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STRUCTURAL CALCULATIONS

FOR

ROOF ANCHOR - RAS-354

PREPARED FOR:

MS ROOF ANCHOR

Applies to ROOF ANCHOR - RAS-354 Hardware and Attachment Only

Structural Members by Others

04/14/24

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STRUCTURAL CALCULATIONS INDEX

REGISTERED PROFESSIONAL ENGINEER
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Applies to ROOF ANCHOR - RAS-354 Hardware and Attachment Only
Structural Members by Others
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DESIGN CRITERIA AND ASSUMPTIONS

BUILDING CODES AND MATERIAL STANDARDS

STRUCTURAL DESIGN MEETS OR EXCEEDS PROVISIONS OF THE FOLLOWING BUILDING CODES AND MATERIAL STANDARDS

2021 IBC	INTERNATIONAL BUILDING CODE
2021 IRC	INTERNATIONAL RESIDENTIAL CODE
2022 CBC	CALIFORNIA BUILDING CODE
2022 CRC	CALIFORNIA RESIDENTIAL CODE
2018 NDS	NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION
ASCE 7-16	MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
AISC 360-16	STEEL CONSTRUCTION MANUAL, FOURTEENTH EDITION
AISC 341-16	SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS
ACI 318-14	BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
AWS D1.1 / D1.1M 2015	STRUCTURAL WELDING CODE

MATERIAL SPECIFICATIONS

UNLESS OTHERWISE NOTED ON THE DRAWINGS, MATERIALS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS

1) **STRUCTURAL STEEL:**

STRUCTURAL STEEL SHALL CONFORM TO THE ASTM DESIGNATION AS FOLLOWS:

W SHAPE	ASTM A992	F_y =	50 ksi
PIPE	ASTM A53 - Gr. B	F_y =	35 ksi
RECTANGULAR HSS	ASTM A500 - Gr. B	F_y =	46 ksi
CIRCULAR HSS	ASTM A500 - Gr. B	F_y =	42 ksi
ANGLES	ASTM A36	F_y =	36 ksi
CHANNELS	ASTM A36	F_y =	36 ksi
STEEL PLATES	ASTM A572 GRADE 50	F_y =	50 ksi

2) **CONNECTIONS:**

BOLTS	ASTM A325 - N
WELDS	E70XX

STRUCTURAL COMPONENTS OF ROOF ANCHOR - RAS-354

-

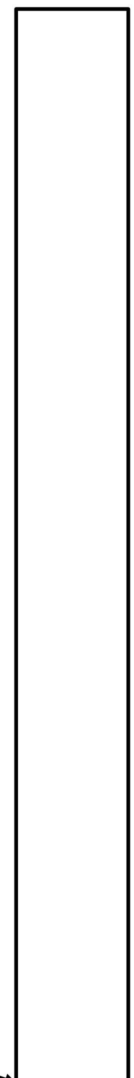
POST:

SHAPE:	SQUARE HSS
SECTION:	HSS2X2X1/4
ASTM SPEC.	ASTM A500 Grade B Rect. HSS
POST HEIGHT =	4.00 ft

SCREEN HEIGHT CAN BE LOWER THAN POST HEIGHT

SCREEN HEIGHT SHALL NOT BE HIGHER THAN THE POST HEIGHT.

POST CAN BE CUT ON-SITE TO A LOWER HEIGT TO MATCH THE SCREEN HEIGHT

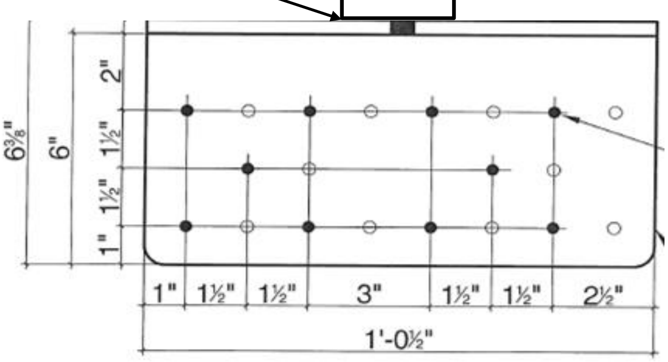


POST WELD TO SKIRT:

ALL AROUND
COMPLETE JOINT PENETRATION

SKIRT DETAIL:

THE TWO SKIRT SIDES WILL BE MIRRORED TO OFFSET SCREW PENETRATION AND AVOID OVERLAPPING



WOOD STRUCTURAL MEMBER (BY OTHERS)

NOMINAL SIZE:	4 x
MEMBER WIDTH =	3.50 in
MINIMUM MEMBER DEPTH =	7.50 in
MINIMUM SPECIFIC GRAVITY =	0.50
MINIMUM MEMBER NOMINAL SIZE =	4 x 8

ABBREVIATIONS

THROUGHOUT THIS PACKAGE THE FOLLOWING ABBREVIATIONS WILL BE USED AS INDENTED HERE:

- ASD ALLOWABLE STRESS DESIGN
- EOR ENGINEER OF RECORD
- RAS-354 ROOF ANCHOR - SMALL - 3.5 INCHES WIDE SADDLE, 4' TALL POST
- RA MS ROOF ANCHOR
- N/P NOT PERMITTED

