LOADING

DEAD LOAD

8 PSF CEILING/WALLS

SNOW

25 PSF

WIND

110 MPH EXPOSURE B.

$$P_{W\rightarrow} = \underset{\lambda}{(1.0)}\underset{K_{zt}}{(1.0)}\underset{I}{(1.0)}\underset{P_{NET30}}{(21.3)} = 21.3 \text{ PSF} \rightarrow$$

$$P_{W\uparrow} = (1)(1.0)(1.0)(23.6) = 23.6 \uparrow$$

SEISMIC

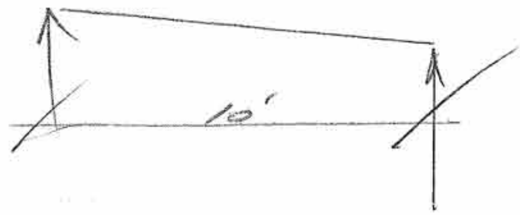
→ WIND CONTROLS BY ENGINEERING OBSERVATION.

ROOF RAFTERS

DL = 8PSF   SL = 25PSF   TL = 33PSF

S = 3'

W = 33PSF x 3' = 99PLF



$M = 99 \times 10^2 \times \frac{1}{8} = 1238$ FT LB

$R = \frac{99(10)}{2} = \underline{495^{\#}}$

$M_{A\,DBL} = 778$ FT-LB < 1238 FT-LB → NO GOOD!

REVISE SPACING

$S_{REVISED} = \frac{778}{1238}(3') = 1.88'$ SAY 1.5'

