

TO: _____

PROJECT: _____

PROJECT LOCATION: _____

SPECIFIED ITEM: _____

Section	Page	Paragraph	Description
---------	------	-----------	-------------

FOR USE BY THE ARCHITECT AND/OR ENGINEER

☐ **Approved** ☐ **Approved as Needed** ☐ **Not Approved**

(If not approved, please briefly explain why the product was not accepted.)

By: _____ Date: _____

Remarks: _____

SUBMITTED BY:

Name: _____ Signature: _____

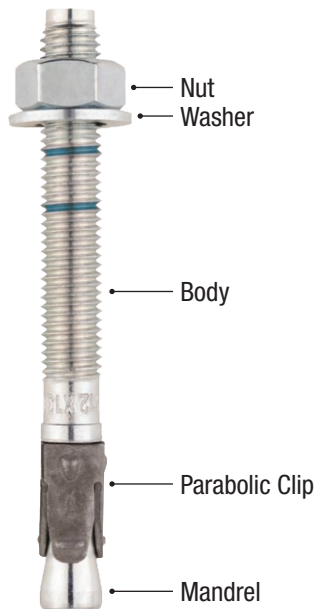
Company: _____

Address: _____

Date: _____ Telephone: _____ Fax: _____

PRODUCT SUBMITTAL / SUBSTITUTION REQUESTED:

The attached submittal package includes the product description, specifications, drawings, and performance data for use in the evaluation of the request.



Fastenal's WA++ Wedge Anchor stud is cold formed and consists of a threaded section with standard coarse bolt threads at one end and a taper shaped mandrel at the opposite end for a smoother expansion. It has a 360° three wing clip for more contact, a torque controlled expansion and can be installed into a bottomless hole.

Anchor bodies are made of carbon steel. The length code on the bolt head identifies the length of the anchor. Use a carbide tipped drill bit made in accordance with ANSI B212.15(-1994) to install anchors. Anchors are listed by the following agencies as required by the building codes: ICC-ES, FM, UL, Los Angeles Building & Residential Code, California Building & Residential Code, International Building & Residential Code (IBC) (IRC), Florida Building & Residential Code

APPROVALS

WA++ WEDGE ANCHOR Seismic, cracked & uncracked concrete rated / approved (ICC-ES)

ICC Evaluation Service Inc. #ESR-4385

- All diameters are Category 1
- Meets ACI 318-14 ductility requirements
- Tested in accordance with ACI 355.2 and ICC-ES AC193
- Sizes 3/8", 1/2", 5/8" and 3/4" are used in uncracked and cracked concrete applications (Seismic Design Categories A through F)
- 2015, 2012, 2009 and 2006 IBC and IRC compliant
- 2017 Los Angeles Building & Residential Code
- 2016 California Building & Residential Code
- 2017 Florida Building & Residential Code

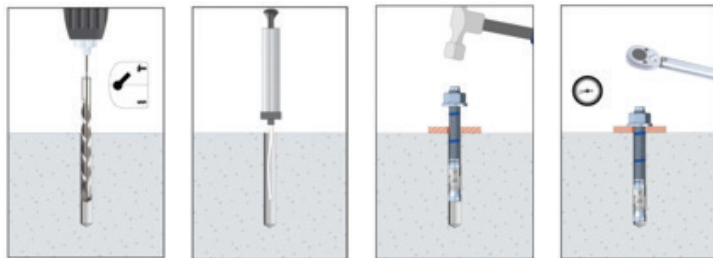
FM approvals

Underwriters Laboratories (UL)



INSTALLATION INSTRUCTIONS

*ONLY FOR USE IN CONCRETE



1. DRILL

Drill a hole into the base material of the correct diameter and depth using a drill bit that meets the requirements of ANSI B212.15

2. BLOW AND CLEAR

Remove dust and debris from hole using a hand pump, compressed air or a vacuum to remove loose particles left from drilling.

3. INSTALL

Position the washer on the anchor and thread on the nut. If installing through a fixture drive the anchor through the fixture into the hole. Be sure the anchor is driven until the corresponding green marked is levelled with the base material surface.

Use a hammer if necessary.

4. APPLY TORQUE

Tighten the anchor with a torque wrench by applying the required installation torque, Tins. Note: the threaded stud will draw up during tightening of the nut; the expansion wedge (clip) remains in the original position.

Once installed, the total length of the anchor may be checked using the letter on the head.

