Extreme Wind Condition Mounting Kit

INSTALLATION INSTRUCTIONS

For Anchoring (*)DF2SF(*), DF6SF(*), (*)P6SD(*), P8SE(*), PDF2SF(*), PPA3SE(*), PPG2GF(*), PPG2GI(*), PPG3G(*), PPG3HE(*), PPH2SEX(*), Q6SD(*), Q6SE(*), R6GD(*), R6GF(*), R6GI(*), (*)R8GE(*), R8HE(*), PPG3GE(*), S5BP(*), T5BP(*), TGRG(*)

KIT CONTENTS

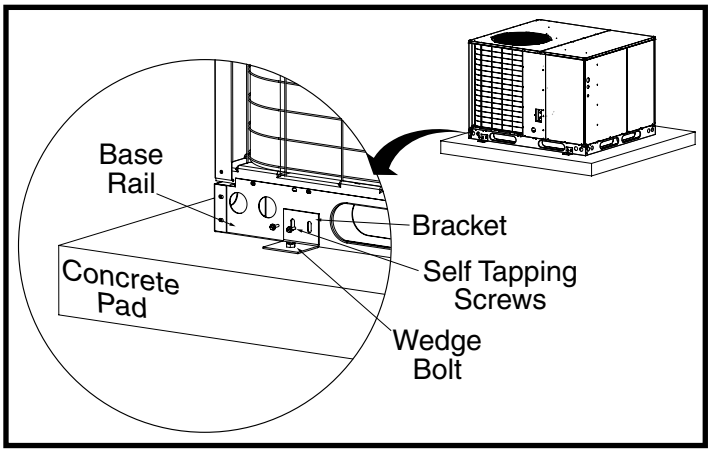
DESCRIPTION	QUANTITY
High Wind Strap (for anchoring single package convertible units and commercial split units)	4
Self Tapping Screws	8
3/8" x 2 1/2" Hex Washer Wedge Bolt	4
Installation Instructions	1

ABOUT THE KIT

The extreme wind condition mounting kit is used to anchor single package convertible units and commercial split units on a concrete pad.

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 so that it can withstand a 3 second gust of a maximum wind speed of 186 MPH. Minimum concrete pad requirements are shown in the illustration.

- Two brackets must be installed on each of the longest sides of the unit (4 brackets total per unit) within 10” of the corner of the unit.
- 2 bracket-to-frame screws must be installed through each bracket into the unit base rail.
- Concrete anchors require a clearance hole to be drilled with a nominal diameter of 3/8” with the proper concrete wedge bolt drill bit.
- Pads are either poured in place or pre-fabricated normal weight concrete with a minimum strength of 3000 psi and is located at ground level.
- Unit must be centered on pad with opposite sides having equal clearance
- Concrete pads must meet the minimum dimension requirements shown in Table 1.



MODELS	WIDTH (IN.)	DEPTH (IN.)	THICKNESS (IN.)
ALL TONNAGES: P6SD, P8SE, PPA3SE, PPG3HE, PPH2SEX, Q6SD, Q6SE, R6GD, (*)R8GE, R8HE, PPG3GE, TGRG	70"	72"	5"
UP TO 4 TON COOLING: DF6SF, PDF2SF, PPG2GF, PPG2GI, R6GF, R6GI	70"	72"	5"
5 TON COOLING: DF6SF, PDF2SF, PPG2GF, PPG2GI, R6GF, R6GI	72"	78"	5"
SPLIT SYSTEM (ALL TONNAGES): S5BP, T5BP	60"	60"	5"

Table 1. Minimum Concrete Pad Size (IN.)

Bri-Ko Engineering, Inc., Structural Analysis

Spreadsheet designed by: B. Schwartz, PE

Date data input: 31-Jan-16

Calc Sht: EC-1 Mechanical Equipment on Concrete Pad Calc

Description: 'Structural Analysis of concrete pad mounted mechanical equipment to resist wind forces.

