PRCTI20240722

STRUCTURAL CALCULATIONS

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

City of Puyallup
Building
REVIEWED
FOR
COMPLIANCE
BSnowden
05/29/2024
2:17:58 PM

Steel Storage Shelving

By Mobile Media Storage Solutions

JD Sports - Store #1315

South Hill Mall - Space #530
3500 South Meridian Street
Puyallup, Washington 98373

Calculations required to be provided by the Permittee on site for all Inspections

ROBERT VANCAMP
STATE OF WASHINGTON
22011471
REGISTERED
PROFESSIONAL ENGINEER

Prepared For:

Mobile Media Storage Solutions
45 Turner Drive - Suite #2A
Middletown, NY 10941

Please note: the calculations contained within justify the seismic resistance of the shelving systems for both vertical and lateral forces as required by the 2021 WSBC, ASCE 7-16, and ANSI/RMI-MH16.1 (2012). These storage shelves are not accessible to the general public

MOBILE MEDIA STORAGE SOLUTIONS

STEEL STORAGE SHELVING - LIGHT RETAIL

CODES: Current Editions of the: IBC & CBC & ASCE 7 & RMI

Design Inputs: Steel Storage Shelving: 10'H Mobile Shelf Units

Shelving Geometry -

Height of Shelving Unit =	10.0	ft	Steel Yield Stress =	33	ksi
Width of Shelving Unit =	4.0	ft	Modulus of Elast. =	29000	ksi
Depth of Shelving Unit =	2.0	ft			
Number of Shelves/Unit =	6		Eff. Length Factor =	1.7	
Vertical Shelf Spacing =	23.4	in	Unbraced Length,x =	23.4	in
Back to Back Units?	NO		Unbraced Length,y =	23.4	in
Are There Mobile Units?	YES		Type of Post?	14ga Upright Posts	
# of Units Per Anti-Tip?	1.5		Type of Beam?	DRL Low Profile	

Shelving Loading -

Live Load per Shelf =	9.4	psf	Display On Plaque Near Shelving Units
Maximum Weight per Shelf =	75	lbs	Per 2ft Deep Shelf
Dead Load per Shelf =	2.0	psf	Wire Grid Shelf Material
Weight of Each Post =	7.5	lbs	
Weight of Mobile Carriage =	50	lbs	
Floor Load Calculations:			
Total Load on Each "L" Post =	144	lbs	
Total Load On Each Unit =	627	lbs	

Seismic Information -

Importance Factor - 1.0 Not Open to the Public SDC: D

Site Class - D - Default

Mapped Accel. Parameters:

S_s = 1.264	F_a = 1.200	S_{ms} = 1.517	S_{ds} = 1.011
S_1 = 0.436	F_v = 1.864	S_{m1} = 0.813	S_{d1} = 0.542

Structural System - ASCE 7 Section 15.5.3

Steel Storage Shelving: R = 4 a_p = 2.5 I_p = 1.0

Average Roof Height =	20	ft	0'-0" For Ground Floor Location
Height of Base Attachment =	0	ft	Ground Floor

Shear Coeff Boundaries = V_{min} = 0.044

V_{max} = 0.253

Design Base Shear Coeff = V_t = 0.177 Adjusted For ASD

Lateral Force Distribution: per ASCE 7 Section 15.5.3.3

Total Dead Load per Shelf =	21.0	lbs
Total Live Load per Shelf =	75.2	lbs
Lateral DL Force per Shelf =	3.7	lbs
Lateral LL Force per Shelf =	13.3	lbs
67% of LL Force per Shelf =	8.9	lbs
Total DL Base Shear =	22.3	lbs
Total LL Base Shear =	79.8	lbs

LC1: Each Shelf is Loaded to 67% of its Live Weight Cumulative Moment: 26337 in-lbs

