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Reference: **Product Certification Statement**
Rooftop Mounted Mechanical Equipment
Fujitsu Outdoor HVAC Unit (Group 12)
Model Nos.: **AOUA120RLBV1**
AOUA120RLCV
AOUA120TLBV
AOUA120TLCV

Based on the manufacturers cut sheets for the referenced rooftop equipment, I have performed a wind load analysis to determine compliance with wind load criteria set forth by 2017 Florida Building Code Mechanical Section 301.15, Florida Building Code Building Chapter 16 and ASCE 7-10. Analysis results demonstrate that the equipment without retrofit is structurally adequate to withstand wind loads at the specified mounting heights for Exposure Categories identified in Table 1. This wind certification includes anchorage of equipment with 5/16" diameter anchors at the six base mount locations. Anchor material strength shall meet or exceed ASTM A307 requirements. Specifications for anchor attachment to host structure and certification for structural adequacy of host support structure is not included and shall be determined by others. For analysis results, refer to Summary of Results at the end of the structures report associated with this certification.

TABLE 1

Design Wind Speed	Max Mounting Height Above Natural Grade (ft)		Kz
	Exposure C	Exposure D	
120	500	500	2.21
130	500	475	1.88
140	340	225	1.63
150	175	95	1.42
160	90	45	1.24
170	50	22	1.10
175	40	15	1.04
180	30	Ground Mount Only	0.98
186	22	Ground Mount Only	0.92
190	17	Ground Mount Only	0.88
200	Ground Mount Only	Ground Mount Only	0.80

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8/20/2020

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WIND LOAD ANALYSIS AND STRUCTURAL CALCULATIONS

FOR

WIND CERTIFICATION

OF

ROOFTOP MECHANICAL EQUIPMENT

FUJITSU OUTDOOR HVAC UNIT (GROUP 12)

MODEL NOS:
AOUA120RLBV1
AOUA120RLCV
AOUA120TLBV
AOUA120TLCV

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AUGUST 2020

Wind Load Analysis for Rooftop Mounted Equipment

Equipment:

Fujitsu 10.0 Ton Chassis

Model Nos: **AOUA120RLBV1**
AOUA120RLCV
AOUA120TLBV
AOUA120TLCV

Approximate Weight of Unit (wt_{unit}): $wt_{unit} := 611 \cdot lbf$

Length of Unit (L_e): $L_e := 48.8 \cdot in$

Width of Unit (W_e): $W_e := 30.1 \cdot in$

Height of Unit (H_e): $H_e := 66.5 \cdot in$

Dimension between Exterior Anchors along Same Side Bracket $L := 39.4 \cdot in$

Dimension between Interior Anchors along Same Side Bracket $M := 33.1 \cdot in$

Effective Mount Hole spacing Along Length (MH_L): $MH_L := \frac{L + M}{2} = 36.3 \cdot in$

Mount Hole spacing Along Width (MH_W): $MH_W := 28.1 \cdot in$

Corner Weight at Point A (Rdl_A): $Rdl_A := \frac{wt_{unit}}{4}$ $Rdl_A = 152.8 \cdot lbf$

Corner Weight at Point B (Rdl_B): $Rdl_B := \frac{wt_{unit}}{4}$ $Rdl_B = 152.8 \cdot lbf$

Corner Weight at Point C (Rdl_C): $Rdl_C := \frac{wt_{unit}}{4}$ $Rdl_C = 152.8 \cdot lbf$

Corner Weight at Point D (Rdl_D): $Rdl_D := \frac{wt_{unit}}{4}$ $Rdl_D = 152.8 \cdot lbf$

Material Data:

Ultimate Tensile Strength of Cold Formed Sheet Metal Casing in Contact with Screw Head ($Fu1_{cas}$): $Fu1_{case} := 45 \cdot ksi$

Ultimate Tensile Strength of Cold Formed Sheet Metal Casing Not in Contact with Screw Head ($Fu2_{cas}$): $Fu2_{case} := 45 \cdot ksi$

Ultimate Strength of Metal Fasteners (Fu_{fas}): $Fu_{fas} := 50 \cdot ksi$

Yield Strength of Metal Casing (Fy) $F_y := 30 \cdot ksi$

Calculate Wind Load (Per ASCE 7-10)

