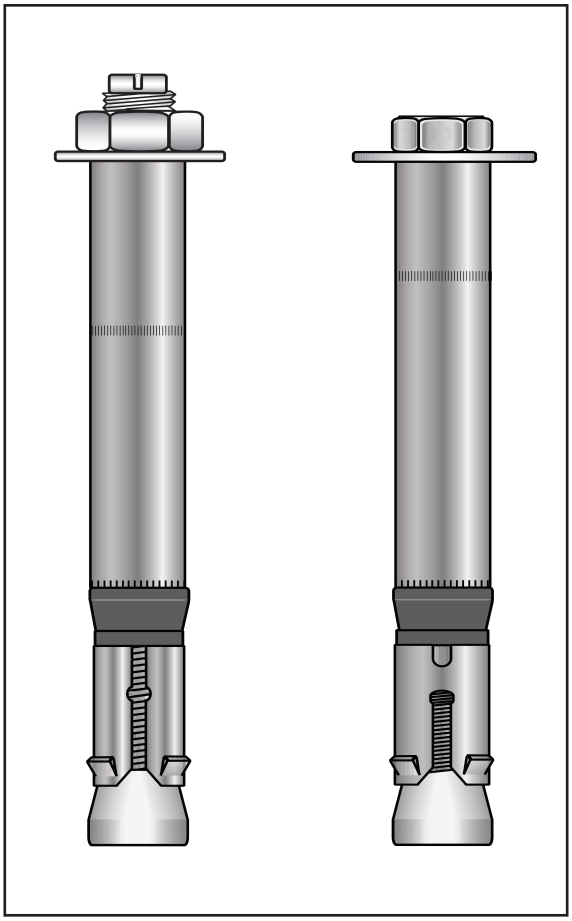
SZ HEAVY LOAD EXPANSION ANCHOR

DESCRIPTION

The UCAN SZ heavy load expansion anchor is a mechanical anchor with controlled expansion that delivers exceptionally high tension and shear loads. This anchor is ideal for applications requiring a high degree of security and reliability.



FEATURES

- ACI 318 category 1 anchor for cracked and uncracked concrete
- ICC-ES Listed (ESR - 3304)
- Superior for dynamic and static loads
- Torque controlled expansion
- High shear load
- Four slot expansion sleeve ensures excellent load transfer
- Through fastening
- Collapsible collar provides reliable pull-down force
- Multiple head styles also available
- Available in Stainless Steel A4-70

LIMITATIONS

Not recommended for uncured concrete (less than 7 days old), lightweight concrete, masonry block or brick.

TYPICAL APPLICATIONS

- Structural steel columns and frames
- Machinery and equipment installation
- Vibratory loading applications
- Parking structure rehabilitation
- Road and bridge construction
- Crane, conveyor installation
- Robotics
- Seismic anchoring

MATERIAL SPECIFICATIONS

Anchor Component	Material Standard	Mechanical Properties Fu	Fy
Carbon steel hex-head bolt	Class 8.8; EN ISO 891-1	800 MPa (116 ksi)	640 MPa (93 ksi)
Carbon steel threaded stud	Class 8.8; EN ISO 891-1	800 MPa (116 ksi)	640 MPa (93 ksi)
Collapsible collar	-	Polyethylene	
Corrosion protection	DIN ISO 4042	≤5μm, zinc plated	
Stainless steel (A4) hex bolt, distance and expansion sleeve cone, washer (EN 10088)	Class 70; EN10088 1.4401/ 1.4404 / 1.4571	700 MPa (101.5 ksi)	450 MPa (65.3 ksi)
Stainless steel hex nut (A4)	Class 70; ISO 3506		

SZ HEAVY LOAD EXPANSION ANCHOR

ANCHOR SELECTION - CARBON STEEL -

Part Number		Bolt/Stud	Drill Bit/ Anchor	Anchor Length		Maximum Thickness	Box Quantity
LHL	BHL	diameter	diameter	LHL	BHL		
		mm	mm	mm	mm	mm	
LHL600	BHL600	6	10	65	67	0	100
LHL610	BHL610			75	77	10	50
*LHL630	BHL630			95	97	30	50
*LHL650	BHL650			115	117	50	25
-	BHL6100			-	167	100	25
LHL800	BHL800	8	12	77	80	0	50
LHL810	BHL810			87	90	10	50
*LHL830	*BHL830			107	110	30	50
*LHL850	BHL850			127	130	50	25
-	BHL8100			-	180	110	25
LHL1000	BHL1000	10	15	93	96	0	25
LHL1015	BHL1015			108	116	15	25
*LHL1025	*BHL1025			118	121	25	25
*LHL1045	*BHL1045			138	141	45	25
LHL1095	BHL1095			188	191	95	25
LHL1200	BHL1200	12	18	107	112	0	20
LHL1210	BHL1210			117	122	10	20
*LHL1220	*BHL1220			127	132	20	20
*LHL1240	*BHL1240			147	152	40	20
LHL1270	BHL1270			177	182	70	20
-	BHL12100			-	212	100	10
LHL1600	BHL1600	16	24	132	137	0	10
*LHL1620	*BHL1620			152	157	20	10
*LHL1650	*BHL1650			182	187	50	10
-	BHL16100			-	237	100	5
LHL2000	BHL2000	20	28	152	161	0	10
*LHL2030	*BHL2030			192	201	30	10
*LHL2060	*BHL2060			222	231	60	5
LHL20100	BHL20100			262	271	100	5

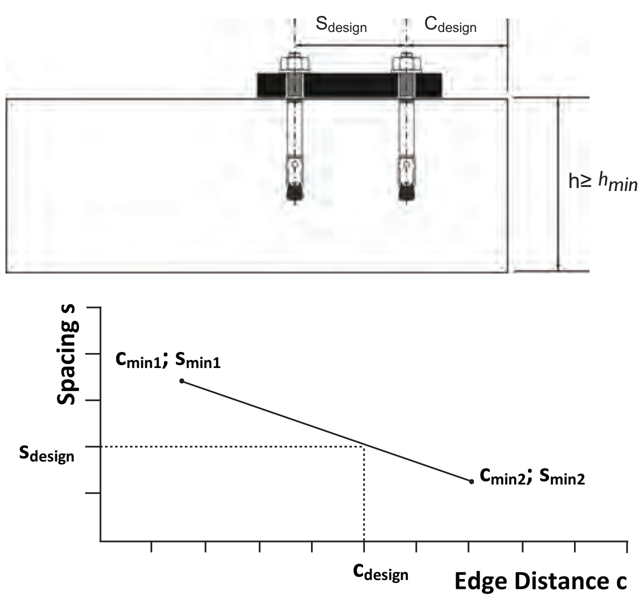
*** = Stock Items**

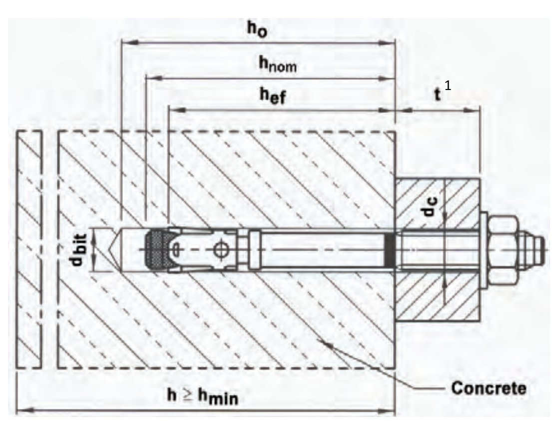
TECHNICAL DATA (LIMIT STATE DESIGN / STRENGTH DESIGN) IN CRACKED AND UNCRACKED CONCRETE - CARBON STEEL ANCHORS

ANCHOR INSTALLATION

SETTING INFORMATION	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER	
			M16	M20
Anchor Outside diameter	d_a	in. (mm)	0.93 (23,5)	1.08 (27,5)
Drill Bit Diameter	d_{bit}	in. (mm)	0.95 (24)	1.10 (28)
Minimum Hole Depth	h_0	in. (mm)	5.12 (130)	6.3 (160)
Minimum Base Plate Clearance Hole Diameter[2]	d_c	in. (mm)	1.02 (26)	1.22 (31)
Installation torque (Carbon Steel)	T_{inst}	ft-lbf (N-m)	118 (160)	207 (280)
Embedment Depth	h_{nom}	in. (mm)	4.68 (118)	5.83 (148)
Effective Embedment depth	h_{ef}	in. (mm)	3.94 (100)	4.92 (125)
Minimum Edge Distance	C_{min1}	in. (mm)	4.7 (120)	7.1 (180)
Minimum Spacing[3]	S_{min1}	in. (mm)	12.6 (mm)	21.3 (540)
Minimum Edge Distance	C_{min2}	in. (mm)	7.1 (180)	11.8 (300)
Minimum Spacing[4]	S_{min2}	in. (mm)	3.9 (100)	4.9 (125)
Minimum Concrete Thickness	h_{min}	in. (mm)	7.9 (200)	9.8 (250)

For SI: 1 inch = 25.4 mm, 1ft-lbf = 1.356 N-m.
[1]The information presented in this table must be used in conjunction with the design requirements of ACI 318 Appendix D
[2]The clearance must comply with applicable code requirements for the connected element.
[3]S_{min1} applies when C_{min1} is provided.
[4]S_{min2} applies when C_{min2} is provided.





[1] Thickness of base plate

SZ HEAVY LOAD EXPANSION ANCHOR

STRENGTH DESIGN INFORMATION (TENSION) - CARBON STEEL ANCHORS

Characteristic	Symbol	Units	Nominal anchor diameter	
			M16	M20
Anchor Category	1,2 or 3	-	1	1
Embedment Depth	h_{nom}	in. (mm)	4.65 (118)	5.83 (148)
Steel Strength in Tension (ACI 318 D.5.1)				
Specified Yield Strength	f_{ya}	psi (N/mm²)	92,888 (640)	92,888 (640)
Specified Tensile Strength	f_{uta}	psi (N/mm²)	116,110 (800)	116,110 (800)
Effective Tensile Stress Area	A_{se}	in² (mm²)	0.2429 (156.7)	0.3794 (244.8)
Tension Resistance of Steel	N_{sa}	lbf (kN)	28,171 (125.4)	44,009 (195.8)
Strength Reduction Factor-Steel Failure[2]	$\varnothing_{sa}$	-	0.65	0.65
Concrete Breakout Strength in Tension (ACI 318 D.5.2)				
Effective Embedment Depth	h_{ef}	in. (mm)	3.94 (100)	4.92 (125)
Critical Edge Distance	C_{ac}	in. (mm)	9.1 (230)	11.3 (288)
Effectiveness Factor-Uncracked Concrete	k_{uncr}	-	24 (10)	24 (10)
Effectiveness Factor-Cracked Concrete	k_{cr}	-	17 (7)	17 (7)
Radio of k_{uncr}/k_{cr}	$\Psi_{c,N}$	-	1.4	1.4
Strength Reduction Factor-Concrete Breakout Failure[3]	$\varnothing_{cb}$	-	0.65	0.65
Pull-Out Strength in Tension (ACI 318 D.5.3				
Pull-Out Resistance Cracked Concrete (f'_c=2,500 psi)[5]	$N_{pn,cr}$	lbf (kN)	N/A[4)]	N/A[4)]
Pull-Out Resistance Uncracked Concrete (f'_c=2,500 psi)[5]	$N_{pn,uncr}$	lbf (kN)	N/A[4)]	N/A[4)]
Strength Reduction Factor-Pullout Failure[6]	Φ_p	-	0.65	0.65
Tension Strength for Seismic Applications (ACI 318 D.3.3.3)				
Tension Resistance of Single Anchor for Seismic Loads (f'_c=2,500 psi)[5]	$N_{np,eq}$	lbf (kN)	N/A[4]	N/A[4]
Strength Reduction Factor-Pullout Failure[6]	Φ_{eq}	-	0.65	0.65
Axial Stiffness in Service Load Range, Cracked Concrete	ß *min*	lb/in. (kN/mm)	57,102 (10)	142,754 (25)
	ß *m*	lb/in. (kN/mm)	171,305 (30)	256,957 (45)
	ß *max*	lb/in. (kN/mm)	285,508 (50)	371,161 (65)
Axial Stiffness in Service Load Range, Unracked Concrete	ß *min*	lb/in. (kN/mm)	114,203 (20)	485,364 (85)
	ß *m*	lb/in. (kN/mm)	456,813 (80)	827,974 (145)
	ß *max*	lb/in. (kN/mm)	799,423 (140)	1,170,583 (205)

For **SI:** 1inch = 25.4mm, 1lbf = 4.45N, 1 lb/in = 0.175 N/mm, 1 psi = 6.89 Pa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

[1] The information presented in this table must be used in conjunction with the design requirements of ACI 318 Appendix D.

