Carrier 09DP 18-60 ton Condenser **Models by Size**

Models / Nominal Tonnage	Unit Chassis	Dims.(In.) L x W x H (See Note 1)	Chassis Description	Unit weight (lbs) Minimum (Base unit - NO options / accessories)	Unit weight (lbs) MAXIMUM (Fully Optioned)
018	2a	89 x 41 x 66.5	Longer than Chassis-1 (1 cond. fan)	638	756
020	2a	89 x 41 x 66.5	Longer than Chassis-1 (2 cond. fans)	719	855
030	2b	89 x 41 x 78.5	Taller than Chassis-2a (2 cond. fans)	869	1005

Carrier 30RAP 10-60 ton Chiller **Models by Size**

Models / Nominal Tonnage	Unit Chassis	Dims.(In.) L x W x H (See Note 1)	Chassis Description	Unit weight (lbs) Minimum (Base unit - NO options / accessories)	Unit weight (lbs) MAXIMUM (Fully Optioned)
018, 020	2a	89 x 41 x 66.5	Longer than Chassis-1 (2 cond. fans)	1125	1608
025, 030	2b	89 x 41 x 78.5	Taller than Chassis-2a (2 cond. fans)	1242	1758

Carrier 38AP 25-60 ton Condensing Unit **Models by Size**

Models / Nominal Tonnage	Unit Chassis	Dims.(In.) L x W x H (See Note 1)	Chassis Description	Unit weight (lbs) Minimum (Base unit - NO options / accessories)	Unit weight (lbs) MAXIMUM (Fully Optioned)
025	2a	89 x 41 x 66.5	Longer than Chassis-1 (2 cond. fans)	1077	1281
027, 030	2b	89 x 41 x 78.5	Taller than Chassis-2a (2 cond. fans)	1240	1450

THE UNIT MODELS LISTED BELOW WERE ANALYZED TO MEET THE REQUIREMENTS OF THE FLORIDA BUILDING CODE 5TH EDITION (2014) AND THE ASCE 7-10 WIND ANALYSIS CODE. THE UNITS AND CONNECTIONS WERE ANALYZED FOR 186 MPH WIND SPEED AT 60 FEET ABOVE GROUND FOR CATEGORY III AND IV STRUCTURES.

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JOB NAME: CARRIER 09DP, 30RAP, 38AP GROUP 2
18-30 TON CHILLERS & CONDENSING UNITS