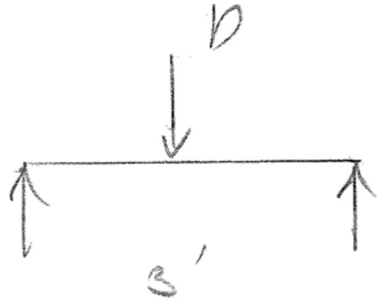
⇒ USE DBL EXTRUSIONS @ 1'-6" O.C. MAX FOR ROOF RAFTERS

RAFTER @ MIDSPAN OR EDGE

$P = 5' \times 33\,PSF = 165\#$

$M = 165\,(3)\left(\frac{1}{4}\right) = 123.9\ FT\text{-}LB$

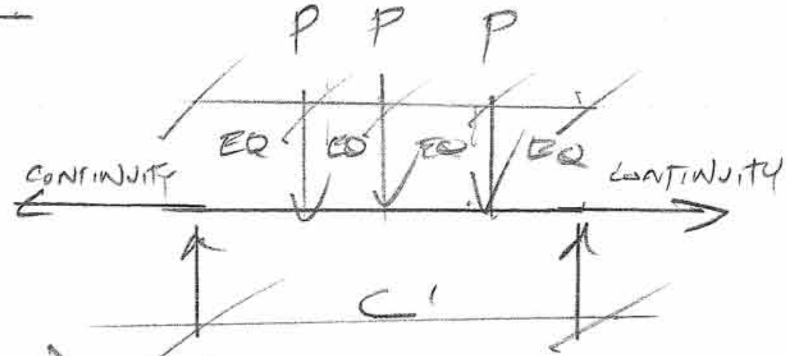
$< 123\ FT\text{-}LB$



⇒ SINGLE PERIMETER EDGE ELEMENT OK

HEADER SYSTEM

$P = 495 \frac{\#}{\text{MULLION}}$



$M = 495(1.5)(1.5) + 495(0.5)(1.5) = 1455 \text{ FT-LB}$

(2) DBL MULLION SYSTEMS $M_a = 778 \times 2 = 1556 \text{ FT LBS}$

→ (2) DBL MULLION SYSTEMS @ DOOR HEADERS IS ACCEPTABLE

WALL MULLION

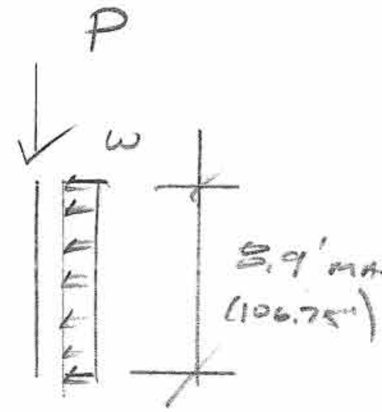
BUILT UP MULLION - (2) TOTAL

S = 3' OC

P = 495# (120 DL, 375 LL) / MULLION

W = 21.3 PSF × 3' = 63.9 PLF

$M_W = (63.9)(9)^2(\frac{1}{8}) = 647$ FT·LB



$Kl/r = \frac{106.75}{0.997} = 107$

$F_a = \frac{51000}{107^2} = 4.45 \text{ KSI}$

$f_a = \frac{495}{1.3} = 381$

$F_b = 9500 \text{ PSI} \times 1.33 = 12635$

$f_b = \frac{647(12)}{0.739} = 10506$

UNITY

$\frac{.381}{4.45} + \frac{10506}{12635} = 0.92 < 1.0 \Rightarrow OK$

⟹ BUILT UP MULLION ACCEPTABLE.

⟹ NOTE: DBL UP @ DOOR JAMBS. (6'-WIDE)

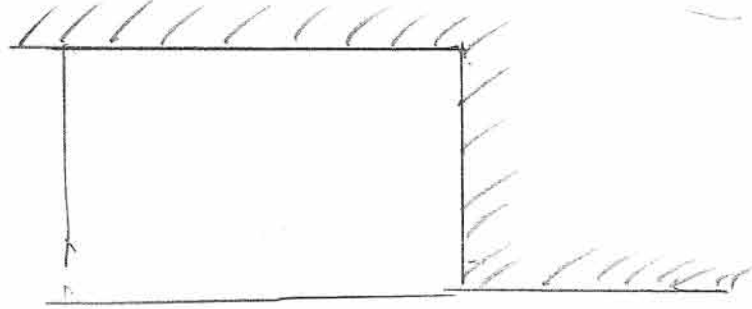
LATERAL.

$H_{AVG} = 8.5'$

$V_{WIND} = 21.3(\frac{8.5}{2})(27) = 2441\#$ ↕

10'

$w_V = \frac{2441}{27} = 90.4$ PLF ↕



$V_{WIND} = 21.3 (\frac{8.5}{2})(10) = 905\#$ ⇄

$w_{V} = \frac{905}{2 \times 27} = 16.8$ PLF < 70 PLF LOW,

⇒ DIAPHRAGM SHEARS ARE LOW AND STRUCTURE IS TIED OFF TO REST OF BLDG. HOUSE WALLS. LATERAL IS ACCEPTABLE

END

SUNROOM BEARS ON EXISTING HOUSE AND DECK. VERIFICATION OF THESE ITEMS IS BY OTHERS. SYSTEMS MUST SUPPORT THE FOLLOW'G LOADS

- SUNROOM GRAVITY LOADS = $\left(\frac{10}{2}\right)(33)$ = 165 PLF
- UPLIFT = $(0.6 \times B - 23.6)\left(\frac{10'}{2}\right) \doteq$ 94 PLF ↑
- LATERAL = 17 PLF ⇄