SCOPE OF WORK

- THE SCOPE OF THIS CALCULATION PACKAGE IS TO PROVIDE THE EOR WITH THE CAPACITY OF STRUCTURAL STRENGTH OF THE "RAS-354" (AVAILABLE STRENGTH), SO THE EOR CAN DETERMINE THE NUMBER OF ANCHORS NEEDED, AND SPACING OF ANCHORS ACCORDING TO EOR CALCULATIONS OF REQUIRED STRENGTH BASED ON ROOF AND SCREEN SPECIFIC LOADING CONDITIONS
- AVAILABLE STRENGTH IS GIVEN FOR BOTH ALLOWABLE STRENGTH DESIGN (ASD) AND STRENGTH DESIGN (LRFD)
- THE CALCULATIONS IN SUMMARY TABLE PRESENTED HERE ASSUME UNIFORM WIND PRESSURE ON THE SCREEN. EOR TO VERIFY ALL OTHER WIND LOADING CONDITIONS AND OTHER ANTICIPATED LOADS
- THE CALCULATIONS IN SUMMARY TABLE PRESENTED HERE ASSUME THE RESULTANT OF THE UNIFORM WIND PRESSURE TO ACT ON THE CENTER OF GRAVITY OF THE ROOF SCREEN. EOR TO VERIFY OTHER CODE REQUIREMENTS.
- SCOPE OF WORK DOES NOT INCLUDE CALCULATIONS OF WIND LOADING, OTHER LOADING CONDITIONS, LOAD CASES, OR LOAD COMBINATIONS
- PROPER FACTORS WILL BE APPLIED TO WIND LOAD CALCULATIONS ACCORDING TO ASCE 7-16 TO COMPLY WITH LOAD COMBINATIONS OF GOVERNING BUILDING CODES.
- SCOPE OF WORK DOES NOT INCLUDE DESIGN OF THE ROOF SCREEN
- SCOPE OF WORK DOES NOT INCLUDE DESIGN OF A COMPLETE LOAD PATH FROM SCREEN TO THE RAS-354
- SCOPE OF WORK DOES NOT INCLUDE DESIGN OF ROOF SCREEN ATTACHMENT TO RAS-354
- SCOPE OF WORK DOES NOT INCLUDE DESIGN OF STRUCTURAL MEMBERS SUPPORTING RAS-354. EOR TO DESIGN SUCH MEMBERS TO SUPPORT ALL SITE-SPECIFIC LOADING CONDITIONS FOR STRENGTH AND ALLOWABLE DEFLECTION
- EOR OF THE PROJECT USING RAS-354 SHALL DESIGN ALL THE ELEMENTS NOT INCLUDED IN THIS SCOPE

ASSUMPTIONS:

- ALL DOWNWARD LOADS INCLUDING SELF WEIGHT OF SCREEN WILL BE TRANSFERRED TO STRUCTURAL MEMBERS THROUGH BEARING OF RAS-354 ON THE STRUCTURAL MEMBER. EOR TO INCLUDE ALL SUCH LOADS IN THE STRUCTURAL MEMBER DESIGN
- WIND LOADING IS ASSUMED TO BE UNIFORM, NORMAL TO THE SCREEN SURFACE. ALL OTHER WIND LOADING CASES TO BE VERIFIED BY THE EOR
- ATTACHMENT OF ROOF SCREEN TO RAS-354 SHALL BE DESIGNED BY THE EOR AND WILL NOT AFFECT THE RAS-354 STRENGTH IN ANY WAY, INCLUDING DRILLING OR OTHERWISE ADDING ANY HOLES TO RAS-354
- ALL LOAD EFFECTS CALCULATIONS ARE PROVIDED AT THE BOTTOM OF THE RAS-354 POST
- SCREEN HEIGHT SHALL NOT BE HIGHER THAN THE POST HEIGHT.

AVAILABLE STRENGTH OF RAS-354 POST (RECTANGULAR OR SQUARE HSS)

BY PROVISIONS OF AISC 360-16

(POINTS OF SUPPORT ARE RESTRAINED AGAINST ROTATION ABOUT THEIR LONGITUDINAL AXIS.)

MEMBER INPUT

SECTION INPUT: MEMBER ID	RAS-354 POST		SHAPE:	SQUARE HSS
SECTION:	HSS2X2X1/4	ASTM SPEC.	SELECT PREFERRED SPECIFICATION	ASTM A500 Grade B Rect. HSS
AISC 360-16 SECTION (B4-2)	USE DESIGN WALL THICKNESS = 0.93 NOMINAL WALL THICKNESS?			YES

EFFECTIVE LENGTH FOR DESIGN FOR COMPRESSION: AISC 360-10 SECTION E2	**FOR X AXIS (MAJOR AXIS)**	**FOR Y AXIS (MINOR AXIS)**
LATERALLY UNBRACED LENGTH L	4.00 ft	4.00 ft
K	2.20	2.20

SUMMARY OF RESULTS

AVAILABLE STRENGTH OF SECTION:	**LRFD**		**ASD**	
AVAILABLE COMPRESSIVE STRENGTH:	$\Phi_c P_n =$	**15.107 kips**	$P_n / \Omega_c =$	**10.051 kips**
AVAILABLE TENSILE STRENGTH:	$\Phi_t P_n =$	**62.514 kips**	$P_n / \Omega_t =$	**41.593 kips**
AVAILABLE FLEXURAL STRENGTH (MAJOR AXIS	$\Phi_b M_n =$	**3.330 kip-ft**	$M_n / \Omega_b =$	**2.210 kip-ft**
AVAILABLE FLEXURAL STRENGTH (MINOR AXIS)	$\Phi_b M_n =$	**3.330 kip-ft**	$M_n / \Omega_b =$	**2.210 kip-ft**
AVAILABLE SHEAR STRENGTH (MAJOR AXIS):	$\Phi_v V_n =$	**14.985 kips**	$V_n / \Omega_v =$	**9.970 kips**
AVAILABLE SHEAR STRENGTH (MINOR AXIS):	$\Phi_v V_n =$	**14.985 kips**	$V_n / \Omega_v =$	**9.970 kips**

MATERIAL PROPERTIES

MATERIAL PROPERTIES	YOUNG'S MODULUS $E_s =$	29000 ksi
	$F_y =$	46 ksi
	$F_u =$	58 ksi