TITLE: GROUP TWO MODELS LIST

Job No:	15-34
Date: Rev Date:	03-24-16
Chkd By:	R. Samara
Drawn By:	A.Barnet

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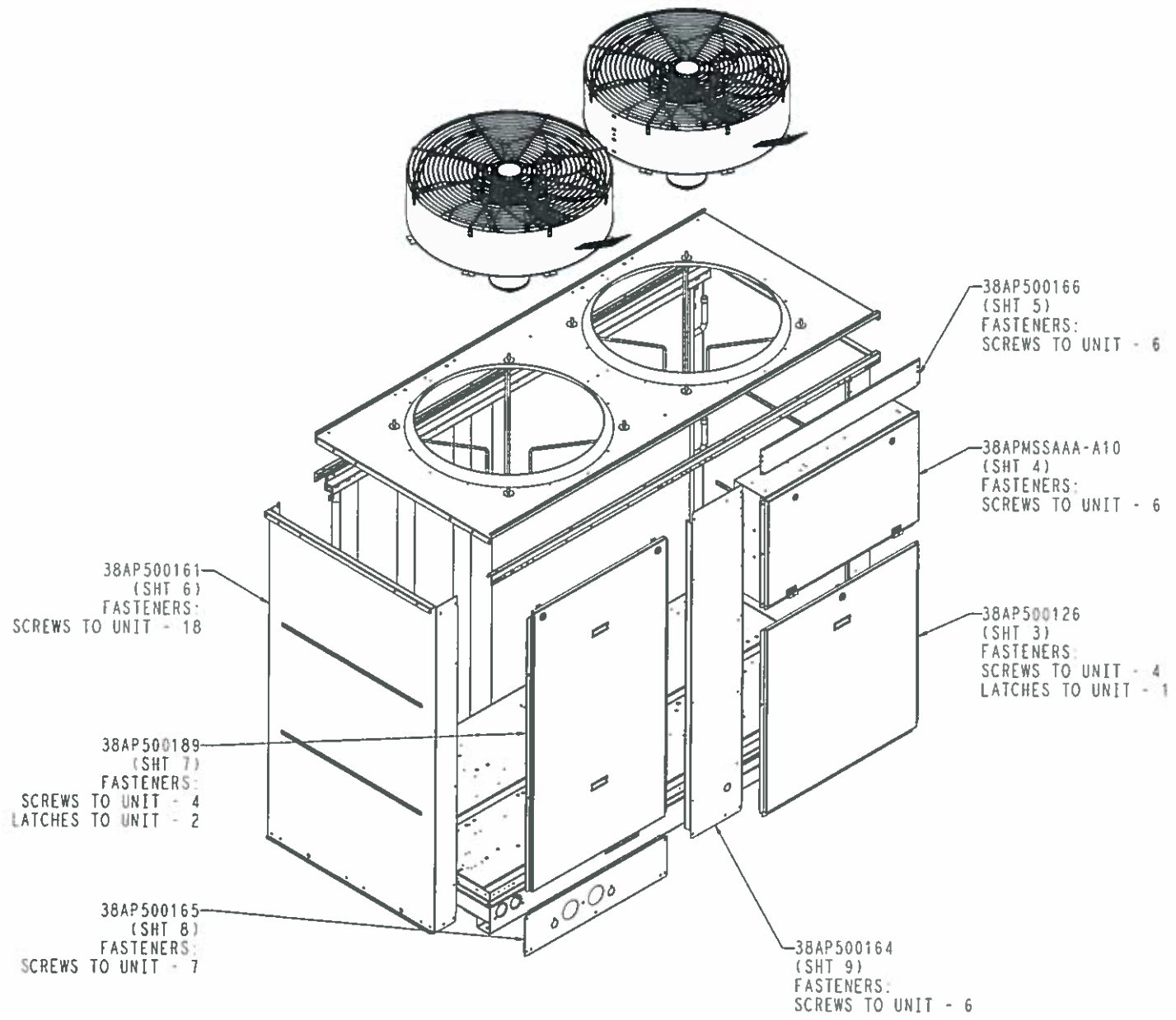
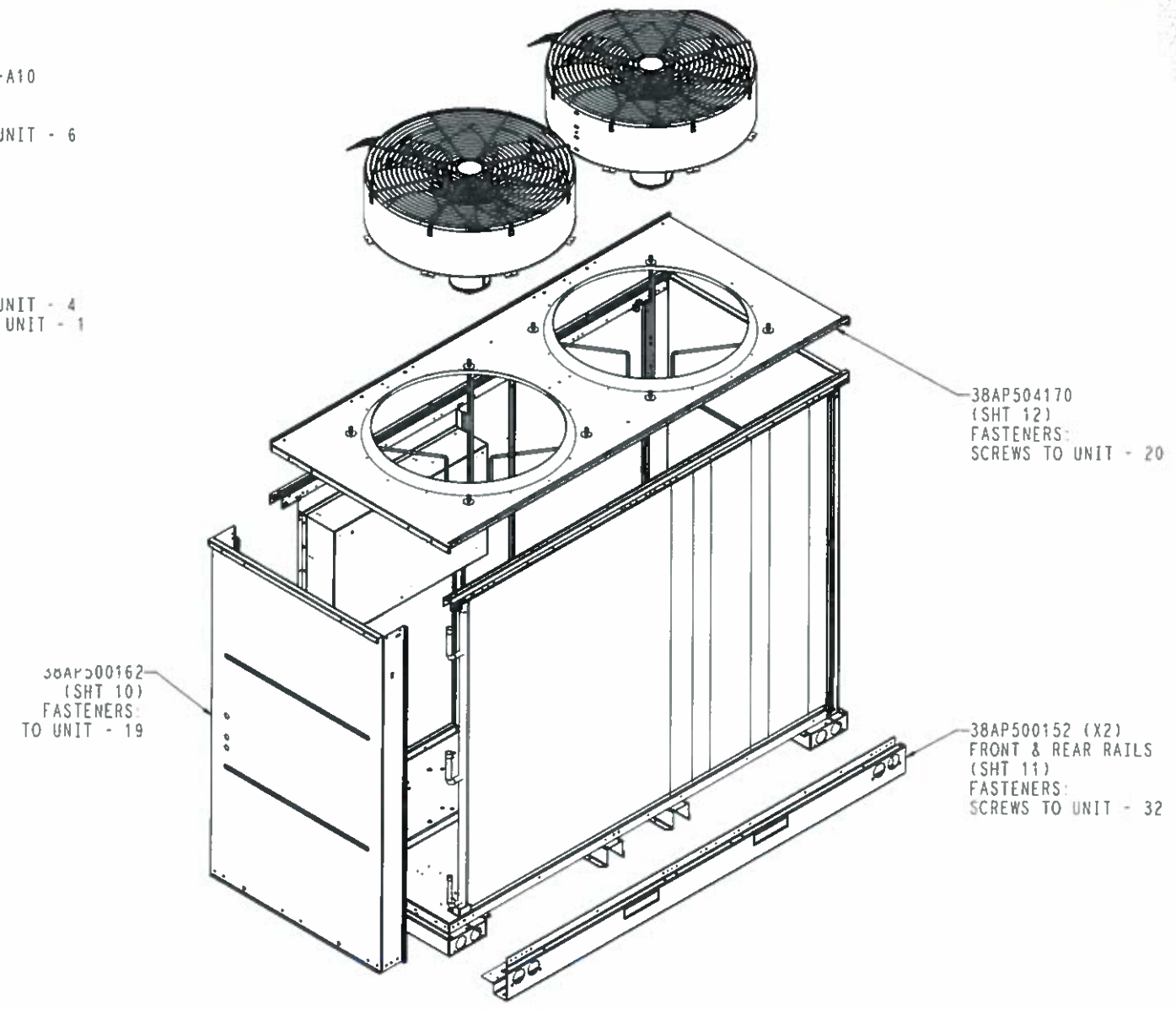
NOTE THAT VERTICAL UNIT PANELS ARE ATTACHED TO BASE RAIL WITH AT LEAST (12) 1/4-14x $\frac{5}{8}$" LONG "CRIMPTITE" FASTENER SCREWS , EACH LONG SIDE, WITH A SHEAR CAPACITY OF 953 POUNDS EACH, WITH A SAFETY FACTOR OF (3) AND A TOTAL CAPACITY OF 11,436 POUNDS.