[2] The tabulated value of Φ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 18 9.2 are used. If the load combinations of Section 1909.2 of the UBC or ACI 318 Appendix C are used, the appropriate value of Φ_{sa} must be determined in accordance with ACI 318 D.4.5. The M16 and M20 diameter anchors are brittle 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, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. For installations where complying supplementary reinforcement can be verified, the Φ_{cb} factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4 for Condition A are satisfied, the appropriate value of Φ_{cb} must be determined in accordance with ACI 318 D.4.4(c). If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, the app ropriate value of Φ_{cb} must be determined in accordance with ACI 318 D.4.5.

[4] As described in Section 4.1.3 of this report, N/A (Not Applicable) denotes that pullout resistance is not critical and does not need to be considered.

[5] The characteristic pull-out resistance for greater concrete compressive strengths may be increased by multiplying the tabular value by $(f'_c / 2{,}500)^{0.5}$.

[6] The tabulated value of Φ_p or Φ_{eq} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where pullout strength governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

STRENGTH DESIGN INFORMATION (SHEAR) - CARBON STEEL ANCHORS

Characteristic	Symbol	Units	Nominal anchor diameter			
			M16		M20	
Anchor type			B	S	B	S
Anchor Category	1,2 or 3	-	1		1	
Embedment Depth	h_{nom}	in. (mm)	4.65 (118)		5.83 (148)	
Steel Strength in Shear (ACI 318 D.6.1)						
Shear Resistance of Steel	V_{sa}	lb (kN)	19,131 (85,1)	25,448 (113,2)	28,101 (125,0)	32,552 (144,8)
Strength Reduction Factor-Steel Failure[2]	Φ_{sa}	-	0.60		0.60	
Concrete Breakout Strength is Shear (ACI 318 D.6.2)						
Anchor Outside Diameter	d_a	in. (mm)	0.93 (23,5)		1.08 (27,5)	
Load Bearing Length of Anchor in Shear	l_e	in. (mm)	3.94 (100)		4.92 (125)	
Strength Reduction Factor-Concrete Breakout Failure[3]	Φ_{cb}	-	0.7		0.7	
Concrete Pryout Strength in Shear (ACI 318 D.6.3)						
Coefficient for Pryout Strength	k_{cp}	-	2		2	
Strength Reduction Factor-Concrete Pryout Failure[4]	Φ_{cp}	-	0.7		0.7	
Shear Strength for Seismic Applications (ACI 318 D.3.3.3)						
Shear Resistance of Single Anchor for Seism. loads(f'_c=2,500 psi)	$V_{sa,eq}$	lb (kN)	9,217 (41)		22,256 (99)	
Strength Reduction Factor-Steel Failure	Φ_{cp}	-	0.65		0.65	

For **SI:** 1inch = 25.4mm, 1lbf = 4.45N, 1 psi = 6.89 Pa, 1 in^2 = 645 mm^2.

[1] The information presented in this table must be used in conjunction with the design requirements of ACI 318 Appendix D.

[2] The tabulated value of Φ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. If the load combinations of Section 1909.2 of the UBC or ACI 318 Appendix C are used, the appropriate value of Φ_{sa} must be determined in accordance with ACI 318 D.4.5. The M16 and M20 diameter anchors are brittle 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, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where strength governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4 for Condition A are satisfied, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.4(c). If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

[4] The tabulated value of Φ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where Pryout governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

SZ HEAVY LOAD EXPANSION ANCHOR

TECHNICAL DATA (ALLOWABLE STRESS DESIGN) IN CRACKED AND UNCRACKED CONCRETE

- CARBON STEEL ANCHOR -

Load & Performance Data	Conc.(psi)	Symbol	Units	M6	M8	M10	M12
Cracked Concrete							
Aveg. ultimate load, tension	4,000	N_{pn}	lbs	3,765	5,780	7,717	9,988
Aveg. ultimate load shear BHL	4,000	V_n	lbs	5,620	8,497	12,510	18,849
Aveg. ultimate load shear LHL	4,000	V_n	lbs	5,125	7,171	10,363	19,041
Allowable Tension Loads[1]	2,500	N_{allow}	lbs	484	1,162	1,549	2,206
	4,000	N_{allow}	lbs	612	1,469	1,959	2,790
	6,000	N_{allow}	lbs	750	1,799	2,399	3,417
	8,500	N_{allow}	lbs	892	2,142	2,856	4,068
Uncracked Concrete							
Allowable Tension Loads[1]	2,500	N_{allow}	lbs	1,537	1,936	2,604	3,114
	4,000	N_{allow}	lbs	1,927	2,449	3,294	3,939
	6,000	N_{allow}	lbs	1,927	2,999	4,034	4,825
	8,500	N_{allow}	lbs	1,927	3,493	4,801	5,742
Cracked and Uncracked Concrete							
Allowable Shear Loads[1]	2,500	V_{allow}	lbs	1,670	2,557	3,778	4,751
	4,000	V_{allow}	lbs	1,670	2,557	3,778	6,010
	6,000	V_{allow}	lbs	1,670	2,557	3,778	6,597
Spacing & Edge Distance							
Effective Anchorage Depth		h_{ef}	in. (mm)	1.97 (50)	2.36 (60)	2.80 (71)	3.15 (80)
Critical Edge Distance		C_{ac}	in. (mm)	2.95 (75)	3.54 (90)	4.89 (107)	4.72 (102)
Critical Anchor Spacing		S_{ac}	in. (mm)	5.90 (150)	7.09 (180)	(213)	8.34 (240)
Minimum Spacing for Edge Distance C		S_{min}/C	in. (mm)	1.97/3.15 (50/80)	2.36/3.94 (60/100)	2.76/4.72 (70/120)	3.15/6.30 (80/160)
Minimum Edge Distance for Spacing S		C_{min}/S	in. (mm)	1.57/3.94 (50/100)	2.56/4.72 (60/120)	2.76/6.89 (70/175)	3.15/7.87 (80/200)
Minimum Thickness of Concrete slab		h_m	in. (mm)	3.94 (100)	4.72 (120)	5.51 (140)	6.30(160)
Installation Parameters							
Drilled Hole Diameter		d_o	in. (mm)	.39 (10)	.47 (12)	.59 (15)	.71 (18)
Diameter of Clearance Hole		d_c	in.(mm)	.47 (12)	.55 (14)	.67 (17)	.79 (20)
Depth of Drilled Hole		h_o	in. (mm)	2.25 (65)	3.15 (80)	3.74 (95)	4.13 (105)
Installation Torque		T_{inst}	ft-lbs	11	22	37	59
Wrench Size		WS	(mm)	(10)	(13)	(17)	(19)

NOTES:

1) Design strengths for use with allowable stress design (ASD) are calculated in accordance with ACI 318, Appendix D

SZ HEAVY LOAD EXPANSION ANCHOR

ANCHOR SELECTION - STAINLESS STEEL (GRADE A4-70)

Part Number		Bolt/Stud	Drill Bit/ Anchor	Anchor Length		Maximum Thickness	Box Quantity
LHS	BHS	diameter	diameter	LHS	BHS		
		mm	mm	mm	mm	mm	
LHS800	BHS800	8	12	75	79	0	50
LHS810	BHS810			85	89	10	50
*LHS830	*BHS830			105	109	30	50
LHS850	BHS850			125	129	50	25
-	BHS8100			-	179	110	25
LHS1000	BHS1000	10	15	91	95	0	25
LHS1015	BHS1015			106	110	15	25
*LHS1025	BHS1025			116	120	25	25
*LHS1045	*BHS1045			136	140	45	25
LHS1095	BHS1095			186	190	95	25
LHS1200	BHS1200	12	18	108	110	0	20
LHS1210	BHS1210			118	122	10	20
*LHS1220	*BHS1220			128	131	20	20
*LHS1240	*BHS1240			148	151	40	20
LHS1270	BHS1270			178	182	70	20
-	BHS12100			-	212	100	10
LHS1600	BHS1600	16	24	130	137	0	10
*LHS1620	*BHS1620			150	157	20	10
LHS1650	BHS1650			180	187	50	10
-	BHS16100			-	237	100	5

