Extreme Wind Condition Mounting Kit

INSTALLATION INSTRUCTIONS

For Anchoring (*)S3, (*)S4, (*)S5, (*)SA2, (*)SA4, (*)S6, RSN13, RSG13, & RSG14 Air Conditioners and (*)T3, (*)T4, (*)T5, (*)T6, (*)SH2, (*)SH4, HRN13, HRG13, & HRG14 Heat Pump Models From 1.5 - 5 Ton

KIT CONTENTS

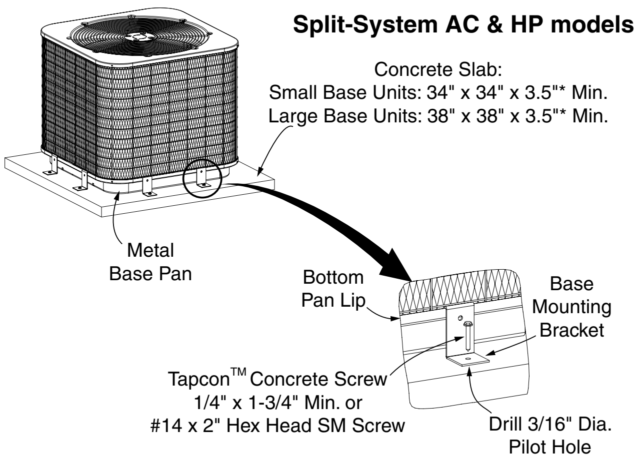
DESCRIPTION	QUANTITY
Base Mounting Bracket for models with metal base pan	8
Base Mounting Bracket for models with composite base pan	8
Tapcon™ Concrete Screw 1/4" x 1-3/4"	8
Hex Head SM Screw #14 x 2"	8
Installation Instructions	1

ABOUT THE KIT

The extreme wind condition mounting kit is used to anchor split-system air conditioners and heat pumps.

This anchor system is designed to meet the requirements of Section 1620 of the Florida Building Code, 5th Edition (2014), regarding the wind resistance and anchoring requirements for mechanical equipment in Florida hurricane zones. This kit will secure these units to an adequately designed concrete base pad, metal frame or roof structure so that it can withstand a 3 second gust of a maximum wind speed of 180 MPH. Minimum concrete pad requirements are shown in the illustration.

The kit has been updated to include four additional base mounting brackets for use on units that have the composite base pan. These brackets can be identified by the number of holes in the base of the bracket. Composite base pan mounting brackets have 3 holes in the base.



*Slab may be less than 3.5" but not less than 2" if allowed by all applicable codes.
Mounting system depicted is suitable for mounting to 3000 PSI poured concrete, 1/8" minimum thickness steel, or 1/4" minimum thickness aluminum at a height above ground up to 250 feet.

INSTALLATION OF THE ANCHOR KIT ON SPLIT-SYSTEM AC/HP MODELS:

1. It is recommended that this kit be installed on the unit prior to connecting refrigerant lines and electrical wiring. It may be installed later if necessary.
2. Position the unit on the concrete pad or other structure and install the base mounting brackets as shown in the figure below. **NOTE:** The provided concrete screws may be used if the unit is being anchored to a concrete pad or slab. If the unit is mounted on a built-up roof or other appropriate structure or framework, the provided 2" sheet metal screws may be used.
3. Install two anchors on each side of the corners of the unit as shown for split-system AC/HP models (below). **IMPORTANT:** The screws used in this kit must be properly installed so that the head of the fastener engages the bracket and anchors it securely.

PRODUCT CERTIFICATION

The test data, instructions, and contents of the "high-wind" mounting kits for anchoring Model (*)S3, (*)S4, (*)S5, (*)SA2, (*)SA4, (*)S6, RSN13, RSG13, & RSG14 Air Conditioners and (*)T3, (*)T4, (*)T5, (*)T6, (*)SH2, (*)SH4, HRN13, HRG13, & HRG14 heat pumps have been reviewed and these findings have been established:

- The mounting kit clips allow the designated units to resist a 180 MPH wind speed when fastened to an adequately designed hard concrete or metal support (stand) in accordance with provided instructions.
- The acceptable anchoring fasteners include 1/4" TapconsTM with 1 1/2" embedment into concrete and #14 x 2" sheet metal screws, one through each clip and into mating metal support.
- The technical study was based upon Section 1620 of the Florida Building Code, 5th Edition (2014), 3 second gust wind speed, and an exposure to category "C".
- This installation is approved for units on buildings with a height less than or equal to 250 ft.