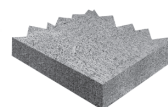
FEATURES

- Roll Formed Thread
- Full Thread Design
- Chamfered Head (dog point)
- Body Steel Grade: ANSI 1035
- Nut ASME B18.2.2
- Washer ASME B18.21.1
- Diameter Code
- Length Identification
- Triple Expansion Clip
- Taper Shapes Mandrel
- Comes assembled with nut & washer

TOOLS REQUIRED



MATERIALS



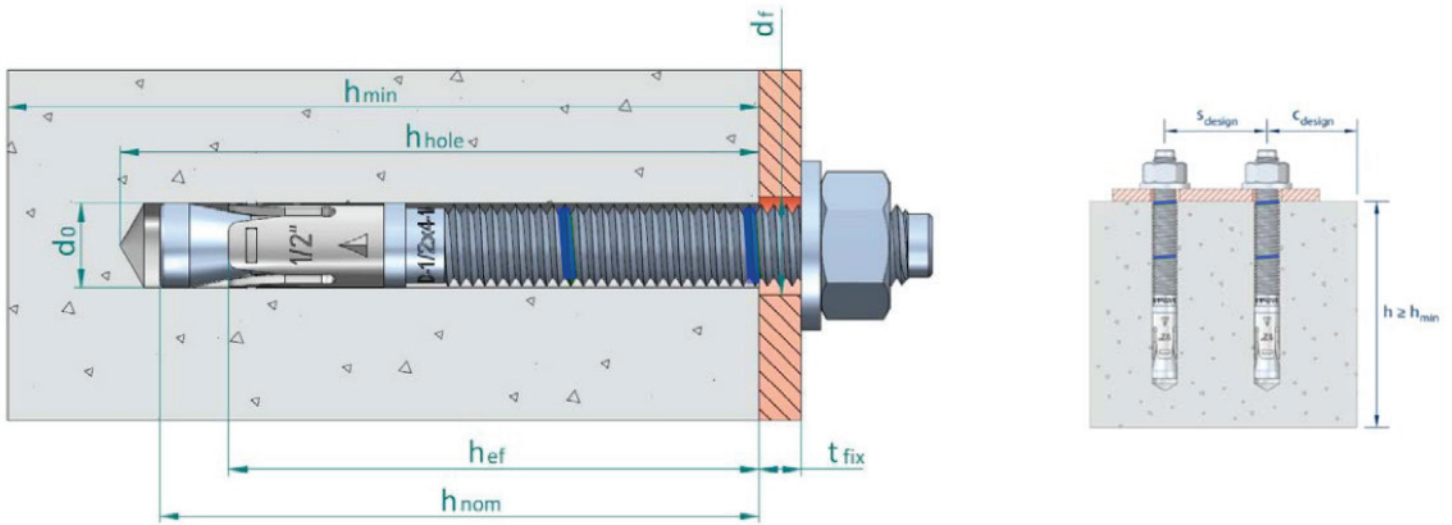


TABLE 1 - WA++ WEDGE ANCHOR DESIGN AND INSTALLATION INFORMATION

Characteristic	Symbol	Unit	Nominal Anchor Diameter						
			3/8"	1/2"		5/8"		3/4"	
Outside diameter	d_o	in (mm)	3/8 (9.5)	1/2 (12.7)	1/2 (12.7)	5/8 (15.9)	5/8 (15.9)	3/4 (19.1)	3/4 (19.1)
Nominal Embedment Depth	h_{nom}	in (mm)	2.33 (59)	2.33 (59)	3.59 (91)	3.23 (82)	4.49 (114)	3.74 (95)	5.26 (134)
Effective Embedment Depth	h_{ef}	in (mm)	2 (51)	2 (51)	3-1/4 (83)	2-3/4 (70)	4 (102)	3-1/4 (83)	4-3/4 (121)
Minimum Hole Depth	h_{hole}	in (mm)	2-5/8 (67)	2-5/8 (67)	4 (102)	3-1/2 (89)	4-3/4 (121)	4 (102)	5-3/4 (146)
Clearance Hole Diameter	d_f	in (mm)	7/18 (11.1)	9/18 (14.3)		11/18 (17.5)		7/8 (22.2)	
Recommended Installation Torque	$T_{inst,max}$	ft. lb (Nm)	30 (41)	45 (61)	45 (61)	75 (102)	75 (102)	150 (203)	150 (203)
Minimum Concrete Thickness	$T_{impact,max}$	in (mm)	4 (102)	4 (102)	6 (152)	5-1/2 (140)	6-1/2 (165)	6 (152)	8 (203)
Critical Edge Distance	c_{ac}	in (mm)	6 (152)	6 (152)	7-1/2 (191)	7 (178)	8-1/2 (216)	9 (229)	12 (305)
Minimum Edge Distance (C_{min}) for Edge Spacing ($s \geq$)	c_{min}	in (mm)	2-1/2 (64)	3 (76)	2-1/2 (64)	3-1/2 (89)	3-1/2 (89)	5 (157)	4-1/2 (114)
		in (mm)	6-1/2 (165)	6 (152)	6 (152)	8 (203)	6 (152)	10-1/2 (267)	9-1/2 (241)
Minimum Spacing (S_{min}) for Edge Distance ($c \geq$)	s_{min}	in (mm)	2-1/2 (64)	2-3/4 (70)	2-1/2 (64)	4-1/2 (114)	4 (102)	5 (157)	4 (102)
		in (mm)	4 (102)	6 (152)	4 (102)	6 (152)	5 (127)	10-1/2 (267)	8-1/2 (216)
Minimum Overall Anchor Length	l_{anch}	in (mm)	3 (76)	3-1/4 (89)	4-1/4 (114)	4-1/4 (108)	5-3/4 (140)	5 (127)	6-1/2 (165)
Torque Wrench Socket Size	-	in	9/16	3/4		15/16		1-1/8	

TABLE 2 - LENGHT IDENTIFICATION CODE

