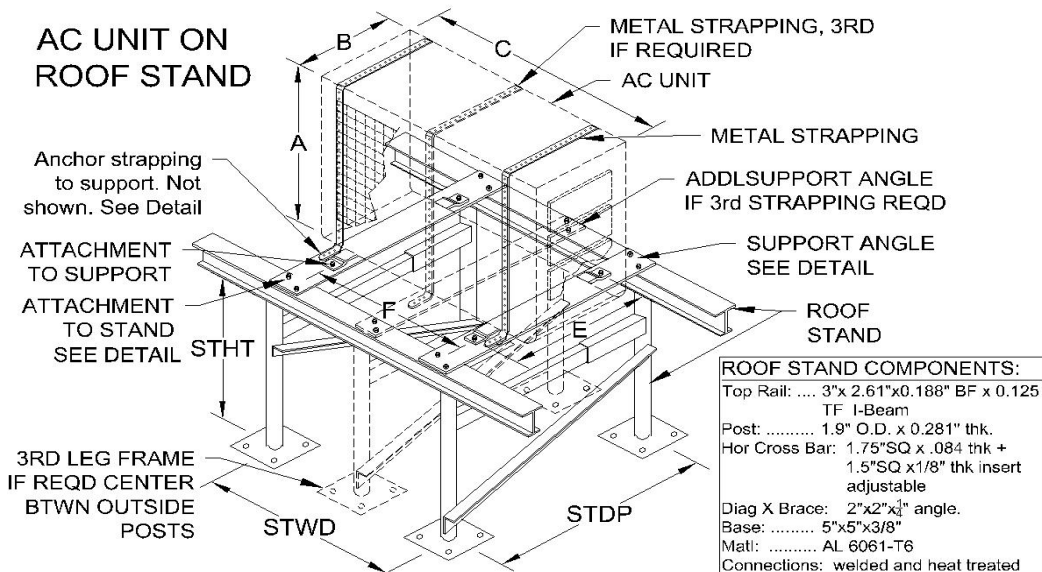


**AC UNIT ON ROOF STAND**



**ROOF STAND COMPONENTS:**  
 Top Rail: .... 3"x 2.61"x0.188" BF x 0.125 TF I-Beam  
 Post: ..... 1.9" O.D. x 0.281" thk.  
 Hor Cross Bar: 1.75"SQ x .084 thk + 1.5"SQ x 1/8" thk insert adjustable  
 Diag X Brace: 2"x2"x1/4" angle.  
 Base: ..... 5"x5"x3/8"  
 Matl: ..... AL 6061-T6  
 Connections: welded and heat treated

**GREE MULTI PRO OUTDOOR CONDENSING UNITS**  
 ROOF STAND 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 ROOF STAND AND ANCHOR TYPES FOR VARIOUS MODELS OF HVAC OUTDOOR EQUIPMENT UP TO 5 TONS THAT MEET THE FOLLOWING ANALYSIS: • OVERTURN • SLIDING • ANCHOR PULLOUT AND SHEAR STRENGTH • EQUIPMENT INTEGRITY.

**TABLE A-2**

GREE Multi PRO Series Model No.	Weight (lbs)	Length C (in.)	Width B (in.)	Height A (in.)	Mount E (in.)	Mount F (in.)
GMV-24WL/C-T(U)	176	38.6	14.2	31.1	15.6	25.6
GMV-28WL/C-T(U)	176	38.6	14.2	31.1	15.6	25.6
GMV-36WL/B-T(U)	296	35.4	13.4	53.0	14.9	22.5
GMV-36WL/C-T(U)	246	35.4	13.4	53.0	14.9	22.5
GMV-48WL/B-T(U)	296	35.4	13.4	53.0	14.9	22.5
GMV-48WL/C-T(U)	246	35.4	13.4	53.0	14.9	22.5
GMV-60WL/C-T(U)	273	37.0	12.6	56.3	13.8	24.9

