

Edition 24A

# ANCHOR SELECTION GUIDE

**FOR ALL THINGS FASTENING.**
































**AFOS<sup>®</sup>**

Anchor Design Software

# ANCHOR LOOKUP

- Compliant/Approved
- Suitable

	EXPANSION		SCREW				CHEMICAL	
	 <b>ETB-S2</b> Wedge Anchor 304 Stainless Steel	 <b>ETB-Z</b> Wedge Anchor Zinc	 <b>AFR</b> Rod Hanger For Concrete	 <b>XCS-F</b> Flat Masonry Screw Blue Ruspert	 <b>XCS-H</b> Hex Masonry Screw Blue Ruspert	 <b>SAH-Z</b> Hex Head Concrete Screw Anchor Zinc	 <b>EF600</b> High Performance Structural Pure Epoxy	 <b>VF200PRO</b> Fast Cure Anchoring Adhesive Injection
 <b>Un cracked Concrete</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 <b>Cracked Concrete</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 <b>ICC-ESR Evaluated</b>	 ICC ESR-4346	 ICC ESR-4346	 ICC ESR-5217	 ICC ESR-5175	 ICC ESR-5175	 ICC ESR-5217	 ICC ESR-4732	 ICC ESR-4632
 <b>Seismic Design A-F</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 <b>Zinc Plated</b>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
 <b>Galvanized</b>								
 <b>Stainless Steel</b>	<input checked="" type="checkbox"/>							
 <b>Close to Edge</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 <b>Overhead</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
 <b>Removable</b>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
 <b>Diamond Core Drill</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
 <b>Hammer Drill</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 <b>Flooded / Damp Hole</b>	<input type="checkbox"/>	<input type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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# Anchor Selection Guide

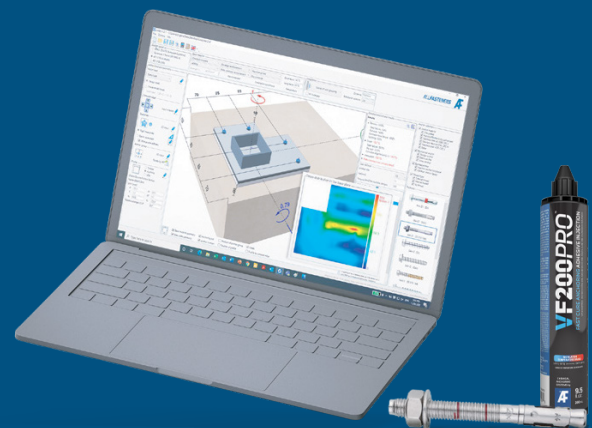
The purpose of this publication is to help the design engineer or the builder to find the right anchor type, length and part number.

## AFOS® Anchor Design Software

All anchors included in this publication can be designed with AFOS. The design capacity values given in this guide do not consider all connection details such as anchor spacings, edge distances, packing thickness, and so forth. Therefore, unless it is a very simple single anchor design, for accurate design of connections it is necessary to use AFOS software.

Anchor design software helps you select the correct anchor option for your connection design.

Allfasteners AFOS anchor design software is complimentary and is available to download here: [allfasteners.com/afos](http://allfasteners.com/afos)



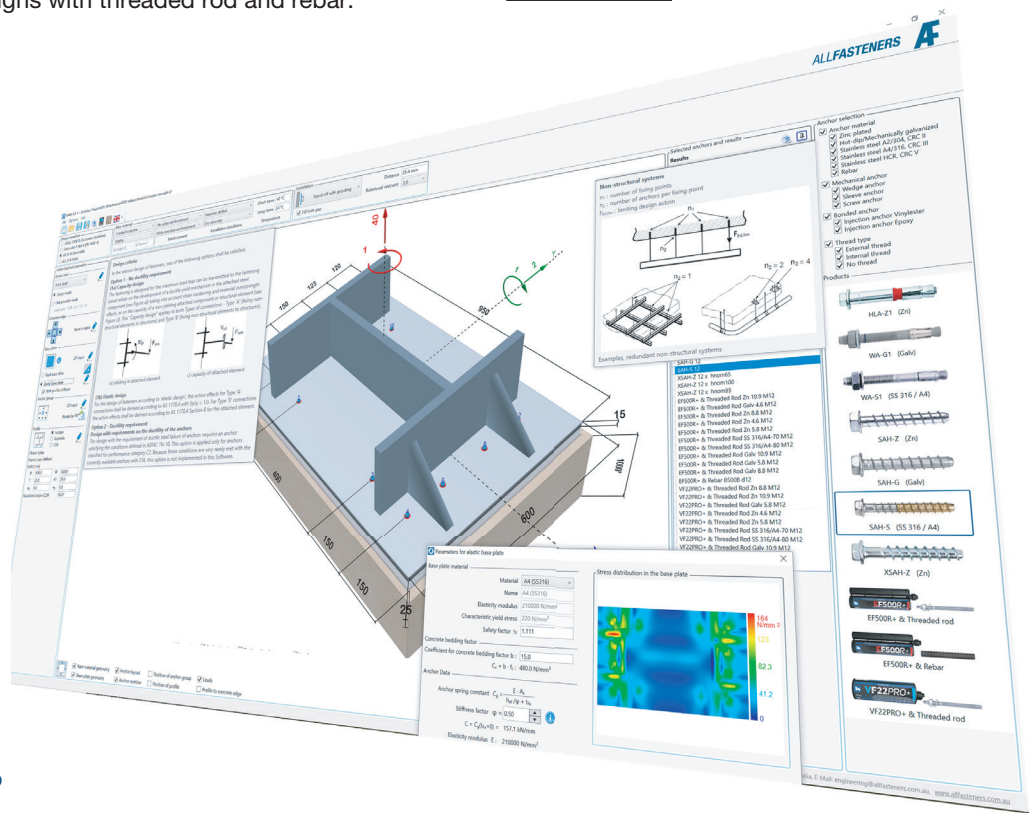
[DOWNLOAD allfasteners.com/afos](http://allfasteners.com/afos)



# AFOS® Anchor Design Software

AFOS is a very powerful, yet simple-to-use anchor design software. It has been developed to be compliant with **ACI 318 Chapter 17**.

- Easy to use and intuitive interface allows for quick design changes to run different scenarios such sizes, embedment depths, edge distances, installation conditions and more.
- All inputs and results are visible on the same screen, so there is no need to toggle back and forth between multiple tabs or screens.
- Run multiple anchor options at the same time.
- 3D model rendering creates better project visualization.
- Select standard patterns or enter customized anchor layouts.
- Choose from the library of profile shapes, or enter specific parameters.
- Use rigid analysis or the Finite Element Analysis option to optimize the design of elastic base plates with prying loads considered.
- Includes ability to select seismic design considerations.
- Contains the option to generate detailed or summary calculation reports.
- Produce post-installed anchor designs with threaded rod and rebar.



**AFOS®**  
Anchor Design Software

[DOWNLOAD](#) [allfasteners.com/afos](http://allfasteners.com/afos)

## AFOS®: FAQs

### Q: Are all anchors in AFOS building code compliant?

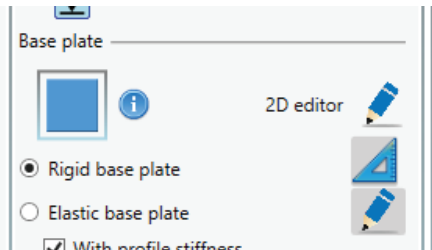
Yes, all anchors available for selection in the AFOS software have an Evaluation Report from ICC Evaluation Services showing they meet the requirement for use in anchoring to concrete. Allfasteners supplies a large number of other anchors that may not require an ICC-ESR. Please refer to our website for more information.

### Q: I can't find a compliant anchor I need in AFOS?

Allfasteners also supplies other special order anchors for more unique applications, please contact us for further assistance.