Dwg Reference: ENG-1 Code: Florida Building Code 5th Ed. (2014) /ASCE 7-10.

Input Criteria:

Pad edge to Anc (X), min:	4.5 in.	Unit to anchor distance (V), min:	0.75 in.
Pad edge to unit (Y) min:	2.0 in.	Unit to anchor distance (V), max:	2.0 in.
Concrete unit weight:	150 pcf	Clip to base rail corner (Z), max:	10.0 in.

Design Methodology and Load Combinations:

Design Method:		LRFD	Φ=	0.90			
Load Combos:	FBC:	Eqn. 16-1	1.4 D+	0.0 W	Eqn. 16-6	0.90 D+	1.0 W

Wind Forces: based on FBC 2014, 1620.6, B =h, B = L, (equipment is stand-alone structure.)

Wind Design Requirements:

Ultimate Design Wind Speed, Vult (3-sec gust):			186 mph	Miami Dade	
Nominal Design Wind Speed, Vasd:			144 mph		
Risk Category:	IV	Wind Directionality Factor, Kd:			0.90
Height, h:	15 ft	Topographic Factor, Kzt:			1.00
Exp, Category:	C	Vel. Pres. Exposure Coef., Kz:			0.85
Enclosure Cat.	Not Applicable	Gust Effect Factor, G:			N/A
Velocity Pressure	qh = 0.00256 KzKztKdV² (lb/ft²)			qh=	67.7 psf
F = qh(GCr)Af	(GCr) v,l =	1.0 vert.	1.1 lat.	Fver, Flat:	67.7 psf, 74.4 psf

Limit States: Select model # for illustration purposes: Size 5

Verify Pad and anchor clearances: Anchor critical edge distance is 12d = 4.5" for 0.375" dia.

Distance from pad edge to AC unit = 8 in. **CHECKS OK**

Dist from pad edge to anchor center = 6 in. **CHECKS OK**

Resistance to Pad overturn: Use Load Combo: 0.90 D + 1.00 W FBC 1605.2 Eqn. 16-1

Concrete Pad wt: 2125 lbs Moverturn = " & TEXT(W_Over,"0.00")&"*(Pwh*Area*(A/2+t)+Pwv*area*(pw/2)) = 75.2 k-in

Mdead wt = 0.90*(pad + unit wt*(D/2))= 77.7 k-in **CHECKS OK**

Resistance to sliding: Use Load Combo: 0.90 D + 1.00 W FBC 1605.2 Eqn. 16-1

Reqd Shear = 1.00*(Pwh*area)= A= 16.7 sf 1240 lbs

Nominal Shear from Table A-1 *4 anchors = 5480 lbs **CHECKS OK**

Nominal Shear from Table A-3 *4 Screws = 2860 lbs **CHECKS OK**

Anchor hold down: Use Load Combo: 0.90 D + 1.00 W FBC 1605.2 Eqn. 16-1

Reqd Overturn M = 1.00*(Pwh*Area*A/2+Pwv*area*E/2-Wt*E/2)= 1 47.4 k-in

Nominal Anchor pull-down from Table A-1 * 2 anchors = 98.9 k-in **CHECKS OK**

SMS in Clip to Frame hold down:

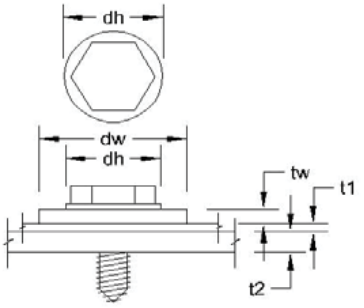
Nominal Screw pull-down from Table A-3 * 2 screw = 67.9 k-in **CHECKS OK**

Equipment Integrity: Sheet metal cover fastener resistance

Analysis based on AISI S100-2007 "Cold Formed Steel Structural Members", Section E4: Screw Connections

