TM RIPPEY
CONSULTING ENGINEERS

7650 S. W. Beveland St.
Tigard, Oregon 97223
Phone: (503) 443-3900
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STRUCTURAL CALCULATIONS

PROJECT: GOODYEAR T.I.

LOCATION: 8541 N COLUMBIA BLVD
PORTLAND OREGON 97203

CLIENT: WYSE REAL ESTATE ADVISORS

DATE: AUGUST 28, 2023

PROJECT NUMBER: 22202

REGISTERED PROFESSIONAL ENGINEER
78807PE
OREGON
March 13, 2007
GEOFFREY MICHAEL CORE
EXP: 06/30/25

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DESCRIPTION:

THIS DESIGN PACKAGE INCLUDES SKETCHES AND CALCULATIONS FOR SEISMIC ANCHORAGE OF VARIOUS PRODUCTION EQUIPMENT AND STORAGE RACKS AT THE ADDRESS NOTED ABOVE.

8/28/2023

REVISION 08-28-2023:
REVISED MONORAIL ANCHORS TO UTILIZE NEW ANCHORS INSTEAD OF EXISTING ANCHORS. REVISED TIRE CHAMBER ANCHORS TO ALLOW TO THERMAL EXPANSION OF EQUIPMENT REQUIRED DURING USE.

Architect of Record
Review of Deferred Submittal

Architect of Record has performed a general review of this deferred submittal and finds it to be:

[x] In general conformance with project design

[ ] In general conformance with project design, except as noted

Architect of Record has reviewed this deferred submittal only for general conformance with this design concept of the project and for information given in the Architect of Record's documents. Any noted nonconformities and errors are marked.

However, deviations from plans or specifications not clearly indicated by the contractor have not been reviewed.

The Architect of Record's review does not include engineering calculations or review of contractors' engineering calculations unless expressly noted herein. The Design of members and systems contained in this submittal is the responsibility of the professional engineer whose professional stamp appears on the submittal.

MACKENZIE.

By: djr Date: 09/08/2023

EQUIPMENT

$S_{DS} = 0.701$ Ch. 14

[Process Equipment] $a_p = 1.0$ $R_p = 2.5$ $\Omega = 2.0$

$$F_p = \frac{0.4(1.0)(0.701)W_p}{(2.5/1.0)}\left(1+2\frac{0}{h}\right) = 0.112\,W_p$$

$F_{pmin} = 0.3(0.701)(1.0)W_p = 0.210\,W_p$ ← governs

O.T.M = F_p x COG height

$M_R = (0.9 - 0.2 \times S_{DS})$(Equipment weight)(base width/2)

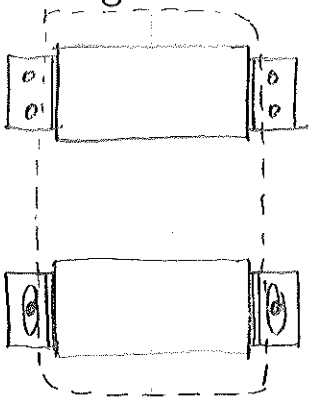
T = (OTM − M_R)/(distance between anchors)/(no. of anchors tension. (when OTM > M_R)

V = F_p / (No. of anchors shear)

See attached for calcs for the equipment

8/28/2023

* Weld angles to fire chamber legs instead using existing holes in feet



½"Ø x 3½" Titen HD (see attached)

- Provide slots at one support to allow expansion of equipment during use.
- Longitudinal seismic taken entirely by front anchors (non-slotted angles)
- Transverse seismic shared by both legs.