Length ID marking on threaded stud head		A	B	C	D	E	F	G	H	I	J	K
Overall anchor length (in.)	From	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2
	Up to, but not including	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7

TABLE 3 - PERFORMANCE TABLE ^{1,2}

ANCHOR PARAMETERS					SAFE WORKING LOAD IN UNCRACKED CONCRETE					
					Concrete 3.000 psi		Concrete 4.000 psi		Concrete 6.000 psi	
Drill size	Installation torque ft.lb	Nominal embedment	Thread length	Installation torque ft.lb	Tension lbf	Shear lbf	Tension lbf	Shear lbf	Tension lbf	Shear lbf
1/4	5	1,19	0,59	5	399	428	438	428	498	428
1/4	5	1,69	1,00	5	733	428	804	428	915	428
1/4	5	1,69	2,00	5	733	428	804	428	915	428
3/8	30	1,58	0,59	30	773	869	863	1,003	1,006	1,256
3/8	30	2,08	1,10	30	1,281	1,256	1,429	1,256	1,667	1,256
3/8	30	2,33	1,50	30	1,565	1,256	1,746	1,256	2,037	1,256
3/8	30	2,33	2,25	30	1,565	1,256	1,746	1,256	2,037	1,256
3/8	30	2,33	3,50	30	1,565	1,256	1,746	1,256	2,037	1,256
1/2	45	1,83	0,91	45	1,040	1,142	1,163	1,319	1,362	1,615
1/2	45	2,33	1,93	45	1,600	1,759	1,790	2,031	2,097	2,117
1/2	45	2,33	2,40	45	1,600	1,759	1,790	2,031	2,097	2,117
1/2	45	2,33	3,66	45	1,600	1,759	1,790	2,031	2,097	2,117
1/2	45	2,33	5,16	45	1,600	1,759	1,790	2,031	2,097	2,117
5/8	75	2,48	1,38	75	1,633	1,759	1,886	2,031	2,309	2,487
5/8	75	3,23	2,36	75	2,633	3,970	3,040	3,970	3,723	3,970
5/8	75	3,23	2,87	75	2,633	3,970	3,040	3,970	3,723	3,970
5/8	75	3,23	3,88	75	2,633	3,970	3,040	3,970	3,723	3,970
5/8	75	3,23	4,88	75	2,633	3,970	3,040	3,970	3,723	3,970
3/4	150	3,24	1,89	150	2,633	5,402	3,040	5,402	3,723	5,402
3/4	150	3,74	2,40	150	3,805	5,402	4,394	5,402	5,382	5,402
3/4	150	3,74	3,15	150	3,805	5,402	4,394	5,402	5,382	5,402
3/4	150	3,74	3,90	150	3,805	5,402	4,394	5,402	5,382	5,402
3/4	150	3,74	4,65	150	3,805	5,402	4,394	5,402	5,382	5,402

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14, section 17 using a conversion factor of $a = 1.48$. The conversion factor a is based on the load combination $1.2D + 1.6L$ assuming 30% dead load and 70% live load: $1.2(0.3) + 1.6(0.7) = 1.48$.

