



***SPEARS CONSTRUCTION SUPPLY INC.***

**Tools - Fasteners - Firestop - Supplies**

# ***Critical Application Handbook***

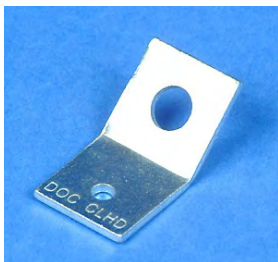
(For Special Code and Seismic Applications)

We have all ICC and related data available upon request.

Please call 503-351-2098 with any questions you may have or for any documentation you may need.



Due to the confusion with current codes and seismic applications, we have created an array of products and technical resources available for you.



## CEILING CLIP ASSEMBLIES



### Standard Powder Clip Assemblies

#### ANGLE CLIP IN CONCRETE

PART NUMBER SERIES	SHANK DIAMETER (INCH)	MINIMUM PENETRATION (INCH)	INSTALLED IN STONE AGGREGATE CONCRETE – CONCRETE COMPRESSIVE STRENGTH					
			ALLOWABLE LOAD – <i>Ultimate Load</i>					
			4000 PSI					
			TENSION (LBS)	SHEAR (LBS)	OBLIQUE (LBS)			
SDC100 / SDC125	0.145	7/8	<b>115</b> <i>575</i>	<b>120</b> <i>1014</i>	<b>145</b> <i>726</i>			
SDC125	0.145	1-1/8	<b>130</b> <i>744</i>	<b>167</b> <i>1090</i>	<b>205</b> <i>1032</i>			

PART NUMBER SERIES	SHANK DIAMETER (INCH)	MINIMUM PENETRATION (INCH)	ALLOWABLE WORKING VALUES – INSTALLED IN 3000 PSI LIGHTWEIGHT CONCRETE							
			ALLOWABLE LOAD – <i>Ultimate Load</i>							
			3000 PSI LIGHTWEIGHT WITH METAL DECKING							
			LOWER FLUTE TENSION (LBS)	LOWER FLUTE SHEAR (LBS)	LOWER FLUTE OBLIQUE (LBS)	UPPER FLUTE TENSION (LBS)	UPPER FLUTE SHEAR (LBS)			
SDC100	0.145	7/8	<b>67</b> <i>335</i>	<b>237</b> <i>1186</i>	<b>90</b> <i>448</i>	<b>104</b> <i>571</i>	<b>310</b> <i>1678</i>			
SDC125	0.145	1-1/8	<b>94</b> <i>471</i>	<b>276</b> <i>1378</i>	<b>119</b> <i>596</i>	<b>106</b> <i>528</i>	<b>319</b> <i>1597</i>			

**Note 1:** ALLOWABLE loads are shown in the **LARGE BOLD** font, *Ultimate* loads are shown in *smaller italic* font. **Note 2:** Testing conducted in accordance with ICC AC70 & ASTM E1190. **Note 3:** Safety factors are based on coefficient of variation. In accordance with ICC AC70, the safety factor will be no less than 5. **Note 4:** Values shown in concrete are for the clip assembly only. Connected members must be investigated separately. **Note 5:** Cyclic, fatigue, shock loads, and other design criteria may require a different safety factor. **Note 6:** Job site testing may be required to determine actual job site values. **Note 7:** Minimum edge distance is 3 inches unless otherwise approved. **Note 8:** For SI: 1 lbf = 4.448 N, 1 inch = 25.4 mm, 1 ksi = 6.89MPa. Tables converted to metric are available on our website.

### Power Point Powder Clip Assemblies —

Designed for difficult overhead applications



#### ANGLE CLIP IN CONCRETE

PART NUMBER SERIES	SHANK DIAMETER (INCH)	MINIMUM PENETRATION (INCH)	INSTALLED IN STONE AGGREGATE CONCRETE – CONCRETE COMPRESSIVE STRENGTH					
			ALLOWABLE LOAD – <i>Ultimate Load</i>					
			4000 PSI			6000 PSI		
			TENSION (LBS)	SHEAR (LBS)	OBLIQUE (LBS)	TENSION (LBS)	SHEAR (LBS)	OBLIQUE (LBS)
SPC78	0.150	3/4	<b>155</b> <i>897</i>	<b>188</b> <i>1050</i>	-----	<b>150</b> <i>788</i>	<b>153</b> <i>949</i>	<b>140</b> <i>769</i>
SPC114	.150/.180	1-1/8	<b>127</b> <i>811</i>	<b>226</b> <i>1130</i>	<b>181</b> <i>904</i>	<b>169</b> <i>853</i>	<b>300</b> <i>1500</i>	<b>223</b> <i>1114</i>

PART NUMBER SERIES	SHANK DIAMETER (INCH)	MINIMUM PENETRATION (INCH)	ALLOWABLE WORKING VALUES – INSTALLED IN 3000 PSI LIGHTWEIGHT CONCRETE							
			ALLOWABLE LOAD – <i>Ultimate Load</i>							
			3000 PSI LIGHTWEIGHT WITH METAL DECKING							
			LOWER FLUTE TENSION (LBS)	LOWER FLUTE SHEAR (LBS)	LOWER FLUTE OBLIQUE (LBS)	UPPER FLUTE TENSION (LBS)	UPPER FLUTE SHEAR (LBS)			
SPC78	0.150	3/4	<b>59</b> <i>293</i>	<b>202</b> <i>1109</i>	<b>65</b> <i>323</i>	<b>84</b> <i>419</i>	<b>324</b> <i>1622</i>			
SPC114	150/.180	1-1/8	<b>157</b> <i>786</i>	<b>272</b> <i>1358</i>	<b>153</b> <i>766</i>	<b>180</b> <i>899</i>	<b>334</b> <i>1673</i>			

**Note 1:** ALLOWABLE loads are shown in the **LARGE BOLD** font, *Ultimate* loads are shown in *smaller italic* font. **Note 2:** Testing conducted in accordance with ICC AC70 & ASTM E1190. **Note 3:** Safety factors are based on coefficient of variation. In accordance with ICC AC70, the safety factor will be no less than 5. **Note 4:** Values shown in concrete are for the clip assembly only. Connected members must be investigated separately. **Note 5:** Cyclic, fatigue, shock loads, and other design criteria may require a different safety factor. **Note 6:** Job site testing may be required to determine actual job site values. **Note 7:** Minimum edge distance is 3 inches unless otherwise approved. **Note 8:** For SI: 1 lbf = 4.448 N, 1 inch = 25.4 mm, 1 ksi = 6.89MPa. Tables converted to metric are available on our website.

# Code-Compliant Anchors



The codes are changing, and the dust **hasn't quite settled, but we are here to** help you navigate the landscape with the latest code-compliant anchors available.





