Strength

TABLE 7—STEEL DESIGN INFORMATION FOR FRACTIONAL REINFORCING BARS

DESIGN INFORMATION		Symbol	Units	Nominal Reinforcing bar size (Rebar)							
				#3	#4	#5	#6	#7	#8	#9	#10
Nominal bar diameter		d	in. (mm)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	1 1/4 (31.8)
Bar effective cross-sectional area		A_{se}	in.^{2} (mm^2)	0.11 (71)	0.2 (129)	0.31 (200)	0.44 (284)	0.6 (387)	0.79 (510)	1.0 (645)	1.27 (819)
ASTM A615 Grade 40	Factored steel resistance as governed by steel strength	N_{sa}	kN	29.4	53.4	82.7	117.4	160.1	210.9	266.9	339.0
		V_{sa}	kN	17.6	32.0	49.6	70.5	96.1	126.5	160.1	203.4
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70							
	Resistance modification factor ϕ for tension[2]	R	-	0.70							
	Resistance modification factor ϕ for shear[2]	R	-	0.65							
ASTM A615 Grade 60	Factored steel resistance as governed by steel strength	N_{sa}	kN	44.0	80.1	124.1	176.2	240.2	316.3	400.4	508.5
		V_{sa}	kN	26.4	48.0	74.5	105.7	144.1	189.8	240.2	305.1
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70							
	Resistance modification factor ϕ for tension[2]	R	-	0.70							
	Resistance modification factor ϕ for shear[2]	R	-	0.65							
ASTM A706 Grade 60	Factored steel resistance as governed by steel strength	N_{sa}	kN	39.1	71.2	110.3	156.6	213.5	281.1	355.9	452.0
		V_{sa}	kN	23.5	42.7	66.2	94.0	128.1	168.7	213.5	271.2
	Reduction for seismic shear	$\alpha_{V,seis}$		0.70							
	Resistance modification factor ϕ for tension[3]	R		0.80							
	Resistance modification factor ϕ for shear[3]	R		0.75							

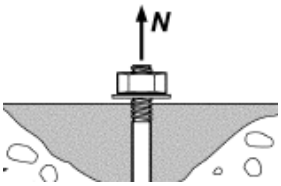
For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf

[1] Values provided for common rod material types are based on specified strengths and calculated in accordance with CSA A23.3-14 Eq. D.2 and Eq. D.31. Nuts and washers must be appropriate for the rod.

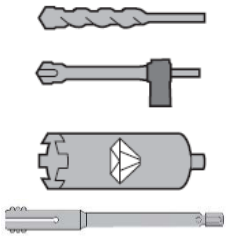
[2] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of the material resistance factors ϕ_c and ϕ_s, and the appropriate value of R must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a brittle steel element.

[3] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of the material resistance factors ϕ_c and ϕ_s, and the appropriate value of R must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a ductile steel element.

Fractional Threaded Rod and Reinforcing Bars



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

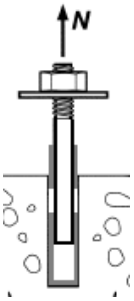
TABLE 8—CONCRETE BREAKOUT DESIGN INFORMATION FOR FRACTIONAL THREADED ROD AND REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (in.) / Reinforcing bar size							
			$^3/_8$ or #3	$^1/_2$ or #4	$^5/_8$ or #5	$^3/_4$ or #6	$^7/_8$ or #7	1 or #8	#9	$1^1/_4$ or #10
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb	17							
		(SI)	(7.1)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in-lb	24							
		(SI)	(10)							
Minimum Embedment	$h_{ef,min}$	in.	$2^3/_8$	$2^3/_4$	$3^1/_8$	$3^1/_2$	$3^1/_2$	4	$4^1/_2$	5
		(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(114)	(127)
Maximum Embedment	$h_{ef,max}$	in.	$7^1/_2$	10	$12^1/_2$	15	$17^1/_2$	20	$22^1/_2$	25
		(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(572)	(635)
Min. anchor spacing[3]	s_{min}	in.	$1^7/_8$	$2^1/_2$	$3^1/_8$	$3^3/_4$	$4^3/_8$	5	$5^5/_8$	$6^1/_4$
		(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)	(159)
Min. edge distance (Threaded rods)	c_{min}	in.	1¾	1¾	2 (3)	$2^1/_8$ (3)	2¼ (3)	2¾ (3)	n/a	$3^1/_8$ (3)
		(mm)	(45)	(45)	(50) (3)	(55) (3)	(60) (3)	(70) (3)		(80) (3)
Min. edge distance (Reinforcing bars)[3]	c_{min}	-	5d; or see Installation Torque Subject to Edge Distance for design with reduced minimum edge distances							
Minimum concrete thickness	h_{min}	in.	$h_{ef} + 1^1/_4$		$h_{ef} + 2d_0$ (4)					
		(mm)	(h_{ef} + 30)							
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	$2h_{ef}$							
Modification resistance factor for tension, concrete failure modes, Condition B[2]	R	-	1.00							
Modification resistance factor for shear, concrete failure modes, Condition B[2]	R	-	1.00							