SECTION PROPERTIES

SECTION PROPERTIES	NOMINAL WALL THICKNESS $t_{nom} =$	0.25 in
AISC 360-16 SECTION (B4-2)	DESIGN WALL THICKNESS $t_{des} =$	0.233 in
	CROSS SECTION AREA A =	1.51 sq.in
FLANGE	WIDTH B =	2 in
AISC 360-16 SECTION (B4.1b (d))	$b = B - 3\,t_{des} =$	1.303 in
	b/t =	5.58
WEB	HEIGHT HT =	2 in
AISC 360-16 SECTION (B4.1b (d))	$h = HT - 3\,t_{des} =$	1.303 in
	h/t =	5.58
X-X AXIS	MOMENT OF INERTIA ABOUT X-X AXIS $I_x (in^4) =$	0.747
	SECTION MODULUS ABOUT X-X AXIS $S_x =$	0.747 cu.in
	RADIUS OF GYRATION $r_x =$	0.704 in
	PLASTIC SECTION MODULUS ABOUT X-X AXIS $Z_x =$	0.964 cu.in
Y-Y AXIS	MOMENT OF INERTIA ABOUT Y-Y AXIS $I_y (in^4) =$	0.747
	SECTION MODULUS ABOUT Y-Y AXIS $S_y =$	0.747 cu.in
	RADIUS OF GYRATION $r_y =$	0.704 in
	PLASTIC SECTION MODULUS ABOUT Y-Y AXIS $Z_y =$	0.964 cu.in

AVAILABLE COMPRESSIVE STRENGTH P_n

SLENDERNESS RATIO: AISC 360-16 SECTION E2

1- CLASSIFICATION OF SECTION FOR UNIFORM COMPRESSION: (AISC 360-16 TABLE B.4.1a)

FLANGE: (CASE 6)	WIDTH TO THICKNESS RATIO $\lambda = b/t$ =	5.58
	λ_r = 1.40 $\sqrt{E/F_y}$ =	35.152
	FLANGE CLASSIFICATION FOR UNIFORM COMPRESSION:	NONSLENDER
WEB: (CASE 6)	WIDTH TO THICKNESS RATIO $\lambda = h/t$ =	5.580
	λ_r = 1.40 $\sqrt{E/F_y}$ =	35.152
	WEB CLASSIFICATION FOR UNIFORM COMPRESSION:	NONSLENDER
2- SLENDERNESS RATIO: AISC 360-16 SECTION E2	$(KL/r)_x$ =	150.00
	$(KL/r)_y$ =	150.00
	$(KL/r)_{max}$ =	150.00
	≤ 200	**OK**

MEMBERS WITHOUT SLENDER ELEMENTS

1- LIMIT STATE OF FLEXURAL BUCKLING: BY PROVISIONS OF AISC 360-16 SECTION E3

AISC 360-16 EQUATION (E3-4)	ELASTIC BUCKLING STRESS $F_e = \pi^2 E / (KL/r)^2$ =	12.721 ksi
	4.71 $\sqrt{E/F_y}$ =	118.26
AISC 360-16 EQUATION (E3-2)	CRITICAL STRESS $F_{cr} = [0.658^{Fy/Fe}] F_y$	N/A
AISC 360-16 EQUATION (E3-3)	CRITICAL STRESS $F_{cr} = 0.877 F_e$	11.156 ksi
K L / r > 4.71 √(E/Fy), AISC 360-10 EQUATION E3-3 APPLIES	F_{cr} =	11.156 ksi

AVAILABLE COMPRESSIVE STRENGTH PROVISIONS OF AISC 360-16 SECTION E3, "MEMBERS WITHOUT SLENDER ELEMENTS"APPLY

	F_{cr} =	11.156 ksi
AISC 360-16 EQUATION (E3-1)	$P_n = F_{cr} A_g$ =	16.79 kips

	LRFD		ASD	
AISC 360-16 SECTION E1	**Φ_c =**	**0.9**	**Ω_c =**	**1.67**
AVAILABLE COMPRESSIVE STRENGTH:	**$\Phi_c P_n$ =**	**15.107 kips**	**P_n / Ω_c =**	**10.05 kips**

AVAILABLE TENSILE STRENGTH

(ASSUMING $A_g = A_n = A_e$)	$A_g = A_n = A_e$ =	1.510 sq.in
TENSILE YIELDING IN THE GROSS SECTION: AISC 360-16 EQUATION (D2-1)	$P_n = F_y A_g$ =	69.46 kips

	LRFD		ASD	
AISC 360-16 SECTION D2	Φ_t =	0.9	Ω_t =	1.67
AVAILABLE TENSILE STRENGTH:	$\Phi_t P_n$ =	62.514 kips	P_n / Ω_t =	41.59 kips

TENSILE RUPTURE IN THE NET SECTION: AISC 360-10 EQUATION (D2-2)	$P_n = F_u A_e$ =	87.58 kips

	LRFD		ASD	
AISC 360-16 SECTION D2	Φ_t =	0.75	Ω_t =	2.00
AVAILABLE TENSILE STRENGTH:	$\Phi_t P_n$ =	65.685 kips	P_n / Ω_t =	43.79 kips

TENSILE YIELDING IN THE GROSS SECTION GOVERNS	**LRFD**		**ASD**	
AVAILABLE TENSILE STRENGTH:	$\Phi_t P_n$ =	**62.514 kips**	P_n / Ω_t =	**41.59 kips**

AVAILABLE FLEXURE STRENGTH M_{nx} (STRONG AXIS)

