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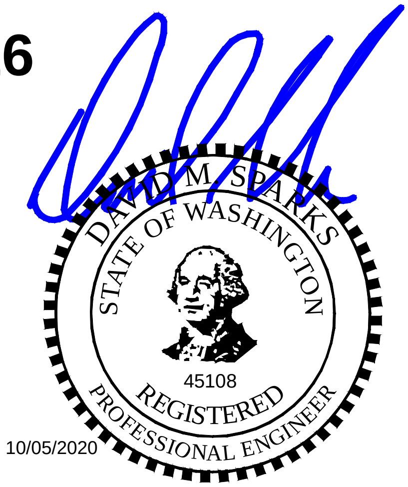
Studio Shed

1500 Cherry Street
Louisville, Colorado 80027

Siefken Residence - 12x16



10/05/2020

EXPIRES: 10/25/2021

<u>INDEX TO STRUCTURAL CALCULATIONS</u>

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CO-FE20-010769
68492

18325 N. ALLIED WAY, SUITE #200 * PHOENIX, AZ 85054 * PHONE: 602.867.2500 * FAX: 602.867.2503

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CLIENT:	STUDIO SHED	SHEET 1	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS	

GOVERNING CODE AND LATERAL LOAD CRITERIA:

MUNICIPALITY:	MERCER ISLAND, WA	SEISMIC SITE CLASSIFICATION:	D
BUILDING CODE:	2015 IBC/IRC	EXPOSURE AT MWFRS:	C
3 SEC GUST (MPH):	110	EXPOSURE AT C & C:	C
RISK CATEGORY:	II		
MCE SHORT PERIOD, S_s:	1.444	MCE 1 SECOND PERIOD, S_1:	0.501

ROOF LOADS:

ROOF FRAMING DEAD LOAD

TOTAL ROOF DL (PSF) =	15.00

ROOF FRAMING LIVE LOAD

LESS THAN 4:12 SLOPE ROOF LL (PSF) =	20.00

SNOW LOAD

TOTAL GROUND SNOW LOAD (PSF) =	32.47
TOTAL FLAT (SEE SHEET 2) ROOF SNOW LOAD (PSF) =	26.00

WALL DEAD LOADS:

EXTERIOR WALL DEAD LOAD

TOTAL WALL DL (PSF) =	10.00

INTERIOR WALL DEAD LOAD

TOTAL WALL DL (PSF) =	7.00

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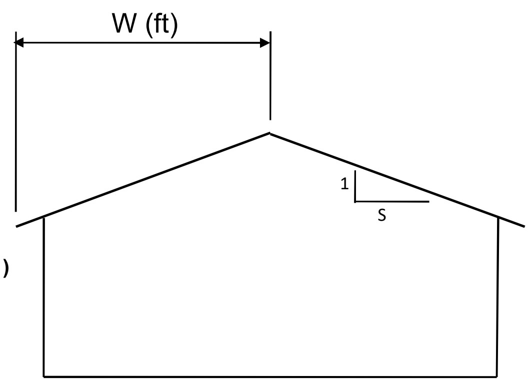
ROOF SNOW LOADS PER ASCE 7-16 CHAPTER 7

$p_f = 0.7C_eC_tI_sp_g$	FLAT ROOF SNOW LOAD PER EQUATION 7.3-1
C_e	EXPOSURE FACTOR PER TABLE 7-2
C_t	THERMAL FACTOR PER TABLE 7-3
C_s	SLOPE FACTOR PER FIGURE 7-2
I_s	IMPORTANCE FACTOR PER TABLE 1.5-2
p_g	GROUND SNOW LOAD PER SECTION 7.2 AND/OR FIGURE 7-1
$p_s = C_sp_f$	SLOPED ROOF SNOW LOAD PER EQUATION 7.4-1
$p_m = I_sp_g$	MINIMUM SNOW LOAD FOR LOW SLOPE ROOFS PER SECTION 7.3.4

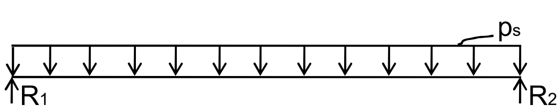
RISK CATEGORY =	II	PER TABLE 1.5-1
TERRAIN CATEGORY =	C	PER SECTION 26.7
EXPOSURE OF ROOF =	PARTIALLY	PER FOOTNOTE a OF TABLE 7-2
PITCH OF ROOF =	1.512	/12 THETA (θ) = 7.18 DEGREES
TYPE OF ROOF SURFACE =	OTHER	
C_e =	1.000	TABLE 7-2
C_t =	1.100	TABLE 7-3
C_s =	1.000	FIGURE 7-2
I_s=	1.000	TABLE 1.5-2
pg =	32.470	psf, FIGURE 7-1
pf =	25.002	psf, pf = 0.7*Ce*Ct*Is*pg (EQN 7.3-1)
ps =	25.002	psf, ps = Cs*pf (EQN 7.4-1)
pm =	20.000	psf, SECTION 7.3.4
W =	15.000	ft (W = L_u FOR DRIFT)
S =	7.937	
h_d =	1.710	PER FIGURE 7-9
γ =	18.221	pcf, γ = 0.13pg+14 <= 30 pcf (EQN 7.7-1)
$^8/_3 * h_d * \sqrt{S}$ =	12.845	ft
$h_d * \gamma / \sqrt{S}$ =	11.058	psf

FIGURE 7-5



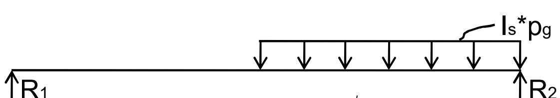
NOTE: IN ORDER TO COMPARE THE BALANCED AND UNBALANCED SNOW LOADS, WE SOLVE THE DIAGRAMS IN FIGURE 7-5 TO THE RIGHT FOR R_2 AND THEN FIND AN EQUIVALENT p_s BY TAKING R_2 / W.

p_s = 25.00 psf * BALANCED

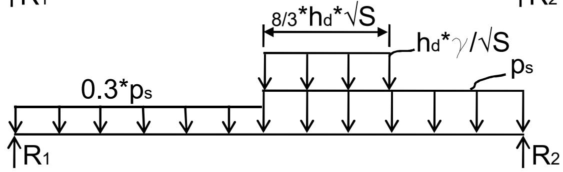


* 5 psf RAIN-ON-SNOW SURCHARGE OMITTED PER SECTION 7.10

EQUIVALENT p_s = 24.35 psf UNBALANCED W<=20ft



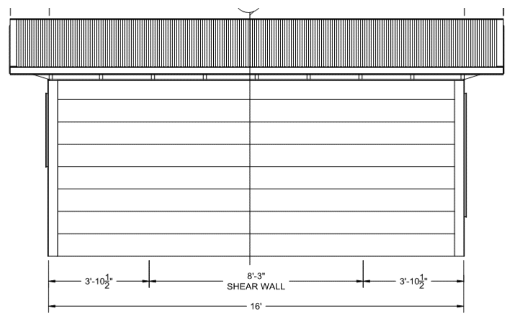
EQUIVALENT p_s = ______ NOT APPLICABLE UNBALANCED W>20ft



THEREFORE, THE BALANCED SNOW LOAD OF 25.00psf SHOULD BE USED FOR W <= 20

CLIENT:	STUDIO SHED	SHEET 3	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS	

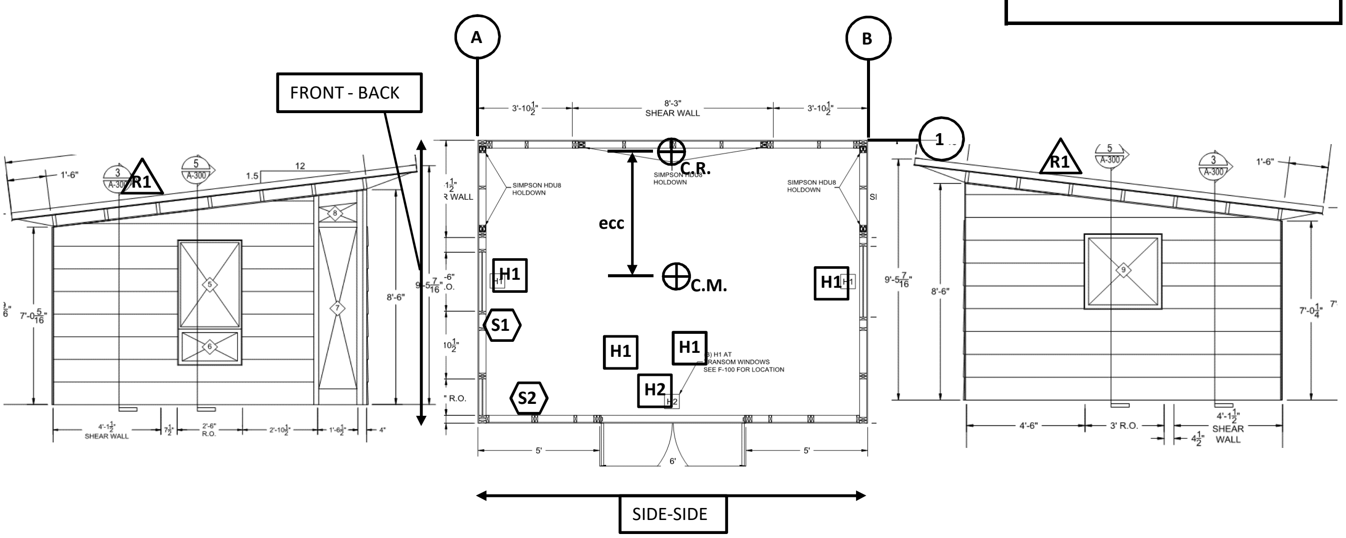
H = HEADER
S = STUD
# = SHEAR LINE
R = RAFTER

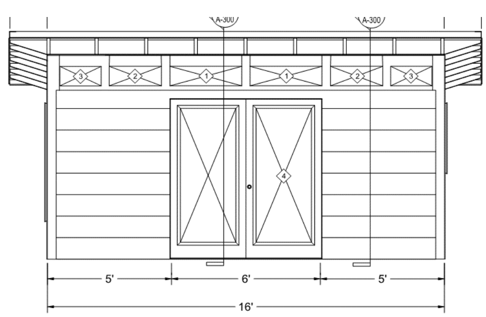


DIAPHRAGM ASPECT RATIO

L =	12.000	ft
B =	16.000	ft
SIDE O.H. =	1.500	ft
REAR O.H. =	1.500	ft
FRONT O.H. =	2.000	ft
L	<=	25 O.K.
L/B =	0.750	<= 1 O.K.