2. Tabulated values are for a single anchor with no influence of another anchor and far away from edges.

TABLE 4 - TENSION DESIGN INFORMATION FOR WA++ WEDGE ANCHOR 1,2,3,4,5

Characteristic	Symbol	Unit	Nominal Anchor Diameter						
			3/8"	1/2"		5/8"		3/4"	
Outside Diameter	d_o^2	in (mm)	3/8 (9.5)	1/2 (12.7)	1/2 (12.7)	5/8 (15.9)	5/8 (15.9)	3/4 (19.1)	3/4 (19.1)
Nominal Embedment Depth	h_{nom}	in (mm)	2.33 (59)	2.33 (59)	3.59 (91)	3.23 (82)	4.49 (114)	3.74 (95)	5.26 (134)
Effective Embedment Depth	h_{ef}	in (mm)	2 (51)	2 (51)	3.25 (83)	2.75 (70)	4 (102)	3.25 (83)	4.75 (121)
Effective Steel Stress Area (Threads)	A_{se}^2	in2 (mm2)	0.077 (49.7)	0.141 (91)	0.141 (91)	0.2326 (145.8)	0.2326 (145.8)	0.334 (215.5)	0.334 (215.5)
Effective Steel Stress Area (Neck)	A_{se}^2	in2 (mm2)	0.0562 (36.3)	0.100 (64.5)	0.100 (64.5)	0.160 (103.2)	0.160 (103.2)	0.238 (153.5)	0.238 (153.5)
Steel Strength in Tension									
Minimum Specified Yield Strength (Threads)	f_y	psi (N/mm2)	69,500 (480)						
Minimum Specified Yield Strength (Neck)	f_y	psi (N/mm2)	85,000 (585)			81,000 (560)		77,000 (530)	
Minimum Specified Ultimate Strength	f_{ut}	psi (N/mm2)	87,000 (600)						
Steel Strength in Tension	N_{sa}	lb (kN)	6,125 (27.2)	10,600 (47.2)	10,600 (47.2)	16,240 (72.2)	16,240 (72.2)	22,730 (101.1)	22,730 (101.1)
Strength Reduction Factor for Steel Failure in Tension	$\emptyset_{sa}$	-	0.75						
Pullout Strength in Tension									
Pullout Strength in Uncracked Concrete	$N_{p,uncr}$	lb (kN)	3,325 (14.79)	3,394 (15.1)	5,723 (25.46)	-	-	-	-
Pullout Strength in Cracked Concrete	$N_{p,cr}$	lb (kN)	2,163 (9.62)	-	4,252 (18.91)	-	-	-	-
Pullout Strength in Cracked Concrete, Seismic	N_{eq}	lb (kN)	2,115 (9.41)	-	4,252 (18.91)	-	-	-	-
Anchor Category	1, 2 or 3	-	1	1	1	1	1	1	1
Strength Reduction Factor for Pullout Strength in Tension	$\emptyset_p$	-	0.65						
Concrete Breakout Strength in Tension									
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
Strength Reduction Factor for Concrete Breakout Strength in Tension	$\emptyset_{cb}$	-	0.65						
Axial stiffness in service load range in uncracked concrete	β_{uncr}	lb/inch	169,540	296,770	129,020	134,210	88,970	165,900	138,430
		(N/mm)	(29,690)	(51,972)	(22,594)	(23,503)	(15,580)	(29,053)	(24,242)
Axial stiffness in service load range in cracked concrete	β_{cr}	lb/inch	74,240	76,285	52,680	48,940	61,430	75,610	90,400
		(N/mm)	(13,001)	(13,359)	(9,225)	(8,570)	(10,758)	(13,241)	(15,830)
Normalization Exponent, Uncracked Concrete	n	-	0.38	0.39	0.50	0.50	0.50	0.50	0.50
Normalization Exponent, Cracked Concrete	n	-	0.50	0.50	0.46	0.50	0.50	0.50	0.50

1. The tabulated data is to be used in conjunction with the design criteria given in ACI 318-14 Chapter 17 or ACI 318-11 Appendix D.