Fw = 1240 lbs Overturn= 47.4 k-in See above Since LRFD: Φ = 0.50

Min number of screws per long side:	3	
Number of screws provided:	14	**CHECKS OK**
Base Rail fastener resistance:		
Nominal SMS pull-down * 8 screws=	181.6 k-in	**CHECKS OK**
Screw size, washer dia. (d, dw):	(#10, 1/2 in.)	
Thkness of mtl shell, frame (t1,t2):	0.036 in.	0.030 in.
Screw yield strength:	50 ksi	
Allowable tensile, pull-over strength/screw:	438 lbs	458 lbs
Allowable shear strength/screw:	478 lbs	



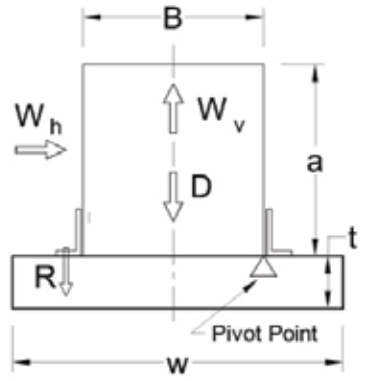
Note: Minimum required screws on the largest size is set to 4.

ENGINEERING CONFORMANCE ANALYSIS:

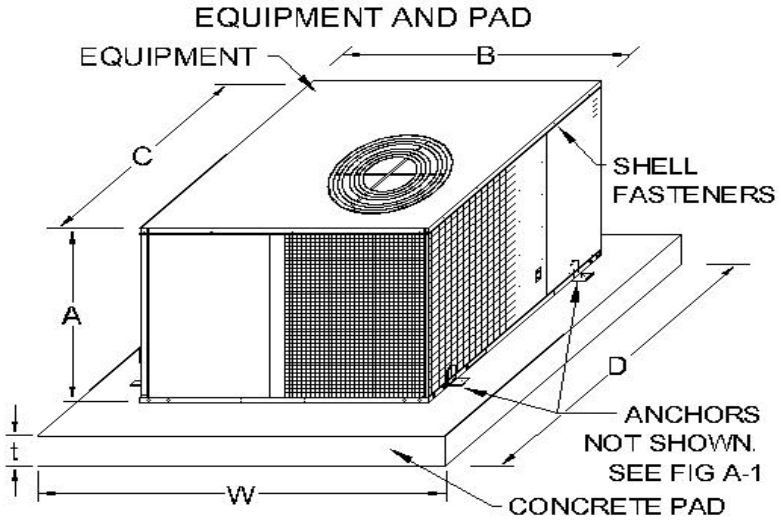
THE TABLE SHOWS PAD SIZE AND ANCHOR TYPES FOR VARIOUS MODELS OF NORTEK AC EQUIPMENT VERIFYING OVERTURN, SLIDING & EQUIPMENT INTEGRITY.

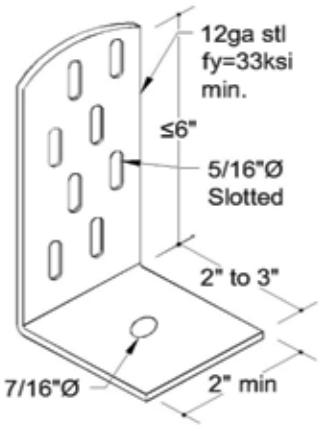
Nortek Models: TABLE A-2

Model families S5BP, T5BP, Q6SD, Q6SE, R6GD, R6GF, DF6SF, P6SD, P8SE, R8GE, R6GI, and R8HE	Weight Range (lbs)	Length C (in.)	Width B (in.)	Height A (in.)
Cabinet Size 1	386 to 390	37.5	37.5	44.3
Cabinet Size 2	423 to 427	37.5	37.5	52.3
Cabinet Size 3	380 to 411	55.8	47.5	35.0
Cabinet Size 4	360 to 480	55.8	47.5	39.0
Cabinet Size 5	415 to 612	55.8	47.5	43.0
Cabinet Size 6	485 to 609	55.8	47.5	47.0
Cabinet Size 7	612 to 659	63.6	47.5	47.0