CONNECTIONS

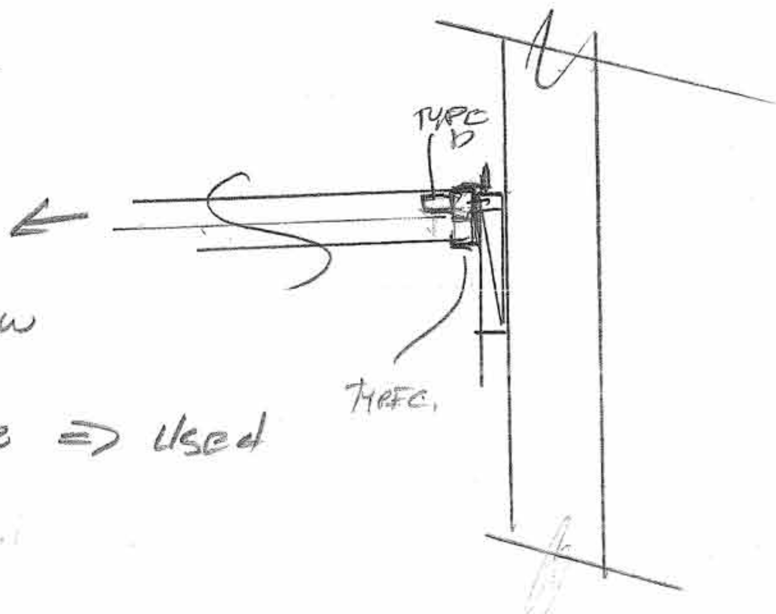
ALL SCREWS TO BE STAINLESS STEEL

- RAFTER TO 2x OR TYPE

R = 485 #

#12 SMS V_A = 121#/SCREW

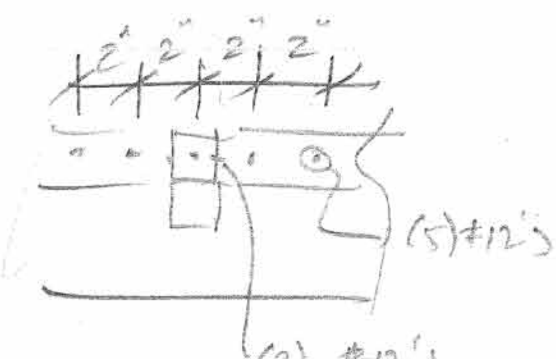
REQ'D = $\frac{485}{121}$ = 4.008 ⇒ Used



D TO C

V = 90.4 x 3 = 271.2

REQD OF #12's = $\frac{271.2}{121 \times 1.33}$ = 1.69 < 2.0 ⇒ OK USE 2)



ATTACH ROOF RAFTER TO TYPE (D) W/ (2) #12 SMS AND ATTACH TYPE C TO 2x LEDGER W/ (5) #12's SCREWS.

ATTACH D TO C W/ (2) #12 SCREWS

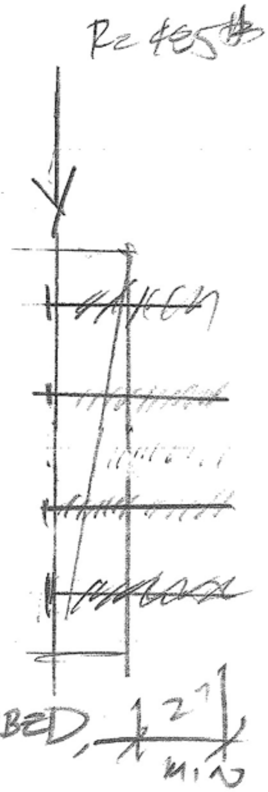
WOOD LEDGER,

R= 485#

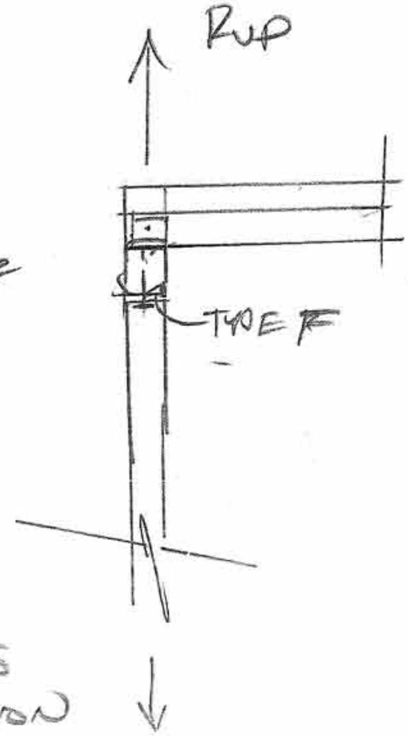
(3) #12 SMS

V_A = 147 x 3 x 1.15   507# > 485# => OK

=> ATTACH A 2x8 LEDGER TO THE HOUSE W/ (4) #12 WOOD SCREWS @ 24" OC, 2" MIN EMBED.