INFO
Stand Base Pullup (lbs)
1571
1571
1821
1836
1821
1836
2073

**Installation Requirements**

Roof Stand	Support Angle	Type and number of Straps
Conc Anchor Type	Support Angle (thickness in.)	Unit foot to Support Anchor
Number of Leg Frames	Support Angle	Type and number of Straps
A-1	2	1/4 A-4 S-1, 2
A-1	2	1/4 A-4 S-1, 2
A-1	3	5/16 A-4 S-2, 3
A-1	3	5/16 A-4 S-2, 3
A-1	3	5/16 A-4 S-2, 3
A-1	3	5/16 A-4 S-2, 3
A-1	3	5/16 A-4 S-2, 3
A-2	3	3/8 A-5 S-2, 4

**Design Check: Nomnal / Reqd ≥ 1.00 = OK**

Conc Anc Pullout	Conc Anc Shear	Unit Foot Anchor Pullout	Strap Strength
1.26	1.98	2.70	1.07
1.26	1.98	2.70	1.07
1.09	1.90	1.07	1.03
1.08	1.90	1.06	1.02
1.09	1.90	1.07	1.03
1.08	1.90	1.06	1.02
1.16	2.87	1.23	1.09

Bri-Ko Engineering, Inc.,  
 Structural Analysis  
 Calc Sht: EC-1  
 Description: Mechanical Equipment on Roof Stand Calc  
 Code: FBC 7th Ed. (2020) and ASCE 7-16.  
 Spreadsheet designed by: B. Schwartz, PE  
 Date data input: 4-Oct-22

**Design Methodology and Load Combinations:**  
 Design Method: LRFD  $\Phi = 0.90$   
 Load Combos: FBC Eqn. 16-6 0.9 D + 1.0 W  
 Wind Forces: based on ASCE 7-16 Eqn. 29.4-1, and FBC 1620.6

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: **60 ft** Exp. Cat.: **C** Vel. Pres. Exp Coef., Kz: **1.137**  
 Enclosure Cat: **N/A**  
 Velocity Pressure  $q_h = 0.00256 K_z K_{zt} K_d V^2$  (lb/ft<sup>2</sup>)  $q_h =$  **99.6 psf**  
 $F = q_h(GC_p)A_r$  (GC<sub>p</sub>)<sub>v,l</sub> (1.5 ver., 1.9 lat.) F<sub>ver, Flat</sub>: **149.4 psf, 189.2 psf**

**Limit States:** for illustration purposes only:  
 Select UnitType: **MULTI** Select Model #: **GMV-60WL/C-T(U)**  
 Number of Leg Frames is 3

**Loads, (lbs):** P1= 2738 P2= 484 P3= 932 PD= 273

**Resistance to sliding stand post:**  
 Reqd. Shear/leg = **482 lbs** Nominal Shear per leg: **850 lbs** CHECKS OK

**Resistance to sliding anchors to support:**  
 Reqd Sher/anc: **723 lbs** Nom Shear per bolt: **2000 lbs** CHECKS OK

**Resistance to Moment and Uplift:** Use Load Combo: **0.90 D + 1.00 W**

Overturn M at stand base:	<b>174.1 k-in</b>	Base Pullup:	<b>2073 lbs</b>
Overturn M at unit foot:	<b>78.7 k-in</b>	Foot Pullup:	<b>2918 lbs</b>
Nom Pullup Str, 4xConcAnc, Bolt:	<b>7860 lbs</b>	<b>3500 lbs</b>	<b>CHECKS OK</b>

**Verification of Support Angle:**

Forces, lbs:	<b>-R<sub>1</sub> = 1192</b>	<b>R<sub>2</sub> = 2918</b>	<b>R<sub>3</sub> = 2676</b>	<b>R<sub>4</sub> = 950</b>
Required Mom.:	<b>13.2 k-in</b>	Reqd Section Modulus:	<b>0.701 in<sup>3</sup></b>	