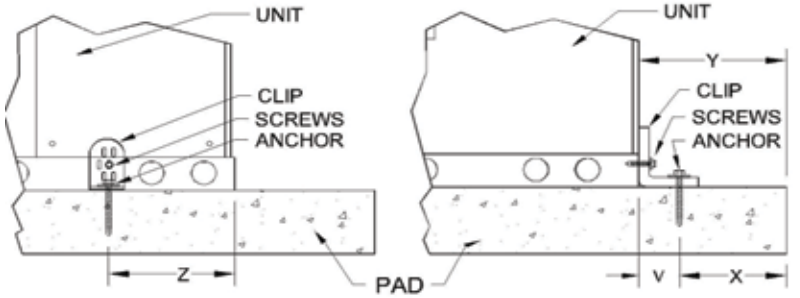
Structural Analytical Model





TIE-DOWN CLIP

ANCHOR CLEARANCES FIG "A-1"



X: PAD EDGE TO ANCHOR CENTER
Y: PAD EDGE TO EQUIPMENT.
Z: CLIP TO BASE RAIL CORNER.

V: EQUIPMENT TO ANCHOR CENTER
NOTE: CLIPS ARE PLACED ON LONG SIDES OF UNIT MIN 2 PER SIDE

TABLE A-1 ANCHOR TYPE AND STRENGTH

SYM	ANCHOR DESCRIPTION	SUPPLIER	LENGTH EMBED	MIN EDGE DIST	STRENGTH AT MIN EDGE DISTANCE	
					PULL OUT (LBS)	SHEAR (LBS)
A-1	3/8" WEDGE BOLT	POWERS FASTENERS	2.5"	4.5"	1025	1370
A-2	3/8" KWIK Bolt TZ expansion	HILTI	2"	4.5"	1155	1925
Notes:	1. Strength of concrete is min 3000 psi with minimum safety factor of 4 for the anchors. 2. Pullout and shear for wedge anchor are at critical edge distance 12xd. 3. Engineering calcs of anchor strength use type "A-1"; however, Type "A-2" is permissable.					

TABLE A-3 SMS FROM CLIP TO FRAME (LBS)

SYM	DESCRIPTION	PULL	SHEAR
S-1	#14 ASTM C1513 Self Tapping	607	715
Note:	"Safety factor of 3 applied."		

CODE: FMC and FBC 5th Ed. (2014), ASCE 7-10
MIAMI-DADE WIND SPEED = 186 MPH

Pad and Anchor Requirements							Design Check: Nomnal / Reqd ≥ 1.00 = OK			
# Clips to Secure Unit	Anchor Type	SMS Type	Pad Size, minimum (in.) W, D, t			Min # screws per side to secure shell	Overturn	Anchor Pullout	Anchor Sliding	SMS Pullout
4	A-1	S-1	58,	58,	5	4 #10	1.14	3.16	6.39	2.16
4	A-1	S-1	60,	60,	5	4 #10	1.04	2.47	5.41	1.69
4	A-1	S-1	66,	72,	5	4 #10	1.14	2.46	5.43	1.69
4	A-1	S-1	66,	72,	5	4 #10	1.05	2.23	4.87	1.53
4	A-1	S-1	68,	72,	5	4 #10	1.03	2.09	4.42	1.43
4	A-1	S-1	70,	72,	5	4 #10	1.02	1.94	4.04	1.33
4	A-1	S-1	72,	78,	5	4 #10	1.04	1.74	3.55	1.19

GENERAL NOTES:

1. THIS ENGINEERING REPORT DOCUMENTS THE ANALYSIS OF THE PERFORMANCE OF HVAC MECHANICAL EQUIPMENT TO MEET WIND LOAD OVERTURN AND ANCHOR STRENGTH.
2. THE ANALYSIS CONFORMS TO THE REQUIREMENTS OF THE 2014 FLORIDA BUILDING CODE (HIGH VELOCITY HURRICANE ZONE) AND ASCE 7-10 DESIGN WIND LOADS - OTHER STRUCTURES SECTION 29.5. NOTE: THE CONCRETE PAD AND AC UNIT ARE NOT SET ON A ROOFTOP BUT ACT AS A STAND-ALONE STRUCTURE.
3. THE LOAD PATH VERIFIED IS FROM THE EQUIPMENT AS A SINGLE UNIT, ENCLOSURE FASTENERS, TIE-DOWN CLIP ANCHORS TO CONCRETE PAD.
4. PADS ARE EITHER POURED IN PLACE OR PRE-FABRICATED NORMAL WEIGHT CONCRETE WITH A MINIMUM STRENGTH OF 3000 PSI AND IS LOCATED AT GROUND LEVEL.
5. ANCHORS USED TO FASTEN THE CONDENSER FEET TO THE CONCRETE PAD ARE DEFINED IN TABLE A-1, SPECIFIED IN TABLE A-2. THE EMBED IS SPECIFIED IN TABLE A-1. THESE ANCHORS ARE TYPICALLY MANUFACTURED FROM HEAT-TREATED STEEL AND CORROSION RESISTANCE SPECIFIED BY THE MANUFACTURER.
6. UNIT MUST BE CENTERED ON PAD WITH OPPOSITE SIDES HAVING EQUAL CLEARANCE.
7. TIE-DOWN CLIPS SHALL HAVE MINIMUM THICKNESS AND WIDTH AS SHOWN IN FIG.
8. CALCULATIONS HAVE BEEN PERFORMED USING MINIMUM WEIGHTS OF THE MODELS.
9. THE TIE-DOWN CLIP SHALL BE FIXED TO THE UNIT USING SELF TAPPING SCREWS SHOWN IN TABLE A-3. THE SCREWS SHALL BE PLACE WITHIN THE HEIGHT OF THE PACKAGED UNIT BASE RAIL, AS SHOWN IN FIGURE A-1.

CALCULATIONS:

OVERTURN:
1. THE CRITICAL WIND LOAD IS ON THE LONG FACE OF THE CONDENSER.
2. THE MOMENT CREATED BY THE WIND LOAD MUST BE RESISTED BY THE MOMENT CREATED FROM THE WEIGHT OF THE PAD AND THE CONDENSER.

CLEARANCES:
3. DISTANCE FROM THE EDGE OF THE PAD TO THE UNIT MUST BE GREATER THAN 2.0 IN.
4. DISTANCE FROM THE EDGE OF THE PAD TO THE CENTER OF THE ANCHOR MUST BE GREATER THAN THAT SPECIFIED IN THE TABLE A-1.

ANCHOR STRENGTH:
5. THE SLIDING RESISTANCE IS TRANSFERRED TO THE PAD BY THE SHEAR STRENGTH IN THE ANCHORS. LOAD COMBINATION FBC Eqn 16-15.
6. OVERTURN RESISTANCE IS TRANSFERRED TO THE PAD BY THE ANCHORS. CONFIG AND ANCHOR STRENGTH BASED ON MIN EDGE DISTANCE YIELD MOMENT RESISTANCE.

ENCLOSURE FASTENERS:
7. TO PREVENT THE METAL SHELL FROM BECOMING WIND-BORNE DEBRIS, THE SHELL FASTENERS MUST RESIST THE NEGATIVE WIND PRESSURES CAUSING TENSILE STRESS IN SCREWS AND PULL-OVER EFFECTS OF SHEET METAL.
8. BASE RAIL TO FRAME FASTENER MUST RESIST OVERTUNING MOMENT DUE TO WIND FORCES.

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Specifications & illustrations subject to change without notice or incurring obligations (03/16).
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