TECHNICAL ENGINEERING BULLETIN

AT-XP® Design Information — Concrete

- AT-XP has been qualified per ACI 355.4 and AC308. In order to design AT-XP in accordance with ACI 318 Chapter 17, the design information is published in Simpson Strong-Tie's C-A-2021 and IAPMO UES ER-263. In addition, the design values are included in the Simpson Strong-Tie Anchor Designer Software. Simpson strongly encourages the designer to utilize the software when designing concrete anchorage solutions.
- In an attempt to provide the designer quick reference tables, Simpson Strong-Tie has provided the tables contained within this Technical Engineering Bulletin. These tables provide Tension Capacities only. The tables provide either a Design Strength level capacity or an Allowable Tension Load capacity. The footnotes of each table further explain how the Design Strength capacities were calculated and what factors were used to calculate the Allowable Load capacities. For additional information, please refer to Anchor Designer software and/or contact Simpson Strong-Tie.

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Icons and Nomenclature

In order to facilitate easier identification of performance data, the following icon system has been incorporated into the sections of the technical bulletin with multiple load tables. These icons will appear in the heading of the table to promote easier visual identification of the type of load, insert type and substrate addressed in the table. Icons are intended for quick identification. All specific information regarding suitability should be read from the table itself.

Threaded Rod

Rebar

Normal-Weight Concrete

Tension Load

Valid for International Building Code

c_{ac}	Critical Edge Distance
f'_c	Concrete Compressive Strength
h_{ef}	Effective Embedment Depth
h_{min}	Minimum Concrete Thickness

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Tension Design Strength for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi)

IBC *

Rod Dia. (in.)	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼	4¾	—	—	2,140	—	1,605	—	1,115	—	835	—
		5¾	4¼							1,250		935	
	3	4⅞	6⅜	4⅞	4¼	2,700	2,110	2,025	1,580	1,050	1,230	790	925
		7¼	4⅝							1,450		1,090	
	4½	6⅜	10¼	6⅜	5¼	4,055	3,165	**3,040**	**2,375**	975	1,845	735	1,385
		10⅞	6⅞							1,450		1,090	
	6	7⅞	14⅛	7⅞	6	5,405	4,220	**4,055**	**3,165**	945	2,250	710	1,685
		14½	9¼							1,450		1,090	
	7½	9⅜	18	9⅜	6¾	6,755	5,275	**5,065**	**3,955**	925	2,585	695	1,935
		18	11½							1,450		1,090	
½	2¾	5¼	6⅛	—	—	3,555	—	2,410	—	1,720	—	1,225	—
		6⅝	6⅛							1,920		1,225	
	3	5½	6⅛	5½	6⅛	4,055	2,680	2,625	1,710	1,800	1,365	1,335	870
		7¼	6⅛							2,095		1,335	
	6	8½	14⅜	8½	7	8,240	5,365	**5,255**	3,420	1,755	2,700	1,120	1,740
		14½	9¾							2,605		1,660	
	8	10½	19⅞	10½	8½	10,990	7,155	**7,005**	**4,560**	1,695	3,425	1,080	2,320
		19¼	13							2,605		1,660	
	10	12½	25¼	12½	9¾	13,735	8,940	**8,755**	**5,700**	1,665	4,070	1,060	2,895
		24	16⅛							2,605		1,660	
⅝	3⅛	6¼	7⅞	6¼	7⅝	4,310	3,050	3,230	1,995	2,180	1,485	1,635	950
		7½	7⅞							2,405		1,735	
	5	8⅛	10½	8⅛	7⅞	8,720	5,285	5,905	3,370	2,965	2,485	2,065	1,585
		12	7⅞							4,095		2,770	
	7½	10⅝	18⅜	10⅝	9⅛	13,890	7,935	**8,855**	5,060	2,780	3,705	1,770	2,375
		18	12⅜							4,130		2,630	
	12½	15⅝	32⅝	15⅝	12½	23,150	13,230	**14,760**	**8,435**	2,610	5,620	1,665	3,960
		30	20⅞							4,090		2,605	
¾	3½	7¼	9⅝	7¼	8⅞	5,105	3,620	3,830	2,340	2,680	1,695	2,010	1,080
		8½	9⅝							2,725		2,045	
	6	9¾	12⅛	9¾	9⅝	11,465	7,380	8,600	4,705	3,855	3,300	2,890	2,105
		14½	9⅝							5,190		3,895	
	9	12¾	21¼	12¾	11¼	20,645	11,080	**13,160**	7,065	4,145	4,895	2,640	3,160
		21⅝	14⅜							6,155		3,925	
	15	18¾	39⅝	18¾	15¾	34,405	18,465	**21,935**	**11,775**	3,705	7,660	2,360	5,265
		36	25¼							5,800		3,700	
⅞	3¾	8⅛	11⅛	8⅛	10½	5,665	4,010	4,250	1,825	2,945	1,825	1,900	805
		9	11⅛							2,945		1,900	
	7	11⅜	13¾	11⅜	11⅛	14,445	8,625	8,195	3,815	4,840	3,735	2,855	1,655
		16⅞	11⅛							6,320		3,550	
	10½	14⅞	24	14⅞	12½	26,540	12,940	12,295	5,725	5,540	5,605	2,450	2,480
		25¼	16¼							8,225		3,640	
	17½	21⅞	46	21⅞	17½	46,300	21,565	**20,490**	9,540	4,820	8,840	2,135	4,130
		42	29⅜							7,555		3,345	

* See page 4 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

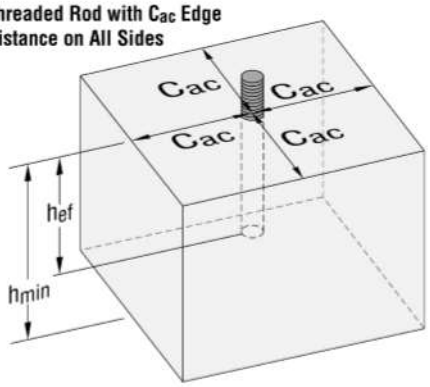
Tension Design Strength for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi)

