WARNING: ALL INDIVIDUALS INTERESTED IN BIDDING ON THIS PROJECT MUST OBTAIN THE FINAL PLANS AND SPECIFICATIONS FROM THE DEPARTMENT MANAGING THE PROJECT OR AS OTHERWISE STATED IN THE ADVERTISEMENT FOR BIDS FOR THE PROJECT. DO NOT USE THE PLANS AND SPECIFICATIONS POSTED ON THE CLERK OF THE BOARD'S WEBSITE FOR BIDDING ON THIS PROJECT.

BUEHLER

STRUCTURAL CALCULATIONS

FOR

SAN BERNARDINO ISD – ACQUISITION & IMPROVEMENTS

851 E. COOLEY AVENUE, COLTON, CA 92324

January 21st, 2022

Client: Holt Architecture
Buehler Principal in Charge: Brian Wiens, S.E.
Buehler Project Manager: Brian Wiens, S.E.
Buehler Project Engineer: Scott Mulligan, S.E., Ken Nazareth, P.E.
Buehler Job No.: 2021-0014

NOT FOR BID

TI-2022-00020

County of San Bernardino
BUILDING AND SAFETY
THE PLANS AND DETAILS HAVE BEEN
REVIEWED
FOR CODE COMPLIANCE
THE REVIEW OF THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR ANY VIOLATION OF ANY CODE OR ORDINANCE OF THIS COUNTY
By
Date 04/19/2022
THESE PLANS SHALL BE ON THE JOB FOR ALL REQUESTED INSPECTIONS

COUNTY APPROVAL IS GOOD FOR ALL 214 SHEETS INCLUDED IN THIS SET.

REGISTERED PROFESSIONAL ENGINEER
BRIAN S. WIENS
No. 6259
STRUCTURAL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY
--- REVIEWED ---
This review is intended only to verify general conformity to the 2019 edition of the California Building Standards. It does not relieve Contractor and Applicant of responsibility for requirements of Project drawings and specifications. No responsibility is assumed for fabrication or construction techniques, correctness of quantities or dimensions, or coordination of work with other trades. Omissions & Errors on documents shall not be valid and all codes and Laws must be complied with.

Digitally signed by Scott Woody
Reason: Reviewed for Code Compliance
Date: 2022.04.18 21:10:17 -07'00'

Buehler
www.buehlerengineering.com

BUEHLER

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

CLIENT Holt BY KRN SHEET NO.

PROJECT DESCRIPTION & DESIGN CRITERIA

BUEHLER

PROJECT	San Bernardino ISD		
JOB NO.	2021-0014	DATE	1/1/20201
CLIENT	HOLT	BY	EPV
		PAGE NO.	1

Project Description:

The project consists of improvements to an existing three-story structure in San Bernardino, California. The existing structure was constructed in 2007 as Summit Career College and consists of precast concrete exterior wall panels and structural steel floor framing with steel open-web joist roof structure. The proposed improvements include new equipment installation at the floors and roof, new HVAC duct routing, new openings through existing concrete shear walls, and a new generator yard.

Project Location: 851 E. Cooley Dr, Colton, CA 92324

Design Criteria:

Building Type: Risk Category: II

Design Codes: 2019 California Building Code (2018 IBC)

ASCE 7-16:	Minimum Design Loads for Buildings and Other Structures
AISC 360-16:	Specification for Structural Steel Buildings
AISC 341-16:	Seismic Provisions for Structural Steel Buildings
AISI S100-16:	North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S240-15:	North American Standard for Cold-Formed Steel Structural Framing
AISI S400-15:	North American Standard for Seismic Design of Cold-Formed Steel Structural Systems
ACI 318-14:	Building Code Requirements for Structural Concrete
TMS 402/602-16:	Building Code Requirements and Specifications for Masonry Structures
ANSI/AWC NDS-18:	National Design Specification (NDS) for Wood Construction with 2018 Supplement.
AWC SDPWS-15:	Special Design Provisions for Wind and Seismic

Wind Criteria: 125 mph, Exposure C $GC_{pi} = \pm 0.18$ (Enclosed Structure)

Seismic Criteria: Site Class: D $S_S = 2.306$ $S_1 = 0.922$ $S_{DS} = 1.54$ $S_{D1} = 1.045$

Seismic Design Category: D $I = 1.00$ $I_p = 1.00$

Material Specifications:

Concrete: (Cement ASTM C-150)		W/C Ratio
Footings:	$f'_c = 3000$ psi	0.58
Pier / pile caps:	$f'_c = 4000$ psi	0.50
Slab-on-grade:	$f'_c = 3500$ psi	0.45
Elevated Slabs & Bms:	$f'_c = 4000$ psi	0.50
Columns:	$f'_c = 4000$ psi	0.50
Shear Walls:	$f'_c = 4000$ psi	0.50