Total Base Shear = 75.8 lbs Controlling Load Case By Inspection

Height:	Load:	% Per Level:	Lateral Force/Level:		
h1 = 3 in	75 lbs	0.8%	F1 =	0.6	lbs
h2 = 26 in	75 lbs	7.2%	F2 =	5.4	lbs
h3 = 50 in	75 lbs	13.5%	F3 =	10.2	lbs
h4 = 73 in	75 lbs	19.8%	F4 =	15.0	lbs
h5 = 97 in	75 lbs	26.2%	F5 =	19.8	lbs
h6 = 120 in	75 lbs	32.5%	F6 =	24.6	lbs
h7 = 0 in	0 lbs	0.0%	F7 =	0.0	lbs
h8 = 0 in	0 lbs	0.0%	F8 =	0.0	lbs
h9 = 0 in	0 lbs	0.0%	F9 =	0.0	lbs
h10 = 0 in	0 lbs	0.0%	F10 =	0.0	lbs
h11 = 0 in	0 lbs	0.0%	F11 =	0.0	lbs
h12 = 0 in	0 lbs	0.0%	F12 =	0.0	lbs
h13 = 0 in	0 lbs	0.0%	F13 =	0.0	lbs
h14 = 0 in	0 lbs	0.0%	F14 =	0.0	lbs
h15 = 0 in	0 lbs	0.0%	F15 =	0.0	lbs
		Sum = 100%		75.8	lbs

LC 2: Top Shelf Only is Loaded to 100% of its Live Weight

Total Base Shear = 35.6 lbs Does Not Control

By inspection, the force distribution for intermediate shelves without live load (case 2) is negligible. Calculate the moment for each column based on the total seismic base shear for each shelf being loaded to 67% of it's allowable live weight. The column at the center of the shelving system is the worst case for this condition.

Column Calculations - Combined Bending and Axial

Post Type: **Double Rivet "L" or "T" Post**

Width =	1.5	in	r_x =	0.470	in
Depth =	1.5	in	S_x =	0.040	in3
Thickness =	0.075	in	I_x =	0.060	in4
E =	29000	ksi	A_p =	0.220	in2
			A_e =	0.157	in2

Column Bending Calculations -

Max Column Moment =	18.3	ft-lbs	For L Post
Allowable Bending Stress =	19.8	ksi	
Bending Stress on Column =	5.5	ksi	**Bending Stress OK**

Column Deflection Calculations -

Max Deflection =	0.306	in	At Top of Unit
Deflection Ratio =	392		L/Δ
Allowable Deflection =	6	in	Max Deflection = 5% of Height
			Deflection OK

Shelf Rivet Connection -

Diameter of Rivet =	0.25	in	
Shear on Each Rivet =	293.2	lbs	
Brg Capacity of Rivet =	787.5	lbs	**Brg Stress OK**
Allowable Shear Stress =	13.2	ksi	
Shear Stress on Rivet =	6.0	ksi	**Shear Stress OK**

Column Axial Calculations - Per "L" Post

DL + PL =	144	lbs	RMI Load Combination #1
DL + PL + EQ =	252	lbs	RMI Load Combination #6

Column Capacity Calculations -

Controlling Buckling Stress =	23.5	ksi	
Allowable Comp. Stress =	18.3	ksi	
Factor of Safety for Comp. =	1.80		
Nominal Column Capacity =	2878	lbs	
Allowable Column Capacity =	1599	lbs	
Static Axial Load on Column =	144	lbs	**Axial Load OK**

Combined Bending And Axial Forces -

Critical Buckling Load =	10852	lbs		
Axial Stress Unity =	0.158		Magnification Factor =	0.976
Bending Stress Unity =	0.242		C_m =	0.85
Combined Stress Unity =	0.400		**Column is Adequate**	

Overturning and Anti-Tip Calculations

Overturning Forces -

Total Weight =	428	lbs	Load Case 1: Dead Load + 67% Live Load
Total Lateral Force =	76	lbs	
Overturning Force =	552	ft*lbs	**Controlling Overturning Force**
Total Weight =	201	lbs	Load Case 2: Dead Load + 100% Top Shelf
Total Lateral Force =	36	lbs	
Overturning Force =	288	ft*lbs	**Does Not Control**
Tension Force per Anchor =	178	lbs	
Shear Force per Anchor =	38	lbs	