IBC *

Rod Dia. (in.)	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1	4	9	12⅜	9	12⅜	6,240	4,420	4,680	2,885	3,175	1,920	2,380	1,225
		9⅝	12⅜							3,175		2,380	
	8	13	15⅜	13	12⅜	17,650	9,050	11,935	5,770	5,915	3,840	4,070	2,450
		19¼	12⅜							7,520		5,065	
	12	17	26¾	17	12¾	28,075	13,570	**17,900**	8,650	5,480	5,760	3,495	3,670
		28⅞	18							8,135		5,185	
	20	25	51⅜	25	18¼	46,795	22,620	**29,830**	14,420	4,750	9,365	3,025	6,120
		48	32¾							7,440		4,745	
1¼	5	11¼	13⅜	11¼	13⅜	8,720	6,175	6,215	3,480	—	—	—	—
		12	13⅜										
	10	16¼	18¼	16¼	13⅜	22,090	12,370	12,425	6,960	—	—	—	—
		24	15										
	15	21¼	32	21¼	15¾	33,135	18,555	18,640	10,435	—	—	—	—
		36	22½										
	25	31¼	57⅜	31¼	22	55,225	30,925	**31,065**	17,395	—	—	—	—
		60	37½										

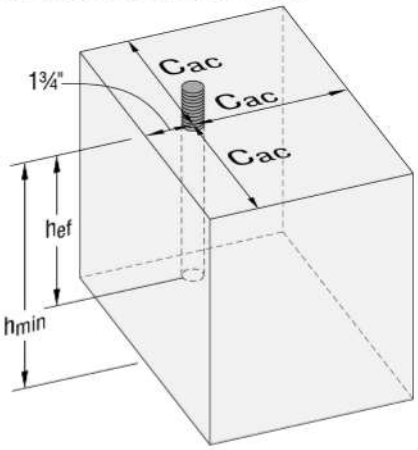
1. Tension design strength (SD level) must be the lesser of the concrete, bond or threaded rod steel design strength.
2. Tension design strengths are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. Strength reduction factor, ϕ, is based on using a load combination from ACI 318-14 Section 5.3.
6. 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.
7. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3. Design strengths in **Bold** indicate that the anchor ductility requirements of 17.2.3.4.3 (a) (i) to (iii) are satisfied when using ASTM F1554 Grade 36 threaded rod. Any other ductility requirements must be satisfied.
8. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
9. The Designer of Record is responsible for the foundation design.

Threaded Rod with C_{ac} Edge Distance on All Sides



Flat Slab

Threaded Rod with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

IBC *

Rod Dia. (in.)	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼	4¾	—	—	1,530	—	795	—
		5¾	4¼					895	
	3	4⅞	6⅜	4⅞	4¼	1,930	1,505	750	880
		7¼	4⅝					1,035	
	4½	6⅜	10¼	6⅜	5¼	2,895	2,260	695	1,320
		10⅞	6⅞					1,035	
	6	7⅞	14⅛	7⅞	6	3,860	3,015	675	1,605
		14½	9¼					1,035	
	7½	9⅜	18	9⅜	6¾	4,825	3,770	660	1,845
		18	11½					1,035	
½	2¾	5¼	6⅛	—	—	2,540	—	1,230	—
		6⅝	6⅛					1,370	
	3	5½	6⅛	5½	6⅛	2,895	1,915	1,285	975
		7¼	6⅛					1,495	
	6	8½	14⅜	8½	7	5,885	3,830	1,255	1,930
		14½	9¾					1,860	
	8	10½	19⅞	10½	8½	7,850	5,110	1,210	2,445
		19¼	13					1,860	
	10	12½	25¼	12½	9¾	9,810	6,385	1,190	2,905
		24	16⅛					1,860	
⅝	3⅛	6¼	7⅞	6¼	7⅝	3,080	2,180	1,555	1,060
		7½	7⅞					1,720	
	5	8⅛	10½	8⅛	7⅞	6,230	3,775	2,120	1,775
		12	7⅞					2,925	
	7½	10⅝	18⅜	10⅝	9⅛	9,920	5,670	1,985	2,645
		18	12⅜					2,950	
	12½	15⅝	32⅝	15⅝	12½	16,535	9,450	1,865	4,015
		30	20⅞					2,920	
¾	3½	7¼	9⅝	7¼	8⅞	3,645	2,585	1,915	1,210
		8½	9⅝					1,945	
	6	9¾	12⅛	9¾	9⅝	8,190	5,270	2,755	2,355
		14½	9⅝					3,705	
	9	12¾	21¼	12¾	11¼	14,745	7,915	2,960	3,495
		21⅝	14⅜					4,395	
	15	18¾	39⅝	18¾	15¾	24,575	13,190	2,645	5,470
		36	25¼					4,145	
⅞	3¾	8⅛	11⅛	8⅛	10½	4,045	2,865	2,105	1,305
		9	11⅛					2,105	
	7	11⅜	13¾	11⅜	11⅛	10,320	6,160	3,455	2,670
		16⅞	11⅛					4,515	
	10½	14⅞	24	14⅞	12½	18,955	9,245	3,955	4,005
		25¼	16¼					5,875	
	17½	21⅞	46	21⅞	17½	33,070	15,405	3,445	6,315
		42	29⅜					5,395	

* See page 6 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

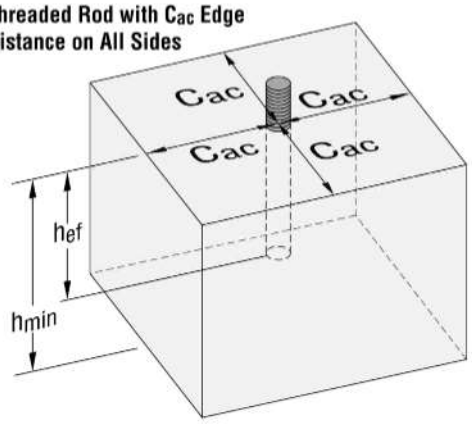
Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