### Q: Why is AFOS running slow?

AFOS runs the calculations automatically after any modification of design inputs by the user. When in "Rigid base plate" design mode, this happens instantly. When in "Elastic base plate" mode, FEA takes a few moments to run, especially if in "Multiple design" mode. Please create and modify the model while in "Rigid base plate" mode, then switch to "Elastic base plate" for final calculations and fine tuning of the design. Design with elastic base plate is optional and at the discretion of the user.



### Q: What is the difference between $h_{nom}$ & $h_{ef}$ ?

$h_{nom}$  is the physical embedment depth to the bottom of the fixing that the builder should install the anchor to.

$h_{ef}$  is the effective depth of the anchor that is used in calculating the concrete cone size engaged by the fixing.

$h_{ef}$  is smaller than  $h_{nom}$ . For chemical anchors  $h_{ef}=h_{nom}$ .

Diagrams for each anchor in this publication illustrate both.

### Q: How do I specify an anchor?

If the grout/standoff thickness or the total fixture thickness is not known during design, then specifying the anchor length or part number may not be appropriate. It will be determined by the builder during construction.

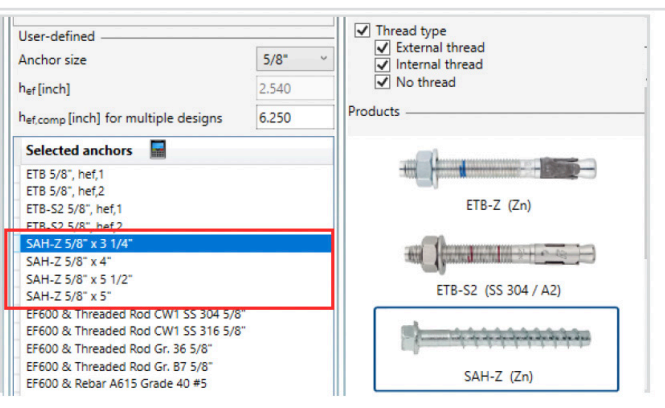
However, the total fixture thickness (grout/standoff + base plate) has an impact on anchor shear capacity, and mechanical anchors have limited length. Therefore, the designer should specify the maximum grout/standoff thickness or the maximum total fixture thickness if applicable.

### Q: Is AFOS training available?

Yes, contact your Allfasteners representative to set up a training session for your team to go over the inputs and outputs of the program or reach out to us on the website to schedule.

## Pro Tip: Embedment Options

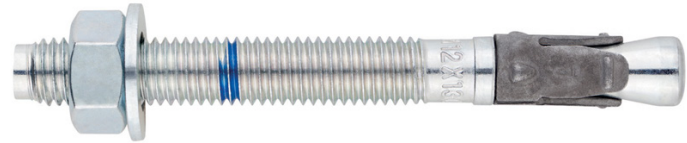
Select an anchor on the right of screen by clicking on the image. Then an embedment option will be highlighted. Check various embedment options (if available) as these may have different minimum edge distance and spacing limitations.





## ETB-S2

### Wedge Expansion Anchor 304 Stainless Steel



## APPLICATIONS & USES

- Heavy duty applications
- Solid concrete (normal-weight and light-weight)
- Grout-filled concrete block
- Concrete-filled metal deck
- Structural anchorage
- Machinery, hand rail, dock bumper installation
- Storage racking anchorage
- Fastening sheet metal, steel and aluminum angles, or wood to concrete

## APPROVALS & CERTIFICATIONS

- ICC-ESR 4346 Evaluation
- 2021, 2018, 2015, 2012, 2009 & 2006 International Building Code (IBC)
- 2021, 2018, 2015, 2012, 2009 & 2006 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-4346
- Supported by AFOS anchor design software

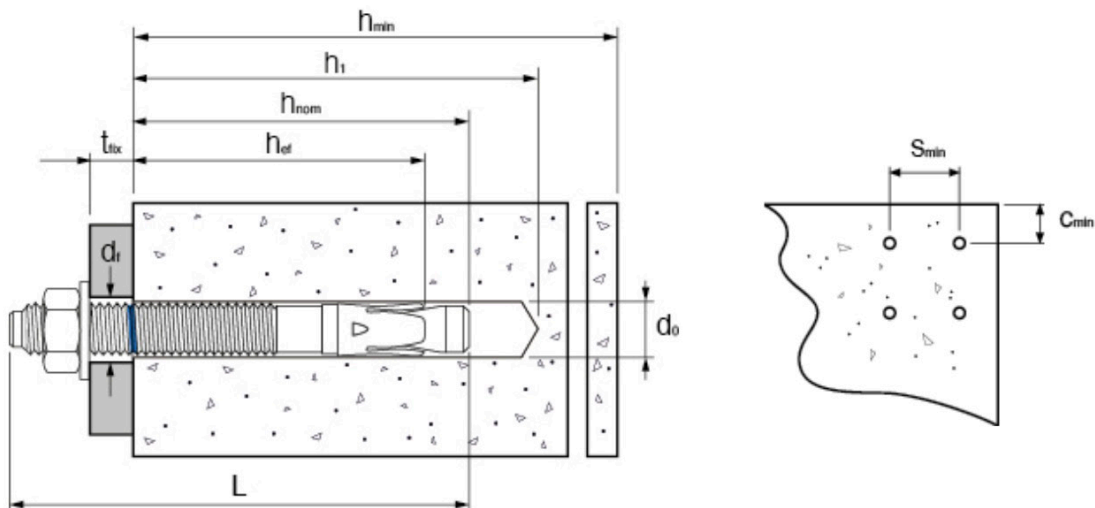
## Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Eff. Embedment Depth $h_{ef}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o \times h_t$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1ETBS238334	3/8 x 3-3/4"	9/16"	2"	2.33"	3/8 x 2-5/8"	4"	1535 lbs.	1680 lbs.
1ETBS238500	3/8 x 5"	1-3/4"	2"	2.33"	3/8 x 2-5/8"	4"	1535 lbs.	1680 lbs.
1ETBS212412	1/2 x 4 1/2"	1"	2"	2.33"	1/2 x 2-5/8"	4"	1376 lbs.	1680 lbs.
1ETBS212512	1/2 x 5-1/2"	2"	2"	2.33"	1/2 x 2-5/8"	4"	1376 lbs.	1680 lbs.
		3/4"	3-1/4"	3.59"	1/2 x 4"	6"	3227 lbs.	4746 lbs.
1ETBS212700	1/2 x 7"	3-1/2"	2"	2.33"	1/2 x 2-5/8"	4"	1376 lbs.	1680 lbs.
		2-1/4"	3-1/4"	3.59"	1/2 x 4"	6"	3227 lbs.	4746 lbs.
1ETBS212812	1/2 x 8 1/2"	5"	2"	2.33"	1/2 x 2-5/8"	4"	1376 lbs.	1680 lbs.
		3-3/4"	3-1/4"	3.59"	1/2 x 4"	6"	3227 lbs.	4746 lbs.
1ETBS258500	5/8 x 5"	3/8"	2-3/4"	3.23"	5/8 x 3-1/2"	5-1/2"	2513 lbs.	5414 lbs.
1ETBS234512	3/4 x 5 1/2"	1/8"	3-1/4"	3.74"	3/4 x 4"	6"	3999 lbs.	8614 lbs.
1ETBS234614	3/4 x 6 1/4"	7/8"	4-3/4"	5.26"	3/4 x 5-3/4"	8"	5710 lbs.	9623 lbs.

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.