Structural Steel:	
WF shapes:	ASTM A992 (50 ksi)
HSS (rectangular):	ASTM A500-C (50 ksi)
HSS (round):	ASTM A500-C (46 ksi)
Pipe:	ASTM A53 (35 ksi)
Channel & Angle:	ASTM A36 (36 ksi)
Plate:	ASTM A36 (36 ksi)
Anchor Rods (non-frame):	ASTM F1554 Gr 36
Anchor Rods (frames):	ASTM F1554 Gr 55

EXISTING FRAMING CALCULATIONS

PROJECT	San Bernardino ISD				
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Building Loads

A: Floor Loads

	deck	joists	girders
5 1/4" LW conc (3 1/2" o/ 2" deck)	41.7	41.7	41.7
ponding load	10.0	10.0	10.0
joist truss @ 9' cc		2.5	2.5
W24 girders @ 35' cc			3.3
floor weight	1.0	1.0	1.0
sprinklers	1.5	1.5	1.5
MEP	3.0	3.0	3.0
susp gyp ceilings	3.8	3.8	3.8
misc	1.0	1.5	1.2
Dead Load	62.0 psf	65.0 psf	68.0 psf

Comparative to 70 psf (joists) per existing drawings, reasonable load take off

B: Roof Loads

	deck	joists	girders
re-roofing load	0.7	0.7	0.7
4-ply built-up roofing w/ cap sheet	3.0	3.0	3.0
2" LW insul conc	5.8	5.8	5.8
4" EPS insulation	0.8	0.8	0.8
16 ga metal deck w/ insul conc fill	6.4	6.4	6.4
joist truss @ 9' cc		1.5	1.5
W24 girders @ 35' cc			3.2
sprinklers	1.5	1.5	1.5
MEP	3.0	3.0	3.0
susp gyp ceiling (See NOTE 1)	3.8	3.8	3.8
misc	1.7	1.2	1.0
Dead Load	26.7 psf	27.7 psf	30.7 psf

Comparative to 27 psf (joists) and 30 psf (girders) per existing drawings, reasonable load take off

NOTES:
1. The assumed weight of 3.8 for the suspended gypsum ceiling is a conservative estimate. The ceiling is being changed to a partial dropped ceiling, which will conservatively weight 80% of the original ceiling weight due the reduction of overall square footage.

In joists that do not work with the conservative 3.8 psf assumption, the less conservative assumption is used, leading to a 26.9 psf total weight.

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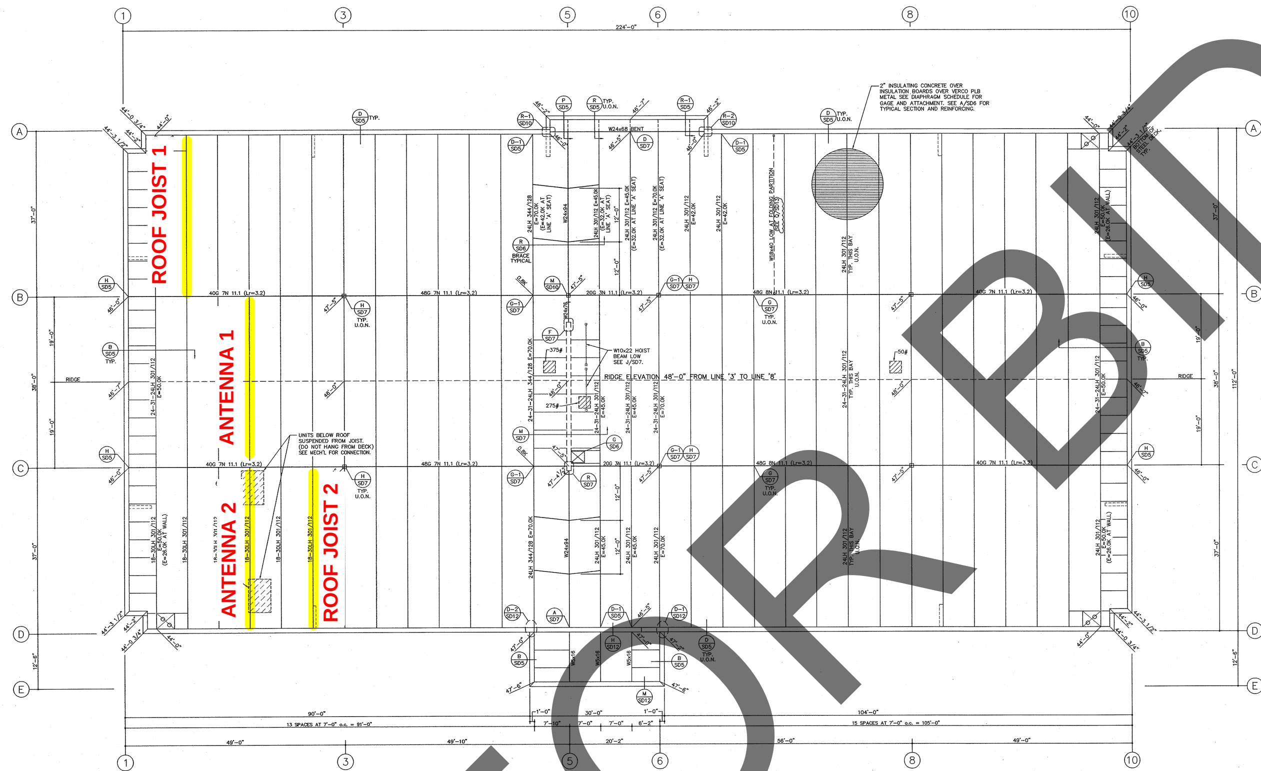
PROJECT San Bernardino ISD

