

**MIDEA Heat Pumps**      OUTDOOR CONDENSING UNITS  
**PAD MOUNT CONFIGURATION AND ANCHOR SELECTION - WIND LOAD RESISTANCE VERIFICATION**

CODE: FBC 5<sup>th</sup> Ed. (2014) BLDG, MECH, ASCE 7-10  
 MIAMI-DADE WIND SPEED = 186 MPH

Spreadsheet designed by: B. Schwartz, PE

Bri-Ko Engineering, Inc., Structural Analysis      Date data input: 30-Jun-15  
 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 2010 and ASCE 7-10.

**Design Methodology and Load Combinations:**

Design Method: ASD      Ω = 1.65

Load Combos: FBC Eqn. 16-6      0.6 D + 0.6 W

**Wind Forces:** based on FBC 2010, 1609.8, B=h, B=L

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: 0.85

Ht to roof, h: 15 ft      Topographic Factor, Kzt: 1.00

Exposure Cat.: C      Vel. Pres. Exposure Coef., Kz: 0.849

Enclosure Cat. Not Applicable      Gust Effect Factor, G: 0.85

**Velocity Pressure**       $q_h = 0.00256 K_z K_{zt} K_d V^2$  (lb/ft<sup>2</sup>)       $q_h =$  **63.9 psf**

$F = q_h(GC_p)A_f$        $(GC_p)_v, l =$  1.0 vert. 1.1 lat.       $F_{ver} =$  **63.9 psf**       $F_{lat} =$  **70.3 psf**

**Limit States:**

Select model # for illustration purposes: **WCH848604MKA1**

**Verify Pad and anchor clearances:**

Anchor critical edge distance is  $12d = 4.5"$  for 0.375" dia.

Distance from pad edge to AC unit = **9.4 in.**      **CHECKS OK**

Dist from pad edge to anchor center = **7.4 in.**      **CHECKS OK**

**Resistance to Pad overturn:**

Use Load Combo: 0.67 D + 0.78 W      FBC 1605.3.2 Eqn. 16-18

Concrete Pad wt: 800 lbs       $M_{overturn} = 0.78*(W_h*Area*(A+t)/2+W_v*area*(D/2)) =$  **14.6 k-in**

Mdead wt =  $0.67*(pad + unit wt*(D/2)) =$  **16.2 k-in**      **Checks OK**

**Resistance to sliding:**      Use Load Combo: 0.60 D + 0.60 W      FBC 1605.3.1 Eqn. 16-14

Reqd Shear =  $0.60*(W_h*Area) =$  283 lbs

Nominal Shear from Table A-1 \*4 anchors = 1660 lbs      **Checks OK**

**Anchor hold down:**      Use Load Combo: 0.67 D + 0.78 W      FBC 1605.3.2 Eqn. 16-18

Reqd Overtrn M =  $0.78*(W_h*Area*A/2+W_v*area*E/2-W_t*E/2) =$  9.4 k-in

Nominal Anchor pull-down from Table A-1 \* 2 anchors = 26.6 k-in      **Checks OK**

**SMS in Clip to Frame hold down:**

Nominal Anchor pull-down from Table A-3 \* 2 anchors = 9.5 k-in      **Checks OK**

**Sheet metal cover fastener resistance:**      Analysis based on AISI S100-2007 "Cold Formed Steel Structural Members", Section E4: Screw Connections      **Checks OK**

Load Combo: 0.60 D + 0.60 W       $F_w =$  283 lbs      See above

Number of screws Req'd, Provided: **2**      **10**

Screw Size (d)      #8      Units

Integral washer size (dw): 0.322 in.

Thickness of metal shell (t1): 0.024 in.

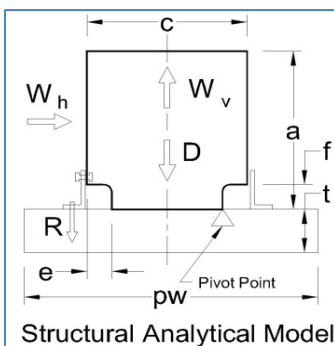
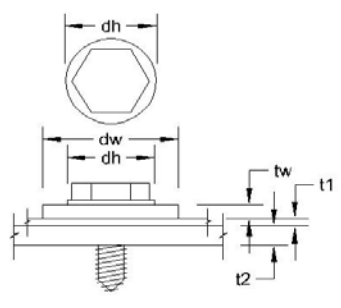
Thickness of frame (t2): 0.039 in.

