Torq-Cut™ Design Information — Concrete

Torq-Cut™ Anchor Installation and Additional Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)		
			½	⅝	¾
Installation Information					
Drill Bit Diameter	d	in.	⅞	1	1¼
Pre-Set Fixture Hole Diameter Range [2]	d_c	in.	9⁄16–¾	11⁄16–⅞	13⁄16–1⅛
Through-Set Minimum Fixture Hole Diameter [2]	d_c	in.	15⁄16	1 1⁄16	1 5⁄16
Installation Torque	T_{inst}	ft.-lb.	90	185	240
Minimum Nominal Embedment Depth	h_{nom}	in.	6⅝	8⅞	11⅜
Minimum Overall Depth of Drilled Hole	h_{hole}	in.	7	9½	12
Critical Edge Distance	c_{ac}	in.	8⅝	12	15⅜
Minimum Edge Distance	c_{min}	in.	7	10	7¾
Minimum Spacing	s_{min}	in.	7	9	7¾
Minimum Concrete Thickness	h_{min}	in.	8⅝	12	15⅜
Additional Data					
Anchor Category	Category	—	1	1	1
Yield Strength	f_{ya}	ksi	80	80	80
Tensile Strength	f_{uta}	ksi	100	100	100
Effective Tensile and Shear Stress Area	A_{se}	in^2	0.142	0.226	0.334
Axial Stiffness in Service Load Range – uncracked concrete	β_{uncr}	lb./in.	635,830		
Axial Stiffness in Service Load Range - cracked concrete	β_{cr}	lb./in.	346,694		

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
2. The clearance must comply with applicable code requirements for the connected element.

Torq-Cut™ Tension Strength Design Data[1]

IBC *

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)		
			½	⅝	¾
Minimum Nominal Embedment Depth	h_{nom}	in.	6⅝	8⅞	11⅜
Steel Strength in Tension					
Nominal Steel Strength in Tension	N_{sa}	lb.	14,190	22,600	33,450
Strength Reduction Factor – Steel Failure	ϕ_{sa}	—	0.75[2]		
Concrete Breakout Strength in Tension [6]					
Minimum Effective Embedment Depth	h_{ef}	in.	5¾	8	10¼
Critical Edge Distance	c_{ac}	in.	8⅝	12	15⅜
Effectiveness Factor – Uncracked Concrete	k_{uncr}	—	24	24	24
Effectiveness Factor – Cracked Concrete	k_{cr}	—	21	17	21
Modification Factor	$\psi_{c,N}$	—	1.0	1.0	1.0
Strength Reduction Factor – Concrete Breakout Failure	ϕ_{cb}	—	0.65[5]		
Pullout Strength in Tension [6]					
Pullout Strength Uncracked Concrete	$N_{p,uncr}$	lb	N/A[3]	N/A[3]	N/A[3]
Pullout Strength Cracked Concrete	$N_{p,cr}$	lb	N/A[3]	N/A[3]	N/A[3]
Strength Reduction Factor - Pullout Failure	ϕ_p	—	N/A[3]	N/A[3]	N/A[3]
Tension Resistance for Seismic Applications [6]					
Tension Resistance - Seismic Loads	N_{eq}	lb	14,190	22,600	33,450
Strength Reduction Factor – Steel Failure	ϕ_{sa}	—	0.75[2]		

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318 D.4.4. Torq-Cut™ anchors are ductile steel elements as defined in ACI 318 D.1.
3. N/A (Not Applicable) denotes that pullout resistance does not need to be considered.
4. The tabulated value of ϕ_p applies when the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.3(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, appropriate value of ϕ must be determined in accordance with ACI 318 Section D.4.4(c).
5. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318 D.4.3 for Condition A are allowed. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.3 for Condition A are met, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D.4.3(c). If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D.4.4(c).
6. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.6, modify the value of concrete breakout strength, $N_{p,cr}$, $N_{p,uncr}$ and N_{eq} by 0.6. All-lightweight concrete is beyond the scope of this table.
7. Pullout strength applies for 2,500 psi ≤ f'_c ≤ 3,500 psi concrete. For f'_c > 3,500 psi concrete, pullout strength need not be considered since steel controls for concrete strengths greater than 3,500 psi.

* See page 12 for an explanation of the load table icons.