CLASSIFICATION OF SECTION FOR LOCAL BUCKLING IN FLEXURE: (AISC 360-16 TABLE B.4.1b)		
FLANGE: (CASE 17)	WIDTH TO THICKNESS RATIO $\lambda = b/t$ =	5.580
	$\lambda_p = 1.12 \sqrt{(E/F_y)}$ =	28.121
	$\lambda_r = 1.4 \sqrt{(E/F_y)}$ =	35.152
	FLANGE CLASSIFICATION FOR LOCAL BUCKLING IN FLEXURE:	COMPACT
WEB: (CASE 19)	WIDTH TO THICKNESS RATIO $\lambda = h/t$ =	5.580
	$\lambda_p = 2.42 \sqrt{(E/F_y)}$ =	60.762
	$\lambda_r = 5.7 \sqrt{(E/F_y)}$ =	143.118
AISC 360-16 SECTION B4.1	WEB CLASSIFICATION FOR LOCAL BUCKLING IN FLEXURE:	COMPACT
LIMIT STATE OF YIELDING: AISC 360-16 EQUATION (F7-1)	$M_n = M_p = F_y Z$ =	44 kip-in
LIMIT STATE OF FLANGE LOCAL BUCKLING:		
FOR SECTIONS WITH NONCOMPACT FLANGES:		
AISC 360-16 EQUATION (F7-2)	$M_n = M_p - (M_p - F_y S)(3.57\ b/t_f \sqrt{(F_y/E)} - 4.0) \le M_p$ =	N/A
FOR SECTIONS WITH SLENDER FLANGES:		
AISC 360-16 EQUATION (F7-4)	$b_e = 1.92\ t_f \sqrt{(E/F_y)}\ (1-0.38/(b/t_f) \sqrt{(E/F_y)}) \le b$	N/A
	$b - b_e$ =	N/A
	EFFECTIVE MOMENT OF INERTIA ABOUT X-X AXIS $I_{eff}(in^4)$ =	N/A
	S =	N/A
AISC 360-16 EQUATION (F7-3)	$M_n = F_y S_e$ =	N/A
FLANGE IS COMPACT, THE LIMIT STATE OF FLANGE LOCAL BUCKLING DOES NOT APPLY		
	M_n =	N/A
LIMIT STATE OF WEB LOCAL BUCKLING:		
FOR SECTIONS WITH NONCOMPACT WEBS:		
AISC 360-16 EQUATION (F7-6)	$M_n = M_p - (M_p - F_y S_x)(0.305\ h/t_w \sqrt{(F_y/E)} - 0.738) \le M_p$ =	N/A
WEB IS COMPACT, THE LIMIT STATE OF WEB LOCAL BUCKLING DOES NOT APPLY		
	M_n =	N/A
DESIGN FLEXURE STRENGT THE LIMIT STATE OF YIELDING GOVERNS,		
	NOMINAL FLEXURAL STRENGTH OF THE SECTION M_n =	**44 kip-in**

	LRFD		ASD	
AISC 360-16 SECTION F1	**Φ_b =**	**0.9**	**Ω_b =**	**1.67**
AVAILABLE FLEXURAL STRENGTH:	**$\Phi_b M_n$ =**	**39.910 kip-in**	**M_n / Ω_b =**	**26.553 kip-in**

AVAILABLE FLEXURE STRENGTH M_{ny} (WEAK AXIS)

CLASSIFICATION OF SECTION FOR LOCAL BUCKLING IN FLEXURE: (AISC 360-16 TABLE B.4.1b)		
FLANGE: (CASE 17)	WIDTH TO THICKNESS RATIO $\lambda = b/t$ =	5.580
	$\lambda_p = 1.12 \sqrt{(E/F_y)}$ =	28.121
	$\lambda_r = 1.4 \sqrt{(E/F_y)}$ =	35.152
	FLANGE CLASSIFICATION FOR LOCAL BUCKLING IN FLEXURE:	COMPACT
WEB: (CASE 19)	WIDTH TO THICKNESS RATIO $\lambda = h/t$ =	5.580
	$\lambda_p = 2.42 \sqrt{(E/F_y)}$ =	60.762
	$\lambda_r = 5.7 \sqrt{(E/F_y)}$ =	143.118
AISC 360-16 SECTION B4.1	WEB CLASSIFICATION FOR LOCAL BUCKLING IN FLEXURE:	COMPACT
LIMIT STATE OF YIELDING: AISC 360-16 EQUATION (F7-1)	$M_n = M_p = F_y Z$ =	44 kip-in
LIMIT STATE OF FLANGE LOCAL BUCKLING:		
FOR SECTIONS WITH NONCOMPACT FLANGES:		
AISC 360-16 EQUATION (F7-2)	$M_n = M_p - (M_p - F_y S)(3.57\ b/t \sqrt{(F_y/E)} - 4.0) \le M_p$ =	N/A
FOR SECTIONS WITH SLENDER FLANGES:		
AISC 360-16 EQUATION (F7-4)	$b_e = 1.92\ t \sqrt{(E/F_y)}\ (1-0.38/(b/t) \sqrt{(E/F_y)}) \le b$	N/A
	$b - b_e$ =	N/A
	EFFECTIVE MOMENT OF INERTIA ABOUT X-X AXIS $I_{eff}(in^4)$ =	N/A
	S_e =	N/A
AISC 360-16 EQUATION (F7-3)	$M_n = F_y S_e$ =	N/A
FLANGE IS COMPACT, THE LIMIT STATE OF FLANGE LOCAL BUCKLING DOES NOT APPLY		
	M_n =	N/A
LIMIT STATE OF WEB LOCAL BUCKLING:		
FOR SECTIONS WITH NONCOMPACT WEBS:		
AISC 360-16 EQUATION (F7-6)	$M_n = M_p - (M_p - F_y S_x)(0.305\ h/t_w \sqrt{(F_y/E)} - 0.738) \le M_p$ =	N/A
WEB IS COMPACT, THE LIMIT STATE OF WEB LOCAL BUCKLING DOES NOT APPLY		
	M_n =	N/A
DESIGN FLEXURE STRENGT THE LIMIT STATE OF YIELDING GOVERNS,		
	NOMINAL FLEXURAL STRENGTH OF THE SECTION M_n =	**44 kip-in**

