

GREE MODULAR / SINGLE CHASSIS OUTDOOR CONDENSING UNITS
PAD MOUNT CONFIGURATION AND ANCHOR SELECTION - WIND LOAD EXAMINATION

CODE: FMC and FBC 7th Ed. (2020) BLDG, ASCE 7-16
 MIAMI-DADE WIND SPEED = 195 MPH (Risk Cat. IV)

ENGINEERING CONFORMANCE ANALYSIS:

THE TABLE SHOWS PAD SIZE AND ANCHOR TYPES FOR VARIOUS MODELS OF HVAC OUTDOOR EQUIPMENT FROM 6 TO 14 TONS THAT MEET THE FOLLOWING ANALYSIS: • OVERTURN • EDGE CLEARANCES • ANCHOR PULLOUT AND SHEAR STRENGTH • EQUIPMENT INTEGRITY.

TABLE A-2

GREE Modular Model No.	Weight (lbs)		Length C (in.)	Width B (in.)	Height A (in.)	Mount E (in.)	Mount F (in.)
	Min.	Max.					
GMV-x72WM/y-z(U)	496	672	36.6	30.1	63.2	28.7	31.2
GMV-x96WM/y-z(U)	662	694	52.8	30.1	63.2	28.7	47.2
GMV-x120WM/y-z(U)	650	816	52.8	30.1	63.2	28.7	47.2
GMV-x144WM/y-z(U)	794	816	52.8	30.1	63.2	28.7	47.2
GMV-x168WM/y-z(U)	849	871	52.8	30.1	68.5	28.7	47.2

Notes: - Model #'s: x = blank, Q or V; y = A, B, or B1; z = F or U; M may be omitted
 - Min and max weights are for similar dimension units but different model #'s

Installation Requirements			Anchor Type and Number per Long Side	Alternate 4" thick Slab Size (in.)		Design Check: Nom. / Req'd		
Pad Size, minimum (in.)				W, D		Overturn	Anchor Pullout	Anchor Sliding
W, D, t								
68	60	6	A-4, 2	84	72	1.02	1.61	1.93
78	60	8	A-4, 2	114	84	1.01	1.11	1.34
78	60	8	A-4, 2	114	84	1.01	1.10	1.34
78	60	8	A-4, 2	114	84	1.05	1.14	1.34
84	60	8	A-5, 2	120	84	1.01	2.24	2.04

- Must have pad oriented with long side perpendicular to width of unit.
- Anchor Type is the minimum, higher strength types permitted.
- Alternate slab size assumes a min. slab thickness of 4".

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 FBC 7th ed. (HIGH VELOCITY HURRICANE ZONE) AND ASCE 7-16 DESIGN WIND LOADS - OTHER STRUCTURES SECTION 29.5. NOTE: THE CONCRETE PAD AND AC UNIT IS NOT A ROOFTOP STRUCTURE.
- THE LOAD PATH VERIFIED IS FROM THE EQUIPMENT AS A SINGLE UNIT, UNIT LEG 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. AN ALTERNATE PAD SIZE MAY BE USED WHEN A 4" SLAB EXISTS, USUALLY AS A CONTINUOUS SLAB.
- ANCHORS USED TO FASTEN THE CONDENSER FEET TO THE CONCRETE PAD ARE DEFINED IN TABLE A-1 AND SPECIFIED IN TABLE A-2. THE EMBED IS SPECIFIED IN TABLE A-1. THESE ANCHORS ARE TYPICALLY MANUFACTURED FROM HEAT-TREATED STEEL AND HAVE CORROSION RESISTANCE AS SPECIFIED BY THE MANUFACTURER.
- AC UNIT MUST BE CENTERED ON PAD WITH OPPOSITE SIDES HAVING EQUAL CLEARANCE.
- UNIT INTEGRITY, IF NOT DESIGNATED BY THE MANUFACTURER FOR THE STATED WIND PRESSURES, IS MET BY VERIFYING SCREW PULLOUT STRENGTH RESISTANCE TO WIND NEGATIVE PRESSURE ON SHELL. INTERNAL FRAME INTEGRITY IS NOT INVESTIGATED.

