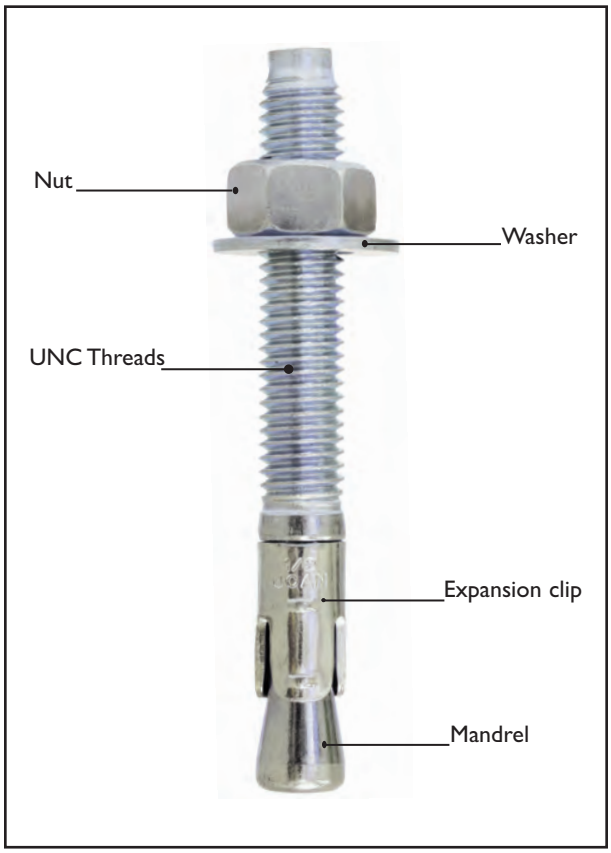
TZ WEDGE ANCHOR FOR CRACKED AND UNCRACKED CONCRETE

DESCRIPTION

UCAN TZ torque controlled mechanical expansion wedge anchors have a Category 1 classification. They are used to resist static, wind and seismic tension and shear loads in cracked and uncracked normal weight concrete that has a specified compressive strength of between 2,500 psi (17.2 MPa) and 8,500 psi (58.6 MPa). UCAN TZ wedge anchors are fully threaded, zinc plated carbon steel anchors assembled with a unique 3 segment clip. They include a nut and washer and are available in diameters ranging from 3/8" to 3/4".



FEATURES

- Fast torque up
- Anchor size = hole size
- Non bottom bearing
- Through fastening type
- Fully threaded

APPROVALS AND LISTINGS

- IAPMO ER-373
- Code compliant with the 2012, 2009, 2006 IBC
- Code compliant with the 2012, 2009, 2006 IRC
- Tested in accordance with ACI 355.2 and ICC-ES AC193 for use in cracked or uncracked structural concrete using the design provisions of ACI 318 Appendix D
- Meets CSA A23.3-14, Annex D requirements
- UL Listed File # EX. 4936

Head Marking

Legend
Letter Code = Length Identification Mark
'+' Symbol = Strength Design Complaint Anchor (see ordering information)

LIMITATIONS

Not recommended for use in concrete less than 21 days old.

TYPICAL APPLICATIONS

- Steel base plates
- Storage racking
- Seating
- Curtain wall
- Tilt-up braces
- Mechanical equipment
- Cable trays
- Pipe support
- Brick shelf angles

MATERIAL SPECIFICATIONS

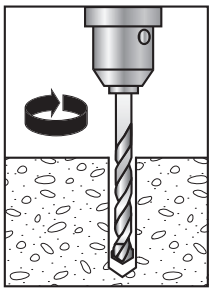
Anchor Body:	Carbon steel with 5 µm zinc plating conforming to ASTM B 633
Expansion Clips:	Carbon steel with 5 µm zinc plating conforming to ASTM B 633
Plain Steel Hex Nuts:	ASTM A 563, Grade A
Plain Steel Washers:	ASTM F 844