NOTE: Copies of the Installation Instructions included with the kit are not stamped. If the local Mechanical Inspection office does not have a stamped copy of this Installation Instruction on file, one may be obtained from the manufacturer of this kit. Contact the distributor where this kit was purchased.

EACH OF THE UNITS LISTED BELOW CONFORM TO THE REQUIREMENTS OF THE 5TH EDITION OF THE FLORIDA BUILDING CODE (2014) AND ASCE 7-10. IF THE HIGH WIND KIT IS PROPERLY INSTALLED THE UNIT WILL REMAIN FASTENED TO THE SLAB OR APPROPRIATE METAL SUPPORT (STAND) AND WILL ALSO NOT LOSE IT'S STRUCTURAL INTEGRITY AND BECOME WINDBORNE DEBRIS IF EXPOSED TO THE FOLLOWING CONDITIONS:

Ultimate design wind speed (3 second gust) = 180 MPH
Maximum heigh of unit installation = 250 feet

The covered units are all less than 30.75" wide and long, less than 45" tall, and less than 301 lbs.

NOTE: (*) MAY BE REPLACED BY A CHARACTER DENOTING A BRAND/STYLE

MODEL NUMBER
(*)S4BD SERIES
(*)S4BE SERIES
(*)S4BF SERIES
(*)S4BG SERIES
(*)S4BI SERIES
(*)S5BD SERIES
(*)S6BF SERIES
(*)SA4BD SERIES
(*)SA4BE SERIES
(*)SA4BF SERIES
(*)SA4BG SERIES
(*)SA4BI SERIES
(*)SH4BD SERIES
(*)SH4BE SERIES
(*)SH4BF SERIES
(*)T4BD SERIES
(*)T4BE SERIES
(*)T4BF SERIES
(*)T5BD SERIES
(*)T6BE SERIES
FT4BG SERIES
FT4BI SERIES
HRG13 SERIES
HRG14 SERIES
HRG16 SERIES
HRN13 SERIES
PSH4BG SERIES
PSH4BI SERIES
RSG13 SERIES
RSG14 SERIES
RSG16 SERIES
RSN13 SERIES

Coefficient Definitions

FBC Ref.			
1620.2	**Ultimate design wind speed (mph)**	V_{ult}	180
1609.3.1	**Nominal design wind speed**	V_{asd}	139

1609.4.3	**Exposure Category**	C

1609.6.2	**Wind Stagnation Pressure**	q_s	82.9

1609.6.4.2	**velocity pressure exposure coefficient**	K_z	=	2.01((z/zg)^(2/a))	=	**1.53**
	height above ground (ft)	z	250			
		z_g	900			
		a	9.5			

1609.6.4.2	**Topographic factor***	K_{zt}	=	(1+(K1*K2*K3))^3	=	**1.06**
	Height of Hill (ft)	H	60			
	Distance upwind of crest to half hill height (ft)	L_h	30			
	Distance from the crest to the building (ft)	x	90			
	Height above local ground level (ft)	z	27			
	*worst case					
		K_1	0.72			
		K_2	0.25			
		K_3	0.11			

6.5.3(6) ASCE 7	**Enclosure Classification**	Partially Enclosed

1609.6.4.3	**Net Pressure Coefficient**	$C_{net,h}$	0.99	Square (Wind Normal to Face)
		$C_{net,v}$	0.97	Partially Enclosed Flat Roof

1609.6.3	**Wind Pressure (psf)**	$P_{net,horiz}$	=	$q_s*K_z*C_{net,h}*K_{zt}$	=	**134**
		$P_{net,vert}$	=	$q_s*K_z*C_{net,v}*K_{zt}$	=	**131**