## Installation Parameters

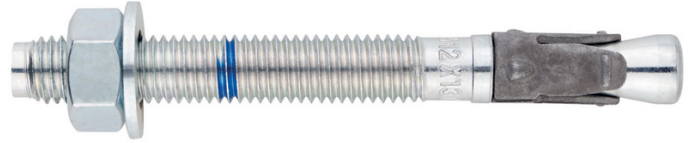
Anchor Size			1/4"	3/8"	1/2"	5/8"	3/4"			
Nominal Diameter of Drill Bit, $d_o$	$d_o$	in.	1/4	3/8	1/2	5/8	3/4			
Fixture Clearance Hole Diameter, $d_f$	$d_f$	in.	5/16	7/16	9/16	11/16	7/8			
Recommended Installation Torque, $T_{inst}$	$T_{inst}$	ft.lb.	5	20	45	80	150			
Minimum Thickness of Concrete Member	$h_{min}$	in.	4	4	4	6	5-1/2	6-1/2	6	8
Minimum Hole Depth	$h_1$	in.	2	2-5/8	2-5/8	4	3-1/2	4-3/4	4	5-3/4
Overall Anchor Embedment Depth in the Concrete	$h_{nom}$	in.	1.68	2.33	2.33	3.59	3.23	4.49	3.74	5.26
Minimum Spacing, $S_{min}$ , for Edge Distance $C \geq$	$s_{min}$	in.	2-1/4	2-1/2	2-3/4	2-1/2	4-1/2	4	5	4
	$c \geq$	in.	1-3/4	4	6	4	6	5	10-1/2	8-1/2
Minimum Edge Distance, $C_{min}$ , for Spacing $S \geq$	$c_{min}$	in.	1-3/4	2-1/2	3	2-1/2	3-1/2	3-1/2	5	4-1/2
	$s \geq$	in.	2-1/4	6-1/2	6	6	8	6	10-1/2	9-1/2





# ETB-Z

## Wedge Expansion Anchor Zinc



### APPLICATIONS & USES

- Heavy duty applications
- Solid concrete (normal-weight and light-weight)
- Grout-filled concrete block
- Concrete-filled metal deck
- Structural anchorage
- Machinery, hand rail, dock bumper installation
- Storage racking anchorage
- Fastening sheet metal, steel and aluminum angles, or wood to concrete

### APPROVALS & CERTIFICATIONS

- ICC-ESR 4346 Evaluation
- 2021, 2018, 2015, 2012, 2009 & 2006 International Building Code (IBC)
- 2021, 2018, 2015, 2012, 2009 & 2006 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-4346
- Supported by AFOS anchor design software

### Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Eff. Embedment Depth $h_{ef}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o \times h_t$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1ETB38312	3/8 x 3-1/2"	5/16"	2"	2.33"	3/8 x 2-5/8"	4"	1406 lbs.	1680 lbs.
1ETB38334	3/8 x 3-3/4"	9/16"	2"	2.33"	3/8 x 2-5/8"	4"	1406 lbs.	1680 lbs.
1ETB38500	3/8 x 5"	1-3/4"	2"	2.33"	3/8 x 2-5/8"	4"	1406 lbs.	1680 lbs.
1ETB12334	1/2 x 3-3/4"	5/16"	2"	2.33"	1/2 x 2-5/8"	4"	1562 lbs.	1680 lbs.
1ETB12412	1/2 x 4-1/2"	1"	2"	2.33"	1/2 x 2-5/8"	4"	1562 lbs.	1680 lbs.
1ETB12512	1/2 x 5-1/2"	2"	2"	2.33"	1/2 x 2-5/8"	4"	1562 lbs.	1680 lbs.
	1/2 x 5-1/2"	3/4"	3 1/4"	3.59"	1/2 x 4"	6"	2764 lbs.	2652 lbs.
1ETB12700	1/2 x 7"	3-1/2"	2"	2.33"	1/2 x 2-5/8"	4"	1562 lbs.	1680 lbs.
	1/2 x 7"	2-5/16"	3 1/4"	3.59"	1/2 x 4"	6"	2764 lbs.	3131 lbs.
1ETB58500	5/8 x 5"	3/8"	2-3/4"	3.23"	5/8 x 3-1/2"	5-1/2"	3115 lbs.	5876 lbs.
1ETB58600	5/8 x 6"	1-3/8"	2-3/4"	3.23"	5/8 x 3-1/2"	5-1/2"	3115 lbs.	5876 lbs.
	5/8 x 6"	1/8"	4"	4.49"	5/8 x 4-3/4"	6-1/2"	4417 lbs.	5876 lbs.

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.



## Anchor Summary - Continued

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Eff. Embedment Depth $h_{ef}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o$ x $h_t$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1ETB58700	5/8 x 7"	2-3/8"	2-3/4"	3.23"	5/8 x 3-1/2"	5-1/2"	3115 lbs.	5876 lbs.
	5/8 x 7"	1-1/8"	4"	4.49"	5/8 x 4-3/4"	6-1/2"	4417 lbs.	5876 lbs.
1ETB58812	5/8 x 8-1/2"	3-7/8"	2-3/4"	3.23"	5/8 x 3-1/2"	5-1/2"	3115 lbs.	5876 lbs.
	5/8 x 8-1/2"	2-5/8"	4"	4.49"	5/8 x 4-3/4"	6-1/2"	4417 lbs.	5876 lbs.
1ETB34512	3/4 x 5-1/2"	1/8"	3 1/4"	3.74"	3/4 x 4"	6"	3999 lbs.	7995 lbs.
1ETB34614	3/4 x 6-1/4"	7/8"	3 1/4"	3.74"	3/4 x 4"	6"	3999 lbs.	7995 lbs.
1ETB34700	3/4 x 7"	1-5/8"	3 1/4"	3.74"	3/4 x 4"	6"	3999 lbs.	7995 lbs.
	3/4 x 7"	1/8"	4-3/4"	5.26"	3/4 x 5-3/4"	8"	7077 lbs.	9282 lbs.

## Installation Parameters

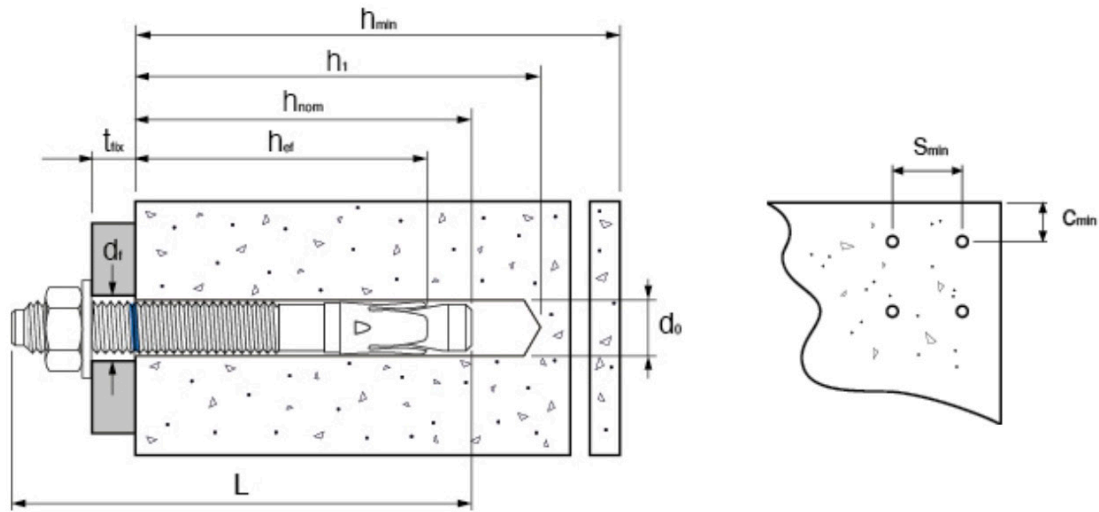
Anchor Size			1/4"	3/8"	1/2"	5/8"	3/4"			
Nominal Diameter of Drill Bit, $d_o$	$d_o$	in.	1/4	3/8	1/2	5/8	3/4			
Fixture Clearance Hole Diameter, $d_f$	$d_f$	in.	5/16	7/16	9/16	11/16	7/8			
Recommended Installation Torque, $T_{inst}$	$T_{inst}$	ft.lb.	5	30	45	75	150			
Minimum Thickness of Concrete Member	$h_{min}$	in.	4	4	4	6	5-1/2	6-1/2	6	8
Minimum Hole Depth	$h_t$	in.	2	2-5/8	2-5/8	4	3-1/2	4-3/4	4	5-3/4
Overall Anchor Embedment Depth in the Concrete	$h_{nom}$	in.	1.68	2.33	2.33	3.59	3.23	4.49	3.74	5.26
Minimum Spacing, $S_{min}$ , for Edge Distance $C \geq$	$s_{min}$	in.	2-1/4	2-1/2	2-3/4	2-1/2	4-1/2	4	5	4
	$c \geq$	in.	1-3/4	4	6	4	6	5	10-1/2	8-1/2
Minimum Edge Distance, $C_{min}$ , for Spacing $S \geq$	$c_{min}$	in.	1-3/4	2-1/2	3	2-1/2	3-1/2	3-1/2	5	4-1/2
	$s \geq$	in.	2-1/4	6-1/2	6	6	8	6	10-1/2	9-1/2