USE: 'Hilti' HUS-EZ (or equivalent) POST INSTALLED ANCHOR BOLTS

Allowable Tension Force =	736	lbs	For Concrete Slab on Grade
Allowable Shear Force =	1056	lbs	3/8" Diameter x 2.5" Embedment
Vertical Seismic Force =	30.3	lbs	
Overstrength Factor =	2		For Anchoring to Concrete
Combined Loading =	0.484		**Floor Anchors are Adequate**

Mobile Carriage OR Baseplate Connection For Static Units -

Type of Connection =	**Mobile Carriage**	OR	**14ga Baseplate at Static Units**
Tension per Side =	267	lbs	
Capacity of (1) Tek Screw =	394	lbs	**(2) #12 Screws Are Adequate**
Tension Cap. of Baseplate Leg =	2030	lbs	**Baseplate Thickness OK**
			(Yielding in Net / Fracture in Gross)

Anti-Tip Arm and Track Design -

Anti-Tip Yield Stress =	16	ksi	6063-T5
Thickness Anti-Tip =	0.12	in	
Width of Anti-Tip =	0.43	in	
Section Modulus of Leg =	0.0092	in3	
Allowable Stress on Leg =	12.61	ksi	
Bending Stress on Leg =	9.32	ksi	
Anti-Tip Stress Unity =	0.739		**Bending Stress OK**
Section Modulus of Track =	0.090	in3	
Spacing of Track A.B's =	24	in	
Allowable Alumn. Stress =	12.61	ksi	6063-T5
Bending Stress on Track =	8.90	ksi	
Track Stress Unity =	0.706		**Bending Stress OK**

Shelf Beam Calculations

Shelf Beam Calculations: **DRL Low Profile**

Steel Yield Stress =	33	ksi	Shelf DL =	2.0	psf
Modulus of Elast. =	29000	ksi	Shelf LL =	9.40	psf

Beam Type:	DRL	DRH	DRC	
Area of Beam =	0.168	0.277	0.445	in2
Section Modulus of Beam =	0.020	0.219	0.346	in3
Moment of Inertia of Beam =	0.014	0.220	0.477	in4

Shelf Width =	4.0	ft	Allowable Bending Stress =	19.3	ksi
Shelf Depth =	2.0	ft	Allowable Shear Stress =	13.2	ksi
Total Load/Shelf =	91	lbs			
Distributed Load =	11.4	plf			

Beam Type:	DRL	DRH	DRC	
Maximum Design Moment =	22.8			ft-lbs
Maximum Design Shear =	22.8			lbs
Beam Bending Stresses =	13.9			ksi
Beam Shear Stresses =	0.14			ksi

Bending Stress Unity =	0.720		**Bending Stress OK**
Shear Stress Unity =	0.010		**Shear Stress OK**
Max Allowable Deflection =	0.267	in	L/180
Maximum Beam Deflection =	0.163	in	**Deflection OK**

Shelf Beam Rivet Check:

Diameter of Rivet =	0.25	in	
Post Moment Shear on Rivet =	293.2	lbs	
Beam Shear on Rivet =	22.8	lbs	
Resultant Shear =	294.0	lbs	
Brg Capacity of Rivet =	787.5	lbs	**Brg Stress OK**
Allowable Shear Stress =	13.2	ksi	
Shear Stress on Rivet =	6.0	ksi	**Shear Stress OK**

Slab Bearing & Uplift Calculations

Slab Design Properties -

Minimum Concrete Strength =	2500	psi	Assumed
Thickness of Concrete Slab =	4	in	Assumed
Weight of Concrete Slab =	50	psf	
Allowable Bearing Pressure =	500	psf	Assumed
Bearing Loads On Post =	80	lbs	Dead Load
	226	lbs	Live Load
	276	lbs	EQ Load
Uplift Loads on Post =	178	lbs	Resultant Uplift