TZ WEDGE ANCHOR FOR CRACKED AND UNCRACKED CONCRETE

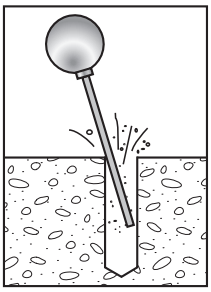
CARBON STEEL WEDGE ANCHOR SIZES

	Item Number	Nominal Anchor Dia. and Drill Bit Dia. (in.)	Anchor Length (in.)	Installation Torque (ft. lb)	Head (Length) Mark
Standard	WED14134	1/4	1 ¾	8	A
	WED14214	1/4	2 ¼	8	B
	WED14314	1/4	3	8	D
	WED38214	3/8	2 ¼	20	B
	WED38234	3/8	2 ¾	20	C
TZ for cracked / uncracked concrete	WED383	3/8	3	20	D +
	WED38334	3/8	3 ¾	20	E +
	WED385	3/8	5	20	H +
	WED12234	1/2	2 ¾	40	E +
	WED12334	1/2	3 ¾	40	E +
	WED12412	1/2	4 ½	40	F +
	WED12512	1/2	5 ½	40	I +
	WED127	1/2	7	40	L +
	WED12812	1/2	8 ½	40	O +
	WED1210	1/2	10	40	R +
	WED58412	5/8	4 ½	80	G +
	WED585	5/8	5	80	H +
	WED586	5/8	6	80	J +
	WED587	5/8	7	80	L +
	WED58812	5/8	8 ½	80	O +
	WED5810	5/8	10	80	R +
	WED34512	3/4	5 ½	110	I +
	WED34614	3/4	6 ¼	110	J +
	WED347	3/4	7	110	L +
	WED34812	3/4	8 ½	110	O +
	WED3410	3/4	10	110	R +
	WED3412	3/4	12	110	T +
Standard	WED786	7/8	6	160	J
	WED788	7/8	8	160	N
	WED7810	7/8	10	160	R
	WED16	1	6	250	J
	WED19	1	9	250	P
	WED112	1	12	250	T
	WED1149	1 ¼	9	320	P
	WED11412	1 ¼	12	320	T

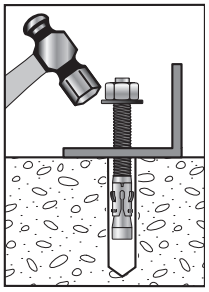
INSTALLATION



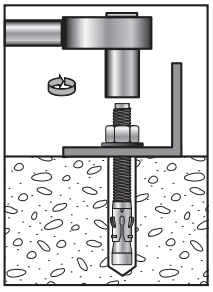
1) Select the correct diameter drill hole to minimum required hole depth or deeper. Drill bit must conform to ANSI Standard B212.15



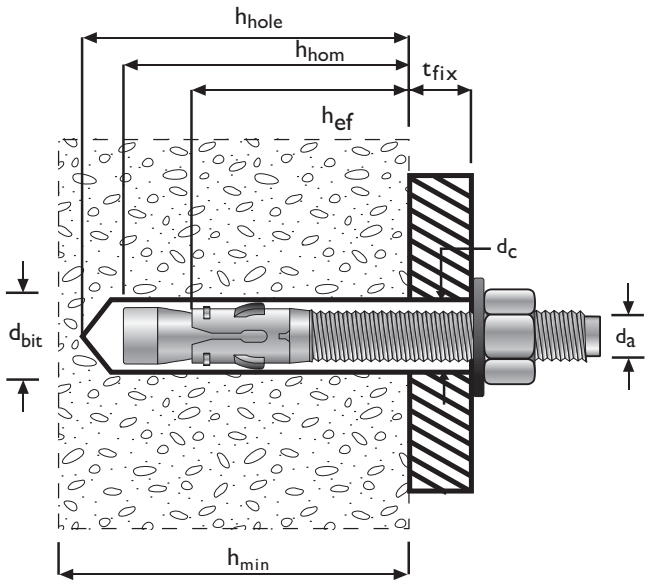
2) Remove drilling debris with a hand pump or with compressed air.

