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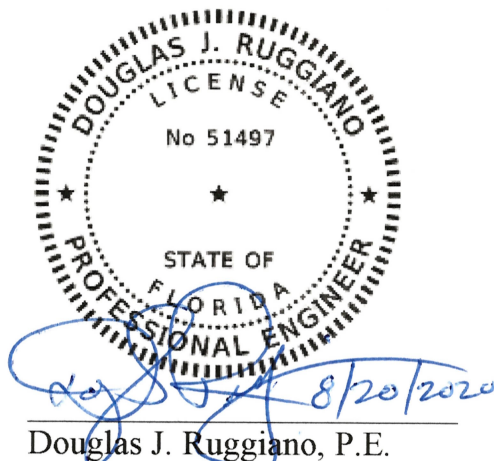
Miami, FL. 33196

786-210-0881

Reference: **Product Certification Statement**
Rooftop Mounted Mechanical Equipment
Fujitsu Outdoor HVAC Unit (Group 11)
Model Nos.: **AOUA72RLBV1; AOUA96RLBV1**
 AOUA72RLCV; AOUA96RLCV
 AOUA72TLBV; AOUA96TLBV
 AOUA72TLCV; AOUA96TLCV

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



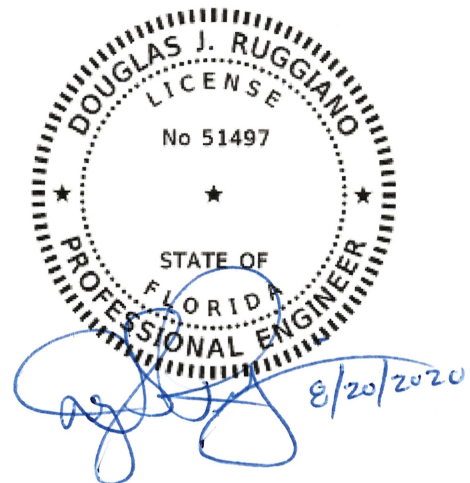
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WIND LOAD ANALYSIS AND STRUCTURAL CALCULATIONS
FOR
WIND CERTIFICATION
OF
ROOFTOP MECHANICAL EQUIPMENT
FUJITSU OUTDOOR HVAC UNIT (GROUP 11)

MODEL NOS:
AOUA72RLBV1; AOUA96RLBV1
AOUA72RLCV; AOUA96RLCV
AOUA72TLBV; AOUA96TLBV
AOUA72TLCV; AOUA96TLCV

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AUGUST 2020

Wind Load Analysis for Rooftop Mounted Equipment

Equipment:
Fujitsu 6.0 - 8.0 Ton Chassis
Model Nos: AQUA72RLBV1; AOUA96RLBV1
 AQUA72RLCV; AOUA96RLCV
 AQUA72TLBV; AOUA96TLBV
 AQUA72TLCV; AOUA96TLCV