SDPWS 4.2.5.2.1 APPLIES. USE RIGID ANALYSIS.





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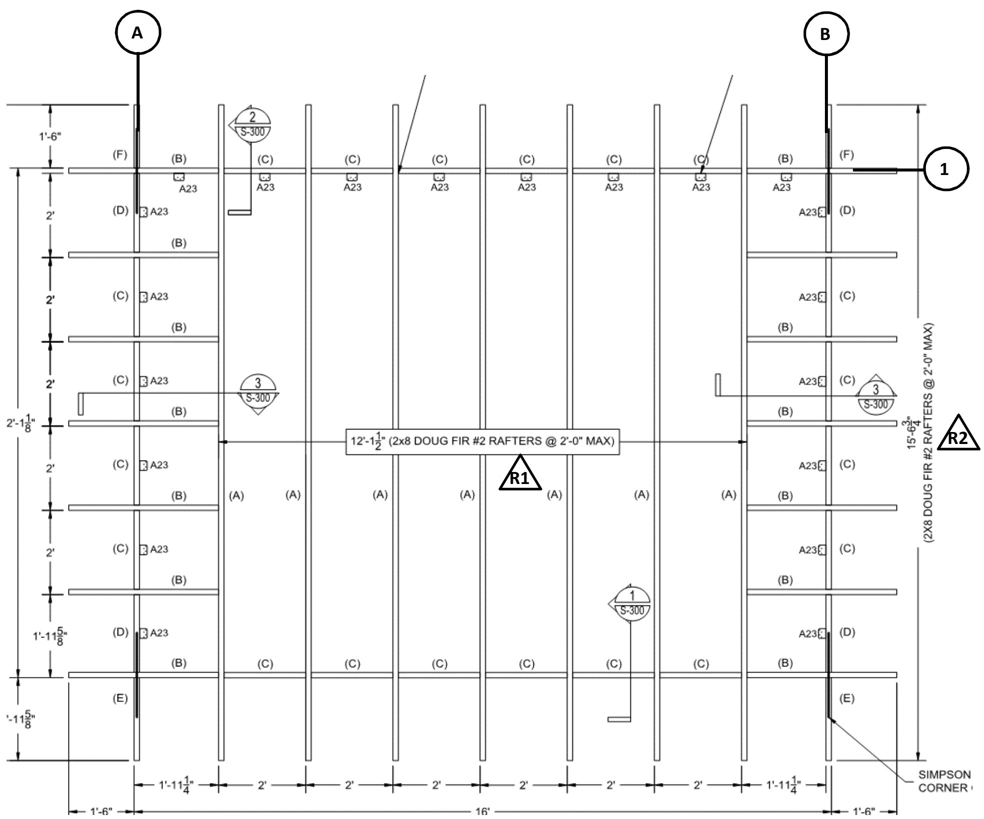
CLIENT:	STUDIO SHED	SHEET	4	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS		

H = HEADER
S = STUD
# = SHEAR LINE
R = RAFTER



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CLIENT:	STUDIO SHED	SHEET 5	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS	

	Header/Beam Loading							Unbraced Lengths	Deflection Data		Results	Load Combo	Actual Stress	Allowable Stress
		Point Loads		Uniform Loads										
Id	Load Type	P (lb)	x (ft)	w_{start} (plf)	w_{stop} (plf)	x_{start} (ft)	x_{stop} (ft)	$L_{ub,top}$ (ft)	TL (L/x)	DL Creep Factor	V_{max} (lb)	V	fv (psi)	F'v (psi)
								$L_{ub,bot}$ (ft)	LL (L/x)					
Span 1 (ft)								NDS Factors	Cantilever Data		$M+_{max}$ (lb-ft)	M+	fb+ (psi)	F'b+ (psi)
								C_r	Left	Δ_{TL} Limit	$M-_{max}$ (lb-ft)	M-	fb- (psi)	F'b- (psi)
Span 2 (ft)								C_i						
								C_M	Right	Δ_{LL} Limit	Deflections			
								C_T			Δ_{max} (in)	Δ_{TL}		
Span 3 (ft)								C_{Ltop}	Scarf Cut Data		Δ_{cant} (in)	Δ_{TL}		
								C_{Lbot}	Left	d_n (in)	Δ_{max} (in)	Δ_{LL}	Total Length, L (ft)	
								C_F/C_{vtop}	Right	d_n (in)	Δ_{cant} (in)	Δ_{LL}		
Span 4 (ft)								C_F/C_{vbot}	Material Type			Member Size		

Header/ Beam Support Design	Max/Min Reaction R1 (lb)	Load Combo	Max/Min Reaction R2 (lb)	Load Combo	Max/Min Reaction R3 (lb)	Load Combo	Max/Min Reaction R4 (lb)	Load Combo	Max/Min Reaction R5 (lb)	Load Combo
	Bearing Length (in)/Hanger		Bearing Length (in)/Hanger		Bearing Length (in)/Hanger		Bearing Length (in)/Hanger		Bearing Length (in)/Hanger	
	Trimmer or Post Height		Trimmer or Post Height		Trimmer or Post Height		Trimmer or Post Height		Trimmer or Post Height	
	King Stud Height		King Stud Height		King Stud Height		King Stud Height		King Stud Height	
	Support Material Type		Support Material Type		Support Material Type		Support Material Type		Support Material Type	
	Trimmers / Hanger		Trimmers / Hanger		Trimmers / Hanger		Trimmers / Hanger		Trimmers / Hanger	
	King Studs		King Studs		King Studs		King Studs		King Studs	
Foundation Support Design	Support Condition		Support Condition		Support Condition		Support Condition		Support Condition	
	Support Location		Support Location		Support Location		Support Location		Support Location	
	Slab Thickness (in)		Slab Thickness (in)		Slab Thickness (in)		Slab Thickness (in)		Slab Thickness (in)	
	Bearing Pressure (psf)		Bearing Pressure (psf)		Bearing Pressure (psf)		Bearing Pressure (psf)		Bearing Pressure (psf)	
	Support Width (in)		Support Width (in)		Support Width (in)		Support Width (in)		Support Width (in)	
	Support Depth (in)		Support Depth (in)		Support Depth (in)		Support Depth (in)		Support Depth (in)	
	Point Load at Support (lb)		Point Load at Support (lb)		Point Load at Support (lb)		Point Load at Support (lb)		Point Load at Support (lb)	
	Uniform Load at Support (plf)		Uniform Load at Support (plf)		Uniform Load at Support (plf)		Uniform Load at Support (plf)		Uniform Load at Support (plf)	
	Support Size		Support Size		Support Size		Support Size		Support Size	

Beam/Header Diagram

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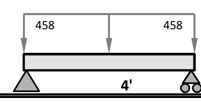
CLIENT:	STUDIO SHED	SHEET	6	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS		

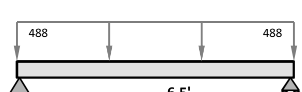
H1	D			113	113	0.000	4.000		240	1.000	531	D + S	65	460
	S			195	195	0.000	4.000		360					
4.000	Lr			150	150	0.000	4.000	Factors	Cantilever Data		621	D + S	1043	2190
								No	No					
								1.000			0	D	0	1530
								No	No					
								MC<=19%			Deflections			
								T<=100			-0.110	D + S		
								1.000	Scarf Cut Data		0.000			
								1.000	No		-0.069	S	4.000	
								1.120	No		0.000			
								1.000	Timberstrand 1.3E (Beam)		3 1/2" x 3 1/2" LSL			
									Select Material					

Header/ Beam Support Design	621	D + S	621	D + S
	231	D	231	D
	3.5		3.5	
	7		7	
	8.5		8.5	
	SPF #2 (2" to 4" wide)		SPF #2 (2" to 4" wide)	
	(1) 2x4 TRIMMERS		(1) 2x4 TRIMMERS	
	(1) 2x4 KING STUDS		(1) 2x4 KING STUDS	
Foundation Support Design	Conventional		Conventional	
	Edge		Edge	
	1500		1500	
	10		10	
	18		18	
	200		200	
	NOT REQ'D		NOT REQ'D	



H2	D			120	120	0.000	6.500		240	1.000	931	D + S	73	460
	S			208	208	0.000	6.500		360					
6.500	Lr			160	160	0.000	6.500	Factors	Cantilever Data		1762	D + S	1198	2081
								No	No					
								1.000			0	D	0	1530
								No	No					
								MC<=19%			Deflections			
								T<=100			-0.212	D + S		
								0.991	Scarf Cut Data		0.000			
								1.000	No		-0.132	S	6.500	
								1.074	No		0.000			
								1.000	Timberstrand 1.3E (Beam)		3 1/2" x 5 1/2" LSL			
									Select Material					