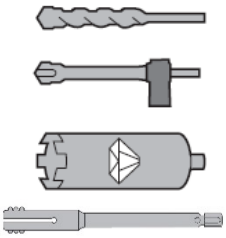
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Additional setting information is described in Figure 2, Manufacturers Printed Installation Instructions (MPII).
[2] Values provided for post-installed anchors under Condition B without supplementary reinforcement as defined in CSA A23.3-14 D.5.3.
[3] For installations with $1^3/_4$-inch edge distance, refer to Installation Torque Subject to Edge Distance for spacing and maximum torque requirements.
[4] d_0 = hole diameter.

Fractional Reinforcing Bars

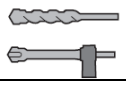
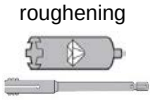


Bond Strength



Carbide Bit or
Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 9—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

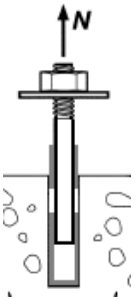
DESIGN INFORMATION		Symbol	Units	Nominal reinforcing bar size							
				#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment		$h_{ef,min}$	in. (mm)	$2^3/_8$ (60)	$2^3/_4$ (70)	$3^1/_8$ (79)	$3^1/_2$ (89)	$3^1/_2$ (89)	4 (102)	$4^1/_2$ (114)	5 (127)
Maximum Embedment		$h_{ef,max}$	in. (mm)	$7^1/_2$ (191)	10 (254)	$12^1/_2$ (318)	15 (381)	$17^1/_2$ (445)	20 (508)	$22^1/_2$ (572)	25 (635)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.4	7.4	7.5	7.5	5.7	5.8	5.9	5.9
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.8	6.9	6.9	6.9	5.3	5.3	5.4	5.4
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.8	5.9	5.9	5.9	4.5	4.6	4.6	4.6
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Permissible installation conditions	Dry concrete	Anchor Category	-	1							
		R_d	-	1.00							
	Water saturated concrete	Anchor Category	-	2							
		R_{ws}	-	0.85							
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.80				0.85	0.90	0.95	1.0
	Core drilled + roughening 			N/A		0.71	0.77	0.82	0.95	0.79	0.83

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

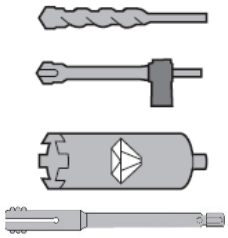
[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Fractional Threaded Rod

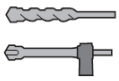
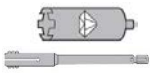


Bond Strength



Carbide Bit or
Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 10—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

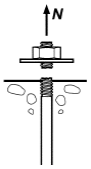
DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)						
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$	$^7/_8$	1	$1^1/_4$
Minimum Embedment		$h_{ef,min}$	in. (mm)	$2^3/_8$ (60)	$2^3/_4$ (70)	$3^1/_8$ (79)	$3^1/_2$ (89)	$3^1/_2$ (89)	4 (102)	5 (127)
Maximum Embedment		$h_{ef,max}$	in. (mm)	$7^1/_2$ (191)	10 (254)	$12^1/_2$ (318)	15 (381)	$17^1/_2$ (445)	20 (508)	25 (635)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.2	7.8	8.1	8.7	8.9	9.1	9.5
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.2	7.8	8.1	8.7	8.9	9.1	9.5
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.9	6.4	6.6	7.1	7.3	7.5	7.8
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Permissible installation conditions	Dry and water saturated concrete	Anchor Category	-	1						
		R_d, R_{ws}	-	1.00						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.99	0.99	1.0	1.0	0.95	0.99
	Core drilled + roughening 			N/A		0.88	0.96	0.96	1.0	0.82

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Metric Threaded Rod and EU Metric Reinforcing Bars