Slab Bearing Capacity -

Depth of Post on Slab =	1.5	in	
Factored Bearing Load =	852	lbs	
Required Bearing Area =	167.70	in2	12.95 inches per side
Critical Section =	3.72	in	For Bending
Soil Pressure on Crit. Section =	731.7	plf	Along Critical Length
Section Modulus =	32.0	in3	Plain Concrete per Foot
Shear Area =	22	in	
Conc. Shear Stress =	9.7	psi	
Allowable Shear Stress =	73.2	psi	**Shear Stress OK**
Conc. Bending Stress =	13.2	psi	
Allowable Bending Stress =	137.5	psi	**Bending Stress OK**

Slab Uplift Capacity -

Required Area to Resist Uplift =	5.93	ft2	
Length of Slab Req'd =	1.48	ft	Assume Full Shelf Width x Req'd Length
Worst Case Length of Slab =	4.00	ft	Maximum of Width or Length Req'd
Distance to Anchor Bolt =	2.00	ft	
Shear Force on 1ft Strip =	140.0	lbs	
Allowable Shear Force =	1760.0	lbs	**Shear OK**
Bending Moment on 1ft Strip =	140.0	ft-lbs	
Allowable Bending Moment =	366.7	ft-lbs	**Bending OK**

MOBILE MEDIA STORAGE SOLUTIONS

STEEL STORAGE SHELVING - LIGHT RETAIL

CODES: Current Editions of the: IBC & CBC & ASCE 7 & RMI

Design Inputs: Steel Storage Shelving: 12'H Freestanding Units

Shelving Geometry -

Height of Shelving Unit =	12.0	ft	Steel Yield Stress =	33	ksi
Width of Shelving Unit =	5.0	ft	Modulus of Elast. =	29000	ksi
Depth of Shelving Unit =	2.0	ft (MAX)			
Number of Shelves/Unit =	7		Eff. Length Factor =	1.7	
Vertical Shelf Spacing =	23.5	in	Unbraced Length,x =	23.5	in
Back to Back Units?	NO		Unbraced Length,y =	23.5	in
Are There Mobile Units?	NO		Type of Post?	14ga Upright Posts	
# of Units Per Anti-Tip?	NA		Type of Beam?	DRL Low Profile	

Shelving Loading -

Live Load per Shelf =	7.5	psf	Display On Plaque Near Shelving Units
Maximum Weight per Shelf =	75	lbs	Per 2ft (MAX) Deep Shelf
Dead Load per Shelf =	2.0	psf	Wire Grid Shelf Material
Weight of Each Post =	9.0	lbs	
Weight of Mobile Carriage =	0	lbs	
Floor Load Calculations:			
Total Load on Each "L" Post =	175	lbs	
Total Load On Each Unit =	701	lbs	

Seismic Information -

Importance Factor - 1.0 Not Open to the Public SDC: D

Site Class - D - Default

Mapped Accel. Parameters:

S_s = 1.264	F_a = 1.200	S_{ms} = 1.517	S_{ds} = 1.011
S_1 = 0.436	F_v = 1.864	S_{m1} = 0.813	S_{d1} = 0.542

Structural System - ASCE 7 Section 15.5.3

Steel Storage Shelving: R = 4 a_p = 2.5 I_p = 1.0

Average Roof Height =	20	ft	0'-0" For Ground Floor Location
Height of Base Attachment =	0	ft	Ground Floor

Shear Coeff Boundaries = V_{min} = 0.044

V_{max} = 0.253

Design Base Shear Coeff = V_t = 0.177 Adjusted For ASD

Lateral Force Distribution: per ASCE 7 Section 15.5.3.3

Total Dead Load per Shelf =	25.1	lbs
Total Live Load per Shelf =	75	lbs
Lateral DL Force per Shelf =	4.4	lbs
Lateral LL Force per Shelf =	13.3	lbs
67% of LL Force per Shelf =	8.9	lbs
Total DL Base Shear =	31.1	lbs
Total LL Base Shear =	92.9	lbs

LC1: Each Shelf is Loaded to 67% of its Live Weight Cumulative Moment: 38785 in-lbs