Roof Mount Only Coefficients

6.5.3(1) ASCE 7	**wind directionality factor**	K_d	1

6.5.3(9) ASCE 7	**Velocity Pressure (psf)**	q_z	=	$.00256*K_z*K_{zt}*K_d*(V^2)$	=	**135**

Load Combinations

1605.3.1	$0.6D_L + 0.6W_L + H$	(Equation 16 - 15)

Dead Loads (lb)	D_L	=	Weight of unit
Lateral Earth Loads (lb)	H_L	=	0
Fluid Loads (lb)	F_L	=	0
Wind Loads (lb)	W_L	=	$F_w + F_L$

SEP 21 2015
John D. Buerosse
Florida P.E. 0050867
750 E. Sample Rd.
Bldg. 3, Suite 220
Pompano Beach, Fl 33064
954-633-4692

Calculate Centroid of unit (force from wind) (Figure 1)

$$Y = \frac{(H-2.25)\,(W)\,((H-2.5)/2 + 2.25) \;+\; (2.25)\,(W-3.8)\,(2.25/2)}{(H-2.25)\,(W) \;+\; (2.25)\,(W-3.8)}$$

$$Y = \frac{(W*(H^2))/2) - 9.62}{(W*H - 8.55)}$$

Case 1:	PSH4BF060KA

where

W_1 (in)	30.75
H_1 (in)	45

Y_1 (in)	22.6329

Case 2:	JS5BD-018KA	

W_2 (in)	22.75
H_2 (in)	23

Y_2 (in)	11.67

<u>CASE 1: Ground Mounted Units</u>

Calculate Force from wind with velocity of 180 MPH (Figure 2)

$$F_W = P_{net} * A$$

HORIZONTAL FORCE

where

$P_{net,horiz}$ (psf)	133.67
$A_{1,H}$ (sqft)	9.61

$F_{W,1}$ (lbf)	1285

where

$P_{net,horiz}$ (psf)	133.67
$A_{2,H}$ (sqft)	3.63

$F_{W,2}$ (lbf)	486

VERTICAL FORCE (LIFT)

where

$P_{net,vert}$ (psf)	130.97
$A_{1,H}$ (sqft)	6.57

$F_{L,1}$ (lbf)	860

where

$P_{net,vert}$ (psf)	130.97
$A_{2,H}$ (sqft)	3.59

$F_{L,2}$ (lbf)	471

Calculate Lifting Force on Side of Unit (Figure 3)

Unit consists of 2 Anchors per side

Load Combination

In the vertical direction, the load combination reduces to the weight of the unit and the lift force (Wt and F^{L})

In the horizontal direction, the load combination reduces to just F^{W}.

$$Mo = (0.6W_t - 0.6*F_L)*(D) + (W-1.9)(N*Fa) - (0.6*Fw)*Y = 0$$

sum of moments = 0

$$Fa = \frac{(0.6*F_W*Y) - ((0.6Wt - 0.6*F_L)*D))}{N(W - 1.9)}$$

where

Wt_1 (lb)	301
D_1 (in)	13.475
N	2

Force per screw:

Fa_1 (lbf)	381	< 505 lbf allowable

Wt_2 (lb)	103
D_2 (in)	9.475
N	2

Force per screw:

Fa_2 (lbf)	132	< 505lb allowable

Therefore, Two 1/4"x1 3/4" Tapcon screws per side are sufficient to secure a ground mounted split unit.

SEP 21 2015
John D. Buerosse
Florida P.E. 0050867
750 E. Sample Rd.
Bldg. 3, Suite 220
Pompano Beach, Fl 33064
954-633-4692

CASE 2: Roof Mounted Units (Updated Per 1609.8)