Steel Strength

TABLE 11—STEEL DESIGN INFORMATION FOR METRIC THREADED ROD AND EU METRIC REINFORCING BARS

DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (mm)[1]						
				10	12	16	20	24	27	30
Rod Outside Diameter		d	mm (in.)	10 (0.39)	12 (0.47)	16 (0.63)	20 (0.79)	24 (0.94)	27 (1.06)	30 (1.18)
Rod effective cross-sectional area		A_{se}	mm^2 (in.^{2})	58.0 (0.090)	84.3 (0.131)	157 (0.243)	245 (0.380)	353 (0.547)	459 (0.711)	561 (0.870)
ISO 898-1 Class 5.8	Factored steel resistance as governed by steel strength	N_{sa}	kN	29.0	42.0	78.5	122.5	176.5	229.5	280.5
		V_{sa}	kN	14.5	25.5	47.0	73.5	106.0	137.5	168.5
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Modification resistance factor for tension[2]	R	-	0.70						
	Modification resistance factor for shear[2]	R	-	0.65						
ISO 898-1 Class 8.8	Factored steel resistance as governed by steel strength	N_{sa}	kN	46.5	67.5	125.5	196.0	282.5	367.0	449.0
		V_{sa}	kN	23.0	40.5	75.5	117.5	169.5	220.5	269.5
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Modification resistance factor for tension[2]	R	-	0.70						
	Modification resistance factor for shear[2]	R	-	0.65						
ISO 3506-1 Class A4 Stainless[3]	Factored steel resistance as governed by steel strength	N_{sa}	kN	40.6	59.0	109.9	171.5	247.1	183.1	223.8
		V_{sa}	kN	20.3	35.4	65.9	102.9	148.3	109.9	134.3
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70						
	Modification resistance factor for tension[2]	R	-	0.70						
	Modification resistance factor for shear[2]	R	-	0.65						

DESIGN INFORMATION		Symbol	Units	Reinforcing bar size							
				10	12	14	16	20	25	28	32
Nominal bar diameter		d	mm (in.)	10.0 (0.394)	12.0 (0.472)	14.0 (0.551)	16.0 (0.630)	20.0 (0.787)	25.0 (0.984)	28.0 (1.102)	32.0 (1.260)
Bar effective cross-sectional area		A_{se}	mm^2 (in.^{2})	78.5 (0.122)	113.1 (0.175)	153.9 (0.239)	201.1 (0.312)	314.2 (0.487)	490.9 (0.761)	615.8 (0.954)	804.2 (1.247)
DIN 488 BSt 550/500	Factored steel resistance as governed by steel strength	N_{sa}	kN	43.0	62.0	84.5	110.5	173.0	270.0	338.5	442.5
		V_{sa}	kN	26.0	37.5	51.0	66.5	103.0	162.0	203.0	265.5
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70							
	Modification resistance factor for tension[2]	R	-	0.70							
	Modification resistance factor for shear[2]	R	-	0.65							

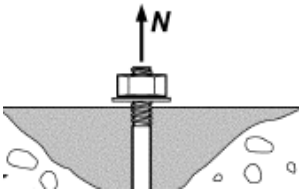
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Values provided for common rod material types are based on specified strengths and calculated in accordance with CSA A23.3 Eq. D.2 and Eq. D.31. Nuts and washers must be appropriate for the rod.

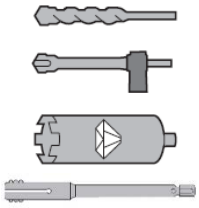
[2] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of the material resistance factors ϕ_c and ϕ_s, and the appropriate value of R must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a brittle steel element.

[3] A4-70 Stainless (M8- M24); A4-502 Stainless (M27- M30)

Metric Threaded Rod and EU Metric Reinforcing Bars



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 12—CONCRETE BREAKOUT DESIGN INFORMATION FOR METRIC THREADED ROD AND EU METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

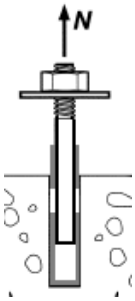
DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (mm)						
			10	12	16	20	24	27	30
Minimum Embedment	$h_{ef,min}$	mm	60	70	80	90	96	108	120
		(in.)	(2.4)	(2.8)	(3.1)	(3.5)	(3.8)	(4.3)	(4.7)
Maximum Embedment	$h_{ef,max}$	mm	200	240	320	400	480	540	600
		(in.)	(7.9)	(9.4)	(12.6)	(15.7)	(18.9)	(21.3)	(23.6)
Min. anchor spacing[3]	s_{min}	mm	50	60	80	100	120	135	150
		(in.)	(2.0)	(2.4)	(3.2)	(3.9)	(4.7)	(5.3)	(5.9)
Min. edge distance[3]	c_{min}	-	5d; or see Installation Torque Subject to Edge Distance for design with reduced minimum edge distances						
Minimum concrete thickness	h_{min}	mm	h_{ef} + 30	h_{ef} + $2d_o$[4]					
		(in.)	(h_{ef} + $1^1/_4$)						