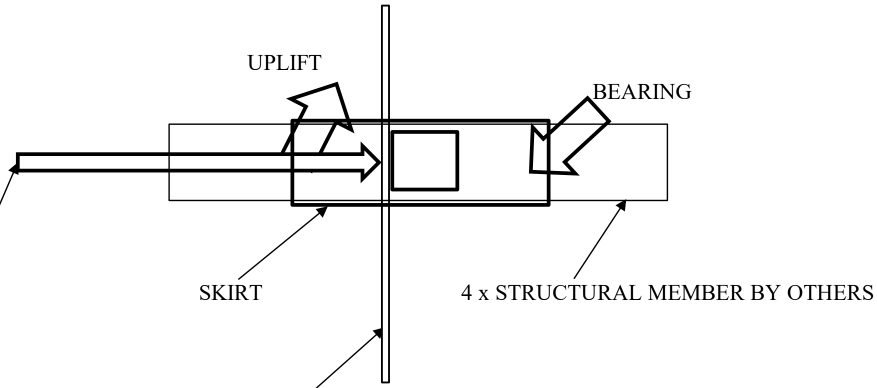
	LRFD		ASD	
AISC 360-16 SECTION F1	**Φ_b =**	**0.9**	**Ω_b =**	**1.67**
AVAILABLE FLEXURAL STRENGTH:	**$\Phi_b M_n$ =**	**39.910 kip-in**	**M_n / Ω_b =**	**26.553 kip-in**

AVAILABLE SHEAR STRENGTH V_{ny} (STRONG AXIS)				
		h/t_w =	5.58	
		k_v =	5	
		A_w =	0.603 sq.in	
		$1.1\sqrt{k_v E / F_y}$ =	61.76	
		$1.37\sqrt{k_v E / F_y}$ =	76.92	
AISC 360-16 EQUATION (G2-9)	FOR $h/t_w \le 1.1\sqrt{k_v E / F_y}$, $C_{v2} = 1$	C_{v2} =	1.00	
AISC 360-16 EQUATION (G2-11	FOR $h/t_w > 1.37\sqrt{k_v E / F_y}$, $C_v = 1.51Ek_v/(h/t_w)^2F_v$	C_{v2} =	N/A	
AISC 360-16 EQUATION (G2-10	OTHERWISE, $C_v = 1.10\sqrt{k_v E / F_y} / (h/t_w)$	C_{v2} =	N/A	
		C_{v2} =	1.000	
AISC 360-16 EQUATION (G4-1)	NOMINAL SHEAR STRENGTH $V_n = 0.6\ F_y\ A_w\ C_{v2}$ =		16.65 kips	
	LRFD		**ASD**	
AISC 360-16 SECTION G1	**Φ_v =**	**0.9**	**Ω_v =**	**1.67**
AVAILABLE SHEAR STRENGTH:	**$\Phi_v\ V_n$ =**	**14.985 kips**	**V_n / Ω_v =**	**9.97 kips**

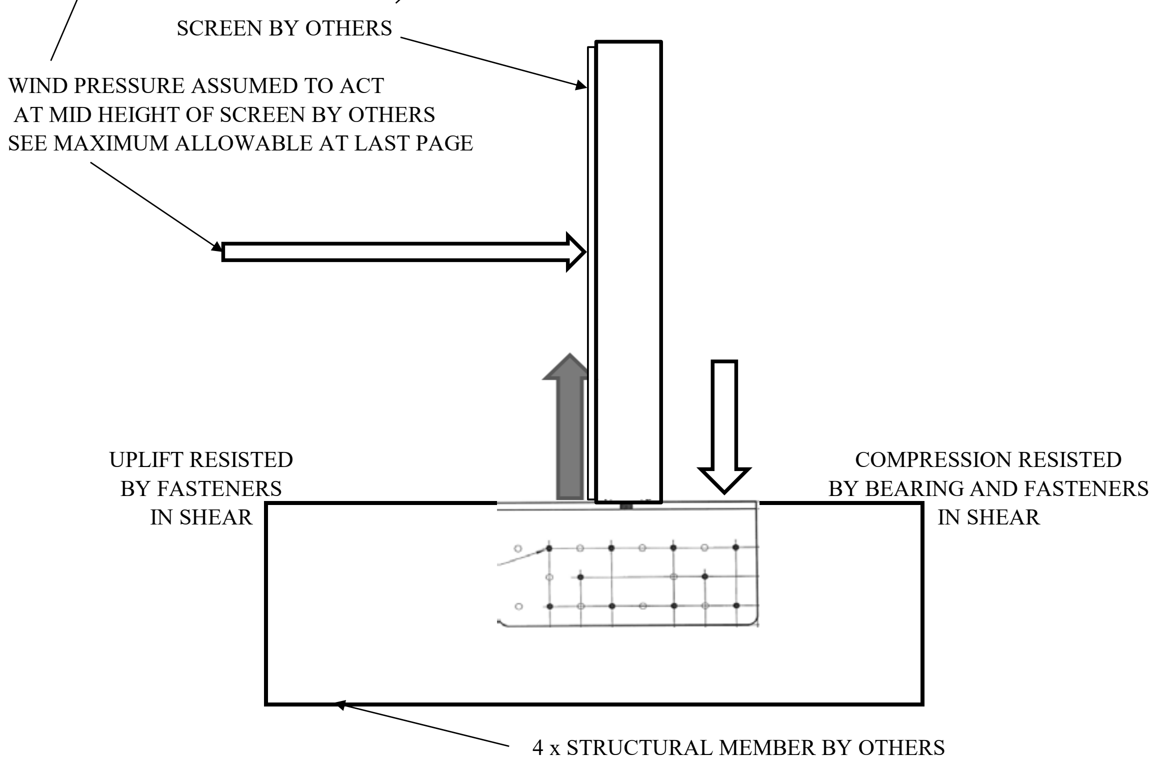
AVAILABLE SHEAR STRENGTH V_{nx} (WEAK AXIS)				
		h/t_w =	5.58	
		k_v =	5	
		A_w =	0.603 sq.in	
		$1.1\sqrt{k_v E / F_y}$ =	61.76	
		$1.37\sqrt{k_v E / F_y}$ =	76.92	
AISC 360-16 EQUATION (G2-9)	FOR $h/tw \le 1.1\sqrt{k_v E / F_y}$, $C_{v2} = 1$	C_{v2} =	1.00	
AISC 360-16 EQUATION (G2-11	FOR $h/tw > 1.37\sqrt{k_v E / F_y}$, $C_v = 1.51Ek_v/(h/t_w)^2F_y$	C_{v2} =	N/A	
AISC 360-16 EQUATION (G2-10	OTHERWISE, $C_v = 1.10\sqrt{k_v E / F_y} / (h/t_w)$	C_{v2} =	N/A	
		C_{v2} =	1.000	
AISC 360-16 EQUATION (G4-1)	NOMINAL SHEAR STRENGTH $V_n = 0.6\ F_y\ A_w\ C_{v2}$ =		16.65 kips	
	LRFD		**ASD**	
AISC 360-16 SECTION G1	**Φ_v =**	**0.9**	**Ω_v =**	**1.67**
AVAILABLE SHEAR STRENGTH:	**$\Phi_v\ V_n$ =**	**14.985 kips**	**V_n / Ω_v =**	**9.97 kips**