ROOF RAFTER TO WALL



RAFTER TO EDGE EXTRUSION

$R_{UP} = 1.5' \times 5' \times (23.6 - 0.6 \times 8) = 141\#$

#12 SMS $T_A = 82.2 \times 1.33 = 109\#$

$\# REQD = \frac{141}{109} = 1.29 < 2$

ATTACH ROOF RAFTERS TO PERIMETER EXTRUSION W/ TYPE F CLIP AND (2) #12 SCREWS.

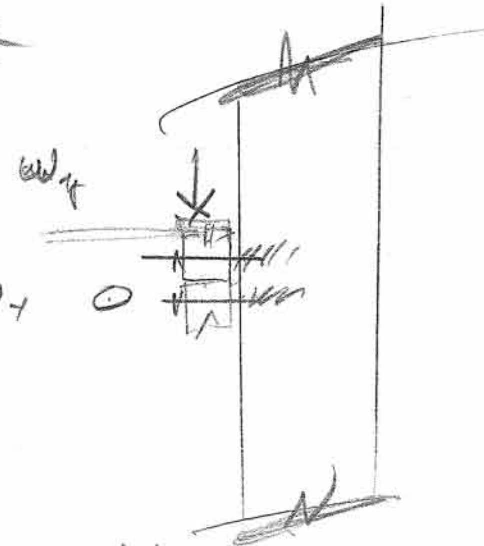
PERIMETER TO WALL WINDOW MULLIONS

$R_{UP} = 3' \times 5' \times (23.6 - 0.6 \times 8) = 282\#$

#12 SMS REQ'D $= \frac{282}{109} = 2.6 < 4$

ATTACH PERIMETER TO WINDOW WALL MULLIONS W/ (4) #12 SMS.

PARRALLEL RAFTER TO WALL



$\omega_x = 17$ PLF

$\omega_y = \left(\frac{1.5'}{2}\right)(33\ PSF) = 25$ PLF

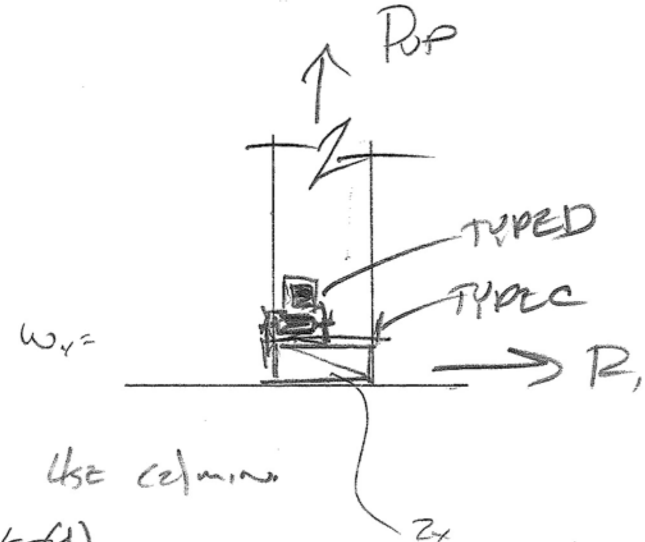
#12 SMS $V_A = 147$#/SCREW

(2) @ 24 ⇒ $V_A = 147 \times 2 = 294$#/2' = 147#/SCREW >> 25+17 = 42#/FT

⇒ OK

⇒ ATTACH DBL ROOF RAFTER AT EDGE w/ (2) #12 SMS @ 24" OC, 3" EMBED MIN.