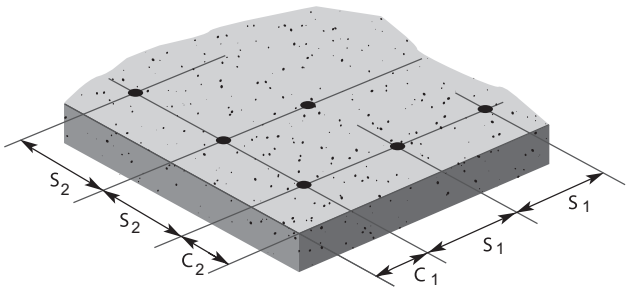


3) Locate the washer on the anchor and thread the nut in place. Using a hammer tap the anchor through the fixture into the drill hole until the washer is in contact with the fixture.
Ensure anchor is inserted to minimun required embedment depth h_{nom}



4) Using a torque wrench, apply the specified installation torque.





DESIGN DATA IN CRACKED AND UNCRACKED NORMAL WEIGHT CONCRETE (CARBON STEEL ANCHOR)

Table 1 - Installation Parameters in Concrete[1,2]

Property	Notation	Unit	Nominal Anchor Diameter (in.)						
			3/8	1/2		5/8		3/4	
Anchor Diameter	d_a[2]	inch	3/8	1/2		5/8		3/4	
		mm	9.5	12.7		15.9		19.1	
Drill Bit Diameter	d_{bit}	inch	3/8 ANSI	1/2 ANSI		5/8 ANSI		3/4 ANSI	
Minimum Clearance Hole Diameter (through drilling)	d_h	inch	1/2	5/8		3/4		7/8	
		mm	12	16		18		22	
Nominal Embedment Depth	h_{nom}	inch	2-3/8	2-3/4	3-/34	3-3/8	4-5/8	4	5-5/8
		mm	60	70	95	85	117	102	143
Effective Embedment Depth	h_{ef}	inch	2	2	3-1/2	2-3/4	4	3-1/4	4-3/4
		mm	51	51	89	70	102	83	121
Minimum Hole Depth	h_{hole}	inch	2-1/2	2-3/4	3-3/4	3-3/8	4-5/8	4	5-5/8
		mm	64	70	95	86	117	102	143
Installation Torque	T_{inst}	ft.lb	20	40	40	80	80	110	110
		Nm	27	54	54	108	108	149	149
Minimum Concrete Member Thickness	h_{min}	inch	3-1/2	4	7	6	7	7	10
		mm	89	102	178	152	178	178	254
Minimun Edge Distance	c_{min}	inch	3	3	2-1/2	6	3	7	6
		mm	76	76	64	152	76	178	152
Minimum Spacing Distance	s_{min}	inch	4-1/2	5	3	4	5	4-1/2	3-1/2
		mm	114	127	76	102	127	114	89
Critical Edge Distance (Uncracked Concrete)	c_{ac}	inch	7	5	7	5-1/2	8	8	8-1/2
		mm	178	127	178	140	203	203	216

[1]Information in this table is for use in conjunction with the design criteria of ACI 318 Appendix D or CSA A23.3-14, Annex D (Canada)

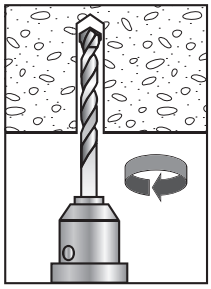
[2]For the 2006 IBC, d_o becomes d_a

OVERHEAD PIPE- SUPPORT INSTALATION

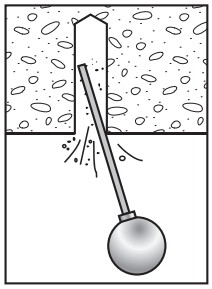
Anchor Selection

Part Number		Anchor Size (in.)	Drill bit diameter (in.)	Minimum hole depth (in.)	Nominal embedment (in.)	Installation torque (ft-lbs)
Anchor	Anchor and Coupling Nut					
WED 383	WED 383C	3/8 x 3	3/8	2 - 1/2	2 - 3/8	20
WED 12234	WED 12234C	1/2 x 2-3/4	1/2	2 - 3/4	2 - 3/4	40
WED 58312	WED 58312C	5/8 x 3-1/2	5/8	3 - 3/8	3 - 3/8	80
WED 34414	WED 34314C	3/4 x 4-1/4	3/4	4	4	110