# New Code Compliant Products



**Power-Stud™ + SD2**

Carbon Steel Bolt  
Stainless Steel Clip

Tension Zone, Seismic  
& Wind Loading



**Power-Stud™ + SD1**

Carbon Steel Bolt  
Carbon Steel Clip

Tension Zone, Seismic  
& Wind Loading  
Applications



**Wedge-Bolt@+**

All-Steel Screw Bolt

Anchoring Window  
Frames, Racking, Ma-  
chinery to Concrete



**Snake™+**

Zinc Plated Carbon  
Steel Internally  
Threaded Self-Tapping  
Anchor

Overhead Anchoring  
with Threaded Rod



**AC100+ Gold™**

High-Strength Adhesive

All Weather Adhesive for  
Bonding Threaded Rod  
into Concrete



**PE1000+™**

High-Strength Epoxy

Rebar Doweling, Guard  
Rails, Structural An-  
choring to Concrete

**MADE IN USA**



**RED HEAD®**  
*CONCRETE ANCHORING SPECIALISTS*

**BUILDING AMERICA'S  
INFRASTRUCTURE FOR  
100 YEARS**

**Trubolt®+**  
*Seismic Wedge Anchors*

**ESR-2427**

Approved for:

- Seismic
- Cracked and  
Uncracked Concrete



# Dependable, Heavy-Duty, Inspectible, Wedge Type Expansion Anchor

## DESCRIPTION/SUGGESTED SPECIFICATIONS

### SPECIFIED FOR ANCHORAGE INTO CONCRETE

Trubolt Wedge anchors feature a stainless steel expansion clip, threaded stud body, nut and washer. Anchor bodies are made of plated carbon steel, hot-dipped galvanized carbon steel, type 304 stainless steel or type 316 stainless steel as identified in the drawings or other notations.

Trubolt+ Wedge anchors consist of a high-strength threaded stud body, expansion clip, nut and washer. Anchor bodies are made of plated carbon steel. The expansion clip consists of a split cylindrical ring with undercutting grooves.

The exposed end of the anchor is stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

Use carbide tipped hammer drill bits made in accordance with ANSI B212.15-1994 to install anchors.

Anchors are tested to ASTM E488 criteria and ICC-ES AC193. Anchors are listed by the following agencies as required by the local building code: ICC-ES, UL, FM, City of Los Angeles, California State Fire Marshal and Caltrans.

See Appendix B and C for performance values in accordance to 2006 IBC. (Found in our Product and Resource Catalog, pages 93-96 or at [www.itwredhead.com](http://www.itwredhead.com))

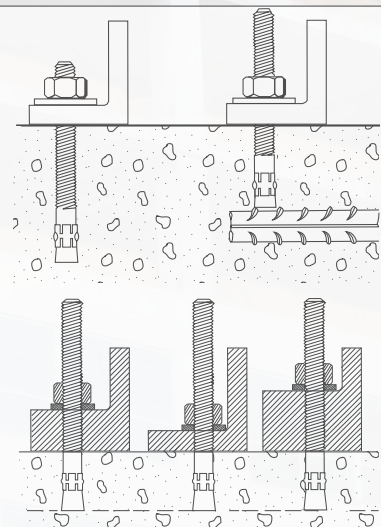
## ADVANTAGES

- ✓ 2006 International Building Code (IBC) Compliant
- ✓ Versatile fully threaded design is standard on sizes up to 3/4" diameter and 10" length
- ✓ Anchor diameter equals hole diameter
- ✓ Standard carbon and stainless steel anchors
- ✓ 360° contact with concrete assures full expansion for reliable working loads
- ✓ Non bottom-bearing, may be used in hole depth exceeding anchor length
- ✓ Can be installed through the work fixture, eliminating hole spotting
- ✓ Inspectible torque values, indicating proper installation

### Fully Threaded Advantage

Trubolt's fully threaded feature eliminates subsurface obstruction problems.

Fully threaded design accommodates various material thicknesses at the same embedment. One anchor length saves time and money.



**Trubolt®**  
Wedge Anchors

**Trubolt+®**  
Seismic Wedge Anchors



## APPROVALS/LISTINGS

### Trubolt® Wedge Anchors



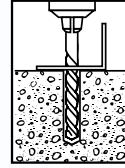
- ✓ ICC Evaluation Service, Inc. # ESR-2251
  - Category 1 performance rating
  - 2003 IBC and 2006 IBC compliant
  - Meets ACI 318 ductility requirements
  - Tested in accordance with ACI 355.2 and ICC-ES AC193
  - For use in seismic zones A & B
  - 1/4", 3/8" & 1/2" diameter anchors listed in ESR-2251
- ✓ Underwriters Laboratories
- ✓ Factory Mutual
- ✓ City of Los Angeles - #RR2748
- ✓ California State Fire Marshall
- ✓ Caltrans
- ✓ Meets or exceeds U.S. Government G.S.A. Specification A-A-1923A Type 4 (formerly GSA: FF-S-325 Group II, Type 4, Class 1)

### Trubolt+® Seismic Wedge Anchors

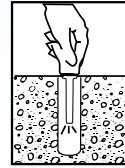


- ✓ ICC Evaluation Service, Inc. # ESR-2427
  - Category 1 performance rating
  - 2003 IBC and 2006 IBC compliant
  - Meets ACI ductility requirements
  - Tested in accordance with ACI 355.2 and ICC-ES AC193
  - For use in seismic zones A, B, C, D, E, & F
  - 1/2" & 5/8" diameter anchors listed in ESR-2427

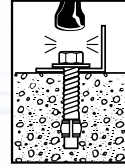
## INSTALLATION STEPS



1. Select a carbide drill bit with a diameter equal to the anchor diameter. Drill hole to any depth exceeding the desired embedment. See chart for minimum recommended embedment.



2. Clean hole or continue drilling additional depth to accommodate drill fines.



3. Assemble washer and nut, leaving nut flush with end of anchor to protect threads. Drive anchor through material to be fastened until washer is flush to surface of material.



4. Expand anchor by tightening nut 3-5 turns past the hand tight position, or to the specified torque requirement.



### LENGTH INDICATION CODE\*

ID STAMP

CODE	LENGTH OF ANCHOR	CODE	LENGTH OF ANCHOR
A	1-1/2 < 2 (38.1 < 50.8)	K	6-1/2 < 7 (165.1 < 177.8)
B	2 < 2-1/2 (50.8 < 63.5)	L	7 < 7-1/2 (177.8 < 190.5)
C	2-1/2 < 3 (63.5 < 76.2)	M	7-1/2 < 8 (190.5 < 203.2)
D	3 < 3-1/2 (76.2 < 88.9)	N	8 < 8-1/2 (203.2 < 215.9)
E	3-1/2 < 4 (88.9 < 101.6)	O	8-1/2 < 9 (215.9 < 228.6)
F	4 < 4-1/2 (101.6 < 114.3)	P	9 < 9-1/2 (228.6 < 241.3)
G	4-1/2 < 5 (114.3 < 127.0)	Q	9-1/2 < 10 (241.3 < 254.0)
H	5 < 5-1/2 (127.0 < 139.7)	R	10 < 11 (254.0 < 279.4)
I	5-1/2 < 6 (139.7 < 152.4)	S	11 < 12 (279.4 < 304.8)
J	6 < 6-1/2 (152.4 < 165.1)	T	12 < 13 (304.8 < 330.2)

\*Located on top of anchor for easy inspection.