WALL MULLIONS TO WOOD



P_{UP} = 282#

R_{WIND} = 21.3 x 3 x $\frac{9}{2}$ = 288#/3'

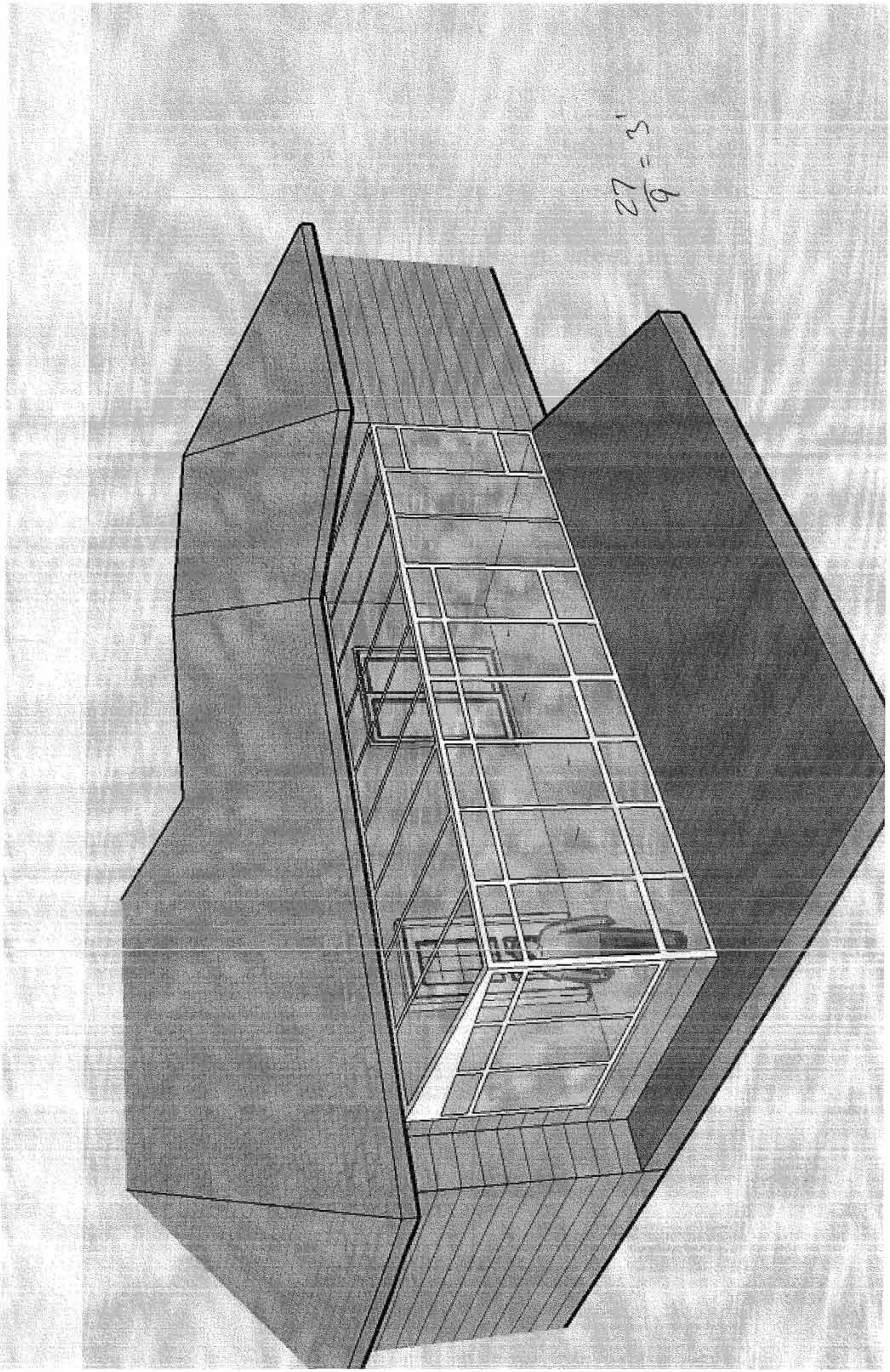
W_Y = 16.9 PLF

#12 SCREWS V_A = 121# x 1.33 = 161# USE (2) MIN.