***= Stock Items**

SZ HEAVY LOAD EXPANSION ANCHOR

TECHNICAL DATA (ALLOWABLE STRESS DESIGN) FOR STAINLESS STEEL (A4) ANCHORS IN CRACKED AND UNCRACKED CONCRETE

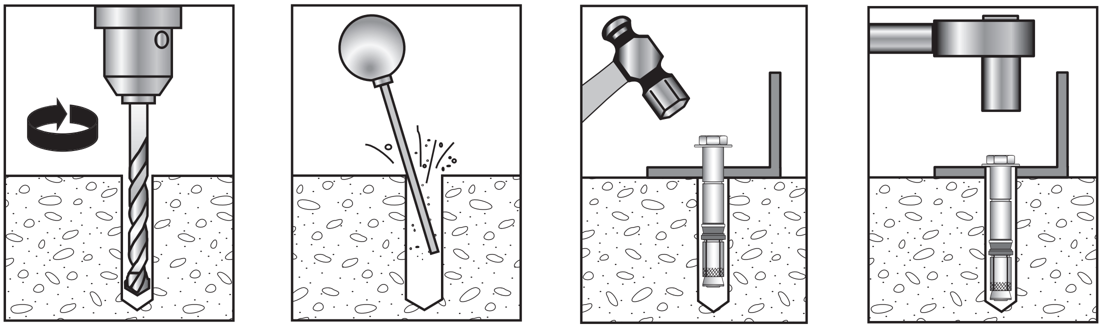
Load & Performance Data		Conc.(psi)	Symbol	Units	M8	M10	M12	M16
Cracked Concrete								
Aveg. ultimate load, tension		4,000	N_{pn}	lbs	4,676	7,459	8,781	16,240
Aveg. ultimate load shear	BHS	4,000	V_n	lbs	7,648	11,307	17,220	26,235
Aveg. ultimate load shear	LHS	4,000	V_n	lbs	7,648	11,307	17,220	26,235
Allowable Tension Loads[1]		2,500	N_{allow}	lbs	899	1,589	2,752	3,575
		4,000	N_{allow}	lbs	1,131	1,999	3,235	4,498
		6,000	N_{allow}	lbs	1,382	2,443	3,954	5,497
		8,500	N_{allow}	lbs	1,653	2,922	4,728	6,574
Uncracked Concrete								
Allowable Tension Loads[1]		2,500	N_{allow}	lbs	1,589	2,488	3,492	5,018
		4,000	N_{allow}	lbs	1,999	3,130	4,393	6,313
		6,000	N_{allow}	lbs	2,443	3,826	5,369	7,715
		8,500	N_{allow}	lbs	2,922	4,575	6,420	9,226
Uncracked Concrete								
Allowable Shear Loads[1]		2,500	V_{allow}	lbs	2,832	4,361	6,050	9,711
		4,000	V_{allow}	lbs	3,080	4,747	7,095	10,791
		6,000	V_{allow}	lbs	3,080	4,747	7,095	10,791
Spacing & Edge Distance								
Effective Anchorage Depth			h_{ef}	in. (mm)	2.36 (60)	2.80 (71)	3.15 (80)	3.93 (100)
Critical Edge Distance			C_{ac}	in. (mm)	3.54 (90)	4.89 (107)	4.72 (102)	5.9 (150)
Critical Anchor Spacing			S_{ac}	in. (mm)	7.09 (180)	8.38 (213)	8.34 (240)	11.81 (300)
Minimum Spacing for Edge Distance C			S_{min}/C	in. (mm)	2.36/3.94 (60/100)	2.76/4.72 (70/120)	3.15/6.30 (80/160)	7.08/7.08 (180/180)
Minimum Edge Distance for Spacing S			C_{min}/S	in. (mm)	2.56/4.72 (60/120)	2.76/6.89 (70/175)	3.15/7.87 (80/200)	7.08/7.08 (180/180)
Minimum Thickness of Concrete slab			h_m	in. (mm)	4.72 (120)	5.51 (140)	6.30(160)	7.87 (200)
Installation Parameters								
Drilled Hole Diameter			d_o	in. (mm)	.47 (12)	.59 (15)	.71 (18)	(24)
Diameter of Clearance Hole			d_c	in.(mm)	.55 (14)	.67 (17)	.79 (20)	(26)
Depth of Drilled Hole			h_o	in. (mm)	3.15 (80)	3.74 (95)	4.13 (105)	(130)
Installation Torque (LHS / BHS)			T_{inst}	Nm	35/30	55/50	90/80	170/170
Wrench Size			WS	(mm)	(13)	(17)	(19)	(24)

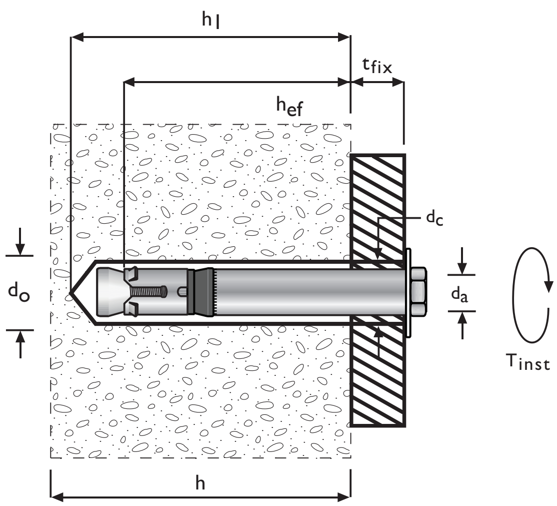
NOTES:

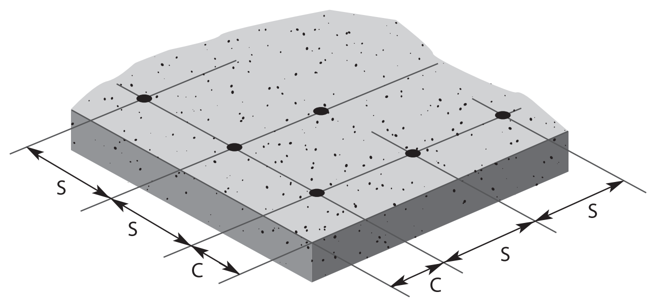
1) Design strengths for use with allowable stress design (ASD) are calculated in accordance with ACI 318, Appendix D

SZ HEAVY LOAD EXPANSION ANCHOR

ANCHOR INSTALLATION







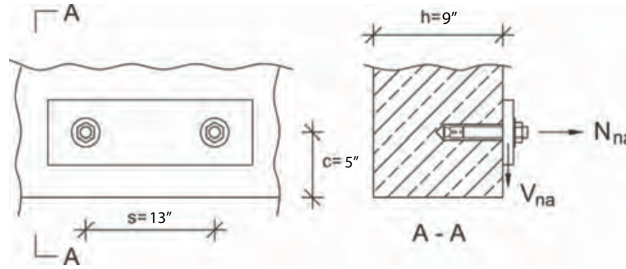
ANCHOR SPACING AND EDGE DISTANCE GUIDELINES (ALLOWBLE STRESS DESIGN)

Anchor Spacing	**Reduction Factor**	
	Tension	**Shear**
S_{ac} = 3.0 x h_{ef}	1.0	1.0
S_{min} = 1.5 x h_{ef}	0.70	0.70
Edge Distance		
C_{ac} = 1.5 x h_{ef}	1.0	1.0
C_{min} = 2.5 x h_{ef}	0.70	0.3

SZ HEAVY LOAD EXPANSION ANCHOR

EXAMPLE CALCULATION - STRENGTH DESIGN

Determine if two M16 diameter SZ-B (Stud) carbon steel High Load anchors with an effective embedment depth h_{ef} = 3.94 inches installed 13 inches from center to center and 5 inches from the edge of a 9 inch deep slab is adequate for a service tension load of 4,000 lb. (live load) and a reversible service shear load of 2,000 lb. (live load) The anchor group will be in the tension zone, away from other anchors in f'_c = 3,000 psi normal – weight concrete.



	ACI318-08 Code Ref.	Report Ref.

1. Verify minimum Member Thickness, Spacing and Edge Distance:

h = 9 in. ≥ h_{mi} = 7.9 in. o.k.
s = 12 in. ≥ S_{min} = 12.6 in. o.k.
$c_{a,min}$ = 5 in. ≥ c_{min} = 4.7 in. o.k.

2. Determine the Factored Tension and Shear Design Loads: 9.2.1

N_{ua} = 1.6 L = 1.6 x 4,000 = 6,400 lb.
V_{ua} = 1.6 L = 1.6 x 2000 = 3,200 lb.

3. Steel Capacity under Tension Loading: D.5.1

N_{sa} = 28,171
Φ = 0.65
n = 2 (double anchor group)
Calculating for ΦN_{sa} :
ΦN_{sa} = 0.65 x 2 x 28,171 = 36,622 lb.

4. Concrete Breakout Capacity under Tension Loading D.5.2

$$N_{cbg} = \frac{A_{Nc}}{A_{Nco}} \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$$ Eq.(D-5)

where:

$$N = K_c \sqrt{f'_c} h_{ef}^{1.5}$$ Eq.(D-7)

with $K_c = K_{cr} = 17$

$\Psi_{ec,N}$ = 1.0 since eccentrically e_N = 0 Eq.(D-9)

$$\Psi_{ed,N} = 0.7 + 0.3 \frac{C_{a,min}}{1.5h_{ef}} \text{ when } C_{a,min} \leq 1.5h_{ef}$$ Eq.(D-11)

by observation $C_{a,min}$ =3<$1.5h_{ef}$ = 5.91in.

$$\Psi_{ed,N} = 0.7 + 0.3 \frac{(5)}{1.5(3.94)} = 0.95$$

$\Psi_{c,N}$ = 1.0 assuming cracking at service loads ($f_t > f_r$) D.5.2.6

$\Psi_{cp,N}$ = 1.0 designed for cracked concrete D.5.2.7

	ACI318-08 Code Ref.	Report Ref.

calculation for $\frac{A_{Nc}}{A_{Nco}}$

$A_{Nco} = 9h_{ef}^2 = 9(3.94)^2$ = 139.71 In^2 Eq. (D-6)

$A_{Nc} = (c_{a1} + 1.5h_{ef})\ (2 \times 1.5h_{er} + s_1)$
= (3 + 1.5 x 3.94) (2 x 1.5 x 3.94 + 13) Fig. RD.5.2.1 b
= 270.8 $in.^2$

$$\frac{A_{Nc}}{A_{Nco}} = \frac{270.8}{139.71} = 1.94$$

Calculation for N_b and N_{cbg}:

$N_b = 17 \times \sqrt{3{,}000} \times (3.94)^{1.5}$ = 7,282 lb.
N_{cbg} = 1.94 x 1.0 x 0.96 x 1.0 x 1.0 x 7,282 = 13,562 lb.
Φ = 0.65 for Condition B
(no supplementary reinforcement provided)

ΦN_{cb} = 0.65 x 13,493 = 8,815

5. Pullout Capacity D.5.3

not decicive

6. Check all Failure Modes under Tension Loading: D.4.1.2

Summary:

Steel Capacity	= 36,622 lb.
Concrete Breakout Capacity	= 8,815 lb. ← **Controls**
Pullout Capacity	= not decisive

ΦN_n = 8,815 lb. as Concrete Breakout Capacity Controls
> N_{ua} = 6,400 lb. - OK

7. Steel Capacity under Shear Loading: D.6.1

Calculating for ΦV_{sa}:
V_{sa} = 2 x 19,131 = 38,262 lb.
Φ = 0.65 Φ = 0.65
ΦV_{sa} = 0.65 x 38,262 = 24,870 lb.

ACI318-08 Code Ref. | Report Ref.

8. Concrete Breakout Capacity under Shear Loading: D.6.2

$V_{cbg} = \frac{A_{vc}}{A_{vco}} \Psi_{ec,V} \Psi_{ed,V} \Psi_{c,V} V_b$ Eq.(D-24)

where:

$V_b = 7\left(\frac{l_e}{d_o}\right)^{0.2} \sqrt{d_o} \sqrt{f'_c}\, c_{a1}^{1.5}$ Eq. (D-24)

$\Psi_{ec,V}$ = 1.0 since eccentricity $e'_V = 0$ Eq.(D-26)

$\Psi_{ed,V}$ = 1.0 since $c_{a2} > 1.5c_{a1}$ Eq.(D-27)

$\Psi_{c,V}$ = 1.0 assuming cracking at service loads ($f_t > f_r$) D.6.2.7

calculating for $\frac{A_{Vc}}{A_{Vc0}}$

h = 9 > 1.5 c_{a1} = 1.5 x 5 = 7.5 in.

$A_{Vc} = (2(1.5c_{a1}) + s_1)\ 1.5c_{a1}$ Fig.

= (2 x 1.5 x 5 + 13) x 1.5 x 5 RD.6.2.1b

= 210 in.^{2}

$A_{Vc0} = 4.5\ (c_{a1})^2 = 4.5 \times 5^2 = 112.5$ in.^{2} Eq.(D-23)

$\frac{A_{Vc}}{A_{Vc0}} = \frac{210}{112.5} = 1.87$ D.6.2.1

calculating for V_b and $\Phi\ V_{cbg}$

d_o = 0.93 in.

$l_e = h_{ef}$ = 3.94 in. D.6.2.2

c_{a1} = 5 in.

Φ = 0.70 for Condition B

(no supplementary reinforcement provided)

$Vb = 7 \times \left(\frac{3.94}{0.93}\right)^{0.2} \times \sqrt{0.93} \times \sqrt{3{,}000} \times (5)^{1.5} = 5{,}517$ lb.

$\Phi V_{cbg} = 0.70 \times 1.87 \times 1.0 \times 1.0 \times 1.0 \times 5{,}517 = 7{,}222$ lb.

9. Concrete Pryout Strength: D.6.3

not decisive

ACI318-08 Code Ref. | Report Ref.