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JOB NAME: CARRIER 09DP, 30RAP, 38AP GROUP 2
18-30 TON CHILLERS & CONDENSING UNITS

TITLE: ASSEMBLY DRAWING & ATTACHMENT LOCATION LAN

Job No:	15-34
Date:	03-24-16
Rev Date:	
Chkd By:	R. Samara
Drawn By:	A.Barnet

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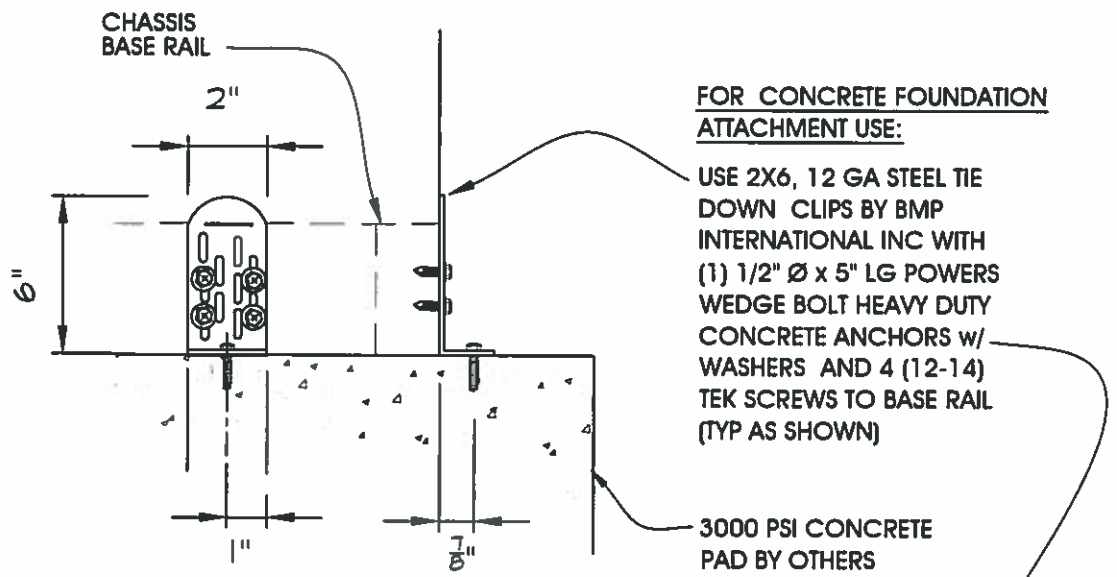
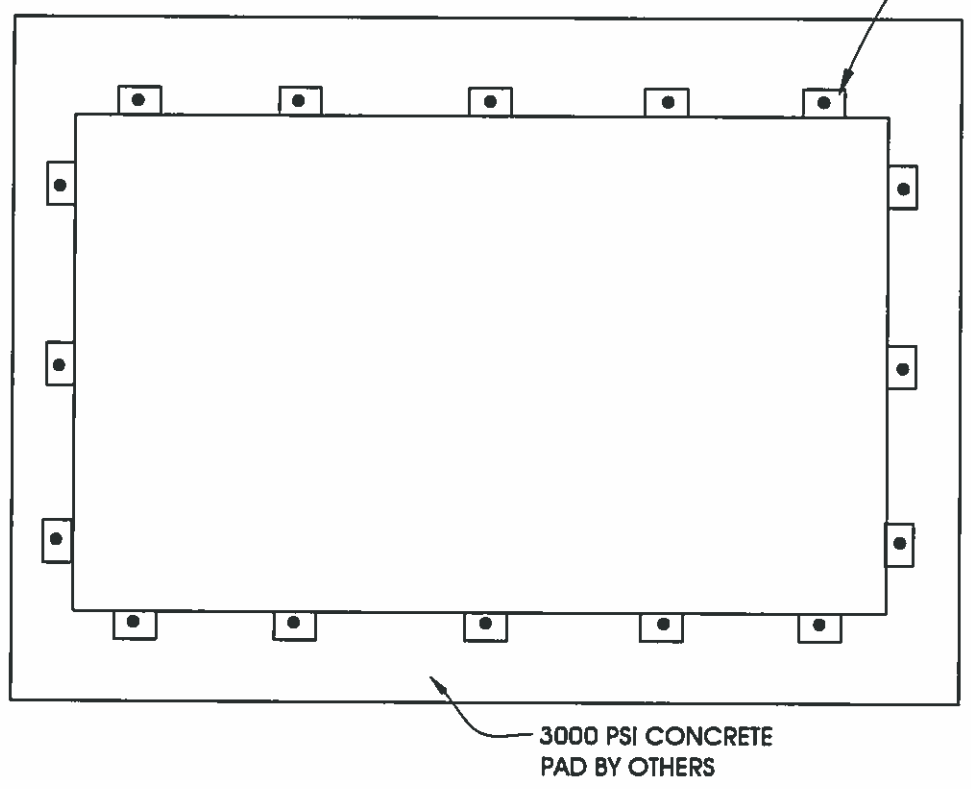
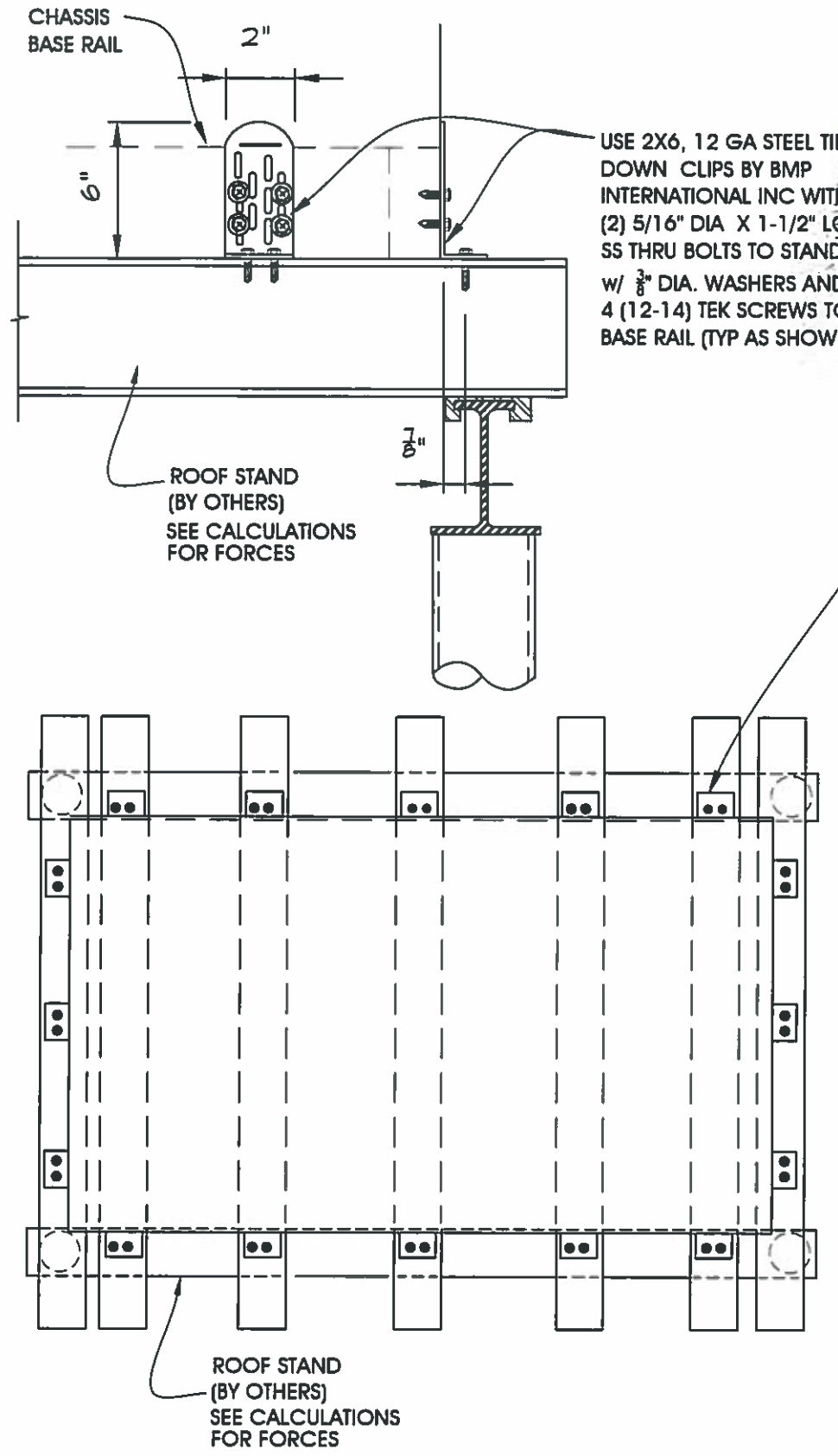