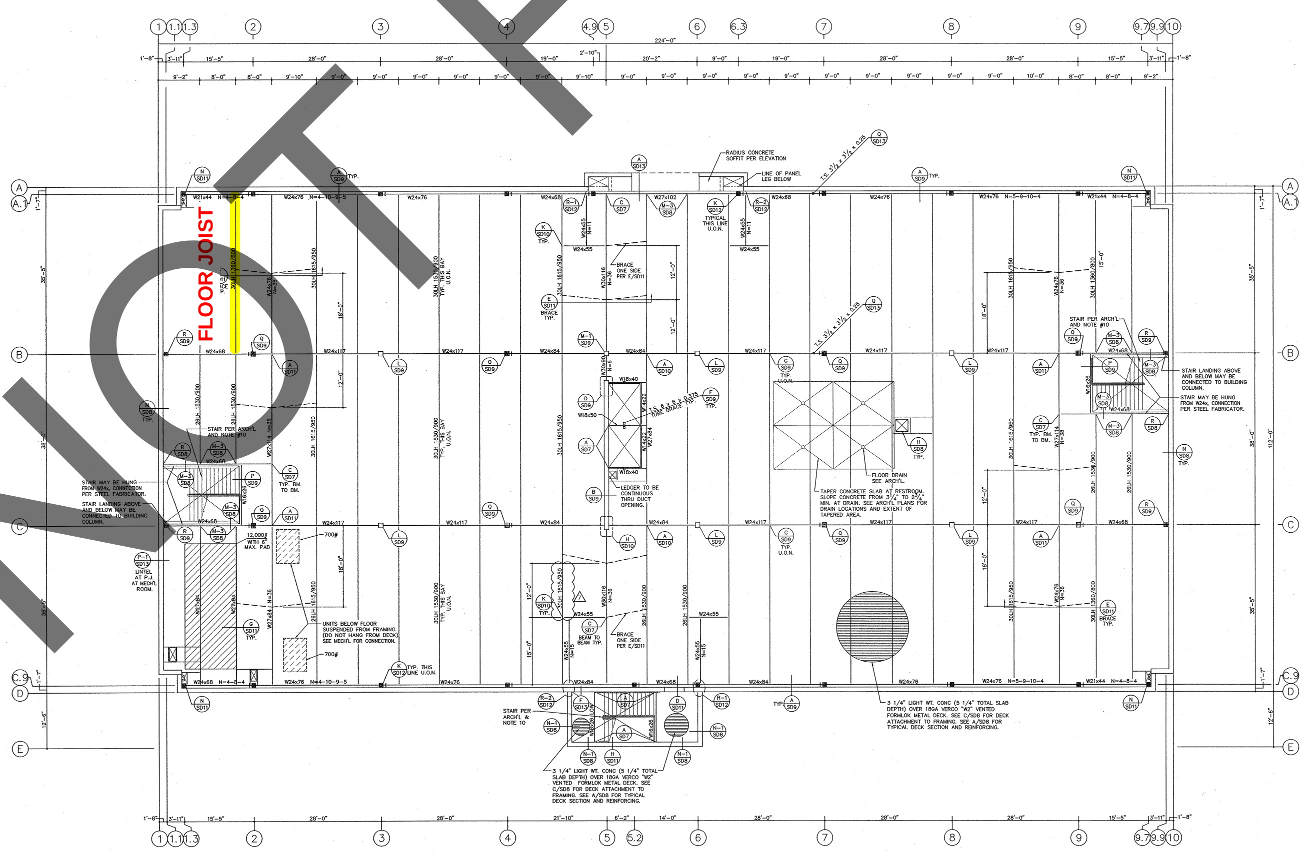
PROJECT NO. 2021-0014 DATE 2/10/2021

CLIENT TBD BY EPV SHEET NO. A2

Joist Loading Key Plan



ROOF FRAMING PLAN



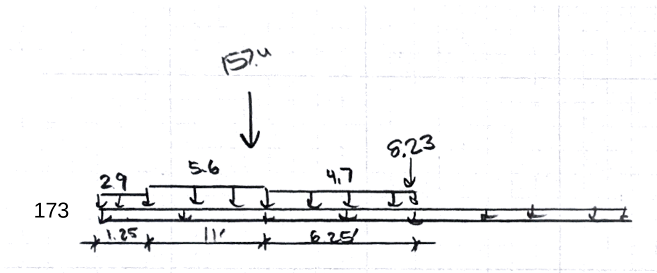
THIRD FLOOR FRAMING PLAN

PROJECT	San Bernardino ISD		
PROJECT NO.	2021-0014	DATE	2/10/2021
CLIENT	TBD	BY	EPV
SHEET NO.	A3		

Joists with Antennas

Antenna 1

173



New

168

Existing

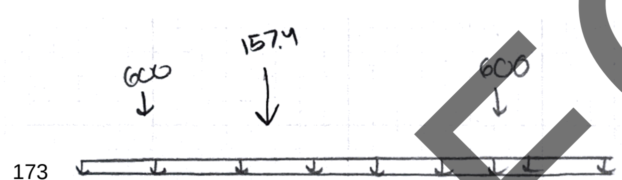
TL = 6834.2 lbs

TL = 6571.0 lbs

% Diff = 4.01%

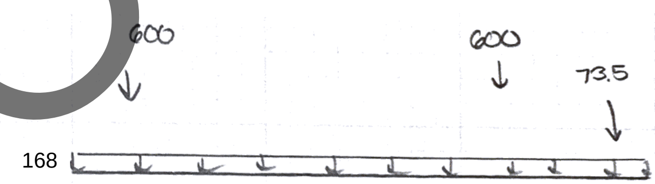
Antenna 2

173



New

168



Existing

TL = 7847.5 lbs

TL = 7741.4 lbs

% Diff = 1.37%

All load changes within 5% of original