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BY KMJ DATE

CHK BY DATE

JOB NO 22202

SHEET C1 OF

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2303.1

Company:		Date:	8/16/2023
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:

TIRE CHAMBER ANCHORS

2. Input Data & Anchor Parameters

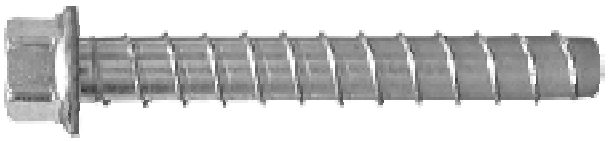
General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.500
Nominal Embedment depth (inch): 3.500
Effective Embedment depth, h_{ef} (inch): 2.560
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 5.42
c_{ac} (inch): 3.88
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 5.50
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental edge 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

Base Plate
Length x Width x Thickness (inch): 3.00 x 6.00 x 0.25

Recommended Anchor
Anchor Name: Titen HD® - 1/2"Ø Titen HD, hnom:3.5" (89mm)
Code Report: ICC-ES ESR-2713



8/28/2023

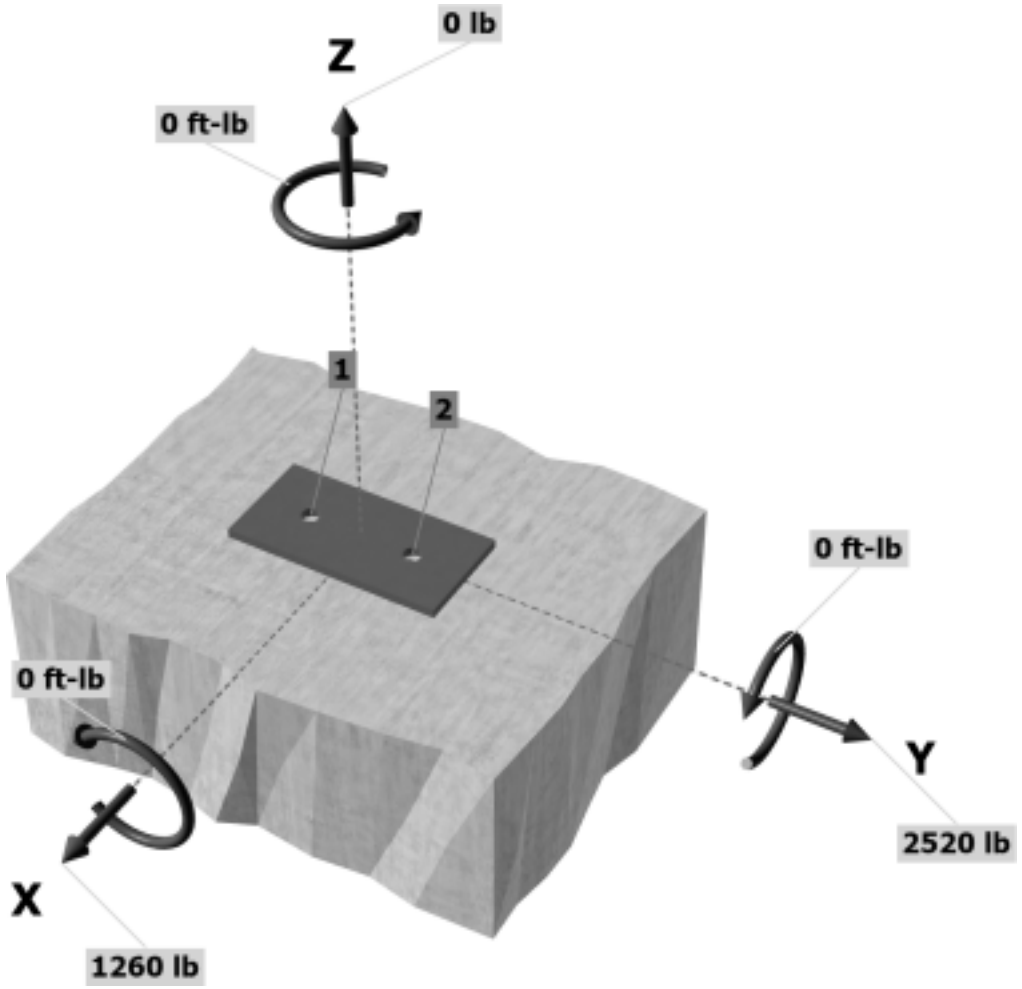
C1a

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: No

Strength level loads:

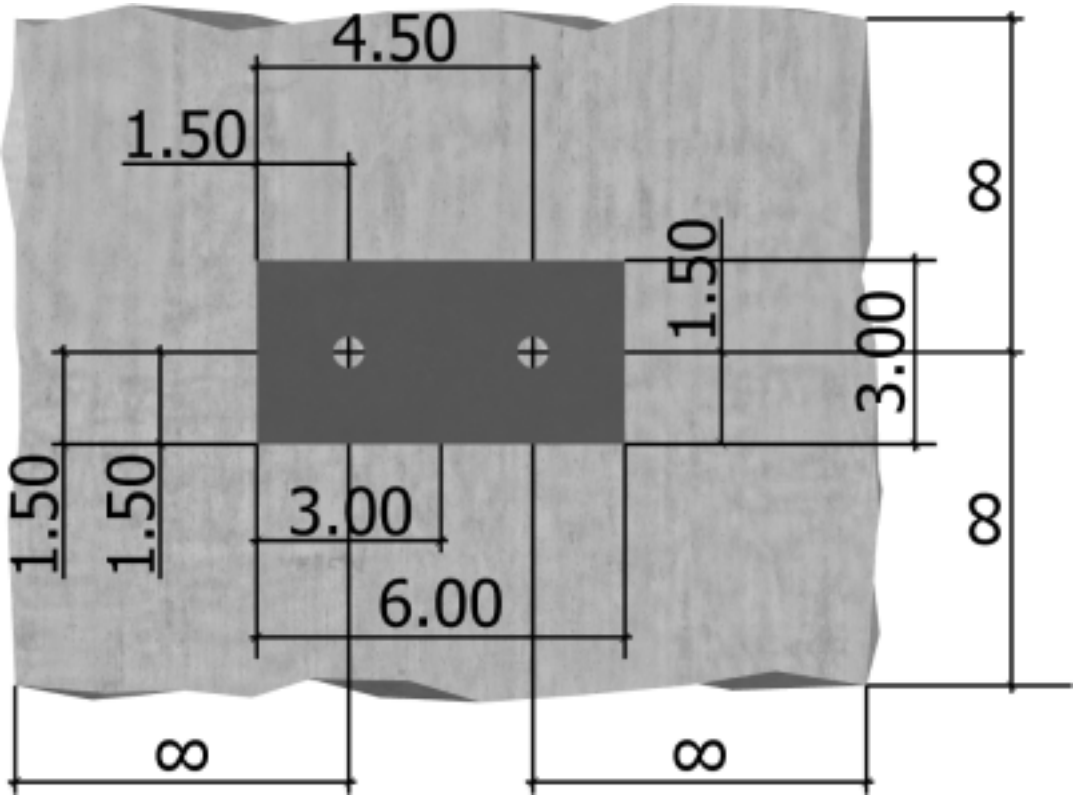
N_{ua} [lb]: 0
V_{uax} [lb]: 1260
V_{uay} [lb]: 2520
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure1>



8/28/2023

<Figure 2>



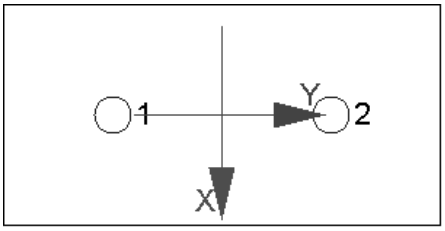
8/28/2023

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	0.0	630.0	1260.0	1408.7
2	0.0	630.0	1260.0	1408.7
Sum	0.0	1260.0	2520.0	2817.4

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

<Figure 3>



8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
4790	1.0	0.60	2874

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp}(A_{Nc}/A_{Nco})\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	82.02	58.98	1.000	1.000	1.000	1.000	4404	0.70	8574

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6)

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**1409**	**2874**	**0.49**	**Pass (Governs)**
Pryout	2817	8574	0.33	Pass

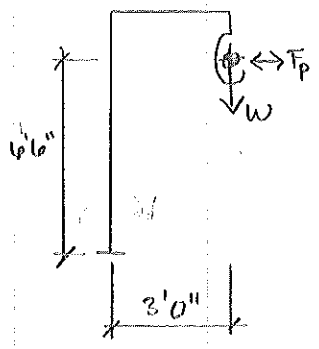
1/2"Ø Titen HD, hnom:3.5" (89mm) meets the selected design criteria.