FOUNDATION ATTACHMENT DETAIL



ROOF STAND ATTACHMENT DETAIL

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JOB NAME: CARRIER 09DP, 30RAP, 38AP GROUP 2
18-30 TON CHILLERS & CONDENSING UNITS

TITLE: ASSEMBLY DRAWING & ATTACHMENT LOCATION LAN

Job No:	15-34	Chkd By	R. Samara
Date: Rev Date	03-24-16	Drawn By:	A.Barnet

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References:
ASCE 7-10 " Minimum Design Loads for Buildings and Other Structures"
Florida Building Code 2014, 5th Edition

Design Criteria:
FBC 2014, Section 1620. "High Velocity Hurricane Zone, Wind Loads"
Wind Analysis (For hts up to 100 ft & 186 MPH wind) (Risk Category III & IV)

Wind design velocity	$V := 186$	
Wind speed conversion	$V_{asd} := V\cdot\sqrt{0.6}$ $V_{asd} = 144.075$	
Structure Category	III & IV	(Table 1.-1 (ASCE)
Height above ground	$H := 100$ ft	
Height of structure	$h := 78.5$ in	
Width of unit	$D := 41$ in	
Length of unit	$L := 89$ in	
Area resisting wind forces	$A_f := \frac{h\cdot D}{144}$ $A_f = 22.3\ ft^2$	
Gust effect factor	$GC_f := 3.1$	(1620.6 FBC-14)
Velocity Exposure Coefficient	$K_z := 1.43$	(Table 297.3-1) Exposure D) (ASCE)
Topographic multipliers	$K_1 := 0$	(Section 26.6-1) (ASCE)
	$K_2 := 0$	(Section 26.6-1) (ASCE)
	$K_3 := 0$	(Section 26.6-1) (ASCE)
Topographic Factor	$K_{zt} := (1 + K_1\cdot K_2\cdot K_3)$ $K_{zt} = 1$	(Section 26.8-1) (ASCE)
Wind Directionality Factor	$K_d := 1.0$	(Table 26.6-1) (ASCE)
Velocity pressure	$q_z := 0.00256\cdot K_z\cdot K_{zt}\cdot K_d\cdot V_{asd}^2$ $q_z = 75.989$ psf	
Design Wind Force	$F := q_z\cdot GC_f$ $F = 235.567$ psf	
	$\frac{F}{144} = 1.636$ psi	

UPLIFT WIND FORCES FOR UNITS WITH SOLID ENCLOSED TOP PANELS

Gust effect factor $GC_r := 3.1$

Design Wind Force $F_{up} := q_z\cdot GC_r$ $F_{up} = 235.567$ psf

$\frac{F_{up}}{144} = 1.636$ psi

ANCHOR DESIGN OF BASE RAIL (14 ga.) TO CONCRETE SUPPORT PAD WITH 2" X 6" TIE-DOWN CLIPS (12 ga.)

Design Criteria:	Width (ft)	Height (ft)	Area (sq ft)	Moment arm (ft)
	$w := \frac{L}{12}$	$h_1 := \frac{h}{12}$	$A_{f1} := w\cdot h_1$	$a_1 := \frac{D}{12}$
	$w = 7.417$	$h_1 = 6.542$	$A_{f1} = 48.517$	$a_1 = 3.417$

Maximum wind moments and overturning reaction forces on each unit

$M_1 := A_{f1}\cdot\frac{h_1}{2}\cdot F$ $M_1 = 3.738\times(ft\,lbs)$ $F_1 := \frac{M_1}{a_1}$ $F_1 = 1.094\times10^4$ (lbs per long side)

Screw Design (Vert. Attachment to Base Rails (Shear capacity of (20) 12-14 Tech Screws (Long Side)(646 lbs. / screw)

$V_s := 20\cdot646$ $V_s = 1.292\times10^4 lbs.$ **Number/Screws/Clip (4)**

Tensile capacity of (5) 1/2" x 5" Anchor devises for Uplift Clips per long side (Uplift capacity of 2522 lbs.)

$F_{kb} := 2522\cdot5$ $F_{kb} = 1.261\times10^4 lbs$ **Number/Anchors/Clip (1)**

Try (5) 2" x 6" Tie-down Clips on each long side with minimum capacity of 3300 lbs. (Vertical Attachment Controls)

$T_s := 5\cdot3300$ $T_s = 1.65\times10^4$ **Number/Clips/Unit (16)**

Use 2" X 6", 12 guage, "Steel Tie-Down Clips, by BMP International, Inc." Attach (5) Clips at each long side and (3) per short side. Use (4) No. 12-14 x 1" (HWH) Hilti Self Drilling steel screws, or equal at each Uplift Clip with a shear capacity of 646 lbs per screw (working stress). For Clip to foundation attachment use (1) 1/2" x 5" long "Powers Wedge Bolt" heavy duty anchors and 9/16" stainless steel washer, with uplift capacity of 2522 lbs per anchor in 3000 psi concrete. (See

ANCHOR DESIGN OF BASE RAIL TO METAL ROOF STAND w/ 2' x 6" TIE-DOWN CLIPS (12 ga.), WITH ADDED UPLIFT

Added wind upift forces

Gust effect factor $GC_r := 1.5$ (1620.6) **(FBC-14)**

Design Wind Force $F_{up} := q_z\cdot GC_r$ $F_{up} = 113.984$ psf $\frac{F_{up}}{144} = 0.792$ psi

$M_1 := A_{f1}\cdot\frac{h_1}{2}\cdot F$ $M_1 = 3.738\times(ft\,lbs)$ $F_1 := \frac{M_1}{a_1}$ $F_1 = 1.094\times10^4$ (lbss per long side)

$F_{tup} := F_{up}\cdot A_{f1}$ $F_{tup} = 5.53\times10^3$ $F_{1adj} := F_1 + \frac{F_{tup}}{16}$ $F_{1adj} = 1.129\times10^4$