Calculate Horizontal Force from wind with velocity of 180 MPH On Roof Mounted Unit (Figure 4)

$$F_W = q_z * G * C_f * A_f * SF$$

where

q_z (psf)	135.02
GC_f	3.1
A_1 (sqft)	9.61
$F_{W,1}$ (lbf)	4022

where

q_z (psf)	135.02
GC_f	3.1
A_2 (sqft)	3.63
$F_{W,2}$ (lbf)	1521

Calculated Lifting Force from wind with velocity of 180 MPH (1609.8, EQN 29.5-1 ASCE 7) (Roof Mounted)

$$F_L = q_z * G * C_f * A_f * SF$$

where

q_z (psf)	135.02	(assuming q_z = Pnet)
A_{f1} (sq. ft.)	6.57	(horiz. proj. area)
GC_f	1.5	
$F_{L,1}$	1330	

where

q_z (psf)	135.02	(assuming q_z = Pnet)
A_{f2} (sq. ft.)	3.59	(horiz. proj. area)
GC_f	1.5	
$F_{L,2}$	728	

Calculate the Force on Anchors When Roof Mounted (Figure 4)

Load Combinations: F_X: $0.6F_W$, F_y: $0.6F_L - 0.6\,Wt$

$$M_0: 0.6F_W y + (0.6F_L - 0.6W_t)D - F_a L_a = 0$$

sum of moments = 0

$$F_A = \frac{0.6(F_W y) + (0.6F_L - 0.6W_t)D}{L_A}$$

where

Wt_1 (lb)	284
D_1 (in)	13.475
L_A (in.)	28.54
$F_{A,1}$ (lbf)	2210

(Total force on the anchors)

Wt_2 (lb)	143
D_2 (in)	9.475
L_A (in.)	20.8
$F_{A,2}$ (lbf)	672

(Total force on the anchors)

Determine number of #14 1/4"x2" Sheet Metal Screws Necessary to Handle the Load

Material:	C1016-C1022	
Yield Strength (psi)	90,000	approx. value from supplier
Ult. Strength (psi)	120,000	approx. value from supplier

d (in)	0.251
Fos	4

$$\sigma_{axial} = \frac{F}{A} = \frac{F_A}{n\frac{\pi d^2}{4}}$$

Determine number of screws needed per side to not fail in yielding with a factor of safety of 4.0

$$\frac{\sigma_y}{F_{os}} = \frac{F_A}{n\frac{\pi d^2}{4}} \rightarrow n = \frac{F_A F_{os}}{\sigma_y \frac{\pi d^2}{4}}$$

n_1	1.99

n_2	0.60

Therefore, 2 #14 screws are needed to secure the largest units to the stand in rooftop applications.
Do not apply the screws to the unit's coil.

SEP 21 2015
John D. Buerosse
Florida P.E. 0050867
750 E. Sample Rd.
Bldg. 3, Suite 220
Pompano Beach, Fl 33064
954-633-4692

CASE 3: Unit integrity failure due to Wind Load (FMC 301.15)

Maximum uplift force seen by units is roof mounted. Failure is assumed to be separation of coil/jacket assembly from base mount.

$F_{L,1}$	1374

(Total force on the screws)

There are 9 #10 screws per side that secure the coil/jacket to the base. They are in direct shear in the same axis $F_{l,1}$ is acting.
The weight of the unit was neglected.

F_{screw} (lb)	153

At #10 (in^2)	0.0143

$$\tau_{screw} = \frac{V}{A} = \frac{F_{screw}}{A_t}$$

τ_{screw} (psi)	10666
Screw Mechanical Properties	
Material:	C1016-C1024
Tensile Strength, Yield (	52200
Shear Strength (psi)	31320

$$n = \frac{\tau_{all}}{\tau_{max}}$$

n	2.9

$F_{L,1}$	760

F_{screw} (lb)	84

At #10 (in^2)	0.0143

$$\tau_{screw} = \frac{V}{A} = \frac{F_{screw}}{A_t}$$

τ_{screw} (psi)	5899
Screw Mechanical Properties	
Material:	C1016-C1024
Tensile Strength, Yiel	52200
Shear Strength (psi)	31320

$$n = \frac{\tau_{all}}{\tau_{max}}$$

n	5.3

Therefore the unit can withstand the design forces without losing unit integrity.