10. Check all Failure Modes under Shear Loading: D.4.1.2

Summary:

Steel Capacity = 24,870 lb.
Concrete Breakout Capacity = 7,222 lb. ← **Controls**
Pryout Capacity = 7,847 not decisive

$\Phi\ V_n$ = 7,222 lb. as Concrete Breakout Capacity controls $> V_{ua}$ = 3,200 lb. - OK

11. Check Interaction of Tension and Shear Forces D.7

If 0.2 $\Phi\ V_n \geq V_{ua}$ then the full tension design strength is permitted. D.7.1
By observation, this is not the case.

If 0.2 $\Phi\ N_n \geq N_{ua}$ then the full tension design strength is permitted. D.7.2
By observation, this is not the case.

Therefore:

$\frac{N_{ua}}{\Phi N_n} + \frac{V_{ua}}{\Phi V_n} \leq 1.2$

$\frac{6{,}400}{8{,}815} + \frac{3{,}200}{7{,}222} = 0.73 + 0.44 = 1.17 < 1.2$ - OK

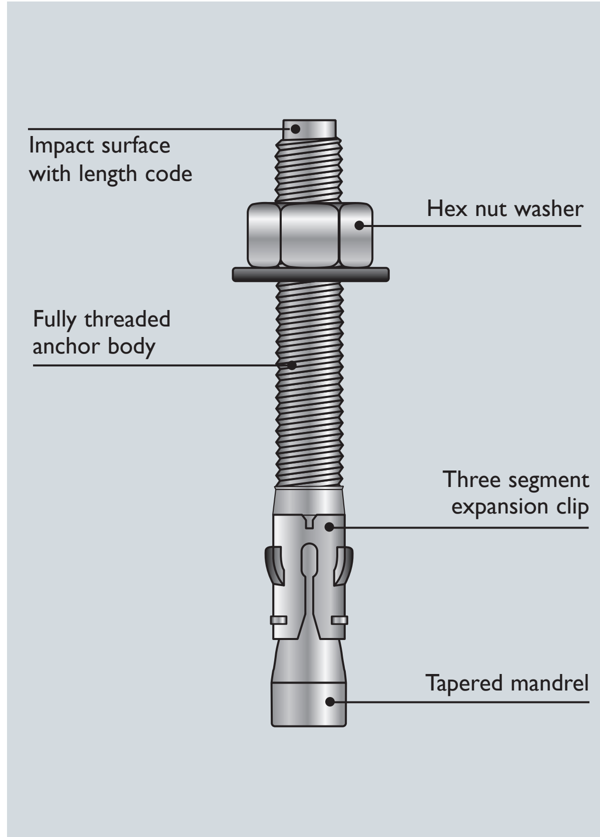
12. Summary

Two M16 diameter SZ High Load anchor at 3.9 in. effective embedment depth are adequate to resist the applied service tension and shear loads of 4,000 and 2,000 lb., respectively.

WEDGE ANCHOR

DESCRIPTION

The UCAN wedge anchor is a fully threaded, high-grade, steel anchor assembled with a three-segment expansion clip. This fastener is supplied complete with nut and washer. All parts are zinc plated for added corrosion resistance. The UCAN wedge anchor is also available in 304 or 316 grade stainless steel. It is most suitable for static applications, and can be loaded immediately.



FEATURES

- Fast torque up
- Anchor size = hole size
- Non bottom bearing
- Through fastening type +1/8" clearance hole diameter required
- Fully threaded

LIMITATIONS

Not recommended for uncured concrete (less than 7 days old), lightweight concrete, masonry block or brick.

TYPICAL APPLICATIONS

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

MATERIAL SPECIFICATIONS

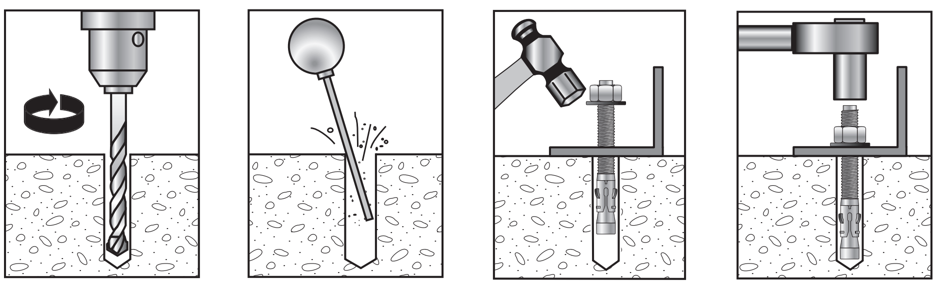
Anchor Component	Material / Standard	
Carbon steel anchor body	1/4" – 3/4" (AISI 1022 - AISI 1035) 7/8" – 1-1/4" (AISI 1008)	
Clip	AISI 1008 – 1010	
Stainless steel, 304 Anchor body and clip	ASTM F593 (AISI 304)	
Stainless steel, 316 Anchor body and clip	ASTM F593 (AISI 316)	
Corrosion protection	ASTM B633 – 98e1 ASTM B695 – 04	0.0002" (5 micron) (electrodeposited) Class 65, Type I mechanically galvanized

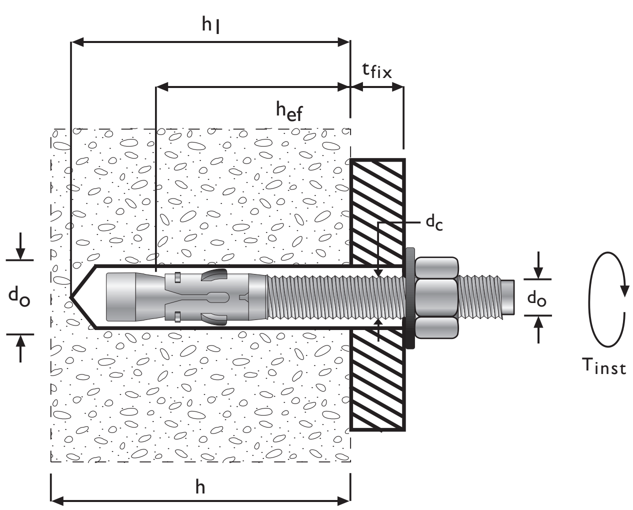
WEDGE ANCHOR

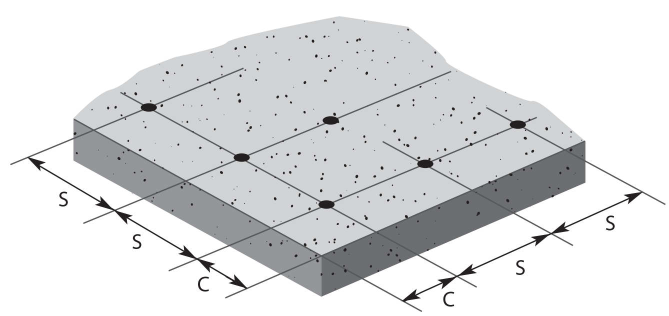
INSTALLATION

Setting Details	Anchor Diameter (in)						
	1/4	3/8	1/2	5/8	3/4	1	1-1/4
Nominal drill bit dia. d_o (in.)	1/4	3/8	1/2	5/8	3/4	1	1-1/4
Minimum embedment (test) h_{ef} (in.)	1-1/2	2	2-1/2	3	3-1/2	4-1/2	N/A
Clearance hole dia. d_c (in.)	3/8	1/2	5/8	3/4	7/8	1-1/8	1-5/16
Required anchor spacing for 100% performance s (in.)	3-1/2	4	5-1/2	6-1/2	8	9	N/A
Minimum anchor spacing in tension s_{min} (in.) @ min. emb.	1-1/2	2	2-1/2	3	3-1/2	4-1/2	N/A
Required edge distance in tension for 100% performance c (in.) @ min. emb.	3	4	4	4-1/2	5-1/2	6-1/2	N/A
Minimum edge distance (tension; shear) c_{min} (in.) @ min. emb.	1-1/2	2	2-1/2	3	4-1/2	5-1/2	N/A
Installation torque T_{inst} (ft. lbs.)	8	30	60	90	130	N/A	N/A
Minimum base material thickness h (in.)	3" or 1.5 x h_{ef} - whichever is greater						

Note: Carbide tipped drill bit shall conform to ANSI B 212.15







WEDGE ANCHOR

ANCHOR SELECTION

Size	Carbon Steel Zinc plated	Stainless Steel (304)	Stainless Steel (316)	Hole Diameter inch	Minimum Embedment inch	Thread Length inch	Overall Anchor Length inch	Fixture Thickness inch
1/4 x 1-3/4	WED14134	ISS14134		1/4	1-1/8	3/4	1-3/4	1/4
1/4 x 2-1/4	WED14214	ISS14214	IST14214	1/4	1-1/8	1-1/8	2-1/4	7/8
1/4 x 3-1/4	WED14314	ISS14314	IST14314	1/4	1-1/8	2-1/8	3	1-5/8
3/8 x 2-1/4	WED38214	ISS38214		3/8	1-5/8	3/4	2-1/4	1/4
3/8 x 2-3/4	WED38234	ISS38234	IST38234	3/8	1-5/8	1-3/8	2-3/4	3/4
3/8 x 3	WED383	ISS383		3/8	1-5/8	1-1/2	3	1
3/8 x 3-3/4	WED38334	ISS38334	IST38334	3/8	1-5/8	2-1/4	3-3/4	1-3/4
3/8 x 5	WED385	ISS385	IST385	3/8	1-5/8	3-5/8	5	3
1/2 x 2-3/4	WED12234	ISS12234	IST12234	1/2	2-1/4	1-1/8	2-3/4	1/8
1/2 x 3-3/4	WED12334	ISS12334	IST12334	1/2	2-1/4	2-1/8	3-3/4	1
1/2 x 4-1/4	WED12414	ISS12414		1/2	2-1/4	2-5/8	4-1/4	1-1/2
1/2 x 5-1/2	WED12512	ISS12512	IST12512	1/2	2-1/4	4	5-1/2	2-3/4
1/2 x 7	WED127	ISS127		1/2	2-1/4	4	7	4-1/4
1/2 x 8-1/2	WED12812			1/2	2-1/4	4	8-1/2	5-3/4
1/2 x 10	WED1210			1/2	2-1/4	4	10	7-1/4
5/8 x 3-1/2	WED58312	ISS58312		5/8	2-3/4	1-5/8	3-1/2	1/8
5/8 x 4-1/2	WED58412	ISS58412	IST58412	5/8	2-3/4	2-5/8	4-1/2	1-1/8
5/8 x 5	WED585			5/8	2-3/4	3-1/8	5	1-5/8
5/8 x 6	WED586	ISS586	IST586	5/8	2-3/4	4	6	2-5/8
5/8 x 7	WED587			5/8	2-3/4	4	7	3-5/8
5/8 x 8-1/2	WED58812			5/8	2-3/4	4	8-1/2	5-1/8
5/8 x 10	WED5810			5/8	2-3/4	4	10	6-5/8
3/4 x 4-1/4	WED34414	ISS34414	IST34414	3/4	3-1/4	2	4-1/4	1/4
3/4 x 4-3/4	WED34434			3/4	3-1/4	2-1/2	4-3/4	3/4
3/4 x 5-1/2	WED34512	ISS34512	IST34512	3/4	3-1/4	3-1/4	5-1/2	1-1/2
3/4 x 6-1/4	WED34614			3/4	3-1/4	4	6-1/4	2-1/4
3/4 x 7	WED347	ISS347	IST347	3/4	3-1/4	4	7	3
3/4 x 8-1/2	WED34812			3/4	3-1/4	4	8-1/2	4-1/2
3/4 x 10	WED3410	ISS3410		3/4	3-1/4	4	10	6
3/4 x 12	WED3412			3/4	3-1/4	4	12	8
7/8 x 6	WED786			7/8	4	3-1/2	6	1-1/8
7/8 x 8	WED788			7/8	4	4	8	3-1/8
7/8 x 10	WED7810	ISS7810		7/8	4	4	10	5-1/2
1 x 6	WED16			1	4-1/2	3-1/2	6	1/2
1 x 9	WED19	ISS19		1	4-1/2	4	9	3-1/2
1 x 12	WED112			1	4-1/2	4	12	6-1/2
1-1/4 x 9	WED1149			1-1/4	5-1/2	4	9	2-1/4
1-1/4 x 12	WED11412			1-1/4	5-1/2	4	12	5-1/4