# ITW RED HEAD TRUBOLT WEDGE ANCHOR

## DESIGN INFORMATION TESTED TO ICC-ES AC193 AND ACI 355, IN ACCORDANCE WITH 2006 IBC

### TRUBOLT WEDGE ANCHOR DESIGN INFORMATION<sup>1,2,3</sup>

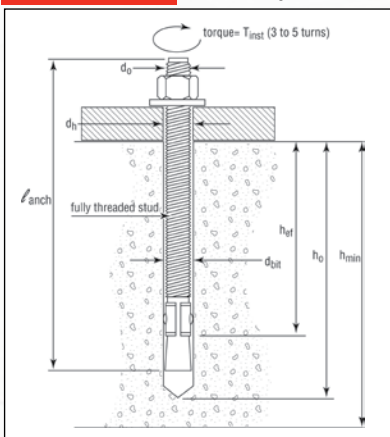
DESIGN INFORMATION	Symbol	Units	Nominal Anchor Diameter									
			1/4		3/8		1/2		5/8		3/4	
Anchor O.D.	$d_o$	in	0.250		0.375		0.500		0.625		0.750	
Effective embedment	$h_{ef}$	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Minimum member thickness	$h_{min}$	in	4	4	4	5	5	6	5	8	6	8
Critical edge distance	$c_{ac}$	in	2-5/8	3	2-5/8	5-1/4	3-3/4	6-3/4	5	8	7	9
Minimum edge distance	$c_{min}$	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Minimum anchor spacing	$s_{min}$	in	1-3/4	1-1/2	2-1/4	2	3-3/4	3-3/4	4-1/4	3-1/4	3-3/4	3-1/2
Min. Specified Yield Strength	$f_y$	lb/in <sup>2</sup>	55,000									
Min. Specified Ultimate Strength	$f_{uta}$	lb/in <sup>2</sup>	75,000									
Effective tensile stress area	$A_{se}$	in <sup>2</sup>	0.032		0.078		0.142		0.226		0.334	
Steel strength in tension	$N_s$	lb	2,385		5,815		10,645		16,950		25,050	
Steel strength in shear	$V_s$	lb	1,430		2,975	3,490	4,450	6,385	6,045	10,170	10,990	15,030
Pullout strength, uncracked concrete	$N_{p,uncr}$	lb	1,392	1,706	2,198	3,469	2,400	4,168	4,155	6,638	8,031	10,561
Anchor Category (All anchors are ductile)			1									
Effectiveness factor $k_{uncr}$ uncracked concrete			24									
Axial stiffness in service load range	$\beta$	lb/in	14,651	9,385	17,515	26,424	32,483	26,136	42,899	21,749	43,576	28,697
Coefficient for variation for axial stiffness in service load range			34	47	28	45	17	33	55	22	63	28
Strength reduction factor $\phi$ for tension, steel failure modes			0.75									
Strength reduction factor $\phi$ for shear, steel failure modes			0.65									
Strength reduction factor $\phi$ for tension, concrete failure modes, Condition B			0.65									
Strength reduction factor $\phi$ for shear, concrete failure modes, Condition B			0.70									

<sup>1</sup> Trubolt+ Anchor Design Strengths must be determined in accordance with ACI 318-05 Appendix D and this table

<sup>2</sup> The Trubolt+ Wedge Anchor is a ductile steel element as defined by ACI 318 D.1

<sup>3</sup> 1/4", 3/8", & 1/2" diameter data is listed in ICC-ES ESR-2251.

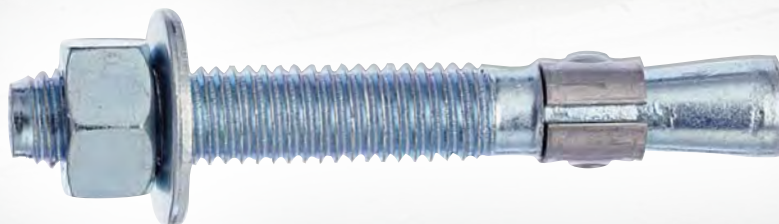
### TRUBOLT WEDGE ANCHOR (INSTALLED)



### TRUBOLT WEDGE INSTALLATION INFORMATION

	Symbol	Units	Nominal Anchor Diameter (in.)									
			1/4		3/8		1/2		5/8		3/4	
Anchor outer diameter	$d_o$	in	0.25		0.375		0.5		0.625		0.750	
Nominal carbide bit diameter	$d_{bit}$	in	1/4		3/8		1/2		5/8		3/4	
Effective embedment depth	$h_{ef}$	in	1-1/2	2	1-3/4	2-5/8	1-7/8	3-3/8	2-1/2	4	3-1/2	4-3/4
Min hole depth	$h_0$	in	2	2-1/2	2-1/2	3-3/8	2-3/4	4-1/4	3-3/4	5-1/4	4-3/4	6
Min slab thickness	$h_{min}$	in	4	4	5	5	6	5	8	6	8	8
Installation torque	$T_{inst}$	ft-lb	4		25		55		90		110	
Min hole diameter	$d_h$	in	5/16		7/16		9/16		11/16		13/16	

**Trubolt®**  
Wedge Anchors





### Performance values in accordance with 2006 IBC

#### TRUBOLT WEDGE PULLOUT STRENGTH ( $N_p, unc$ ) (POUNDS) <sup>1</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		$f'c = 2,500$ psi	$f'c = 3,000$ psi	$f'c = 4,000$ psi	$f'c = 6,500$ psi
1/4	1-1/2	1,392	1,525	1,610	1,822
	2	1,706	1,869	1,947	2,151
3/8	1-3/4	2,198	2,408	2,621	3,153
	2-5/8	3,469	3,800	3,936	4,275
1/2	1-7/8	2,400	2,629	3,172	4,520
	3-3/8	4,168	4,520	4,520	4,520
5/8	2-1/2	4,155	4,155	4,376	5,578
	4	6,638	6,900	7,968	10,157
3/4	3-1/2	8,031	8,322	9,610	12,251
	4-3/4	10,561	10,561	10,561	12,251

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

<sup>1</sup> Values are for single anchors with no edge distance or spacing reduction.

#### TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC TENSION (ASD), NORMAL-WEIGHT UNCRACKED CONCRETE <sup>1-6</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength			
		$f'c = 2,500$ psi	$f'c = 3,000$ psi	$f'c = 4,000$ psi	$f'c = 6,500$ psi
1/4	1-1/2	611	670	707	800
	2	749	821	855	945
3/8	1-3/4	965	1,058	1,151	1,385
	2-5/8	1,524	1,669	1,729	1,878
1/2	1-7/8	1,054	1,155	1,393	1,985
	3-3/8	1,831	1,985	1,985	1,985
5/8	2-1/2	1,825	1,825	1,922	2,450
	4	2,915	3,030	3,499	4,461
3/4	3-1/2	3,527	3,655	4,221	5,381
	4-3/4	4,638	4,638	4,638	5,381

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

Design Assumptions:

- <sup>1</sup> Single anchor with static tension load only.
- <sup>2</sup> Concrete determined to remain uncracked for the life of the anchorage.
- <sup>3</sup> Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
- <sup>4</sup> Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L
- <sup>5</sup> Calculation of weighted average: 1.2D + 1.6L = 1.2 (0.3) + 1.6 (0.7) = 1.48
- <sup>6</sup> Values do not include edge distance or spacing reductions.