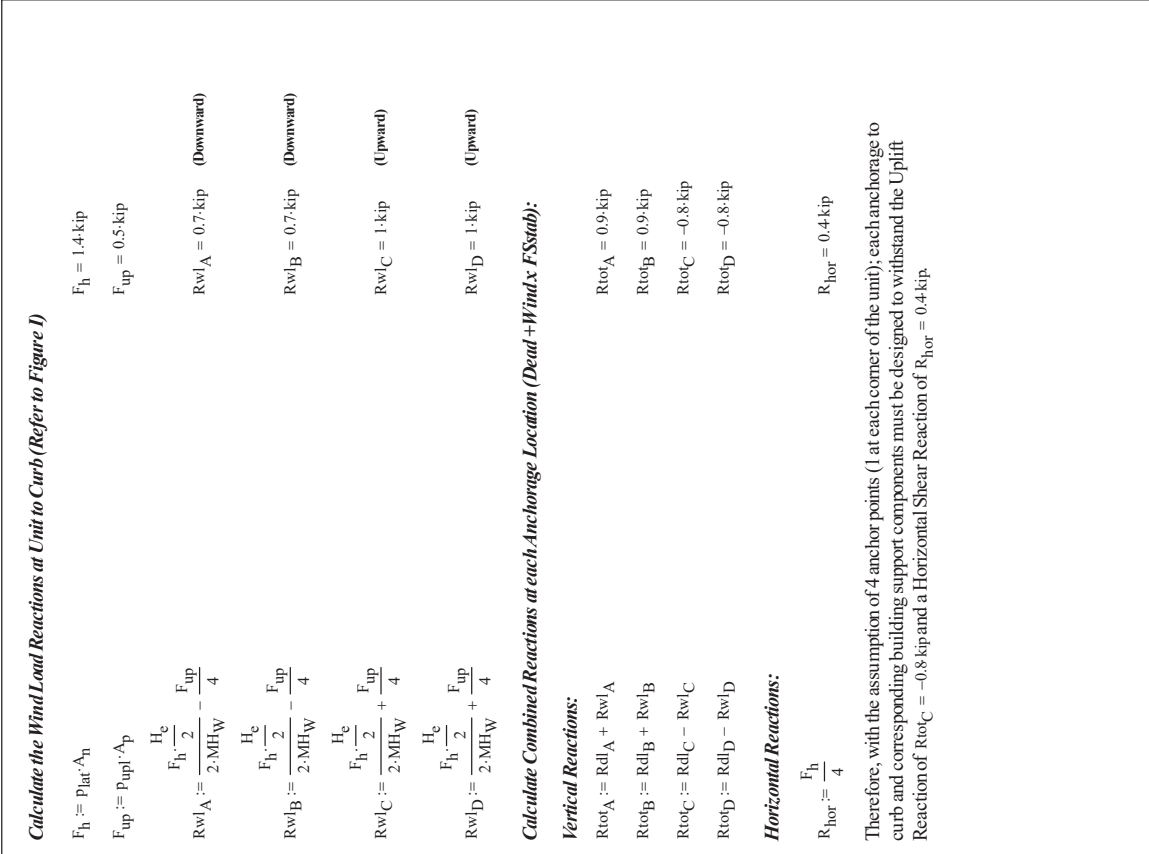
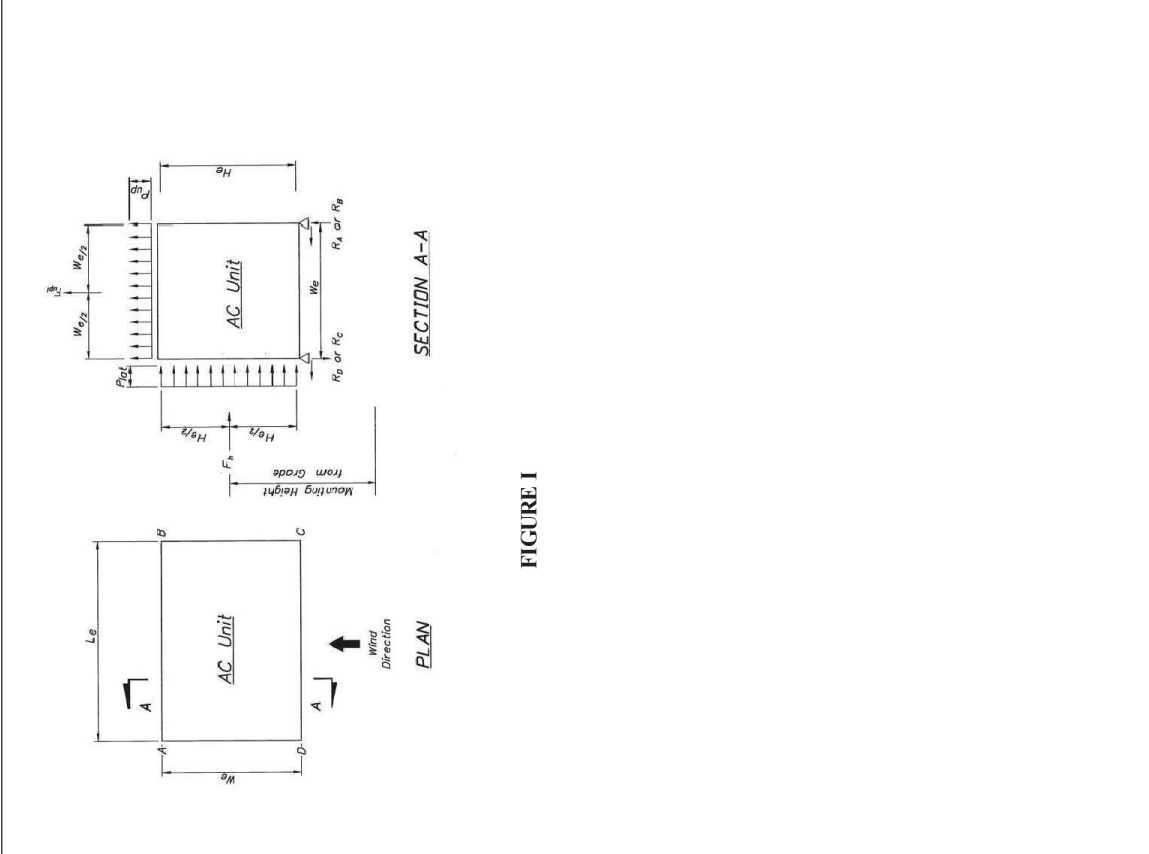
Approximate Weight of Unit (w_{unit}):
 $w_{unit} := 564 \cdot \text{lb} \cdot \text{f}$
Length of Unit (L_u):
 $L_u := 36.6 \cdot \text{in}$
Width of Unit (W_u):
 $W_u := 30.1 \cdot \text{in}$
Height of Unit (H_u):
 $H_u := 66.5 \cdot \text{in}$
Dimension between Exterior Anchors along Same Side Bracket
 $L := 27.5 \cdot \text{in}$
Dimension between Interior Anchors along Same Side Bracket
 $M := 20.9 \cdot \text{in}$
Effective Mount Hole spacing Along Length (MH_L):
 $MH_L := \frac{L + M}{2} = 24 \cdot \text{in}$
Mount Hole spacing Along Width (MH_W):
 $MH_W := 28.1 \cdot \text{in}$
Corner Weight at Point A (Rd_A):
 $Rd_A := \frac{w_{unit}}{4}$
Corner Weight at Point B (Rd_B):
 $Rd_B := \frac{w_{unit}}{4}$
Corner Weight at Point C (Rd_C):
 $Rd_C := \frac{w_{unit}}{4}$
Corner Weight at Point D (Rd_D):
 $Rd_D := \frac{w_{unit}}{4}$