Torq-Cut™ Design Information — Concrete

Torq-Cut™ Shear Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)		
			½	⅝	¾
Nominal Embedment Depth	h_{nom}	in.	6⅝	8⅞	11⅜
Steel Strength in Shear					
Pre-Set Configuration: Steel Strength in Shear	V_{sa}	lb.	8,515	13,560	20,070
Through-Set Configuration: Steel Strength in Shear	V_{sa}	lb.	26,065	38,720	49,235
Strength Reduction Factor – Steel Failure	ϕ_{sa}	—	0.65[2]		
Concrete Breakout Strength in Shear[5]					
Outside Diameter	d_a	in.	⅞	1	1¾
Load Bearing Length of Anchor in Shear	ℓ_e	in.	4.3	5.8	7.5
Strength Reduction Factor – Concrete Breakout Failure	ϕ_{cb}	—	0.70[3]		
Concrete Pryout Strength in Shear					
Coefficient for Pryout Strength	k_{cp}	lb.	2.0		
Strength Reduction Factor – Concrete Pryout Failure	ϕ_{cp}	—	0.70[4]		
Steel Strength in Shear for Seismic Applications					
Pre-Set Configuration: Steel Strength in Shear for Seismic Loads	V_{eq}	lb.	8,515	13,560	20,070
Through-Set Configuration: Steel Strength in Shear for Seismic Loads	V_{eq}	lb.	15,640	30,975	44,310
Strength Reduction Factor – Steel Failure	ϕ_{sa}	—	0.65[2]		

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318 D.4.4.
   Torq-Cut™ anchors are ductile steel elements as defined in ACI 318 D.1.
3. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318 D.4.3 for Condition A are allowed. If the load combinations of ACI 318 Section 9.2 are used and the requirements of ACI 318 Section D.4.3 for Condition A are met, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D.4.3(c). If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318 D.4.4(c).
4. The tabulated value of ϕ_{cp} applies when both the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.3(c) for Condition B are met. if the load combinations of ACI 318 Appendix C are used, appropriate value of ϕ_{cp} must be determined in accordance with ACI 318 Section D.4.4(c).
5. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.6, modify the value of concrete breakout strength by 0.6. All-lightweight concrete is beyond the scope of this table.

* See page 12 for an explanation of the load table icons.

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Torq-Cut™ Tension Design Strengths in Normal-Weight Concrete (f'_c = 2,500 psi)

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Tension Design Strength (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B[5]		SDC C-F[6,7]		SDC A-B[5]		SDC C-F[6,7]	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
½	6⅝	8⅝	8⅝	7	10,645	9,410	8,065	7,060	9,190	8,040	6,895	6,030
⅝	8⅞	12	12	10	16,950	12,500	13,235	9,375	15,370	10,885	11,525	8,165
¾	11⅜	15⅜	15⅜	7¾	25,090	22,395	19,195	16,800	16,385	14,335	12,290	10,755

1. Tension design strengths are based on the strength design provisions of ACI 318-11 Appendix D.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ, is based on using a load combination from ACI 318-11 Section 9.2.
5. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-11 Section D.3.3.
7. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

Torq-Cut™ Allowable Tension Loads in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
½	6⅝	8⅝	8⅝	7	7,605	6,720	6,565	5,745
⅝	8⅞	12	12	10	12,105	8,930	10,980	7,775
¾	11⅜	15⅜	15⅜	7¾	17,920	15,995	11,705	10,240

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-11 Appendix D using a conversion factor of α = 1.4. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: 1.2(0.5) + 1.6(0.5) = 1.4.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.

* See page 12 for an explanation of the load table icons.

Torq-Cut™ Design Information — Concrete

Torq-Cut™ Allowable Tension Loads in Normal-Weight Concrete (f'_c = 2,500 psi) — Wind Load

IBC *

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
½	6⅝	8⅝	8⅝	7	6,385	5,645	5,515	4,825
⅝	8⅞	12	12	10	10,170	7,500	9,220	6,530
¾	11⅜	15⅜	15⅜	7¾	15,055	13,435	9,830	8,600

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-11 Appendix D using a conversion factor of $\alpha = 1/0.6 = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.

Torq-Cut™ Allowable Tension Loads in Normal-Weight Concrete (f'_c = 2,500 psi) — Seismic Load

IBC *

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B[4]		SDC C-F[5,6]		SDC A-B[4]		SDC C-F[5,6]	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
½	6⅝	8⅝	8⅝	7	7,450	6,585	5,645	4,940	6,435	5,630	4,825	4,220
⅝	8⅞	12	12	10	11,865	8,750	9,265	6,565	10,760	7,620	8,070	5,715
¾	11⅜	15⅜	15⅜	7¾	17,565	15,675	13,435	11,760	11,470	10,035	8,605	7,530

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-11 Appendix D using a conversion factor of $\alpha = 1/0.7 = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-11 Section D.3.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

* See page 12 for an explanation of the load table icons.