T_A = 82# x 1.33 x 109#/SCREW ⇒ USE (4)

#12 IN WOOD 1½" EMBED T_A = 135 x 1.5 x 1.33 = 270#

- ATTACH WINDOW MULLION TO TYPE D W/ (2) #12'S
- ATTACH TYPE D TO C W/ (2) #12'S
- ATTACH C TO 2x W/ (4) #12'S
- ATTACH 2x W/ (2) #12'S @ 16" O.C. W/ 2" MIN EMBED


27/9 = 3'

DBL EXTRUSION SECTION PROPERTIES

$$\Sigma I_x + A d^2$$

$$I_x = 0.2126(2) + 0.6542(0.917)^2(2) = 1.299 \text{ in}^4$$

$$S = \frac{1.299}{1.759} = 0.7385 \text{ in}^3$$

F_b

6063-T5 ALUMINUM

$t = 0.08''$ MAX.

$F_t = 9.5$ ksi

$M_A = 0.7385(9.5)\left(\frac{1}{12}\right) = 585$ FT-LB.

M_A w/ 1/3 ↑ $= 585(1.33) = 778$ FT-LB. SHORT TERM LOADING

EXTRUSION SCREWS

USE #12 SCREWS

$V_A = 121$ LB/SCREW

V_{MAX}

$q = 283(1.5) = 424$ PLF

$s = \frac{121(1.33)}{424}(12) = 4.55"$ →

MATE ALUMINUM EXTRUSION RAFTERS TOGETHER W/ #12 SCREWS AT 4" OC.

#12 @ 4" OC.

DESCRIPTION:

SHEAR AND TENSION VALUES FOR BOLTS AND SCREWS IN ALUMINUM

DESIGN INPUT

$F_{tu} := 21ksi$ 6063-T5 $n_u := 3.0$

$t := .08 \cdot in$ Aluminum Thickness

BOLT DIAMETERS

$d_{0.1875} := 0.1875 \cdot in$ $d_{0.25} := 0.25 \cdot in$ $d_{0.375} := 0.375 \cdot in$

$d_{0.3125} := 0.3125 \cdot in$ $d_{0.4375} := 0.4375 \cdot in$ $d_{0.5} := 0.5 \cdot in$

SCREW DIAMETERS

$d_6 := .138 \cdot in$ $d_8 := 0.164 \cdot in$ $d_{10} := 0.190 \cdot in$ $d_{12} := 0.216 \cdot in$ $d_{14} := 0.242 \cdot in$

BOLT ALLOWABLE ALUMINUM BEARING LOADS

$F := \frac{2 \cdot F_{tu}}{n_u}$ $F = 14000\,psi$

$A_{0.1875} := t\,d_{0.1875}$ $A_{0.1875} = 0.015\,in^2$ $V_{bearing} := F \cdot A_{0.1875}$ $V_{bearing} = 210\,lb$

$A_{0.25} := t\,d_{0.25}$ $A_{0.25} = 0.02\,in^2$ $V_{bearing} := F \cdot A_{0.25}$ $V_{bearing} = 280\,lb$

$A_{0.3125} := t\,d_{0.3125}$ $A_{0.3125} = 0.025\,in^2$ $V_{bearing} := F \cdot A_{0.3125}$ $V_{bearing} = 350\,lb$

$A_{0.375} := t \cdot d_{0.375}$ $A_{0.375} = 0.03\,in^2$ $V_{bearing} := F \cdot A_{0.375}$ $V_{bearing} = 420\,lb$

$A_{0.4375} := t \cdot d_{0.4375}$ $A_{0.4375} = 0.035\,in^2$ $V_{bearing} := F \cdot A_{0.4375}$ $V_{bearing} = 490\,lb$

$A_{0.5} := t \cdot d_{0.5}$ $A_{0.5} = 0.04\,in^2$ $V_{bearing} := F \cdot A_{0.5}$ $V_{bearing} = 560\,lb$

SCREW ALLOWABLE ALUMINUM BEARING LOADS

$F := \frac{F_{tu}}{n_u}$ $F = 7000\,psi$ Recommended - not required - bearing allowable for screws.