# ETB-Z

Wedge Expansion Anchor Zinc

888 859 6060

Customer Support



ANCHOR SELECTION GUIDE:

# SCREW ANCHORS



**AFOS<sup>®</sup>**  
Anchor Design Software

DOWNLOAD [allfasteners.com/afos](http://allfasteners.com/afos)



# AFR

## Rod Hanger - Vertical For Concrete Zinc



### APPLICATIONS & USES

- Single or multiple pipes
- Overhead applications
- Duct and piping installations
- Close to edge/close to anchor applications
- Replacement for Drop-In Anchors
- Zinc plated, carbon steel anchors

### APPROVALS & CERTIFICATIONS

- ICC-ESR 5217 Evaluation
- 2021, 2018, 2015 & 2012 International Building Code (IBC)
- 2021, 2018, 2015 & 2012 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2022 California Building Code (CBC)
- 2022 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-5217
- Supported by AFOS anchor design software

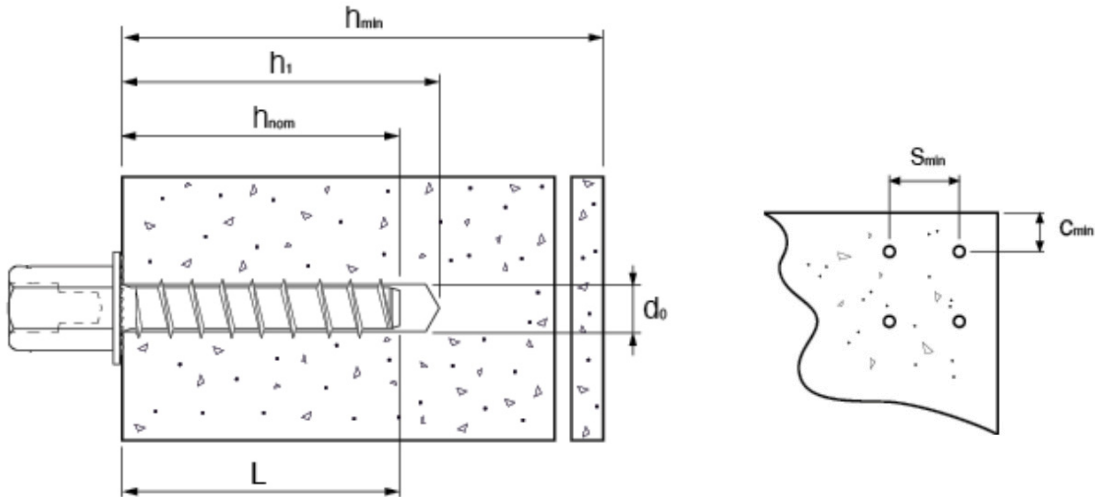
### Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Rod Size	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o$ x $h_l$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1AFR14	1/4 x 1-5/8"	0"	1/4"	1 5/8"	1/4 x 2"	4"	272 lbs.	810 lbs.
1AFR38	1/4 x 1-5/8"	0"	3/8"	1 5/8"	1/4 x 2"	4"	272 lbs.	810 lbs.
1AFR385	1/4 x 2-1/2"	0"	3/8"	2 1/2"	1/4 x 2-7/8"	4-3/8"	594 lbs.	810 lbs.
1AFR12	3/8 x 2-1/2"	0"	1/2"	2 1/2"	3/8 x 2-7/8"	4-3/8"	1539 lbs.	1654 lbs.

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.

## Installation Parameters

Anchor Size			1/4"	3/8"
Nominal Diameter of Drill Bit, $d_o$	$d_o$	in.	1/4	3/8
Fixture Clearance Hole Diameter, $d_f$	$d_f$	in.	3/8	1/2
Minimum Edge Distance	$c_{min}$	in.	1-3/4	
Minimum Spacing	$s_{min}$	in.	3	
Maximum Installation Torque	$T_{inst,max}$	ft.lb.	21	N/A
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft.lb.	135	135
Socket Driver	A/F	in.	1/2	3/4



# XCS-F

Flat Phillips Concrete Masonry Screw Blue Ruspert

888 859 6060

Customer Support



## XCS-F

Flat Phillips Concrete Masonry Screw  
Blue Ruspert



### APPLICATIONS & USES

- Carbon steel screw with epoxy coating
- Uncracked normal-weight concrete
- Light-weight concrete
- I.P.
- Hollow core block
- Solid block
- Brick
- Other misc. masonry material

### APPROVALS & CERTIFICATIONS

- ICC-ESR 5175 Evaluation
- 2021, 2018, 2015 & 2012 International Building Code (IBC)
- 2021, 2018, 2015 & 2012 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-5175
- Supported by AFOS anchor design software

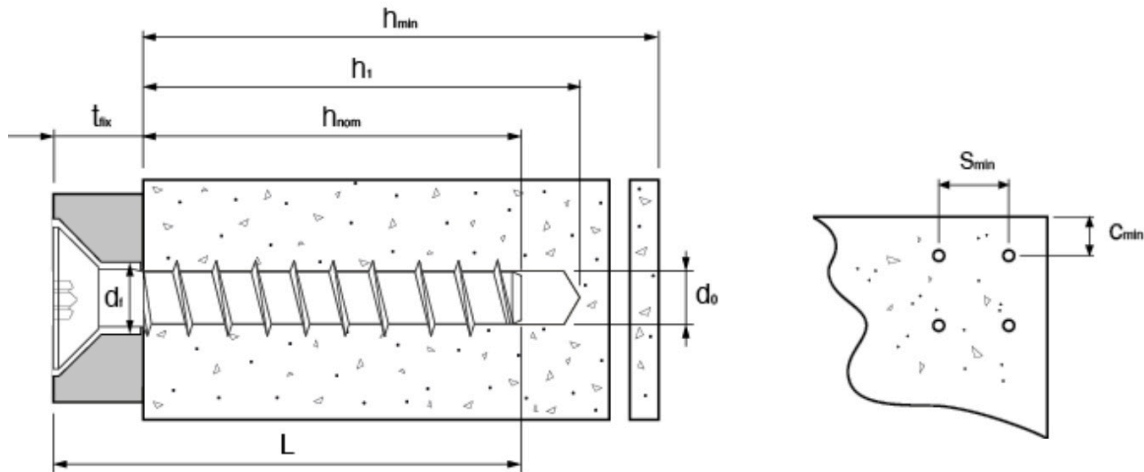
### Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Min Depth, $d_{bit}$ x $h_o$	Minimum Con- crete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
						Tension	Shear
1XCSF14214	1/4 x 2-1/4"	0.15"	2.10"	3/16 x 2.35"	3-1/2"	1356 lbs.	992 lbs.
1XCSF14234	1/4 x 2-3/4"	0.65"					
1XCSF14314	1/4 x 3-1/4"	1.15"					
1XCSF14334	1/4 x 3-3/4"	1.65"					
1XCSF14400	1/4 x 4"	1.90"					

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.