WEDGE ANCHOR

DESIGN DATA

Average Ultimate Tension and Shear Loads
Normal weight stone aggregate concrete

Anchor Diameter	Minimum Embedment	Tension						Shear	
		2,000 psi Concrete		4,000 psi Concrete		6,000 psi Concrete		4,000 psi Concrete	
(in)	(in)	lbf	kN	lbf	kN	lbf	kN	lbf	kN
1/4	1-1/2	1,210	5.38	1,560	6.94	1,800	8.01	1,450	6.45
	2-1/4	1,900	8.45	2,100	9.34	2,030	9.03	1,823	8.11
3/8	2	2,875	12.79	4,550	20.24	5,776	25.69	4,860	21.62
	4-1/2	3,600	16.01	6,024	26.80	7,250	32.25	5,150	22.91
1/2	2-1/2	4,428	19.70	5,940	26.42	7,411	32.97	8,990	39.99
	4-3/4	7,150	31.80	9,284	41.30	12,100	53.82	9,870	43.90
5/8	3	6,187	27.52	8,050	35.81	10,589	47.10	12,083	53.75
	5-1/2	11,500	51.15	14,180	63.08	14,950	66.50	17,800	79.18
3/4	3-1/2	8,133	36.18	10,020	44.57	12,094	53.80	15,489	68.90
	5	12,010	53.42	15,600	69.39	23,450	104.31	21,200	94.30
1	4-1/2	10,226	45.49	15,670	69.70	18,800	83.63	26,997	120.09
	6	16,700	74.29	21,500	95.64	27,800	123.66	31,540	139.90

Note: Tabulated values are developed using independent laboratory and in-house testing data.

Allowable Tension and Shear Loads
Normal weight stone aggregate concrete

Anchor Diameter	Minimum Embedment	Tension						Shear	
		2,000 psi Concrete		4,000 psi Concrete		6,000 psi Concrete		4,000 psi Concrete	
(in)	(in)	lbf	kN	lbf	kN	lbf	kN	lbf	kN
1/4	1-1/2	318	1.42	411	1.83	474	2.11	382	1.70
	2-1/4	500	2.22	553	2.46	534	2.38	480	2.13
3/8	2	757	3.37	1,197	5.33	1,520	6.76	1,279	5.69
	4-1/2	947	4.21	1,585	7.05	1,908	8.49	1,355	6.03
1/2	2-1/2	1,165	5.18	1,563	6.95	1,950	8.68	2,366	10.52
	4-3/4	1,882	8.37	2,443	10.87	3,184	14.16	2,597	11.55
5/8	3	1,628	7.24	2,118	9.42	2,787	12.40	3,180	14.14
	5-1/2	3,026	13.46	3,732	16.60	3,934	17.50	4,684	20.84
3/4	3-1/2	2,140	9.52	2,637	11.73	3,183	14.16	5,276	23.47
	5	3,161	14.06	4,105	18.26	6,171	27.45	5,579	24.82
1	4-1/2	2,691	11.97	4,124	18.34	4,947	22.01	7,104	31.60
	6	4,395	19.55	5,658	25.17	7,316	23.54	8,276	36.81

DESIGN DATA

Load Adjustment Factors Anchor in Tension
– Spacing –

Anchor in Tension												
Anchor Dia. (in)	**1/4**		**3/8**		**1/2**		**5/8**		**3/4**		**1**	
Embedment (in)	1.5	2.25	2	4.5	2.5	4.75	3	5.5	3.5	5	4.5	6
Spacing (in)												
1.5	0.65											
2	0.74		0.65									
2.5	0.83	0.65	0.74		0.65							
3	0.91	0.72	0.83		0.71		0.65					
3.5	1.00	0.79	0.91		0.77		0.70		0.65			
3.75		0.83	0.96		0.80		0.73		0.67			
4		0.86	1.00		0.83	0.65	0.75		0.69			
4.5		0.93		0.65	0.88	0.69	0.80		0.73		0.65	
5		1.00		0.68	0.94	0.72	0.85		0.77	0.65	0.69	
5.5				0.71	1.00	0.76	0.90	0.65	0.81	0.69	0.73	
6				0.75		0.79	0.95	0.69	0.84	0.72	0.77	0.65
6.5				0.78		0.83	1.00	0.72	0.88	0.76	0.81	0.67
7.5				0.84		0.90		0.79	0.96	0.83	0.88	0.72
8				0.87		0.93		0.83	1.00	0.86	0.92	0.74
9				0.94		1.00		0.90		0.93	1.00	0.79
10				1.00				0.97		1.00		0.84
10.5								1.00				0.86
12												0.93
13.5												1.00

Load Adjustment Factors Edge Distance

Anchor in Tension												
Anchor Dia. (in)	**1/4**		**3/8**		**1/2**		**5/8**		**3/4**		**1**	
Embedment (in)	1.5	2.25	2	4.5	2.5	4.75	3	5.5	3.5	5	4.5	6
Spacing (in)												
1.5	0.70											
2	0.80	0.70	0.70									
2.5	0.90	0.78	0.78		0.70							
3	1.00	0.85	0.85		0.80		0.70					
3.5		0.93	0.93		0.90		0.80		0.70			
3.75		0.96	0.96		0.95		0.85		0.74			
4		1.00	1.00		1.00		0.90		0.78			
4.5				0.70		0.70	1.00		0.85		0.70	
5				0.76		0.76			0.93	0.70	0.76	
5.5				0.82		0.82		0.70	1.00	0.75	0.82	
6				0.88		0.88		0.76		0.80	0.88	0.70
6.5				0.94		0.94		0.82		0.85	0.94	0.75
7				1.00		1.00		0.88		0.90	1.00	0.80
8								1.00		1.00		0.90
9												1.00

WEDGE ANCHOR

DESIGN DATA

Load Adjustment Factors Edge Distance

	Anchor in Shear					
Anchor Dia. (in)	**1/4**	**3/8**	**1/2**	**5/8**	**3/4**	**1**
Embedment (in)	**1.5**	**2**	**2.5**	**3**	**3.5**	**4.5**
Edge (in)						
1.5	0.50					
2	0.67	0.50				
2.5	0.83	0.63	0.50			
3	1.00	0.75	0.63	0.50		
3.5		0.88	0.75	0.57		
3.75		0.94	0.88	0.61		
4		1.00	0.94	0.64		
4.5			1.00	0.71	0.50	
5				0.79	0.56	
5.5				0.86	0.61	
6				0.93	0.67	0.50
6.5				1.00	0.72	0.54
7					0.78	0.57
8					0.89	0.64
9					1.00	0.71
13						1.00

SPECIFICATION

The following sample specification clause is arranged for inclusion in any one of a variety of master specification sections utilizing the Construction Specifications Canada (CSC) format. Square brackets [ ] indicate alternatives, data required, or need for the specifier to fill in information.

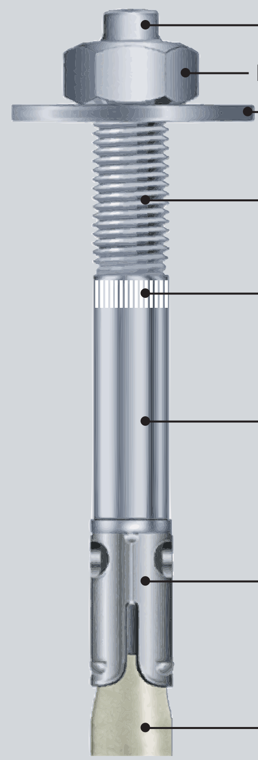
ANCHORS (FASTENERS)

Expansion anchors shall be UCAN Wedge Anchors [diameter and length to suit load and fixture requirements], supplied by UCAN Fastening Products. Anchors to be zinc plated (stainless steel, AISI grade 304 or 316) and installed according to UCAN's published instructions.

SRS TZ WEDGE ANCHOR

DESCRIPTION

UCAN SRS TZ wedge anchor combines high ultimate loads with minimal anchor spacing and edge distance. The expansion cone is coated with a patented, durable and temperature resistant surface treatment. This feature controls the friction between the expansion cone and the expansion sleeve; not only at the time of installation, but also over the lifetime of the fastening.



FEATURES

- ACI 318, category 1 anchor (high reliability)
- Suitable for seismic, tension zone (cracked concrete) anchoring application
- Available in carbon and 304 / 316 Stainless Steel
- High load capacity
- Patented surface treatment on expansion cone for reliable performance
- Through fastening

APPROVALS

- ICC ES listing (ESR - 3305)
- Tested in accordance with ACI 255 and AC 193

TYPICAL APPLICATIONS

- Seismic anchoring
- Structural steel column and frame installation
- Machinery and equipment installation
- Vibratory loading applications
- Parking structure rehabilitation
- Road and bridge construction
- Crane, conveyor installation
- Robotics

MATERIAL SPECIFICATIONS

Anchor Component	Specifications Carbon Steel	304 SS	316 SS
Anchor Body	Cold formed: DIN EN 10263-3	AISI/SAE 304	AISI/SAE 316
Nut	ASTM A 563	ASTM F 563 304 Alloy group	ASTM F 563 316 Alloy group
Washer	ANSI/ASME B18.22.1,	ANSI/ASME B18.22.1, 304 Alloy group	ANSI/ASME B18.22.1, 316 Alloy group
Expansion Sleeve	AISI/SAE grade 304	AISI/SAD grade 304	AISI/SAD grade 316
Corrosion Protection	Zinc plated ASTM B 633	304 SS	316 SS