#### TRUBOLT WEDGE ANCHOR ALLOWABLE STATIC SHEAR (ASD), STEEL (POUNDS)<sup>1-5</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Allowable Steel Capacity, Static Shear
1/4	1-1/2	628
	2	
3/8	1-3/4	1,307
	2-5/8	1,533
1/2	1-7/8	1,954
	3-3/8	2,804
5/8	2-1/2	2,655
	4	4,467
3/4	3-1/2	4,827
	4-3/4	6,601

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

Design Assumptions:

- <sup>1</sup> Single anchor with static shear load only.
- <sup>3</sup> Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).
- <sup>3</sup> Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L
- <sup>4</sup> Calculation of weighted average: 1.2D + 1.6L = 1.2 (0.3) + 1.6 (0.7) = 1.48
- <sup>5</sup> Values do not include edge distance or spacing reductions.

# ITW RED HEAD **TRUBOLT+** WEDGE ANCHOR

## DESIGN INFORMATION TESTED IN ACCORDANCE WITH ICC-ES AC 193 AND ACI 355

### COMPLIANT WITH 2006 IBC

#### **TRUBOLT+** WEDGE ANCHOR DESIGN INFORMATION<sup>1,2,3</sup>

Characteristic	Symbol	Units	Nominal Anchor Diameter inch (mm)							
			3/8"		1/2"		5/8"			
<b>Installation Information</b>										
Minimum effective embedment depth	$h_{ef}$	in	1-5/8		2		3-1/4		4-1/4	
Minimum slab thickness	$h_{min}$	in	4	5	4	6	6	8	6	8
Critical edge distance	$c_{ac}$	in	5	3	6	6	7-1/2	6	7-1/2	7-1/2
Minimum edge distance	$c_{min}$	in	3	3	6	6	6	6	7-1/2	5
Minimum anchor spacing	$s_{min}$	in	3-1/2	2-1/2	6	5-3/4	4	5-3/4	8	6
<b>Anchor Data</b>										
Anchor category	1, 2 or 3	—	1							
Minimum specified yield strength	$f_y$	lb/in <sup>2</sup>	60,000				55,000			
Minimum specified ultimate strength	$f_{uta}$ (fut)	lb/in <sup>2</sup>	75,000							
Effective tensile stress area (neck)	$A_{se}$	in <sup>2</sup>	0.056		0.119		0.183			
Effective tensile stress area (thread)	$A_{se}$	in <sup>2</sup>	0.0715		0.142		0.217			
Steel strength in tension	$N_{sa}$ ( $N_s$ )	lb	4,200		8,925		13,725			
Steel strength in shear	$V_{sa}$ ( $V_s$ )	lb	2,550		5,175		8,955			
Effectiveness factor for uncracked concrete	$k_{uncr}$	—	24							
Effectiveness factor for cracked concrete	$k_{cr}$	—	17							
Pullout strength, uncracked concrete	$N_{p,uncr}$	lb	* N/A		* N/A		6,540		5,430	
Pullout strength, cracked concrete	$N_{p,cr}$	lb	* N/A		* N/A		* N/A		* N/A	
Tension pullout strength for seismic loads	$N_{eq}$	lb	* N/A		* N/A		* N/A		6,715	
Steel strength in shear for seismic loads	$V_{eq}$ ( $V_{sa,seis}$ )	lb	1,785		5,175		8,955			
Strength reduction factor $\phi$ for tension, steel failure modes			0.75							
Strength reduction factor $\phi$ for shear, steel failure modes			0.65							
Strength reduction factor $\phi$ for tension, concrete failure modes, Condition B			0.65							
Strength reduction factor $\phi$ for shear, concrete failure modes, Condition B			0.70							

For SI: 1 inch = 25.4 mm, 1 in<sup>2</sup> = 645.16mm<sup>2</sup>, 1 lbf = 4.45 N, 1 psi = 0.006895 MPa, 1 lbf • 10<sup>2</sup>/in - 17,500 N/m.

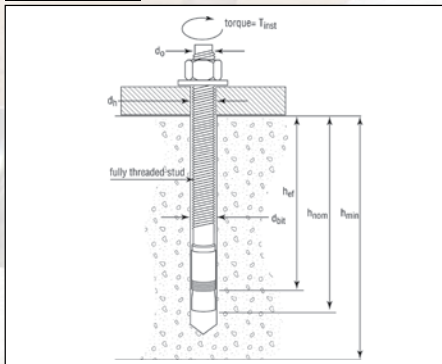
<sup>1</sup> The 1/2" and 5/8" diameter anchors are classified as ductile in accordance with D1 of ACI 318.

<sup>2</sup> The 3/8" diameter anchor is classified as ductile (tension only) in accordance with D1 of ACI 318.

<sup>3</sup> 1/2" & 5/8" diameter data is listed in ICC-ES ESR-2427

\* Anchor pullout strength does not control anchor design. Determine steel and concrete capacity only.

#### **TRUBOLT+** WEDGE ANCHOR (INSTALLED)



#### **TRUBOLT+** WEDGE INSTALLATION INFORMATION

	Symbol	Units	3/8"		1/2"		5/8"	
Anchor outer diameter	$d_o$	in	3/8		1/2		5/8	
Nominal carbide bit diameter	$d_{bit}$	in	3/8		1/2		5/8	
Effective embedment depth	$h_{ef}$	in	1-5/8		2		3-1/4	
Anchor embedment depth	$h_{nom}$	in	2		2-1/2		3-3/4	
Minimum slab thickness	$h_{min}$	in	4	5	4	6	6	8
Installation torque	$T_{inst}$	ft-lb	30		45		90	
Reference hole diameter	$d_h$	in	1/2		9/16		11/16	

#### **TRUBOLT+** WEDGE ANCHOR ALLOWABLE STATIC TENSION (ASD), NORMAL-WEIGHT UNCRACKED CONCRETE (POUNDS)<sup>1-5</sup>

Nominal Anchor Diameter (in.)	Effective Embedment Depth (in.)	Concrete Compressive Strength		
		$f'_c = 2,500$ psi	$f'_c = 3,000$ psi	$f'_c = 4,000$ psi
3/8	1-5/8	1,015	1,110	1,285
	2	1,490	1,630	1,885
1/2	3-1/4	2,870	3,145	3,635
	2-3/4	2,385	2,610	3,015
5/8	4-1/4	3,910	4,285	4,945

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 Mpa

Design Assumptions:

<sup>1</sup> Single anchor with static tension load only.

<sup>2</sup> Load combinations from 2006 IBC, Sections 1605.2.1 and 1605.3.1 (no seismic loading).

<sup>3</sup> Assumed thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L

<sup>4</sup> Calculation of weighted average: 1.2D + 1.6L = 1.2(0.3) + 1.6(0.7) = 1.4

<sup>5</sup> Values do not include edge distance or spacing reductions.