Total Base Shear = 93.4 lbs Controlling Load Case By Inspection

Height:		Load:	% Per Level:	Lateral Force/Level:		
h1 =	3 in	75 lbs	0.6%	F1 =	0.5	lbs
h2 =	27 in	75 lbs	5.2%	F2 =	4.8	lbs
h3 =	50 in	75 lbs	9.7%	F3 =	9.1	lbs
h4 =	74 in	75 lbs	14.3%	F4 =	13.3	lbs
h5 =	97 in	75 lbs	18.9%	F5 =	17.6	lbs
h6 =	121 in	75 lbs	23.4%	F6 =	21.9	lbs
h7 =	144 in	75 lbs	28.0%	F7 =	26.1	lbs
h8 =	0 in	0 lbs	0.0%	F8 =	0.0	lbs
h9 =	0 in	0 lbs	0.0%	F9 =	0.0	lbs
h10 =	0 in	0 lbs	0.0%	F10 =	0.0	lbs
h11 =	0 in	0 lbs	0.0%	F11 =	0.0	lbs
h12 =	0 in	0 lbs	0.0%	F12 =	0.0	lbs
h13 =	0 in	0 lbs	0.0%	F13 =	0.0	lbs
h14 =	0 in	0 lbs	0.0%	F14 =	0.0	lbs
h15 =	0 in	0 lbs	0.0%	F15 =	0.0	lbs
			Sum = 100%	Total =	93.4	lbs

LC 2: Top Shelf Only is Loaded to 100% of its Live Weight

Total Base Shear = 44.4 lbs Does Not Control

By inspection, the force distribution for intermediate shelves without live load (case 2) is negligible. Calculate the moment for each column based on the total seismic base shear for each shelf being loaded to 67% of it's allowable live weight. The column at the center of the shelving system is the worst case for this condition.

Column Calculations - Combined Bending and Axial

Post Type: **Double Rivet "L" or "T" Post**

Width =	1.5	in	r_x =	0.470	in
Depth =	1.5	in	S_x =	0.040	in3
Thickness =	0.075	in	I_x =	0.060	in4
E =	29000	ksi	A_p =	0.220	in2
			A_e =	0.157	in2

Column Bending Calculations -

Max Column Moment =	22.7	ft-lbs	For L Post
Allowable Bending Stress =	19.8	ksi	
Bending Stress on Column =	6.8	ksi	**Bending Stress OK**

Column Deflection Calculations -

Max Deflection =	0.438	in	At Top of Unit
Deflection Ratio =	329		L/Δ
Allowable Deflection =	7.2	in	Max Deflection = 5% of Height
			Deflection OK

Shelf Rivet Connection -

Diameter of Rivet =	0.25	in	
Shear on Each Rivet =	363.6	lbs	
Brg Capacity of Rivet =	787.5	lbs	**Brg Stress OK**
Allowable Shear Stress =	13.2	ksi	
Shear Stress on Rivet =	7.4	ksi	**Shear Stress OK**

Column Axial Calculations - Per "L" Post

DL + PL =	175	lbs	RMI Load Combination #1
DL + PL + EQ =	343	lbs	RMI Load Combination #6

Column Capacity Calculations -

Controlling Buckling Stress =	23.4	ksi	
Allowable Comp. Stress =	18.3	ksi	
Factor of Safety for Comp. =	1.80		
Nominal Column Capacity =	2871	lbs	
Allowable Column Capacity =	1595	lbs	
Static Axial Load on Column =	175	lbs	**Axial Load OK**

Combined Bending And Axial Forces -

Critical Buckling Load =	10760	lbs		
Axial Stress Unity =	0.215		Magnification Factor =	0.971
Bending Stress Unity =	0.302		C_m =	0.85
Combined Stress Unity =	0.516		**Column is Adequate**	