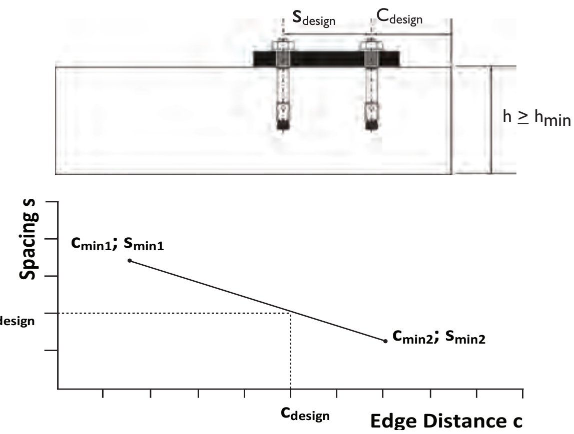
SRS TZ WEDGE ANCHOR

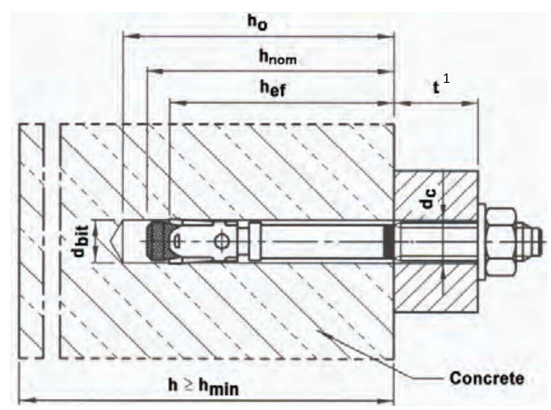
INSTALLATION DATA

Setting Information	Symbol	Units	Nominal anchor diameter	
			½ inch	⅝ inch
Nominal Diameter	d_0	in. (mm)	½ (12.7)	5/8 (15.9)
Drill Bit Diameter	d_{bit}	in. (mm)	½	5/8
Minimum Hole Depth	h_0	in. (mm)	3 1/4 (83)	4 1/8 (105)
Minimum Base Plate Clearance Hole Diameter [2]	d_c	in. (mm)	9/16 (14.3)	11/16 (17,5)
Installation Torque (Carbon Steel)	T_{inst}	ft-lbf (N-m)	35 (47.5)	65 (90)
Installation Torque (304 Stainless Steel)	T_{inst}	ft-lbf (N-m)	60 (80)	110 (150)
Installation Torque (316 Stainless Steel)	T_{inst}	ft-lbf (N-m)	60 (80)	96 (130)
Embedment Depth	h_{nom}	in. (mm)	2 7/8 (73)	3 3/4 (95)
Effective Embedment Depth	h_{ef}	in. (mm)	2 ½ (64)	3 1/4 (83)
Minimum Edge Distance	c_{min1}	in. (mm)	5 (127)	6 (152)
Minimum Spacing [3]	s_{min1}	in. (mm)	2 ½ (64)	3 (76)
Minimum Edge Distance	c_{min2}	in. (mm)	3 (76)	3 ½ (89)
Minimum Spacing [4]	s_{min2}	in. (mm)	6 (152)	9 ½ (241)
Minimum Concrete Thickness	h_{min}	in. (mm)	5 (127)	6 ½ (165)

For **SI**: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1] The information presented in this table must be used in conjunction with the design requirements of ACI 318 Appendix D.
[2] The clearance must comply with applicable code requirements for the connected element.
[3] s_{min1} applies when c_{min1} is provided.
[4] s_{min2} applies when c_{min2} is provided.

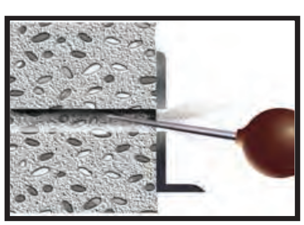




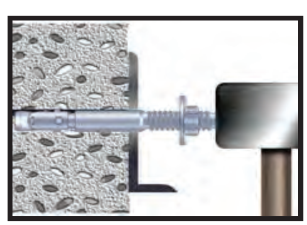
[1] Thickness of base plate

INSTALLATION INSTRUCTIONS

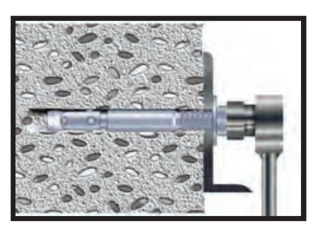
Drill hole to the proper diameter and depth



Blow out dust from the hole



Place anchor in drill hole



Apply installation torque to set anchor

STRENGTH DESIGN INFORMATION - TENSION

Characteristic	Symbol	Units	Nominal anchor diameter	
			½ inch	⅝ inch
Anchor Category	1,2 or 3	-	1	1
Embedment Depth	h_{nom}	in. (mm)	2⅞ (73)	3¾ (95)
Steel Strength in Tension (ACI 318 D.5.1)				
Specified Yield Strength (Carbon Steel)	f_{ya}	psi (N/mm^2)	75,420 (520)	75,420 (520)
Specified Yield Strength (304 and 316 Stainless Steel)	f_{ya}	psi (N/mm^2)	81,280 (560)	81,280 (560)
Specified Tensile Strength (Carbon Steel)	f_{uta}	psi (N/mm^2)	94,275 (650)	94,275 (650)
Specified Tensile Strength (304 and 316 Stainless Steel)	f_{uta}	psi (Nmm^2)	101,600 (700)	101,600 (700)
Effective Tensile Stress Area	A_{se}	in^2 (mm^2)	0.0964 (62)	0.1419 (92)
Tension Resistance of Steel (RSR TZ Carbon Steel)	N_{sa}	lbf (kN)	9080 (40.0)	13,375 (59.5)
Tension Resistance of Steel (SRS TZ 304 and 316 S.S.)	N_{sa}	lbk (kN)	9775 (43.5)	14,405 (64.1)
Strength Reduction Factor-Steel Failure[2]	Φ_{sa}	-	0.75	0.75
Concrete Breakout Strength in Tension (ACI 318 D.5.2)				
Effective Embedment Depth	h_{if}	in. (mm)	2½ (64)	3¼ (83)
Critical Edge Distance	C_{ac}	in. (mm)	3.2h_{ef}	3h_{ef}
Effectiveness Factor-Uncracked Concrete	k_{uncr}	-	24 (10)	24 (10)
Effectiveness Factor-Cracked Concrete	k_{cr}	-	17 (7)	17 (7)
Radio k_{uncr} k_{cr}	$\Psi_{c,N}$	-	1.4	1.4
Strength Reduction Factor-Concrete Breakout Failure[3]	Φ_{cb}	-	0.65	0.65
Pull-Out Strength in Tension (ACI 318 D.5.3)				
Pull-Out Resistance Cracked Concrete (f_c = 2,500 psi)[5]	$N_{pn,cr}$	lbf (kN)	2810 (12.5)	NA[4]
Pull-Out Resistance Uncracked Concrete (f_c = 2,500 psi)[5]	$N_{pn,uncr}$	lbf (kN)	4495 (20)	NA[4]
Strength reduction Factor Pullout Failure[6]	Φ_p	-	0.65	0.65
Tension Strength for Seismic Applications (ACI 318 D.3.3.3)				
Tension Resistance of Single Anchor Seis. Load (f_c=2,500 psi)[5]	$N_{pn,eq}$	lbf (kN)	2810 (12.5)	NA[4]
Strength reduction Factor Pullout Failure[6]	Φ_{eq}	-	0.65	0.65
Axial Stiffness in Service Load Range	β	-	342,620 (60)	342,620

For SI: 1inch = 25.4mm, 1lbf = 4.45N, 1 lb/in = 0.175 N/mm, 1 psi = 6.89 Pa, 1 in2 = 645 mm2, 1 lb/in = 0.175 N/mm.

[1] The information presented in this table must be used in conjunction with the design requirements of ACI 318 Appendix D.
[2] The tabulated value of Φ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 18 9.2 are used. If the load combinations of Section 1909.2 of the UBC or ACI 318 Appendix C are used, the appropriate value of Φ_{sa} must be determined in accordance with ACI 318 D.4.5. The 1/2 inch and 5/8 inch diameter 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, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. For installations where complying supplementary reinforcement can be verified, the Φ_{cb} factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4 for Condition A are satisfied, the appropriate value of Φ_{cb} must be determined in accordance with ACI 318 D.4.4(c). If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, the appropriate value of Φ_{cb} must be determined in accordance with ACI 318 D.4.5.
[4] As described in Section 4.1.3 of this report, N/A (Not Applicable) denotes that pullout resistance is not critical and does not need to be considered.
[5] The characteristic pull-out resistance for greater concrete compressive strengths may be increased by multiplying the tabular value by $(f_c / 2{,}500)^{0.5}$.
[6] The tabulated value of Φ_p or Φ_{eq} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 Section 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where pullout strength governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Appendix C or Section 1902. 2 of the UBC are used, appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.
[7] For all design cases, Ψ_{cp} = 1.0
[8] For 2006 IBC, $N_{sa} = N_s$; $A_{se} = A_s$

SRS TZ WEDGE ANCHOR

STRENGTH DESIGN INFORMATION - SHEAR

Characteristic	Symbol	Units	Nominal anchor diameter	
			½ inch	⅝ inch
Anchor Category	1,2 or 3	-	1	1
Embedment Depth	h_{nom}	in.	2⅞ (73)	3¾ (95)
Steel Strength in Shear (ACI 318 D.6.1)				
Specified Yield Strength for Shear (Carbon Steel)	f_{ya}	psi (N/mm^2)	69,620 (480)	69,620 (480)
Specified Yield Strength for Shear (304 and 316 S.S.)	f_{ya}	psi (N/mm^2)	60,960 (420)	75,470 (520)
Specified Tensile Strength for Shear (Carbon Steel)	f_{uta}	psi (N/mm^2)	87,025 (650)	87,025 (650)
Specified Tensile Strength for Shear (304 and 316 S.S.)	f_{uta}	psi (Nmm^2)	75,470 (520)	94,340 (650)
Effective Shear Stress Area	A_{se}	in^2 (mm^2)	0.142 (92)	0.226 (146)
Shear Resistance of Steel (SRS TZ Carbon Steel)	V_{sa}	lbf (kN)	7420 (33)	11,015 (49)
Shear Resistance of Steel (SRS TZ 304 and 316 S.S.)	V_{sa}	lbk (kN)	6430 (28.6)	12,0790 (56.9)
Strength Reduction Factor-Steel Failure[2]	Φ_{sa}	-	0.65	0.65
Concrete Breakout Strength in Shear (ACI 318 D.6.2)				
Nominal Diameter	d_o	in.	½ (12.7)	⅝ (15.9)
Load Bearing Length of Anchor in Shear	l_e	in.	2 ½ (64)	3 ¼ (83)
Strength Reduction Factor-Concrete Breakout Failure[3]	Φ_{cb}	-	0.7	0.7
Concrete Pryout Strength in Shear (ACI 318 D.6.3)				
Coefficient for Pryout Strength	k_{cp}	-	2	2
Strength Reduction Factor-Concrete Pryout Failure[4]	Φ_{cp}	-	0.7	0.7
Shear Strength for Seismic Applications (ACI 318 D.3.3.3)				
Shear Resistance of Single Anchor for Seismic Load (f'_c = 2,500 psi) (Carbon Steel)	$V_{sa,eq}$	lbf (kN)	5170 (23)	7645 (34)
Shear Resistance of Single Anchor for Seismic Load (f'_c = 2,500 psi) (304 and 316 Stainless Steel)	$V_{sa,eq}$	lbf (kN)	4500 (20)	8950 (39.8)
Strength Reduction Factor-Steel Failure	Φ_{eq}	-	0.65	0.65

For SI: 1inch = 25.4mm, 1 lbf = 4.45 N, 1 psi = 6.89 Pa, 1 in2 = 645 mm2.

[1]The information presented in this table must be used in conjunction with the design criteria of ACI 318 Appendix D.

[2]The tabulated value of Φ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. If the load combinations of Section 1909.2 of the UBC or ACI 318 Appendix C are used, the appropriate value of Φ_{sa} must be determined in accordance with ACI 318 D.4.5. The ½ inch and 5/8 inch diameter anchors are ductile steel elements as defined in ACI 318 D.1.1.

[3]The tabulated value of Φ_{cb} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where pry-out strength governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for condition A are allowed. If the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4 for Condition A are satisfied, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.4(c). If the load combinations of ACI 318 Appendix C or Section 1909.2 of the UBC are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

[4]The tabulated value of Φ_{cp} applies when both the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 9.2 are used and the requirements of ACI 318 D.4.4(c) for Condition B are satisfied. Condition B applies where supplementary reinforcement is not provided or where pry-out strength governs. For installations where complying supplementary reinforcement can be verified, the Φ factors described in ACI 318 D.4.4 for Condition A are allowed. If the load combinations of ACI 318 Appendix C or Section 1909.2 of the UBC are used, the appropriate value of Φ must be determined in accordance with ACI 318 D.4.5.