New ductwork and antenna ok

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PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE 2/19/2021

CLIENT HOLT BY EPV SHEET NO. A4

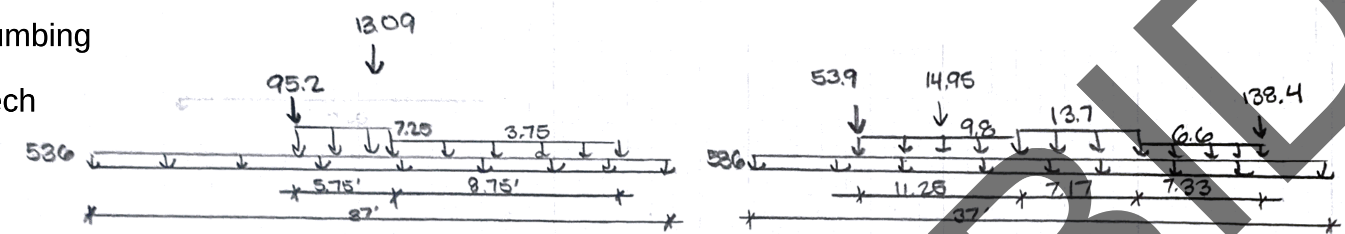
Joist Evaluation

Floor Joist

Plumbing

Mech

Ex



Existing

TL = 20,015 lbs

New

TL = 20,296 lbs

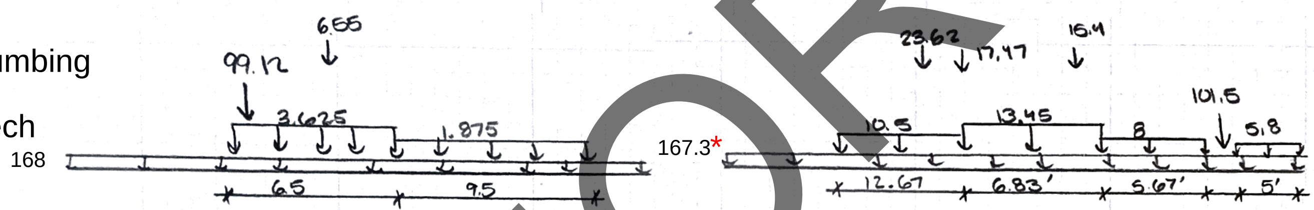
% = 1.41%

Roof Joist 1

Plumbing

Mech

Ex 168



Existing

TL = 6195.0 lbs

New

TL = 6480.0 lbs

% Diff = 4.60%

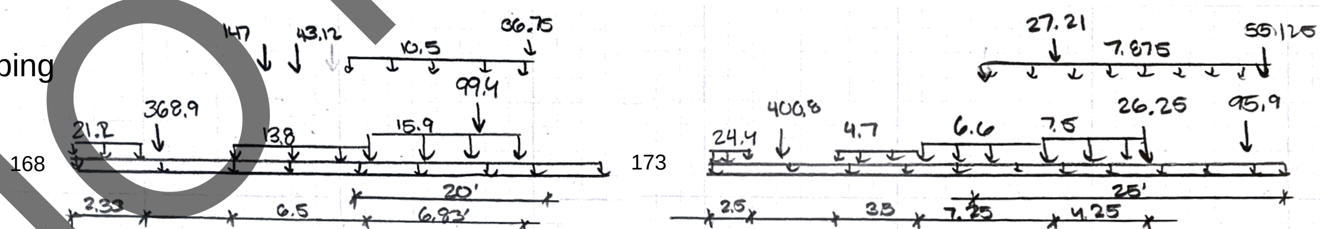
*New roof joist load accounting for reduction due to new ceiling load. See roof load take off for more information.