8/28/2023

C1d

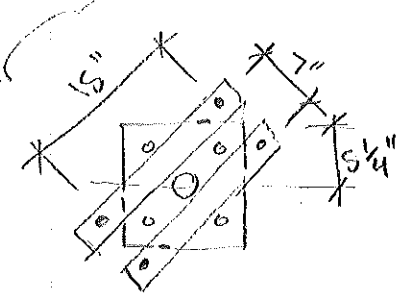
MONORAIL

$F_p = 0.210\ W_p$ (same as rest of equipment)



Wgt = 125 plf
F_p = 26 plf (ULT)

Post spg = 8'
$\Omega V_u = (\Omega = 2.0)(8' \times 26\ plf) = 416$ lbs (ULT)
LC: $(0.9 - 0.2S_{DS})DL + E$
$M_u = (0.716)(125 \times 8')(3') + (26 \times 8')(16.5') = 3632$ lb·ft
$P_u = (0.716)(125 \times 8') = 7160$ lbs



Base plate anchors

- L3x3 angle across existing base plate weld angle to base plate & put new anchors in angles
- $\Omega T_u = [2280\ lb \cdot ft + \Omega(1352)]/(10.25"/12) = 5835$ lbs per pair of anchors
- See attached for full anchor calcs.

8/28/2023

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BY KMJ DATE
CHK BY DATE
JOB NO 22202
SHEET C3 OF

1.Project information

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

Project description:
Location:
Fastening description: MONORAIL ANCHORS AT ANGLES

2. Input Data & Anchor Parameters

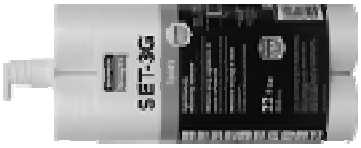
General
Design method:ACI 318-19
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 4.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 5.25
c_{ac} (inch): 10.49
C_{min} (inch): 1.75
S_{min} (inch): 2.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 5.50
State: Cracked
Compressive strength, f'_c (psi): 4000
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Continuous
Temperature range, Short/Long: 150/110°F
Reduced installation torque (for AT-3G): Not applicable
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 3.00 x 12.00 x 0.25

Recommended Anchor
Anchor Name: SET-3G™ - SET-3G w/ 1/2"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057