IBC *

Rod Dia. (in.)	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
1	4	9	12⅜	9	12⅜	4,455	3,155	2,270	1,370
		9⅝	12⅜					2,270	
	8	13	15⅜	13	12⅜	12,605	6,465	4,225	2,745
		19¼	12⅜					5,370	
	12	17	26¾	17	12¾	20,055	9,695	3,915	4,115
		28⅞	18					5,810	
	20	25	51⅜	25	18¼	33,425	16,155	3,395	6,690
		48	32¾					5,315	
1¼	5	11¼	13⅜	11¼	13⅜	6,230	4,410	—	—
		12	13⅜						
	10	16¼	18¼	16¼	13⅜	15,780	8,835	—	—
		24	15						
	15	21¼	32	21¼	15¾	23,670	13,255	—	—
		36	22½						
	25	31¼	57⅜	31¼	22	39,445	22,090	—	—
		60	37½						

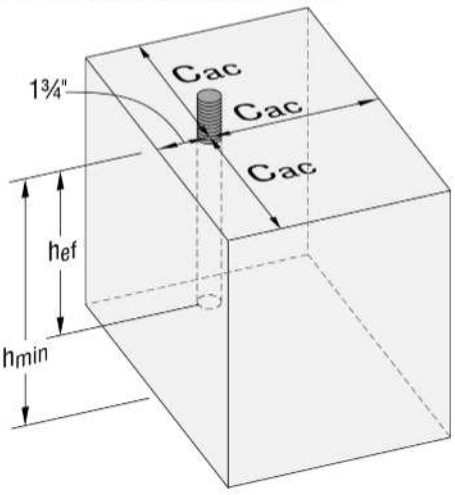
1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load. Designer to select the lower value from the table above and the allowable tension load based on steel strength (page 10).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads 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.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The Designer of Record is responsible for the foundation design.

Threaded Rod with C_{ac} Edge Distance on All Sides



Flat Slab

Threaded Rod with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Wind Load

IBC

Rod Dia. (in)	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼	4¾	—	—	1,285	—	670	—
		5¾	4¼					750	
	3	4⅞	6⅜	4⅞	4¼	1,620	1,265	630	740
		7¼	4⅝					870	
	4½	6⅜	10¼	6⅜	5¼	2,435	1,900	585	1,105
		10⅞	6⅞					870	
	6	7⅞	14⅛	7⅞	6	3,245	2,530	565	1,350
		14½	9¼					870	
	7½	9⅜	18	9⅜	6¾	4,055	3,165	555	1,550
		18	11½					870	
½	2¾	5¼	6⅛	—	—	2,135	—	1,030	—
		6⅝	6⅛					1,150	
	3	5½	6⅛	5½	6⅛	2,435	1,610	1,080	820
		7¼	6⅛					1,255	
	6	8½	14⅜	8½	7	4,945	3,220	1,055	1,620
		14½	9¾					1,565	
	8	10½	19⅞	10½	8½	6,595	4,295	1,015	2,055
		19¼	13					1,565	
	10	12½	25¼	12½	9¾	8,240	5,365	1,000	2,440
		24	16⅛					1,565	
⅝	3⅛	6¼	7⅞	6¼	7⅝	2,585	1,830	1,310	890
		7½	7⅞					1,445	
	5	8⅛	10½	8⅛	7⅞	5,230	3,170	1,780	1,490
		12	7⅞					2,455	
	7½	10⅝	18⅜	10⅝	9⅛	8,335	4,760	1,670	2,225
		18	12⅜					2,480	
	12½	15⅝	32⅝	15⅝	12½	13,890	7,940	1,565	3,370
		30	20⅞					2,455	
¾	3½	7¼	9⅝	7¼	8⅞	3,065	2,170	1,610	1,015
		8½	9⅝					1,635	
	6	9¾	12⅛	9¾	9⅝	6,880	4,430	2,315	1,980
		14½	9⅝					3,115	
	9	12¾	21¼	12¾	11¼	12,385	6,650	2,485	2,935
		21⅝	14⅜					3,695	
	15	18¾	39⅝	18¾	15¾	20,645	11,080	2,225	4,595
		36	25¼					3,480	
⅞	3¾	8⅛	11⅛	8⅛	10½	3,400	2,405	1,765	1,095
		9	11⅛					1,765	
	7	11⅜	13¾	11⅜	11⅛	8,665	5,175	2,905	2,240
		16⅞	11⅛					3,790	
	10½	14⅞	24	14⅞	12½	15,925	7,765	3,325	3,365
		25¼	16¼					4,935	
	17½	21⅞	46	21⅞	17½	27,780	12,940	2,890	5,305
		42	29⅜					4,535	

* See page 8 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

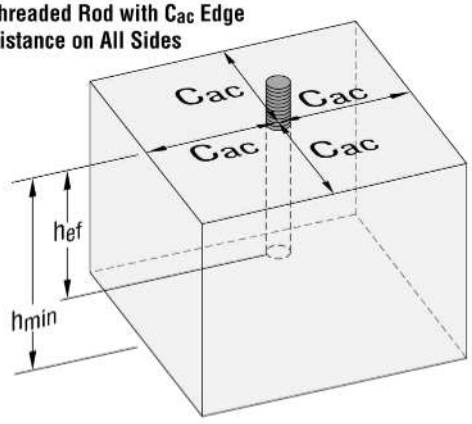
Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) —Wind Load

IBC *

Rod Dia. (in)	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
1	4	9	12⅜	9	12⅜	3,745	2,650	1,905	1,150
		9⅝	12⅜					1,905	
	8	13	15⅜	13	12⅜	10,590	5,430	3,550	2,305
		19¼	12⅜					4,510	
	12	17	26¾	17	12¾	16,845	8,140	3,290	3,455
		28⅞	18					4,880	
	20	25	51⅜	25	18¼	28,075	13,570	2,850	5,620
		48	32¾					4,465	
1¼	5	11¼	13⅜	11¼	13⅜	5,230	3,705	—	—
		12	13⅜						
	10	16¼	18¼	16¼	13⅜	13,255	7,420	—	—
		24	15						
	15	21¼	32	21¼	15¾	19,880	11,135	—	—
		36	22½						
	25	31¼	57⅜	31¼	22	33,135	18,555	—	—
		60	37½						