Roof Joist 2

Plumbing

Mech

Ex 168



Existing

TL = 7368.9 lbs

New

TL = 7360.3 lbs

% = -0.12%

All load changes within 5% of original
New ductwork ok

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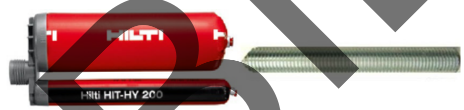
Specifier's comments:

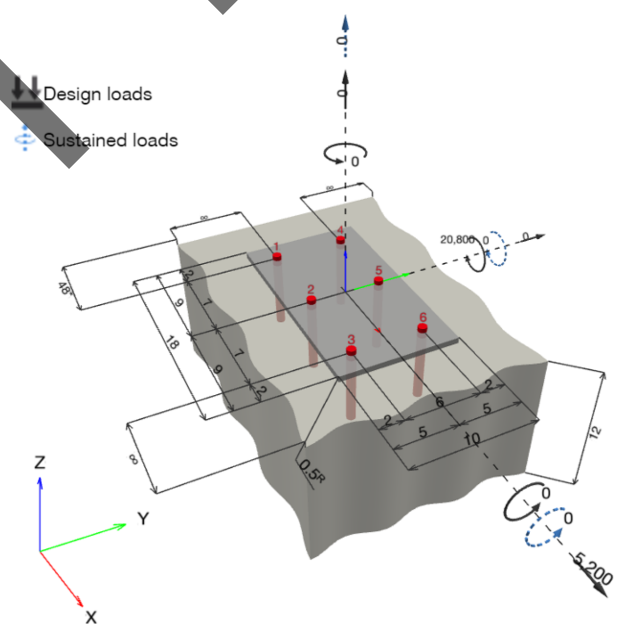
1 Input data



Anchor type and diameter:	**HIT-HY 200 + HAS-V-36 (ASTM F1554 Gr.36) 3/4**
Item number:	2198029 HAS-V-36 3/4"x8" (element) / 2022793 HIT-HY 200-R (adhesive)
Effective embedment depth:	$h_{ef,act}$ = 6.000 in. ($h_{ef,limit}$ = - in.)
Material:	ASTM A 1554 Grade 36
Evaluation Service Report:	ESR-3187
Issued I Valid:	4/1/2020 | 3/1/2022
Proof:	Design Method ACI 318-14 / Chem
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate^R :	l_x x l_y x t = 18.000 in. x 10.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 12.000 in., Temp. short/long: 32/32 °F
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar

^{R} - The anchor calculation is based on a rigid anchor plate assumption.

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



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1.1 Design results

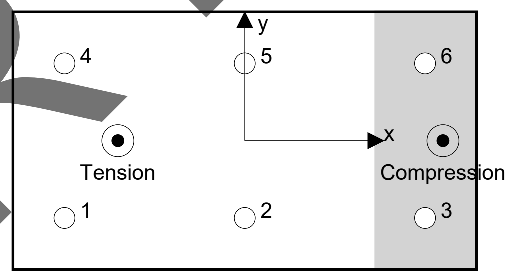
Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 0$; $V_x = 5{,}200$; $V_y = 0$; $M_x = 0$; $M_y = 20{,}800$; $M_z = 0$; $N_{sus} = 0$; $M_{x,sus} = 0$; $M_{y,sus} = 0$;	no	12

2 Load case/Resulting anchor forces

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	580	867	867	0
2	244	867	867	0
3	0	867	867	0
4	580	867	867	0
5	244	867	867	0
6	0	867	867	0



max. concrete compressive strain:	0.02 [‰]
max. concrete compressive stress:	84 [psi]
resulting tension force in (x/y)=(-4.927/0.000):	1,648 [lb]
resulting compression force in (x/y)=(7.695/0.000):	1,648 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	580	14,550	4	OK
Bond Strength**	1,648	18,102	10	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	1,648	16,418	11	OK

* highest loaded anchor **anchor group (anchors in tension)

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3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-3187

$\phi\ N_{sa} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.33	58,000

Calculations

N_{sa} [lb]
19,400

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
19,400	0.750	14,550	580

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3.2 Bond Strength

$N_{ag} = \left(\frac{A_{Na}}{A_{Na0}}\right) \psi_{ec1,Na}\ \psi_{ec2,Na}\ \psi_{ed,Na}\ \psi_{cp,Na}\ N_{ba}$ — ACI 318-14 Eq. (17.4.5.1b)

$\phi\ N_{ag} \geq N_{ua}$ — ACI 318-14 Table 17.3.1.1

A_{Na} see ACI 318-14, Section 17.4.5.1, Fig. R 17.4.5.1(b)

$A_{Na0} = (2\ c_{Na})^2$ — ACI 318-14 Eq. (17.4.5.1c)

$c_{Na} = 10\ d_a \sqrt{\frac{\tau_{uncr}}{1100}}$ — ACI 318-14 Eq. (17.4.5.1d)

$\psi_{ec,Na} = \left(\frac{1}{1 + \frac{e_N}{c_{Na}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.3)