DESIGN INFORMATION	Symbol	Units	Reinforcing bar size							
			10	12	14	16	20	25	28	32
Minimum Embedment	$h_{ef,min}$	mm	60	70	75	80	90	100	112	128
		(in.)	(2.4)	(2.8)	(3.0)	(3.1)	(3.5)	(3.9)	(4.4)	(5.0)
Maximum Embedment	$h_{ef,max}$	mm	200	240	280	320	400	500	560	640
		(in.)	(7.9)	(9.4)	(11.0)	(12.6)	(15.7)	(19.7)	(22.0)	(25.2)
Min. anchor spacing[3]	s_{min}	mm	50	60	80	100	120	135	140	160
		(in.)	(2.0)	(2.4)	(3.2)	(3.9)	(4.7)	(5.3)	(5.5)	(6.3)
Min. edge distance[3]	c_{min}	-	5d; or see Installation Torque Subject to Edge Distance for design with reduced minimum edge distances							
Minimum concrete thickness	h_{min}	mm	h_{ef} + 30	h_{ef} + $2d_o$[4]						
		(in.)	(h_{ef} + $1^1/_4$)							
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	$2h_{ef}$							
Effectiveness factor for cracked concrete	$k_{c,cr}$	SI	7.1							
		(-)	(17)							
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	SI	10							
		(-)	(24)							
Modification resistance factor for tension, concrete failure modes, Condition B[2]	R	-	1.00							
Modification resistance factor for shear, concrete failure modes, Condition B[2]	R	-	1.00							

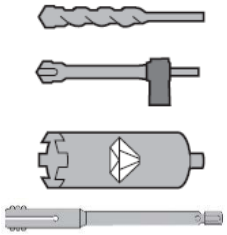
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Additional setting information is described in Figure 9, Manufacturers Printed Installation Instructions (MPII).
[2] Values provided for post-installed anchors installed under Condition B without supplementary reinforcement as defined in in CSA A23.3-14 D.5.3.
[3] For installations with $1^3/_4$-inch edge distance, refer to Installation Torque Subject to Edge Distance for spacing and maximum torque requirements.
[4] d_0 = hole diameter.

EU Metric Reinforcing Bars



Bond Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 13—BOND STRENGTH DESIGN INFORMATION FOR EU METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

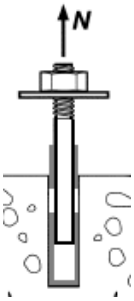
DESIGN INFORMATION		Symbol	Units	Reinforcing bar size							
				10	12	14	16	20	25	28	32
Minimum Embedment		$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	75 (3.0)	80 (3.1)	90 (3.5)	100 (3.9)	112 (4.4)	128 (5.0)
Maximum Embedment		$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	280 (11.0)	320 (12.6)	400 (15.7)	500 (19.7)	560 (22.0)	640 (25.2)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.4	7.5	7.5	7.5	7.5	5.8	5.8	5.9
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.8	6.9	6.9	6.9	6.9	5.3	5.4	5.4
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.8	5.9	5.9	5.9	5.9	4.6	4.6	4.6
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Permissible Installation Conditions	Dry concrete	Anchor Category	-	1							
		R_d	-	1.0							
	Water saturated concrete	Anchor Category	-	2							
		R_{ws}	-	0.85							
Reduction for seismic tension	Hammer drilled	$\alpha_{N,seis}$	-	0.80					0.85	0.90	1.00
	Core drilled + roughening			N/A			0.71	0.77	0.86	0.78	0.86

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

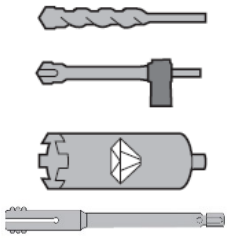
[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature =110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Metric Threaded Rod

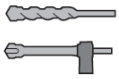
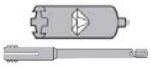


Bond Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 14—BOND STRENGTH DESIGN INFORMATION FOR METRIC THREADED ROD IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

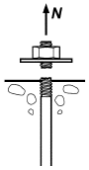
DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (mm)						
				10	12	16	20	24	27	30
Minimum Embedment		$h_{ef,min}$	mm (in.)	60 (2.4)	70 (2.8)	80 (3.1)	90 (3.5)	96 (3.8)	108 (4.3)	120 (4.7)
Maximum Embedment		$h_{ef,max}$	mm (in.)	200 (7.9)	240 (9.4)	320 (12.6)	400 (15.7)	480 (18.9)	540 (21.3)	600 (23.6)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.3	7.6	8.1	8.8	9.0	9.2	9.4
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.3	7.6	8.2	8.8	9.0	9.2	9.4
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	15.3	15.3	15.3	15.3	15.3	15.3	15.3
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.0	6.3	6.6	7.2	7.4	7.6	7.7
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Permissible Installation Conditions	Dry and water saturated concrete	Anchor Category	-	1						
		R_d, R_{ws}	-	1.00						
Reduction for seismic tension	Hammer drilled 	$\alpha_{N,seis}$	-	0.88	0.88	0.99	1.0	0.95	0.95	0.95
	Core drilled + roughening 			N/A		0.88	0.96	0.96	0.82	0.82