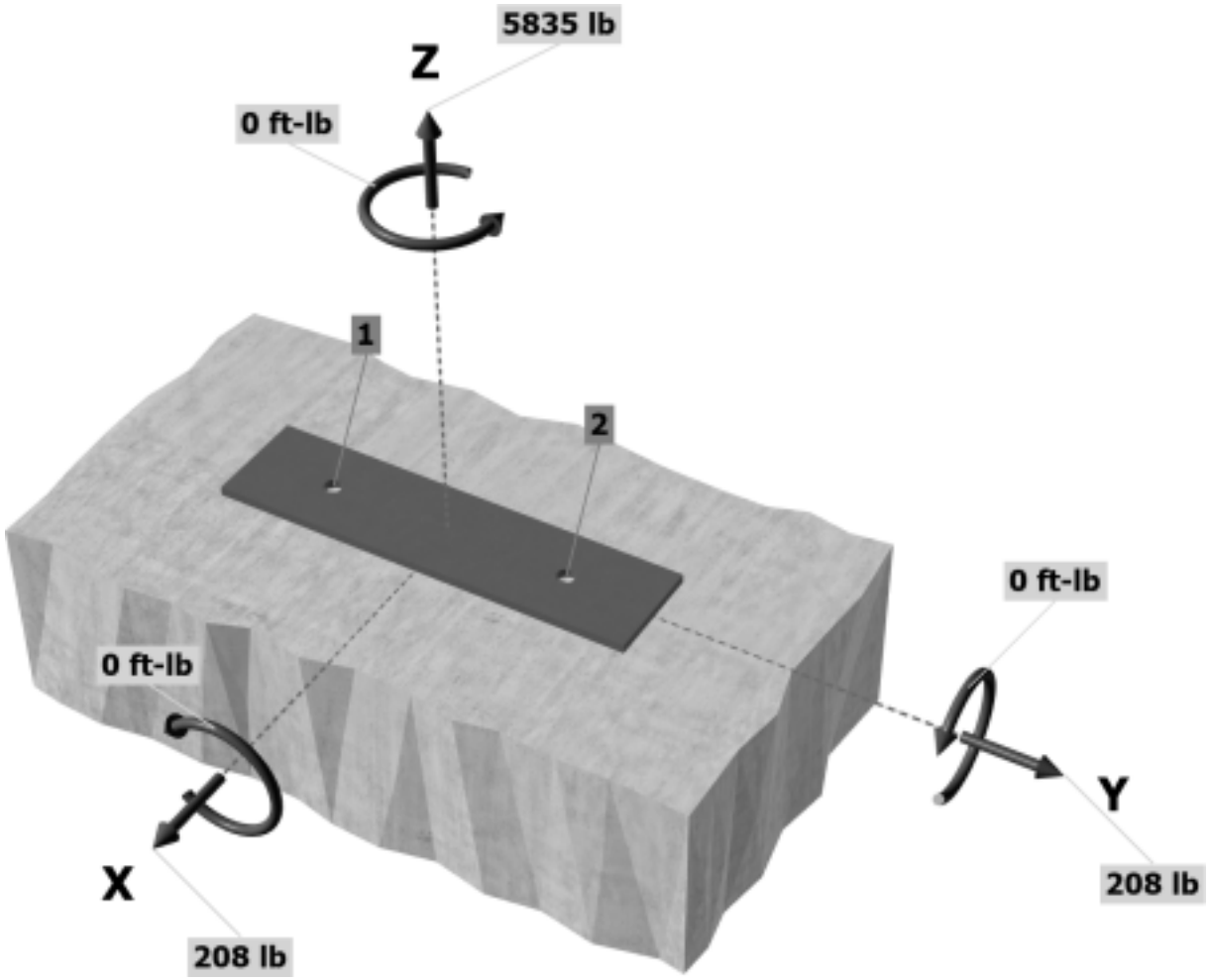
8/28/2023

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: No
Ductility section for tension: 17.10.5.3 (d) is satisfied
Ductility section for shear: 17.10.6.3 (c) is satisfied
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

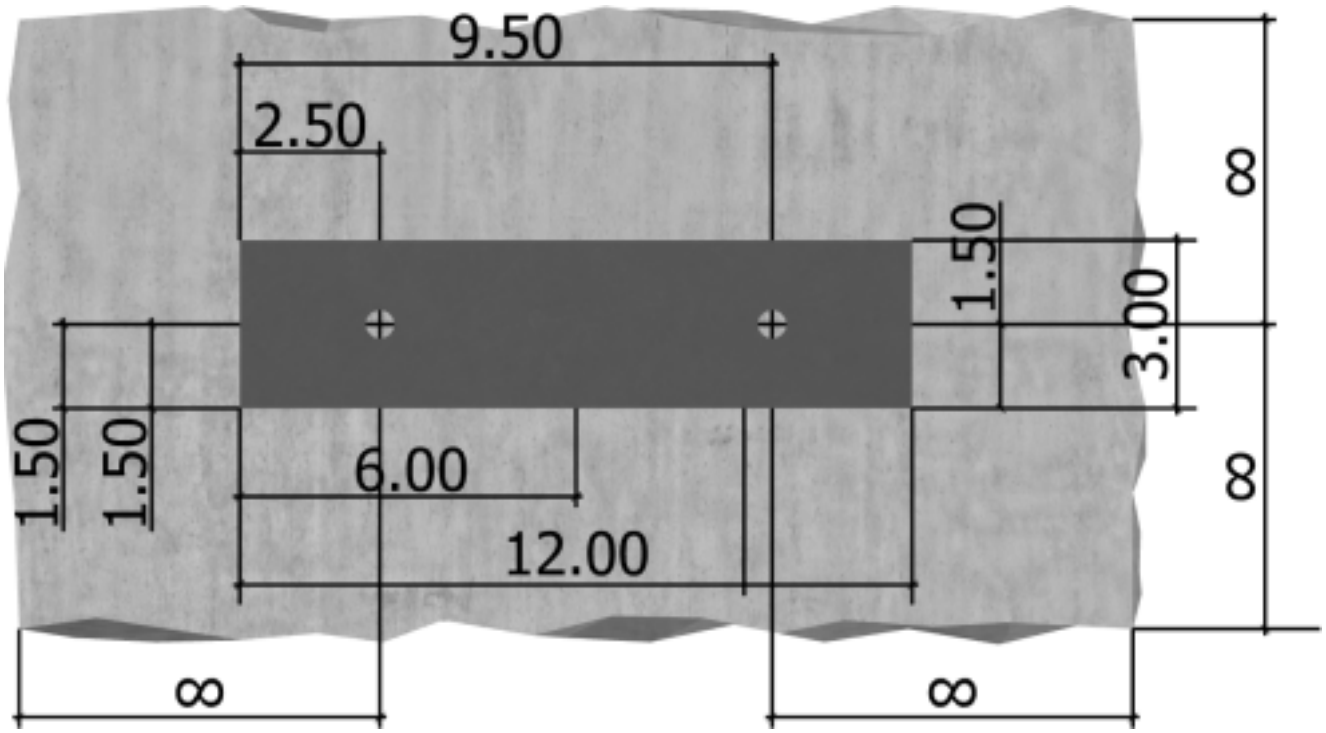
N_{ua} [lb]: 5835
V_{uax} [lb]: 208
V_{uay} [lb]: 208
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure1>