Depth of penetration: 0.375 in.

Screw yield strength: 55 ksi

Allowable tensile strength/screw: 257 lbs

Allowable pull-over strength/screw: 163 lbs



**ENGINEERING CONFORMANCE ANALYSIS:**

THE TABLE SHOWS PAD SIZE AND ANCHOR TYPES FOR VARIOUS MODELS OF BAKER DISTRIBUTING HVAC OUTDOOR EQUIPMENT FROM 2 TO 5 TONS THAT SATISFY THE REQUIREMENTS OF THIS ANALYSIS.

**TABLE A-2**

Model No.	kBtu	Wt (lbs)	Length, Width, Height (C,B,A) (in.)	Recess E (in.)	Recess F (in.)
WCH824364MKA1	24/36	157	29 1/8, 29 1/8, 24 15/16	2.76	1.57
WCH848604MKA1	48/60	205	29 1/8, 29 1/8, 33 3/16	2.76	1.57

SMS Type	Anchor Type	Pad Size, minimum (in.) W, D, t	Min # screws to secure shell
S-1	A-1	44, 44, 4	4 #8
S-2	A-1	48, 48, 4	4 #8

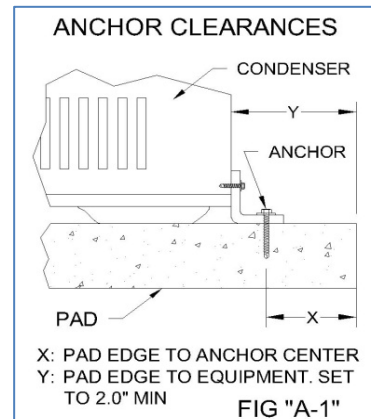
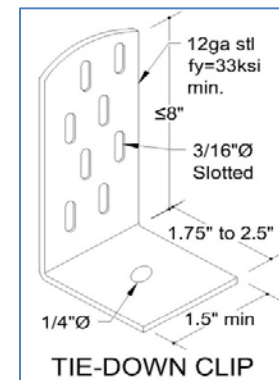
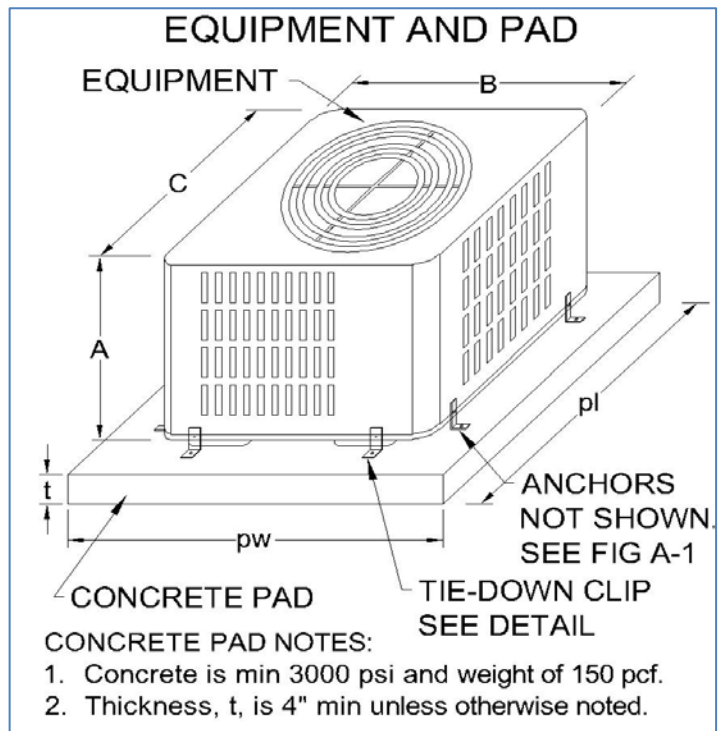
Design Check: Nomnal / Req'd  
 ≥ 1.00 = OK

Overturn	Anchor Pullout	SMS Pullout	Anchor Sliding
1.11	3.93	1.13	7.80
1.10	2.84	1.01	5.86

Notes: 1. Tie clips only required on two sides opposite each other. Each tie clip has one anchor at bottom leg and one SMS screw into equipment frame at vertical leg.

