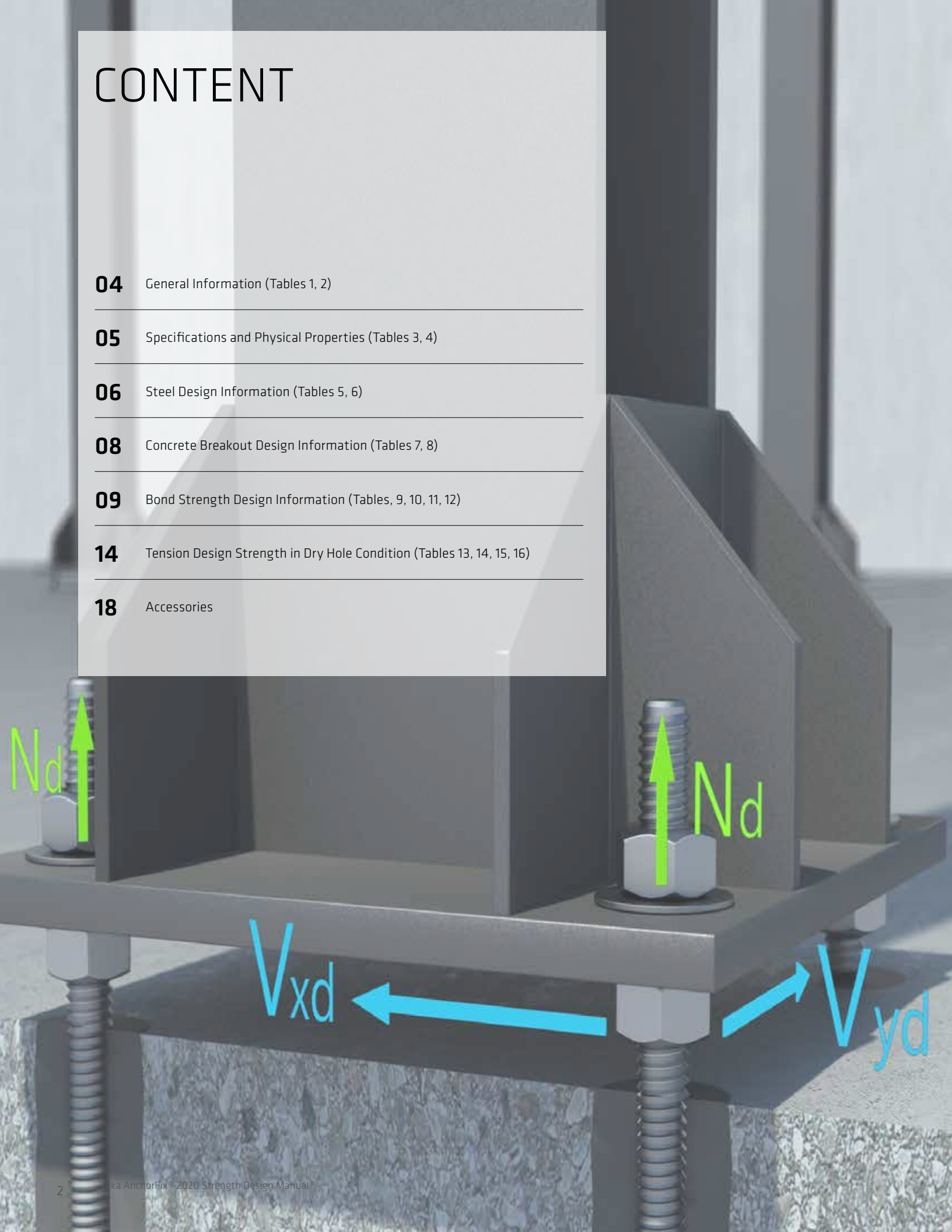
# DESIGN GUIDE
# Sika AnchorFix®-2020

STRENGTH DESIGN MANUAL

BUILDING TRUST
CONSTRUIRE LA CONFIANCE

# CONTENT





# Sika AnchorFix®-2020

## PRODUCT DESCRIPTION
Sika AnchorFix®-2020 is a two-component, solvent and styrene-free, epoxy acrylate-based anchoring adhesive engineered for application down to -10 °C. Sika AnchorFix®-2020 achieves high early strengths quickly in numerous base materials and is suitable for medium / heavy loads in both structural and non-structural applications.

## FEATURES
- Fast curing - cures down to -10 °C when material is pre-conditioned to 5 °C.
- Cartridge format compatible with standard application guns.
- High load capacity.
- Suitable for cracked and uncracked concrete.
- Styrene-free, VOC-compliant and odourless.
- Non-sag, may be applied overhead.
- Sets up in dry or damp holes.
- Approved for threaded rods and reinforcing bars in concrete.
- Approved for threaded bars and sockets in masonry.
- Reduced edge and spacing values allowing critical applications.
- Reduced drilling diameters of 2 mm clearance resulting in economic installation.
- Flexible embedment depths from 8d -12d.
- Resistant to a wide range of chemicals. Contact Sika Canada for detailed information.

| Head Type | | | | | Base Material | | | | Corrosion Resistance | | | Features | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stud (Externally Threaded) | Flush or Internally Threaded | Rebar | Hex Bolt | Round/ Mushroom | Concrete | Lightweight Concrete | Grout-filled Block | Hollow Block/ Brick | Hot-Dip Galvanized Steel | 304 Stainless Steel | 316 Stainless Steel | Seismic | Cracked Concrete | Uncracked Concrete | Dry /Water-Satured Concrete | Water-filled | Unreinforced Brick | Oversized Holes | Cored Holes | Submerged | Overhead |
| ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■* | ■ | ■ | ■ | ■ | | | | | ■ |

* Only with threaded rods

## APPROVALS AND LISTINGS
- ANSI/NSF Standard 61 approved for contact with potable water.
- Seismic Design Categories: C, D, E & F under the IBC or IRC.
- ES to AC308 by IAPMO (ER-0601) - approved for cracked and uncracked concrete.
- Evaluation in progress for The Road Authority (TRA) and Ministry of Transportation of Ontario (MTO) - 9.30.25 prequalification list for Structural Dowel Adhesives - Acrylic and Epoxy Resins.
- Ministère des Transports du Québec
- IBC/IRC

## PACKAGING
- 300 mL (10.1 US fl. oz) Single piston cartridge, (12 per case)
- 825 mL (27.8 US fl. oz) Side-by-side 10:1 cartridge, (6 per case)

## SHELF LIFE
12 months if stored properly in original and unopened packaging, in cool and dry conditions, out of direct sunlight, and at temperatures between 5 and 25 °C (41 and 77 °F). Pre-condition product to 23 °C (73 °F) to ease application when using hand dispensers and working at low temperatures.

## HEALTH AND SAFETY
For information and advice on the safe handling, storage and disposal of chemical products, users should refer to the most recent Safety Data Sheet containing physical, ecological, toxicological and other safety-related data.