Header/ Beam Support Design	1084	D + S	1084	D + S
	408	D	408	D
	3.5		3.5	
	8		8	
	8.5		8.5	
	SPF #2 (2" to 4" wide)		SPF #2 (2" to 4" wide)	
	(1) 2x4 TRIMMERS		(1) 2x4 TRIMMERS	
	(1) 2x4 KING STUDS		(1) 2x4 KING STUDS	
Foundation Support Design	Conventional		Conventional	
	Edge		Edge	
	1500		1500	
	10		10	
	18		18	
	200		200	
	NOT REQ'D		NOT REQ'D	



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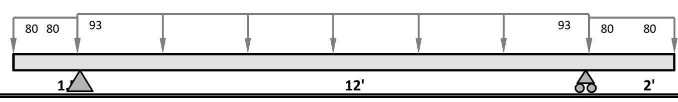
CLIENT:	STUDIO SHED	SHEET	7	OF
PROJECT:	SIEFKEN RESIDENCE	BY DMS		

R1	D			30	30	0.000	15.500	0.000	240	1.000	463	D + S	64	207
	S			52	52	0.000	15.500		360					
1.500	0.6W			-29	-29	1.500	13.500	Factors	Cantilever Data		1386	D + S	1266	1428
	0.6W			-42	-42	0.000	1.500	Yes	Yes	60				
	0.6W			-42	-42	13.500	15.500	1.150			-169	D + S	154	1063
12.000	Lr			40	40	0.000	15.500	No	Yes	90				
								MC<=19%			Deflections			
								T<=100			-0.462	D + S		
2.000								1.000	Scarf Cut Data		-0.020	0.6D + 0.6W		
								0.744	No		-0.285	S	15.500	
								1.000	No		-0.109	+ 0.6W		
								1.000	Doug-Fir #2 (2" to 4" wide)		2x8			
									Select Material					

Header/ Beam Support Design						
		626	D + S	681	D + S	
		-90	0.6D + 0.6W	-105	0.6D + 0.6W	
		3.125		3.125		
		To Framing Below		To Framing Below		

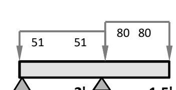
Foundation Support Design		
	To Framing Below	To Framing Below
	To Framing Below	To Framing Below



R2	D			30	30	0.000	3.500	1.000	240	1.000	126	D + S	17	207
	S			52	52	0.000	3.500		360					
2.000	0.6W			-29	-29	0.000	2.000	Factors	Cantilever Data		25	0.6D + 0.6W	23	1711
	0.6W			-42	-42	0.000	3.500	No	No	60				
	Lr			40	40	0.000	3.500	1.000			-95	D + S	87	1223
1.500								No	Yes	90				
								MC<=19%			Deflections			
								T<=100			0.000	D + S		
								0.990	Scarf Cut Data		-0.002	D + S		
								0.984	No		0.000	S	3.500	
								1.000	No		-0.001	S		
								1.000	Doug-Fir #2 (2" to 4" wide)		2x8			
									Select Material					

Header/ Beam Support Design				
37	D + S	258	D + S	
-39	0.6D + 0.6W	-98	0.6D + 0.6W	
3.125		3.125		
To Framing Below		To Framing Below		

Foundation Support Design		
	To Framing Below	To Framing Below
	To Framing Below	To Framing Below

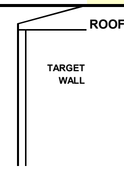


CLIENT: STUDIO SHED — SHEET 8 OF

PROJECT: SIEFKEN RESIDENCE — BY DMS

WALL NUMBER:	⟨S1⟩	STUD LOCATION:	1	(1 = ROOF, 2 = FIRST FLOOR BELOW ROOF, 3 = SECOND FLOOR BELOW ROOF)			
TOP PLATE THICKNESS (IN)	3.00	WALL HAS CONTINUOUS SHEATHING ON ONE SIDE	YES	ROOF ASSEMBLY TYPE	$C\&C_{WIND}$ DEFLECTION, L/ 180	GYP COMP.	NO
SOLE PLATE THICKNESS (IN)	1.50			PRE-FAB TRUSSES	$C\&C_{WIND}$ FACTOR = 0.7	GYP + WOOD COMP.	NO

ROOF SPAN (FT)		ROOF LOADS (PSF)		SUPPORTING WALL	
TYPE:	SIMPLE	D	15.00	HEIGHT (FT)	8.50
MAIN SPAN	2.00	L_R	20.00	WEIGHT (PSF)	10.00
OVERHANG	1.50	S	26.00		
TOTAL TRIB.	2.50	R			
SIMPLE		$0.6{*}W_{UPLIFT}$	14.50		



TARGET WALL			
0.6*C&C (PSF)	21.19	HEIGHT (FT)	8.50
0.6*W (PSF)	11.53	WEIGHT (PSF)	10.00
0.7*E (PSF)	5.00	PARTIAL LOADING (WIND)	
		STOP (FT)	8.13
WALL WIDTH (IN)	3.50	START (FT)	0.00

STUD MATERIAL					
SPECIES	SPF #2 (2" to 4" wide)	TITLE	2x4 SPF #2 GRADE STUDS		
SCANT	NO	C_{FB}	1.50	b (IN)	1.50
F_B (PSI)	875	C_{FC}	1.15	d (IN)	3.50
F_C (PSI)	1150	C_R	1.15	A (IN^2)	5.250
E_{MIN} (PSI)	510000	c	0.80	S_x (IN^3)	3.063
E_x (PSI)	1400000				5.359

C & C LOADING

BENDING (NDS Section 3.3)

Le = 8.50ft - (3.00in + 1.50in)(1ft/12in) = 8.13ft
M = 349.69#-ft
F'b = Fb(Cd)(Cr)(Cfb) = 875(1.60)(1.15)(1.50) = 2415.00psi
fb = (12in/1ft)(349.69#-ft)/3.06in^3 = 1370.23psi

DEFLECTION (NDS Section 3.5.1)

DELTA = 0.39in

BENDING AND DEFLECTION CAPACITY CHECK

1370.23psi/2415.00psi = 0.567 < 1.000 O.K.
0.39in < 0.54in O.K.

THEREFORE, USE 2x4 SPF #2 GRADE STUDS AT 24in O.C.

ASCE7 LOAD COMBINATIONS	C_D			
D	0.90	487.65	" o.c.	
D + L	1.00	499.46	" o.c.	
D + L_R	1.25	319.80	" o.c.	
D + S	1.15	282.93	" o.c.	
D + R	1.25	519.68	" o.c.	
D + 0.75L + 0.75L_R	1.25	353.83	" o.c.	
D + 0.75L + 0.75S	1.15	318.64	" o.c.	
D + 0.75L + 0.75R	1.25	519.68	" o.c.	
D + 0.6W	1.60	75.24	" o.c.	
D + 0.7E	1.60	133.80	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75L_R	1.60	86.76	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75S	1.60	84.36	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75R	1.60	95.28	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75L_R	1.60	136.92	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75S	1.60	130.92	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75R	1.60	161.40	" o.c.	
0.6C&C	1.60	35.21	" o.c.	GOVERNS

D + L (NON-CONCURRENT)	1.00		" o.c.	

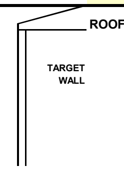
DESIRED SPACING FOR CALCULATIONS:	24	" o.c.

CLIENT: STUDIO SHED — SHEET 9 OF

PROJECT: SIEFKEN RESIDENCE — BY DMS

WALL NUMBER:	S2	STUD LOCATION:	1	(1 = ROOF, 2 = FIRST FLOOR BELOW ROOF, 3 = SECOND FLOOR BELOW ROOF)				
TOP PLATE THICKNESS (IN)	3.00	WALL HAS CONTINUOUS SHEATHING ON ONE SIDE	YES	ROOF ASSEMBLY TYPE	$C\&C_{WIND}$ DEFLECTION, L/	180	GYP COMP.	NO
SOLE PLATE THICKNESS (IN)	1.50			PRE-FAB TRUSSES	$C\&C_{WIND}$ FACTOR =	0.7	GYP + WOOD COMP.	NO

ROOF SPAN (FT)		ROOF LOADS (PSF)		SUPPORTING WALL	
TYPE:	SIMPLE	D	15.00	HEIGHT (FT)	8.50
MAIN SPAN	12.00	L_R	20.00	WEIGHT (PSF)	10.00
OVERHANG	2.00	S	26.00		
TOTAL TRIB.	8.00	R			
SIMPLE		$0.6{*}W_{UPLIFT}$	14.50		



TARGET WALL			
0.6*C&C (PSF)	21.19	HEIGHT (FT)	8.50
0.6*W (PSF)	11.53	WEIGHT (PSF)	10.00
0.7*E (PSF)	5.00	PARTIAL LOADING (WIND)	
		STOP (FT)	8.13
WALL WIDTH (IN)	3.50	START (FT)	0.00

STUD MATERIAL					
SPECIES	SPF #2 (2" to 4" wide)	TITLE	2x4 SPF #2 GRADE STUDS		
SCANT	NO	C_{FB}	1.50	b (IN)	1.50
F_B (PSI)	875	C_{FC}	1.15	d (IN)	3.50
F_C (PSI)	1150	C_R	1.15	A (IN^2)	5.250
E_{MIN} (PSI)	510000	c	0.80	S_x (IN^3)	3.063
E_x (PSI)	1400000				5.359

C & C LOADING

BENDING (NDS Section 3.3)

Le = 8.50ft - (3.00in + 1.50in)(1ft/12in) = 8.13ft
M = 349.69#-ft
F'b = Fb(Cd)(Cr)(Cfb) = 875(1.60)(1.15)(1.50) = 2415.00psi
fb = (12in/1ft)(349.69#-ft)/3.06in^3 = 1370.23psi

DEFLECTION (NDS Section 3.5.1)

DELTA = 0.39in

BENDING AND DEFLECTION CAPACITY CHECK

1370.23psi/2415.00psi = 0.567 < 1.000 O.K.
0.39in < 0.54in O.K.