**Input Criteria:**

Concrete Pad weight, (pcf):	150	lbs
Pad edge to anchor dist. (min):	4.50	in.
Pad edge to AC unit (min):	2.00	in.
Dist. Unit side to anchor (min,max):	0.75	2.00



**GENERAL NOTES:**

- THIS ENGINEERING REPORT DOCUMENTS THE ANALYSIS OF THE PERFORMANCE OF HVAC MECHANICAL EQUIPMENT TO MEET WIND LOAD OVERTURN AND ANCHOR STRENGTH.
- 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: GCf FOR BOTH LATERAL AND VERTICAL DIRECTIONS ARE SET TO THE MINIMUM AS THE CONCRETE PAD AND AC UNIT ARE NOT SET ON A ROOFTOP BUT ACT AS A STAND-ALONE STRUCTURE.
- THE LOAD PATH VERIFIED IS FROM THE EQUIPMENT AS A SINGLE UNIT, ENCLOSURE FASTENERS, TIE-DOWN CLIP ANCHORS TO CONC SLAB.
- PADS ARE EITHER POURED IN PLACE OR PRE-FABRICATED NORMAL WEIGHT CONCRETE WITH A MINIMUM STRENGTH OF 3000 PSI AND ARE LOCATED AT GROUND LEVEL.
- ANCHORS USED TO FASTEN THE CONDENSER FEET TO THE CONCRETE PAD ARE DEFINED IN TABLE A-1 AND TABLE A-3. THESE ANCHORS ARE TYPICALLY MANUFACTURED FROM HEAT-TREATED STEEL AND HAVE CORROSION RESISTANCE AS SPECIFIED BY THE MANUFACTURER.
- TIE-DOWN CLIPS MUST HAVE MINIMUM THICKNESS AND WIDTH AS SHOWN IN SKETCH.
- AC UNIT MUST BE CENTERED ON PAD WITH OPPOSITE SIDES HAVING EQUAL CLEARANCE.

**CALCULATIONS:**

- OVERTURN:**
- THE CRITICAL WIND LOAD IS ON THE LONG FACE OF THE CONDENSER.
  - THE MOMENT CREATED BY THE WIND LOAD MUST BE RESISTED BY THE MOMENT CREATED FROM THE WEIGHT OF THE PAD AND THE CONDENSER.
- CLEARANCES:**
- DISTANCE FROM THE EDGE OF THE PAD TO THE CONDENSER SIDE (Y IN FIG.) MUST BE GREATER THAN 2.0 INCH.
  - DISTANCE FROM THE EDGE OF THE PAD TO THE CENTER OF THE ANCHOR MUST BE GREATER THAN THAT SPECIFIED IN THE INPUT CRITERIA.
- ANCHOR STRENGTH:**
- THE SLIDING RESISTANCE IS TRANSFERRED TO THE PAD BY THE SHEAR STRENGTH IN THE ANCHORS.
  - THE OVERTURN RESISTANCE IS TRANSFERRED TO THE PAD BY THE ANCHORS. CONFIGURATION AND ANCHOR STRENGTH BASED ON MINIMUM EDGE DISTANCE YIELD MOMENT RESISTANCE. ENCLOSURE FASTENERS:
  - THE METAL SHELL FASTENERS MUST RESIST THE NEGATIVE WIND PRESSURES CAUSING TENSILE STRESS IN THE SCREWS AND PULL-OVER EFFECTS OF THE SHEET METAL.

**TABLE A-1 ANCHOR TYPE AND STRENGTH**

SYM	ANCHOR DESCRIPTION & MANUFACTURER	EMBED	STRENGTH AT MIN EDGE DISTANCE	
			PULL OUT (LBS)	SHEAR (LBS)
A-1	1/4" TAPCON	1-3/4"	505	415

Notes:  
 1. Strengths are for poured concrete min 3000 psi from manufacturer's specs with min. safety factor of 4.  
 2. Each anchor includes a 1"Ø fender washer.

**Table A-3 SMS from Clip to Frame (lbs)**

SYM	Description	Pull	Shear
S-1	#8 ASTM C1513 Self Tapping	145	335
S-2	#10 ASTM C1513 Self Tapping	180	535

Note: Safety factor of 3 applied.

Issue Date:	30-Jun-15	Sheet:
Dwn By:	B.S.	<b>ENG-1</b>
Dwg Size:	11x 17	
Doc:	BakerDist_Midea_Pad_6-30-15	<b>Page 1 of 1</b>

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