Building Risk Category (B_{Risk}): $Bldg_{Risk} := "II"$

Design Wind Speed (V): $V := 175$ mph

Mounting Height above Grade (H): $H := 40 \cdot ft$

$ExpCat := "C"$

Velocity pressure exposure coefficient at height from ground to Centroid of Equipment (K_z): $K_z := 1.04$

Topographic Factor (K_{zt}): $K_{zt} := 1.0$

Directionality Factor From Table 6-4 (Similar Structures) (K_d): $K_d := 0.90$

Ultimate Design Velocity Pressure Evaluated at height z of the Centroid of the Effective Area (q_{zULT}):

$q_{zULT} := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot psf$ $q_{zULT} = 73.4 \cdot psf$

Allowable Design Velocity Pressure Evaluated at height z of the Centroid of the Effective Area (q_z):

$q_z := q_{zULT} \cdot 0.6$ $q_z = 44 \cdot psf$

Lateral Pressure Coefficent $GCf_{lat} := 1.9$

Uplift Pressure Coefficent $GCf_{upl} := 1.5$

Lateral Wind Pressure (p_{lat}): $p_{lat} := q_z \cdot GCf_{lat}$ $p_{lat} = 83.7 \cdot psf$

Uplift Wind Pressure (p_{upl}): $p_{upl} := q_z \cdot GCf_{upl}$ $p_{upl} = 66 \cdot psf$

Projected Area Normal to Wind (A_n): $A_n := L_e \cdot H_e$ $A_n = 22.5 \cdot ft^2$

Projected Area Parallel to Wind (A_p): $A_p := L_e \cdot W_e$ $A_p = 10.2 \cdot ft^2$

Calculate the Wind Load Reactions at Unit to Curb (Refer to Figure I)

$F_h := p_{lat} \cdot A_n$ $\qquad F_h = 1.9 \cdot kip$

$F_{up} := p_{upl} \cdot A_p$ $\qquad F_{up} = 0.7 \cdot kip$

$Rwl_A := \dfrac{F_h \cdot \frac{H_e}{2}}{2 \cdot MH_W} - \dfrac{F_{up}}{4}$ $\qquad Rwl_A = 0.9 \cdot kip$ **(Downward)**

$Rwl_B := \dfrac{F_h \cdot \frac{H_e}{2}}{2 \cdot MH_W} - \dfrac{F_{up}}{4}$ $\qquad Rwl_B = 0.9 \cdot kip$ **(Downward)**

$Rwl_C := \dfrac{F_h \cdot \frac{H_e}{2}}{2 \cdot MH_W} + \dfrac{F_{up}}{4}$ $\qquad Rwl_C = 1.3 \cdot kip$ **(Upward)**

$Rwl_D := \dfrac{F_h \cdot \frac{H_e}{2}}{2 \cdot MH_W} + \dfrac{F_{up}}{4}$ $\qquad Rwl_D = 1.3 \cdot kip$ **(Upward)**

Calculate Combined Reactions at each Anchorage Location (Dead+Wind x FSstab):

Vertical Reactions:

$Rtot_A := Rdl_A + Rwl_A$ $\qquad Rtot_A = 1.1 \cdot kip$

$Rtot_B := Rdl_B + Rwl_B$ $\qquad Rtot_B = 1.1 \cdot kip$

$Rtot_C := Rdl_C - Rwl_C$ $\qquad Rtot_C = -1.1 \cdot kip$

$Rtot_D := Rdl_D - Rwl_D$ $\qquad Rtot_D = -1.1 \cdot kip$

Horizontal Reactions:

$R_{hor} := \dfrac{F_h}{4}$ $\qquad R_{hor} = 0.5 \cdot kip$

Therefore, with the assumption of 4 anchor points (1 at each corner of the unit); each anchorage to curb and corresponding building support components must be designed to withstand the Uplift Reaction of $Rtot_C = -1.1 \cdot kip$ and a Horizontal Shear Reaction of $R_{hor} = 0.5 \cdot kip$.