Screw design (Vertical Attachment to Base Rail)
Shear capacity of (20) #12-14 Tech Screws

$V_s := 20\cdot646$ $V_s = 1.292\times10^4$ **Number of Screws per Clip (4)**

Tensile capacity of (10) 5/16" Stainless Thru Bolts for "Steel Tie-Down Clips" to Metal Roof Stand at long sides

$F_{kb} := 1530\cdot10$ $F_{kb} = 1.53\times10^4$ lbs **Number/Thru Bolts/Clip (2)**

Try (5) Uplift Clips on each long side with minimum capacity of 3300 lbs. (Controlled by Tech Screw capacity)

$T_s := 5\cdot3300$ $T_s = 1.65\times10^4$ **Number/Clips/Unit (16)**

Use 2" X 6", 12 guage, "Steel Tie-Down Clips, by BMP International, Inc."Use (5) Clips evenly spaced along each long side and (3) Clips along each short side. Use (2) 5/16" x 1 1/2" Stainless Steel Thru Bolts per "Steel Tie-Down Clip", with 3/8" dia. washers at long sides, for Attached Hold Down Clips to Metal Roof Stand connection and (4) #12-14 Tech Screws per clip at base rail. (See attached drawings).

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3/31/16

JOB NAME: CARRIER 09DP, 30RAP, 38AP GROUP 2
18-30 TON CHILLERS & CONDENSING UNITS

TITLE: WIND ANALYSIS AND CALCULATIONS

Job No:	Date: Rev Date:	Chkd By:	Drawn By:
15-34	03-24-16	R. Samara	A.Barnet

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UTC-GROUP-2 PARTS

DESIGN BUILDINGS FOR 186 MPH WIND VELOCITY AND 100 FEET OR LESS IN HEIGHT

References:

Florida State Building Code 2014 5th Edition

ASCE 7-10 "Minimum Design Loads for Buildings and Other Structures"

Design criteria:

Maximum Load Conditions for Individual interior panels are evaluated for their capacity to resist wind forces for 186 mph velocity at 100 feet height (Category III &IV). Stress analysis is based on drawings, dimensions and section properties provided by UTC for their GROUP-2 Units.

Wind force: $F := 1.636$ psi **Steel pan yield stress :** $f_t := 36.3 \cdot 1.33$ $f_t = 48.279$ ksi