8/28/2023

<Figure 2>



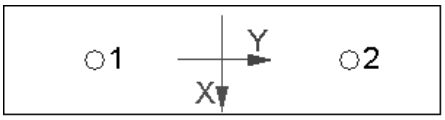
8/28/2023

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	2917.5	104.0	104.0	147.1
2	2917.5	104.0	104.0	147.1
Sum	5835.0	208.0	208.0	294.2

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5835
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
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
8235	0.75	6176

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	4000	4.000	8601

$0.75\phi N_{cbg} = 0.75\,\phi (A_{Nc}/A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.6.2.1a)

A_{Nc} (in²)	A_{Nco} (in²)	$c_{a,min}$ (in)	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	ϕ	$0.75\phi N_{cbg}$ (lb)
228.00	144.00	-	1.000	1.000	1.00	1.000	8601	0.65	6639

6. Adhesive Strength of Anchor in Tension (Sec. 17.6.5)

$\tau_{k,cr} = \tau_{k,cr} f_{shortterm} K_{sat} (f'_c / 2{,}500)^n \kappa_{N,seis}$

$\tau_{k,cr}$ (psi)	$f_{shortterm}$	K_{sat}	$\kappa_{N,seis}$	f'_c (psi)	n	$\tau_{k,cr}$ (psi)
1402	1.00	1.00	0.90	4000	0.24	1412

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (Eq. 17.6.5.2.1)

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	1412	0.50	4.000	8875

$0.75\phi N_{ag} = 0.75\,\phi (A_{Na}/A_{Na0}) \psi_{ec,Na} \psi_{ed,Na} \psi_{cp,Na} N_{ba}$ (Sec. 17.5.1.2 & Eq. 17.6.5.1b)

A_{Na} (in²)	A_{Na0} (in²)	c_{Na} (in)	$c_{a,min}$ (in)	$\psi_{ec,Na}$	$\psi_{ed,Na}$	$\psi_{cp,Na}$	N_{ba} (lb)	ϕ	$0.75\phi N_{ag}$ (lb)
305.79	205.45	7.17	-	1.000	1.000	1.000	8875	0.65	6439

8/28/2023

8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\alpha_{V,seis}$	$\phi_{grout}\alpha_{V,seis}\phi V_{sa}$ (lb)
4940	1.0	0.65	0.75	2408