## Installation Parameters

Anchor Size			3/16"	1/4"
Nominal Diameter of Drill Bit, $d_{bit}$ ( $d_o$ )	$d_o$	in.	5/32	3/16
Fixture Clearance Hole Diameter, $d_f$	$d_f$	in.	1/4	5/16
Minimum Edge Distance	$c_{min}$	in.	2	
Minimum Spacing	$s_{min}$	in.	2-1/2	
Maximum Installation Torque (Use AF Provided XCS Setting Tool)	$T_{inst,max}$	ft.lb.	N/A	N/A
Driver	Countersink	-	PH2 / T25	PH3 / T30



## XCS-H

Hex Head Concrete Masonry Screw  
Blue Ruspert



### APPLICATIONS & USES

- Carbon steel screw with epoxy coating
- Uncracked normal-weight concrete
- Lightweight concrete
- I.P
- Hollow core block
- Solid block
- Brick
- Other misc. masonry material

### APPROVALS & CERTIFICATIONS

- ICC-ESR 5175 Evaluation
- 2021, 2018, 2015 & 2012 International Building Code (IBC)
- 2021, 2018, 2015 & 2012 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-5175
- Supported by AFOS anchor design software

### Anchor Summary

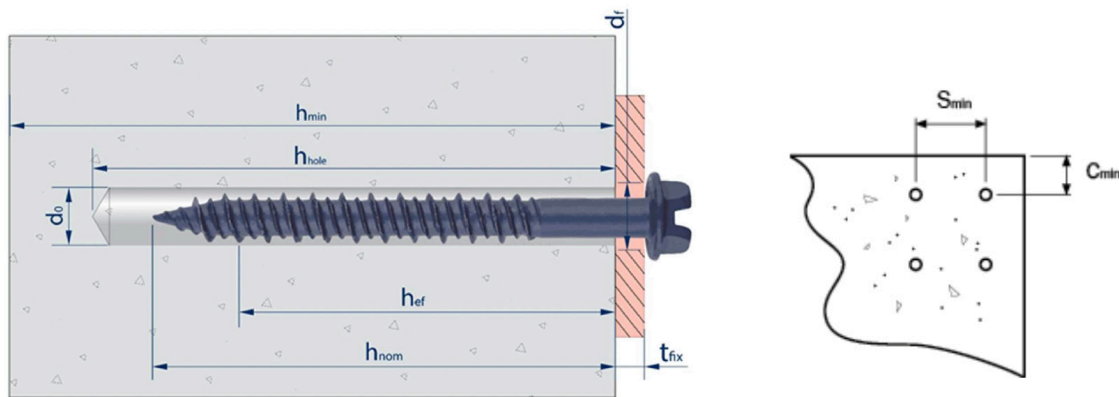
Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Min Depth, $d_{bit}$ x $h_o$	Minimum Con- crete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
						Tension	Shear
1XCSH14214	1/4 x 2-1/4"	0.15"	2.10"	3/16 x 2.35"	3-1/2"	1356 lbs.	992 lbs.
1XCSH14234	1/4 x 2-3/4"	0.65"					
1XCSH14314	1/4 x 3-1/4"	1.15"					
1XCSH14334	1/4 x 3-3/4"	1.65"					
1XCSH14400	1/4 x 4"	1.90"					

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.



## Installation Parameters

Anchor Size			3/16"	1/4"
Nominal Diameter of Drill Bit, $d_{bit}$ ( $d_o$ )	$d_o$	in.	5/32	3/16
Fixture Clearance Hole Diameter, $d_f$	$d_f$	in.	1/4	5/16
Minimum Edge Distance	$c_{min}$	in.	2	
Minimum Spacing	$s_{min}$	in.	2-1/2	
Maximum Installation Torque (Use AF Provided XCS Setting Tool)	$T_{inst,max}$	ft.lb.	N/A	N/A
Driver	Hexagonal	-	1/4	5/16



# SAH-Z

## Hex Head Concrete Screw Anchor Zinc



### APPLICATIONS & USES

- Zinc plated carbon steel anchors
- Totally removable
- Rotation setting thread-forming anchor
- Ideal for temporary or permanent anchoring into substrates such as concrete, brick, hollow brick or block

### APPROVALS & CERTIFICATIONS

- ICC-ESR 5217 Evaluation
- 2021, 2018, 2015 & 2012 International Building Code (IBC)
- 2021, 2018, 2015 & 2012 International Residential Code (IRC)
- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)
- 2022 California Building Code (CBC)
- 2022 California Residential Code (CRC)
- 2020 Florida Building Code - Building
- 2020 Florida Building Code - Residential
- Approved for providing anchorage to cracked & uncracked concrete per ESR-5217
- Supported by AFOS anchor design software

### Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Effective Embedment Depth, $h_{ef}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o$ x $h_t$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SAHZ14134	1/4 x 1-3/4"	1/8"	-	1-5/8"	1/4 x 2"	3-5/8"	N/A <sup>2</sup>	N/A <sup>2</sup>
1SAHZ14214	1/4 x 2-1/4"	5/8"	-	1-5/8"	1/4 x 2"	3-5/8"	N/A <sup>2</sup>	N/A <sup>2</sup>
1SAHZ38212	3/8 x 2-1/2"	7/8"	1.21"	1-5/8"	3/8 x 2"	3-5/8"	468 lbs.	787 lbs.
1SAHZ38300	3/8 x 3"	1-3/8"	1.21"	1-5/8"	3/8 x 2"	3-5/8"	468 lbs.	787 lbs.
		1/2"	1.98"	2-1/2"	3/8 x 2-7/8"	4-1/2"	1141 lbs.	1654 lbs.
1SAHZ38400	3/8 x 4"	2-3/8"	1.21"	1-5/8"	3/8 x 2"	3-5/8"	468 lbs.	787 lbs.
		1-1/2"	1.98"	2-1/2"	3/8 x 2-7/8"	4-1/2"	1141 lbs.	1654 lbs.
		3/4"	2.62"	3-1/4"	3/8 x 3-5/8"	5-1/4"	1709 lbs.	1890 lbs.
1SAHZ12300	1/2 x 3"	3/4"	1"	2-1/4"	1/2 x 2-5/8"	4-1/4"	743 lbs.	1270 lbs.
1SAHZ12400	1/2 x 4"	1-3/4"	1.66"	2-1/4"	1/2 x 2-5/8"	4-1/4"	743 lbs.	1270 lbs.
		1"	2.30"	3"	1/2 x 3-3/8"	5"	1534 lbs.	2071 lbs.
1SAHZ12500	1/2 x 5"	2-3/4"	1.66"	2-1/4"	1/2 x 2-5/8"	4-1/4"	743 lbs.	1270 lbs.
		2"	2.30"	3"	1/2 x 3-3/8"	5"	1534 lbs.	2071 lbs.
		3/4"	3.34"	4-1/4"	1/2 x 4-5/8"	6-1/4"	2857 lbs.	4047 lbs.

1. Concrete design capacity provided does not consider edge or spacing influence. For detailed calculations and capacity refer to AFOS anchor design software and ESR details.

2. 1SAHZ14134 and 1SAHZ14214 approved for use in uncracked concrete.

## Anchor Summary

Part Number	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Effective Embedment Depth, $h_{ef}$	Embedment Depth, $h_{nom}$	Drill Hole Dia. x Depth, $d_o$ x $h_t$	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SAHZ12600	1/2 x 6"	3-3/4"	1.66"	2-1/4"	1/2 x 2-5/8"	4-1/4"	743 lbs.	1270 lbs.
		3"	2.30"	3"	1/2 x 3-3/8"	5"	1534 lbs.	2071 lbs.
		1-3/4"	3.34"	4-1/4"	1/2 x 4-5/8"	6-1/4"	2857 lbs.	4047 lbs.
1SAHZ58400	5/8 x 4"	3/4"	2.54"	3-1/4"	5/8 x 3-5/8"	5-1/4"	2031 lbs.	4805 lbs.
1SAHZ58600	5/8 x 6"	2-3/4"	2.54"	3-1/4"	5/8 x 3-5/8"	5-1/4"	2031 lbs.	4805 lbs.
		2"	3.19"	4"	5/8 x 4-1/2"	6"	2629 lbs.	6069 lbs.
		1"	3.99"	5"	5/8 x 5-3/8"	7"	3377 lbs.	6069 lbs.
		1/2"	4.42"	5-1/2"	5/8 x 6"	7-1/2"	3786 lbs.	6069 lbs.