# GENERAL INFORMATION

**Table 1**

**INSTALLATION INFORMATION**

| Characteristic | | Symbol | Units | Nominal Anchor Element Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fractional Threaded Rods (in) | Size | $d_a$ | in | - | 3/8 | 1/2 | 5/8 | 3/4 | 1 | - | 1-1/4 |
| | Drill Size | $d_o$ | in | - | 1/2 | 9/16 | 11/16 | 13/16 | 1-1/16 | - | 1-3/8 |
| US Reinforcing Bars | Size | $d_a$ | in | - | #3 | #4 | #5 | #6 | #8 | - | #10 |
| | Drill Size | $d_o$ | in | - | 9/16 | 5/8 | 3/4 | 1 | 1-1/4 | - | 1-5/8 |
| Embedment Depth Range for US / fractional Sized Anchors | | $h_{ef,min}$ | in | - | 2-3/8 | 2 -3/4 | 3-1/8 | 3-1/2 | 4 | - | 5 |
| | | $h_{ef,min}$ | in | - | 7-1/2 | 10 | 12-1/2 | 15 | 20 | - | 25 |
| Metric Threaded Rods | Size | $d_a$ | mm | M8 | MIO | M I2 | M16 | M20 | M24 | M27 | M30 |
| | Drill Size | $d_o$ | mm | 10 | 12 | 14 | 18 | 22 | 26 | 30 | 35 |
| Embedment Depth Range for Metric Threaded Rods | | $h_{ef,min}$ | mm | 60 | 70 | 80 | 90 | 90 | 102 | 108 | 127 |
| | | $h_{ef,max}$ | mm | 160 | 200 | 240 | 320 | 400 | 480 | 540 | 600 |
| Metric Reinforcing Bars | Size | $d_a$ | mm | 08 | 0 10 | 0 12 | 0 16 | 020 | 025 | - | 032 |
| | Drill Size | $d_o$ | mm | 12 | 14 | 16 | 20 | 25 | 32 | - | 40 |
| Embedment Depth Range for Metric Reinforcing Bars | | $h_{ef,min}$ | mm | 60 | 70 | 80 | 90 | 90 | 102 | - | 127 |
| | | $h_{ef,max}$ | mm | 160 | 200 | 240 | 320 | 400 | 500 | - | 640 |
| Maximum Tightening Torque | | $T_{inst}$ | ft.lb (Nm) | 7 (10) | 15 (20) | 30 (40) | 60 (80) | 110 (1 50) | 145 (200) | 160 (216) | 200 (275) |
| Minimum Concrete Thickness | | $h_{ef,min}$ | - | 2.0 $h_{ef}$ | | | | | | | |
| Critical Edge Distance | | $C_{ac}$ | - | See Section 3.2.6 of IAPMO UES ER-0601 | | | | | | | |
| Minimum Edge Distance | | $c_{min}$ | - | 0.5 $h_{ef}$ | | | | | | | |
| Minimum Anchor Spacing | | $s_{min}$ | - | 0.5 $h_{ef}$ | | | | | | | |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.
For use with the design provisions of ACI 318-14 Ch. 17 or ACI 318-11 Appendix D as applicable, ICC-ESAC308, Section 4.2 and IAPMO UES ER-0601.
For No. 8 rebar an 1-1/4" ANSI drill bit is also suitable for use.
Torque may not be applied to the anchors until the full cure time of the adhesive has been achieved.
For ASTM A36/F1554 Grade 36 carbon steel threaded rods with 3/8-inch-diameter, Tmax = 11 ft-lb.
For installations at the reduced minimum edge distance, $c_{min,red}$, the maximum toque applied must be max torque reduced, $T_{max,red}$.
For installations at the reduced minimum edge distance, $c_{min,red}$, the miminim spacing, $s_{min}$ = 5 x da.

**Table 2**

**WORKING (GEL) AND LOADING (CURE) TIMES**

| Concrete Temperature | Gel Time[1] | Cure Time[2] |
|---|---|---|
| -10 to 5 °C | 15 min | 12 h |
| 5 to 10 °C | 10 min | 145 min |
| 10 to 15 °C | 8 min | 85 min |
| 15 to 20 °C | 6 min | 75 min |
| 20 to 25 °C | 5 min | 50 min |
| 25 to 30 °C | 4 min | 40 min |
| 30 to 35 °C | 2 min | 30 min |
| Cartridge shall be conditioned to a minimum 5 °C prior to use. | | |

[1]Gel time refers to the highest temperature in the range.
[2]Cure time refers to the lowest temperature in the range.

# SPECIFICATIONS AND PHYSICAL PROPERTIES

**Table 3**

**COMMON THREADED CARBON AND STAINLESS STEEL ROD MATERIALS**

| Threaded Rod Specification | | Units | Minimum Specified Ultimate Strength | Minimum Specified Yield Strength | $f_{uta}$ / $f_{ya}$ | Minimum Percent Elongation | Minimum Percent Reduction of Area | Specification for Nuts |
|---|---|---|---|---|---|---|---|---|
| Carbon Steel | ASTM F1554 Grade 36 (A 307 Gr.C)[1] | MPa (psi) | 400 (58 000) | 250 (36 000) | 1.61 | 23 | 40 | ASTM A194 Grade A |
| | ASTM A193 Grade B7[1] | MPa (psi) | 860 (125 000) | 725 (105 000) | 1.19 | 16 | 50 | ASTM A194 |
| | ISO 898-1 Class 5.8[1] | MPa (psi) | 500 (72 500) | 400 (58 000) | 1.25 | 22 | 35 | DIN 934 (Grade 6) |
| | ISO 898-1 Class 8.8[2] | MPa (psi) | 800 (116 000) | 640 (92 800) | 1.25 | 12 | 52 | DIN 934 (Grade 8) |
| Stainless Steel | ASTM F593 CWI (1/4 - 5/8)[2] | MPa (psi) | 690 (100 000) | 450 (65 000) | 1.54 | 20 | - | F594 |
| | ASTM F593 CW2 (3/4 - 1 1/4)[2] | MPa (psi) | 585 (85 000) | 310 (45 000) | 1.89 | 25 | - | F594 |
| | ASTM F593 SH1[2] | MPa (psi) | 800 (115 000) | 620 (90 000) | 1.28 | 12 | - | - |
| | ASTM F593 SH2[2] | MPa (psi) | 725 (105 000) | 480 (70 000) | 1.50 | 15 | - | - |
| | ASTM F593 SH3[2] | MPa (psi) | 655 (95 000) | 380 (55 000) | 1.73 | 20 | - | - |
| | ISO 3506 -1 A4-70[2] | MPa (psi) | 700 (101 500) | 450 (65 250) | 1.56 | 40 | - | ISO 4032 |
| | ISO 3506-1 A4-80[2] | MPa (psi) | 800 (116 000) | 600 (87 000) | 1.33 | 30 | - | - |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.
[1] Rods are considered ductile steel elements in accordance with Sections 4.3.4. 1, 4.3.4.2 and 4.3.5 of IAPMO UES ER-0601.
[2] Rods are conside red brittle steel elements in accordance with Sections 4.3.4.1, 4.3.4.2 and 4.3.5 of IAPMO UES ER-0601.

**Table 4**

**COMMON STEEL DEFORMED REINFORCING BARS**

| Reinforcing Bar Specification | Units | Minimum Specified Ultimate Strength, $f_{uta}$ | Minimum Specified Yield Strength, $f_{ya}$ |
|---|---|---|---|
| ASTM A615 Grade 40 | MPa (psi) | 415 (60 000) | 275 (40 000) |
| ASTM A615 Grade 60 | MPa (psi) | 620 (90 000) | 415 (60 000) |
| DIN 488 BSt 500 | MPa (psi) | 550 (79 750) | 500 (72 500) |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