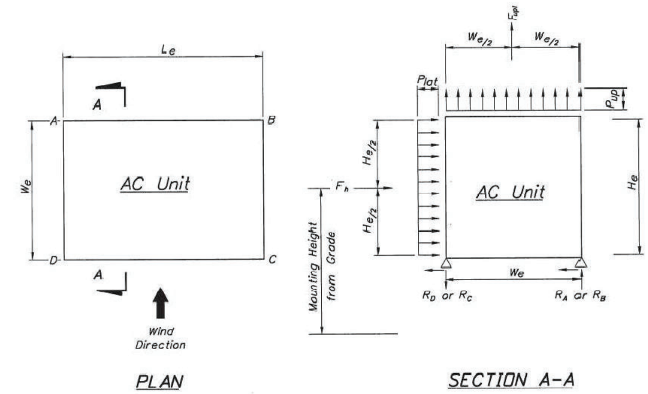

FIGURE I

Calculate No. of Fasteners Req'd for Panel No. 1

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Shear Stress Area of Screw (A_v):

$$A_v := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{1.2269}{unc} \right)^2 \cdot in^2 \qquad A_v = 0.0094 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0315 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0315 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $\quad rc = 1$

Panel Length (L_{pan}): $L_{pan} := L_e = 48.8 \cdot in$

Panel Width (W_{pan}): $W_{pan} := W_e = 30.1 \cdot in$

Calculate Nominal Shear per Fastener Based on Bearing for rc <= 1.0 (Pns_{case}):

$Pns1 := 4.2 \cdot \sqrt{t1^3 \cdot \phi_{screw}} \cdot Fu1_{case}$ $\quad Pns1 = 0.469 \cdot kip$

$Pns2 := 2.7 \cdot t1 \cdot \phi_{screw} \cdot Fu1_{case}$ $\quad Pns2 = 0.753 \cdot kip$

$Pns3 := 2.7 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $\quad Pns2 = 0.753 \cdot kip$

$Pns_{case} := if(Pns1 \le Pns2, if(Pns1 \le Pns3, Pns1, Pns3), if(Pns2 \le Pns3, Pns2, Pns3))$

$Pns_{case} = 0.469 \cdot kip$

Calculate Nominal Shear per Fastener Based on Shear Capacity of Screw (Pns_{screw}):

$Pns_{screw} := Fu_{fas} \cdot A_v$ $\quad Pns_{screw} = 0.468 \cdot kip$

Calculate Allowable Shear per Fastener (Pas):

$\Omega_{brg} := 3.0$ $\quad Pas1 := \frac{Pns_{case}}{\Omega_{brg}}$ $\quad Pas1 = 0.156 \cdot kip$

$\Omega_{screw} := \frac{\sqrt{3}}{0.40}$ $\quad Pas2 := \frac{Pns_{screw}}{\Omega_{screw}}$ $\quad Pas2 = 0.108 \cdot kip$

$Pas := if(Pas1 \le Pas2, Pas1, Pas2)$ $\quad Pas = 0.108 \cdot kip$

Calculate Total Uplift on Panel (F_{upl}):

$\%open := 50\%$

$F_{upl} := p_{upl} \cdot L_{pan} \cdot W_{pan} \cdot (1 - \%open)$ $\quad F_{upl} = 0.3 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws1} := ceil\left(\frac{F_{upl}}{Pas}\right)$ $\quad No_{screws1} = 4$

Calculate No. of Fasteners Req'd for Panel No. 2

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ $\quad$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0394 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0394 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $\quad rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.9 \cdot L_e = 43.9 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.24 \cdot W_e = 7.2 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $\quad Pnt1 = 0.297 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $\quad Pnt2 = 1.117 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $\quad Pnt_{case} = 0.297 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $\quad Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $\quad Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $\quad Pat1 = 0.099 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $\quad Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $\quad Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $\quad Pat = 0.099 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $\quad F_{horiz} = 0.184 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws2} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $\quad No_{screws2} = 2$

Calculate No. of Fasteners Req'd for Panel No. 3

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0236 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0236 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.9L_e = 43.9 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.4 \cdot W_e = 12 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.178 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 0.669 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.178 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.059 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.059 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $F_{horiz} = 0.307 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws3} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws3} = 6$