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:

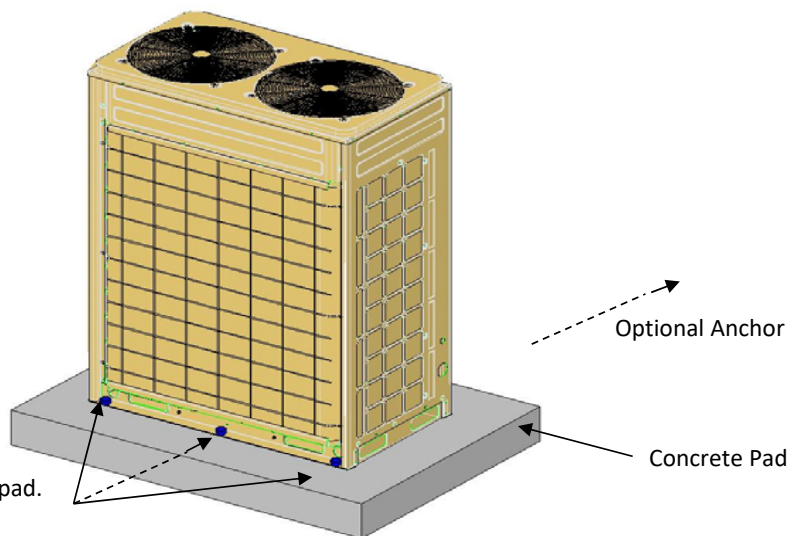
- DISTANCE FROM THE EDGE OF THE PAD TO THE CONDENSER SIDE (Y IN FIG.) MUST BE GREATER THAN 2.0 INCH. DISTANCE FROM THE EDGE OF THE PAD TO THE CENTER OF THE ANCHOR MUST BE GREATER THAN THAT SPECIFIED IN THE INPUT CRITERIA.

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.

UNIT INTEGRITY:

- IF REQUIRED, SCREW STRENGTH RESISTS SHELL AND FRAME SEPARATION.



Bri-Ko Engineering, Inc., Spreadsheet designed by: B. Schwartz, PE
 Structural Analysis Date data input: 29-Nov-22

Calc Sht: EC-1 Mechanical Equipment on Concrete Pad Calc
 Description: Structural Analysis of concrete pad mounted mechanical equipment to resist wind forces.

Code: FBC 7th Ed. (2020) and ASCE 7-16.

Design Methodology and Load Combinations:

Design Method:	LRFD	Φ =	0.90
Load Combos:	FBC Eqn. 16-6	0.9 D + 1.0 W	

Wind Forces: based on FBC Section 1620 (equipment is stand-alone structure.)

Ultimate Design Wind Speed, Vult (3-sec gust):	195 mph	Miami Dade			
Nominal Design Wind Speed, Vasd:	151 mph				
Risk Category:	IV	Dir., Topo., Gust Effect:	0.90	1.00	N/A
Height, h:	15 ft	Exp. Cat.:	C	Vel. Pres. Exp Coef., Kz:	0.849
Enclosure Cat.	N/A				

Velocity Pressure qh = 0.00256 K _z K _{zt} K _d V ² (lb/ft ²)	qh =	74.4 psf
F = qh(GCr)Af (GC _r) _{v,l} = (1.0 ver., 1.1 lat.)	F _{ver, Flat} :	74.4 psf, 81.8 psf

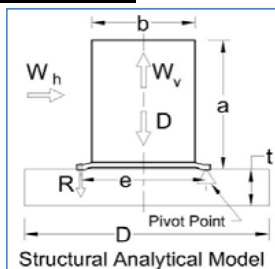
Limit States: for illustration purposes only:

Select UnitType:	MOD HEAT PUMP
Select model # for illustration purposes:	GMV-x144WM/y-z(U)

Verify Pad and anchor clearances:

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

Distance from pad edge to AC unit =	12.6 in.	CHECKS OK
Dist from pad edge to anchor center =	15.4 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: 3250 lbs	Overturn moment due to wind =	77.7 k-in	
Pad dims: 78" x 60" x 8"	Moment due to dead weight =	81.3 k-in	Checks OK

Resistance to sliding:	Use Load Combo:	0.90 D + 1.00 W	FBC 1605.2 Eqn. 16-6
Req'd Shear = (Fwh*Area) =	1896 lbs	Nom Shr (Table A-1 *4 anchors) =	2540 lbs Checks OK

Anchor hold down:	Use Load Combo:	0.67 D + 0.78 W	FBC 1605.3.2 Eqn. 16-18
Required overturn moment about unit edge =	48.3 k-in		
Nominal Anchor pull-down from Table A-1* E * 2 anchors =	54.8 k-in		Checks OK

Unit Integrity: If Required. Only if manufacturer does not state design wind pressure.