# STEEL DESIGN INFORMATION

**Table 5**

**US CUSTOMARY STEEL THREADED RODS AND REINFORCING BAR STEEL GRADES[1]**

| | Characteristic | Symbol | Units | Nominal Anchor Element Diameter | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fractionnal Threaded Rods | Nominal Anchor Diameter | $d_a$ | in | 3/8 | 1/2 | 5/8 | 3/4 | 1 | 1-1/4 |
| | Stress Area[2] | $A_{se}$ | in² | 0.078 | 0.142 | 0.226 | 0.334 | 0.606 | 0.969 |
| | Tension Resistance of Carbon Steel ASTM F 1554 Grade 36 (A 307 Gr. C) | $N_{sa}$ | kN (lb) | 20 (4495) | 36.6 (8230) | 58.3 (13 110) | 86.2 (19 370) | 156.4 (35 150) | 250.0 (56 200) |
| | Tension Resistance of Carbon Steel ASTM A 193 B7 | $N_{sa}$ | kN (lb) | 43.1 (9690) | 78.9 (17 740) | 125.7 (28 250) | 185.7 (41 750) | 337.0 (75 750) | 538.8 (121 125) |
| | Tension Resistance of Stainless Steel ASTM F 593 CW1 | $N_{sa}$ | kN (lb) | 34.5 (7750) | 63.1 (14 190) | 100.5 (22 600) | - | - | - |
| | Tension Resistance of Stainless Steel ASTM F 593 CW2 | $N_{sa}$ | kN (lb) | - | - | - | 126.3 (28 390) | 229.1 (51 510) | 366.4 (82 365) |
| | Tension Resistance of Stainless Steel ASTM F 593 SH1 | $N_{sa}$ | kN (lb) | 39.7 (8915) | 72.6 (16 320) | 115.6 (25 990) | - | - | - |
| | Tension Resistance of Stainless Steel ASTM F 593 SH2 | $N_{sa}$ | kN (lb) | - | - | - | 156.0 (35 070) | 283.0 (63 630) | - |
| | Tension Resistance of Stainless Steel ASTM F 593 SH3 | $N_{sa}$ | kN (lb) | - | - | - | - | - | 409.5 (92 055) |
| | Shear Resistance of Carbon Steel ASTM F 1554 Grade 36 (A 307 Gr. C) | $V_{sa}$ | kN (lb) | 10.0 (2250) | 220.0 (4940) | 35.0 (7865) | 51.7 (11 625) | 938 (21 090) | 150.0 (33 720) |
| | Shear Resistance of Carbon Steel ASTM A 193 B7 | $V_{sa}$ | kN (lb) | 21.6 (4845) | 47.4 (10 645) | 75.4 (16 950) | 111.4 (25 050) | 202.2 (45 450) | 323.3 (72 675) |
| | Shear Resistance of Stainless Steel ASTM F 593 CW1 | $V_{sa}$ | kN (lb) | 17.2 (3875) | 31.6 (7095) | 50.3 (11 300) | - | - | - |
| | Shear Resistance of Stainless Steel ASTM F 593 CW2 | $V_{sa}$ | kN (lb) | - | - | - | 63.1 (14 195) | 114.6 (25 755) | 183.2 (41 185) |
| | Shear Resistance of Stainless Steel ASTM F 593 SH1 | $V_{sa}$ | kN (lb) | 19.8 (4455) | 43.5 (9790) | 69.4 (15 595) | - | - | - |
| | Shear Resistance of Stainless Steel ASTM F 593 SH2 | $V_{sa}$ | kN (lb) | | - | - | 78.0 (17 535) | 141.5 (31 815) | - |
| | Shear Resistance of Stainless Steel ASTM F 593 SH3 | $V_{sa}$ | kN (lb) | - | - | - | - | | 204.8 (46 030) |
| | Strength Reduction Factor for Tension Steel Failure[3] | ø | - | 0.75 | | | | | |
| | Strength Reduction Factor for Shear Steel Failure[3] | ø | - | 0.65 | | | | | |
| | Reduction for Seismic Shear | $\alpha v,_{seis}$ | - | 0.73 | 0.73 | 0.67 | 0.67 | 0.61 | 0.46 |
| US Reinforcing Bar | Nominal Anchor Diameter | $d_a$ | in | 3/8 (#3) | ½ (#4) | 5/8 (#5) | ¾ (#6) | 1.000 | 1.250 |
| | Stress Area[2] | $A_{se}$ | in² | 0.11 | 0.20 | 0.31 | 0.44 | 0.79 | 1.27 |
| | Tension Resistance of Reinforcing Bars ASTM A 615 Grade 40 | $N_{sa}$ | kN (lb) | 29.4 (6600) | 53.4 (12 000) | 82.7 (18 600) | 117.4 (26 400) | 210.8 (47 400) | 339.0 (76 200) |
| | Tension Resistance of Reinforcing Bars ASTM A 615 Grade 60 | $N_{sa}$ | kN (lb) | 44.0 (9900) | 80.1 (18 000) | 124.1 (27 900) | 176.1 (39 600) | 316.3 (71 100) | 508.4 (114 300) |
| | Shear Resistance of Reinforcing Bars ASTM A 615 Grade 40 | $V_{sa}$ | kN (lb) | 17.6 (3960) | 32.0 (7200) | 49.6 (11 160) | 70.5 (15 840) | 126.5 (28 440) | 203.4 (45 720) |
| | Shear Resistance of Reinforcing Bars ASTM A 615 Grade 60 | $V_{sa}$ | kN (lb) | 26.4 (5940) | 48.0 (10 800) | 74.5 (16 740) | 105.7 (23 760) | 189.8 (42 660) | 305.1 (68 580) |
| | Strength Reduction Factor for Tension Steel Failure[3] | ø | - | 0.75 | | | | | |
| | Strength Reduction Factor for Shear Steel Failure[3] | ø | - | 0.65 | | | | | |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318-14 Eq. (17.4.1.2) and Eq. (17.5.1.2b) or ACI 318-11 Eq. (D-2) and Eq. (D-29). Nuts and washers shall be appropriate for the rod as set forth in Table 3 of this report.

[2]Stress area is minimum stress area applicable for either tension or shear.

[3]Tabulated value of ø complies with ACI 318-14 17.3.3 (ACI 318-11 D.4.3) and applies when the load combinations of Section 1605.1 of the IBC or ACI 318-14 5.3 (ACI 3 18-11 9.2) are used. When the load combinations in ACI 318-11 Appendix C are used, the appropriate value of ø shall be determined in accordance with ACI 318-11 D.4.4.

# STEEL DESIGN INFORMATION

**Table 6**

**METRIC THREADED ROD AND REINFORCING BAR STEEL GRADES[1]**

| | Characteristic | Symbol | Units | Nominal Anchor Element Diameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Metric Threaded Rods | Nominal Anchor Diameter | $d_a$ | mm | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
| | Stress Area[2] | $A_{se}$ | mm² | 36.6 | 58.0 | 84.3 | 157.0 | 245.0 | 353.0 | 459.0 | 561.0 |
| | Tension Resistance of Carbon Steel ISO 898 Class 5.8 | $N_{sa}$ | kN (lb) | 18.3 (4414) | 29.0 (6519) | 42.0 (9476) | 78.5 (17 647) | 122.5 (27 539) | 176.5 (39 679) | 229.5 (51 594) | 280.5 (63 059) |
| | Tension Resistance of Carbon Steel ISO 898 Class 8.8 | $N_{sa}$ | kN (lb) | 29.3 (6582) | 46.5 (10 431) | 67.5 (15 161) | 125.5 (28 236) | 196.0 (44 063) | 282.5 (63 486) | 367.0 (82 550) | 449.0 (100 894) |
| | Tension Resistance of Stainless Steel ISO 3506-1 A4-70 | $N_{sa}$ | kN (lb) | 26.0 (5845) | 40.6 (9127) | 59.0 (13 266) | 109.9 (24 707) | 171.5 (38 555) | 247.1 (55 550) | 321.0 (72 163) | 392.7 (88 282) |
| | Tension Resistance of Stainless Steel ISO 3506-1 A4-80 | $N_{sa}$ | kN (lb) | 29.0 (6519) | 46.6 (10 431) | 67.4 (15 161) | 125.6 (28 236) | 196.0 (44 063) | 282.4 (63 486) | 367.0 (82 504) | 448.8 (100 894) |
| | Shear Resistance of Carbon Steel ISO 898 Class 5.8 | $V_{sa}$ | kN (lb) | 11.0 (2648) | 14.5 (3260) | 25.5 (5685) | 47.0 (10 588) | 73.5 (16 523) | 106.0 (23 807) | 137.5 (30 956) | 168.5 (37 835) |
| | Shear Resistance of Carbon Steel ISO 898 Class 8.8 | $V_{sa}$ | kN (lb) | 17.6 (3949) | 23.0 (52 16) | 40.5 (9097) | 75.5 (16 942) | 117.5 (26 438) | 169.5 (38 092) | 220.5 (49 530) | 269.5 (60 537) |
| | Shear Resistance of Stainless Steel ISO 3506-1 A4-70 | $V_{sa}$ | kN (lb) | 13.0 (2922) | 24.4 (5476) | 35.4 (7960) | 65.9 (14 824) | 102.9 (32 133) | 148.3 (33 330) | 161.0 (36 194) | 235.6 (52 969) |
| | Shear Resistance of Stainless Steel ISO 3506-1 A4-80 | $V_{sa}$ | kN (lb) | 15.0 (3372) | 27.8 (6259) | 40.5 (9097) | 75.4 (16 942) | 117.6 (26 438) | 169.4 (38 092) | 184.0 (41 364) | 269.3 (60 537) |
| | Strength Reduction Factor for Tension Steel Failure[3] | ø | - | 0.65 | | | | | | | |
| | Strength Reduction Factor for Shear Steel Failure[3] | ø | - | 0.60 | | | | | | | |
| | Reduction for Seismic Shear | $\alpha v, seis$ | - | - | 066 | 0.67 | 0.77 | 0.66 | 0.61 | 0.59 | 0.59 |
| Metric Rebar | Nominal Anchor Diameter | $d_a$ | mm | | 10 | 12 | 16 | | | | |
| | Stress Area[2] | $A_{se}$ | mm² | | 78.5 | 113.0 | 201.0 | | | | |
| | Tension Resistance of Reinforcing Bars DIN 488 BSt 500 | $N_{sa}$ | kN (lb) | | 43.2 (9706) | 62.2 (13 972) | 110.6 (24 853) | | | | |
| | Shear Resistance of Reinforcing Bars DIN 488 BSt 500 | $V_{sa}$ | kN (lb) | | 25.9 (5824) | 37.3 (8383) | 66.3 (14 912) | | | | |
| | Strength Reduction Factor for Tension Steel Failure[3] | ø | - | 0.65 | | | | | | | |
| | Strength Reduction Factor for Shear Steel Failure[3] | ø | - | 0.60 | | | | | | | |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318-14 Eq. (17.4.1.2) and Eq. (17.5.1.2b) or ACI 318-11 Eq. (D-2) and Eq. (D-29). Nuts and washers shall be appropriate for the rod as set forth in Table 3 of this report.