2. For the 2006 IBC: do replaces d_a and A_{se} , N replaces A_{se} .

3. The tabulated values of ϕ_{sa} are applicable when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318-11 D.4.4.

4. The tabulated values of ϕ_{sa} are applicable when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c), as applicable, for Condition B are met. Condition B applies where supplementary reinforcement is not supplied.

5. Where no value is reported for pullout strength, this resistance does not need to be considered.

TABLE 5 - SHEAR DESIGN INFORMATION FOR WA++ WEDGE ANCHOR 1,2,3,4

Characteristic	Symbol	Unit	Nominal Anchor Diameter						
			3/8"	1/2"		5/8"		3/4"	
Outside Diameter	d_o^2	in (mm)	3/8 (9.5)	1/2 (12.7)	1/2 (12.7)	5/8 (15.9)	5/8 (15.9)	3/4 (19.1)	3/4 (19.1)
Nominal Embedment Depth	h_{nom}	in (mm)	2.33 (59)	2.33 (59)	3.59 (91)	3.23 (82)	4.49 (114)	3.74 (95)	5.26 (134)
Effective Embedment Depth	h_{ef}	in (mm)	2 (51)	2 (51)	3.25 (83)	2.75 (7)	4 (102)	3.25 (83)	4.75 (121)
Effective Steel Stress Area (Threads)	A_{se}^2	in ² (mm ²)	0.077 (49.7)	0.141 (91)	0.141 (91)	0.226 (145.8)	0.226 (145.8)	0.334 (215.5)	0.334 (215.5)
Steel Strength in Shear									
Minimum Specified Yield Strength (Threads)	f_y	psi (N/mm2)	69,500 (48)						
Minimum Specified Ultimate Strength	f_y	psi (N/mm2)	87,000 (60)						
Steel Strength in Shear	V_{sa}	lb (kN)	2,860 (12.7)	4,820 (21.4)	4,820 (21.4)	9,040 (40.2)	9,040 (40.2)	12,300 (54.7)	14,280 (63.5)
Steel Strength in Shear, Seismic	$V_{ss,eq}$	lb (kN)	2,720 (12.1)	4,045 (17.9)	4,045 (17.9)	7,700 (34.2)	7,700 (34.2)	8,870 (39.4)	8,870 (39.4)
Strength Reduction Factor for Steel Failure in Shear	ϕ_{sa}	-	0.65						
Concrete Breakout Strength in Shear									
Nominal Diameter	d_o^2	in	3/8	1/2	1/2	5/8	5/8	3/4	3/4
		(mm)	(9.5)	(12.7)	(12.7)	(15.9)	(15.9)	(19.1)	(19.1)
Load Bearing Length of Anchor	l_e	in	2	2	3.25	2.75	4	3.25	4.75
		(mm)	(51)	(51)	(83)	(7)	(102)	(83)	(121)
Reduction Factor for Concrete Breakout Strength in Shear	ϕ_{cb}	-	0.70						
Concrete Pryout Strength in Shear									
Coefficient for Pryout Strength	k_{cp}	-	1	1	2	2	2	2	2
Reduction Factor for Pryout Strength in Shear	ϕ_{ch}	-	0.70						

1. The tabulated data is to be used in conjunction with the design criteria given in ACI 318-14 Chapter 17 or ACI 318-11 Appendix D.

2. For the 2006 IBC: d_o replaces d_o and $A_{se,N}$ replaces A_{se} .

3. The tabulated values of ϕ_{sa} are applicable when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318-11 D.4.4.

4. The tabulated values of ϕ_{sa} are applicable when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c), as applicable, for Condition B are met. Condition B applies where supplementary reinforcement is not supplied.

TABLE 6 - WA++ WEDGE ANCHOR SPACING INFORMATION ^{1,2,3}

Size	Embedment depth [in]	Minimum concrete member [in]	Minimum edge distance [in]	Spacing = critical spacing		Spacing = minimum spacing		Spacing = critical spacing		Spacing = minimum spacing	
				Critical spacing [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]	Minimum spacing [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]	Critical spacing [in]	Allowable tension load in 3,000 psi cracked concrete [lbf]	Minimum spacing [in]	Allowable tension load in 3,000 psi cracked concrete [lbf]
1/4	1.68	4	2-3/4	4-1/2	733	2-1/4	550	---	---	---	---
3/8	2.33	4	6	6	1,565	2-1/2	1,108	6	1,041	2-1/2	737
1/2	2.33	4	6	6	1,600	2-3/4	1,167	6	1,157	2-3/4	843
5/8	3.23	5-1/2	7	8-1/4	2,633	4-1/2	2,034	8-1/4	2,304	4-1/2	1,780
3/4	3.74	6	10-1/2	9-3/4	3,805	5	2,878	9-3/4	2,960	5	2,240