ROOF ANCHOR - RAS-354 ATTACHMENT (CASE 1) - CAPACITY

CASE 1: LOAD PARALLEL TO STRUCTURAL MEMBER



PLAN VIEW



FRONT VIEW

HORIZONTAL DISTANCE BETWEEN BEARING / UPLIFT ON STRUCTURAL MEMBERS =		7.00 in
FROM CONNECTION AVAILABLE STRENGTH CALCULATIONS IN THE NEXT PAGE:		
UPLIFT STRENGTH = SHEAR DESIGN VALUE OF CONNECTION =		**6650 lb**
MAXIMUM MOMENT CAPACITY AT POST BASE M_{max} =	**3.879 kip-ft**	**3879. lb-ft**

ROOF ANCHOR - RAS-354 UPLIFT CAPACITY - CASE 1

	TYPE OF FASTENERS	SDS 2 1/2"X1/4"
IAPMO UES 461 SECTION 4.2.2	MINIMUM MAIN MEMBER THICKNESS =	3 1/2 in
IAPMO UES 461 SECTION 4.2.2	MAIN MEMBER SPECIFIC GRAVITY =	0.50 in
ICC ESR-2236 TABLE 2	REFERENCE SHEAR DESIGN VALUE Z =	420 lb

GROUP ACTION FACTOR C_g NDS 2018 SECTION 11.3.6

	ASSUMING A MINIMUM STRUCTURAL MEMBER 4 x 8 A_m =	32.00 sq.in
	A_s = 7.5 X 1/4 =	1.88 sq.in
	A_m / A_s =	17
GROUP 1:	NUMBER OF FASTENER ROWS (2 SIDES OF SKIRT) =	4
	NUMBER OF FASTENERS IN A ROW =	2
NDS 2018 TABLE 11.3.6C	GROUP ACTION FACTOR C_g =	0.99
GROUP 2:	NUMBER OF FASTENER ROWS (2 SIDES OF SKIRT) =	2
	NUMBER OF FASTENERS IN A ROW =	1
NDS 2018 TABLE 11.3.6C	GROUP ACTION FACTOR C_g =	1.00