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cpg} = \phi \min[k_{cp}N_{ag}; k_{cp}N_{cbg}] = \phi \min[k_{cp}(A_{Na}/A_{Na0})\psi_{ec,Na}\psi_{ed,Na}\psi_{cp,Na}N_{ba}; k_{cp}(A_{Nc}/A_{Nco})\psi_{ec,N}\psi_{ed,N}\psi_{c,N}\psi_{cp,N}N_b]$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

k_{cp}	A_{Na} (in²)	A_{Na0} (in²)	$\psi_{ed,Na}$	$\psi_{ec,Na}$	$\psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	305.79	205.45	1.000	1.000	1.000	8875	13209

A_{Nc} (in²)	A_{Nco} (in²)	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
228.00	144.00	1.000	1.000	1.000	1.000	8601	13619	0.70

ϕV_{cpg} (lb)
18492

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2918	6176	0.47	Pass
Concrete breakout	5835	6639	0.88	Pass
Adhesive	**5835**	**6439**	**0.91**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**147**	**2408**	**0.06**	**Pass (Governs)**
Pryout	294	18492	0.02	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.8.1	0.91	0.00	90.6%	1.0	Pass

SET-3G w/ 1/2"Ø F1554 Gr. 36 with hef = 4.000 inch 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.

8/28/2023

C4d

SUPPLEMENTAL

Architect of Record
Review of Deferred Submittal

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[x] In general conformance with project design

[ ] In general conformance with project design, except as noted

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MACKENZIE.

By: djr Date: 10/16/2023

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Fax: (503) 443-3700

STRUCTURAL CALCULATIONS

PROJECT: GOODYEAR T.I.

LOCATION: 8541 N COLUMBIA BLVD
PORTLAND OREGON 97203

CLIENT: WYSE REAL ESTATE ADVISORS

DATE: AUGUST 28, 2023

PROJECT NUMBER: 22202

REGISTERED PROFESSIONAL ENGINEER
78807PE
OREGON
March 13, 2007
GEOFFREY MICHAEL CORE
EXP: 06/30/25

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ITEM	SHEET NUMBER
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CALCULATIONS	C1 – C11

10/3/23

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THIS DESIGN PACKAGE INCLUDES SKETCHES AND CALCULATIONS FOR SEISMIC ANCHORAGE OF VARIOUS PRODUCTION EQUIPMENT AND STORAGE RACKS AT THE ADDRESS NOTED ABOVE.

REVISION 08-28-2023:
REVISED MONORAIL ANCHORS TO UTILIZE NEW ANCHORS INSTEAD OF EXISTING ANCHORS. REVISED TIRE CHAMBER ANCHORS TO ALLOW TO THERMAL EXPANSION OF EQUIPMENT REQUIRED DURING USE.

10/3/23

REVISION 10-03-2023:
REVISED ANCHORS TO UTILIZE NEW ANCHORS INSTEAD OF EXISTING ANCHORS FOR THE FOLLOWING EQUIPMENT: AIR TANK, PRESSURE TESTER, LINE DRYER, NDT (D.2), ENVELOPER, 201 BUILDER, AZ 6011 EXTRUDER.

SUBMITTED 10/16/2023

Item ID	Equipment Name	Operating Weight (lbs)	Equipment Height (ft)	COG heigh t (ft)	Base width (in)	Distance between anchors (in.)	No. of anchors shear	No. of anchors tension	Fp (lbs)	OTM (lb-ft)	MR (lb-ft)	T (lbs)	V (lbs)
A	Tire Chamber	12000	8.00	4.81	54	46	8	4	2520	12128	20515	0	315
B	Air Tank	2670	12.25	6.13	36	38.5	4	1	561	3434	3043	122	140
C	Pressure Tester	4900	6.17	3.08	24	14	4	2	1029	3173	3723	0	257
D.1	NDT	800	5.00	2.25	24	22.5	4	2	168	378	608	0	42
D.2	NDT	1000	5.00	2.25	22	20	4	2	210	473	696	0	53
E	Enveloper	900	6.67	2.22	29	22.5	4	2	189	420	826	0	47
F	Unicycler	2650	6.00	3.00	62	65	4	2	557	1670	5201	0	139
G	201 Builder	2200	3.25	2.17	54	18	4	2	462	1001	3761	0	116
H	AZ 6011 Extruder	4000	6.33	3.17	45	34	4	2	840	2660	5699	0	210
I	98E Ultra Buffer	5300	10.00	5.00	42	36	5	2	1113	5565	7047	0	223
J	Final Inspectors	1000	3.50	2.63	24	8.5	3	1	210	551	760	0	70
K	Line Dryer	440	4.00	2.00	33.5	37.5	4	2	92	185	467	0	23
L	400 gal Air Tank	880	8.00	4.00	36	32	4	1	185	739	1003	0	46