Part No.	Height (in)	Eff Width (in)	Moment (in kips)		Sect. Mod. in^3		Resisting Moment Capacity (in kips)	
FRONT PANEL 126	$s_1 := 35.75$	$w_1 := 36.25$	$M_1 := \frac{0.111 \cdot s_1 \cdot F \cdot w_1^2}{1000}$	$M_1 = 8.531$	$S_{1x} := 0$	$S_{1y} := 0.78418$	$M_{r1} := f_t \cdot (S_{1x}) + f_t \cdot S_{1y}$	$M_{r1} = 37.859$
FRONT PANEL A10	$s_2 := 35.92$	$w_2 := 21.89$	$M_2 := \frac{0.111 s_2 \cdot F \cdot w_1^2}{1000}$	$M_2 = 8.572$	$S_{2y} := 11.261$	$S_{2x} := 0$	$M_{r2} := f_t \cdot (S_{2y}) + f_t \cdot S_{2x}$	$M_{r2} = 543.67$
FRONT PANEL166	$s_3 := 36.0$	$w_3 := 5.03$	$M_3 := \frac{0.111 w_3 \cdot F \cdot s_3^2}{1000}$	$M_3 = 1.184$	$S_{3x} := 0.0515$	$S_{3y} := 0.0645$	$M_{r3} := f_t \cdot S_{3x} + f_t \cdot S_{3y}$	$M_{r3} = 5.6$
LEFT END PANEL 161	$s_4 := 38.69$	$w_4 := 63.89$	$M_4 := \frac{0.111 \cdot w_4 \cdot F \cdot s_4^2}{1000}$	$M_4 = 17.367$	$S_{4x} := 0.7892$	$S_{4y} := 0$	$M_{r4} := f_t \cdot S_{4y} + f_t \cdot S_{4x}$	$M_{r4} = 38.102$
FRONT PANEL 189	$s_5 := 15.87$	$w_5 := 54.76$	$M_5 := \frac{0.111 \cdot w_5 \cdot F \cdot s_5^2}{1000}$	$M_5 = 2.505$	$S_{5x} := 0.0645$	$S_{5y} := 0$	$M_{r5} := f_t \cdot (S_{5x}) + f_t \cdot S_{5y}$	$M_{r5} = 3.114$
FRONT PANEL 165	$s_6 := 32.18$	$w_6 := 0$	$M_6 := \frac{0.111 \cdot w_6 \cdot F \cdot s_6^2}{1000}$	$M_6 = 0$	$S_{6x} := 0.0142$	$S_{6y} := 0.00698$	$M_{r6} := f_t \cdot S_{6x} + f_t \cdot S_{6y}$	$M_{r6} = 1.023$
FRONT PANEL 164	$s_7 := 45.55$	$w_7 := 62.59$	$M_7 := \frac{0.111 \cdot s_7 \cdot F \cdot w_7^2}{1000}$	$M_7 = 32.404$	$S_{7x} := 0$	$S_{7y} := 0.6721$	$M_{r7} := f_t \cdot S_{7x} + f_t \cdot S_{7y}$	$M_{r7} = 32.448$
RIGHT END PANEL 162	$s_8 := 38.69$	$w_8 := 63.88$	$M_8 := \frac{0.111 w_8 \cdot F \cdot s_8^2}{1000}$	$M_8 = 17.365$	$S_{8x} := 1.234$	$S_{8y} := 0$	$M_{r8} := f_t \cdot (S_{8x}) + f_t \cdot (S_{8y})$	$M_{r8} = 59.576$
FRONT & REAR RAIL 152	$l_9 := 88.0$	$w_9 := 0$	$M_9 := \frac{0.111 \cdot l_9 \cdot F \cdot w_9^2 \cdot 1.5}{1000 \cdot 1.9}$	$M_9 = 0$	$S_{9x} := 0.0559$	$S_{9y} := 0.733$	$M_{r9} := f_t \cdot S_{9x} + f_t \cdot S_{9y}$	$M_{r9} = 38.087$
COVER PANEL 170	$s_{10} := 88.24$	$w_{10} := 40.04$	$M_{10} := \frac{0.125 \cdot s_{10} \cdot F \cdot w_{10}^2}{1000}$	$M_{10} = 28.93$	$S_{10x} := 0.0665$	$S_{10y} := 0.2235$	$M_{r10} := f_t \cdot S_{10x} + f_t \cdot S_{10y}$	$M_{r9} = 38.087$

NOTE: ALL PANELs OF THE WIND RESISTING EXTERIOR PANELS, INDIVIDUALLY MEET OR EXCEED THEIR CAPACITY TO RESIST THE DESIGN WIN LOADS AS STATED IN THE CALCULATIONS AS REQUIRED BY THE FLORIDA STATE BUILDING CODE 2014. DUE TO THE INDETERMINENT NATURE OF THESE UNITS, DISTORTION AND DEFLECTION CANNOT BE ACCURATELY EVALUATED, BUT WITH DIAPHRAGM ACTION OF EXTERNAL COMPONENTS AND INTERNAL STIFFENERS, THE BASE UNIT HAS THE CAPACITY TO WITHSTAND THESE FORCES WITH INDIVIDUAL EXTERNAL PARTS BEING CONTAINED. YEARLY INSPECTIONS OR DURING EQUIPMENT MAINTENANCE, ALL TECH SCREWS, CABINET COMPONENTS, CLIPS AND ANCHOR BOLTS ARE TO BE VERIFIED BY THE A/C CONTRACTOR. ALL DAMAGED CABINET COMPONENTS, LOOSE, CORRODED, BROKEN TECH SCREWS OR ANCHOR BOTS SHALL BE REPLACED TO ENSURE STRUCTURAL INTEGRITY FOR HURRICANE WIND FORCES.

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JOB NAME: CARRIER 09DP, 30RAP, 38AP GROUP 2
18-30 TON CHILLERS & CONDENSING UNITS

TITLE: PARTS ANALYSIS AND CALCULATIONS

Job No:	15-34
Date:	03-24-16
Rev Date:	
Chkd By:	R. Samara
Drawn By:	A.Barnet

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