[2]Stress area is minimum stress area applicable for either tension or shear.

[3]Tabulated value of Ø complies with ACI 318-14 17.3.3 (ACI 318-11 D.4.3) and applies when the load combinations of 1605.1 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2) are used. When the load combinations in ACI 318-11 Appendix C are used, the appropriate value of Ø shall be determined in accordance with ACI 318-11 D.4.4.

# CONCRETE BREAKOUT DESIGN INFORMATION

## Table 7

**FRACTIONALLY SIZED THREADED RODS AND US REINFORCING BARS**

| Design Information | Symbol | Units | Nominal Anchor Element Diameter | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 3/8 in | 1/2 in | 5/8 in | 3/4 in | 1 in | 1-1/4 in |
| | | | #3 | #4 | #5 | #6 | #8 | #10 |
| Effectiveness Factor for Cracked Concrete | $k_{c,cr}$ | in-lb (SI) | 17 (7.1) | | | | | |
| Effectiveness Factor for Uncracked Concrete | $k_{c,\ uncr}$ | in-lb (SI) | 24 (10) | | | | | |
| Minimum Embedment Depth | $h_{ef,\ min}$ | in | 2-3/8 | 2-3/4 | 3-1/8 | 3-1/2 | 4 | 5 |
| Maximum Embedment Depth | $h_{ef,\ max}$ | in | 7-1/2 | 10 | 12-1/2 | 15 | 20 | 25 |
| Minimum Edge Distance | $C_{min}$ | in | 0.5 $h_{ef}$ | | | | | |
| Minimum Anchor Spacing | $S_{min}$ | in | 0.5 $h_{ef}$ | | | | | |
| Critical Edge Distance | $C_{ac}$ | mm \| in | $C_{ac} = h_{ef} \cdot \left(\frac{\tau_{uncr}}{8}\right)^{0.4} \cdot [\,3.1\text{-}0.7\,\frac{h}{h_{ef}}\,]$ \| $C_{ac} = h_{ef} \cdot \left(\frac{\tau_{uncr}}{1160}\right)^{0.4} \cdot [\,3.1\text{-}0.7\,\frac{h}{h_{ef}}\,]$ | | | | | |
| Minimum Concrete Thickness | $h_{min}$ | in | 2.0 $h_{ef}$ | | | | | |
| Strength Reduction Factor for Tension, Concrete Failure Modes, Condition B | ø | - | 0.65 | | | | | |
| Strength Reduction Factor for Shear, Concrete Failure Modes, Condition B | ø | - | 0. 70 | | | | | |

## Table 8

**METRIC SIZED THREADED RODS AND METRIC SIZED REINFORCING BARS**

| Design Information | Symbol | Units | Nominal Anchor Element Diameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | M8 | M10 | M12 | Ml6 | M20 | M24 | M27 | M30 |
| | | | 8 mm | 10 mm | 12 mm | 16 mm | 20 mm | 24 mm | 27 mm | 30 mm |
| Effectiveness Factor for Cracked Concrete | $k_{c,cr}$ | in-lb (SI) | 17 (7.1) | | | | | | | |
| Effectiveness Factor for Uncracked Concrete | $k_{c,\ uncr}$ | in-lb (SI) | 24 (10) | | | | | | | |
| Minimum Embedment Depth for Threaded Rods | $h_{ef,\ min}$ | mm | 60 | 70 | 80 | 90 | 90 | 102 | 108 | 127 |
| Maximum Embedment Depth for Threaded Rods | $h_{ef,\ max}$ | mm | 191 | 254 | 318 | 381 | 445 | 508 | 540 | 635 |
| Minimum Embedment Depth for Rebars | $h_{ef,\ min}$ | mm | - | 70 | 80 | 90 | 90 | 102 | - | 127 |
| Maximum Embedment Depth for Rebars | $h_{ef,\ max}$ | mm | - | 254 | 318 | 381 | 445 | 508 | - | 635 |
| Minimum Edge Distance | $C_{min}$ | in | 0.5 $h_{ef}$ | | | | | | | |
| Minimum Anchor Spacing | $S_{min}$ | in | 0.5 $h_{ef}$ | | | | | | | |
| Critical Edge Distance | $C_{ac}$ | mm \| in | $C_{ac} = h_{ef} \cdot \left(\frac{\tau_{uncr}}{8}\right)^{0.4} \cdot [\,3.1\text{-}0.7\,\frac{h}{h_{ef}}\,]$ \| $C_{ac} = h_{ef} \cdot \left(\frac{\tau_{uncr}}{1160}\right)^{0.4} \cdot [\,3.1\text{-}0.7\,\frac{h}{h_{ef}}\,]$ | | | | | | | |
| Minimum Concrete Thickness | $h_{min}$ | in | 2.0 $h_{ef}$ | | | | | | | |
| Strength Reduction Factor for Tension, Concrete Failure Modes, Condition B | ø | - | 0.65 | | | | | | | |
| Strength Reduction Factor for Shear, Concrete Failure Modes, Condition B | ø | - | 0.70 | | | | | | | |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

1.Characteristic bond strengths are for dry concrete, Max. LTT = 50 °C; Max. STT = 80 °C.

2.For installation between the minimum edge distance, $c_{min}$, and the reduced minimum edge distance, cmin,red, the maximum torque applied must be reduced (multiplied) by a factor of 0.45.

3. $\tau_{k,uncr}$ need not be taken as greater than: $\tau_{k,uncr} = \frac{k_{uncr} \cdot \sqrt{h_{ef} \cdot ft}}{\pi \cdot d}$ and $\frac{h}{h_{ef}}$ need not be taken as larger than 2.4.

4. Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pryout governs, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. The tabulated value of fapplies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, are used in accordance with ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of f must be determined in accordance with ACI 318 D.4.4.

# BOND STRENGTH DESIGN INFORMATION

**Table 9**

**FRACTIONAL STEEL THREADED RODS IN HAMMER DRILLED HOLES**

| Design Information | | Symbol | Units | Nominal Anchor Element Diameter | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 3/8 in | 1/2 in | 5/8 in | 3/4 in | 1 in | 1-1/4 in |
| Minimum Embedment Depth | | $h_{ef,\,min}$ | in | 2-3/8 | 2-3/4 | 3-1/4 | 3-1/2 | 4 | 5 |
| Maximum Embedment Depth | | $h_{ef,\,max}$ | in | 7-1/2 | 10 | 12-1/2 | 15 | 20 | 25 |
| Characteristic Bond Strength in Uncracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 9.10 (1320) | 8.53 (1237) | 7.95 (1154) | 7.38 (1070) | - | - |
| Characteristic Bond Strength in Uncracked Concrete for Short Term Loads[2,3] | | $\tau_{k,uncr}$ | N/mm² (psi) | 9.10 (1320) | 8.53 (1237) | 7.95 (1154) | 7.38 (1070) | - | - |
| Characteristic Bond Strength in Cracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 4.13 (598) | 5.63 (817) | 5.30 (769) | 4.96 (720) | 4.29 (623) | 3.57 (518) |
| Characteristic Bond Strength in Cracked Concrete for Short Term Loads[2,3] | | $\tau_{k,cr}$ | N/mm² (psi) | 4.13 (598) | 5.63 (817) | 5.30 (769) | 4.96 (720) | 4.29 (623) | 3.57 (518) |
| Permissible Installation Conditions, Periodic Special Inspection | Dry Concrete | *Anchor Category* | - | 2 | 2 | 2 | 2 | 2 | 3 |
| | | $\varnothing_d$ | - | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.45 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 2 | 2 | 2 | 2 | 2 |
| | | $\varnothing_{ws}$ | - | 0 . 65 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| | Water-filled Holes | *Anchor Category* | - | 3 | 3 | 3 | 3 | 3 | 3 |
| | | $\varnothing_{wf}$ | - | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |
| Permissible Installation Conditions, Continuous Special Inspection | Dry Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\varnothing_d$ | - | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\varnothing_{ws}$ | - | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-filled Holes | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\varnothing_{wf}$ | - | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| Reduction for Seismic Tension | | $\alpha_{N,seis}$ | - | 1.00 | 0.41 | 0.54 | 1.00 | 0.50 | 0.96 |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Bond strength values correspond to concrete compressive strength, $f'_c$ = 2500 psi. Bond strength values shall not be increased for concrete compressive strength.

[2]Maximum long term temperature: 50 °C; maximum short-term temperature: 80 °C.