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Canadian Reinforcing Bars



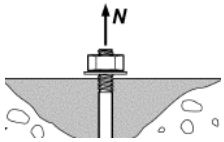
Steel Strength

TABLE 15—STEEL DESIGN INFORMATION FOR CANADIAN METRIC REINFORCING BARS

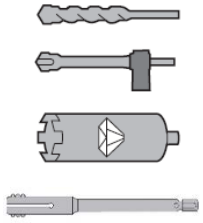
DESIGN INFORMATION		Symbol	Units	Bar size				
				10 M	15 M	20 M	25 M	30 M
Nominal bar diameter		d	mm (in.)	11.3 (0.445)	16.0 (0.630)	19.5 (0.768)	25.2 (0.992)	29.9 (1.177)
Bar effective cross-sectional area		A_{se}	mm^2 ($in.^2$)	100.3 (0.155)	201.1 (0.312)	298.6 (0.463)	498.8 (0.773)	702.2 (1.088)
CSA G30	Factored steel resistance as governed by steel strength	N_{sa}	kN	54.0	108.5	161.5	270.0	380.0
		V_{sa}	kN	32.5	65.0	97.0	161.5	227.5
	Reduction for seismic shear	$\alpha_{V,seis}$	-	0.70				
	Modification resistance factor for tension[1]	R	-	0.70				
	Modification resistance factor for shear[1]	R	-	0.65				

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi
[1] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of material resistance factors ϕ_c and ϕ_s, the appropriate value of R must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a brittle steel element.

Canadian Reinforcing Bars



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

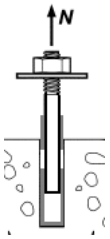
TABLE 16—CONCRETE BREAKOUT DESIGN INFORMATION FOR CANADIAN METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION	Symbol	Units	Bar size				
			10 M	15 M	20 M	25 M	30 M
Effectiveness factor for cracked concrete	$k_{c,cr}$	SI (in-lb)	7.1 (17)				
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	SI (in-lb)	10 (24)				
Minimum Embedment	$h_{ef,min}$	mm (in.)	70 (2.8)	80 (3.1)	90 (3.5)	101 (4.0)	120 (4.7)
Maximum Embedment	$h_{ef,max}$	mm (in.)	226 (8.9)	320 (12.6)	390 (15.4)	504 (19.8)	598 (23.5)
Min. bar spacing[3]	s_{min}	mm (in.)	57 (2.2)	80 (3.1)	98 (3.8)	126 (5.0)	150 (5.9)
Min. edge distance[3]	c_{min}	mm (in.)	5d; or see Installation Torque Subject to Edge Distance for design with reduced minimum edge distances				
Minimum concrete thickness	h_{min}	mm (in.)	h_{ef} + 30 (h_{ef} + $1^1/_4$)	$h_{ef} + 2d_o$[4]			
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	$2h_{ef}$				
Modification resistance factor for tension, concrete failure modes, Condition B[2]	R	-	1.00				
Modification resistance factor for shear, concrete failure modes, Condition B[2]	R	-	1.00				

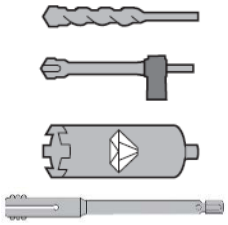
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Additional setting information is described in Figure 9, Manufacturers Printed Installation Instructions (MPII).
[2] Values provided for post-installed anchors installed under Condition B without supplementary reinforcement.
[3] For installations with $1^3/_4$-inch the edge distance, refer to Installation Torque Subject to Edge Distance for spacing and maximum torque requirements.
[4] d_o = hole diameter.

Canadian Reinforcing Bars



Bond Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 17—BOND STRENGTH DESIGN INFORMATION FOR CANADIAN METRIC REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL [1]

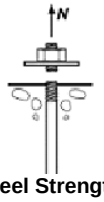
DESIGN INFORMATION		Symbol	Units	Bar size				
				10 M	15 M	20 M	25 M	30 M
Minimum Embedment		$h_{ef,min}$	mm (in.)	70 (2.8)	80 (3.1)	90 (3.5)	101 (4.0)	120 (4.7)
Maximum Embedment		$h_{ef,max}$	mm (in.)	226 (8.9)	320 (12.6)	390 (15.4)	504 (19.8)	598 (23.5)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	7.4	7.5	7.5	5.8	5.9
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	10.8	10.8	10.8	10.8	10.8
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.8	6.9	6.9	5.3	5.4
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	9.9	9.9	9.9	9.9	9.9
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	5.8	5.9	5.9	4.6	4.6
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	8.5	8.5	8.5	8.5	8.5
Permissible installation conditions	Dry concrete	Anchor Category	-	1				
		R_d	-	1.00				
	Water saturated concrete	Anchor Category	-	2				
		R_{ws}	-	0.85				
Reduction for seismic tension	Hammer drilled	$\alpha_{N,seis}$	-	0.80			0.85	0.97
	Core drilled + roughening			N/A	0.71	0.77	N/A	