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14, section 17 using a conversion factor of $a = 1.48$. The conversion factor a is based on the load combination $1.2D + 1.6L$ assuming 30% dead load and 70% live load: $1.2(0.3) + 1.6(0.7) = 1.48$.
2. Tabulated values are for each anchor of anchor pairs with distance to edge longer than "Minimum edge distance" value shown in table.
3. Interpolation between spacings is not allowed

TABLE 7 - WA++ WEDGE ANCHOR EDGE DISTANCE INFORMATION ^{1,2,3}

Size	Embedment depth [in]	Minimum thickness of concrete member [in]	Minimum spacing [in]	Edge distance = critical edge distance		Edge distance = minimum edge distance		Edge distance = critical edge distance		Edge distance = minimum edge distance	
				Edge distance [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]	Minimum edge distance [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]	Edge distance [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]	Minimum edge distance [in]	Allowable tension load in 3,000 psi uncracked concrete [lbf]
1/4	1.68	4	4-1/2	2-3/4	733	1-3/4	335	---	---	---	---
3/8	2.33	4	6-1/2	6	1,565	2-1/2	477	6	1,041	2-1/2	317
1/2	2.33	4	6	6	1,600	3	581	6	1,157	3	420
5/8	3.23	5-1/2	8-1/4	7	2,633	3-1/2	983	7	2,304	3/12	860
3/4	3.74	6	10-1/2	9	3,805	5	1543	9	2,960	5	1,091

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14, section 17 using a conversion factor of $a = 1.48$. The conversion factor a is based on the load combination $1.2D + 1.6L$ assuming 30% dead load and 70% live load: $1.2(0.3) + 1.6(0.7) = 1.48$.
2. Tabulated values are each anchor of anchor pairs with spacing longer than "Minimum spacing" value shown in table.
3. Interpolation between spacings is not allowed
4. Shear load is assumed to be applied towards the edge of the concrete member

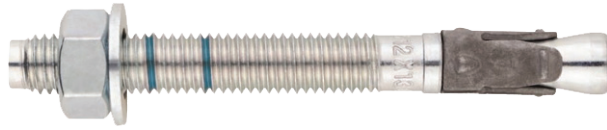


TABLE 8 - SELECTION CHART

ORDER INFORMATION			ANCHOR PARAMETERS			
Product number	Size	Quantity	Drill size	Installation torque ft.lb	Nominal embedment	Thread length
11562820A	1/4 x1-3/4	100	1/4	5	1,19	0.59
11562821A	1/4x2-1/4	100	1/4	5	1,69	0.98
11562822A	1/4x3-1/4	100	1/4	5	1,69	2.01
11562823A	3/8x2-1/4	50	3/8	30	1,58	0.59
11562824A	3/8x2-3/4	50	3/8	30	2,08	1.10
11562825A	3/8x3	50	3/8	30	2,33	1.50
11562826A	3/8x3-3/4	50	3/8	30	2,33	2.24
11562827A	3/8x5	50	3/8	30	2,33	3.50
11562828A	1/2x2-3/4	50	1/2	45	1,83	0.91
11562829A	1/2x3-3/4	50	1/2	45	2,33	1.93
11562830A	1/2x4-1/4	50	1/2	45	2,33	2.40
11562831A	1/2x5-1/2	25	1/2	45	2,33	3.66
11562832A	1/2x7-00	25	1/2	45	2,33	5.16
11562833A	5/8x3-1/2	20	5/8	75	2,48	1.38
11562834A	5/8x4-1/2	20	5/8	75	3,23	2.36
11562835A	5/8x5	20	5/8	75	3,23	2.87
11562836A	5/8x6	20	5/8	75	3,23	3.88
11562837A	5/8x7	20	5/8	75	3,23	4.88
11562839A	3/4x4-1/4	10	3/4	150	3,24	1.89
11562840A	3/4x4-3/4	10	3/4	150	3,74	2.40
11562841A	3/4x5-1/2	10	3/4	150	3,74	3.15
11562842A	3/4x6-1/4	10	3/4	150	3,74	3.90
11562843A	3/4x7	10	3/4	150	3,74	4.65