THEREFORE, USE 2x4 SPF #2 GRADE STUDS AT 24in O.C.

ASCE7 LOAD COMBINATIONS	C_D			
D	0.90	240.07	" o.c.	
D + L	1.00	245.89	" o.c.	
D + L_R	1.25	128.91	" o.c.	
D + S	1.15	110.73	" o.c.	
D + R	1.25	255.84	" o.c.	
D + 0.75L + 0.75L_R	1.25	147.17	" o.c.	
D + 0.75L + 0.75S	1.15	128.81	" o.c.	
D + 0.75L + 0.75R	1.25	255.84	" o.c.	
D + 0.6W	1.60	74.88	" o.c.	
D + 0.7E	1.60	100.92	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75L_R	1.60	68.52	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75S	1.60	63.84	" o.c.	
D + 0.75(0.6W) + 0.75L + 0.75R	1.60	90.00	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75L_R	1.60	82.68	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75S	1.60	76.20	" o.c.	
D + 0.75(0.7E) + 0.75L + 0.75R	1.60	115.80	" o.c.	
0.6C&C	1.60	35.21	" o.c.	GOVERNS

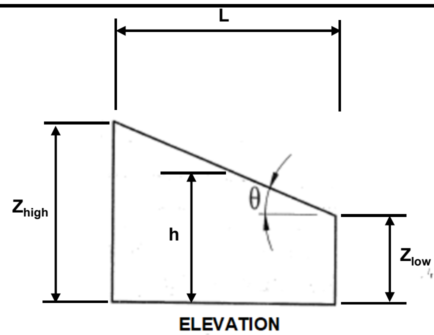
D + L (NON-CONCURRENT)	1.00		" o.c.	

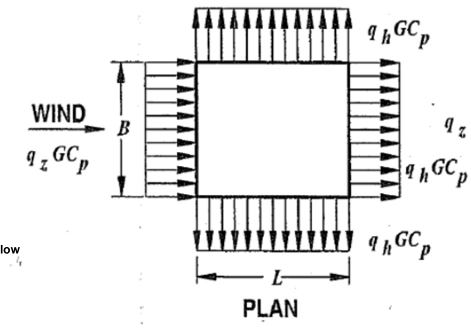
DESIRED SPACING FOR CALCULATIONS: 24 " o.c.

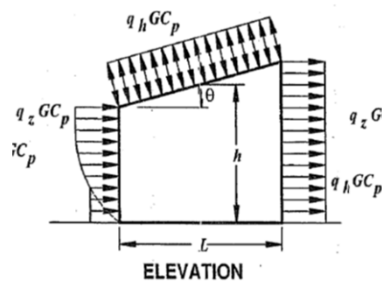
WIND LOAD CALCULATIONS PER ASCE 7-16

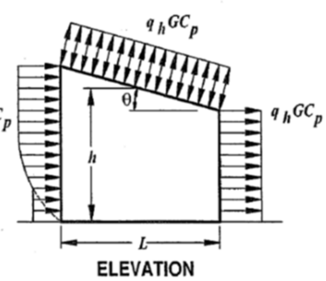
MWFRS (SECTION 27.3 - ALL HEIGHTS)

Z_{low} =	7.000	ft	
Z_{high} =	8.500	ft	
ROOF THICKNES, t =	0.643	ft	
L =	12.000	ft	
B =	16.000	ft	
L/B =	0.750		
O.H. =	1.500	ft	
Θ =	7.181	deg	
h =	8.398	ft	
h / L =	0.700		
EXPOSURE =	C		
RISK CATEGORY =	II		
3 SEC GUST (Vult) =	110.00	mph	
GUST-EFFECT (G) =	0.850	(26.11)	
K_d =	0.850	(26.6)	
Kzt =	1.000	(26.8)	
Elevation Above MSL (ft) =	0		
K_e =	1.000	(26.9)	
$K_{z\,low}$ =	0.849	(Table 26.10-1)	
$K_{z\,high}$ =	0.849	(Table 26.10-1)	
K_h =	0.849	(Table 26.10-1)	
$q_{z\,low}$ =	22.351	psf (Eq 27.3-1)	
$q_{z\,high}$ =	22.351	psf (Eq 27.3-1)	
q_h =	22.351	psf (Eq 27.3-1)	
GC_{pi} =	0.180		









MWFRS:WALLS

				GCpi = +0.18		GCpi = -0.18	
Windward Wall	$C_{p\,WW}$ =	0.800	P_{WW} =	11.175	psf (27.3-1)	19.222	psf (27.3-1)
Leeward Wall	$C_{p\,LW}$ =	-0.500	P_{LW} =	-13.522	psf (27.3-1)	-5.476	psf (27.3-1)
Side Wall	$C_{p\,SW}$ =	-0.700	P_{SW} =	-17.322	psf (27.3-1)	-9.276	psf (27.3-1)

MWFRS:ROOFS

NORMAL TO RIDGE Θ >= 10°

				GCpi = +0.18		GCpi = -0.18	
Windward -	$C_{p\,R}$ =	0.000	P_{WW-} =	0.000	psf (27.3-1)	0.000	psf (27.3-1)
Windward +	$C_{p\,R}$ =	0.000	P_{WW+} =	0.000	psf (27.3-1)	0.000	psf (27.3-1)
Leeward	$C_{p\,R}$ =	0.000	P_{LW} =	0.000	psf (27.3-1)	0.000	psf (27.3-1)

NORMAL TO RIDGE Θ < 10° and PARALLEL TO RIDGE ALL Θ

				GCpi = +0.18		GCpi = -0.18	
$C_{p\,R}$ =	-1.060	(Table 27.3-1) for 0 to 4.20ft	P =	-24.159	psf (27.3-1)	-16.113	psf (27.3-1)
$C_{p\,R}$ =	-0.820	(Table 27.3-1) for 4.20 to 8.40ft	P =	-19.603	psf (27.3-1)	-11.556	psf (27.3-1)
$C_{p\,R}$ =	-0.580	(Table 27.3-1) for 8.40 to 16.80ft	P =	-15.041	psf (27.3-1)	-6.995	psf (27.3-1)
$C_{p\,R}$ =	-0.460	(Table 27.3-1) greater than 16.80ft	P =	-12.760	psf (27.3-1)	-4.714	psf (27.3-1)

WINDWARD ROOF OVERHANG (27.3.3) — $q_h G(C_{pmin} - C_{pOH})$

C_p =	0.800	P =	-35.334	psf

C & C (SECTION 30.3 - LOW RISE MONOSLOPE)

C & C:WALLS (EQN & FIG 30.3-1) a = 3.000 ft

Zone					
4	GC_{p+}=	1.000	P_{WW} =	26.374	psf
	GC_{p-}=	-1.100	P_{LW} =	-28.609	psf
5	GC_{p+}=	1.000	P_{WW} =	26.374	psf
	GC_{p-}=	-1.400	P_{LW} =	-35.3142	psf

C & C:ROOF (EQN 30.3-1 & FIG 30.3-5A&B) a = 3.000 ft 2a = 6.000 ft 4a = 12.000 ft

Zone						OVERHANGS	
3	GC_{p-} =	-1.800	P_3 =	-44.255	psf	-58.112	psf
3'	GC_{p-} =	-2.600	$P_{3'}$ =	-62.1352	psf	-75.993	psf
2	GC_{p-} =	-1.300	P_2 =	-33.079	psf	-46.937	psf
2'	GC_{p-} =	-1.600	$P_{2'}$ =	-39.7844	psf	-53.642	psf
1	GC_{p-} =	-1.100	P_1 =	-28.609	psf		
ALL	GC_{p+}=	0.300	$P_{+\,ALL}$ =	10.728	psf		

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SEISMIC LOAD CALCULATIONS PER ASCE 7-16

USING BASIC LOAD COMBINATIONS PER SECTION 2.4.1
ALL LOAD COMBINATIONS USE: 0.7*E

$E = E_h + E_v$	(EQN 12.4-1 and EQN 12.4-3)
$E_h = \rho Q_E$	(EQN 12.4-3)
$\rho = 1.30$	(SECTION 12.3.4.2.a)
$Q_E = V$	(SECTION 12.4.2.1)
$E_v = 0.2S_{DS}D$ ($E_V = 0$ IF $S_{DS} <= 0.125$)	(EQN 12.4-4)