Material Data:

Ultimate Tensile Strength of Cold Formed Sheet Metal Casing in Contact with Screw Head (Fu_{cass}):
 $Fu_{cass} := 45 \cdot \text{ksi}$
Ultimate Tensile Strength of Cold Formed Sheet Metal Casing Not in Contact with Screw Head (Fu_{cassb}):
 $Fu_{cassb} := 45 \cdot \text{ksi}$
Ultimate Strength of Metal Fasteners (Fu_{fb}):
 $Fu_{fb} := 50 \cdot \text{ksi}$
Yield Strength of Metal Casing (Fy):
 $Fy := 30 \cdot \text{ksi}$

Calculate Wind Load (Per ASCE 7-10)

Building Risk Category (B_{Risk}):
 $B_{Risk} := "II"$
Design Wind Speed (V):
 $V := 175 \cdot \text{mph}$
Mounting Height above Grade (H):
 $H := 40 \cdot \text{ft}$
Exposure Category ($ExpCat$):
 $ExpCat := "C"$
Risk Category (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}):
 $q_{zULT} := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot \text{psf}$
 $q_{zULT} = 73.4 \cdot \text{psf}$
Allowable Design Velocity Pressure Evaluated at height z of the Centroid of the Effective Area (q_z):
 $q_z := q_{zULT} \cdot 0.6$
 $q_z = 44 \cdot \text{psf}$
Latent Pressure Coefficient
 $GCF_{lat} := 1.9$
Uplift Pressure Coefficient
 $GCF_{upl} := 1.5$
Lateral Wind Pressure (q_{pl}):
 $P_{lat} := q_z \cdot GCF_{lat}$
 $P_{lat} = 83.7 \cdot \text{psf}$
Uplift Wind Pressure (q_{upl}):
 $P_{upl} := q_z \cdot GCF_{upl}$
 $P_{upl} = 66 \cdot \text{psf}$
Projected Area Normal to Wind (A_n):
 $A_n := L_u \cdot H_u$
 $A_n = 16.9 \cdot \text{ft}^2$
Projected Area Parallel to Wind (A_p):
 $A_p := L_u \cdot W_u$
 $A_p = 7.7 \cdot \text{ft}^2$



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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}):

Thread Series, threads per in (unc):

Affective Shear Area of Screw (A_v):

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

Thickness of Metal Casing in Contact with Screw Head (t1):

Thickness of Metal Casing Not in Contact with Screw Head (t2):

$$rc := \frac{t2}{t1}$$

Panel Length (L_{pan}):

Panel Width (W_{pan}):