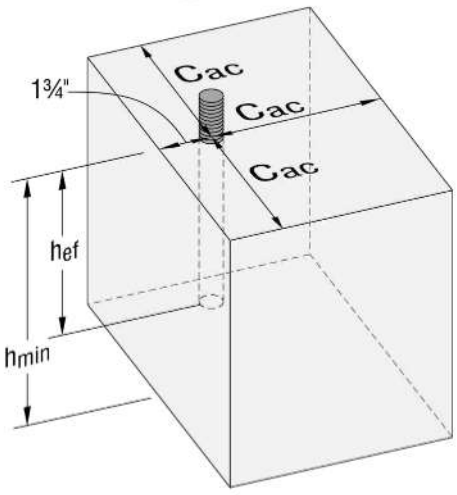
1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load. Designer to select the lower value from the table above and the allowable tension load based on steel strength (page 10).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads 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.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The Designer of Record is responsible for the foundation design.

Threaded Rod with C_{ac} Edge Distance on All Sides



Flat Slab

Threaded Rod with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Seismic Load

IBC *

Rod Dia. (in.)	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all side				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼	4¾	—	—	1,500	—	1,125	—	780	—	585	—
		5¾	4¼							875		655	
	3	4⅞	6⅜	4⅞	4¼	1,890	1,475	1,420	1,105	735	860	555	650
		7¼	4⅝							1,015		765	
	4½	6⅜	10¼	6⅜	5¼	2,840	2,215	**2,130**	**1,665**	685	1,290	515	970
		10⅞	6⅞							1,015		765	
	6	7⅞	14⅛	7⅞	6	3,785	2,955	**2,840**	**2,215**	660	1,575	495	1,180
		14½	9¼							1,015		765	
	7½	9⅜	18	9⅜	6¾	4,730	3,695	**3,545**	**2,770**	650	1,810	485	1,355
		18	11½							1,015		765	
½	2¾	5¼	6⅛	—	—	2,490	—	1,685	—	1,205	—	860	—
		6⅝	6⅛							1,345		860	
	3	5½	6⅛	5½	6⅛	2,840	1,875	1,840	1,195	1,260	955	935	610
		7¼	6⅛							1,465		935	
	6	8½	14⅜	8½	7	5,770	3,755	**3,680**	2,395	1,230	1,890	785	1,220
		14½	9¾							1,825		1,160	
	8	10½	19⅞	10½	8½	7,695	5,010	**4,905**	**3,190**	1,185	2,400	755	1,625
		19¼	13							1,825		1,160	
	10	12½	25¼	12½	9¾	9,615	6,260	**6,130**	**3,990**	1,165	2,850	740	2,025
		24	16⅛							1,825		1,160	
⅝	3⅛	6¼	7⅞	6¼	7⅝	3,015	2,135	2,260	1,395	1,525	1,040	1,145	665
		7½	7⅞							1,685		1,215	
	5	8⅛	10½	8⅛	7⅞	6,105	3,700	4,135	2,360	2,075	1,740	1,445	1,110
		12	7⅞							2,865		1,940	
	7½	10⅝	18⅜	10⅝	9⅛	9,725	5,555	**6,200**	3,540	1,945	2,595	1,240	1,665
		18	12⅜							2,890		1,840	
	12½	15⅝	32⅝	15⅝	12½	16,205	9,260	**10,330**	**5,905**	1,825	3,935	1,165	2,770
		30	20⅞							2,865		1,825	
¾	3½	7¼	9⅝	7¼	8⅞	3,575	2,535	2,680	1,640	1,875	1,185	1,405	755
		8½	9⅝							1,910		1,430	
	6	9¾	12⅛	9¾	9⅝	8,025	5,165	6,020	3,295	2,700	2,310	2,025	1,475
		14½	9⅝							3,635		2,725	
	-	12¾	21¼	12¾	11¼	14,450	7,755	**9,210**	4,945	2,900	3,425	1,850	2,210
		21⅝	14⅜							4,310		2,750	
	15	18¾	39⅝	18¾	15¾	24,085	12,925	**15,355**	**8,245**	2,595	5,360	1,650	3,685
		36	25¼							4,060		2,590	
⅞	3¾	8⅛	11⅛	8⅛	10½	3,965	2,805	2,975	1,280	2,060	1,280	1,330	565
		9	11⅛							2,060		1,330	
	7	11⅜	13¾	11⅜	11⅛	10,110	6,040	5,735	2,670	3,390	2,615	2,000	1,160
		16⅞	11⅛							4,425		2,485	
	10½	14⅞	24	14⅞	12½	18,580	9,060	8,605	4,010	3,880	3,925	1,715	1,735
		25¼	16¼							5,760		2,550	
	17½	21⅞	46	21⅞	17½	32,410	15,095	**14,345**	6,680	3,375	6,190	1,495	2,890
		42	29⅜							5,290		2,340	

* See page 10 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Seismic Load

IBC *

Rod Dia. (in.)	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all side				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1	4	9	12⅜	9	12⅜	4,370	3,095	3,275	2,020	2,225	1,345	1,665	860
		9⅝	12⅜							2,225		1,665	
	8	13	15⅜	13	12⅜	12,355	6,335	8,355	4,040	4,140	2,690	2,850	1,715
		19¼	12⅜							5,265		3,545	
	12	17	26¾	17	12¾	19,655	9,500	**12,530**	6,055	3,835	4,030	2,445	2,570
		28⅞	18							5,695		3,630	
	20	25	51⅜	25	18¼	32,755	15,835	**20,880**	10,095	3,325	6,555	2,120	4,285
		48	32¾							5,210		3,320	
1¼	5	11¼	13⅜	11¼	13⅜	6,105	4,325	4,350	2,435	—	—	—	—
		12	13⅜										
	10	16¼	18¼	16¼	13⅜	15,465	8,660	8,700	4,870	—	—	—	—
		24	15										
	15	21¼	32	21¼	15¾	23,195	12,990	13,050	7,305	—	—	—	—
		36	22½										
	25	31¼	57⅜	31¼	22	38,660	21,650	**21,745**	12,175	—	—	—	—
		60	37½										