[3]Short term elevated concrete temperatures are those that occur over brief intervals, e.g. transient or part of a regular cycle of heating and cooling, such as day-night temperature rise and fall. Long term elevated concrete temperatures are roughly constant over significant periods of time.

[4]The tabulated value of ø applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ø shall be determined in accordance with ACI 318-11 D.4.4.

[5]The values of ø correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ø shall be determined.

# BOND STRENGTH DESIGN INFORMATION

**Table 10**

**METRIC STEEL THREADED RODS IN HAMMER DRILLED HOLES**

| Design Information | | Symbol | Units | Nominal Anchor Element Diameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | M8 | M10 | M12 | Ml6 | M20 | M24 | M27 | M30 |
| Minimum Embedment Depth | | $h_{ef,min}$ | mm | 60 | 60 | 70 | 83 | 89 | 102 | 108 | 127 |
| Maximum Embedment Depth | | $h_{ef,max}$ | mm | 160 | 200 | 240 | 320 | 400 | 480 | 540 | 600 |
| Characteristic Bond Strength in Uncracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 9.38 (1360) | 9.02 (1308) | 8.65 (1255) | 7.93 (1150) | 7.21 (1045) | - | - | - |
| Characteristic Bond Strength in Uncracked Concrete for Short Term Loads[2,3] | | $\tau_{k,uncr}$ | N/mm² (psi) | 9.38 (1360) | 9.02 ( 1308) | 8.65 (1255) | 7.93 (1150) | 7.21 (1045) | - | - | - |
| Characteristic Bond Strength in Cracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 6.13 (889) | 5.78 (839) | 5.71 (828) | 5.29 (767) | 4.86 (705) | 3.97 (576) | 4.07 (590) | 3.75 (545) |
| Characteristic Bond Strength in Cracked Concrete for Short Term Loads[2,3] | | $\tau_{k,cr}$ | N/mm² (psi) | 6.13 (889) | 5.78 (839) | 5.71 (828) | 5.29 (767) | 4.86 (705) | 3.97 (576) | 4.07 (590) | 3.75 (545) |
| Permissible Installation Conditions, Periodic Special Inspection | Dry Concrete | *Anchor Category* | - | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| | | $\emptyset_d$ | - | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.45 | 0.45 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| | | $\emptyset_{ws}$ | - | 0.65 | 0.65 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| | Water-filled Holes | *Anchor Category* | - | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | | $\emptyset_{wf}$ | - | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |
| Permissible Installation Conditions, Continuous Special Inspection | Dry Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\emptyset_d$ | - | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\emptyset_{ws}$ | - | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-filled Holes | *Anchor Category* | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | $\emptyset_{wf}$ | - | 0 .65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 | 0.65 |
| Reduction for Seismic Tension | | $\alpha_{N,seis}$ | - | - | 034 | 0.4 1 | 0.54 | 0.36 | 0.50 | 0.50 | 0.45 |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Bond strength values correspond to concrete compressive strength, $f'_c$ = 2500 psi. Bond strength values shall not be increased for concrete compressive strength.

[2]Maximum long term temperature: 50 °C; maximum short-term temperature: 80 °C.

[3]Short term elevated concrete temperatures are those that occur over brief intervals, e.g. transient or part of a regular cycle of heating and cooling, such as day-night temperature rise and fall. Long term elevated concrete temperatures are roughly constant over significant periods of time.

[4]The tabulated value of ø applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ø shall be determined in accordance with ACI 318-11 D.4.4.

[5]The values of ø correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ø shall be determined.

# BOND STRENGTH DESIGN INFORMATION

**Table 11**

**US REINFORCING BARS IN HAMMER DRILLED HOLES USED AS ANCHOR ELEMENTS**

| Design Information | | Symbol | Units | Nominal Anchor Element Diameter | | | |
|---|---|---|---|---|---|---|---|
| | | | | #3 | #4 | #5 | #6 |
| Minimum Embedment Depth | | $h_{ef,min}$ | in | 2-3/8 | 2-3/4 | 3-1/4 | 3-1/2 |
| Maximum Embedment Depth | | $h_{ef,max}$ | in | 7-1/2 | 10 | 12-1/2 | 15 |
| Characteristic Bond Strength in Uncracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 8.70 (1262) | 8.10 (1174) | 7.49 (1087) | 6.89 (1000) |
| Characteristic Bond Strength in Uncracked Concrete for Short Term Loads[2,3] | | $\tau_{k,uncr}$ | N/mm² (psi) | 8.70 (1262) | 8.10 (1174) | 7.49 (1087) | 6.89 (1000) |
| Permissible Installation Conditions, Periodic Special Inspection | Dry Concrete | *Anchor Category* | - | 2 | 2 | 2 | 2 |
| | | $ø_d$ | - | 0.55 | 0.55 | 0.55 | 0.55 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 2 | 2 | 2 |
| | | $ø_{ws}$ | - | 0.65 | 0.55 | 0.55 | 0.55 |
| | Water-filled Holes | *Anchor Category* | - | 3 | 3 | 3 | 3 |
| | | $ø_{wf}$ | - | 0.45 | 0.45 | 0.45 | 0.45 |
| Permissible Installation Conditions, Continuous Special Inspection | Dry Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 |
| | | $ø_d$ | - | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 1 | 1 | 1 |
| | | $ø_{ws}$ | - | 0.65 | 0.65 | 0.65 | 0.65 |
| | Water-filled Holes | *Anchor Category* | - | 1 | 1 | 1 | 1 |
| | | $ø_{wf}$ | - | 0.65 | 0.65 | 0.65 | 0.65 |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Bond strength values correspond to concrete compressive strength, $f'_c$ = 2500 psi. Bond strength values shall not be increased for concrete compressive strength.

[2]Maximum long term temperature: 50 °C; maximum short-term temperature: 80 °C.

[3]Short term elevated concrete temperatures are those that occur over brief intervals, e.g. transient or part of a regular cycle of heating and cooling, such as day-night temperature rise and fall. Long term elevated concrete temperatures are roughly constant over significant periods of time.

[4]The tabulated value of ø applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ø shall be determined in accordance with ACI 318-11 D.4.4.

[5]The values of ø correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ø shall be determined.

# BOND STRENGTH DESIGN INFORMATION

**Table 12**

**METRIC REINFORCING BARS IN HAMMER DRILLED ROLES USED AS ANCHOR ELEMENTS**

| Design Information | | Symbol | Units | Nominal Anchor Element Diameter | | |
|---|---|---|---|---|---|---|
| | | | | ø10 mm | ø12 mm | ø16 mm |
| Minimum Embedment Depth | | $h_{ef,min}$ | mm | 60 | 70 | 83 |
| Maximum Embedment Depth | | $h_{ef,max}$ | mm | 200 | 240 | 320 |
| Characteristic Bond Strength in Uncracked Concrete for Sustained Tension Loading[2,3] | | $\tau_{k,sust,uncr}$ | N/mm² (psi) | 8.61 (1249) | 8.23 (1193) | 7.47 (1083) |
| Characteristic Bond Strength in Uncracked Concrete for Short Term Loads[2,3] | | $\tau_{k,uncr}$ | N/mm² (psi) | 8.61 (1249) | 8.23 (1193) | 7.47 (1083) |
| Permissible Installation Conditions, Periodic Special Inspection | Dry Concrete | *Anchor Category* | - | 2 | 2 | 2 |
| | | $ø_d$ | - | 0.55 | 0.55 | 0.55 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 2 | 2 |
| | | $ø_{ws}$ | - | 0.65 | 0.55 | 0.55 |
| | Water-filled Holes | *Anchor Category* | - | 3 | 3 | 3 |
| | | $ø_{wf}$ | - | 0.45 | 0.45 | 0.45 |
| Permissible Installation Conditions, Continuous Special Inspection | Dry Concrete | *Anchor Category* | - | 1 | 1 | 1 |
| | | $ø_d$ | - | 0.65 | 0.65 | 0.65 |
| | Water-saturated Concrete | *Anchor Category* | - | 1 | 1 | 1 |
| | | $ø_{ws}$ | - | 0.65 | 0.65 | 0.65 |
| | Water-filled Holes | *Anchor Category* | - | 1 | 1 | 1 |
| | | $ø_{wf}$ | - | 0.65 | 0.65 | 0.65 |

For SI: 1 in = 25.4 mm, 1 lbf = 4.448 N. For lb/in units: 1 mm = 0.03937 in, 1 N = 0.2248 lbf.

[1]Bond strength values correspond to concrete compressive strength, $f'_c$ = 2500 psi. Bond strength values shall not be increased for concrete compressive strength.