Calculate Nominal Shear per Fastener Based on Bearing for $rc \leq 1.0$ (Pns_{case}):

$$Pns1 := 4.2 \sqrt{t1 \cdot \phi_{\text{screw}} \cdot Fu1_{\text{case}}}$$

$$Pns2 := 2.7 \cdot t1 \cdot \phi_{\text{screw}} \cdot Fu1_{\text{case}}$$

$$Pns3 := 2.7 \cdot t2 \cdot \phi_{\text{screw}} \cdot Fu2_{\text{case}}$$

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

$$Pns_{\text{case}} = 0.469 \cdot \text{kip}$$

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

$$Pns_{\text{screw}} := Fu_{\text{tens}} \cdot A_v$$

$$Pns_{\text{screw}} = 0.468 \cdot \text{kip}$$

Calculate Allowable Shear per Fastener (Pas):

$$\Omega_{\text{brg}} := 3.0 \quad Pas1 := \frac{Pns_{\text{case}}}{\Omega_{\text{brg}}}$$

$$\Omega_{\text{screw}} := \frac{\sqrt{3}}{0.40} \quad Pas2 := \frac{Pns_{\text{screw}}}{\Omega_{\text{screw}}}$$

$$Pas := \text{if}(Pas1 \leq Pas2, Pas1, Pas2)$$

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

$$\%_{\text{open}} := 50\%$$

$$F_{\text{up1}} := P_{\text{up1}} \cdot L_{\text{pan}} \cdot W_{\text{pan}} \cdot (1 - \%_{\text{open}})$$

$$F_{\text{up1}} = 0.3 \cdot \text{kip}$$

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

$$No_{\text{screws1}} := \text{ceil} \left(\frac{F_{\text{up1}}}{Pas} \right)$$

$$No_{\text{screws1}} = 3$$

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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}):

$$\phi_{\text{screw}} := 0.19685 \cdot \text{in}$$

$$\phi_{\text{head}} := 0.42 \cdot \text{in}$$

Thread Series, threads per in (unc):

$$\text{unc} := 14$$

Affective Tensile Stress Area of Screw (A_t):

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

$$A_t = 0.0127 \cdot \text{in}^2$$

Thickness of Metal Casing in Contact with Screw Head (t1):

$$t1 := 0.0394 \cdot \text{in}$$

Thickness of Metal Casing Not in Contact with Screw Head (t2):

$$t2 := 0.0394 \cdot \text{in}$$

Casing Thickness Ratio (rc):

$$rc := \frac{t2}{t1}$$

$$rc = 1$$

Panel Length (L_{pan}):

$$L_{\text{pan}} := 0.9 \cdot L_e = 32.9 \cdot \text{in}$$

Panel Width (W_{pan}):

$$W_{\text{pan}} := 0.24 \cdot W_e = 7.2 \cdot \text{in}$$

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

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

$$Pnt1 = 0.297 \cdot \text{kip}$$

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

$$Pnt2 = 1.117 \cdot \text{kip}$$

$$Pnt_{\text{case}} := \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2)$$

$$Pnt_{\text{case}} = 0.297 \cdot \text{kip}$$

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

$$Pnt_{\text{screw}} := Fu_{\text{tens}} \cdot A_t$$

$$Pnt_{\text{screw}} = 0.636 \cdot \text{kip}$$

Calculate Allowable Pullout per Fastener (Pat):

$$\Omega_{\text{brg}} := 3.0 \quad Pat1 := \frac{Pnt_{\text{case}}}{\Omega_{\text{brg}}}$$

$$Pat1 = 0.099 \cdot \text{kip}$$

$$\Omega_{\text{screw}} := \frac{1}{0.40}$$

$$Pat2 := \frac{Pnt_{\text{screw}}}{\Omega_{\text{screw}}}$$

$$Pat2 = 0.254 \cdot \text{kip}$$

$$Pat := \text{if}(Pat1 \leq Pat2, Pat1, Pat2)$$

$$Pat = 0.099 \cdot \text{kip}$$

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

$$F_{\text{horiz}} := P_{\text{lat}} \cdot L_{\text{pan}} \cdot W_{\text{pan}}$$

$$F_{\text{horiz}} = 0.138 \cdot \text{kip}$$

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

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

$$No_{\text{screws2}} = 2$$

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

Attachment Data:

$$\begin{aligned} \text{Nominal Screw Diameter } (\phi_{\text{screw}}) &:= 0.19685 \cdot \text{in} & \phi_{\text{head}} &:= 0.42 \cdot \text{in} \\ \text{Thread Series, threads per in (unc)} & & \text{unc} &:= 14 \\ \text{Effective Tensile Stress Area of Screw } (A_t) & & & \\ A_t &:= \frac{\pi}{4} \cdot \left(\frac{\phi_{\text{screw}}}{\text{in}} - \frac{0.9743}{\text{unc}} \right)^2 \cdot \text{in}^2 & A_t &:= 0.0127 \cdot \text{in}^2 \\ \text{Thickness of Metal Casing in Contact with Screw Head (t1)} & & t1 &:= 0.0236 \cdot \text{in} \\ \text{Thickness of Metal Casing Not in Contact with Screw Head (t2)} & & t2 &:= 0.0236 \cdot \text{in} \\ \text{Casing Thickness Ratio (rc)} & & rc &:= 1 \\ & & & rc := \frac{t2}{t1} \\ \text{Panel Length } (L_{\text{pan}}) & & L_{\text{pan}} &:= 0.9 L_e = 32.9 \cdot \text{in} \\ \text{Panel Width } (W_{\text{pan}}) & & W_{\text{pan}} &:= 0.4 W_e = 12 \cdot \text{in} \end{aligned}$$

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

$$\begin{aligned} Pnt1 &:= 0.85 \cdot t2 \cdot \phi_{\text{screw}} \cdot Fu2_{\text{case}} & Pnt1 &:= 0.178 \cdot \text{kip} \\ Pnt2 &:= 1.5 \cdot t1 \cdot \phi_{\text{head}} \cdot Fu1_{\text{case}} & Pnt2 &:= 0.669 \cdot \text{kip} \\ Pnt_{\text{case}} &:= \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2) & Pnt_{\text{case}} &:= 0.178 \cdot \text{kip} \end{aligned}$$

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

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

Calculate Allowable Pullout per Fastener (Pat):

$$\begin{aligned} \Omega_{\text{brg}} &:= 3.0 & Pat1 &:= \frac{Pnt_{\text{case}}}{\Omega_{\text{brg}}} & Pat1 &:= 0.059 \cdot \text{kip} \\ \Omega_{\text{screw}} &:= \frac{1}{0.40} & Pat2 &:= \frac{Pnt_{\text{screw}}}{\Omega_{\text{screw}}} & Pat2 &:= 0.254 \cdot \text{kip} \\ Pat &:= \text{if}(Pat1 \leq Pat2, Pat1, Pat2) & Pat &:= 0.059 \cdot \text{kip} \end{aligned}$$

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

$$F_{\text{horiz}} := Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}} \quad F_{\text{horiz}} = 0.230 \cdot \text{kip}$$

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

$$No_{\text{screws3}} := \text{ceil} \left(\frac{F_{\text{horiz}}}{Pat} \right) \quad No_{\text{screws3}} = 4$$

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

Attachment Data:

$$\begin{aligned} \text{Nominal Screw Diameter } (\phi_{\text{screw}}) &:= 0.19685 \cdot \text{in} & \phi_{\text{head}} &:= 0.42 \cdot \text{in} \\ \text{Thread Series, threads per in (unc)} & & \text{unc} &:= 14 \\ \text{Effective Tensile Stress Area of Screw } (A_t) & & & \\ A_t &:= \frac{\pi}{4} \cdot \left(\frac{\phi_{\text{screw}}}{\text{in}} - \frac{0.9743}{\text{unc}} \right)^2 \cdot \text{in}^2 & A_t &:= 0.0127 \cdot \text{in}^2 \\ \text{Thickness of Metal Casing in Contact with Screw Head (t1)} & & t1 &:= 0.0236 \cdot \text{in} \\ \text{Thickness of Metal Casing Not in Contact with Screw Head (t2)} & & t2 &:= 0.0236 \cdot \text{in} \\ \text{Casing Thickness Ratio (rc)} & & rc &:= 1 \\ & & & rc := \frac{t2}{t1} \\ \text{Panel Length } (L_{\text{pan}}) & & L_{\text{pan}} &:= 0.9 L_e = 32.9 \cdot \text{in} \\ \text{Panel Width } (W_{\text{pan}}) & & W_{\text{pan}} &:= 0.42 W_e = 12.6 \cdot \text{in} \end{aligned}$$