SEP 21 2015
John D. Buerosse
Florida P.E. 0050867
750 E. Sample Rd.
Bldg. 3, Suite 220
Pompano Beach, Fl 33064
954-633-4692

Figure 1: Calculate Centroid

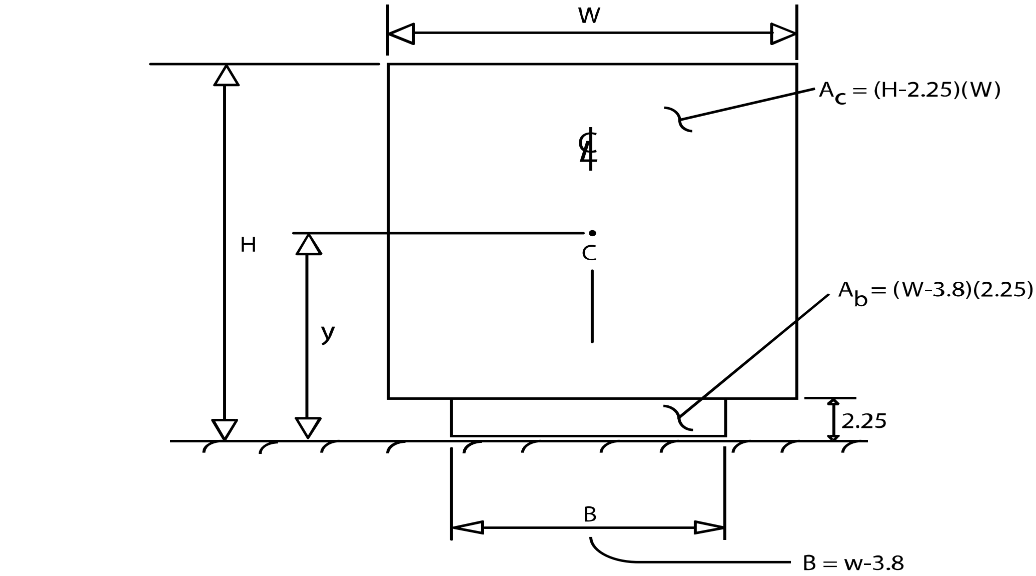