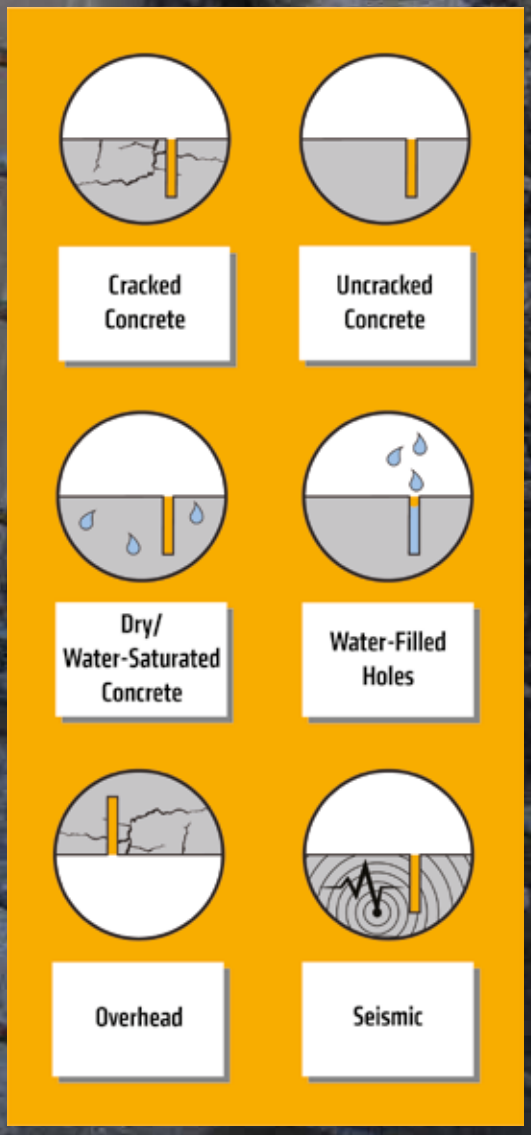
[2]Maximum long term temperature: 50 °C; maximum short-term temperature: 80 °C.

[3]Short term elevated concrete temperatures are those that occur over brief intervals, e.g. transient or part of a regular cycle of heating and cooling, such as day-night temperature rise and fall. Long term elevated concrete temperatures are roughly constant over significant periods of time.

[4]The tabulated value of ø applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ø shall be determined in accordance with ACI 318-11 D.4.4.

[5]The values of ø correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ø shall be determined.

# WHERE TO USE


Cracked Concrete
Uncracked Concrete
Dry/ Water-Saturated Concrete
Water-Filled Holes
Overhead
Seismic

# TENSION DESIGN STRENGTH IN DRY HOLE CONDITION

## Normal Weight Uncracked Concrete
## Drilled with Hammer Drill and Carbide Bit
## Temperature Range: 50 to 80 °C (122 to 176 °F)

**Table 13**

| Nominal Size | Embed. Depth | Minimum Concrete Compressive Strength, f'c | | | | |
|---|---|---|---|---|---|---|
| in | mm (in) | 17.2 MPa (2500 psi) $øN_a$ or $øN_{cb}$ | 20.7 MPa (3000 psi) $øN_a$ or $øN_{cb}$ | 27.6 MPa (4000 psi) $øN_a$ or $øN_{cb}$ | 41.4 MPa (6000 psi) $øN_a$ or $øN_{cb}$ | 55.2 MPa (8000 psi) $øN_a$ or $øN_{cb}$ |
| 3/8 | 60 (2-3/8) | 10.68 (2401) | 10.68 (2401) | 10.68 (2401) | 10.68 (2401) | 10.68 (2401) |
| | 76 (3) | 13.49 (3032) | 13.49 (3032) | 13.49 (3032) | 13.49 (3032) | 13.49 (3032) |
| | 114 (4-1/2) | 20.23 (4549) | 20.23 (4549) | 20.23 (4549) | 20.23 (4549) | 20.23 (4549) |
| | 191 (7-1/2) | 33.72 (7581) | 33.72 (7581) | 33.72 (7581) | 33.72 (7581) | 33.72 (7581) |
| 1/2 | 70 (2-3/4) | 15.45 (3473) | 15.45 (3473) | 15.45 (3473) | 15.45 (3473) | 15.45 (3473) |
| | 102 (4 ) | 22.47 (5052) | 22.47 (5052) | 22.47 (5052) | 22.47 (5052) | 22.47 (5052) |
| | 152 (6) | 33.71 (7578) | 33.71 (7578) | 33.71 (7578) | 33.71 (7578) | 33.71 (7578) |
| | 254 (10) | 56.18 (12 630) | 56.18 (12 630) | 56.18 (12 630) | 56.18 (12 630) | 56.18 (12 630) |
| 5/8 | 79 (3- 1/8) | 19.17 (4309) | 20.47 (4603) | 20.47 (4603) | 20.47 (4603) | 20.47 (4603) |
| | 127 (5) | 32.76 (7364) | 32.76 (7364) | 32.76 (7364) | 32.76 (7364) | 32.76 (7364) |
| | 191 (7-1/2) | 49.13 (11 046) | 49.13 (11 046) | 49.13 (11 046) | 49.13 (11 046) | 49.13 (11 046) |
| | 318 (12-1/2) | 81.89 (18 410) | 81.89 (18 410) | 81.89 (18 410) | 81.89 (18 410) | 81.89 (18 410) |
| 3/4 | 89 (3-1/2) | 22.72 (5107) | 24.89 (5595) | 25.51 (5736) | 25.51 (5736) | 25.51 (5736) |
| | 152 (6) | 43.73 (9832) | 43.73 (9832) | 43.73 (9832) | 43.73 (9832) | 43.73 (9832) |
| | 229 (9) | 65.60 (14 749) | 65.60 (14 749) | 65.60 (14 749) | 65.60 (14 749) | 65.60 (14 749) |
| | 381 (15) | 109.34 (24 581) | 109.34 (24 581) | 109.34 (24 581) | 109.34 (24 581) | 109.34 (24 581) |
| 1 | 4 | Not Applicable | | | | |
| | 8 | | | | | |
| | 12 | | | | | |
| | 20 | | | | | |
| 1-1/4 | 5 | Not Applicable | | | | |
| | 10 | | | | | |
| | 15 | | | | | |
| | 25 | | | | | |

1. Values provided are for illustration purposes only and apply to single anchors installed in normal weight concrete without reduction for close edge or anchor spacing.
2. Calculations were performed according to ACI 318-14 Ch17 and ICC-ES AC308 for the load levels corresponding to the listed failure modes (Concrete Breakout Strength and Bond Strength). This must be checked against the corresponding steel strength with the lowest load controlling.
3. Tabular values are for static loads only. Periodic Special Inspection must be performed.
4. Where anchors are subjected to combined tension and shear loads the interaction of shear and tension must be checked according to ACI 318-14 Ch17.
5. Interpolation of tabulated values is not permitted.

## Normal Weight Cracked Concrete
## Drilled with Hammer Drill and Carbide Bit
## Temperature Range: 50 to 80 °C (122 to 176 °F)