Analysis based on AISI S100-2007 "Cold Formed Steel Structural Members", Section E4: Screw Connections			
Screw Size: (#10, 0.190)	Thkness of mtl shell, frame (t1,t2):	19ga. 16ga	Fy= 50 ksi
Screw pullout strength:	Req'd # screws/ft ² :	0.34	
Num screws/Area top+sides: 51 / 83.8 ft ² = 0.61 screws/ft ² provided.			Checks OK

Input Criteria:	
Concrete Pad weight:	150 pcf
Pad edge to anch distance (min):	4.5 in.
Pad edge to AC unit (min):	2.0 in.

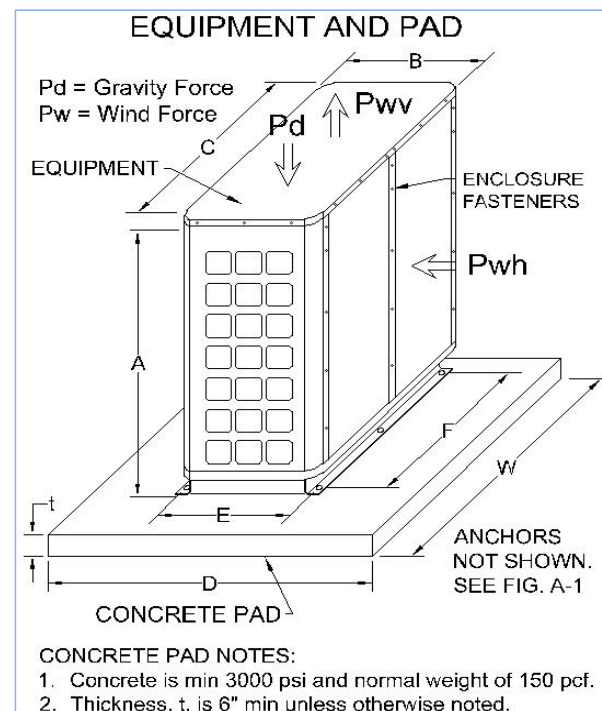
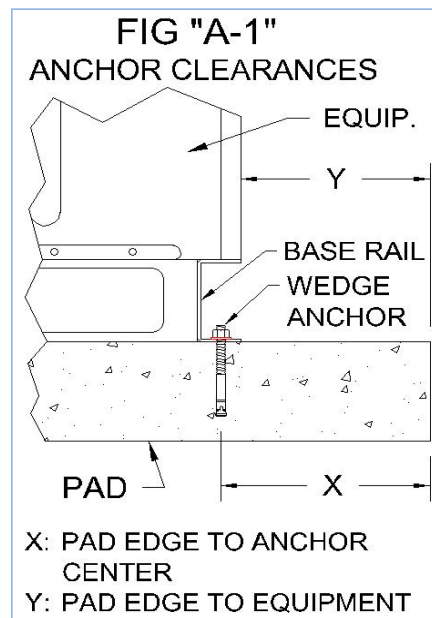


TABLE A-1 ANCHOR TYPE AND ALLOWABLE STRENGTHS				
SYM	ANCHOR DESCRIPTION & MANUFACTURER	EMBED (min)	ANCHOR STRENGTH	
			PULL OUT (LBS)	SHEAR (LBS)
A-4	3/8" Power Stud+ SD1 (Powers)	2-3/8"	955	635
A-5	1/2" Power Stud+ SD1 (Powers)	3-3/4"	2180	1050

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

Sheet: Pg 1of1	ENG-1	BRI-KO ENGINEERING INC	Cert. Of Auth.:#27622	tel: 954.648.6218
Doc: Mod Heat Pump on Conc Pad				
Issue Date: 28-Dec-22				
Dwn By: B.S.				
Dwg Size: 11x 17				

This item has been digitally signed and sealed by Brian I Schwartz on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.