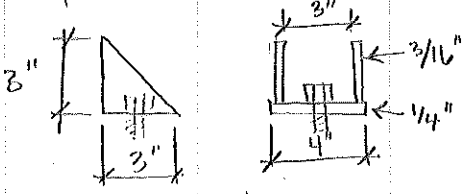
10/3/23

C2

Updated anchors to avoid testing

Air tank (B)

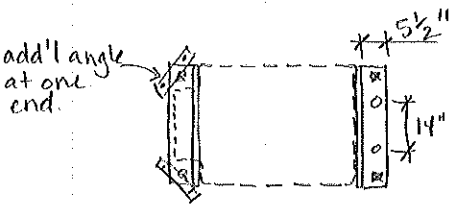
- anchor loading didn't change ∴ use anchors previously called out
- provide new feet in between existing to match existing



3/16" fillet: $\phi R_n = (1.392)(2.75")(3) = 11.5^k$ ULT

Pressure Tester (C)

- on one end of the equipment, part of the equipment obstructs unused holes, so cut off existing anchors and weld angles across corners w/ anchors



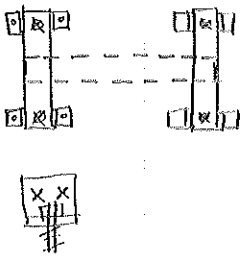
- at the other end, use existing holes to add new anchors.
- new loading @ 14" spg.: $\Omega T_u = 500$ lbs $\Omega V_u = 514$

$\frac{N_u}{\phi N_n} = \frac{500}{762} = 0.66$ $\frac{V_u}{\phi V_n} = \frac{514}{1713} = 0.30$ ⇒ Int. = 0.63

NDT (D.2)

- Drill new holes in base to install new anchors, offset from existing holes by ~2".

Enveloper (E)



- where existing anchors are already installed provide angle clips either side
- screw to (E) base:

#10 screw into 1/8" (actual base thickness = 1/4") = 301 lbs ASD (pull-out) > F_p = 189 x0.7

- L2x2x3/16 w/ (2) #10 self-drill screws to feet & Kynoic 2 anchors.

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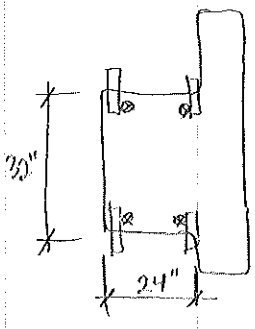
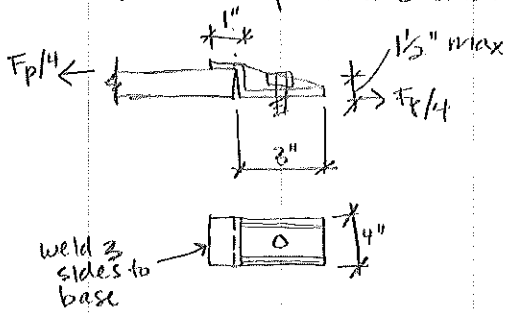
201 Builder (G)

- one had no existing anchors - use key note #2 anchors.
- new straps where existing anchors are installed





$M_u = (462/4)(1.5") = 173$ lb-in

$\Omega T_u = M_u / 0.85(1.5") = 272$ lbs.

- use kn #2 anchors.

Line Dryer (K)

- existing base of thick gauge steel
- screw clips to skirt.
- use same clip as enveloper since loads are lower

400 gal. Air Tank (L)

- anchor loading didn't change so use anchors previously called out.
- provide new feet between existing - use same as other air tank.

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