Figure 2: Calculate Wind Force

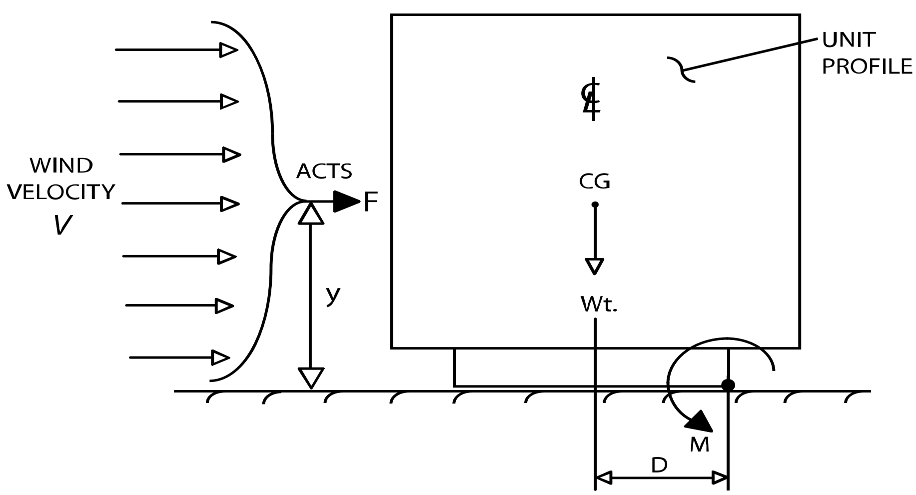


Figure 3: Calculate Lifting Force

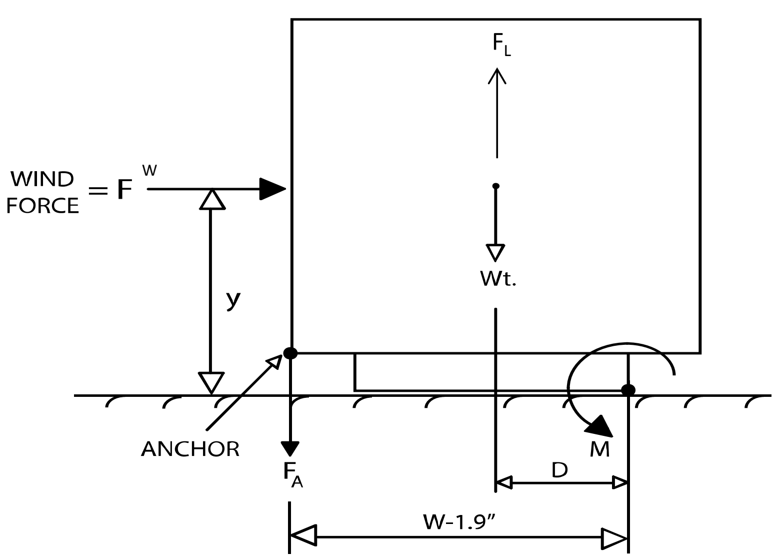
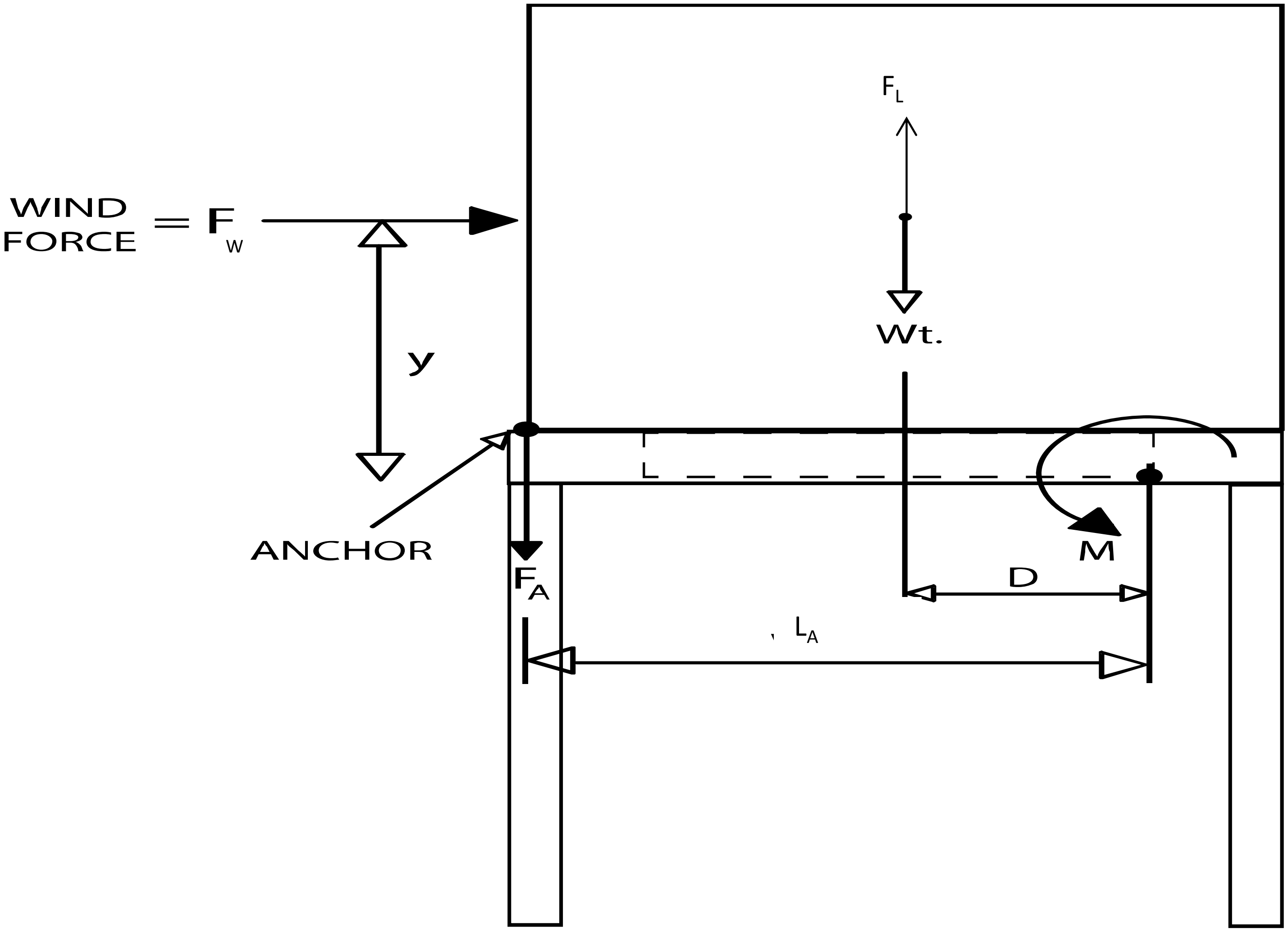