RISK CATEGORY =	II	(TABLE 1.5-1)	
SITE CLASS =	D	(PER PROJECT SOILS REPORT OR TABLE 20.3-1)	DEFAULT
h_n (ft) =	8.398	(MEAN ROOF HEIGHT OF STRUCTURE)	
S_s =	1.444	(MAPPED MCE SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS)	
S_1 =	0.501	(MAPPED MCE SPECTRAL RESPONSE ACCELERATION AT A PERIOD OF 1 s)	
F_a =	1.200	(TABLE 11.4-1)	
F_v =	1.799	(TABLE 11.4-2)	
$S_{MS} = F_aS_s$ =	1.733	(EQN 11.4-1)	
$S_{M1} = F_vS_1$ =	0.901	(EQN 11.4-2)	
$S_{DS} = {}^2/_3S_{MS}$ =	1.155	(EQN 11.4-3)	
$S_{D1} = {}^2/_3S_{M1}$ =	0.601	(EQN 11.4-4)	
I_E=	1.000	(TABLE 1.5-2)	
T_s=	0.520	(SECTION 11.4.5)	
SDC BASED ON S_{DS} =	D	(TABLE 11.6-1)	**EXCEPTION IN SECTION 11.6 CAN BE CHECKED S1<0.75 AND Ta<0.8Ts
SDC BASED ON S_{D1} =	N/A	(TABLE 11.6-2)	**USE TABLE 11.6-1 ALONE IF RIGID DIAPHRAGM AND T<Ts OR WHEN USING BRACING TABLES FOR IRC DESIGN
DESIGN SDC =	D	(SECTION 11.6)	
Front-Back R=	6.500	Side-Side R= 6.500	(TABLE 12.2-1 (A.15))
C_t=	0.020	(TABLE 12.8-2)	
x =	0.750	(TABLE 12.8-2)	
$T_a = C_th_n^x$ =	0.099	(EQN 12.8-7)	
T_L =	12.000	(TABLE 22-12)	

$V = C_SW$	(EQN 12.8-1)
C_S = SEISMIC RESPONSE COEFFICIENT	(SECTION 12.8.1.1)
W = EFFECTIVE SEISMIC WEIGHT	(SECTION 12.7.2)

FRONT-BACK

	C_S =	$S_{DS}/(R/I_E)$ =	0.178		
GOVERNS	$C_s$max =	$S_{D1}/(T(R/I_E))$ =	0.937	}	0.937
	$C_s$max =	$S_{D1}T_L/(T^2(R/I_E))$ =	113.95		
GOVERNS	$C_s$min =	$0.044*S_{DS}*I_E>=0.01$	0.051	}	0.051
	$C_s$min =	$0.5S_1/(R/I_E)$ =	0.039		

SIDE-SIDE

	C_S =	$S_{DS}/(R/I_E)$ =	0.178			(EQN 12.8-2)
GOVERNS	$C_s$max =	$S_{D1}/(T(R/I_E))$ =	0.937	}	0.937	(EQN 12.8-3)
	$C_s$max =	$S_{D1}T_L/(T^2(R/I_E))$ =	113.95			(EQN 12.8-4)
GOVERNS	$C_s$min =	$0.044*S_{DS}*I_E>=0.01$	0.051	}	0.051	(EQN 12.8-5)
	$C_s$min =	$0.5S_1/(R/I_E)$ =	0.039			(EQN 12.8-6)

EQN 12.8-2 GOVERNS AND QE = V=			0.178 *W
S_{DS} > 0.125, THEREFORE			
E_V = 0.231 *D		$0.7*E_V$ =	0.162 *D

EQN 12.8-2 GOVERNS AND QE = V=			0.178 *W
S_{DS} > 0.125, THEREFORE			
E_V = 0.231 *D		$0.7*E_V$ =	0.162 *D

Mass Calculations

Front-Back Direction											
Level	Plate Height (ft)	Diaphram			Exterior Walls			Interior Walls			Total Weight (lb)
		Area (ft^2)	Load (psf)	Weight (lb)	Total Length (ft)	Load (psf)	Weight (lb)	Total Length (ft)	Load (psf)	Weight (lb)	
Roof	8.5	294.5	15.00	4418	32	10.00	1360	0	7.00	0	5778
				4418			1360			0	5778

Redundancy	Base Shear	ASD	Vertical Distribution of Seismic Forces for Front-Back Direction						
$\rho_{F\text{-}B}$	$E_{hF\text{-}B}$ (lb)	$E_{hF\text{-}B}$* 0.7 (lb)	Level	w_x (lb)	h_x (ft)	$w_x h_x$ (lb-ft)	$\frac{w_x h_x^k}{\sum w_i h_i^k}$ (%)	$F_{x\,F\text{-}B}$ (lb)	$\frac{F_{x\,F\text{-}B}}{Ax}$ (psf)
1.30	1335	934	Roof	5778	8.5	49109	1.000	934	3.17
				5778		49109		934	

Side-Side Direction											
Level	Plate Height (ft)	Diaphram			Exterior Walls			Interior Walls			Total Weight (lb)
		Area (ft^2)	Load (psf)	Weight (lb)	Total Length (ft)	Load (psf)	Weight (lb)	Total Length (ft)	Load (psf)	Weight (lb)	
Roof	8.5	294.5	15.00	4418	24	10.00	1020	0	7.00	0	5438
				4418			1020			0	5438

Redundancy	Base Shear	ASD	Vertical Distribution of Seismic Forces for Side-Side Direction						
$\rho_{S\text{-}S}$	$E_{hS\text{-}S}$ (lb)	$E_{hS\text{-}S}$* 0.7 (lb)	Level	w_x (lb)	h_x (ft)	$w_x h_x$ (lb-ft)	$\frac{w_x h_x}{\sum w_i h_i}$ (%)	$F_{x\,S\text{-}S}$ (lb)	$\frac{F_{x\,S\text{-}S}}{Ax}$ (psf)
1.30	1256	879	Roof	5438	8.5	46219	1.000	879	2.99
				5438		46219		879	

WIND LOAD CALCULATIONS (MWFRS) FIGURE 27.4-8 & 27.4.6 EXCEPTION CASES 1 & 3

CASE 1: FRONT-BACK

V_{FB} = [19.22psf * (9.15ft/2) - -5.48psf * (9.15ft/2) + 24.16psf*(1.50ft)] * 16.00ft = 2322 # (ULT)

(A) = 1161 # (ULT)

(B) = 1161 # (ULT)

CASE 1: SIDE-SIDE

V_{SS} = 0.5 * [(9.15ft + 7.65ft) / 2] * [19.22psf - -5.48psf] * 12.00ft = 1245 # (ULT)

(1) = 1245 # (ULT)

(A) = 233 # (ULT) (CANTILEVER)

(B) = 233 # (ULT) (CANTILEVER)

CASE 3: 75% OF BOTH DIRECTIONS SIMULTANEOUSLY

V_{FB} = 1741 # (ULT)

(A) = 1046 # (ULT) (INCLUDES CANTILEVER)

(B) = 1046 # (ULT) (INCLUDES CANTILEVER)

V_{SS} = 933 # (ULT)

(1) = 933 # (ULT)

SEISMIC LOAD CALCULATIONS EQUIVALENT LATERAL FORCE (ELF) 12.8

FRONT-BACK

V_{FB} = 1.30 * 5778# * (0.178) = 1335 # (ULT)

SIDE-SIDE

V_{SS} = 1.30 * 5438# * (0.178) = 1256 # (ULT)

WALL STIFFNESSES (SDPWS EQ 4.3-1)

FRONT-BACK

$K_{FB\ A}$ = 4065 #/in	Relative Rigidity = 1.000	ORIGIN - LOWER LEFT	X= 0.000	Y= 0.000
#/in	Relative Rigidity = 0.000	CENTER OF MASS	X= 8.000	Y= 6.000
$K_{FB\ B}$ = 4065 #/in	Relative Rigidity = 1.000	CENTER OF RIGIDITY	X= 8.000	Y= 11.854
#/in	Relative Rigidity = 0.000			

SIDE-SIDE

$K_{SS\ 1}$ = 10238 #/in Relative Rigidity = 2.518

#/in Relative Rigidity = 0.000

SEISMIC DISTRIBUTION

WALL	X_{START} ft	Y_{START} ft	X_{STOP} ft	Y_{STOP} ft	L ft	X_{CENTER} ft	Y_{CENTER} ft	R_{SS}	R_{FB}	X e_{ECC} ft	Y e_{ECC} ft	X e_{ACC} ft	Y e_{ACC} ft
(A)	0.146	7.875	0.146	12.000	4.125	0.146	9.938	0.000	1.000	0.000	5.854	0.600	0.800
					0.000	0.000	0.000	0.000	0.000				
(B)	15.854	7.875	15.854	12.000	4.125	15.854	9.938	0.000	1.000				
					0.000	0.000	0.000	0.000	0.000				
(1)	3.875	11.854	12.125	11.854	8.250	8.000	11.854	2.518	0.000				
					0.000	0.000	0.000	0.000	0.000				
								2.518	2.000				

WALL	R_{FB}*X ft	R_{SS}*Y ft	X_B ft	Y_B ft	R_{FB}*X_B^2 ft	R_{SS}*Y_B^2 ft	V_{DIRECT} FB (#)	V_{ECC} FB (#)	V_{ACC} FB (#)	V_{DIRECT} SS (#)	V_{ECC} SS (#)	V_{ACC} SS (#)	V_{TOTAL} FB (#)	V_{TOTAL} SS (#)
(A)	0.146	0.000	-7.854	1.917	61.688	0.000	467	0	36	0	0	9	503	9
	0.000	0.000	-8.000	11.854	0.000	0.000	0	0	0	0	0	0	0	0
(B)	15.854	0.000	7.854	1.917	61.688	0.000	467	0	36	0	0	9	503	9
	0.000	0.000	-8.000	11.854	0.000	0.000	0	0	0	0	0	0	0	0
(1)	0.000	29.854	0.000	0.000	0.000	0.000	0	0	0	879	0	0	0	879
	0.000	0.000	-8.000	11.854	0.000	0.000	0	0	0	0	0	0	0	0
	16.000	29.854		J =	123.376									

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CLIENT: STUDIO SHED **SHEET** L5 **OF**