# ITW RED HEAD TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION FOR INSTALLATION IN THE SOFFIT OF CONCRETE FILL ON METAL DECK FLOOR AND ROOF ASSEMBLIES

## TRUBOLT+ WEDGE ANCHOR DESIGN INFORMATION<sup>1</sup>

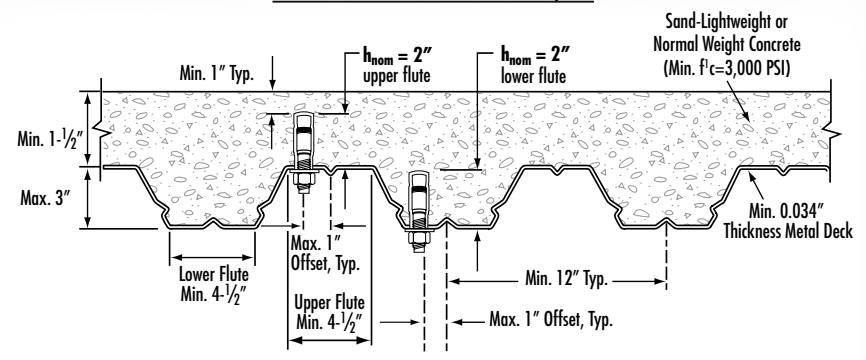
Characteristic	Symbol	Units	Nominal Anchor Diameter					
			3/8"		1/2"		5/8"	
			Upper /Lower	Upper Only	Lower Only	Lower Only	Lower Only	Lower Only
Pullout strength, uncracked concrete over metal deck	$N_{p, deck, uncr}$	lbf	2,170	2,515	2,515	5,285	3,365	6,005
Pullout strength, cracked concrete over metal deck	$N_{p, deck, cr}$	lbf	1,650	1,780	1,780	4,025	2,405	5,025
Reduction factor for pullout strength in tension, Condition B	$\phi$	—	0.65					
Shear strength, uncracked concrete over metal deck	$V_{p, deck, uncr}$	lbf	1,640	2,200		3,790	2,890	6,560
Reduction factor for steel strength in shear	$\phi$	—	0.65					

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N  
<sup>1</sup> 1/2" diameter data is listed in ICC-ES ESR-2427

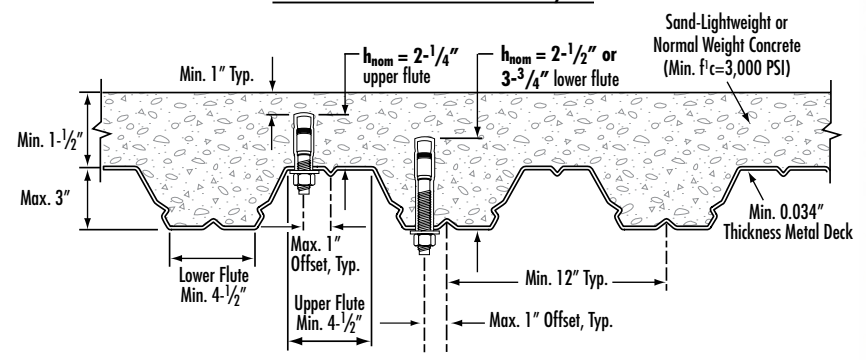
**2006 IBC  
Compliant**



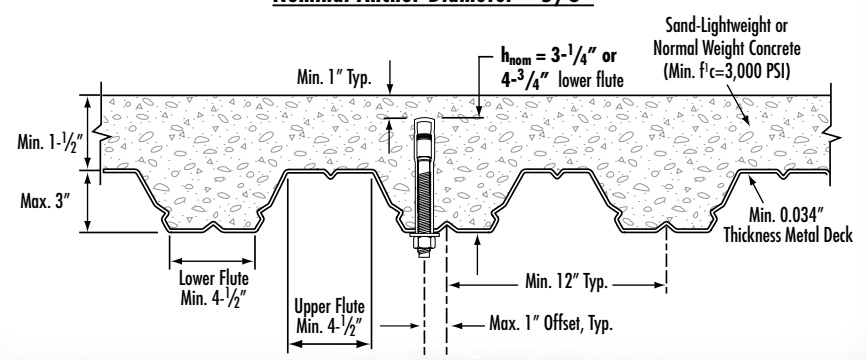
### Nominal Anchor Diameter = 3/8"



### Nominal Anchor Diameter = 1/2"



### Nominal Anchor Diameter = 5/8"



## TRUBOLT+ SELECTION GUIDE

TRUBOLT+ PART NO.	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY PER BOX	QTY PER MASTER CARTON
CWS-3830	1-5/8 (41.3)	3/8" - 16	3 (76.2)	5/8 (15.9)	50	400
CWS-3836	2-3/8 (60.3)		3-3/4 (95.3)	1-3/8 (34.9)	50	300
CWS-3850	3-5/8 (92.1)		5 (127.0)	2-5/8 (66.7)	50	300
CWS-1236	2-1/8 (54.0)	1/2" - 13	3-3/4 (95.3)	3/4 (19.1)	25	150
CWS-1242	2-5/8 (66.7)		4-1/4 (108.0)	1-1/4 (31.8)	25	150
CWS-1244	2-7/8 (73.0)		4-1/2 (114.3)	1-1/2 (38.1)	25	150
CWS-1254	3-7/8 (98.4)		5-1/2 (139.7)	2-1/2 (63.5)	25	150
CWS-1270	5-3/8 (136.5)		7 (177.8)	4 (101.6)	25	150
CWS-5850	3-3/16 (81.0)	5/8" - 11	5 (127.0)	1-1/8 (28.6)	10	100
CWS-5860	4-3/16 (106.4)		6 (152.4)	2-1/8 (54.0)	10	50
CWS-5870	5-3/16 (131.8)		7 (177.8)	3-1/8 (79.4)	10	30
CWS-5884	5-3/4 (146.0)		8-1/2 (215.9)	4-5/8 (117.5)	10	30