INSTALLATION

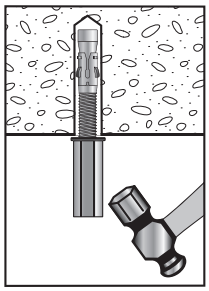


Drill the specified hole diameter and minimum hole depth using ANSI compliant drill bit

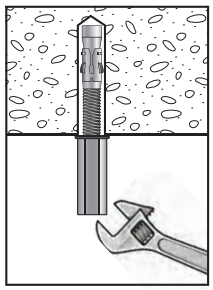


Clean hole free of dust and debris

Thread on the rod coupler and washer until the distance between the bottom of the anchor and the underside of the nut is equal to the nominal embedment



Tap the anchor, rod couple and washer assembly into the drilled hole until the washer is flush with the underside of the concrete structure



Set the anchor by applying the specified installation torque using a torque wrench

TZ WEDGE ANCHOR FOR CRACKED AND UNCRACKED CONCRETE

DESIGN DATA IN CRACKED AND UNCRACKED NORMAL WEIGHT CONCRETE (CARBON STEEL ANCHOR)

Table 2 - Tension Design Parameters[1,2]

Property	Notation	Unit	Nominal Anchor Size (in.)						
			3/8	1/2		5/8		3/4	
Anchor Category	1,2 or 3	-	1	1	1	1	1	1	1
Steel Strength in Tension									
Minimum Specified Yield Strength	f_{ya}	ksi	60	60	60	60	60	60	60
		Mpa	414	414	414	414	414	414	414
Minimum Specified Tensile Strength	f_{uta}	ksi	75	75	75	75	75	75	75
		Mpa	517	517	517	517	517	517	517
Effective Tensile Stress Area	$A_{se,N}$	$in.^2$	0.0775	01419	0.1419	0.2260	0.2260	0.3345	0.3345
		mm^2	49.2	90.1	90.1	144.0	144.0	212.0	212.0
Axial Tension Strength[4,5]	N_{sa}	lbf	5,813	10,643	10,643	16,950	16,950	25,088	25,088
		kN	25.86	47.34	47.34	75.40	75.40	111.59	111.59
Reduction Factor for Steel Strength[2,4]	ϕ	-	0.65	0.75	0.75	0.75	0.75	0.75	0.75
Concrete Breakout Strength in Tension									
Effective Embedment Depth	h_{ef}	inch	2	2	3-1/2	2-3/4	4	3-1/4	4-3/4
		mm	51	51	89	70	102	83	121
Effectiveness Factor for Uncracked Concrete	k_{uncr}	-	24	24	24	24	24	27	24
Effectiveness Factor for Cracked Concrete	k_{cr}	-	17	17	17	21	17	21	21
Modification for Cracked & Uncracked Concrete	$\psi_{c,N}$	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Reduction Factor for Concrete Breakout Strength[2,3]	ϕ	-	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Pullout Strength in Tension (Non-Seismic Applications)									
Characteristic Pullout Strength for Uncracked Concrete[6,8]	$N_{p,uncr}$	lbf	Note 7	Note 7	6,520	Note 7	9,379	Note 7	Note 7
		kN			29		41.72		
Characteristic Pullout Strength for Cracked Concrete[6,8]	$N_{p,cr}$	lbf	2,035	Note 7	4,808	Note 7	Note 7	Note 7	Note 7
		kN	9.05		21.39				
Reduction Factor for Pullout Strength[2,3]	ϕ	-	0.65	Note 7	0.65	Note 7	0.65	Note 7	Note 7
Pullout Strength in Tension for Seismic Applications									
Characteristic Pullout Strength for Seismic[8]	$N_{p,eq}$	lbf	2,035	Note 7	4,808	Note 7	Note 7	Note 7	Note 7
		kN	9.05		21.39				
Reduction Factor for Pullout Strength[2,3]	ϕ	-	0.65	Note 7	0.65	Note 7	Note 7	Note 7	Note 7

[1]The data in this table shall be used with the design provisions of ACI 318 Appendix D, or CSA A23.3-14, Appendix D (Canada). Tabulated parameters apply to normal weight concrete. For installation in sand-lightweight concrete, additional provisions apply.