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [For SI: $(f'_c / 17.2)^{0.1}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature = 110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Steel Strength

TABLE 18—STEEL DESIGN INFORMATION FOR FRACTIONAL AND METRIC HIS-N AND HIS-RN THREADED INSERTS[1]

DESIGN INFORMATION		Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$		8	10	12	16	20
HIS Insert O.D.		*D*	in. (mm)	0.65 (16.5)	0.81 (20.5)	1.00 (25.4)	1.09 (27.6)	mm (in.)	12.5 (0.49)	16.5 (0.65)	20.5 (0.81)	25.4 (1.00)	27.6 (1.09)
HIS insert length		L	in. (mm)	4.33 (110)	4.92 (125)	6.69 (170)	8.07 (205)	mm (in.)	90 (3.54)	110 (4.33)	125 (4.92)	170 (6.69)	205 (8.07)
Bolt effective cross-sectional area		A_{se}	in.^{2} (mm^2)	0.0775 (50)	0.1419 (92)	0.2260 (146)	0.3345 (216)	mm (in.^{2}	36.6 (0.057)	58 (0.090)	84.3 (0.131)	157 (0.243)	245 (0.380)
HIS insert effective cross-sectional area		A_{insert}	in.^{2} (mm^2)	0.178 (115)	0.243 (157)	0.404 (260)	0.410 (265)	mm (in.^{2}	51.5 (0.080)	108 (0.167)	169.1 (0.262)	256.1 (0.397)	237.6 (0.368)
ASTM A193 B7	Factored resistance steel strength – ASTM A193 B7[3] bolt/cap screw	N_{sa}	kN	25.6	46.9	74.8	110.7	kN (lb)	- -	- -	- -	- -	- -
		V_{sa}	kN	14.3	26.1	41.7	61.7	kN (lb)	- -	- -	- -	- -	- -
	Factored resistance steel strength – HIS-N insert	N_{sa}	kN	33.5	42.8	71.3	168.0	kN (lb)	- -	- -	- -	- -	- -
ASTM A193 Grade B8M SS	Factored resistance steel strength – ASTM A193 Grade B8M SS bolt/cap screw	N_{sa}	kN	37.9	69.4	110.6	163.7	kN (lb)	- -	- -	- -	- -	- -
		V_{sa}	kN	22.8	41.7	66.3	98.2	kN (lb)	- -	- -	- -	- -	- -
	Factored resistance steel strength – HIS-RN insert	N_{sa}	kN	76.3	104.2	173.3	175.9	kN (lb)	- -	- -	- -	- -	- -
ISO 898-1 Class 8.8	Factored resistance steel strength – ISO 898-1 Class 8.8 bolt/cap screw	N_{sa}	lb (kN)	- -	- -	- -	- -	kN	29.5	46.5	67.5	125.5	196.0
		V_{sa}	lb (kN)	- -	- -	- -	- -	kN	17.5	28.0	40.5	75.5	117.5
	Factored resistance steel strength – HIS-N insert	N_{sa}	lb (kN)	- -	- -	- -	- -	kN	25.0	53.0	78.0	118.0	110.0
ISO 3506-1 Class A4-70 Stainless	Factored resistance steel strength – ISO 3506-1 Class A4-70 Stainless bolt/cap screw	N_{sa}	lb (kN)	- -	- -	- -	- -	kN	25.5	40.5	59.0	110.0	171.5
		V_{sa}	lb (kN)	- -	- -	- -	- -	kN	15.5	24.5	35.5	66.0	103.0
	Factored resistance steel strength – HIS-RN insert	N_{sa}	lb (kN)	- -	- -	- -	- -	kN	36.0	75.5	118.5	179.5	166.5
Reduction for seismic shear		$\alpha_{V,seis}$	-	0.70				-	0.70				
Modification resistance factor for tension[2]		*R*	-	0.70				-	0.70				
Modification resistance factor for shear[2]		*R*	-	0.65				-	0.65				

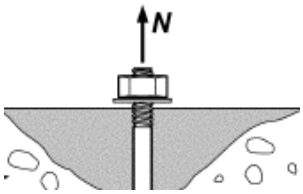
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Values provided for common rod material types based on specified strengths and calculated in accordance with CSA A23.3 Eq. D.2 and Eq. D.31. Nuts and washers must be appropriate for the rod.

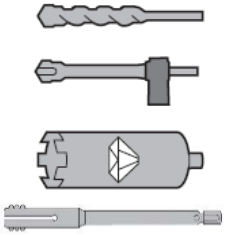
[2] For use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 NBCC or Annex C of CSA A23.3-14, the tabulated value of material resistance factors ϕ_c and ϕ_s, and the appropriate value of *R* must be applied in accordance with CSA A23.3-14 D.5.3. Values correspond to a brittle steel element for the HIS insert.