## TRUBOLT SELECTION GUIDE

CARBON STEEL WITH ZINC PLATING PART NO.	CARBON STEEL WITH HOT-DIPPED GALVANIZING PART NO.	TYPE 304 STAINLESS STEEL PART NO.	TYPE 316 STAINLESS STEEL PART NO.	THREAD LENGTH In. (mm)	ANCHOR DIA. & DRILL BIT SIZE (THREADS) PER INCH	OVERALL LENGTH In. (mm)	MAX. THICKNESS OF MATERIAL TO BE FASTENED In. (mm)	QTY PER BOX	QTY PER MASTER CARTON
WS-1416		WW-1416		3/4 (19.1)	1/4" - 20	1-3/4 (44.5)	3/8 (9.5)	100	1000
WS-1422		WW-1422	SWW-1422	1-1/4 (31.8)		2-1/4 (57.2)	7/8 (22.2)	100	1000
WS-1432		WW-1432	SWW-1432	2-1/4 (57.2)		3-1/4 (82.6)	1-7/8 (47.6)	100	800
WS-3822		WW-3822	SWW-3822	1-1/8 (28.6)	3/8" - 16	2-1/4 (57.2)	3/8 (9.5)	50	500
WS-3826		WW-3826	SWW-3826	1-5/8 (41.3)		2-3/4 (69.9)	7/8 (22.2)	50	400
WS-3830		WW-3830	SWW-3830	1-3/4 (44.5)		3 (76.2)	1-1/8 (28.6)	50	400
WS-3836		WW-3836	SWW-3836	2-1/2 (63.5)		3-3/4 (95.3)	1-7/8 (47.6)	50	300
WS-3850		WW-3850	SWW-3850	3-3/4 (95.2)		5 (127.0)	3-1/8 (79.4)	50	250
WS-3870				3-7/8 (98.4)		7 (177.8)	5-1/8 (130.2)	50	250
WS-1226	WS-1226G	WW-1226	SWW-1226	1-1/4 (31.8)	1/2" - 13	2-3/4 (69.9)	1/8 (3.2)	25	200
WS-1236		WW-1236	SWW-1236	2-1/4 (57.2)		3-3/4 (95.3)	1 (25.4)	25	150
WS-1242	WS-1242G	WW-1242	SWW-1242	2-3/4 (69.9)		4-1/4 (108.0)	1-1/2 (38.1)	25	150
WS-1244				3 (76.2)		4-1/2 (114.3)	1-3/4 (44.5)	25	150
WS-1254	WS-1254G	WW-1254	SWW-1254	4 (101.6)		5-1/2 (139.7)	2-3/4 (69.9)	25	150
WS-1270	WS-1270G	WW-1270		5-1/2 (139.7)		7 (177.8)	4-1/4 (108.0)	25	150
WS-5834	WS-5834G	WW-5834		1-3/4 (44.5)	5/8" - 11	3-1/2 (88.9)	1/8 (3.2)	10	100
WS-5842		WW-5842	SWW-5842	2-1/2 (63.5)		4-1/4 (108.0)	7/8 (22.2)	10	100
WS-5850		WW-5850	SWW-5850	3-1/4 (82.6)		5 (127.0)	1-5/8 (41.3)	10	100
WS-5860	WS-5860G	WW-5860		4-1/4 (107.9)		6 (152.4)	2-5/8 (66.7)	10	50
WS-5870		WW-5870	SWW-5870	5-1/4 (133.4)		7 (177.8)	3-5/8 (92.1)	10	30
WS-5884		WW-5884		5-3/4 (146.0)		8-1/2 (215.9)	5-1/8 (130.2)	10	30
WS-58100				5-3/4 (146.0)		10 (254.0)	6-5/8 (168.3)	10	30
WS-3442		WW-3442		2-3/8 (60.3)	3/4" - 10	4-1/4 (108.0)	1/4 (31.8)	10	60
WS-3446	WS-3446G	WW-3446	SWW-3446	2-7/8 (73.0)		4-3/4 (120.7)	3/4 (19.1)	10	60
WS-3454	WS-3454G	WW-3454	SWW-3454	3-5/8 (92.1)		5-1/2 (139.7)	1-1/2 (38.1)	10	50
WS-3462				4-3/8 (111.1)		6-1/4 (158.8)	2-1/4 (57.2)	10	30
WS-3470		WW-3470		5-1/8 (130.2)		7 (177.8)	3 (76.2)	10	30
WS-3484	WS-3484G	WW-3484		5-3/4 (146.0)		8-1/2 (215.9)	4-1/2 (114.3)	10	30
WS-34100		WW-34100		5-3/4 (146.0)		10 (254.0)	6 (152.4)	10	30
WS-34120				1-3/4 (44.5)		12 (304.8)	8 (203.2)	10	30
WS-7860				2-1/2 (63.5)	7/8" - 9	6 (152.4)	1-3/8 (34.9)	5	25
WS-7880				2-1/2 (63.5)		8 (203.2)	3-3/8 (85.7)	5	15
WS-78100				2-1/2 (63.5)		10 (254.0)	5-3/8 (136.5)	5	15
WS-10060		WW-10060		2-1/2 (63.5)	1" - 8	6 (152.4)	1/2 (12.7)	5	25
WS-10090		WW-10090		2-1/2 (63.5)		9 (228.6)	3-1/2 (88.9)	5	15
WS-100120				2-1/2 (63.5)		12 (304.8)	6-1/2 (165.1)	5	15
<b>Tie Wire</b>									
TW-1400				N/A	1/4"	2-1/8 (54.0)	9/32 -hole (7.1)	100	1000
TW-1400 K				N/A		2-1/8 (54.0)	9/32 -hole (7.1)	BULK	BULK



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RH016 08/09

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# 5 Products designed and tested for cracked concrete



Most states across the country have now adopted the 2006 International Building Code (IBC). As a result, engineers and designers are increasingly being required to specify anchors designed and tested to meet the new requirements.

Designers are now being required to consider whether conditions exist that may cause the concrete to crack. If it's determined such conditions do exist, anchors designed and tested for use in cracked concrete must be specified.

Simpson Strong-Tie Anchor Systems® has devoted years of research and extensive testing to develop these products for cracked and uncracked concrete.



SET-XP™  
Epoxy-Tie® anchoring adhesive

### SET-XP™ anchoring adhesive

Code listed: ICC-ES ESR-2508

- High-strength epoxy adhesive tested to 2006 IBC and ICC-ES AC308 cracked-concrete requirements
- Code listed for installation with rebar and threaded rod in cracked and uncracked concrete
- Tested for 1¾" minimum edge distance
- Easy, standard hole-cleaning procedure
- Cures to a dark teal color for easy identification as a 2006 IBC cracked-concrete product



Titen HD® anchor  
U.S. Patent  
6,674,035 & 6,629,228

### Titen HD® screw anchor

Code listed: ICC-ES ESR 2713 (concrete)  
ICC-ES ESR 1056 (masonry)\*

- Heavy-duty screw anchor tested to 2006 IBC and ICC-ES AC193 cracked-concrete requirements
- Code listed for use in cracked and uncracked concrete
- 'Category 1' anchor
- Fast and easy installation
- Tested for 1¾" minimum edge distance
- Perfect for overhead installations and racking
- Installed with standard, non-metric drill bits – no special drill bit required
- Standard hole-cleaning procedure
- Removable anchor

\* The Titen HD® anchor is also recognized in ESR-1056 for installations in uncracked grout-filled concrete masonry tested to 2006 IBC and ICC-ES AC106.



Strong-Bolt™  
Wedge anchor



Tri-segmented clip

### Strong-Bolt™ wedge anchor

Code listed: ICC-ES ESR-1771

- Expansion anchor tested to 2006 IBC and ICC-ES AC193 cracked-concrete requirements
- Code listed for use in cracked and uncracked concrete
- 1½" and ¾" dia. are 'Category 1' anchors
- Tri-segmented clip with undercutting embossments for superior performance
- Perfect for mechanical equipment and overhead anchorage applications

# Cracked-Concrete Solutions

5 Products designed and tested for cracked concrete



**IXP™ anchor**  
Patent Pending

**SET-XP™**  
Epoxy-Tie® anchoring adhesive

## IXP™ anchor with SET-XP™ anchoring adhesive

ICC-ES pending

- Torque-controlled adhesive anchor
- Tested to 2006 IBC and ICC-ES AC308 cracked-concrete requirements
- 'Category 1' anchor
- Greater load capacity and shallower embedment depth than threaded rod under some adverse conditions
- Uniquely designed for high-strength performance in cracked-concrete applications
- Easy, standard hole-cleaning procedure
- Installed with standard, non-metric drill bits – no special drill bit required



**Torq-Cut™**  
self-undercutting anchor  
U.S. Patent 7,357,613


## Torq-Cut™ undercut anchor

ICC-ES pending

- Self-undercutting anchor – no secondary undercutting operation required
- Our highest strength mechanical anchor
- Tested to 2006 IBC and AC193 cracked-concrete requirements
- 'Category 1' anchor
- Excellent for resisting vibratory and seismic loading
- Installed with standard, non-metric drill bits - no special undercutting drill bits required
- Standard hole-cleaning procedure

## Simpson Strong-Tie® Product Comparison

This chart shows which Simpson Strong-Tie® anchors are code-listed for cracked-concrete applications under the 2006 IBC.