1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load. Designer to select the lower value from the table above and the allowable tension load based on steel strength (page 10).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads 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.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. 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.
6. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3. Design strengths in **Bold** indicate that the anchor ductility requirements of 17.2.3.4.3 (a) (i) to (iii) are satisfied when using ASTM F1554 Grade 36 threaded rod. Any other ductility requirements must be satisfied.
7. Allowable tension loads in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. The Designer of Record is responsible for the foundation design.

Allowable Tension Loads Based on Threaded Rod Steel Strength

Rod Dia. (in.)	ASTM F1554 Gr. 36	ASTM A449 Gr. 92 or ASTM A193 Gr. B7
⅜	1,495	3,090
½	2,720	5,625
⅝	4,325	8,950
¾	6,395	13,225
⅞	8,845	18,295
1	11,600	24,000
1¼	18,545	39,970

1. Allowable steel tension loads are based on the following equation:
   $F_v = 0.33 \times F_u \times$ Tensile Stress Area
   a. ASTM F1554 Gr. 36 - minimum F_u=58ksi
   b. ASTM A449 Gr. 92 - minimum F_u=120ksi
   c. ASTM A193 Gr. B7 - minimum F_u=125ksi
   d. For ½" to 1" diameter, the steel strength is based on ASTM A449 Gr. 92. For 1¼" diameter, the steel strength is based on ASTM A193 Gr. B7.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

Tension Design Strength for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi)

IBC *

Rebar Size	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all side				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4¼	—	—	1,555	—	1,165	—	845	—	635	—
		5¾	3⅜							980		735	
	3	4⅞	5⅝	4⅞	3⅝	1,965	660	1,470	495	795	415	600	310
		7¼	4½							1,100		825	
	4½	6⅜	9	6⅜	3⅝	2,945	990	2,210	745	740	625	555	470
		10⅞	6¾							1,100		825	
	6	7⅞	12½	7⅞	3⅝	3,925	1,320	2,945	990	715	830	540	625
		14½	9							1,100		825	
	7½	9⅜	15⅞	9⅜	3⅝	4,910	1,650	3,680	1,240	705	1,040	525	780
		18	11¼							1,100		825	
#4	2¾	5¼	4¾	—	—	2,350	—	1,765	—	1,305	—	980	—
		6⅝	4¾							1,305		980	
	3	5½	5⅛	5½	4¾	2,565	1,995	1,925	1,495	1,320	1,105	990	830
		7¼	4¾							1,425		1,070	
	6	8½	11⅞	8½	5⅝	5,130	3,990	3,850	2,995	1,140	2,085	855	1,565
		14½	9							1,690		1,265	
	8	10½	16½	10½	6⅞	6,840	5,320	5,130	3,990	1,100	2,640	825	1,980
		19¼	12							1,690		1,265	
	10	12½	21	12½	8	8,555	6,650	6,415	4,990	1,080	3,175	810	2,380
		24	15							1,690		1,265	
#5	3⅛	6¼	5⅞	6¼	5⅞	3,275	2,630	2,455	1,975	1,675	1,350	1,260	1,010
		7½	5⅞							1,675		1,260	
	5	8⅛	9¼	8⅛	5⅞	5,240	4,210	3,930	3,160	1,725	2,160	1,295	1,620
		12	7½							2,385		1,785	
	7½	10⅝	14¾	10⅝	7⅝	7,855	6,320	5,890	4,740	1,605	2,995	1,205	2,245
		18	11¼							2,385		1,785	
	12½	15⅝	26	15⅝	10¾	13,095	10,530	9,820	7,895	1,520	4,615	1,140	3,460
		30	18¾							2,385		1,785	
#6	3½	7¼	7	7¼	7	4,330	3,585	3,250	2,685	2,100	1,735	1,575	1,300
		8½	7							2,100		1,575	
	6	9¾	11	9¾	7½	7,425	6,145	5,570	4,605	2,310	2,935	1,730	2,200
		14½	9							3,190		2,395	
	9	12¾	17⅝	12¾	9⅞	11,140	9,215	8,355	6,910	2,150	4,135	1,610	3,105
		21⅝	13½							3,190		2,395	
	15	18¾	31	18¾	13⅞	18,565	15,355	13,925	11,515	2,035	6,455	1,525	4,845
		36	22½							3,190		2,395	
#7	3¾	8⅛	8⅛	8⅛	7¾	5,300	4,010	3,975	3,010	2,470	1,950	1,850	1,465
		9	8⅛							2,470		1,850	
	7	11⅜	12⅝	11⅜	9¼	9,895	8,415	7,420	6,310	2,950	3,805	2,210	2,855
		16⅞	10½							4,075		3,055	
	10½	14⅞	20⅜	14⅞	12⅛	14,845	12,620	11,130	9,465	2,745	5,400	2,060	4,050
		25¼	15¾							4,075		3,055	
	17½	21⅞	35¾	21⅞	17	24,740	21,035	18,555	15,775	2,600	8,495	1,950	6,370
		42	26¼							4,075		3,055	

* See page 12 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

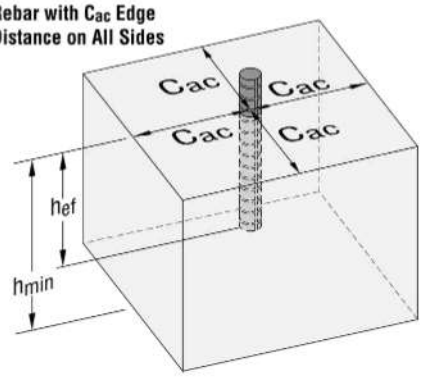
Tension Design Strength for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi)