Calculate No. of Fasteners Req'd for Panel No. 4

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0236 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0236 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.9L_e = 43.9 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.42 \cdot W_e = 12.6 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.178 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 0.669 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.178 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.059 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.059 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$\%open := 8\%$

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan} \cdot (1 - \%open)$ $F_{horiz} = 0.297 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws4} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws4} = 6$

Calculate No. of Fasteners Req'd for Panel No. 5

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0472 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0472 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.95 L_e = 46.4 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.42 \cdot W_e = 12.6 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.355 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 1.338 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.355 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.118 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.118 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $F_{horiz} = 0.340 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws5} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws5} = 3$

Calculate No. of Fasteners Req'd for Panel No. 6

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0394 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0394 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.45 L_e = 22 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.42 \cdot W_e = 12.6 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.297 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 1.117 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.297 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.099 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.099 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $F_{horiz} = 0.161 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws6} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws6} = 2$

Calculate No. of Fasteners Req'd for Panel No. 7

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0394 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0394 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.9 L_e = 43.9 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.2 \cdot W_e = 6 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.297 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 1.117 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.297 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.099 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.099 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $F_{horiz} = 0.154 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws7} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws7} = 2$

Calculate No. of Fasteners Req'd for Panel No. 8

Attachment Data:

Nominal Screw Diameter (Φ_{screw}): $\phi_{screw} := 0.19685 \cdot in$ Dia of Hex Head: $\phi_{head} := 0.42 \cdot in$

Thread Series, threads per in (unc): $unc := 14$

Affective Tensile Stress Area of Screw (A_t):

$$A_t := \frac{\pi}{4} \cdot \left(\frac{\phi_{screw}}{in} - \frac{0.9743}{unc} \right)^2 \cdot in^2 \qquad A_t = 0.0127 \cdot in^2$$

Thickness of Metal Casing in Contact with Screw Head (t1): $t1 := 0.0394 \cdot in$

Thickness of Metal Casing Not in Contact with Screw Head (t2): $t2 := 0.0394 \cdot in$

Casing Thickness Ratio (rc): $rc := \frac{t2}{t1}$ $rc = 1$

Panel Length (L_{pan}): $L_{pan} := 0.67 L_e = 32.7 \cdot in$

Panel Width (W_{pan}): $W_{pan} := 0.42 \cdot W_e = 12.6 \cdot in$

Calculate Nominal Tension or Pullout per Fastener Based on Bearing (Pnt_{case}):

$Pnt1 := 0.85 \cdot t2 \cdot \phi_{screw} \cdot Fu2_{case}$ $Pnt1 = 0.297 \cdot kip$

$Pnt2 := 1.5 \cdot t1 \cdot \phi_{head} \cdot Fu1_{case}$ $Pnt2 = 1.117 \cdot kip$

$Pnt_{case} := if(Pnt1 \le Pnt2, Pnt1, Pnt2)$ $Pnt_{case} = 0.297 \cdot kip$

Calculate Nominal Tensile or Pullout per Fastener Based on Tensile Capacity of Screw (Pnt_{screw}):

$Pnt_{screw} := Fu_{fas} \cdot A_t$ $Pnt_{screw} = 0.636 \cdot kip$

Calculate Allowable Pullout per Fastener (Pat):

$\Omega_{brg} := 3.0$ $Pat1 := \frac{Pnt_{case}}{\Omega_{brg}}$ $Pat1 = 0.099 \cdot kip$

$\Omega_{screw} := \frac{1}{0.40}$ $Pat2 := \frac{Pnt_{screw}}{\Omega_{screw}}$ $Pat2 = 0.254 \cdot kip$

$Pat := if(Pat1 \le Pat2, Pat1, Pat2)$ $Pat = 0.099 \cdot kip$

Calculate Total Horizontal Force on Panel (F_{horiz}):

$F_{horiz} := p_{lat} \cdot L_{pan} \cdot W_{pan}$ $F_{horiz} = 0.240 \cdot kip$

Calculate Total No. of Screws Required (No_{screws}):

