

Strong-Bolt™ Anchor Tension Design Data¹

*See page 10 for an explanation of the load table icons



Characteristic	Symbol	Units	Nominal Anchor Diameter (inch)										
			1/2			5/8			3/4			1	
Embedment Depth	h_{nom}	in.	2 3/4	3 7/8	5	3 3/8	5 1/8	6 1/8	4 1/8	5 3/4	7 1/2	5 1/4	9 3/4
Steel Strength in Tension													
Nominal Steel Strength in Tension	N_{sa}	lb.	13,500			20,875			34,125			36,815	
Strength Reduction Factor – Steel Failure	ϕ	–	0.75 ²			0.75 ²			0.65 ²			0.75 ²	
Concrete Breakout Strength in Tension⁹													
Effective Embedment Depth	h_{ef}	in.	2.250	3.375	4.500	2.750	4.500	5.500	3.375	5.000	6.750	4.500	9.000
Critical Edge Distance ⁷	c_{ac}	in.	9	7 7/8	6 3/4	11	9 5/8	8 1/4	13 1/2	11 3/4	10 1/8	18	13 1/2
Effectiveness Factor – Uncracked Concrete	k_{uncr}	–	24										
Effectiveness Factor – Cracked Concrete	k_{cr}	–	17										
Ratio of k_{uncr}/k_{cr}	$\Psi_{c,N}$	–	1.41										
Strength Reduction Factor – Concrete Breakout Failure	ϕ	–	0.65 ⁸					0.55 ⁸					
Pullout Strength in Tension¹⁰													
Nominal Pullout Strength Uncracked Concrete ($f'_c = 2,500$ psi)	$N_{pn,uncr}$	lb	– ³	4,120 ⁵	4,600 ⁵	– ³	7,250 ⁴	7,300 ⁴	– ³	9,420 ⁵	12,115 ⁵	8,360 ⁵	9,690 ⁵
Nominal Pullout Strength Cracked Concrete ($f'_c = 2,500$ psi)	$N_{pn,cr}$	lb	– ³	2,995 ⁵	2,995 ⁵	– ³	5,200 ⁴	5,260 ⁴	– ³	– ³	9,850 ⁵	7,700 ⁵	11,185 ⁵
Strength Reduction Factor – Pullout Failure	ϕ	–	–	0.65 ⁶	0.65 ⁶	–	0.65 ⁶	0.65 ⁶	–	0.55 ⁶	0.55 ⁶	0.55 ⁶	0.55 ⁶
Pullout Strength in Tension for Seismic Applications¹⁰													
Nominal Pullout Strength of Single Anchor for Seismic Loads ($f'_c = 2,500$ psi)	N_{eq}	lb	– ³	2,995 ⁵	2,995 ⁵	– ³	5,200 ⁴	5,260 ⁴	– ³	– ³	9,850 ⁵	7,700 ⁵	11,185 ⁵
Strength Reduction Factor – Pullout Failure	ϕ	–	–	0.65 ⁶	0.65 ⁶	–	0.65 ⁶	0.65 ⁶	–	–	0.55 ⁶	0.55 ⁶	0.55 ⁶

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
- The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ . The 3/4 inch diameter is considered as a brittle steel element. The 1/2 inch, 5/8 inch, and 1 inch diameters are considered as ductile steel elements.
- Pullout strength is not reported since concrete breakout controls.
- Adjust the characteristic pullout resistance for other concrete compressive strengths by multiplying the tabular value by $(f'_c / 2,500)^{0.7}$.
- Adjust the characteristic pullout resistance for other concrete compressive strengths by multiplying the tabular value by $(f'_c / 2,500)^{0.5}$.
- The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ .
- The modification factor $\Psi_{cp,N} = 1.0$ for cracked concrete. Otherwise, the modification factor for uncracked concrete without supplementary reinforcement to control splitting is either: (1) $\Psi_{cp,N} = 1.0$ if $c_{a,min} \geq c_{ac}$ or (2) $\Psi_{cp,N} = \frac{c_{a,min}}{c_{ac}} \geq \frac{1.5h_{ef}}{c_{ac}}$ if $c_{a,min} < c_{ac}$. The modification factor, $\Psi_{cp,N}$ is applied to the nominal concrete breakout strength, N_{cb} or N_{cbg} .
- The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition A are met, refer to Section D4.4 to determine the appropriate value of ϕ . If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ .
- For sand-lightweight concrete, in lieu of ACI 318 Section D.3.4, modify the value of N_n by multiplying all values of $\sqrt{f'_c}$ affecting N_n by 0.60. All-lightweight concrete is beyond the scope of this table.
- For sand-lightweight concrete, modify the value of $N_{pn,cr}$, $N_{pn,uncr}$ and N_{eq} by 0.60. All-lightweight concrete is beyond the scope of this table.