IBC *

Rebar Size	Eff. Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all side				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#8	4	9	9⅛	9	9⅛	5,175	4,420	3,880	3,315	2,335	2,030	1,750	1,520
		9⅝	9⅛							2,335		1,750	
	8	13	14⅜	13	9¾	10,350	8,990	7,760	6,745	2,985	4,060	2,240	3,045
		19¼	12							4,125		3,095	
	12	17	23⅛	17	12⅝	15,525	13,485	11,640	10,115	2,780	5,695	2,085	4,270
		28⅞	18							4,125		3,095	
	20	25	40½	25	17¾	25,870	22,480	19,405	16,860	2,630	9,015	1,975	6,760
		48	30							4,125		3,095	
#10	5	11¼	11¼	11¼	10½	7,730	6,175	5,800	4,635	—	—	—	—
		12	11¼										
	10	16¼	17⅝	16¼	13¼	15,465	14,490	11,595	10,870	—	—	—	—
		24	15										
	15	21¼	28⅜	21¼	17⅜	23,195	21,735	17,395	16,300	—	—	—	—
		36	22½										
	25	31¼	49¾	31¼	24½	38,655	36,225	28,990	27,170	—	—	—	—
		60	37½										

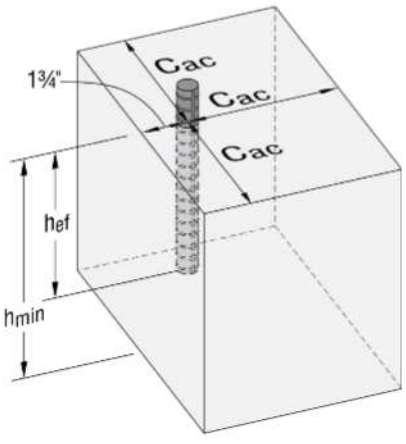
1. Tension design strength (SD level) must be the lesser of the concrete, bond or rebar steel design strength.
2. Tension design strengths are based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. Strength reduction factor, ϕ, is based on using a load combination from ACI 318-14 Section 5.3.
6. 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.
7. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
8. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
9. The Designer of Record is responsible for the foundation design.

Rebar with C_{ac} Edge Distance on All Sides



Flat Slab

Rebar with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

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

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4¼	—	—	1,110	—	605	—
		5¾	3⅝					700	
	3	4⅞	5⅝	4⅞	3⅝	1,405	470	570	295
		7¼	4½					785	
	4½	6⅜	9	6⅜	3⅝	2,105	705	530	445
		10⅞	6¾					785	
	6	7⅞	12½	7⅞	3⅝	2,805	945	510	595
		14½	9					785	
	7½	9⅜	15⅞	9⅜	3⅝	3,505	1,180	505	745
		18	11¼					785	
#4	2¾	5¼	4¾	—	—	1,680	—	930	—
		6⅝	4¾					930	
	3	5½	5⅛	5½	4¾	1,830	1,425	945	790
		7¼	4¾					1,020	
	6	8½	11⅞	8½	5⅝	3,665	2,850	815	1,490
		14½	9					1,205	
	8	10½	16½	10½	6⅞	4,885	3,800	785	1,885
		19¼	12					1,205	
	10	12½	21	12½	8	6,110	4,750	770	2,270
		24	15					1,205	
#5	3⅛	6¼	5⅞	6¼	5⅞	2,340	1,880	1,195	965
		7½	5⅞					1,195	
	5	8⅛	9¼	8⅛	5⅞	3,745	3,005	1,230	1,545
		12	7½					1,705	
	7½	10⅝	14¾	10⅝	7⅝	5,610	4,515	1,145	2,140
		18	11¼					1,705	
	12½	15⅝	26	15⅝	10¾	9,355	7,520	1,085	3,295
		30	18¾					1,705	
#6	3½	7¼	7	7¼	7	3,095	2,560	1,500	1,240
		8½	7					1,500	
	6	9¾	11	9¾	7½	5,305	4,390	1,650	2,095
		14½	9					2,280	
	9	12¾	17⅝	12¾	9⅞	7,955	6,580	1,535	2,955
		21⅝	13½					2,280	
	15	18¾	31	18¾	13⅞	13,260	10,970	1,455	4,610
		36	22½					2,280	
#7	3¾	8⅛	8⅛	8⅛	7¾	3,785	2,865	1,765	1,395
		9	8⅛					1,765	
	7	11⅜	12⅝	11⅜	9¼	7,070	6,010	2,105	2,720
		16⅞	10½					2,910	
	10½	14⅞	20⅜	14⅞	12⅛	10,605	9,015	1,960	3,855
		25¼	15¾					2,910	
	17½	21⅞	35¾	21⅞	17	17,670	15,025	1,855	6,070
		42	26¼					2,910	

* See page 14 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

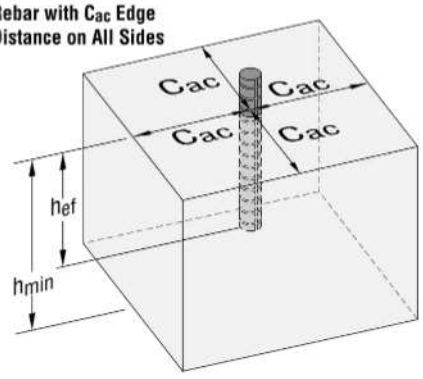
Allowable Tension Loads for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#8	4	9	9⅛	9	9⅛	3,695	3,155	1,670	1,450
		9⅝	9⅛					1,670	
	8	13	14⅜	13	9¾	7,395	6,420	2,130	2,900
		19¼	12					2,945	
	12	17	23⅛	17	12⅝	11,090	9,630	1,985	4,070
		28⅞	18					2,945	
	20	25	40½	25	17¾	18,480	16,055	1,880	6,440
		48	30					2,945	
#10	5	11¼	11¼	11¼	10½	5,520	4,410	—	—
		12	11¼						
	10	16¼	17⅝	16¼	13¼	11,045	10,350	—	—
		24	15						
	15	21¼	28⅜	21¼	17⅜	16,570	15,525	—	—
		36	22½						
	25	31¼	49¾	31¼	24½	27,610	25,875	—	—
		60	37½						