[2]All ϕ factors apply to the load combinations of IBC Section 1605.2.1 or ACI 318 Section 9.2. If the load combinations of ACI 318 Appendix C are used, then the value of ϕ shall be determined in accordance with ACI 318-11 D.4.4 (D.4.5 of ACI 318-08 or ACI 318-05). For reinforcement that satisfies ACI 318. Appendix D requirements for Condition A, refer to ACI 318-11, D.4.3 (ACI 318-08 and ACI 318-05, D.4.4) for the appropriate ϕ factor when the load combination of IBC Section 1605.2 or ACI 318 Section 9.2 are used. For limit state design (Canada), all ϕ factors as per CSA A23.3-14 and R factors as per CSA A23.3-14, Annex D shall be used.

[3]For ϕ factors, Condition B as defined in ACI 318-11 D.4.3 and D.4.4 or ACI 318-08 and -05 D.4.4 and D.4.5 applies.

[4]The 3/8 inch TZ Wedge Anchor is considered a brittle steel element. The other sizes are considered ductile steel elements as defined be ACI 318 D.1.

[5]The tabulated values for steel strength in tension are based on tests and analysis in accordance with ACI 355.2 and shall be used for design.

[6]Pullout strength value, where tabulated is for installation in normal weight concrete with a compressive strength, f'c, of 2,500 psi (17.2 MPa), and may be adjusted for higher concrete compressive strength in accordance with Section 4.1.4 of the IAPMO ER 373 report.

[7]Pullout strength does not control design of these anchors; pullout strength need not be calculated for the indicated anchors.

[8]For all design cases $\psi c,P = 1.0$.

Table 3 - Shear Design Parameters[1,2]

Property	Notation	Unit	Nominal Anchor Size (in.)						
			3/8	1/2		5/8		3/4	
Anchor Category	1,2 or 3	-	1	1	1	1	1	1	1
Steel Strength in Shear									
Minimum Specified Yield Strength	f_{ya}	ksi	60	60	60	60	60	60	60
		Mpa	414	414	414	414	414	414	414
Minimum Specified Tensile Strength	f_{uta}	ksi	75	75	75	75	75	75	75
		Mpa	517	517	517	517	517	517	517
Effective Tensile Stress Area (Threads)	$A_{se,N}$	$in.^2$	0.0775	01419	0.1419	0.2260	0.2260	0.3345	0.3345
		mm^2	49.2	90.1	90.1	144.0	144.0	212.0	212.0
Steel Strength in Shear[4,5]	N_{sa}	lbf	1,678	4,199	4,199	5,151	5,151	9,801	9,801
		kN	7.46	18.68	18.68	22.91	22.91	43.60	43.60
Reduction for Steel Strength[2,4]	ϕ	-	0.6	0.65	0.65	0.65	0.65	0.65	0.65
Concrete Breakout Strength in Shear									
Load Bearing Length of Anchor[6]	$N_{p,uncr}$	inch	2	2	3-1/3	2-3/4	4	3-1/4	4-3/4
		mm	51	51	89	70	102	83	121
Nominal Anchor Diameter	$N_{p,cr}$	inch	0.375	0.500	0.500	0.625	0.625	0.750	0.750
		mm	9.5	12.7	12.7	15.9	15.9	19.1	19.1
Reduction for Concrete Breakout Strength[2,3]	ϕ	-	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Pullout Strength in Shear									
Coefficient for Pryout Strength[7]	k_{cp}	-	1	1	2	2	2	2	2
Effective Embedment Depth	h_{ef}	inch	2	2	3-1/2	2-3/4	4	3-1/4	4-3/4
		mm	51	51	89	70	102	83	121
Reduction Factor for Pryout Strength[2,3]	ϕ	-	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Steel Strength in Shear for Seismic Applications									
Characteristic Pullout Strength for Seismic[8]	$v_{sa,eq}$	lbf	1,678	3,564	3,564	4,904	4,904	6,861	6,861
		kN	7.46	15.85	15.85	21.81	21.81	30.52	30.52
Reduction Factor for Pullout Strength[2,3]	ϕ	-	0.60	0.65	0.65	0.65	0.65	0.65	0.65

[1]The data in this table shall be used with the design provisions of ACI 318 Appendix D. or CSA A23.3-14, Annex D (Canada). Tabulated parameters apply to normal weight concrete. For installation in sand-lightweight concrete, additional provisions apply.