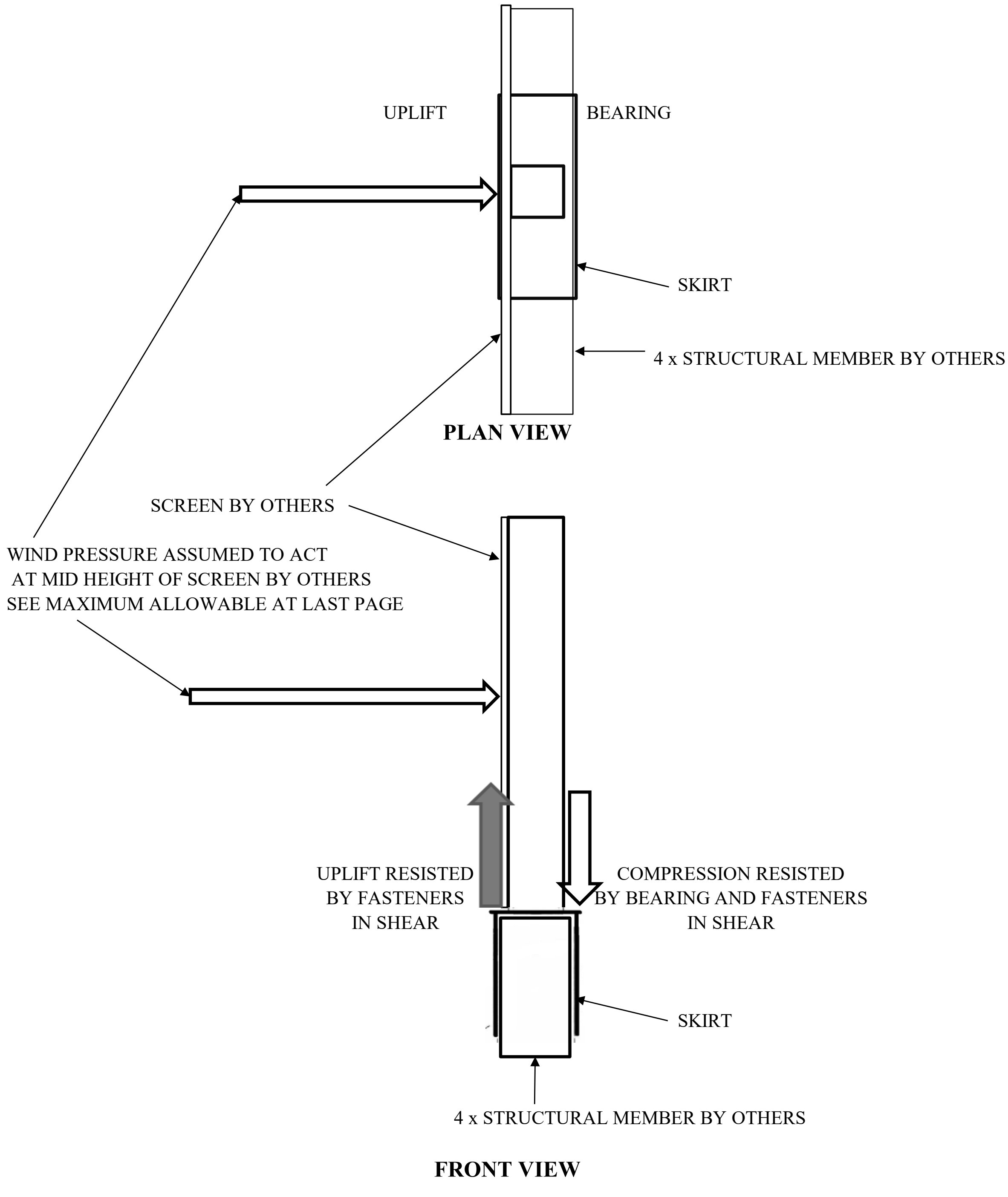
Adjustment Factors per NDS 2018 Table 11.3.1

C_D	C_M	C_t	C_g	C_Δ	C_d	C_{st}
1.6	1	1	VARIES	1	1	1

GROUP 1:	SHEAR DESIGN VALUE OF ONE FASTENER Z' =	663 lb
	SHEAR DESIGN VALUE OF ONE ROW OF FASTENERS =	1326 lb
	SHEAR DESIGN VALUE OF GROUP 1 =	5306 lb
GROUP 2:	SHEAR DESIGN VALUE OF ONE FASTENER Z' =	672 lb
	SHEAR DESIGN VALUE OF ONE ROW OF FASTENERS =	672 lb
	SHEAR DESIGN VALUE OF GROUP 2 =	1344 lb
	UPLIFT STRENGTH = SHEAR DESIGN VALUE OF CONNECTION =	**6650 lb**

ROOF ANCHOR - RAS-354 ATTACHMENT (CASE 2) - CAPACITY

CASE 2: LOAD PERPENDICULAR TO STRUCTURAL MEMBER



HORIZONTAL DISTANCE BETWEEN BEARING / UPLIFT ON STRUCTURAL MEMBERS =		3.50 in
FROM CONNECTION AVAILABLE STRENGTH CALCULATIONS IN THE NEXT PAGE:		
UPLIFT STRENGTH = SHEAR DESIGN VALUE OF CONNECTION =		**6650 lb**
MAXIMUM MOMENT CAPACITY AT POST BASE M_{max} =	**1.939 kip-ft**	**1939. lb-ft**

ROOF ANCHOR - RAS-354 UPLIFT CAPACITY - CASE 2

	TYPE OF FASTENERS	SDS 2 1/2"X1/4"
IAPMO UES 461 SECTION 4.2.2	MINIMUM MAIN MEMBER THICKNESS =	3 1/2 in
IAPMO UES 461 SECTION 4.2.2	MAIN MEMBER SPECIFIC GRAVITY =	0.50 in
ICC ESR-2236 TABLE 2	REFERENCE SHEAR DESIGN VALUE Z =	420 lb
GROUP ACTION FACTOR C_g	NDS 2018 SECTION 11.3.6	
	ASSUMING A MINIMUM STRUCTURAL MEMBER 4 x 8 A_m =	32.00 sq.in
	A_s = 7.5 X 1/4 =	1.88 sq.in
	A_m / A_s =	17
GROUP 1:	NUMBER OF FASTENER ROWS =	4
	NUMBER OF FASTENERS IN A ROW =	2
NDS 2018 TABLE 11.3.6C	GROUP ACTION FACTOR C_g =	0.99
GROUP 2:	NUMBER OF FASTENER ROWS =	2
	NUMBER OF FASTENERS IN A ROW =	1
NDS 2018 TABLE 11.3.6C	GROUP ACTION FACTOR C_g =	1.00