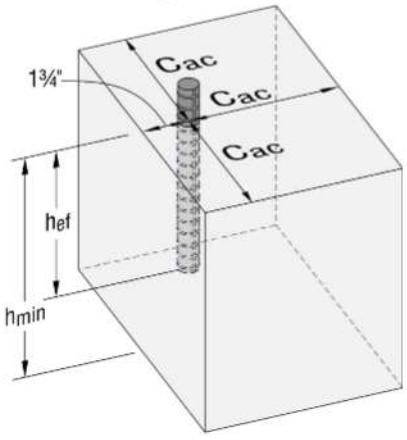
1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load. Designer to select the lower value from the table above and the allowable tension load based on rebar steel strength (page 18).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads 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.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The Designer of Record is responsible for the foundation design.

Rebar with C_{ac} Edge Distance on All Sides



Flat Slab

Rebar with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

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

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge Distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4¼	—	—	935	—	505	—
		5¾	3⅝					590	
	3	4⅞	5⅝	4⅞	3⅝	1,180	395	475	250
		7¼	4½					660	
	4½	6⅜	9	6⅜	3⅝	1,765	595	445	375
		10⅞	6¾					660	
	6	7⅞	12½	7⅞	3⅝	2,355	790	430	500
		14½	9					660	
	7½	9⅜	15⅞	9⅜	3⅝	2,945	990	425	625
		18	11¼					660	
#4	2¾	5¼	4¾	—	—	1,410	—	785	—
		6⅝	4¾					785	
	3	5½	5⅛	5½	4¾	1,540	1,195	790	665
		7¼	4¾					855	
	6	8½	11⅞	8½	5⅝	3,080	2,395	685	1,250
		14½	9					1,015	
	8	10½	16½	10½	6⅞	4,105	3,190	660	1,585
		19¼	12					1,015	
	10	12½	21	12½	8	5,135	3,990	650	1,905
		24	15					1,015	
#5	3⅛	6¼	5⅞	6¼	5⅞	1,965	1,580	1,005	810
		7½	5⅞					1,005	
	5	8⅛	9¼	8⅛	5⅞	3,145	2,525	1,035	1,295
		12	7½					1,430	
	7½	10⅝	14¾	10⅝	7⅝	4,715	3,790	965	1,795
		18	11¼					1,430	
	12½	15⅝	26	15⅝	10¾	7,855	6,320	910	2,770
		30	18¾					1,430	
#6	3½	7¼	7	7¼	7	2,600	2,150	1,260	1,040
		8½	7					1,260	
	6	9¾	11	9¾	7½	4,455	3,685	1,385	1,760
		14½	9					1,915	
	9	12¾	17⅝	12¾	9⅞	6,685	5,530	1,290	2,480
		21⅝	13½					1,915	
	15	18¾	31	18¾	13⅞	11,140	9,215	1,220	3,875
		36	22½					1,915	
#7	3¾	8⅛	8⅛	8⅛	7¾	3,180	2,405	1,480	1,170
		9	8⅛					1,480	
	7	11⅜	12⅝	11⅜	9¼	5,935	5,050	1,770	2,285
		16⅞	10½					2,445	
	10½	14⅞	20⅜	14⅞	12⅛	8,905	7,570	1,645	3,240
		25¼	15¾					2,445	
	17½	21⅞	35¾	21⅞	17	14,845	12,620	1,560	5,095
		42	26¼					2,445	

* See page 16 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

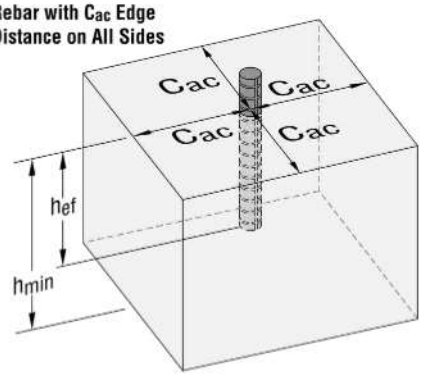
Allowable Tension Loads for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi) — Wind Load

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge Distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#8	4	9	9⅛	9	9⅛	3,105	2,650	1,400	1,220
		9⅝	9⅛					1,400	
	8	13	14⅜	13	9¾	6,210	5,395	1,790	2,435
		19¼	12					2,475	
	12	17	23⅛	17	12⅝	9,315	8,090	1,670	3,415
		28⅞	18					2,475	
	20	25	40½	25	17¾	15,520	13,490	1,580	5,410
		48	30					2,475	
#10	5	11¼	11¼	11¼	10½	4,640	3,705	—	—
		12	11¼						
	10	16¼	17⅝	16¼	13¼	9,280	8,695	—	—
		24	15						
	15	21¼	28⅜	21¼	17⅜	13,915	13,040	—	—
		36	22½						
	25	31¼	49¾	31¼	24½	23,195	21,735	—	—
		60	37½						

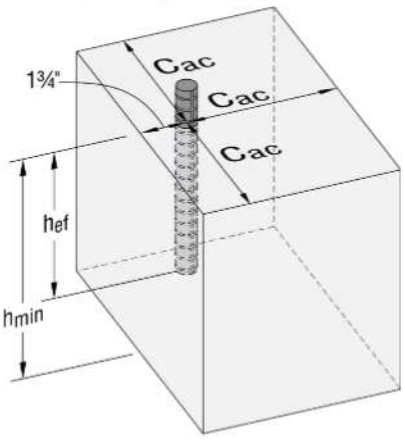
1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load. Designer to select the lower value from the table above and the allowable tension load based on rebar steel strength (page 18).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using a conversion factor of $\alpha = 1/\phi_{cb} = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The Designer of Record is responsible for the foundation design.