$\psi_{ed,Na} = 0.7 + 0.3 \left(\frac{c_{a,min}}{c_{Na}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.4b)

$\psi_{cp,Na} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{c_{Na}}{c_{ac}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.5.5b)

$N_{ba} = \lambda_a \cdot \tau_{k,c} \cdot \pi \cdot d_a \cdot h_{ef}$ — ACI 318-14 Eq. (17.4.5.2)

Variables

$\tau_{k,c,uncr}$ [psi]	d_a [in.]	h_{ef} [in.]	$c_{a,min}$ [in.]	$\alpha_{overhead}$	$\tau_{k,c}$ [psi]
2,327	0.750	6.000	48.000	1.000	1,321

$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	c_{ac} [in.]	λ_a
1.427	0.000	11.536	1.000

Calculations

c_{Na} [in.]	A_{Na} [in.^{2}]	A_{Na0} [in.^{2}]	$\psi_{ed,Na}$
10.859	795.99	471.66	1.000

$\psi_{ec1,Na}$	$\psi_{ec2,Na}$	$\psi_{cp,Na}$	N_{ba} [lb]
0.884	1.000	1.000	18,670

Results

N_{ag} [lb]	ϕ_{bond}	$\phi\ N_{ag}$ [lb]	N_{ua} [lb]
27,849	0.650	18,102	1,648

3.3 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N} \ \psi_{ed,N} \ \psi_{c,N} \ \psi_{cp,N} \ N_b$ — ACI 318-14 Eq. (17.4.2.1b)

$\phi \ N_{cbg} \geq N_{ua}$ — ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9 \ h_{ef}^2$ — ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 \ e_N'}{3 \ h_{ef}}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ — ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c \ \lambda_a \sqrt{f_c'} \ h_{ef}^{1.5}$ — ACI 318-14 Eq. (17.4.2.2a)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
6.000	1.427	0.000	48.000	1.000

c_{ac} [in.]	k_c	λ_a	f_c' [psi]
11.536	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
600.00	324.00	0.863	1.000	1.000	1.000	15,802

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi \ N_{cbg}$ [lb]	N_{ua} [lb]
25,259	0.650	16,418	1,648

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	867	7,566	12	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Concrete Breakout Strength controls)**	5,200	52,438	10	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-3187
$\phi\ V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.33	58,000

Calculations

V_{sa} [lb]
11,640

Results

V_{sa} [lb]	ϕ_{steel}	$\phi\ V_{sa}$ [lb]	V_{ua} [lb]
11,640	0.650	7,566	867

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4.2 Pryout Strength (Concrete Breakout Strength controls)

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b\right]$ ACI 318-14 Eq. (17.5.3.1b)

$\phi\ V_{cpg} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e_N'}{3\ h_{ef}}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.4)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c\ \lambda_a\ \sqrt{f_c'}\ h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	6.000	0.000	0.000	48.000

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f_c' [psi]
1.000	11.536	17	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
768.00	324.00	1.000	1.000	1.000	1.000	15,802

Results

V_{cpg} [lb]	$\phi_{concrete}$	$\phi\ V_{cpg}$ [lb]	V_{ua} [lb]
74,912	0.700	52,438	5,200

5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.100	0.115	5/3	5	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2018, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

Company:		Page:	9
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Operable Wall Bm Conn	Date:	8/20/2021
Fastening point:			

7 Installation data

Profile: no profile

Hole diameter in the fixture: d_f = 0.812 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and diameter: HIT-HY 200 + HAS-V-36 (ASTM F1554 Gr.36) 3/4

Item number: 2198029 HAS-V-36 3/4"x8" (element) / 2022793 HIT-HY 200-R (adhesive)

Maximum installation torque: 1,200 in.lb

Hole diameter in the base material: 0.875 in.

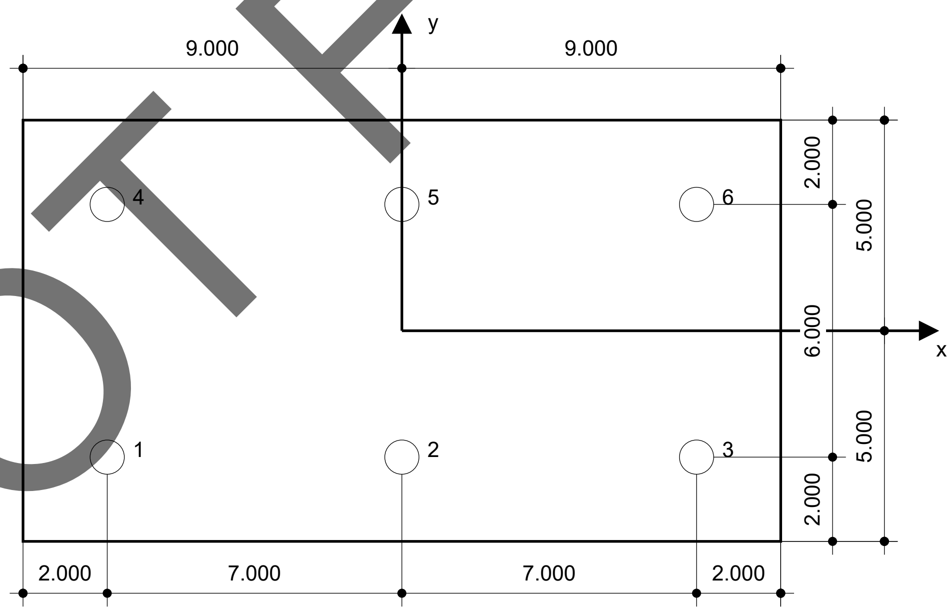
Hole depth in the base material: 6.000 in.