PROJECT: SIEFKEN RESIDENCE **BY** DMS

SHEAR WALL ANALYSES

(A) ☑ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER WIND LOAD CALCULATIONS * 0.6 = 696 #

WALL n	Wall Type	Studs (in o.c.)	2 SIDED	L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	$0.6W_{UPLIFT}$ (psf)
1	3	24		4.13	7.26	2x4	1.4E+06	11.00	0.020	0.154	697	1.000	169	324	2.50	10.00	15.00	13.13
2																		
										V_{TOTAL} (#) =	697							

			LEFT END								RIGHT END							
WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	5338	937	CUSTOM	HDU8	MIDWALL			1158	K	0.044	CUSTOM	HDU8	CORNER	700		738	K	0.044
2																		

(B) ☑ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER WIND LOAD CALCULATIONS * 0.6 = 696 #

WALL n	Wall Type	Studs (in o.c.)	2 SIDED	L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	$0.6W_{UPLIFT}$ (psf)
1	3	24		4.13	7.26	2x4	1.4E+06	11.00	0.020	0.154	697	1.000	169	324	2.50	10.00	15.00	13.13
2																		
										V_{TOTAL} (#) =	697							

			LEFT END								RIGHT END							
WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	5338	937	CUSTOM	HDU8	MIDWALL			1158	K	0.044	CUSTOM	HDU8	CORNER	700		738	K	0.044
2																		

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CLIENT: STUDIO SHED — SHEET L6 OF

PROJECT: SIEFKEN RESIDENCE — BY DMS

SHEAR WALL ANALYSES

(1) ☐ FRONT-BACK ☑ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER WIND LOAD CALCULATIONS * 0.6 = 747 #

WALL n	Wall Type	Studs (in o.c.)	2 SIDED	L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	$0.6W_{UPLIFT}$ (psf)
1	3	24		8.25	7.00	2x4	1.4E+06	11.00	0.011	0.069	751	1.000	91	324	6.00	10.00	15.00	13.13
2																		

V_{TOTAL} (#) = 751

WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	LEFT END WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	RIGHT END WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	7938	5445	CUSTOM	HDU8	MIDWALL			566	K	0.044	CUSTOM	HDU8	MIDWALL			566	K	0.044
2																		

( ) ☐ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☐ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = = #

WALL n	Wall Type	Studs (in o.c.)	2 SIDED	L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	$0.6W_{UPLIFT}$ (psf)
1																		
2																		

V_{TOTAL} (#) =

WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	LEFT END WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	RIGHT END WOOD/ CONC	LOCATION OR NAME	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1																		
2																		

FELTENGROUP
ARCHITECTURE | ENGINEERING | FORENSICS

CLIENT: STUDIO SHED SHEET L7 OF

PROJECT: SIEFKEN RESIDENCE BY DMS

SHEAR WALL ANALYSES

(A) ☑ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER SEISMIC DISTRIBUTION CALCULATIONS = 503 #

WALL n	Wall Type	Studs (in o.c.)		L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	0.7* 0.2*S_{DS}
1	3	24		4.13	7.26	2x4	1.4E+06	11.00	0.012	0.108	503	1.000	122	231	2.00	10.00	15.00	0.16
2																		
										V_{TOTAL} (#) =	503							

			LEFT END								RIGHT END							
WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	3651	873	CUSTOM	HDU8	MIDWALL			792	K	0.040	CUSTOM	HDU8	CORNER	700		372	K	0.040
2																		

(B) ☑ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER SEISMIC DISTRIBUTION CALCULATIONS = 503 #

WALL n	Wall Type	Studs (in o.c.)		L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	0.7* 0.2*S_{DS}
1	3	24		4.13	7.26	2x4	1.4E+06	11.00	0.012	0.108	503	1.000	122	231	2.00	10.00	15.00	0.16
2																		
										V_{TOTAL} (#) =	503							

			LEFT END								RIGHT END							
WALL n	$\sum M_{OT}$ (#-ft)	$\sum M_R$ (#-ft)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	3653	873	CUSTOM	HDU8	MIDWALL			793	K	0.040	CUSTOM	HDU8	CORNER	700		373	K	0.040
2																		

ARCHITECTURE | ENGINEERING | FORENSICS

CLIENT: STUDIO SHED — SHEET L8 OF

PROJECT: SIEFKEN RESIDENCE — BY DMS

SHEAR WALL ANALYSES

(1) ☐ FRONT-BACK ☑ SIDE-SIDE
☐ BASEMENT ☑ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = PER SEISMIC DISTRIBUTION CALCULATIONS = 879 #

WALL n	Wall Type	Studs (in o.c.)		L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	0.7* $0.2{*}S_{DS}$
1	3	24		8.25	7.00	2x4	1.4E+06	11.00	0.009	0.078	883	1.000	107	231	6.00	10.00	15.00	0.16
2																		

V_{TOTAL} (#) = 883

			LEFT END								RIGHT END							
WALL n	ΣM_{OT} (#-ft)	ΣM_R (#-ft)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1	6181	5445	CUSTOM	HDU8	MIDWALL			460	K	0.040	CUSTOM	HDU8	MIDWALL			460	K	0.040
2																		

( ) ☐ FRONT-BACK ☐ SIDE-SIDE
☐ BASEMENT ☐ 1st FLOOR ☐ 2nd FLOOR ☐ 3rd FLOOR

V = = #

WALL n	Wall Type	Studs (in o.c.)		L_n (ft)	h_n (ft)	Wall Width	Chord E_n (psi)	Ga_n (k/in)	Δa_n (in)	Δ (in)	V_{design} (#)	C_{WSP}	v_{design} (plf)	v_{allow} (plf)	$A_{TRIB.}$ (ft)	W_{WALL} (psf)	DL (psf)	0.7* $0.2{*}S_{DS}$
1																		
2																		

V_{TOTAL} (#) =

			LEFT END								RIGHT END							
WALL n	ΣM_{OT} (#-ft)	ΣM_R (#-ft)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)	WOOD/ CONC	LOCATION	POSITION	$W_{INT.WALL}$ (#)	$T_{2nd\ FLOOR}$ (#)	T_{DESIGN} (#)	HOLDOWN	Δa_n (in)
1																		
2																		

SIMPSON Strong-Tie®

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Company:		Date:	7/10/2017
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description: 3/4" Titen-HD (Seismic Design)

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 6.250
Effective Embedment depth, h_{ef} (inch): 4.860
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 10.00
c_{ac} (inch): 7.31
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: A tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: Yes
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Recommended Anchor
Anchor Name: Titen HD® - 3/4"Ø Titen HD, hnom:6.25" (159mm)
Code Report: ICC-ES ESR-2713

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Version 2.9.7376.2

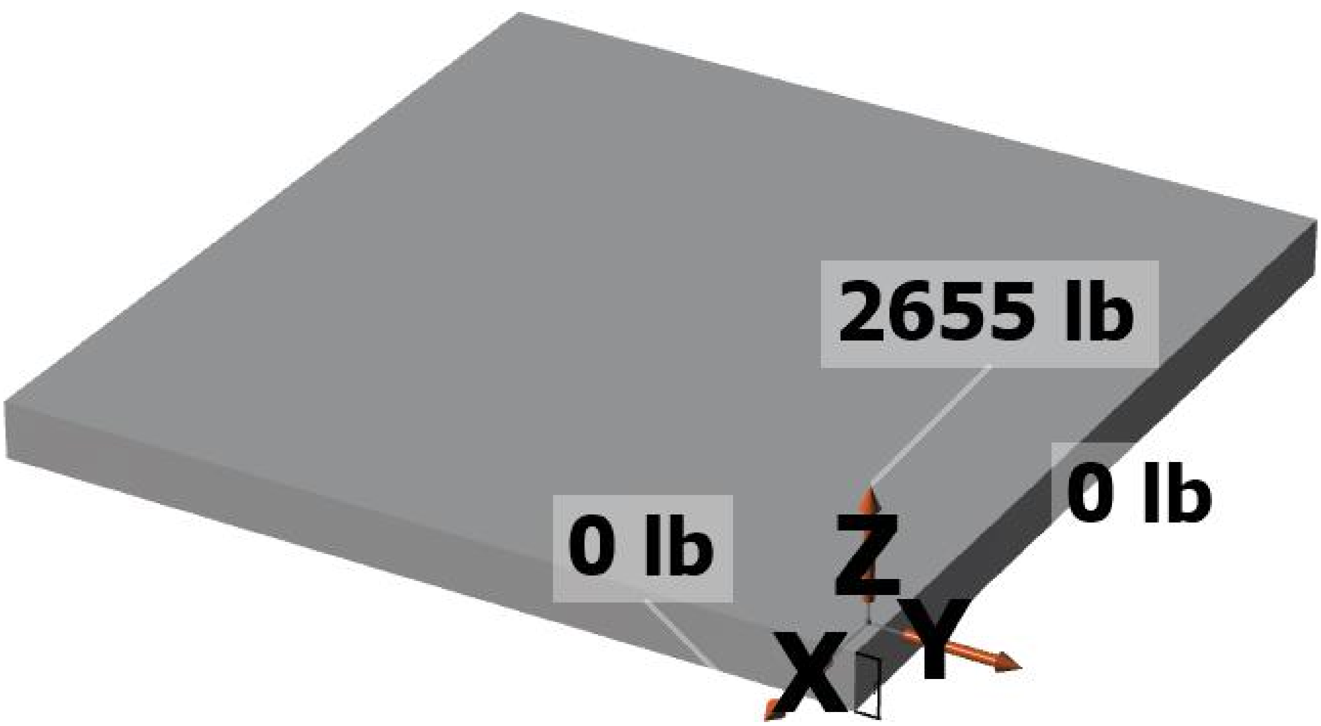
Company:		Date:	7/10/2017
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: U = 0.9D + 1.0E
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.2.3.4.3 (d) is satisfied
Ductility section for shear: 17.2.3.5.3 (c) is satisfied
Ω_0 factor: 3.0
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