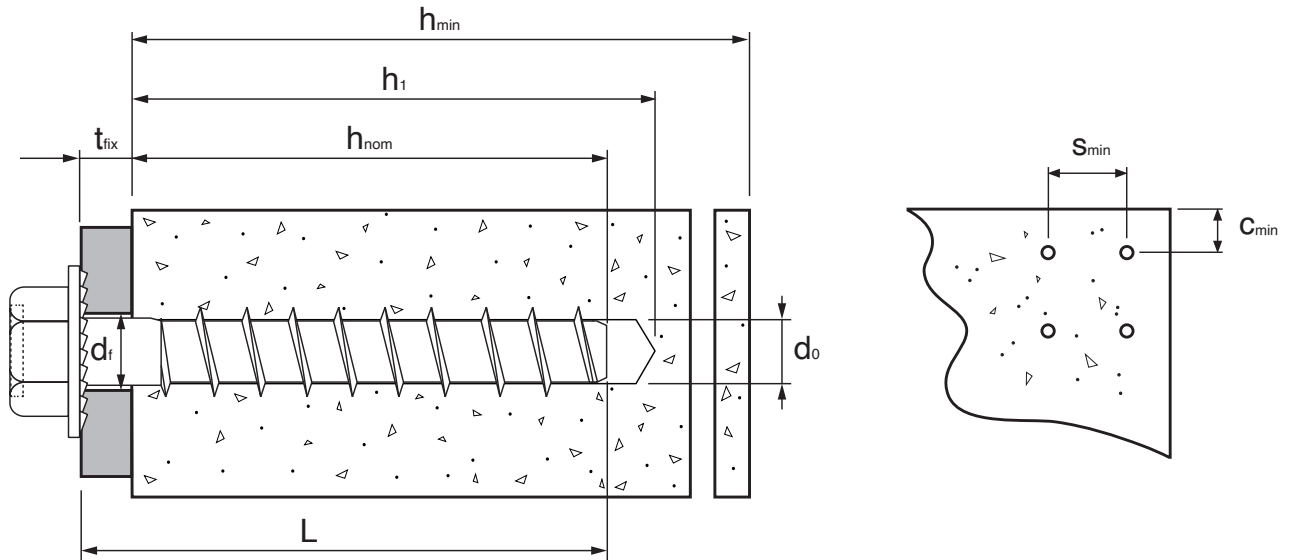
## Installation Parameters

Anchor Size			1/4"	3/8"	1/2"	5/8"
Nominal Diameter of Drill Bit	$d_o$	in.	1/4	3/8	1/2	5/8
Fixture Clearance Hole Diameter	$d_f$	in.	3/8	1/2	5/8	3/4
Minimum Edge Distance	$c_{min}$	in.	1-3/4			
Minimum Spacing	$s_{min}$	in.	3			
Maximum Installation Torque	$T_{inst,max}$	ft.lb.	21	N/A	N/A	N/A
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft.lb.	135	135	260	260

# SAH-Z

Hex Head Concrete Screw Anchor Zinc

888 859 6060  
Customer Support



ANCHOR SELECTION GUIDE:

# CHEMICAL ANCHORS



**AFOS<sup>®</sup>**  
Anchor Design Software

DOWNLOAD [allfasteners.com/afos](http://allfasteners.com/afos)



## EF600

High Performance Structural Pure Epoxy



### APPLICATIONS & USES

- Suitable for dry, wet or flooded holes
- For cracked & uncracked concrete
- Fast cure times
- Seismic rated
- Can be used with core drilled holes

### APPROVALS & CERTIFICATIONS

- ICC-ESR 4732 Evaluation
- 2018, 2015, 2012, 2009 & 2006 International Building Code (IBC)
- 2018, 2015, 2012, 2009 & 2006 International Residential Code (IRC)
- 2013 Abu Dhabi International Building Code (ADIBC)
- 2017 City of Los Angeles Building Code (LABC)
- 2017 City of Los Angeles Residential Code (LARC)
- 2017 Florida Building Code - Building
- 2017 Florida Building Code - Residential
- UL Certified – Drinking Water System Components to NSF/ANSI 61 & Lead Free to NSF/ANSI 372
- OH DOT Approval
- NYS DOT Approval
- NJ DOT Approval
- Approved for providing anchorage to cracked & uncracked concrete per ESR-4732
- Supported by AFOS anchor design software

### Application Times

Temp. (°F)	43°F	45°F	50°F	55°F	60°F	75°F	80°F	85°F	90°F	95°F	100°F	105°F	110°F
Working (mins.)	45	42	35	31	27	16	15	13	12	10	8	5	3
Cure (hrs.)	144	123	72	59	46	7	6	5	4	4	3	3	2



## ASTM A36 Grade 36; ASTM F1554 Grade 36

Part Number For Stud	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Minimum Embedment Depth, $h_{ef,min}$	Drill Hole Dia. $d_o$	Drill Hole Depth	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SCMZ38418	3/8-16 x 4-1/8"	1"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMZ38518	3/8-16 x 5-1/8"	2"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMZ38638	3/8-16 x 6-3/8"	3-1/4"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMZ12612	1/2-13 x 6-1/2"	2-3/4"	2-3/4"	9/16"	3"	4"	2520 lbs.	1149 lbs.
1SCMZ58712	5/8-11 x 7-1/2"	3-1/8"	3-1/8"	3/4"	3-3/8"	4-5/8"	3052 lbs.	1941 lbs.
1SCMZ3410	3/4-10 x 10"	5"	3-1/2"	7/8"	3-3/4"	5-1/4"	3618 lbs.	2642 lbs.



## ASTM A193 Grade B7; ASTM F1554 Grade 105

Part Number For Stud	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Minimum Embedment Depth, $h_{ef,min}$	Drill Hole Dia. $d_o$	Drill Hole Depth	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SCMG38418	3/8-16 x 4-1/8"	1"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMG38518	3/8-16 x 5-1/8"	2"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMG38638	3/8-16 x 6-3/8"	3-1/4"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMG12612	1/2-13 x 6-1/2"	2-3/4"	2-3/4"	9/16"	3"	4"	2520 lbs.	1149 lbs.
1SCMG58712	5/8-11 x 7-1/2"	3-1/8"	3-1/8"	3/4"	3-3/8"	4-5/8"	3052 lbs.	1941 lbs.
1SCMG3410	3/4-10 x 10"	5"	3-1/2"	7/8"	3-3/4"	5-1/4"	3618 lbs.	2642 lbs.