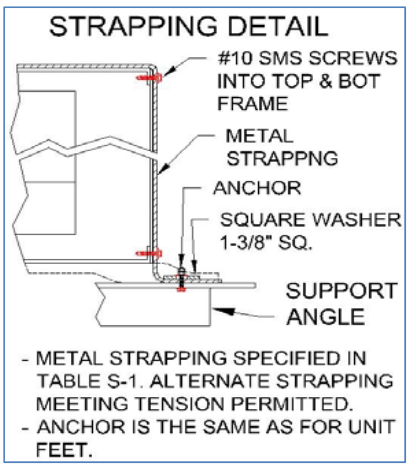
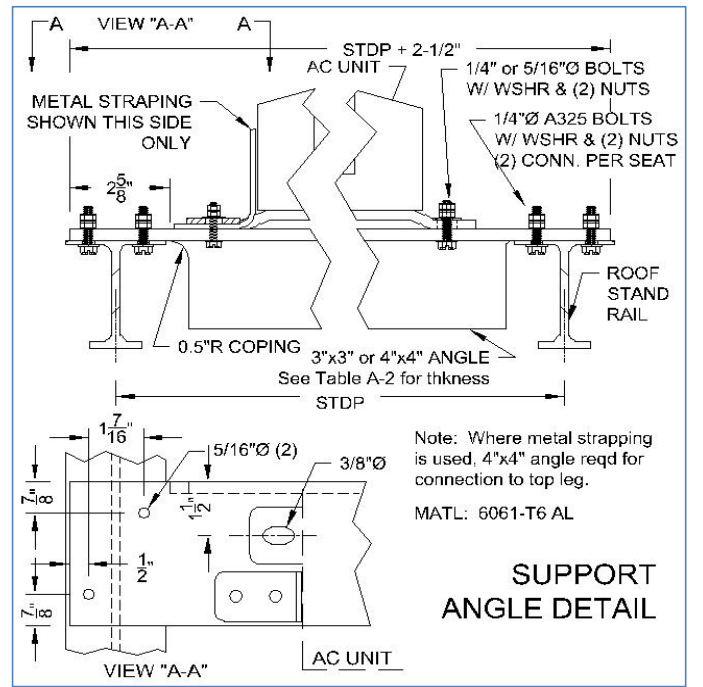
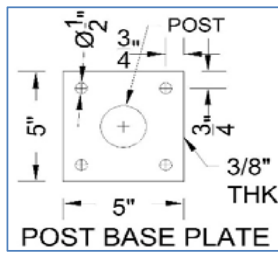
Use: 3"x3"x3/8" with Sx = 0.804 in<sup>3</sup>

**Unit Integrity:** If Required. Only if manufacturer does not state design wind pressure.  
 Required tension on strap= **1559 lbs**  
 Strap width, gauge= **1.375 in.** 18ga min gauge thickness  
 Steel Strength= **50 ksi min.** Strength of strap= **1705 lbs** Checks OK

**Roof Stand min, maxs:**

limits	STWD	STDP	STHT	Leg Max Forces(lbs)
limits				Tension: 5860
min:	24 in.	28 in.	18 in.	Comp.: 6000
max:	36 in.	36 in.	33 in.	Shear: 1700

Number of anchors per stand post base: **4**



**TABLE S-1 Strapping Type**

SYM	Ga.	Description	Tension (lbs)
S-1	20	1-1/4"W CS20	1030
S-2	16	1-3/8"W CS16	1705

Note: Matl is galv. and min fy=50ksi. (Permissible: Simpson Strong-Tie Coiled Straps CS20 rated at 1030 lbs, CS16 rated at 1705 lbs.)