Minimum thickness of the base material: 7.750 in.

3/4 Hilti HAS Carbon steel threaded rod with Hilti HIT-HY 200 Safe Set System

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • Torque wrench



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-7.000	-3.000	48.000	-	-	-
2	0.000	-3.000	55.000	-	-	-
3	7.000	-3.000	62.000	-	-	-

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
4	-7.000	3.000	48.000	-	-	-
5	0.000	3.000	55.000	-	-	-
6	7.000	3.000	62.000	-	-	-

8 Remarks; Your Cooperation Duties

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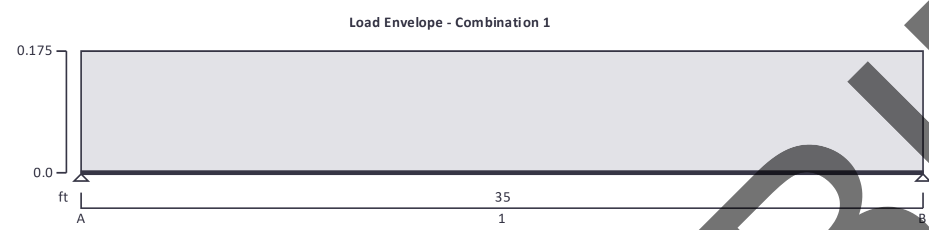
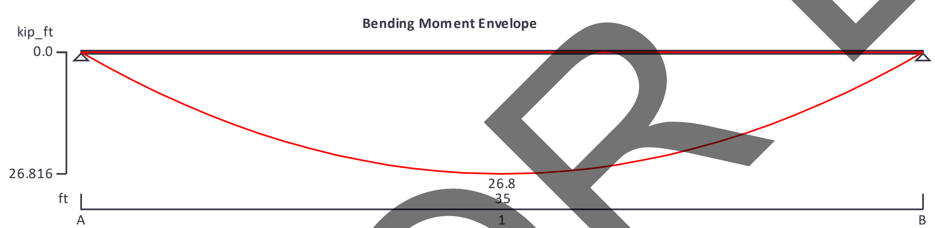
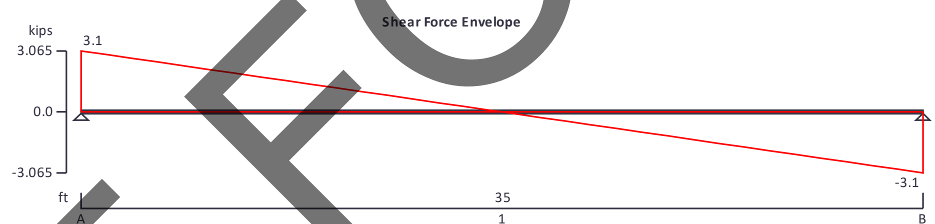
STEEL BEAM ANALYSIS & DESIGN (AISC360-16)

In accordance with AISC360-16 using the LRFD method

Tedds calculation version 3.0.15







Support conditions

Support A	Vertically restrained
	Rotationally free
Support B	Vertically restrained
	Rotationally free

Applied loading

Beam loads	Dead full UDL 0.1 kips/ft
	Dead self weight of beam × 1

Load combinations

Load combination 1	Support A	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60
		Dead × 1.20
		Live × 1.60
		Roof live × 1.60

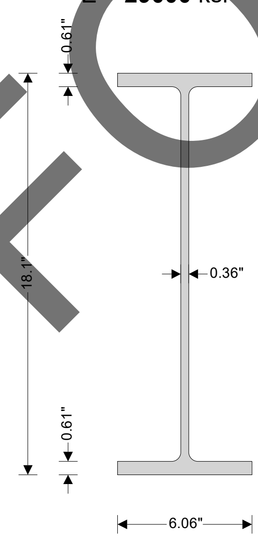
		Snow × 1.60
	Support B	Dead × 1.20
		Live × 1.60
		Roof live × 1.60
		Snow × 1.60

Analysis results

Maximum moment	M_{max} = **26.8** kips_ft	M_{min} = **0** kips_ft
Maximum shear	V_{max} = **3.1** kips	V_{min} = **-3.1** kips
Deflection	δ_{max} = **0.2** in	δ_{min} = **0** in
Maximum reaction at support A	R_{A_max} = **3.1** kips	R_{A_min} = **3.1** kips
Unfactored dead load reaction at support A	R_{A_Dead} = **2.6** kips	
Maximum reaction at support B	R_{B_max} = **3.1** kips	R_{B_min} = **3.1** kips
Unfactored dead load reaction at support B	R_{B_Dead} = **2.6** kips	