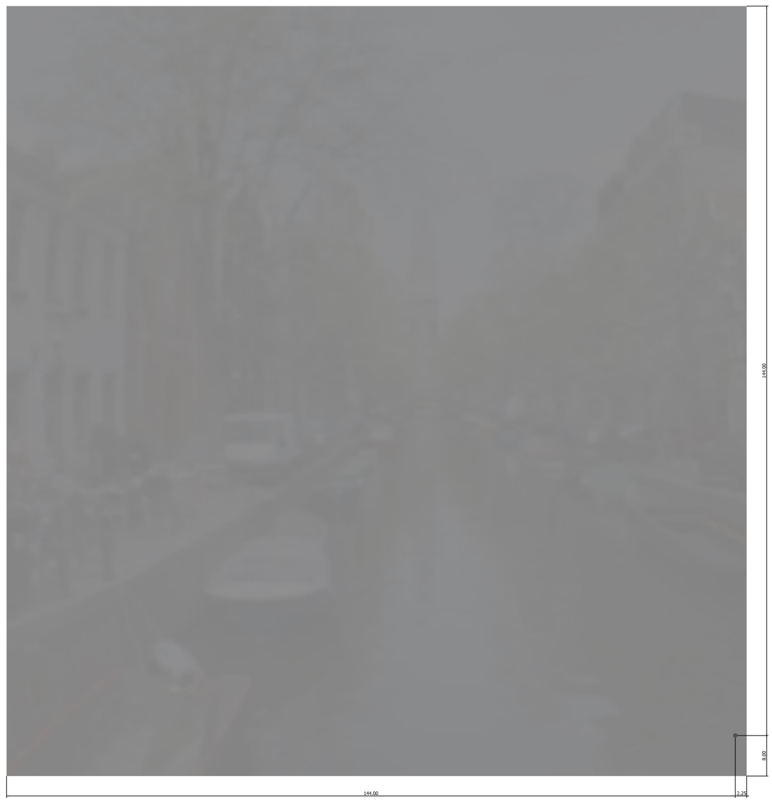
Service level loads:

	D	E	*Strength level loads*
N_a [lb]:	-400	1005	*2655*
V_{ax} [lb]:	0	0	*0*
V_{ay} [lb]:	0	0	*0*

<Figure 1>



<Figure 2>



3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2655.0	0.0	0.0	0.0
Sum	2655.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2655
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
45540	0.65	29601

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	4.860	9107

$0.75\phi N_{cb} = 0.75\phi\,(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
139.09	212.58	2.25	0.793	1.00	1.000	9107	0.75	2657

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$0.75\phi N_{pn} = 0.75\phi\Psi_{c,P}\lambda_a N_p(f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	1.00	7195	2500	0.50	0.65	3508

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2655	29601	0.09	Pass
Concrete breakout	**2655**	**2657**	**1.00**	**Pass (Governs)**
Pullout	2655	3508	0.76	Pass

3/4"Ø Titen HD, hnom:6.25" (159mm) meets the selected design criteria.

12. Warnings

- Concrete breakout strength in shear has not been evaluated against applied shear load(s) per designer option. Refer to ACI 318 Section 17.3.2.1 for conditions where calculations of the concrete breakout strength may not be required.

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.

- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer’s product literature for hole cleaning and installation instructions.

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Company:		Date:	6/3/2020
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description: 3/4" Titen-HD (Seismic Design)

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 6.250
Effective Embedment depth, h_{ef} (inch): 4.860
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 10.00
c_{ac} (inch): 7.31
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: A tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

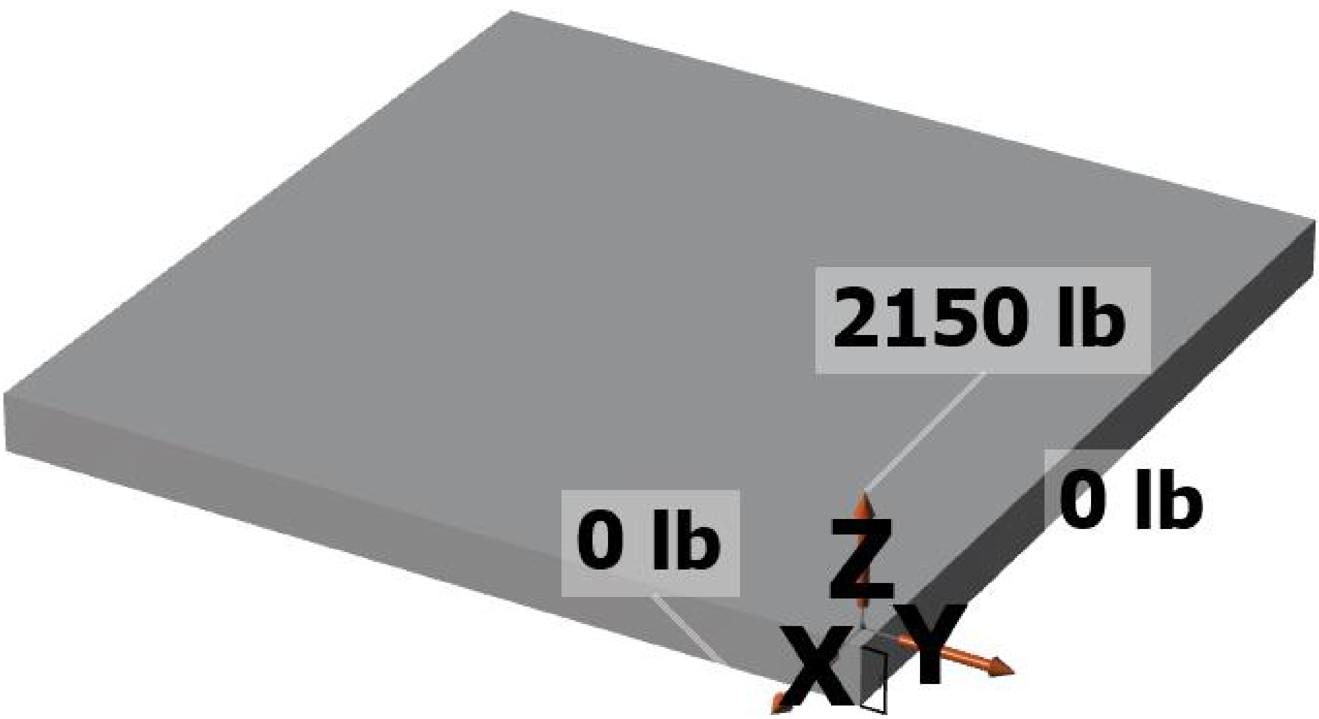
Recommended Anchor
Anchor Name: Titen HD® - 3/4"Ø Titen HD, hnom:6.25" (159mm)
Code Report: ICC-ES ESR-2713

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.2.3.4.3 (d) is satisfied
Ductility section for shear: 17.2.3.5.3 (c) is satisfied
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

N_{ua} [lb]: 2150
V_{uax} [lb]: 0
V_{uay} [lb]: 0

<Figure 1>



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Company:		Date:	6/3/2020
Engineer:		Page:	3/5
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2150.0	0.0	0.0	0.0
Sum	2150.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2150
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
45540	0.65	29601

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	4.860	9107

$0.75\phi N_{cb} = 0.75\phi\,(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cb}$ (lb)
112.48	212.58	2.25	0.793	1.00	1.000	9107	0.75	2148

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$0.75\phi N_{pn} = 0.75\phi\Psi_{c,P}\lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	$0.75\phi N_{pn}$ (lb)
1.0	1.00	7195	2500	0.50	0.65	3508

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	2150	29601	0.07	Pass
Concrete breakout	**2150**	**2148**	**1.00**	**Pass (Governs)**
Pullout	2150	3508	0.61	Pass

3/4"Ø Titen HD, hnom:6.25" (159mm) meets the selected design criteria.

12. Warnings

- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.

- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer’s product literature for hole cleaning and installation instructions.