Figure 4: Calculate Anchor Force For Roof Mounted Units



NOTE: Unit shown on generic mounting stand.

Tapcon Concrete Anchors	
Dimensions	
Diameter (in)	0.25
Embedment Depth (in)	1.75

Mechanical Properties		
Tension Strength*		
Concrete Grade	Tension	Allowable Tension (lbs)
2000 psi	2020	505
4000 psi	2380	595
5000 psi	2770	692

Shear Strength*		
Concrete Grade	Shear	Allowable Shear
2000 psi	1670	418
4000 psi	1670	418
5000 psi	1670	418

* Source:
http://www.concretefasteners.com/anchors-fasteners/tapcon-screw/technical-specifications.aspx

Screw Material
C1022 Case Harden per SAE-J933

Screw Dimensions (Figure 4)	
Minor Diameter of Screw (in)	0.135
Shear Area of screw at Minor Diameter (sq.in)	0.0143

Screw Mechanical Properties	
Tensile Strength, Yield (psi)	52200
Shear Strength (psi)	31320

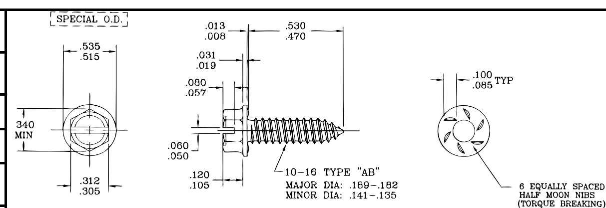


Figure 4

Force required to yield in tension, per screw (lbs)	747
Force required to yield in shear, per screw (lbs)	448

Application	
Area of Top Pan (sq.in) (Figure 5)	210
Roof Design Wind Pressure (psf)	134
Force pulling on Top Pan, +Y (lbs)	195
Shear force on each screw, qty 5 (lbs)	39

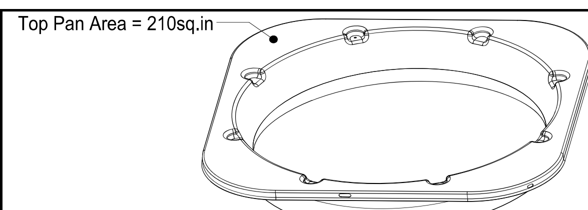
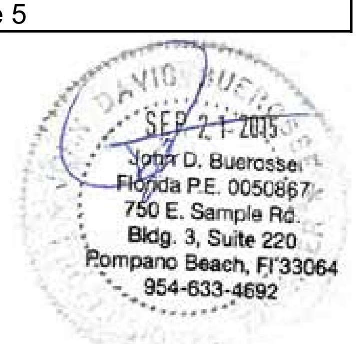


Figure 5



Screw Material C1022 Case Harden per SAE-J933

Minor Diameter of Screw (in) 0.135
Area of screw at Minor Diameter (in^2) 0.0143

Tensile Strength, Yield (psi) 52200
Shear Strength (psi) 31320

Force required to yield in tension, per screw (lbs) 747
Force required to yield in shear, per screw (lbs) 448

Tension Strength	
Concrete Grade	Tension
2000 psi	2020 lbs
4000 psi	2380 lbs
5000 psi	2770 lbs

Shear Strength	
Concrete Grade	Shear
2000 psi	1670 lbs
4000 psi	1670 lbs
5000 psi	1670 lbs

Sheet metal Yield Strength (psi) 65000

Shear area of sheet metal hole (in^2) 0.002290221

148.8643679

0.182
0.128

0.091
0.064

10097480 (Replaces 7095010)