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

$$\begin{aligned} Pnt1 &:= 0.85 \cdot t2 \cdot \phi_{\text{screw}} \cdot Fu2_{\text{case}} & Pnt1 &:= 0.178 \cdot \text{kip} \\ Pnt2 &:= 1.5 \cdot t1 \cdot \phi_{\text{head}} \cdot Fu1_{\text{case}} & Pnt2 &:= 0.669 \cdot \text{kip} \\ Pnt_{\text{case}} &:= \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2) & Pnt_{\text{case}} &:= 0.178 \cdot \text{kip} \end{aligned}$$

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

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

Calculate Allowable Pullout per Fastener (Pat):

$$\begin{aligned} \Omega_{\text{brg}} &:= 3.0 & Pat1 &:= \frac{Pnt_{\text{case}}}{\Omega_{\text{brg}}} & Pat1 &:= 0.059 \cdot \text{kip} \\ \Omega_{\text{screw}} &:= \frac{1}{0.40} & Pat2 &:= \frac{Pnt_{\text{screw}}}{\Omega_{\text{screw}}} & Pat2 &:= 0.254 \cdot \text{kip} \\ Pat &:= \text{if}(Pat1 \leq Pat2, Pat1, Pat2) & Pat &:= 0.059 \cdot \text{kip} \end{aligned}$$

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

$$\begin{aligned} \% \text{open} &:= 8\% \\ F_{\text{horiz}} &:= Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}} \cdot (1 - \% \text{open}) & F_{\text{horiz}} &:= 0.223 \cdot \text{kip} \end{aligned}$$

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

$$No_{\text{screws4}} := \text{ceil} \left(\frac{F_{\text{horiz}}}{Pat} \right) \quad No_{\text{screws4}} = 4$$

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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}) $\phi_{\text{screw}} := 0.19685 \cdot \text{in}$ $\phi_{\text{head}} := 0.42 \cdot \text{in}$
 Thread Series, threads per in (unc) $\text{unc} := 14$
 Effective Tensile Stress Area of Screw (A_t)

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

Thickness of Metal Casing in Contact with Screw Head (t1)

$$t1 := 0.0472 \cdot \text{in}$$

Thickness of Metal Casing Not in Contact with Screw Head (t2)

$$t2 := 0.0472 \cdot \text{in}$$

Casing Thickness Ratio (rc)

$$rc := \frac{t2}{t1}$$

$$rc = 1$$

Panel Length (L_{pan})

$$L_{\text{pan}} := 0.95 L_e = 34.8 \cdot \text{in}$$

Panel Width (W_{pan})

$$W_{\text{pan}} := 0.42 \cdot W_e = 12.6 \cdot \text{in}$$

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

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

$$Pnt1 = 0.355 \cdot \text{kip}$$

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

$$Pnt2 = 1.338 \cdot \text{kip}$$

$$Pnt_{\text{case}} := \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2)$$

$$Pnt_{\text{case}} = 0.355 \cdot \text{kip}$$

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

$$Pnt_{\text{screw}} := Fu_{\text{as}} \cdot A_t$$

$$Pnt_{\text{screw}} = 0.636 \cdot \text{kip}$$

Calculate Allowable Pullout per Fastener (Pat):

$$\Omega_{\text{brg}} := 3.0 \quad Pat1 := \frac{Pnt_{\text{case}}}{\Omega_{\text{brg}}}$$

$$Pat1 = 0.118 \cdot \text{kip}$$

$$\Omega_{\text{screw}} := \frac{1}{0.40} \quad Pat2 := \frac{Pnt_{\text{screw}}}{\Omega_{\text{screw}}}$$

$$Pat2 = 0.254 \cdot \text{kip}$$

$$Pat := \text{if}(Pat1 \leq Pat2, Pat1, Pat2)$$

$$Pat = 0.118 \cdot \text{kip}$$

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

$$F_{\text{horiz}} := Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}}$$

$$F_{\text{horiz}} = 0.255 \cdot \text{kip}$$

Calculate Total No. of Screws Required (No_{screws5}):

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

$$No_{\text{screws5}} = 3$$

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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}) $\phi_{\text{screw}} := 0.19685 \cdot \text{in}$ $\phi_{\text{head}} := 0.42 \cdot \text{in}$
 Thread Series, threads per in (unc) $\text{unc} := 14$
 Effective Tensile Stress Area of Screw (A_t)