$No_{screws8} := ceil\left(\frac{F_{horiz}}{Pat}\right)$ $No_{screws7} = 2$

Check Adequacy of Unit Anchorage

Attachment Data:

Nominal Bolt Diameter (Φ_{bolt}): $\phi_{bolt} := 0.3125 \cdot in$

Affective Bolt Area (A_{eff}):

$$A_{eff} := \frac{\pi}{4} \cdot \left(\frac{\phi_{bolt}}{in}\right)^2 \cdot in^2 \qquad A_{eff} = 0.077 \cdot in^2$$

BoltMaterial := "ASTM A307 or Greater"

Allowable Tensile Strength (F_t): $F_t := 20 \cdot ksi$

Allowable Shear Strength (F_v): $F_v := 9.9 \cdot ksi$

Bolt Shear Capacity (V_{all}): $V_{all} := A_{eff} \cdot F_v = 0.8 \cdot kip$

Bolt Tension Capacity (T_{all}): $T_{all} := A_{eff} \cdot F_t = 1.5 \cdot kip$

Check Bolt Adequacy with Wind Perpendicular to Long Side

Number of Bolts Provided to resist Tension ($NoBolts_{provdtens}$): $NoBolts_{provtens} := 4$

$$t_{bolt} := \frac{|2Rtot_C|}{NoBolts_{provtens}} \qquad t_{bolt} = 0.6 \cdot kip$$

Number of Bolts Provided to resist Shear ($NoBolts_{provdshear}$): $NoBolts_{provshear} := 8$

$$v_{bolt} := \frac{2 \cdot R_{hor}}{NoBolts_{provshear}} \qquad v_{bolt} = 0.1 \cdot kip$$

$$CSR_{bolt} := \frac{t_{bolt}}{T_{all}} + \frac{v_{bolt}}{V_{all}} \qquad CSR_{bolt} = 0.524$$

$$Check_{bolt} := if(CSR_{bolt} \le 1.0, \text{"OK"}, \text{"NG"}) \qquad Check_{bolt} = \text{"OK"}$$

Summary of Results:

$BuildingRisk := Bldg_{Risk} = \text{"II"}$

$DesignWindSpeed := V \cdot mph = 175 \cdot mph$

$ExposureCategory := ExpCat = \text{"C"}$

$MountingHeight := H = 40 \cdot ft$

Number of Panel Fasteners Provided By Manufacturer:		**Number of Panel Fasteners Required By Analysis:**	
Panel No. 1:	$No_{screws.std1} := 14$	Panel No. 1:	$No_{screws1} = 4$
Panel No. 2:	$No_{screws.std2} := 4$	Panel No. 2:	$No_{screws2} = 2$
Panel No. 3:	$No_{screws.std3} := 7$	Panel No. 3:	$No_{screws3} = 6$
Panel No. 4:	$No_{screws.std4} := 6$	Panel No. 1:	$No_{screws4} = 6$
Panel No. 5:	$No_{screws.std5} := 4$	Panel No. 2:	$No_{screws5} = 3$
Panel No. 6:	$No_{screws.std6} := 3$	Panel No. 3:	$No_{screws6} = 2$
Panel No. 7:	$No_{screws.std7} := 5$	Panel No. 2:	$No_{screws7} = 2$
Panel No. 8:	$No_{screws.std8} := 4$	Panel No. 3:	$No_{screws8} = 3$

Panel Fastening Check:

$check_{panel1} := if(No_{screws.std1} \ge No_{screws1}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel2} := if(No_{screws.std2} \ge No_{screws2}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel3} := if(No_{screws.std3} \ge No_{screws3}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel4} := if(No_{screws.std4} \ge No_{screws4}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel5} := if(No_{screws.std5} \ge No_{screws5}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel6} := if(No_{screws.std6} \ge No_{screws6}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel7} := if(No_{screws.std7} \ge No_{screws7}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

$check_{panel8} := if(No_{screws.std8} \ge No_{screws8}, \text{"OK"}, \text{"NG"}) = \text{"OK"}$

Equipment Tie Down to Support By Others:

BoltMaterial = "ASTM A307 or Greater"

$TieDownBoltDia := \phi_{bolt} = 0.3125 \cdot in$

$CSR_{bolt} = 0.5$