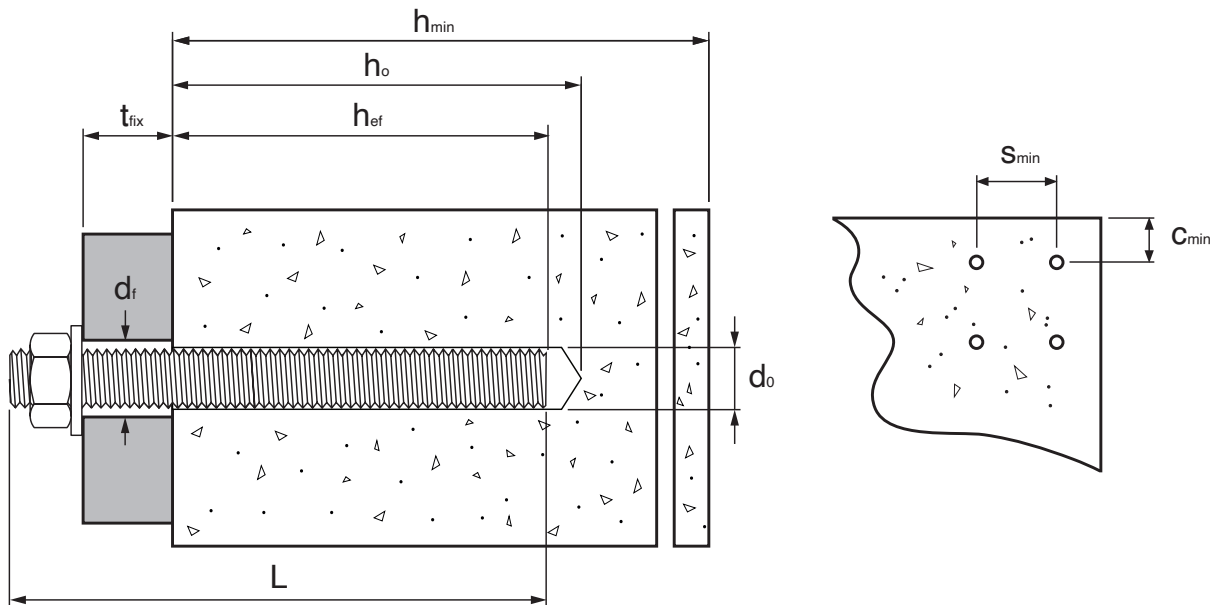
## ASTM F593 CW Stainless Type 304 & 316

Part Number For Stud	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Minimum Embedment Depth, $h_{ef,min}$	Drill Hole Dia. $d_o$	Drill Hole Depth	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SCMS438418	3/8-16 x 4-1/8"	1"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMS438518	3/8-16 x 5-1/8"	2"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMS438638	3/8-16 x 6-3/8"	3-1/4"	2-3/8"	7/16"	2-5/8"	4"	2022 lbs.	702 lbs.
1SCMS412612	1/2-13 x 6-1/2"	2-3/4"	2-3/4"	9/16"	3"	4"	2520 lbs.	1149 lbs.
1SCMS458712	5/8-11 x 7-1/2"	3-1/8"	3-1/8"	3/4"	3-3/8"	4-5/8"	3052 lbs.	1941 lbs.
1SCMS43410	3/4-10 x 10"	5"	3-1/2"	7/8"	3-3/4"	5-1/4"	3618 lbs.	2642 lbs.



## Installation Parameters of Threaded Rod

Anchor Size			3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"
Nominal Drill Hole Diameter	$d_o$	in.	7/16	9/16	3/4	7/8	1	1-1/8	1-3/8
Torque Moment (A36/A307)	$T_{fix,t,max}$	ft.lb.	10	25	50	90	125	165	280
Torque Moment (A193 B7 or F593 SS)	$T_{fix,t,max}$	ft.lb.	16	33	60	105	125	165	280
Embedment Depth (Hammer Drilled)	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-3/4	4	5
Embedment Depth (Hammer Drilled)	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	25
Depth of Drill Hole	$h_o$	in.	$h_{ef} + 1/4$						
Minimum Edge Distance	$c_{min}$	in.	2-3/16	2-13/16	3-3/4	4-3/8	5	5-5/8	6-7/8
Minimum Spacing	$s_{min}$	in.	2-3/16	2-13/16	3-3/4	4-3/8	5	5-5/8	6-7/8
Minimum Thickness of Member	$h_{min}$	in.	$h_{ef} + 1-1/4, \geq 3.94$	$h_{ef} + 2*d_o$ , where $d_o$ is hole diameter					





## Installation Parameters of Rebar

Rebar Size			#3	#4	#5	#6	#7	#8	#9	#10
Nominal Rebar Diameter	$d_a$	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.127	1.270
Nominal Drill Hole Diameter	$d_o$	in.	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2
Embedment Depth (Hammer Drilled)	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-3/4	4	4-1/2	5
Embedment Depth (Hammer Drilled)	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	22-1/2	25
Depth of Drill Hole	$h_o$	in.	$h_{ef} + 1/4''$							
Minimum Edge Distance	$c_{min}$	in.	2-3/16	2-13/16	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8
Minimum Spacing	$s_{min}$	in.	2-3/16	2-13/16	3-3/4	4-3/8	5	5-5/8	6-1/4	6-7/8
Minimum Thickness of Member	$h_{min}$	in.	$h_{ef} + 1-1/4, \geq 3.94$			$h_{ef} + 2*d_o$ , where $d_o$ is hole diameter				

## VF200PRO

### Fast Cure Anchoring Adhesive Injection



### APPLICATIONS & USES

- Suitable for dry, wet or flooded holes
- For cracked & uncracked concrete
- Fast cure times
- Seismic rated
- Post Installed concrete applications
- Low VOC compliant
- Suspending/hanging duct work, pipe or drop ceiling
- Installation into concrete with low integrity
- Marine/close to water fastening
- Reinforcing bars in new construction work
- Overhead applications into terracotta, cider-crete, ash-crete

### APPROVALS & CERTIFICATIONS

- ICC-ESR 4632 Evaluation
- 2018, 2015, 2012, 2009 & 2006 International Building Code (IBC)
- 2018, 2015, 2012, 2009 & 2006 International Residential Code (IRC)
- 2013 Abu Dhabi International Building Code (ADIBC)
- 2017 City of Los Angeles Building Code (LABC)
- 2017 City of Los Angeles Residential Code (LARC)
- 2017 Florida Building Code - Building
- 2017 Florida Building Code - Residential
- USDA Compliant
- UL Certified – Drinking Water System Components to NSF/ANSI 61
- OH DOT Approval
- IL DOT Approval
- ASTM C881 Type I, II, IV, V Grade 3; Class A, B, C, AASHTO M325
- LEED Compliant
- Approved for providing anchorage to cracked & uncracked concrete per ESR-4632
- Supported by AFOS anchor design software

### Application Times

Temp. (°F)	14°F	23°F	32°F	41°F	50°F	70°F	86°F	95°F	104°F
Working (mins.)	90	90	45	25	15	6	4	2	1.5
Cure (hrs.)	24 hrs	14 hrs	7 hrs	2 hrs	90 min	45 min	25 min	20 min	15 min

## ASTM A193 Grade B7; ASTM F1554 Grade 105



Part Number For Stud	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Minimum Embedment Depth, $h_{ef,min}$	Drill Hole Dia. $d_o$	Drill Hole Depth	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SCMG38418	3/8-16 x 4-1/8"	1"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMG38518	3/8-16 x 5-1/8"	2"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMG38638	3/8-16 x 6-3/8"	3-1/4"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMG12612	1/2-13 x 6-1/2"	2-3/4"	2-3/4"	9/16"	3"	4"	1398 lbs.	963 lbs.
1SCMG58712	5/8-11 x 7-1/2"	3-1/8"	3-1/8"	3/4"	3-3/8"	4-5/8"	2070 lbs.	1476 lbs.
1SCMG3410	3/4-10 x 10"	5"	3-1/2"	7/8"	3-3/4"	5-1/4"	2782 lbs.	2097 lbs.