$A_8 := t \cdot d_8$ $A_8 = 0.013\,in^2$ $V_{bearing} := F$ $A(d) := t \cdot d$ $V_{bearing}(d) := F \cdot A(d)$

s $A(d_6) = 0.011\,in^2$ $V_{bearing}(d_6) = 77.3\,lb$

$A(d_8) = 0.013\,in^2$ $V_{bearing}(d_8) = 91.8\,lb$

$A(d_{10}) = 0.015\,in^2$ $V_{bearing}(d_{10}) = 106.4\,lb$

$A(d_{12}) = 0.017\,in^2$ $V_{bearing}(d_{12}) = 121\,lb$

$A(d_{14}) = 0.019\,in^2$ $V_{bearing}(d_{14}) = 135.5\,lb$

NOTES:

1. FOR BOLTS REFERANCE ADM SECTION 3.4.5.
2. MINIMUM EDGE DISTANCE FOR CALCULATED VALUE ABOVE NTE 2D
3. VALUES NOTED ARE FOR ALUMINUM BEARING ONLY!!!

DESCRIPTION

SHEAR VALUES FOR SCREWS IN ALUMINUM

DESIGN INPUT

$F_{tu1} := 21.5 \cdot ksi$ Tensile ultimate strength of material in contact with screw head

$F_{tu2} := 21.5 \cdot ksi$ Tensile ultimate strength of material not in contact with screw head

$n_s := 3.0$ Factor of Safety

$n_u := 1.95$

$t_1 := .0625 \cdot in$ Aluminum Thickness of material in contact with screw head

$t_2 := .41 \cdot in$ Aluminum Thickness of material not in contact with screw head

SCREW DIAMETERS - nominal diameters

$D_6 := 0.138 \cdot in$ $D_8 := 0.164 \cdot in$ $D_{10} := 0.190 \cdot in$ $D_{12} := 0.216 \cdot in$ $D_{14} := 0.242 \cdot in$

ANALYSIS

$$P_{ns1}(D) := 2 \cdot F_{tu1} \cdot D \cdot t_1 \cdot \frac{n_s}{n_u}$$ (EQ.5.3.1.1-2)

$$P_{ns2}(D) := 2 \cdot F_{tu2} \cdot D \cdot t_2 \cdot \frac{n_s}{n_u}$$ (EQ.5.3.1.1-3)

$$P_{ns3}(D) := 4.2 \cdot \left(t_2^{\,3} \cdot D\right)^{\frac{1}{2}} \cdot F_{tu2}$$ (EQ5.3.1.1-4) *screw tilting*

$$P_{ns}(D) := \begin{cases} P_{ns3}(D) & \text{if } \frac{t_2}{t_1} \le 1.0 \wedge P_{ns3}(D) < P_{ns1}(D) \wedge P_{ns3}(D) < P_{ns2}(D) \\ \min\left(2 \cdot F_{tu1} \cdot D \cdot t_1 \cdot \frac{n_s}{n_u}, F_{tu2} \cdot D \cdot t_2 \cdot \frac{n_s}{n_u}\right) & \text{otherwise} \end{cases}$$

$$P_{as}(D) := \frac{P_{ns}(D)}{n_s}$$

RESULTS

$P_{as}(D_6) = 190\ lb$ $P_{as}(D_8) = 226\ lb$ $P_{as}(D_{10}) = 262\ lb$ $P_{as}(D_{12}) = 298\ lb$

$P_{as}(D_{14}) = 334\ lb$

RS

TENSION

$P_{not}(D) := 0.85t_1 \cdot D \cdot F_{tu2}$ $\qquad$ $P_{at}(D) := \dfrac{P_{not}(D)}{n_s}$