Listed for cracked-concrete applications 	Replaces
SET-XP™ adhesive	SET Epoxy-Tie® adhesive
	ET Epoxy-Tie® adhesive
	Acrylic-Tie® adhesive*
Strong-Bolt™ anchor	Wedge-All® anchor
Titen HD® anchor	Titen HD® anchor

\* Acrylic-Tie adhesive is currently being evaluated for listing for cracked-concrete application.

## Competitive Product Comparison

This chart shows which Simpson Strong-Tie® anchors may be suitable as a substitute for a competitor's cracked-concrete listed product under the 2006 IBC.

Simpson Strong-Tie® anchors listed for cracked-concrete applications	Competitor's product listed for cracked-concrete applications
SET-XP™ adhesive	Hilti HIT RE-500-SD
Strong-Bolt™ anchor	Hilti Kwik Bolt TZ
	ITW Red Head Trubolt+
Titen HD® anchor	Powers Power-Stud+ SD1 or SD2
	Powers Wedge-Bolt+

Product comparisons are of the same product type and are for general purposes. Product substitutions must be approved by the engineer of record and local building department or regulatory agency.

*This tier is effective until January 31, 2011, and reflects information available as of January 1, 2008. This information is updated periodically and should not be relied upon after January 31, 2011; contact Simpson Strong-Tie for current information and limited warranty or see [www.simpsonanchors.com](http://www.simpsonanchors.com).*

# Comparison Sheets



You do not have to be stuck with the pins specified on your prints.

We can provide you with specific comparison sheets like those enclosed, both in the straight data style and the comparison style.





## Performance comparison

Hilti X-U vs. Ramset SP				Allowable <b>TENSION</b> Values (lbs) Concrete compressive strength				
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)
Ramset Suggested	Ramset SP series	0.150"	3/4	n/a	150	81	n/a	76
Specified fastner	All Hilti X-U pins	0.157"		100	100	105	125	95
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1	154	243	189	226	134
Specified fastner	All Hilti X-U pins	0.157"		165	170	110	205	120
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1 1/4	207	298	213	329	157
Specified fastner	All Hilti X-U pins	0.157"		240	280	180	315	120
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1 1/2	n/a	384	239	406	233
Specified fastner	All Hilti X-U pins	0.157"		275	325	n/a	425	260

Hilti X-U vs. Ramset SP				Allowable <b>SHEAR</b> Values (lbs) Concrete compressive strength				
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)
Ramset Suggested	Ramset SP series	0.150"	3/4	n/a	105	82	n/a	260
Specified fastner	All Hilti X-U pins	0.157"		125	125	205	115	245
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1	200	175	210	250	265
Specified fastner	All Hilti X-U pins	0.157"		190	225	280	260	330
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1 1/4	230	218	305	377	269
Specified fastner	All Hilti X-U pins	0.157"		310	310	425	435	375
Ramset Suggested	Ramset SP series	0.150"/ 0.180"	1 1/2	n/a	391	594	380	346
Specified fastner	All Hilti X-U pins	0.157"		420	420	n/a	475	430

**NOTES:**

Please visit [www.ramset.com](http://www.ramset.com) or contact your local representative for further details and complete installation instructions and specifications

The above Ramset performance values are taken from the 2006 Ramset catalog

The above Hilti performance values are taken from the 2006 Hilti Technical Guide

**The Ramset Pins are Made in the USA**

## Performance comparison

Hilti X-U vs. Ramset 1500 series				Allowable <b>TENSION</b> Values (lbs) Concrete compressive strength				
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)
Ramset Suggested	Ramset 1500 series	.145"	3/4	50	100	n/a	167	76
Specified fastner	All Hilti X-U pins	0.157"		100	100	105	125	95
Ramset Suggested	Ramset 1500 series	.145"	1	152	157	n/a	200	134
Specified fastner	All Hilti X-U pins	0.157"		165	170	110	205	120
Ramset Suggested	Ramset 1500 series	.145"	1 1/4	159	179	n/a	333	157
Specified fastner	All Hilti X-U pins	0.157"		240	280	180	315	120
Ramset Suggested	Ramset 1500 series	.145"	1 1/2	154	209	n/a	391	233
Specified fastner	All Hilti X-U pins	0.157"		275	325	n/a	425	260

Hilti X-U vs. Ramset 1500				Allowable <b>SHEAR</b> Values (lbs) Concrete compressive strength				
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)
Ramset Suggested	Ramset 1500 series	.145"	3/4	66	104	n/a	179	260
Specified fastner	All Hilti X-U pins	0.157"		125	125	205	115	245
Ramset Suggested	Ramset 1500 series	.145"	1	166	182	n/a	228	265
Specified fastner	All Hilti X-U pins	0.157"		190	225	280	260	330
Ramset Suggested	Ramset 1500 series	.145"	1 1/4	265	267	n/a	400	269
Specified fastner	All Hilti X-U pins	0.157"		310	310	425	435	375
Ramset Suggested	Ramset 1500 series	.145"	1 1/2	340	342	n/a	410	346
Specified fastner	All Hilti X-U pins	0.157"		420	420	n/a	475	430

**NOTES:**

Please visit [www.ramset.com](http://www.ramset.com) or contact your local representative for further details and complete installation instructions and specifications

The above Ramset performance values are taken from the 2006 Ramset catalog

The above Hilti performance values are taken from the 2006 Hilti Technical Guide

The Ramset Pins are Made in the USA

## Performance comparison

Hilti X-U vs. Ramset T3				Allowable <b>TENSION</b> Values (lbs) Concrete compressive strength					
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)	Hollow block
Ramset Suggested	Ramset T3 straight shank	0.125"	3/4	107	104	n	108	93	n
Specified fastner	All Hilti X-U pins	0.157"		100	100	105	125	95	n

Hilti X-U vs. Ramset T3				Allowable <b>SHEAR</b> Values (lbs) Concrete compressive strength					
	Part Number	Shank Diameter	Minimum Penetration (inches)	2000	4000	6000	3000 LT weight	3000 LT weight over metal deck (lower flute)	Hollow block
Ramset Suggested	Ramset T3 straight shank	0.125"	3/4	156	195	n	173	288	n
Specified fastner	All Hilti X-U pins	0.157"		125	125	205	115	245	n

NOTES:  
Please visit [www.ramset.com](http://www.ramset.com) or contact your local representative for further details and complete installation instructions and specifications  
The above Ramset performance values are taken from the 2006 Ramset catalog  
The above Hilti performance values are taken from the 2006 Hilti Technical Guide  
**The Ramset Pins are Made in the USA**

## Performance comparison

Hilti XU vs 1500 series				Allowable <u>TENSION</u> Values (lbs) Concrete Compressive Strength (psi)				
	Part Number	Shank Diameter (inches)	Minimum Penetration (inches)	2000	4000	6000	3000 LT WT ovr decking lwr flute	300 LT WT
Specified Fastener	<b>XU</b>	0.157	1-1/4	<b>240</b>	<b>280</b>	<b>180</b>	<b>120</b>	<b>315</b>
Ramset Suggested	<b>series</b>	0.145	1-1/4	<b>159</b>	<b>179</b>	<b>n</b>	<b>157</b>	<b>333</b>