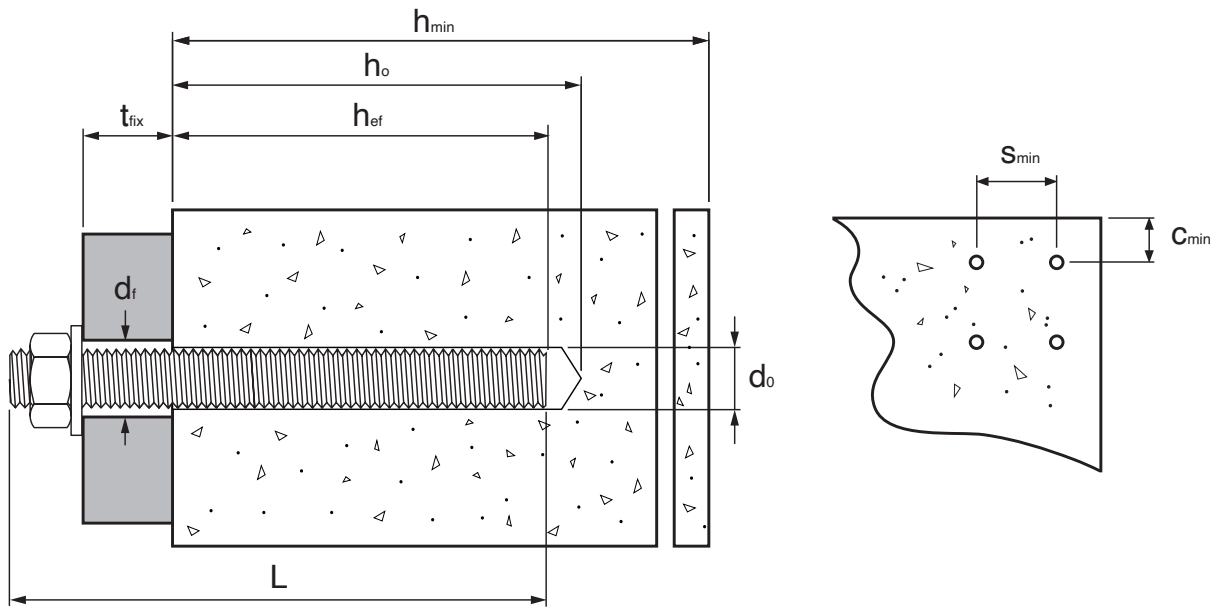
## ASTM F593 CW Stainless Type 304 & 316



Part Number For Stud	Description Dia. x L	Max fixture Thickness, $t_{fix}$	Minimum Embedment Depth, $h_{ef,min}$	Drill Hole Dia. $d_o$	Drill Hole Depth	Minimum Concrete Thickness, $h_{min}$	Design Capacity in 2,500 psi Cracked Concrete <sup>1</sup>	
							Tension	Shear
1SCMS438418	3/8-16 x 4-1/8"	1"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMS438518	3/8-16 x 5-1/8"	2"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMS438638	3/8-16 x 6-3/8"	3-1/4"	2-3/8"	7/16"	2-5/8"	4"	N/A	N/A
1SCMS412612	1/2-13 x 6-1/2"	2-3/4"	2-3/4"	9/16"	3"	4"	1398 lbs.	963 lbs.
1SCMS458712	5/8-11 x 7-1/2"	3-1/8"	3-1/8"	3/4"	3-3/8"	4-5/8"	2070 lbs.	1476 lbs.
1SCMS43410	3/4-10 x 10"	5"	3-1/2"	7/8"	3-3/4"	5-1/4"	2782 lbs.	2097 lbs.

**Installation Parameters of Threaded Rod**

Anchor Size			3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"
Nominal Drill Hole Diameter	$d_o$	in.	7/16	9/16	3/4	7/8	1	1-1/8	1-3/8
Torque Moment (A36/A307)	$T_{fix,t,max}$	ft.lb.	10	25	50	90	125	165	280
Torque Moment (A193 B7 or F593 SS)	$T_{fix,t,max}$	ft.lb.	16	33	60	105	125	165	280
Embedment Depth (Hammer Drilled)	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-3/4	4	5
Embedment Depth (Hammer Drilled)	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	25
Depth of Drill Hole	$h_o$	in.	$h_{ef} + 1/4$						
Minimum Edge Distance	$c_{min}$	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	6-1/4
Minimum Spacing	$s_{min}$	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	6-1/4
Minimum Thickness of Member	$h_{min}$	in.	$h_{ef} + 1-1/4$		$h_{ef} + 2*d_o$				



## Installation Parameters of Rebar

Rebar Size			#3	#4	#5	#6	#7	#8	#9	#10	
Nominal Rebar Diameter	$d_a$	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250	
Nominal Drill Hole Diameter	$d_o$	in.	7/16	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	
Embedment Depth (Hammer Drilled)	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	4-1/2	5	
Embedment Depth (Hammer Drilled)	$h_{ef,max}$	in.	4-1/2	6	7-1/2	9	10-1/2	12	13-1/2	15	
Depth of Drill Hole	$h_o$	in.	$h_{ef} + 1/4''$								
Minimum Edge Distance	$c_{min}$	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	
Minimum Spacing	$s_{min}$	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4	
Minimum Thickness of Member	$h_{min}$	in.	$h_{ef} + 1-1/4, \geq 3.94$				$h_{ef} + 2*d_o$				



# Site Testing of Anchors

## Introduction

Site testing of concrete anchors may be required for one of two reasons:

1. Verification of correct installation (proof tests)
2. Determining the strength in a substrate where performance data is not available (ultimate tests)

Testing of anchors in concrete is generally not necessary as performance is well known and is covered by ACI 318 Chapter 17 and the corresponding product-specific ICC-ESR.

Tensile testing is best to determine correct installation or anchor suitability. Shear strength testing is usually not required because it is less sensitive to poor installation and is dependent on the substrate strength and edge distance. Allfasteners has the capability to do both tension and shear testing onsite.

## Proof Tests

If it is deemed necessary to verify correct installation, proof tests are conducted on a sample of the project's anchors. The test load (proof load) is to be determined by the responsible engineer and is project-dependent. The maximum test load should not exceed both of the following to avoid damage:

1. ULS design capacity (design characteristic strength) of the anchor
2. 0.7 x characteristic yield capacity of the steel

If the design loading for the specific application is close to the design capacity of the anchor, the proof load can be equal to the design load. If the loading is quite low and the engineer just wants to get a general indication of correct installation, the proof load can be equal to the Working Load Limit capacity (WLL) of the anchor. The WLL can be estimated by dividing the design capacity by 2.0. In any case, the proof load should be at least equal to the design load applied to the anchor while not exceeding the above-mentioned limits.

The proof load should be maintained for minimum 30 seconds and should not drop more than 10% in that duration. A minimum of 3 anchors or 2.5% of the total relevant anchor population, whichever is greater, is recommended to be tested. In some cases, such as fall arrest systems, 100% of anchors may need to be tested.

**Important Note:** Whilst all reasonable care is taken in compiling technical data on the Company's products, all information, recommendations, or suggestions regarding the use of such products are made without guarantee, since the conditions of use are beyond the control of the Company. It is the customer's responsibility to satisfy them-self that each product is fit for the purpose for which they intend to use it, that the actual conditions of use are suitable, and that in the light of our continual research and development program the information relating to each product has not been superseded. Allfasteners, its agencies and employees, disclaim any and all liability in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

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## Ultimate Tests

These are required to determine anchor strength. Some examples when these are needed include: into unknown substrate such as masonry that is not covered by ICC-ESR, smaller edge distance than tested in the ICC-ESR, or if the anchor does not have published performance data. All these are subject to the manufacturer provisionally approving the anchor as suitable for the application of interest. Please note that performing these tests would not make the anchor ACI 318 Chapter 17 compliant, but just provide reassurance of adequate performance. The anchors for these tests are sacrificial and should not be used in the project.

A simplified conservative approach is to test minimum 5 anchors to failure, taking the weakest value and applying a factor of safety of 3.1 to determine the Working Load Limit capacity (WLL) which then can be compared with the unfactored design load. This test does not have to be done to failure if all anchors meet 3.0 x unfactored design load. For nylon anchors the factor of safety needs to be 5.1 or 5.0 following the same method. These are just recommendations, and the engineer may elect a more conservative approach.

## Testing Equipment

Typical testing equipment includes a hydraulic cell and a tripod. A tripod is necessary to ensure that concrete failure is tested as well, not just anchor pull-out.

## Safety Warning

When testing anchors, it is not recommended to exceed the steel failure load of the anchor. Sudden steel failure may lead to equipment damage or danger to personnel.

# HYDRAJAWS®

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M2000 25kN Pro Test Kit





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All products inside the Allfasteners Anchor Selection Guide come backed by ICC-ESR Evaluation.



### AFOS COMPATIBLE

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