Overturning and Anti-Tip Calculations

Overturning Forces -

Total Weight =	528	lbs	Load Case 1: Dead Load + 67% Live Load
Total Lateral Force =	93	lbs	
Overturning Force =	806	ft*lbs	**Controlling Overturning Force**
Total Weight =	251	lbs	Load Case 2: Dead Load + 100% Top Shelf
Total Lateral Force =	44	lbs	
Overturning Force =	407	ft*lbs	**Does Not Control**
Tension Force per Anchor =	282	lbs	
Shear Force per Anchor =	47	lbs	

USE: 'Hilti' HUS-EZ (or equivalent) POST INSTALLED ANCHOR BOLTS

Allowable Tension Force =	736	lbs	For Concrete Slab on Grade
Allowable Shear Force =	1056	lbs	3/8" Diameter x 2.5" Embedment
Vertical Seismic Force =	37.4	lbs	
Overstrength Factor =	2		For Anchoring to Concrete
Combined Loading =	0.766		**Floor Anchors are Adequate**

Mobile Carriage OR Baseplate Connection For Static Units -

Type of Connection =	**NONE**		OR **14ga Baseplate at Static Units**
Tension per Side =	282	lbs	Static Baseplate Connection
Capacity of (1) Tek Screw =	394	lbs	**(2) #12 Screws Are Adequate**
Tension Cap. of Baseplate Leg =	2030	lbs	**Baseplate Thickness OK**
			(Yielding in Net / Fracture in Gross)

Anti-Tip Arm and Track Design -

Anti-Tip Yield Stress =	16	ksi	6063-T5
Thickness Anti-Tip =	0.12	in	
Width of Anti-Tip =	0.43	in	
Section Modulus of Leg =	0.0092	in3	
Allowable Stress on Leg =	N/A	ksi	
Bending Stress on Leg =	N/A	ksi	
Anti-Tip Stress Unity =	N/A		**N/A**
Section Modulus of Track =	0.090	in3	
Spacing of Track A.B's =	N/A	in	
Allowable Alumn. Stress =	N/A	ksi	6063-T5
Bending Stress on Track =	N/A	ksi	
Track Stress Unity =	N/A		**N/A**

Shelf Beam Calculations

Shelf Beam Calculations: **DRL Low Profile**

Steel Yield Stress =	33	ksi	Shelf DL =	2.0	psf
Modulus of Elast. =	29000	ksi	Shelf LL =	7.50	psf

Beam Type:	DRL	DRH	DRC	
Area of Beam =	0.168	0.277	0.445	in2
Section Modulus of Beam =	0.020	0.219	0.346	in3
Moment of Inertia of Beam =	0.014	0.220	0.477	in4

Shelf Width =	5.0	ft	Allowable Bending Stress =	19.8	ksi
Shelf Depth =	2.0	ft	Allowable Shear Stress =	13.2	ksi
Total Load/Shelf =	95	lbs			
Distributed Load =	9.5	plf			

Beam Type:	DRL	DRH	DRC	
Maximum Design Moment =	29.7			ft-lbs
Maximum Design Shear =	23.8			lbs
Beam Bending Stresses =	18.1			ksi
Beam Shear Stresses =	0.14			ksi

Bending Stress Unity =	0.913		**Bending Stress OK**
Shear Stress Unity =	0.011		**Shear Stress OK**
Max Allowable Deflection =	0.333	in	L/180
Maximum Beam Deflection =	0.331	in	**Deflection OK**

Shelf Beam Rivet Check:

Diameter of Rivet =	0.25	in	
Post Moment Shear on Rivet =	363.6	lbs	
Beam Shear on Rivet =	23.8	lbs	
Resultant Shear =	364.4	lbs	
Brg Capacity of Rivet =	787.5	lbs	**Brg Stress OK**
Allowable Shear Stress =	13.2	ksi	
Shear Stress on Rivet =	7.4	ksi	**Shear Stress OK**