Adjustment Factors per NDS 2018 Table 11.3.1

C_D	C_M	C_t	C_g	C_Δ	C_d	C_{st}
1.6	1	1	VARIES	1	1	1

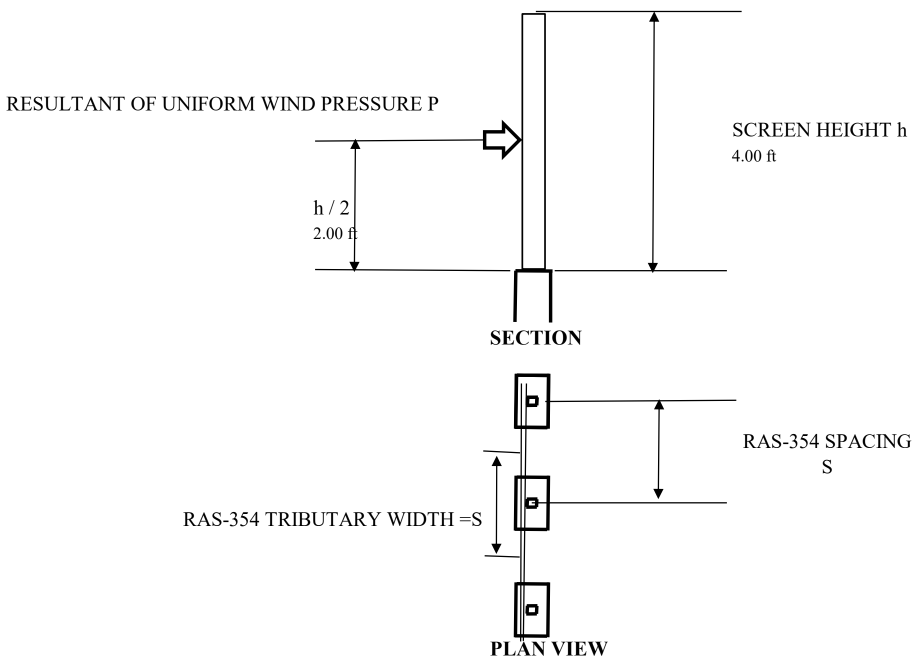
GROUP 1:	SHEAR DESIGN VALUE OF ONE FASTENER Z' =	663 lb
	SHEAR DESIGN VALUE OF ONE ROW OF FASTENERS =	1326 lb
	SHEAR DESIGN VALUE OF GROUP 1 =	5306 lb
GROUP 2:	SHEAR DESIGN VALUE OF ONE FASTENER Z' =	672 lb
	SHEAR DESIGN VALUE OF ONE ROW OF FASTENERS =	672 lb
	SHEAR DESIGN VALUE OF GROUP 2 =	1344 lb
	UPLIFT STRENGTH = SHEAR DESIGN VALUE OF CONNECTION =	**6650 lb**

MAXIMUM AVAILABLE STRENGTH OF ROOF ANCHOR - RAS-354

	AVAILABLE STRENGTH IN SHEAR P (ASD)		AVAILABLE STRENGTH IN BENDING M (ASD)	
POST	9.970 kips	9970 lb	2.210 kip-ft	2210. lb-ft
WELD OF POST BASE	9.970 kips	9970 lb	2.210 kip-ft	2210. lb-ft
RAS-354 ATTACHMENT - CASE 1	6.650 kips	6650 lb	3.879 kip-ft	3879. lb-ft
RAS-354 ATTACHMENT - CASE 2	6.650 kips	6650 lb	1.939 kip-ft	1939. lb-ft
RAS-354 AVAILABLE STRENGTH =	**6.650 kips**	**6650 lb**	**1.939 kip-ft**	**1939. lb-ft**

MAXIMUM ALLOWABLE LOADING OF ROOF ANCHOR - RAS-354

ENGINEER OF RECORD TO VERIFY REQUIRED STRENGTH 0F ROOF ANCHOR - RAS-354 DOES NOT EXCEED THE FOLLOWING AVAILABLE STRENGTH	**ASD LEVEL**	**STRENGTH LEVEL**
AVAILABLE STRENGTH IN SHEAR P	**6650 lb**	**10639 lb**
AVAILABLE STRENGTH IN BENDING M	**1939. lb-ft**	**3103. lb-ft**



LOAD CONVERSION FACTOR α (STRENGTH LEVEL / ASD LEVEL) =	**1.6**
MINIMUM ALLOWABLE UNIFORM IND PRESSURE (ASD) =	**18 psf**

THE FOLLOWING TABLE IS TO HELP EOR PRELIMINARY DESIGN IF CONDITIONS OF THE ASSUMPTIONS AND SKETCH ABOVE MATCH PROJECT CONDITIONS. FINAL DESIGN MUST VERIFY REQUIRED STRENGTH DOES NOT EXCEED AVAILABLE STRENGTH GIVEN ABOVE.

MAXIMUM ALLOWABLE SCREEN HEIGHT	RAS-354 SPACING S	RAS-354 TRIBUTARY AREA A	ALLOWABLE UNIFORM WIND PRESSURE w FOR SHEAR	ALLOWABLE UNIFORM WIND PRESSURE w FOR MOMENT	**ALLOWABLE UNIFORM WIND PRESSURE (ASD)**	**ALLOWABLE UNIFORM WIND PRESSURE w**	
						ASD LEVEL	**STRENGTH LEVEL**
4.00 ft	2.00 ft	8.00 sq.ft.	831.2 psf	121.2 psf	**121.2 psf**	**121 psf**	**194 psf**
4.00 ft	4.00 ft	16.00 sq.ft.	415.6 psf	60.6 psf	**60.6 psf**	**61 psf**	**97 psf**
4.00 ft	6.00 ft	24.00 sq.ft.	277.1 psf	40.4 psf	**40.4 psf**	**40 psf**	**65 psf**
4.00 ft	8.00 ft	32.00 sq.ft.	207.8 psf	30.3 psf	**30.3 psf**	**30 psf**	**48 psf**
4.00 ft	10.00 ft	40.00 sq.ft.	166.2 psf	24.2 psf	**24.2 psf**	**24 psf**	**39 psf**
4.00 ft	11.00 ft	44.00 sq.ft.	151.1 psf	22.0 psf	**22.0 psf**	**22 psf**	**35 psf**
4.00 ft	12.00 ft	48.00 sq.ft.	138.5 psf	20.2 psf	**20.2 psf**	**20 psf**	**32 psf**