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

Thickness of Metal Casing in Contact with Screw Head (t1)

$$t1 := 0.0394 \cdot \text{in}$$

$$t2 := 0.0394 \cdot \text{in}$$

$$rc := \frac{t2}{t1}$$

$$rc = 1$$

Panel Length (L_{pan})

$$L_{\text{pan}} := 0.45 L_e = 16.5 \cdot \text{in}$$

Panel Width (W_{pan})

$$W_{\text{pan}} := 0.42 \cdot W_e = 12.6 \cdot \text{in}$$

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

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

$$Pnt1 = 0.297 \cdot \text{kip}$$

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

$$Pnt2 = 1.117 \cdot \text{kip}$$

$$Pnt_{\text{case}} := \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2)$$

$$Pnt_{\text{case}} = 0.297 \cdot \text{kip}$$

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

$$Pnt_{\text{screw}} := Fu_{\text{as}} \cdot A_t$$

$$Pnt_{\text{screw}} = 0.636 \cdot \text{kip}$$

Calculate Allowable Pullout per Fastener (Pat):

$$\Omega_{\text{brg}} := 3.0 \quad Pat1 := \frac{Pnt_{\text{case}}}{\Omega_{\text{brg}}}$$

$$Pat1 = 0.099 \cdot \text{kip}$$

$$\Omega_{\text{screw}} := \frac{1}{0.40} \quad Pat2 := \frac{Pnt_{\text{screw}}}{\Omega_{\text{screw}}}$$

$$Pat2 = 0.254 \cdot \text{kip}$$

$$Pat := \text{if}(Pat1 \leq Pat2, Pat1, Pat2)$$

$$Pat = 0.099 \cdot \text{kip}$$

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

$$F_{\text{horiz}} := Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}}$$

$$F_{\text{horiz}} = 0.121 \cdot \text{kip}$$

Calculate Total No. of Screws Required (No_{screws6}):

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

$$No_{\text{screws6}} = 2$$

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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}) $\phi_{\text{screw}} := 0.19685 \cdot \text{in}$ Dia of Hex Head $\phi_{\text{head}} := 0.42 \cdot \text{in}$
Thread Series, threads per in (unc) $\text{unc} := 14$
Effective Tensile Stress Area of Screw (A_t)

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

$$A_t = 0.0127 \cdot \text{in}^2$$

Thickness of Metal Casing in Contact with Screw Head (t1)

$$t1 := 0.0394 \cdot \text{in}$$

Thickness of Metal Casing Not in Contact with Screw Head (t2)

$$t2 := 0.0394 \cdot \text{in}$$

Casing Thickness Ratio (rc)

$$rc := \frac{t2}{t1}$$

$$rc = 1$$

Panel Length (L_{pan})

$$L_{\text{pan}} := 0.9 L_e = 32.9 \cdot \text{in}$$

Panel Width (W_{pan})

$$W_{\text{pan}} := 0.2 W_e = 6 \cdot \text{in}$$

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

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

$$Pnt1 = 0.297 \cdot \text{kip}$$

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

$$Pnt2 = 1.117 \cdot \text{kip}$$

$$Pnt_{\text{case}} := \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2)$$

$$Pnt_{\text{case}} = 0.297 \cdot \text{kip}$$

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

$$Pnt_{\text{screw}} := Fu_{\text{as}} \cdot A_t$$

$$Pnt_{\text{screw}} = 0.636 \cdot \text{kip}$$

Calculate Allowable Pullout per Fastener (Pat):

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

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

$$Pat := \text{if}(Pat1 \leq Pat2, Pat1, Pat2)$$

$$Pat = 0.099 \cdot \text{kip}$$

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

$$F_{\text{horiz}} := Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}}$$

$$F_{\text{horiz}} = 0.115 \cdot \text{kip}$$

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

$$No_{\text{screws}7} := \text{ceil} \left(\frac{F_{\text{horiz}}}{Pat} \right)$$

$$No_{\text{screws}7} = 2$$

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

Attachment Data:

Nominal Screw Diameter (ϕ_{screw}) $\phi_{\text{screw}} := 0.19685 \cdot \text{in}$ Dia of Hex Head $\phi_{\text{head}} := 0.42 \cdot \text{in}$
Thread Series, threads per in (unc) $\text{unc} := 14$
Effective Tensile Stress Area of Screw (A_t)