[5]For 2006 IBC, $A_{se} = A_s$

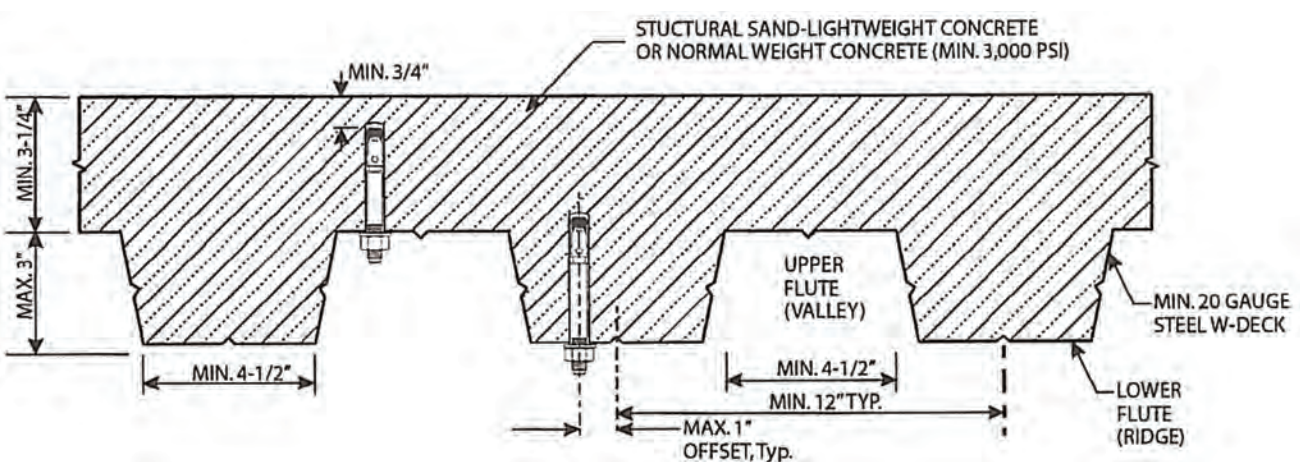
STRENGTH DESIGN INFORMATION - TENSION AND SHEAR FOR INSTALLATION IN CONCRETE OVER METAL DECK

Setting Information	Symbol	Units	Nominal anchor diameter	
			½ inch	⅝ inch
Embedment Depth	h_{nom}	in. (mm)	2 ⅞ (73)	3 ¾ (95)
Effective Embedment Depth	h_{ef}	in. (mm)	2½ (64)	3¼ (83)
Installation Torque	T_{inst}	ft-lbf (Nm)	35 (47.5)	65 (90)
Pull-Out Resistance Cracked Concrete [3]	$N_{pn,deck,cr}$	lbf (kN)	1460 (6.5)	2730 (12,1)
Pull-Out Resistance Uncracked Concrete [4]	$N_{pn,deck,uncr}$	lbf (kN)	2335 (10.4)	3855 (17.2)
Steel Strength in Shear [5]	$V_{sa,deck}$	lbf (kN)	2785 (12.4)	4410 (19.6)

For SI: 1 inch = 25.4mm, 1 ft-lbf = 1.356 N-m, 1 lbf = 4.45 N.

[1] Installation must comply with Section 4.3 and Figure 4. Except as specifically noted, all installations must be into the lower flute of the deck.
[2] Profile steel deck must comply with Figure 4 and have a minimum base steel thickness of 0.034 inch. Steel must comply with ASTM A653 / A635M, with minimum yield strength of 40 ksi (275 MPa).
[3] The values must be used in accordance with Section 4.1.3 and 4.1.8 of this report.
[4] The values must be used in accordance with Section 4.1.3 and of this report.
[5] The values must be used in accordance with Section 4.1.4 and 4.1.8 of this report.
[6] The minimum anchor spacing along the flute must be the greater of 3.0 hef or 1.5 times the flute width.

INSTALLATION IN THE SOFFIT OF CONCRETE OVER METAL DECK



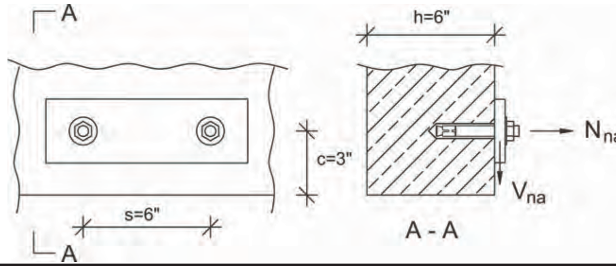
LENGTH IDENTIFICATION SYSTEM (CARBON STEEL AND STAINLESS STEEL ANCHORS)

Length ID marking on stud	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Length of anchor min ≥ (in.)	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	11	12
Length of anchor max < (in.)	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	11	12	13

SRS TZ WEDGE ANCHOR

SRS TZ WEDGE ANCHOR SAMPLE CALCULATIONS

Determine if two ½ inch diameter SRS TZ carbon steel anchors with an effective embedment depth hef = 2½ inches installed 6 inches from center to center and 3 inches from the edge of a 6 inch deep slab is adequate for a service tension load of 2,000 lb. for wind and a reversible service shear load of 400 lb. for wind. The anchor group will be in the tension zone, away from other anchors in f'c = 3,000 psi normal – weight concrete



	ACI318-08 Code Ref.	Report Ref.

1. Verify minimum Member Thickness, Spacing and Edge Distance:

   h = 6 in. ≥ hmi n = 5 in. o.k.
   s = 6 in. ≥ smin = 6 in. o.k.
   c_a, min = 3 in. ≥ c_{min} = 3 in. o.k.

2. Determine the Factored Tension and Shear Design Loads: 9.2.1

   N_{ua} = 1.6 W = 1.6 x 2,000 = 3,200 lb.
   V_{ua} = 1.6 W = 1.6 x 400 = 640 lb.

3. Steel Capacity under Tension Loading: D.5.1

   Nsa = 9,08 0
   Φ = 0.75
   n = 2 (double anchor group)
   Calculating for Φ Nsa :
   Φ Nsa = 0.75 x 2 x 9,080 = 13,620 lb.

4. Concrete Breakout Capacity under Tension Loading D.5.2

   $N_{cbg} = \frac{A_{Nc}}{A_{Nco}} \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ Eq.(D-5)

   where:

   $N = K\sqrt{f'_c} h_{ef}^{1.5}$ Eq.(D-7)

   with $K_c = K_{cr} = 17$

   $\Psi_{ec,N}$ = 1.0 since eccentrically e_N = 0 Eq.(D-9)

   $\Psi_{ed,N} = 0.7 + 0.3 \frac{C_{a,min}}{1.5h_{ef}}$ when $C_{a,min} \leq 1.5h_{ef}$ Eq.(D-11)

   by observation $C_{a,min} = 3 < 1.5h_{ef}$ = 3.75in.

   $\Psi_{ed,N} = 0.7 + 0.3 \frac{(3)}{1.5(2.5)} = 0.94$

   $\Psi_{c,N}$ = 1.0 assuming cracking at service loads ($f_t > f_r$) D.5.2.6

   $\Psi_{cp,N}$= 1.0 designed for cracked concrete D.5.2.7

	ACI318-08 Code Ref.	Report Ref.

calculation for $\frac{A_{Nc}}{A_{Nco}}$

$A_{Nco} = 9h_{ef}^2 = 9(2.5)^2 = 56.25 \text{ In}^2$ Eq. (D-6)

$A_{Nc} = (c_{a1}+1.5h_{ef})(2 \times 1.5h_{er} + s_1)$
$= (3 + 1.5 \times 2.5)(2 \times 1.5 \times 2.5 + 6)$ Fig. RD.5.2.1 b
$= 91.1 \text{in.}^2$

$\frac{A_{Nc}}{A_{Nco}} = \frac{91.1}{56.25} = 1.62$

Calculation for N_b and N_{cbg}:
$N_b = 17 \times \sqrt{3{,}000} \times (2.5)1.5 = 3{,}681$ lb.
N_{cbg} = 1.62 x 1.0 x 0.94 x 1.0 x 1.0 x 3,681 = 5,605 lb.
Φ = 0.65 for Condition B
(no supplementary reinforcement provided)

ΦN_{cb} = 0.65 x 5,605 = 3,643

5. Pullout Capacity D.5.3

   $N_{pn,cr} = 2 \times 2{,}810 \times \left(\frac{3{,}000}{2{,}500}\right)^{0,5} = 6{,}156$ lb.

   Φ = 0.65
   $\Phi N_{pn,cr}$ = 0.65 x 6,156 = 4,002 lb.

6. Check all Failure Modes under Tension Loading: D.4.1.2

   Summary:

Steel Capacity	= 13,620 lb.
Concrete Breakout Capacity	= 3,643 lb. ← **Controls**
Pullout Capacity	= 4,002 lb.

   Φ N_n = 3,643 lb. as Concrete Breakout Capacity Controls > N_{ua} = 3,200 lb. - OK

7. Steel Capacity under Shear Loading: D.6.1

   Calculating for ΦV_{sa}:
   V_{sa} = 2 x 7,420 = 14,840 lb.
   Φ = 0.65 Φ = 0.65
   ΦV_{sa} = 0.65 x 14,840 = 9,646 lb.

	ACI318-08 Code Ref.	Report Ref.

8. Concrete Breakout Capacity under Shear Loading: D.6.2

$V_{cbg} = \frac{A_{Vc}}{A_{Vco}} \Psi_{ec,V} \Psi_{ed,V} \Psi_{c,V} V_b$ Eq.(D-22)

where:

$V_b = 7\left(\frac{l_e}{d_o}\right)^{0.2} \sqrt{d_o} \sqrt{f'_c}\, c_{a1}^{1.5}$ Eq. (D-24)

$\Psi_{ec,V} = 1.0$ since eccentricity $e'_V = 0$ Eq.(D-26)

$\Psi_{ed,V} = 1.0$ since $c_{a2} > 1.5c_{a1}$ Eq.(D-27)

$\Psi_{c,V} = 1.0$ assuming cracking at service loads ($f_t > f_r$) D.6.2.7

calculating for $\frac{A_{Vc}}{A_{Vc0}}$

$h = 6 > 1.5\, c_{a1} = 1.5 \times 3 = 4.5$in.

$A_{Vc} = (2(1.5c_{a1}) + s_1)\, 1.5c_{a1}$ Fig. RD.6.2.1b

$= (2 \times 1.5 \times 3 + 6) \times 1.5 \times 3$

$= 67.5$ in.^{2}

$A_{Vc0} = 4.5\,(c_{a1})^2 = 4.5 \times 3^2 = 40.5$in.^{2} Eq.(D-23)

$\frac{A_{Vc}}{A_{Vc0}} = \frac{67.5}{40.5} = 1.67$ D.6.2.1

calculating for V_b and $\Phi\, V_{cbg}$

$d_o = 0.5$ in.

$l_e = h_{ef} = 2.5$ in. D.6.2.2

$c_{a1} = 3$ in.

$\Phi = 0.70$ for Condition B

(no supplementary reinforcement provided)

$Vb = 7 \times \left(\frac{2.5}{0.5}\right)^{0.2} \times \sqrt{0.5} \times \sqrt{3{,}000} \times (3)^{1.5} = 1{,}944$ lb.

$\Phi V_{cbg} = 0.70 \times 1.67 \times 1.0 \times 1.0 \times 1.0 \times 1{,}944 = 2{,}272$ lb.