RESULTS

$P_{at}(D_6) = 52.5\ \text{lb}$ $P_{at}(D_8) = 62.4\ \text{lb}$ $P_{at}(D_{10}) = 72.3\ \text{lb}$ $P_{at}(D_{12}) = 82.2\ \text{lb}$ $P_{at}(D_{14}) = 92.1\ \text{lb}$

R6

R1

Rafter Section (SCREW TWO TOGETHER)

178 #/FT

Area:	0.6542 in^2		
Bounding Box:	X	−0.755 in	+0.755 in
	Y	−0.817 in	+0.942 in
I xx:	0.2126 in^4		
I yy:	0.1750 in^4		
S xx:	0.2257 in^3		
S yy:	0.2317 in^3		

TORSIONAL CONSTANT √

$T_1 = 0.08$

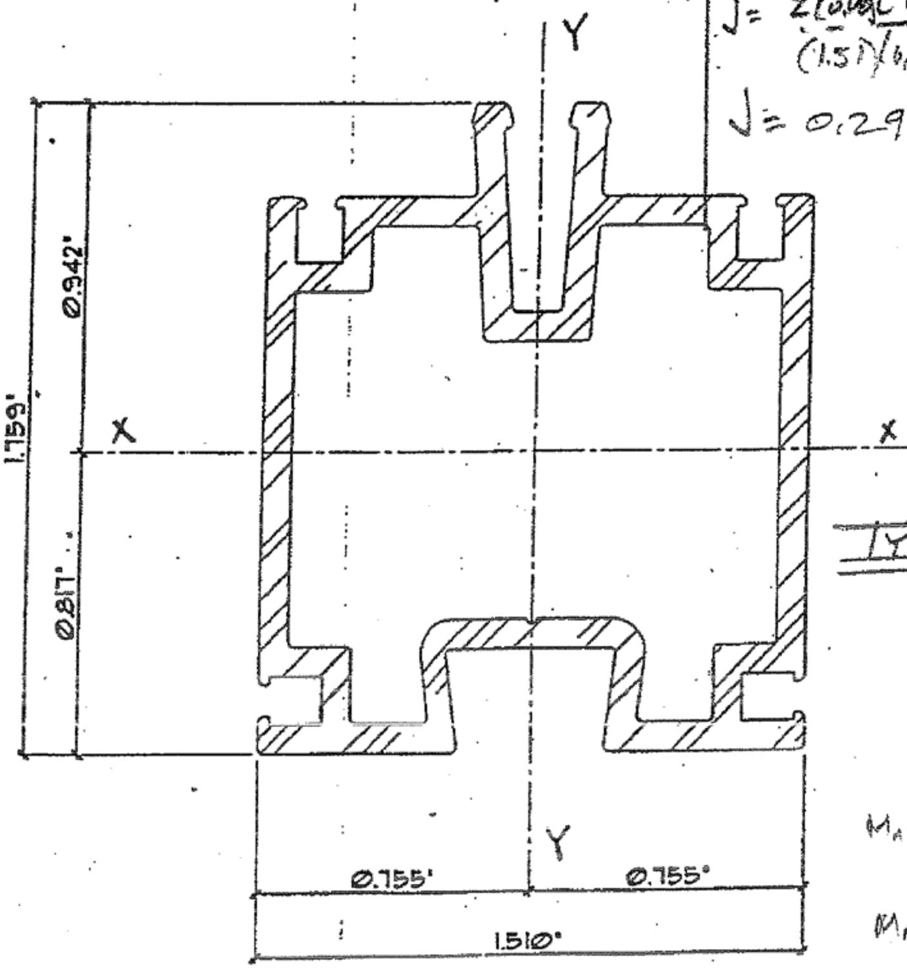
$T_2 = 0.08$

$a = 1.51$

$b = 1.759$

$$J = \frac{2(0.08)^2(1.51-0.08)^2(1.759-0.08)^2}{(1.51)(0.08)+1.759(0.08)-0.08^2-0.01}$$

$J = 0.297 \text{ in}^4$



TYPE A

$$M_A = \frac{9500\text{psi}(0.2317)}{12}$$

$M_A = 183$ ft-lbs

R7