[3] For the calculation of the design steel strength in tension and shear for the bolt or screw, the *R* fact or for ductile steel failure according to CSA A23.3-14 D.5.3 can be used.

Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Concrete Breakout Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

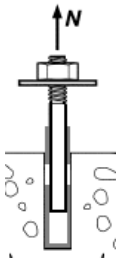
TABLE 19—CONCRETE BREAKOUT DESIGN INFORMATION FOR FRACTIONAL AND METRIC HILTI HIS-N AND HIS-RN INSERTS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION	Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
			$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$		8	10	12	16	20
Effectiveness factor for cracked concrete	$k_{c,cr}$	in-lb	17				SI	7.1				
		(SI)	(7.1)				(in-lb)	(17)				
Effectiveness factor for uncracked concrete	$k_{c,uncr}$	in-lb	24				SI	10				
		(SI)	(10)				(in-lb)	(24)				
Effective embedment depth	h_{ef}	in.	$4^3/_8$	5	$6^3/_4$	$8^1/_8$	mm	90	110	125	170	205
		(mm)	(110)	(125)	(170)	(205)	(in.)	(3.5)	(4.3)	(4.9)	(6.7)	(8.1)
Min. anchor spacing[3]	s_{min}	in.	$3^1/_4$	4	5	$5^1/_2$	mm	63	83	102	127	140
		(mm)	(83)	(102)	(127)	(140)	(in.)	(2.5)	(3.25)	(4.0)	(5.0)	(5.5)
Min. edge distance[3]	c_{min}	in.	$3^1/_4$	4	5	$5^1/_2$	mm	63	83	102	127	140
		(mm)	(83)	(102)	(127)	(140)	(in.)	(2.5)	(3.25)	(4.0)	(5.0)	(5.5)
Minimum concrete thickness	h_{min}	in.	5.9	6.7	9.1	10.6	mm	120	150	170	230	270
		(mm)	(150)	(170)	(230)	(270)	(in.)	(4.7)	(5.9)	(6.7)	(9.1)	(10.6)
Critical edge distance – splitting (for uncracked concrete)	c_{ac}	-	See Installation Torque Subject to Edge Distance of this report				-	See Installation Torque Subject to Edge Distance of this report				
Modification resistance factor for tension, concrete failure modes, Condition B[2]	R	-	1.00				-	1.00				
Modification resistance factor for shear, concrete failure modes, Condition B[2]	R	-	1.00				-	1.00				

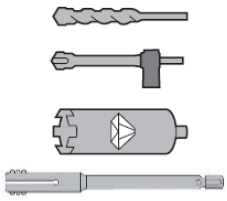
For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Additional setting information is described in Figure 9, Manufacturers Printed Installation Instructions (MPII).
[2] Values provided for post-installed anchors installed under Condition B without supplementary reinforcement as defined in CSA A23.3 D.5.3.
[3] For installations with $1^3/_4$-inch edge distance, refer to Installation Torque Subject to Edge Distance for spacing and maximum torque requirements.

Fractional and Metric HIS-N and HIS-RN Internal Threaded Insert



Bond Strength



Carbide Bit or Hilti Hollow Carbide Bit or Diamond Core Bit + Roughening Tool

TABLE 20—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL AND METRIC HILTI HIS-N AND HIS-RN INSERTS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT) OR CORE DRILLED WITH A DIAMOND CORE BIT AND ROUGHENED WITH A HILTI ROUGHENING TOOL[1]

DESIGN INFORMATION		Symbol	Units	Nominal Bolt/Cap Screw Diameter (in.) Fractional				Units	Nominal Bolt/Cap Screw Diameter (mm) Metric				
				$^3/_8$	$^1/_2$	$^5/_8$	$^3/_4$		8	10	12	16	20
Effective embedment depth		h_{ef}	in. (mm)	$4^3/_8$ (110)	5 (125)	$6^3/_4$ (170)	$8^1/_8$ (205)	mm (in.)	90 (3.5)	110 (4.3)	125 (4.9)	170 (6.7)	205 (8.1)
HIS Insert O.D.		D	in. (mm)	0.65 (16.5)	0.81 (20.5)	1.00 (25.4)	1.09 (27.6)	mm (in.)	12.5 (0.49)	16.5 (0.65)	20.5 (0.81)	25.4 (1.00)	27.6 (1.09)
Temperature range A[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.0	6.1	6.3	6.3	MPa	5.9	6.0	6.1	6.3	6.3
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	13.5	13.5	13.5	13.5	MPa	13.5	13.5	13.5	13.5	13.5
Temperature range B[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	6.0	6.1	6.3	6.3	MPa	5.9	6.0	6.1	6.3	6.3
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	13.5	13.5	13.5	13.5	MPa	13.5	13.5	13.5	13.5	13.5
Temperature range C[2]	Characteristic bond strength in cracked concrete	$\tau_{k,cr}$	MPa	4.9	5.0	5.2	5.2	MPa	4.8	4.9	5.0	5.2	5.2
	Characteristic bond strength in uncracked concrete	$\tau_{k,uncr}$	MPa	11.0	11.0	11.0	11.0	MPa	11.0	11.0	11.0	11.0	11.0
Permissible installation conditions	Dry and water saturated concrete	Anchor Category	-	1				-	1				
		R_d	-	1.00				-	1.00				
Reduction for seismic tension	Hammer drilled	$\alpha_{N,seis}$	-	0.92				-	0.92				
	Core drilled + roughening			0.81	0.88	0.92	0.76		N/A	0.81	0.88	0.92	0.76