**Table 14**

| Nominal Size | Embed. Depth | Minimum Concrete Compressive Strength, f'c | | | | |
|---|---|---|---|---|---|---|
| | | 17.2 MPa (2500 psi) | 20.7 MPa (3000 psi) | 27.6 MPa (4000 psi) | 41.4 MPa (6000 psi) | 55.2 MPa (8000 psi) |
| in | mm (in) | $øN_a$ or $øN_{cb}$ | $øN_a$ or $øN_{cb}$ | $øN_a$ or $øN_{cb}$ | $øN_a$ or $øN_{cb}$ | $øN_a$ or $øN_{cb}$ |
| 3/8 | 60 (2-3/8) | 4.84 (1088) | 4.84 (1088) | 4.84 (1088) | 4.84 (1088) | 4.84 (1088) |
| | 76 (3) | 6.11 (1374) | 6.11 (1374) | 6.11 (1374) | 6.11 (1374) | 6.11 (1374) |
| | 114 (4-1/2) | 9.17 (2061) | 9.17 (2061) | 9.17 (2061) | 9.17 (2061) | 9.17 (2061) |
| | 191 (7-1/2) | 15.28 (3434) | 15.28 (3434) | 15.28 (3434) | 15.28 (3434) | 15.28 (3434) |
| 1/2 | 70 (2-3/4) | 10.20 (2294) | 10.20 (2294) | 10.20 (2294) | 10.20 (2294) | 10.20 (2294) |
| | 102 (4) | 14.84 (3337) | 14.84 (3337) | 14.84 (3337) | 14.84 (3337) | 14.84 (3337) |
| | 152 (6) | 22.26 (5005) | 22.26 (5005) | 22.26 (5005) | 22.26 (5005) | 22.26 (5005) |
| | 254 (10) | 37.10 (8342) | 37.10 (8342) | 37.10 (8342) | 37.10 (8342) | 37.10 (8342) |
| 5/8 | 79 (3-1/8) | 13.58 (3052) | 13.64 (3067) | 13.64 (3067) | 13.64 (3067) | 13.64 (3067) |
| | 127 (5) | 21.83 (4907) | 21.83 (4907) | 21.83 (4907) | 21.83 (4907) | 21.83 (4907) |
| | 191 (7-1/2) | 32.74 (7361) | 32.74 (7361) | 32.74 (7361) | 32.74 (7361) | 32.74 (7361) |
| | 318 (12-1/2) | 54.57 (12 268) | 54.57 (12 268) | 54.57 (12 268) | 54.57 (12 268) | 54.57 (12 268) |
| 3/4 | 89 (3-1/2) | 16.09 (3618) | 17.17 (3859) | 17.17 (3859) | 17.17 (3859) | 17.17 (3859) |
| | 152 (6) | 29.43 (6616) | 29.43 (6616) | 29.43 (6616) | 29.43 (6616) | 29.43 (6616) |
| | 229 (9) | 44.14 (9924) | 44.14 (9924) | 44.14 (9924) | 44.14 (9924) | 44.14 (9924) |
| | 381 (15) | 73.57 (16 540) | 73.57 (16 540) | 73.57 (16 540) | 73.57 (16 540) | 73.57 (16 540) |
| 1 | 102 (4) | 19.66 (4420) | 21.54 (4842) | 22.63 (5089) | 22.63 (5089) | 22.63 (5089) |
| | 203 (8) | 45.27 (10 178) | 45.27 (10 178) | 45.27 (10 178) | 45.27 (10 178) | 45.27 (10 178) |
| | 305 (12) | 67.90 (15 266) | 67.90 (15 266) | 67.90 (15 266) | 67.90 (15 266) | 67.90 (15 266) |
| | 508 (20) | 113.17 (25 444) | 113.17 (25 444) | 113.17 (25 444) | 113.17 (25 444) | 113.17 (25 444) |
| 1-1/4 | 127 (5) | 27.48 (6177) | 29.41 (6611) | 29.41 (6611) | 29.41 (6611) | 29.41 (6611) |
| | 254 10 | 58.81 (13 222) | 58.81 (13 222) | 58.81 (13 222) | 58.81 (13 222) | 58.81 (13 222) |
| | 381 15 | 88.22 (19 833) | 88.22 (19 833) | 88.22 (19 833) | 88.22 (19 833) | 88.22 (19 833) |
| | 635 25 | 147.03 (33 055) | 147.03 (33 055) | 147.03 (33 055) | 147.03 (33 055) | 147.03 (33 055) |

1. Values provided are for illustration purposes only and apply to single anchors installed in normal weight concrete without reduction for close edge or anchor spacing.
2. Calculations were performed according to ACI 318-14 Ch17 and ICC-ES AC308 for the load levels corresponding to the listed failure modes (Concrete Breakout Strength and Bond Strength). This must be checked against the corresponding steel strength with the lowest load controlling.
3. Tabular values are for static loads only. Periodic Special Inspection must be performed.
4. Where anchors are subjected to combined tension and shear loads the interaction of shear and tension must be checked according to ACI 318-14 Ch17.
5. Interpolation of tabulated values is not permitted.

# SHEAR DESIGN STRENGTH IN DRY HOLE CONDITION

## Normal Weight Uncracked Concrete
## Drilled with Hammer Drill and Carbide Bit
## Temperature Range: 50 to 80 °C (122 to 176 °F)

**Table 15**

| Nominal Size | Embed. Depth | Minimum Concrete Compressive Strength, f'c | | | | |
|---|---|---|---|---|---|---|
| in | mm (in) | 17.2 MPa (2500 psi) $øV_a$ or $øV_{cb}$ | 20.7 MPa (3000 psi) $øV_a$ or $øV_{cb}$ | 27.6 MPa (4000 psi) $øV_a$ or $øV_{cb}$ | 41.4 MPa (6000 psi) $øV_a$ or $øV_{cb}$ | 55.2 MPa (8000 psi) $øV_a$ or $øV_{cb}$ |
| 3/8 | 60 (2-3/8) | 8.46 (1903) | 9.27 (2084) | 10.70 (2407) | 11.50 (2585) | 11.50 (2585) |
| | 76 (3) | 12.59 (2830) | 13.79 (3100) | 15.92 (3580) | 19.50 (4385) | 22.52 (5063) |
| | 114 (4-1/2) | 23.13 (5199) | 25.33 (5696) | 29.25 (6577) | 35.83 (8055) | 41.37 (9301) |
| | 191 (7-1/2) | 49.76 (11 188) | 54.51 (12 255) | 62.94 (14 151) | 72.63 (16 328) | 72.63 (16 328) |
| 1/2 | 70 (2-3/4) | 11.38 (2559) | 12.47 (2804) | 14.40 (3237) | 17.64 (3965) | 20.36 (4578) |
| | 102 (4) | 21.53 (4839) | 23.58 (5301) | 27.23 (6121) | 33.35 (7497) | 38.51 (8657) |
| | 152 (6) | 39.54 (8890) | 43.32 (9739) | 50.02 (11 245) | 61.26 (13 773) | 70.74 (15 903) |
| | 254 10 | 85.09 (19 129) | 93.21 (20 955) | 107.63 (24 196) | 121.00 (27 203) | 121.00 (27 203) |
| 5/8 | 79 (3-1/8) | 13.95 (3136) | 15.28 (3435) | 17.64 (3966) | 21.61 (4858) | 24.95 (5609) |
| | 127 (5) | 32.26 (7253) | 35.34 (7945) | 40.81 (9174) | 49.98 (11 236) | 57.71 (12 974) |
| | 191 (7-1/2) | 59.27 (13 324) | 64.92 (14 596) | 74.97 (16 854) | 91.81 (20 642) | 105.83 (23 792) |
| | 318 (12-1/2) | 127.52 (28 669) | 139.69 (31 405) | 161.30 (36 264) | 176.38 (39 653) | 176.38 (39 653) |
| 3/4 | 89 (3-1/2) | 16.56 (3724) | 18.15 (4079) | 20.95 (4710) | 25.66 (5769) | 29.63 (6662) |
| | 152 (6) | 44.40 (9981) | 48.63 (10 934) | 56.16 (12 625) | 68.78 (15 462) | 79.42 (17 854) |
| | 229 (9) | 81.56 (18 336) | 89.34 (20 086) | 103.16 (23 194) | 126.35 (28 406) | 141.30 (31 766) |
| | 381 (15) | 175.49 (39 453) | 192.24 (43 219) | 221.98 (49 905) | 235.49 (52 944) | 235.49 (52 944) |
| | 25 | | | | | |

1. Values provided are for illustration purposes only and apply to single anchors installed in normal weight concrete without reduction for close edge or anchor spacing.
2. Calculations were performed according to ACI 318-14 Ch17 and ICC-ES AC308 for the load levels corresponding to the listed failure modes (Concrete Breakout Strength and Concrete Pryout Strength). This must be checked against the corresponding steel strength with the lowest load controlling.
3. Tabular values are for static loads only. Periodic Special Inspection must be performed.
4. Where anchors are subjected to combined tension and shear loads the interaction of shear and tension must be checked according to ACI 318-14 Ch17.
5. Interpolation of tabulated values is not permitted.