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Company:		Date:	7/10/2017
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description: 3/4" Titen-HD (Wind Design)

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 6.250
Effective Embedment depth, h_{ef} (inch): 4.860
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 10.00
c_{ac} (inch): 7.31
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'$_c$ (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: A tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Recommended Anchor
Anchor Name: Titen HD® - 3/4"Ø Titen HD, hnom:6.25" (159mm)
Code Report: ICC-ES ESR-2713

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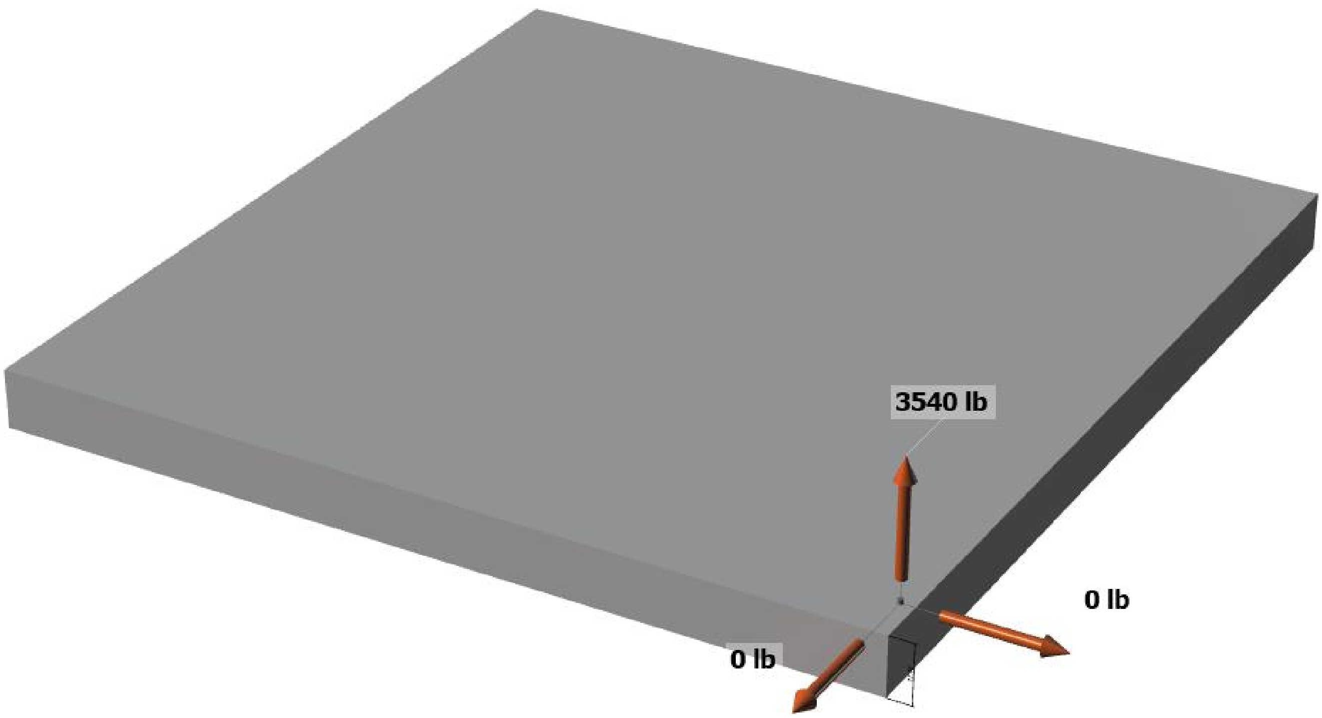
Company:		Date:	7/10/2017
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: U = 0.9D + 1.0W
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Service level loads:

	D	W	*Strength level loads*
N_a [lb]:	-400	3900	*3540*
V_{ax} [lb]:	0	0	*0*
V_{ay} [lb]:	0	0	*0*

<Figure 1>



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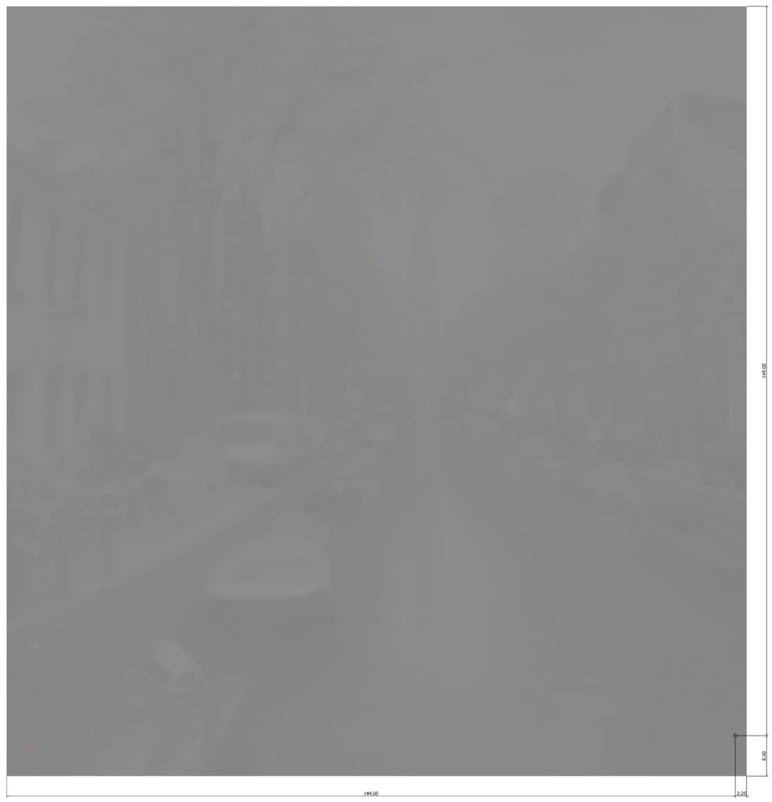
Company:		Date:	7/10/2017
Engineer:		Page:	3/5
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>



3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	3540.0	0.0	0.0	0.0
Sum	3540.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 3540
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
45540	0.65	29601

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	4.860	9107

$\phi N_{cb} = \phi\ (A_{Nc} / A_{Nco})\ \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
139.09	212.58	2.25	0.793	1.00	1.000	9107	0.75	3542

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	7195	2500	0.50	0.65	4677

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	3540	29601	0.12	Pass
Concrete breakout	**3540**	**3542**	**1.00**	**Pass (Governs)**
Pullout	3540	4677	0.76	Pass

3/4"Ø Titen HD, hnom:6.25" (159mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer’s product literature for hole cleaning and installation instructions.

Anchor Designer™ Software
Version 2.9.7376.2

Company:		Date:	6/3/2020
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description: 3/4" Titen-HD (Wind Design)

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.750
Nominal Embedment depth (inch): 6.250
Effective Embedment depth, h_{ef} (inch): 4.860
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 10.00
c_{ac} (inch): 7.31
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: A tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Recommended Anchor
Anchor Name: Titen HD® - 3/4"Ø Titen HD, hnom:6.25" (159mm)
Code Report: ICC-ES ESR-2713

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Version 2.9.7376.2

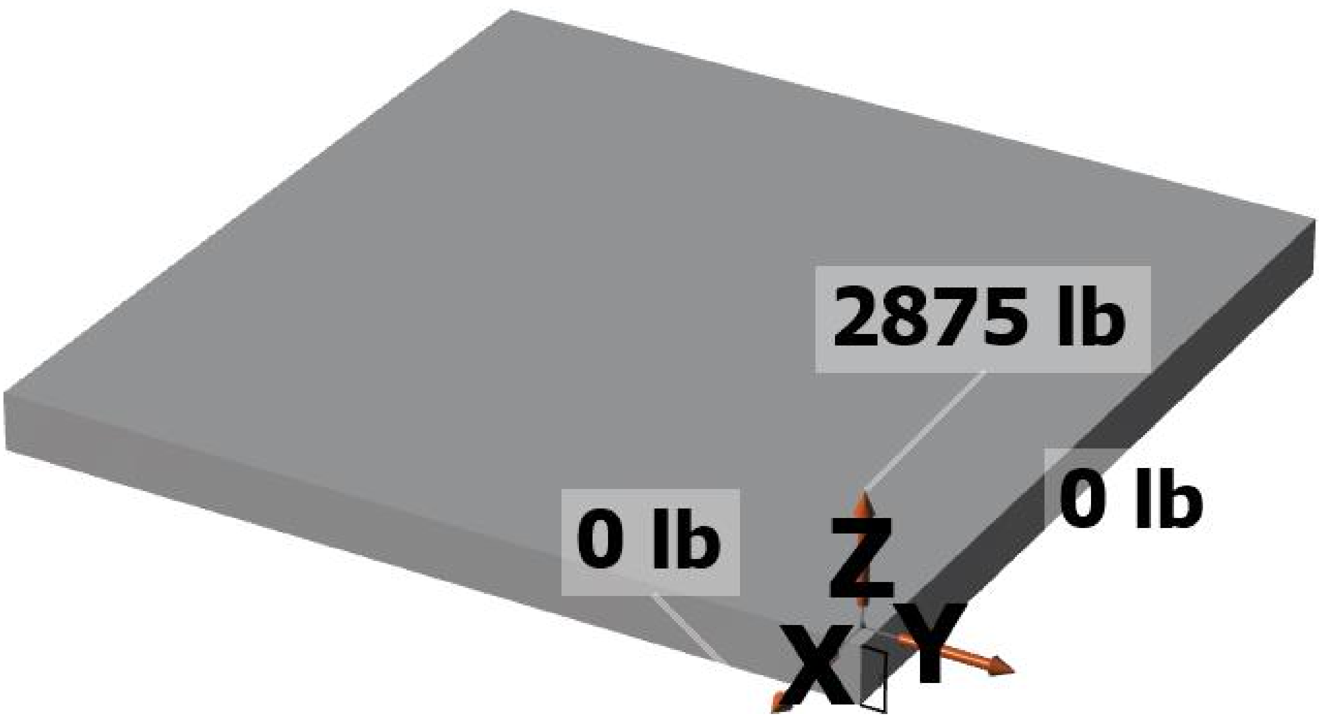
Company:		Date:	6/3/2020
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

N_{ua} [lb]: 2875
V_{uax} [lb]: 0
V_{uay} [lb]: 0

<Figure 1>



SIMPSON Strong-Tie®

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Software
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Company:		Date:	6/3/2020
Engineer:		Page:	3/5
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2875.0	0.0	0.0	0.0
Sum	2875.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2875
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
45540	0.65	29601

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	4.860	9107

$\phi N_{cb} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1a)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
112.48	212.58	2.25	0.793	1.00	1.000	9107	0.75	2864

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	7195	2500	0.50	0.65	4677

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	2875	29601	0.10	Pass
Concrete breakout	**2875**	**2864**	**1.00**	**Pass (Governs)**
Pullout	2875	4677	0.61	Pass

3/4"Ø Titen HD, hnom:6.25" (159mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.