For **SI**: 1 inch ≡ 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ for uncracked concrete, [For SI: $(f'_c / 17.2)^{0.1}$] and $(f'_c / 2{,}500)^{0.3}$ for cracked concrete, [For SI: $(f'_c / 17.2)^{0.3}$].

[2] Temperature range A: Maximum short term temperature = 130°F (55°C), Maximum long term temperature =110°F (43°C).
Temperature range B: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Temperature range C: Maximum short term temperature = 248°F (120°C), Maximum long term temperature = 162°F (72°C).
Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.

Conditions of listing:

1. The listing report addresses only conformance with the standards and code sections noted above.
2. Approval of the product's use is the sole responsibility of the local code official.
3. The listing report applies only to the materials tested and as submitted for review by ICC-ES.
4. Anchor sizes, dimensions, minimum embedment depths and other installation parameters are as set forth in this listing report.
5. Anchors must be limited to use in cracked and uncracked normal-weight concrete and lightweight concrete having a specified compressive strength, f'_c, of 17.2 MPa (2,500 psi) to 58.6 MPa (8,500 psi).
6. The values of f'_c, used for calculation purposes must not exceed 55 MPa.
7. Limit states design values must be established in accordance with this listing report.
8. The use of fatigue or shock loading for these anchors under such conditions is beyond the scope of this listing report.
9. Anchors may be used to resist short-term loading due to wind or seismic forces in locations designed according to NBCC 2015.
10. Where not otherwise prohibited in the code as referenced in CSA A23.3-14, Hilti HIT-HY 200 Adhesive Anchor System are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:
    a. Anchors are used to resist wind or seismic forces only.
    b. Anchors that support a fire-resistance-rated envelope or a fire- resistance-rated membrane are protected by approved fire-resistance- rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
    c. Anchors are used to support nonstructural elements.
11. Use of zinc-coated carbon steel anchors is limited to dry, interior locations.
12. Use of anchors made of stainless steel as specified in this report are permitted for exterior exposure and damp environments.
13. Steel anchoring materials in contact with preservative-treated wood and fire-retardant-treated wood must be of zinc-coated carbon steel or stainless steel. The minimum coating weights for zinc-coated steel must comply with ASTM A153.
14. Installation of anchors in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed by personnel certified by an applicable certification program, and the certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent in accordance with CSA A23.3-14 D.10.2.3. The installation shall be continuously inspected during installation by an inspector specially approved for that purpose. The special inspector shall furnish a report to the licensed design professional and building official that the work covered by the report has been performed and that the materials used and the installation procedures used conform with the approved contract documents and the MPII in accordance with CSA A23.3-14 D.10.2.4.
15. Anchors when installed at temperatures below 40°F (5°C) shall not be used for applications where the concrete temperature can rise from 40°F (5°C) or less to 80°F (27°C) or higher within a 12-hour period. Such applications may include but are not limited to anchorage of building facade systems and other applications subject to direct sun exposure.
16. Anchors may be used to resist tension and shear forces in floor, wall, and overhead installations only if installation is into concrete with a temperature between 14°F (-10°C) and 104°F (40°C) for threaded rods, rebar, and Hilti HIS-(R)N inserts. Overhead installations for hole diameters larger than $^{7}/_{16}$-inch or 10mm require the use of piston plugs (HIT-SZ, -IP) during injection to the back of the hole. $^{7}/_{16}$-inch diameter holes may be injected directly to the back of the hole with the use of extension tubing on the end of the nozzle. The anchor or post-installed reinforcing bars must be supported until fully cured (i.e., with Hilti HIT-OHW wedges, or other suitable means). Where temporary restraint devices are used, their use shall not result in impairment of the anchor shear resistance. Installation in concrete temperature below 32°F requires the adhesive to be conditioned to a minimum temperature of 32°F.