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

$$A_t = 0.0127 \cdot \text{in}^2$$

Thickness of Metal Casing in Contact with Screw Head (t1)

$$t1 := 0.0394 \cdot \text{in}$$

$$t2 := 0.0394 \cdot \text{in}$$

$$rc := \frac{t2}{t1}$$

$$rc = 1$$

Panel Length (L_{pan})

$$L_{\text{pan}} := 0.67 L_e = 24.5 \cdot \text{in}$$

Panel Width (W_{pan})

$$W_{\text{pan}} := 0.42 W_e = 12.6 \cdot \text{in}$$

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

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

$$Pnt1 = 0.297 \cdot \text{kip}$$

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

$$Pnt2 = 1.117 \cdot \text{kip}$$

$$Pnt_{\text{case}} := \text{if}(Pnt1 \leq Pnt2, Pnt1, Pnt2)$$

$$Pnt_{\text{case}} = 0.297 \cdot \text{kip}$$

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

$$Pnt_{\text{screw}} := Fu_{\text{as}} \cdot A_t$$

$$Pnt_{\text{screw}} = 0.636 \cdot \text{kip}$$

Calculate Allowable Pullout per Fastener (Pat):

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

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

$$Pat := \text{if}(Pat1 \leq Pat2, Pat1, Pat2)$$

$$Pat = 0.099 \cdot \text{kip}$$

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

$$F_{\text{horiz}} := Plat \cdot L_{\text{pan}} \cdot W_{\text{pan}}$$

$$F_{\text{horiz}} = 0.180 \cdot \text{kip}$$

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

$$No_{\text{screws}8} := \text{ceil} \left(\frac{F_{\text{horiz}}}{Pat} \right)$$

$$No_{\text{screws}8} = 2$$

Check Adequacy of Unit Anchorage

Attachment Data:

Nominal Bolt Diameter (ϕ_{bolt})

Effective Bolt Area (A_{eff})

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

BoltMaterial := "ASTM A307 or Greater"

Allowable Tensile Strength (F_t)

Allowable Shear Strength (F_v)

Bolt Shear Capacity (V_{all})

Bolt Tension Capacity (T_{all})

Check Bolt Adequacy with Wind Perpendicular to Long Side

Number of Bolts Provided to resist Tension ($NoBolts_{provshear}$)

$$t_{bolt} := \frac{|2RtoFC|}{NoBolts_{provshear}}$$

Number of Bolts Provided to resist Shear ($NoBolts_{provstake}$)

$$v_{bolt} := \frac{2 \cdot R_{bhor}}{NoBolts_{provstake}}$$

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

Checkbolt := if ($CSR_{bolt} \leq 1.0$, "OK", "NG")

Summary of Results:

BuildingRisk := "I"

DesignWindSpeed := V_mph = 175-mph

ExposureCategory := ExpCat = "C"

MountingHeight := H = 40-ft

Number of Panel Fasteners Provided By Manufacturer:

Panel No. 1: $No_{screws, std1} := 12$

Panel No. 2: $No_{screws, std2} := 4$

Panel No. 3: $No_{screws, std3} := 7$

Panel No. 4: $No_{screws, std4} := 4$

Panel No. 5: $No_{screws, std5} := 4$

Panel No. 6: $No_{screws, std6} := 3$

Panel No. 7: $No_{screws, std7} := 5$

Panel No. 8: $No_{screws, std8} := 2$

Number of Panel Fasteners Required By Analysis:

Panel No. 1: $No_{screws1} := 3$

Panel No. 2: $No_{screws2} := 2$

Panel No. 3: $No_{screws3} := 4$

Panel No. 4: $No_{screws4} := 4$

Panel No. 5: $No_{screws5} := 3$

Panel No. 6: $No_{screws6} := 2$

Panel No. 7: $No_{screws7} := 2$

Panel No. 8: $No_{screws8} := 2$

Panel Fastening Check:

check_panel1 := if ($No_{screws, std1} \geq No_{screws1}$, "OK", "NG") = "OK"

check_panel2 := if ($No_{screws, std2} \geq No_{screws2}$, "OK", "NG") = "OK"

check_panel3 := if ($No_{screws, std3} \geq No_{screws3}$, "OK", "NG") = "OK"

check_panel4 := if ($No_{screws, std4} \geq No_{screws4}$, "OK", "NG") = "OK"

check_panel5 := if ($No_{screws, std5} \geq No_{screws5}$, "OK", "NG") = "OK"

check_panel6 := if ($No_{screws, std6} \geq No_{screws6}$, "OK", "NG") = "OK"

check_panel7 := if ($No_{screws, std7} \geq No_{screws7}$, "OK", "NG") = "OK"

check_panel8 := if ($No_{screws, std8} \geq No_{screws8}$, "OK", "NG") = "OK"

Equipment Tie Down to Support By Others:

BoltMaterial = "ASTM A307 or Greater"

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

$CSR_{bolt} = 0.4$