Wall Supported Unit Calculations

Seismic Force at Top of Units -

Average Roof Height =	20.0	ft	
Height of Attachment =	12.0	ft	
Shear Coeff Boundaries =	V_{min} =	0.303	
	V_{max} =	1.618	
Design Base Shear Coeff =	V_t =	0.397	Adjusted For ASD
Total Weight per Unit =	470	lbs	
Lateral Force at Top/Bottom =	93	lbs	
Standard Stud Spacing =	16	in	
Wall Connections per Unit =	2	(to nearest stud each side of T post)	
Tek Screw Capacity =	84	lbs	Tension Cap. for #10 Screw in 20ga Stud
Force Per Connection =	47	lbs	**Screw Capacity OK**

Light Gage Steel Stud Wall Framing

Stud Design Data -

Height of Wall Studs =	16.0	ft	Int. Non-Brg - Worst Case Ht Assumed
Location of Point Load =	12.0	ft	
Design Lateral Load =	46.6	lbs	From Shelving Unit
Additional Lateral Load =	5.0	psf	Interior Seismic Force
Design Axial Load =	85.3	lbs	Dead Load of Wall Framing
Spacing of Studs =	16.0	in	

TRY: 3-5/8" x 1-5/8" x 20ga Studs @ 16" o.c. (Worst Case Assumed)

Width =	3.625	in	rx =	1.450	in
Depth =	1.625	in	ry =	0.616	in
Thickness =	0.035	in	Sx =	0.268	in3
Fy =	33	ksi	Ix =	0.551	in4
E =	29000	ksi	Ap =	0.262	in2
K =	1.0		Unbraced Length X =	16	ft
			Unbraced Length Y =	4	ft

Stud Capacity -

Buckling Stress, X =	16.32	ksi	
Buckling Stress, Y =	47.14	ksi	
Allowable Buckling Stress =	16.32	ksi	
Nominal Axial Strength =	4277	lbs	
Factor of Safety =	1.92		
Allowable Axial Load =	2228	lbs	
Maximum Design Moment =	353.3	ft-lbs	
Maximum Design Shear =	88.3	lbs	
Allowable Bending Stress =	21.78	ksi	
Actual Bending Stress =	15.82	ksi	**Bending Stress OK**
Allowable Shear Stress =	13.20	ksi	
Actual Shear Stress =	0.34	ksi	**Shear Stress OK**
Allowable Axial Stress =	8.50	ksi	
Actual Axial Stress =	0.33	ksi	**Axial Stress OK**
Combined Stress Unity =	0.76		**Combined Stress OK**

Slab Bearing & Uplift Calculations

Slab Design Properties -

Minimum Concrete Strength =	2500	psi	Assumed
Thickness of Concrete Slab =	4	in	Assumed
Weight of Concrete Slab =	50	psf	
Allowable Bearing Pressure =	500	psf	Assumed
Bearing Loads On Post =	79	lbs	Dead Load
	263	lbs	Live Load
	403	lbs	EQ Load
Uplift Loads on Post =	282	lbs	Resultant Uplift

Slab Bearing Capacity -

Depth of Post on Slab =	1.5	in	
Factored Bearing Load =	1090	lbs	
Required Bearing Area =	214.38	in2	14.64 inches per side
Critical Section =	4.57	in	For Bending
Soil Pressure on Crit. Section =	732.4	plf	Along Critical Length
Section Modulus =	32.0	in3	Plain Concrete per Foot
Shear Area =	22	in	
Conc. Shear Stress =	12.4	psi	
Allowable Shear Stress =	73.2	psi	**Shear Stress OK**
Conc. Bending Stress =	19.9	psi	
Allowable Bending Stress =	137.5	psi	**Bending Stress OK**

Slab Uplift Capacity -

Required Area to Resist Uplift =	9.40	ft2	
Length of Slab Req'd =	1.88	ft	Assume Full Shelf Width x Req'd Length
Worst Case Length of Slab =	5.00	ft	Maximum of Width or Length Req'd
Distance to Anchor Bolt =	2.50	ft	
Shear Force on 1ft Strip =	175.0	lbs	
Allowable Shear Force =	1760.0	lbs	**Shear OK**
Bending Moment on 1ft Strip =	218.8	ft-lbs	
Allowable Bending Moment =	366.7	ft-lbs	**Bending OK**