[2]All ϕ factors apply to the load combinations of IBC Section 1605.2.1 or ACI 318 Section 9.2. If the load combinations of ACI 318 Appendix C are used, then the value of ϕ shall be determined in accordance with ACI 318-11 D.4.4 (D.4.5 of ACI 318-08 or ACI 318-05). For reinforcement that satisfies ACI 318. Appendix D requirements for Condition A, refer to ACI 318-11, D.4.3 (ACI 318-08 and ACI 318-05, D.4.4) for the appropriate ϕ factor when the load combination of IBC Section 1605.2 or ACI 318 Section 9.2 are used. For limit state design (Canada), all ϕ factors as per CSA A23.3-14 and R factors as per CSA A23.3-14, Annex D shall be used.

[3]For ϕ factors, Condition B as defined in ACI 318-11 D.4.3 and D.4.4 or ACI 318-08 and -05 D.4.4 and D.4.5 applies.

[4]The 3/8 inch TZ Wedge Anchor is considered a brittle steel element. The other sizes are considered ductile steel elements as defined be ACI 318 D.1.

[5]The tabulated values for steel strength in tension are based on tests and analysis in accordance with ACI 355.2 and shall be used for design.

[6]Load bearing length is the lesser of h_{ef} or $8d_o$.

[7]The coefficient for pryout strength, kcp, shall comply with ACI 318 D.6.3.1.

[8]For the 2006 IBC, d_o becomes d_a.

Table 4 - Design Tension and Shear Capacities in Cracked Concrete[1,2,3,4,5] at effective embedment

Nominal Anchor Size (inch)	Effective Embedment Depth (inch)	Minimum Concrete Compressive Strength									
		f'_c = 2,500 psi		f'_c = 3,000 psi		f'_c = 4,000 psi		f'_c = 6,000 psi		f'_c = 8,000 psi	
		ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)
3/8	2	1,323 (5.82)	1,007 (4.43)	1,449 (6.38)	1,007 (4.43)	1,673 (7.36)	1,007 (4.43)	2,049 (9.02)	1,007 (4.43)	2,366 (10.41)	1,007 (4.43)
1/2	2	1,563 (6.88)	1,683 (7.41)	1,712 (7.53)	1,844 (8.11)	1,977 (8,70)	2,129 (9,37)	2,421 (10.65)	2,607 (11.47)	2,795 (12.30)	2,729 (12.01)
1/2	3-1/2	3,125 (13.75)	2,729 (12.01)	3,423 (15,06)	2,729 (12.01)	3,953 (17.39)	2,729 (12.01)	4,842 (21.30)	2,729 (12.01)	5,591 (24.60)	2,729 (12.01)
5/8	2-3/4	3,112 (13.69)	3,348 (14.73)	3,410 (15.00)	3,348 (14.73)	3,937 (17.32)	3,348 (14.73)	4,822 (21.22)	3,348 (14.73)	5,568 (24.50)	3,348 (14.73)
5/8	4	4,420 (19.45)	3,348 (14.73)	4,842 (21.30)	3,348 (14.73)	5,591 (24.60)	3,348 (14.73)	6,847 (30.13)	3,348 (14.73)	7,907 (34.79)	3,348 (14.73)
3/4	3-1/4	3,999 (17,60)	6,371 (28.03)	4,380 (19,27)	6,371 (28.03)	5,058 (22.26)	6,371 (28.03)	6,195 (27.26)	6,371 (28.03)	7,153 (31.47)	6,317 (28.03)
3/4	4-3/4	7,066 (31.09)	6,371 (28.03)	7,740 (34,06)	6,371 (28.03)	8,937 (39.32)	6,371 (28.03)	10,946 (48.16)	6,371 (28.03)	12,639 (55.61)	6,371 (28.03)

Key:

Steel Strength Controls
Concrete Breakout Strength Controls
Anchor Pullout / Pryout Strength Controls