**GENERAL NOTES:**

- THIS ENGINEERING REPORT DOCUMENTS THE ANALYSIS OF AC EQUIPMENT MOUNTED ON A ROOF STAND ON A CONCRETE ROOF DECK AND THE ASSOCIATED ANCHORING SYSTEMS TO RESIST DEAD WEIGHT AND WIND LOAD FORCES.
- THE LOAD PATH VERIFIED IS FROM THE EQUIPMENT AS A SINGLE UNIT, ENCLOSURE FASTENERS, UNIT FOOT ANCHORS, ROOF STAND CROSS SUPPORT TO ROOF STAND.
- AC UNIT IS MOUNTED ON A METAL ROOF STAND THAT IS SECURED TO THE ROOF.
- ANCHORS USED TO FASTEN THE UNIT TO THE ROOF STAND ARE STAINLESS OR HIGHER STRENGTH STEEL BOLTS.
- THE ROOF STAND IS SUPPLIED BY THE MANUFACTURER INDICATED IN THIS DOCUMENT AND IS INSTALLED IN CONFORMANCE WITH THE ENGINEERING DOCUMENT REFERENCED.
- STAND BASE PULLUP IS PROVIDED FOR ANCHOR SELECTION TO OTHER ROOF TYPES NOT SPECIFIED IN THIS DOCUMENT.
- UNIT INTEGRITY, IF NOT DESIGNATED BY THE MANUFACTURER FOR THE STATED WIND PRESSURES, IS ADDRESSED BY STRAPPING ATTACHED TO THE UNIT AND ANCHORED TO THE SUPPORT ANGLES. THIS RESISTS SHELL AND FRAME SEPARATION.

**CALCULATIONS:**

- THE WIND LOAD ACTING NORMAL TO THE LARGE VERTICAL SIDE OF THE AC UNIT IS USED FOR WORST CASE SHEAR.
- THE WIND LOAD ACTING ON THE TOP OF THE UNIT UPWARD AND THE HORIZONTAL WIND LOAD IS USED TO CALCULATE UPLIFT AND MOMENT.
- THESE FORCES MUST BE RESISTED BY THE SHEAR AND TENSILE STRENGTH OF THE ANCHORS BOTH HOLDING THE UNIT TO THE SUPPORT BAR AND THE SUPPORT BAR TO THE ROOF STAND.
- THE MOMENT AND SHEAR MUST BE TRANSFERRED FROM THE AC UNIT TO THE ROOF STAND BY A SUPPORT BAR AS THE AC UNIT DEPTH IS LESS THAN THE ROOF STAND DEPTH.
- MAX MOMENT AND SHEAR TO THE SUPPORT BAR DETERMINE SELECTION OF THE SUPPORT BAR.

**ROOF STAND NOTES:**

- ROOF STAND IS BASED ON A DESIGN BY R.M. ENTERPRISES, PER ENGINEERING DRWG DATED 03-09-2012 SIGNED AND SEALED BY P.E.#56902, BUT VERIFIED BY BRI-KO ENGINEERING
- STHT = STAND HEIGHT WITH MIN 18", MAX 33".
- STWD = STAND WIDTH = 24" MIN, 36" MAX.
- STDP = STAND DEPTH = 28" MIN, 36" MAX.
- SUPPORT ANGLE AND FASTENERS OF SUPPORT TO STAND AND SUPPORT TO AC UNIT ARE DEFINED IN DETAIL BELOW.
- AC UNIT MUST BE CENTERED ON SUPPORT.W.

ROOF STAND LIMITS.) MAX COMPRESSION PER FOOT = 6000 LBS. MAX UPLIFT PER FOOT = 5860 LBS. MAX SHEAR PER TWO FEET = 1700 LBS.

**TABLE A-1 ANCHOR TYPE AND ALLOWABLE STRENGTHS**

SYM	ANCHOR DESCRIPTION & MANUFACTURER	EMBED	STRENGTH AT MIN SPACING	
			PULL OUT (LBS)	SHEAR (LBS)
A-1	1/4" TAPCON (Buildex)	1-3/4"	495	390
A-2	5/16" Conc Screw "Ultracon" DeWalt	2"	600	655
A-3	3/8" Screw Bolt (Powers)	2-1/2"	1275	1400
A-4	1/4" SS-316 Bolt	N/A	2400	1300
A-5	5/16" SS-316 Bolt	N/A	3500	2000

Notes: 1. Strength for concrete anchors are at spacing of 3.5" in 3000 psi conc.

Sheet: **ENG-1**  
 Doc: **Page 1 of 1**  
 Issue Date: **1-Nov-22**  
 Dwn By: **B.S.**  
 Dwg Size: **11x 17**

BRI-KO ENGINEERING INC Cert. Of Auth.:#27622 tel: 954.648.6218

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.