9. Concrete Pryout Strength: D.6.3

Vcpg = kcp Ncbg Eq.(D-30)

Where:

$\Phi = 0.70$

kcp = 2.0 D.6.3.1

Vcpg = kcpNcbg = 2.0 x 5,605 = 11,210 lb Eq.(D-30)

Φ Vcpg = 0.70 x 11,210 = 7,847 lb.

	ACI318-08 Code Ref.	Report Ref.

10. Check all Failure Modes under Shear Loading: D.4.1.2

Summary:
Steel Capacity = 9,645 lb.
Concrete Breakout Capacity = 2,272 lb. ← **Controls**
Pryout Capacity = 7,847 lb.

$\Phi\, V_n$ = 2,272 lb. as Concrete Breakout Capacity controls $> V_{ua}$ = 640 lb. - OK

11. Check Interaction of Tension and Shear Forces D.7

If $0.2\,\Phi\, V_n \geq V_{ua}$ then the full tension design strength is permitted. D.7.1
By observation, this is not the case.

If $0.2\,\Phi\, N_n \geq N_{ua}$ then the full tension design strength is permitted. D.7.2
By observation, this is not the case.

Therefore:

$\frac{N_{ua}}{\Phi N_n} + \frac{V_{ua}}{\Phi V_n} \geq 1.2$

$\frac{3{,}200}{3{,}643} + \frac{640}{2{,}272} = 0.88 + 0.28 = 1.16 < 1.2$ - OK

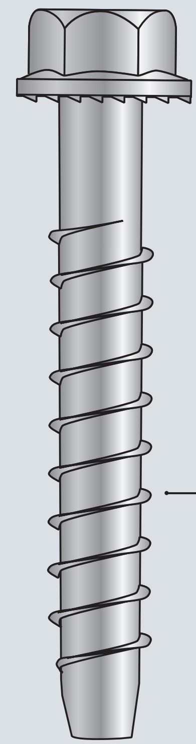
12. Summary

Two 1/2 in. diameter SRS TZ at 2 1/2 in. effective depth are adequate to resist the applied service tension and shear loads of 2,000 and 400 lb., respectively.

TORPEDO ANCHOR

DESCRIPTION

UCAN TORPEDO™ is an excellent anchoring alternative for medium duty and temporary applications. With it's corrosion resistant, mechanically galvanized, finish UCAN TORPEDO™ is also well suited for use outdoors. Matched with a standard UCAN ANSI - tolerance drill bit, this fastener produces consistently high load values. UCAN TORPEDO™ installs quickly leaving the clean appearance of a finished hex washer head on the working surface.



FEATURES

- Anchor size equals drill bit size.
- Faster installation and lower edge distance requirements, compared to mechanical expansion anchors.
- Patented undercutting thread design produces consistently high load values in various concrete strengths.
- One piece design with finished hex washer head-no nut and washer assembly required.
- Unique thread design permits low installation torque.
- Anchor can be set with an impact or manual socket wrench.
- Corrosion resistant, mechanically galvanized, finish for a wide range of applications.
- Anti-rotational head design facilitates a positive lock between the bolt and the working surface for enhanced vibration resistance.
- Removable–Ideal for temporary anchoring applications.
- Anchor size is stamped on head for easy identification and enhanced quality control after anchor Installation.

LIMITATIONS

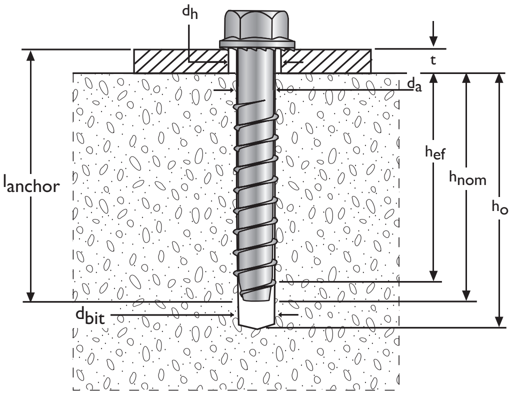
Not recommended for installation into uncured concrete(less than 7 days old) and permanent outdoor applications.

MATERIAL SPECIFICATIONS

Anchor body:	Heat treated carbon steel
Corrosion protection:	Mechanically galvanized as per ASTM B-695, Class 65, Type I
Head style:	Hex flange head with locking serrations

TORPEDO ANCHOR

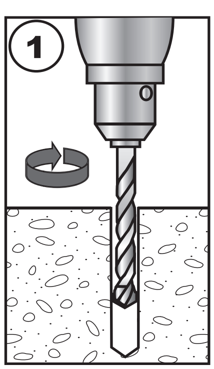
INSTALLATION DATA



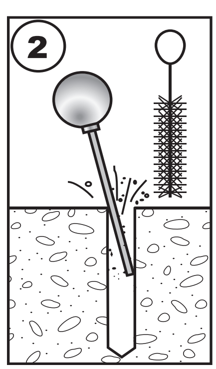
Installation Details

Characteristic	Symbol	Unit	Nominal Anchor diameter				
Anchor diameter	d_a	in.	1/4	3/8	1/2	5/8	3/4
Drill bit diameter	d_{bit}	in.	1/4	3/8	1/2	5/8	3/4
Clearance hole diameter	d_h	in.	3/8	1/2	5/8	3/4	7/8
Installation Torque	T_{inst}	ft-lbs	8	25	55	85	150
Nominal embedment	h_{nom}	in.	1-3/4	2 3-3/4	2 3-3/4	2 3-3/4	3-3/4 4-1/2
Effective embedment	h_{ef}	in.	1-1/2	1-3/4 3-1/2	1-3/4 3-1/2	1-3/4 3-1/2	3-1/2 4-1/4
Minimum hole depth	h_o	in.	2	2-1/2 4-1/4	2-1/2 4-1/4	2-1/2 4-1/4	4-1/4 5
Critical edge distance	-	in.	2	3-1/2 5-1/2	3-1/2 5-1/2	3-1/2 5-1/2	5-1/2 6-3/4
Minimum edge distance	-	in.	-	-	1-3/4	-	-
Critical anchor spacing	-	in.	3	4-1/2	6	7-1/2	9
Minimum anchor spacing	-	in.	1	1-1/2	2	2-1/2	3
Head height	-	in.	1/4	3/8	31/64	19/32	45/64
Washer OD	-	in.	1/2	3/4	1	1-5/32	1-3/8
Wrench socket size	-	in.	7/16	9/16	3/4	15/16	1-1/8

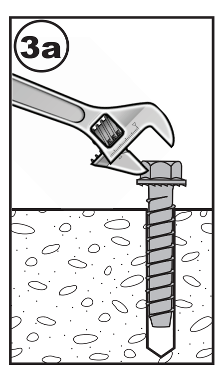
INSTALLATION INSTRUCTIONS



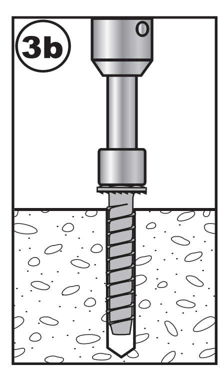
Drill hole to the proper diameter and depth



Blow out dust from the hole



Place anchor in drilled hole



Apply installation torque to set anchor

DESIGN DATA

Ultimate and Allowable Load Data

Anchor diameter	Drill bit diameter	Nominal embedment	Units	Allowable Load Data				Ultimate Load Data			
				3000 psi concrete		6000 psi concrete		3000 psi concrete		6000 psi concrete	
in.	in.	in.	Units	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
1/4	1/4	1-1/2	lbs	181	430	256	670	725	1719	1025	2680
			kN	0.81	1.91	1.14	2.98	3.22	7.65	4.56	11.92
1/4	1/4	2-1/2	lbs	610	430	863	670	2440	1719	3450	2680
			kN	2.71	1.91	3.84	2.98	10.85	7.65	15.35	11.92
3/8	3/8	2	lbs	916	892	1295	1742	3664	3567	5182	6967
			kN	4.07	3.97	5.76	7.75	16.30	15.87	23.05	30.99
3/8	3/8	3-1/2	lbs	2080	2050	2941	3007	8319	8199	11764	12030
			kN	9.25	9.12	13.08	13.38	37.00	36.47	52.33	53.51
1/2	1/2	2	lbs	853	1088	1206	1686	3411	4350	4824	6744
			kN	3.79	4.84	5.37	7.50	15.17	19.35	21.46	30
1/2	1/2	3-1/2	lbs	2190	2235	3097	3068	8759	8938	12387	12272
			kN	9.74	9.94	13.78	13.65	38.96	39.76	55.1	54.59
5/8	5/8	2	lbs	864	1164	1221	1643	3454	4657	4885	6573
			kN	3.84	5.18	5.43	7.31	15.37	20.72	21.73	29.24
5/8	5/8	3-1/2	lbs	2324	2389	3287	3168	9296	9557	13147	12670
			kN	10.34	10.63	14.62	14.09	41.35	42.51	58.48	56.36
3/4	3/4	2-1/2	lbs	1078	1569	1525	2254	4313	6276	6099	9015
			kN	4.80	6.98	6.78	10.03	19.18	27.92	27.13	40.1
3/4	3/4	4	lbs	2632	3167	3723	4729	10530	12667	14891	18918
			kN	11.71	14.09	16.56	21.04	46.84	56.35	66.24	84.15

Note: The data presented in this table is based on independent laboratory testing at critical anchor spacing and edge distance.

TORPEDO ANCHOR

PRODUCT ORDERING INFORMATION

Part number	Head style	Anchor size	Drill bit diameter	Wrench socket size	Minimum embedment	Box qty	Casse qty
UTB 14214	hex	1/4 x 2-1/4	1/4	7/16	1-1/4	100	800
UTB 143	hex	1/4 x 3	1/4	7/16	2-1/4	100	800
UTB 383	hex	3/8 x 3	3/8	9/16	2	50	400
UTB 384	hex	3/8 x 4	3/8	9/16	3-1/2	50	400
UTB 123	hex	1/2 x 3	1/2	3/4	2	50	150
UTB 124	hex	1/2 x 4	1/2	3/4	3-1/2	40	120
UTB 125	hex	1/2 x 5	1/2	3/4	3-1/2	30	90
UTB 583	hex	5/8 x 3	5/8	15/16	2	25	75
UTB 584	hex	5/8 x 4	5/8	15/16	3-1/2	25	75
UTB 585	hex	5/8 x 5	5/8	15/16	3-1/2	20	60
UTB 586	hex	5/8 x 6	5/8	15/16	3-1/2	20	60
UTB 344	hex	3/4 x 4	3/4	1-1/8	2	15	45
UTB 345	hex	3/4 x 5	3/4	1-1/8	3-1/2	15	45
UTB 346	hex	3/4 x 6	3/4	1-1/8	3-1/2	15	45

LOAD ADJUSTMENT FACTORS (ALLOWABLE STRESS DESIGN)

Anchor Spacing

Diameter	Critical spacing		Minimum Spacing		Reduction Factor	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	3"	3"	1"	1"	0.5	0.7
3/8	4-1/2"	4-1/2"	1-1/2"	1-1/2"		
1/2	6"	6"	2"	2"		
5/8	7-1/2"	7-1/2"	2-1/2"	2-1/2"		
3/4	9"	9"	3"	3"		

Edge Distance

Diameter	Critical Edge Distance		Minimum Edge Distance		Reduction Factor	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	1.5 x h_{ef}		0.8 x h_{ef}	1-3/4"	0.75	0.25
3/8						
1/2						
5/8						
3/4						

Note: Reduction factor at critical distances equals 1.0 for edge and spacing distances between critical and minimum distances, use linear interpolation. Reduction factors are cumulative.