[1]Tabulated values are for single anchors installed in normal weight concrete with minimum slab thickness, $h_a = h_{min}$ and:
- $c_{a1} \geq c_{ac}$
- $c_{a2} \geq 1.5c_{a1}$

[2]Calculations were performed according to ACI 318-11 Appendix D. The load level corresponding to the controlling failure mode is listed.
[3]Strength reduction factors are based on ACI 318 section 9.2 for load combinations assuming Condition B.
[4]For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 Appendix D.
[5]Interpolation of tabulated values is not allowed. For intermediate concrete compressive strengths or other design criteria including seismic loading please see ACI 318 Appendix D.

Table 5 - Mean Axial Stiffness, β, in Normal Weight Concrete[1,2]

Concrete type	Unit	Nominal Anchor Size						
		3/8	1/2		5/8		3/4	
Effective Embedment	inch	2	2	3-1/2	3-1/2	4	3-1/4	4-3/4
	mm	51	51	89	70	102	83	121
Uncracked Concrete	10^3 lb/inch	580	476	246	1,334	2,296	1,023	412
	kN/mm	102	83	43	234	402	179	72
Cracked Concrete	10^3 lb/inch	63	66	35	267	59	171	76
	kN/mm	11	12	6	47	10	30	13

[1]The data in this table is based on test results in accordance with ACI 355.2.
[2]Actual stiffness can vary substantially based on a variety of parameters including concrete strength, geometry of installation and use, and loading

Table 6 - Design Tension and Shear Capacities in Uncracked Concrete[1,2,3,4,5,6] at effective embedment

Nominal Anchor Size (inch)	Effective Embedment Depth (inch)	Minimum Concrete Compressive Strength									
		f'_c = 2,500 psi		f'_c = 3,000 psi		f'_c = 4,000 psi		f'_c = 6,000 psi		f'_c = 8,000 psi	
		ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)	ϕN_n Tension lbf (kN)	ϕV_n Shear lbf (kN)
3/8	2	2,206 (9.71)	1,007 (4.43)	2,417 (10.63)	1,007 (4.43)	2,791 (12.28)	1,007 (4.43)	3,418 (15.04)	1,007 (4.43)	3,778 (16.62)	1,007 (4.43)
1/2	2	2,206 (9.71)	2,376 (10.45)	2,417 (10.63)	2,603 (11.45)	2,791 (12,28)	2,729 (12.01)	3,418 (15.04)	2,729 (12.01)	3,947 (17.37)	2,729 (12.01)
1/2	3-1/2	4,238 (18.65)	2,729 (12.01)	4,642 (20.42)	2,729 (12.01)	5,361 (23.59)	2,729 (12.01)	6,565 (28.89)	2,729 (12.01)	7,581 (33.36)	2,729 (12.01)
5/8	2-3/4	3,557 (15.65)	3,348 (14.73)	3,897 (17.15)	3,348 (14.73)	4,499 (19.80)	3,348 (14.73)	5,511 (24.25)	3,348 (14.73)	6,363 (28.00)	3,348 (14.73)
5/8	4	6,069 (26.70)	3,348 (14.73)	6,678 (29.38)	3,348 (14.73)	7,711 (33.93)	3,348 (14.73)	9,444 (41.55)	3,348 (14.73)	10,905 (47.98)	3,348 (14.73)
3/4	3-1/4	5,141 (22.66)	6,371 (28.03)	5,632 (24.78)	6,371 (28.03)	6,503 (28.61)	6,371 (28.03)	7,965 (35.05)	6,371 (28.03)	9,197 (40.47)	6,317 (28.03)
3/4	4-3/4	8,075 (35.53)	6,371 (28.03)	8,846 (38.92)	6,371 (28.03)	10,103 (44.94)	6,371 (28.03)	12,510 (55.04)	6,371 (28.03)	14,445 (63.56)	6,371 (28.03)

Key:

Steel Strength Controls
Concrete Breakout Strength Controls
Anchor Pullout / Pryout Strength Controls

[1]Tabulated values are for single anchors installed in normal weight concrete with minimum slab thickness, $h_a = h_{min}$ and:
- $c_{a1} \geq c_{ac}$
- $c_{a2} \geq 1.5c_{a1}$

[2]Calculations were performed according to ACI 318-11 Appendix D. The load level corresponding to the controlling failure mode is listed.
[3]Strength reduction factors are based on ACI 318 section 9.2 for load combinations assuming Condition B.
[4]Tabular values are permitted for static loading only. Seismic loading is not considered.
[5]For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 Appendix D.
[6]Interpolation of tabulated values is not allowed. For intermediate concrete compressive strengths or other design criteria including seismic loading please see ACI 318 Appendix D.