				Allowable <u>SHEAR</u> Values (lbs) Concrete Compressive Strength (psi)				
	Part Number	Shank Diameter (inches)	Minimum Penetration (inches)	2000	4000	6000	3000 LT WT ovr decking lwr flute	3000 LT WT
Specified Fastener	<b>XU</b>	0.157	1-1/4	<b>310</b>	<b>310</b>	<b>425</b>	<b>375</b>	<b>435</b>
Ramset Suggested	<b>series</b>	0.145	1-1/4	<b>265</b>	<b>267</b>	<b>n</b>	<b>269</b>	<b>400</b>



1500 series



HILTI X-U

Shear spacing specifications					
Required Spacing (in.)	Concrete Compressive Strength (psi)				Adjusted Spacing in Inches for Ramset equivalent
	2000	4000	6000	3000 LT	
6	5.1	5.2	NO STD	4.3	
9	7.7	7.8	NO STD	6.5	
12	10.3	10.3	NO STD	8.6	
14	12.0	12.1	NO STD	10.0	
16	13.7	13.8	NO STD	11.5	
18	15.4	15.5	NO STD	12.9	
20	17.1	17.2	NO STD	14.3	
22	18.8	18.9	NO STD	15.8	
24	20.5	20.7	NO STD	17.2	
26	22.2	22.4	NO STD	18.7	
28	23.9	24.1	NO STD	20.1	
30	25.6	25.8	NO STD	21.5	
32	27.4	27.6	NO STD	23.0	
34	29.1	29.3	NO STD	24.4	
36	30.8	31.0	NO STD	25.8	

**NOTES:**

The above Ramset performance values are taken from the 2006 Ramset catalog  
 The above Hilti performance values are taken from the 2006 Hilti Technical Guide

n = no data provided  
 NO STD = No Standard

**The Ramset 1500 series is Made in the USA**

calculation cannot be performed

Calculations are based upon any differences in allowable shear performance between the specified fasteners and the Ramset fastener. The allowable shear load of the Ramset fastener is divided by the allowable shear load of the specified fastener. The difference in performance of the two fasteners is equated to a difference in percent. This difference in percent is multiplied to the recommended or specified spacing of the fastener effectively reducing it. **By slightly reducing the spacing of the fastener, the originally calculated performance demands are kept the same.** The table above shows the data points where an adjustment in spacing may be needed. Where the Ramset pin equals or surpasses the specified pin performance, spacing of the fastener stays the same.

Calculation Example: Allowable Shear in 4000psi Concrete

$$\text{Ramset Value} \div \text{Hilti Value} = \text{Percent Difference} \times \text{Specified Spacing} = \text{Adjusted Spacing to Equal Performance}$$

$$156\text{lbs} \div 75\text{lbs} = 2.08 \text{ or } 208\% \times 16'' \text{ on center} = > 16'' \text{ on center}$$

## Performance comparison

Hilti XU vs SP series				Allowable <u>TENSION</u> Values (lbs) Concrete Compressive Strength (psi)				
	Part Number	Shank Diameter (inches)	Minimum Penetration (inches)	2000	4000	6000	3000 LT WT ovr decking lwr flute	300 LT WT
Specified Fastener	XU	0.157	1-1/4	240	280	180	120	315
Ramset Suggested	SP			0.150/0.180	207	298	213	175

				Allowable <u>SHEAR</u> Values (lbs) Concrete Compressive Strength (psi)				
	Part Number	Shank Diameter (inches)	Minimum Penetration (inches)	2000	4000	6000	3000 LT WT ovr decking lwr flute	3000 LT WT
Specified Fastener	XU	0.157	1-1/4	310	310	425	375	435
Ramset Suggested	SP			0.150/0.180	1-1/4	230	218	305



SP series



HILTI X-U

Shear spacing specifications					
Required Spacing (in.)	Concrete Compressive Strength (psi)				
	2000	4000	6000	3000 LT WT ovr decking lwr flute	
				2000	4000
6	4.5	4.2	4.3	6.0	Adjusted Spacing in Inches for Ramset equivalent
9	6.7	6.3	6.5	8.9	
12	8.9	8.4	8.6	11.9	
14	10.4	9.8	10.0	13.9	
16	11.9	11.3	11.5	15.9	
18	13.4	12.7	12.9	17.9	
20	14.8	14.1	14.4	19.8	
22	16.3	15.5	15.8	21.8	
24	17.8	16.9	17.2	23.8	
26	19.3	18.3	18.7	25.8	
28	20.8	19.7	20.1	27.8	
30	22.3	21.1	21.5	29.8	
32	23.7	22.5	23.0	31.7	
34	25.2	23.9	24.4	33.7	
36	26.7	25.3	25.8	35.7	

NOTES:

The above Ramset performance values are taken from the 2006 Ramset catalog  
 The above Hilti performance values are taken from the 2006 Hilti Technical Guide

n = no data provided  
 NO STD = No Standard

### The Ramset SP pin is Made in the USA

calculation cannot be performed

Calculations are based upon any differences in allowable shear performance between the specified fasteners and the Ramset fastener. The allowable shear load of the Ramset fastener is divided by the allowable shear load of the specified fastener. The difference in performance of the two fasteners is equated to a difference in percent. This difference in percent is multiplied to the recommended or specified spacing of the fastener effectively reducing it. **By slightly reducing the spacing of the fastener, the originally calculated performance demands are kept the same.** The table above shows the data points where an adjustment in spacing may be needed. Where the Ramset pin equals or surpasses the specified pin performance, spacing of the fastener stays the same.

#### Calculation Example: Allowable Shear in 4000psi Concrete

$$\text{Ramset Value} \div \text{Hilti Value} = \text{Percent Difference} \times \text{Specified Spacing} = \text{Adjusted Spacing to Equal Performance}$$

$$156\text{lbs} \div 75\text{lbs} = 2.08 \text{ or } 208\% \times 16" \text{ on center} = > 16" \text{ on center}$$

July 2, 2008

To Whom It May Concern:

This letter is to certify that the following Ramset fastening products are manufactured in the United States of America and the state they are made in:

FPP series TrakFast Fasteners	KY
T3 series Fasteners	KY
M series Gas-Powered Fasteners	KY
1500 & SP series Powder Actuated Fasteners	KY
Powder Actuated Ceiling Clips	KY
Powder & Gas Threaded Rod Hangers	KY
Powder & Gas Conduit Straps and Clamps	KY
Tie Strap Holder	KY
MP & SP series "Top Hat" pins	KY
Fuel Cells for Ramset Gas-Powered Tools	MS
Powder Actuated Loads	MS & ID
SC200 Sound Caulk	MA
DA100 Drywall Adhesive	MA

The following Ramset Tools are also manufactured in the United States of America:

TF1100 – TrakFast	IL
T3SS	IL
T3MAG	IL
D45A	IL
Rocket	IL

If I can be of any other assistance please call me at 1-800-726-7386.

Best Regards,



Dave Jablonski  
Product Validation Manager