Rebar with C_{ac} Edge Distance on All Sides



Flat Slab

Rebar with 1¾" Edge Distance on One Side and C_{ac} on Three Sides



Flat Slab

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

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

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4¼	—	—	1,090	—	815	—	590	—	445	—
		5¾	3⅝							685		515	
	3	4⅞	5⅝	4⅞	3⅝	1,375	460	1,030	345	555	290	420	215
		7¼	4½							770		580	
	4½	6⅜	9	6⅜	3⅝	2,060	695	1,545	520	520	440	390	330
		10⅞	6¾							770		580	
	6	7⅞	12½	7⅞	3⅝	2,750	925	2,060	695	500	580	380	440
		14½	9							770		580	
	7½	9⅜	15⅞	9⅜	3⅝	3,435	1,155	2,575	870	495	730	370	545
		18	11¼							770		580	
#4	2¾	5¼	4¾	—	—	1,645	—	1,235	—	915	—	685	—
		6⅝	4¾							915		685	
	3	5½	5⅛	5½	4¾	1,795	1,395	1,350	1,045	925	775	695	580
		7¼	4¾							1,000		750	
	6	8½	11⅞	8½	5⅝	3,590	2,795	2,695	2,095	800	1,460	600	1,095
		14½	9							1,185		885	
	8	10½	16½	10½	6⅞	4,790	3,725	3,590	2,795	770	1,850	580	1,385
		19¼	12							1,185		885	
	10	12½	21	12½	8	5,990	4,655	4,490	3,495	755	2,225	565	1,665
		24	15							1,185		885	
#5	3⅛	6¼	5⅞	6¼	5⅞	2,295	1,840	1,720	1,385	1,175	945	880	705
		7½	5⅞							1,175		880	
	5	8⅛	9¼	8⅛	5⅞	3,670	2,945	2,750	2,210	1,210	1,510	905	1,135
		12	7½							1,670		1,250	
	7½	10⅝	14¾	10⅝	7⅝	5,500	4,425	4,125	3,320	1,125	2,095	845	1,570
		18	11¼							1,670		1,250	
	12½	15⅝	26	15⅝	10¾	9,165	7,370	6,875	5,525	1,065	3,230	800	2,420
		30	18¾							1,670		1,250	
#6	3½	7¼	7	7¼	7	3,030	2,510	2,275	1,880	1,470	1,215	1,105	910
		8½	7							1,470		1,105	
	6	9¾	11	9¾	7½	5,200	4,300	3,900	3,225	1,615	2,055	1,210	1,540
		14½	9							2,235		1,675	
	9	12¾	17⅝	12¾	9⅞	7,800	6,450	5,850	4,835	1,505	2,895	1,125	2,175
		21⅝	13½							2,235		1,675	
	15	18¾	31	18¾	13⅞	12,995	10,750	9,750	8,060	1,425	4,520	1,070	3,390
		36	22½							2,235		1,675	
#7	3¾	8⅛	8⅛	8⅛	7¾	3,710	2,805	2,785	2,105	1,730	1,365	1,295	1,025
		9	8⅛							1,730		1,295	
	7	11⅜	12⅝	11⅜	9¼	6,925	5,890	5,195	4,415	2,065	2,665	1,545	2,000
		16⅞	10½							2,855		2,140	
	10½	14⅞	20⅜	14⅞	12⅛	10,390	8,835	7,790	6,625	1,920	3,780	1,440	2,835
		25¼	15¾							2,855		2,140	
	17½	21⅞	35¾	21⅞	17	17,320	14,725	12,990	11,045	1,820	5,945	1,365	4,460
		42	26¼							2,855		2,140	

* See page 18 for footnotes.

* See page 2 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie

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

IBC *

Rebar Size	Effective Embed. Depth h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B		SDC C-F		SDC A-B		SDC C-F	
		h_{min}	c_{ac}	h_{min}	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#8	4	9	9⅛	9	9⅛	3,625	3,095	2,715	2,320	1,635	1,420	1,225	1,065
		9⅝	9⅛							1,635		1,225	
	8	13	14⅜	13	9¾	7,245	6,295	5,430	4,720	2,090	2,840	1,570	2,130
		19¼	12							2,890		2,165	
	12	17	23⅛	17	12⅝	10,870	9,440	8,150	7,080	1,945	3,985	1,460	2,990
		28⅞	18							2,890		2,165	
	20	25	40½	25	17¾	18,110	15,735	13,585	11,800	1,840	6,310	1,385	4,730
		48	30							2,890		2,165	
#10	5	11¼	11¼	11¼	10½	5,410	4,325	4,060	3,245	—	—	—	—
		12	11¼										
	10	16¼	17⅝	16¼	13¼	10,825	10,145	8,115	7,610	—	—	—	—
		24	15										
	15	21¼	28⅜	21¼	17⅜	16,235	15,215	12,175	11,410	—	—	—	—
		36	22½										
	25	31¼	49¾	31¼	24½	27,060	25,360	20,295	19,020	—	—	—	—
		60	37½										

1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load. Designer to select the lower value from the table above and the allowable tension load based on rebar steel strength (page 18).
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-14 Chapter 17 assuming dry concrete, periodic inspection, short-term temperature of 180°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads 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.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. 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.
6. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Allowable tension loads in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. The Designer of Record is responsible for the foundation design.

Allowable Tension Loads Based on Rebar Steel Strength

Rebar Size	ASTM A615 Gr. 40[1]	ASTM A615 Gr. 60[2]
#3	2,200	2,640
#4	4,000	4,800
#5	6,200	7,440
#6	8,800	10,560
#7	12,000	14,400
#8	15,800	18,960
#10	25,400	30,480

1. Allowable steel tension load is based on AC58 Section 3.3.3 (20,000 psi x Tensile Stress Area)
2. Allowable steel tension load is based on AC58 Section 3.3.3 (24,000 psi x Tensile Stress Area)

* See page 2 for an explanation of the load table icons.