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ALLOWABLE STRESS DESIGN

Table 7 - Allowable Load Capacities In Tension Shear[1,2,3,4,5,6]

Anchor Diameter (in.)	Min Embed Depth in. (mm)	Minimum Concrete Compressive Strength					
		f'_c = 2,500 psi (17.2 MPa)		f'_c = 4,000 psi (27.6 MPa)		f'_c = 6,000 psi (41.4 MPa)	
		Tension lbf (kN)	Shear lbf (kN)	Tension lbf (kN)	Shear lbf (kN)	Tension lbf (kN)	Shear lbf (kN)
1/4	1-1/2 (38)	318 (1.42)	382 (1.70)	411 (1.83)	382 (1.70)	474 (2.11)	382 (1.70
	2-1/4 (57)	500 (2.22)	480 (2.13)	553 (2.38)	480 (2.13)	534 (2.38)	480 (2.13)
3/8	2 (51)	1491 (6.56)	680 (2.99)	1,886 (8.30)	680 (2.99)	2,309 (10.16)	680 (2.99)
1/2	2 (51)	1,491 (6.56)	1,605 (7.06)	1,886 (8.30)	1,844 (8.11)	2,309 (10.16)	1,844 (8.11)
	3-1/2 (89)	2,864 (12.60)	1,844 (8.11)	3,622 (15.94)	1,844 (8.11)	4,436 (19.52)	1,844 (8.11)
5/8	2-3/4 (70)	2,403 (10.57)	2,262 (9.95)	3,040 (13.38)	2,262 (9.95)	3,724 (16.38)	2,262 (9.95)
	4 (102)	4,101 (18.04)	2,262 (9.95)	5,210 (22,92)	2,262 (9.95)	6,381 (28.08)	2,262 (9.95)
3/4	3-3/4 (95)	3,474 (15.28)	4,305 (18.94)	4,394 (19.33)	4,305 (18.94)	5,382 (23.68)	4,305 (18.94)
	4-3/4 (121)	5,456 (24.01)	4,305 (18.84)	6,901 (30.37)	4,305 (18.94)	8,453 (37.19)	4,305 (18.94)
1	4-1/2 (114)	2,691 (11.97)	7,104 (31.60)	4,124 (18.34)	7,104 (31.60)	4,947 (22.01)	7,104 (31.60)
	6 (152)	4,395 (19.55)	8,276 (36.81)	5,658 (25.17)	8,276 (36.81)	7,316 (23.54)	8,276 (6.81)

[1]Tabulated values are for anchors installed in uncracked concrete without edge and spacing considerations. Concrete compressive strength must be minimum at the time of installation.

[2]For the 1/4 inch and 1 inch diameter anchors, the allowable load capacities are calculated using an applied safety factor of 4.0 over the ultimate load values.

[3]For 3/8 inch -3/4 inch diameter anchors, the design values for use in allowable stress design load combinations were calculated in accordance with Section 1605.3 of the IBC using the following relationships:

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \text{ and } V_{allowable,ASD} = \frac{\phi V_n}{\alpha}$$

where α = a conversion factor calculated as a weighted average of the load factors for the controlling load combination, load combination is 1.2D + 1.6L. Calculation of α based on weighted average: $\alpha = 0.3*1.2 + 0.7*1.6 = 1.48$

[4]Allowable load capacities must be multiplied by reduction factors when the edge or spacing distances are less than the critical distances.

[5]Greater safety factors may be required depending on the application.

[6]Linear interpolation to determine allowable loads for intermediate depths and compressive strengths is not allowed