## Normal Weight Cracked Concrete
## Drilled with Hammer Drill and Carbide Bit
## Temperature Range: 50 to 80 °C (122 to 176 °F)

**Table 16**

| Nominal Size | Embed. Depth | Minimum Concrete Compressive Strength. f'c | | | | |
|---|---|---|---|---|---|---|
| | | 17.2 MPa (2500 psi) | 20.7 MPa (3000 psi) | 27.6 MPa (4000 psi) | 41.4 MPa (6000 psi) | 55.2 MPa (8000 psi) |
| in | mm (in) | $øV_a$ or $øV_{cb}$ | $øV_a$ or $øV_{cb}$ | $øV_a$ or $øV_{cb}$ | $øV_a$ or $øV_{cb}$ | $øV_a$ or $øV_{cb}$ |
| 3/8 | 60 (2-3/8) | 5.21 (1171) | 5.21 (1171) | 5.21 (1171) | 5.21 (1171) | 5.21 (1171) |
| | 76 (3) | 12.59 (2830) | 13.16 (2959) | 13.16 (2959) | 13.16 (2959) | 13.16 (2959) |
| | 114 (4-1/2) | 19.74 (4438) | 19.74 (4438) | 19.74 (4438) | 19.74 (4438) | 19.74 (4438) |
| | 191 (7-1/2) | 32.90 (7397) | 32.90 (7397) | 32.90 (7397) | 32.90 (7397) | 32.90 (7397) |
| 1/2 | 70 (2-3/4) | 11.38 (2559) | 12.47 (2804) | 14.40 (3237) | 17.64 (3965) | 20.36 (4578) |
| | 102 (4) | 21.53 (4839) | 23.58 (5301) | 27.23 (6121) | 31.97 (7187) | 31.97 (7187) |
| | 152 (6) | 39.54 (8890) | 43.32 (9739) | 47.95 (10 780) | 47.95 (10 780) | 47.95 (10 780) |
| | 254 (10) | 79.92 (17 967) | 79.92 (17 967) | 79.92 (17 967) | 79.92 (17 967) | 79.92 (17 967) |
| 5/8 | 79 (3-1/8) | 13.95 (3136) | 15.28 (3435) | 17.64 (3966) | 21.61 (4858) | 24.95 (5609) |
| | 127 (5) | 32.26 (7 253) | 35.34 (7 945) | 40.81 (9174) | 47.01 (10 569) | 47.01 (10 569) |
| | 191 (7-1/2) | 59.27 (13 324) | 64.92 (14 596) | 70.52 (15 854) | 70.52 (15 854) | 70.52 (15 854) |
| | 318 (12-1/2) | 117.53 (26 424) | 117.53 (26 424) | 117.53 (26 424) | 117.53 (26 424) | 117.53 (26 424) |
| 3/4 | 89 (3-1/2) | 16.56 (3724) | 18.15 (4079) | 20.95 (4710) | 25.66 (5769) | 29.63 (6662) |
| | 152 (6) | 44.40 (9 981) | 48.63 (10 934) | 56.16 (12 625) | 63.39 (14 250) | 63.39 (14 250) |
| | 229 (9) | 81.56 (18 336) | 89.34 (20 086) | 95.08 (21 375) | 95.08 (21 375) | 95.08 (21 375) |
| | 381 (15) | 158.46 (35 626) | 158.46 (35 626) | 158.46 (35 626) | 158.46 (35 626) | 158.46 (35 626) |
| 1 | 102 (4) | 19.85 (4462) | 21.74 (4888) | 25.10 (5644) | 30.74 (6912) | 35.50 (7981) |
| | 203 (8) | 75.78 (17 038) | 83.02 (18 664) | 95.86 (21 921) | 97.50 (21 921) | 97.50 (21 921) |
| | 305 (12) | 139.23 (31 301) | 146.26 (32 881) | 146.26 (32 881) | 146.26 (32 881) | 146.26 (32 881) |
| | 508 (20) | 243.76 (54 802) | 243.76 (54 802) | 243.76 (54 802) | 243.76 (54 802) | 243.76 (54 802) |
| 1-1/4 | 127 (5) | 29.00 (6520) | 31.77 (7142) | 36.68 (8247) | 44.93 (10 101) | 51.88 (11 663) |
| | 254 (10) | 116.00 (26 080) | 126.67 (28 479) | 126.67 (28 479) | 126.67 (28 479) | 126.67 (28 479) |
| | 381 (15) | 190.01 (42 718) | 190.01 (42 718) | 190.01 (42 718) | 190.01 (42 718) | 190.01 (42 718) |
| | 635 (25) | 316.68 (71 196) | 316.68 (71 196) | 316.68 (71 196) | 316.68 (71 196) | 316.68 (71 196) |

1. Values provided are for illustration purposes only and apply to single anchors installed in normal weight concrete without reduction for close edge or anchor spacing.
2. Calculations were performed according to ACI 318-14 Ch17 and ICC-ES AC308 for the load levels corresponding to the listed failure modes (Concrete Breakout Strength and Concrete Pryout Strength). This must be checked against the corresponding steel strength with the lowest load controlling.
3. Tabular values are for static loads only. Periodic Special Inspection must be performed.
4. Where anchors are subjected to combined tension and shear loads the interaction of shear and tension must be checked according to ACI 318-14 Ch17.
5. Interpolation of tabulated values is not permitted.

# ACCESSORIES

## DISPENSING TOOLS

**Battery Side-by-Side Dispenser**

**Manual IK Dispenser**

**Manual Side-by-Side Dispenser**

**Pneumatic Side-by-Side Dispenser**

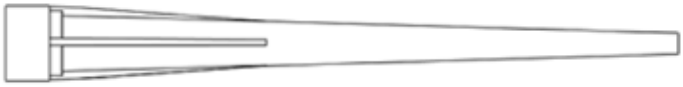
## PACKAGING CONFIGURATIONS


**Single Piston**
300 ml (10.1 US fl. oz)

**Side-by-Side Cartridge**
825 ml (27.8 US fl. oz)

## MIXER NOZZLE

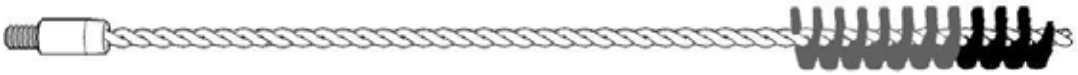
**KW**



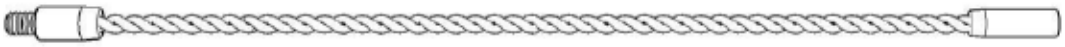
## HOLE CLEANING BRUSHES

**Hole cleaning brush with loop handle**


**Hole cleaning brush with male ferrule**



**Hole cleaning brush extension piece**

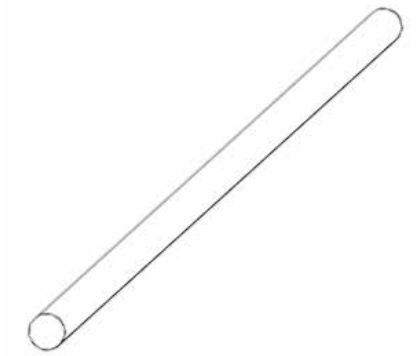


**Hole cleaning brush extension handle**

| Hole Cleaning Brush | H14 | H20 | H29 | H40 |
|---|---|---|---|---|
| Brush Diameter, $d_b$ | 14 mm | 20 mm | 29 mm | 40 mm |

## EXTENSION TUBES AND RESIN STOPPERS

**Straight Extensions**
(11 mm OD)



**Flexible Tubes**
(14 mm OD)

**Resin Stoppers**

# SIKA SOLUTIONS FROM ROOF TO FOUNDATION

## Roofing Systems

**Sarnafil®**
**Sikaplan®**
**Sikalastic®**

## Concrete Production

**Sika® ViscoCrete®**
**Sika® Plastocrete®, SikaSet®**
**Sika® Air / AER[CA]**

## Joint Sealing

**Sikaflex®**
**Sikasil®**
**Sikadur® Combiflex**

## Grouting and Anchoring

**SikaGrout®**
**Sikadur®**
**Sika AnchorFix®**

## Concrete Repair & Protection

**Sika MonoTop®**
**SikaTop®, SikaRepair®**
**Sikagard®**

## Structural Strengthening

**Sikadur®, Sika® CarboDur®**
**SikaWrap®**
**Sika® CarboShear**

## Floor & Wall Systems

**Sikafloor®**
**Sikagard®**
**Sikagard® Duroplast**

## Waterproofing Systems

**SikaProof®, SikaFuko®**
**Sika® Greenstreak®**
**SikaSwell®, SikaFix®**

Sika Canada Inc., a member of the Sika Group, is a leader in the field of speciality chemicals for construction and manufacturing industries. Our product lines feature high quality roofing systems, concrete admixtures, mortars and resins, sealants and adhesives, structural strengthening components, industrial and decorative flooring, as well as protective coatings and waterproofing systems. Our expertise is borne out of a global presence and served by strong, local support. Sika has earned the trust of our customers for over 100 years, by delivering the highest standards of commitment and partnership.


Go to our website
or download @



**SIKA CANADA INC.**
**Head Office**
601, avenue Delmar
Pointe-Claire, Quebec
H9R 4A9

**Other locations**
Toronto
Edmonton
Vancouver

**1-800-933-SIKA**
**www.sika.ca**

Certified ISO 9001 (CERT-0102780)
Certified ISO 14001 (CERT-0102791)

**BUILDING TRUST**
**CONSTRUIRE LA CONFIANCE**