Company:	Eclipse Engineering, PC	Page:	
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	3/8" HUS-EZ	Date:	
Fastening point:			

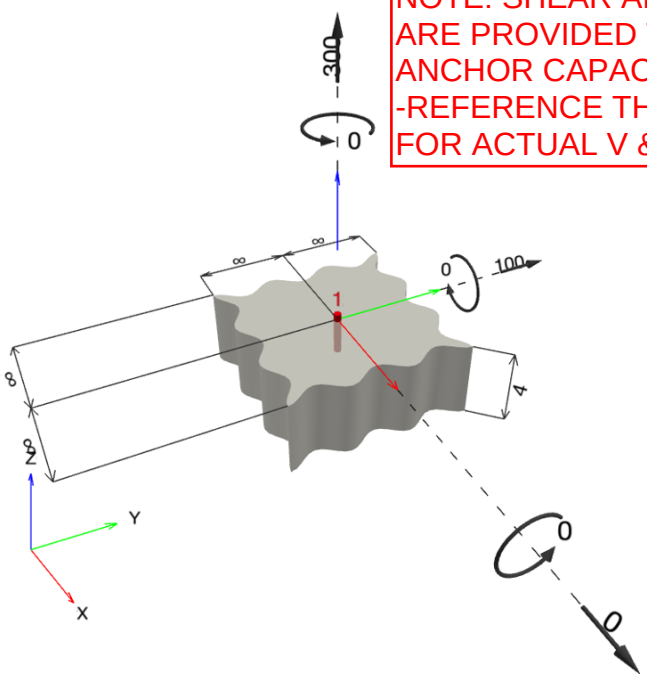
Specifier's comments:

1 Input data

Anchor type and diameter:	**KWIK HUS-EZ (KH-EZ) 3/8 (2 1/2)**
Item number:	418057 KH-EZ 3/8"x3"
Effective embedment depth:	$h_{ef,act}$ = 1.860 in., h_{nom} = 2.500 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-3027
Proof:	Design Method ACI 318
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 2500, f_c' = 2,500 psi; h = 4.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.10.5.3 (d)) Shear load: yes (17.10.6.3 (c))

Geometry [in.] & Loading [lb, in.lb]

NOTE: SHEAR AND TENSION FORCES ARE PROVIDED TO CALCULATE ANCHOR CAPACITY
-REFERENCE THE CALCULATIONS FOR ACTUAL V & T AND UNITY CHECK



Company:	Eclipse Engineering, PC	Page:	
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	3/8" HUS-EZ	Date:	
Fastening point:			

2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Failure	300	1,051	29 / -	OK
Shear	Pryout Strength	100	1,509	- / 7	OK

Loading	**β_N**	**β_V**	**ζ**	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	0.285	0.066	5/3	14	OK

Convert to ASD =
Multiply by 0.7

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

Search Information

Address: 3500 S Meridian, Puyallup, WA 98373, USA

Coordinates: 47.1580315, -122.2973003

Elevation: 431 ft

Timestamp: 2023-12-11T12:20:46.900Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Basic Parameters

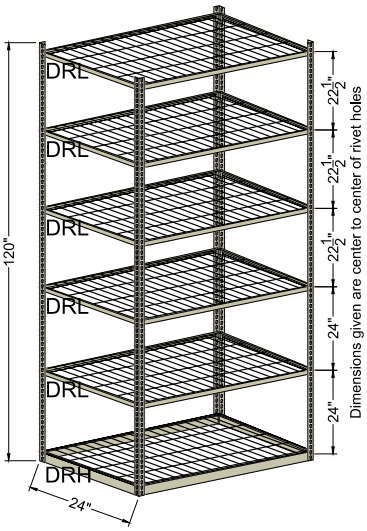
Name	Value	Description
S_S	1.264	MCE_R ground motion (period=0.2s)
S_1	0.436	MCE_R ground motion (period=1.0s)
S_{MS}	1.517	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.011	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.914	Coefficient of risk (0.2s)
CR_1	0.898	Coefficient of risk (1.0s)

10'H UNITS



12'H UNITS