Section details

Section type	**W 18x46 (AISC 15th Edn (v15.0))**
ASTM steel designation	**A992**
Steel yield stress	F_y = **50** ksi
Steel tensile stress	F_u = **65** ksi
Modulus of elasticity	E = **29000** ksi



Resistance factors

Resistance factor for tensile yielding	ϕ_{ty} = **0.90**
Resistance factor for tensile rupture	ϕ_{tr} = **0.75**
Resistance factor for compression	ϕ_c = **0.90**
Resistance factor for flexure	ϕ_b = **0.90**

Lateral bracing

Span 1 has lateral bracing at supports only

Classification of sections for local buckling - Section B4.1

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f)$ = **5.01**
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{[E / F_y]}$ = **9.15**

Limiting ratio for non-compact section $\lambda_{rff} = 1.0 \times \sqrt{[E / F_y]}$ = **24.08** Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio $(d - 2 \times k) / t_w$ = **44.67**

Limiting ratio for compact section $\lambda_{pwf} = 3.76 \times \sqrt{[E / F_y]}$ = **90.55**

Limiting ratio for non-compact section $\lambda_{rwf} = 5.70 \times \sqrt{[E / F_y]}$ = **137.27** Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength $V_r = \max(\text{abs}(V_{max}), \text{abs}(V_{min}))$ = **3.065** kips

Web area $A_w = d \times t_w$ = **6.516** in^2

Web plate buckling coefficient k_v = **5.34**

Web shear coefficient - eq G2-3 C_{v1} = **1**

Nominal shear strength – eq G6-1 $V_n = 0.6 \times F_y \times A_w \times C_{v1}$ = **195.480** kips

Resistance factor for shear ϕ_v = **1.00**

Design shear strength $V_c = \phi_v \times V_n$ = **195.480** kips

PASS - Design shear strength exceeds required shear strength

Design of members for flexure in the major axis - Chapter F

Required flexural strength $M_r = \max(\text{abs}(M_{s1\_max}), \text{abs}(M_{s1\_min}))$ = **26.816** kips_ft

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1 $M_{nyld} = M_p = F_y \times Z_x$ = **377.917** kips_ft

Lateral-torsional buckling - Section F2.2

Unbraced length $L_b = L_{s1}$ = **420** in

Limiting unbraced length for yielding - eq F2-5 $L_p = 1.76 \times r_y \times \sqrt{[E / F_y]}$ = **54.678** in

Distance between flange centroids $h_o = d - t_f$ = **17.495** in

c = **1**

$r_{ts} = \sqrt{[\sqrt{(I_y \times C_w)} / S_x]}$ = **1.58** in

Limiting unbraced length for inelastic LTB - eq F2-6

$L_r = 1.95 \times r_{ts} \times E / (0.7 \times F_y) \times \sqrt{[(J \times c / (S_x \times h_o)) + \sqrt{((J \times c / (S_x \times h_o))^2 + 6.76 \times (0.7 \times F_y / E)^2)}]}$ = **164.364** in

Cross-section mono-symmetry parameter R_m = **1.000**

Moment at quarter point of segment M_A = **20.112** kips_ft

Moment at center-line of segment M_B = **26.816** kips_ft

Moment at three quarter point of segment M_C = **20.112** kips_ft

Maximum moment in segment M_{abs} = **26.816** kips_ft

Lateral torsional buckling modification factor - eq F1-1 $C_b = 12.5 \times M_{abs} / [2.5 \times M_{abs} + 3 \times M_A + 4 \times M_B + 3 \times M_C]$ = **1.136**

Critical flexural stress - eq F2-4 $F_{cr} = C_b \times \pi^2 \times E / (L_b / r_{ts})^2 \times \sqrt{[1 + 0.078 \times J \times c / (S_x \times h_o) \times (L_b / r_{ts})^2]}$ = **11.159** ksi

Nominal flexural strength for lateral torsional buckling - eq F2-2 $M_{nltb} = F_{cr} \times S_x$ = **73.279** kips_ft

Nominal flexural strength $M_n = \min(M_{nyld}, M_{nltb})$ = **73.279** kips_ft

Design flexural strength $M_c = \phi_b \times M_n$ = **65.951** kips_ft

PASS - Design flexural strength exceeds required flexural strength

Design of members for vertical deflection

Consider deflection due to dead, live, roof live and snow loads

Limiting deflection $\delta_{lim} = L_{s1} / 360$ = **1.167** in

Maximum deflection span 1 $\delta = \max(\text{abs}(\delta_{max}), \text{abs}(\delta_{min}))$ = **0.239** in

PASS - Maximum deflection does not exceed deflection limit

STEEL MEMBER DESIGN (AISC 360)

In accordance with AISC360 15th Edition published 2016 using the LRFD method

Tedds calculation version 4.4.05

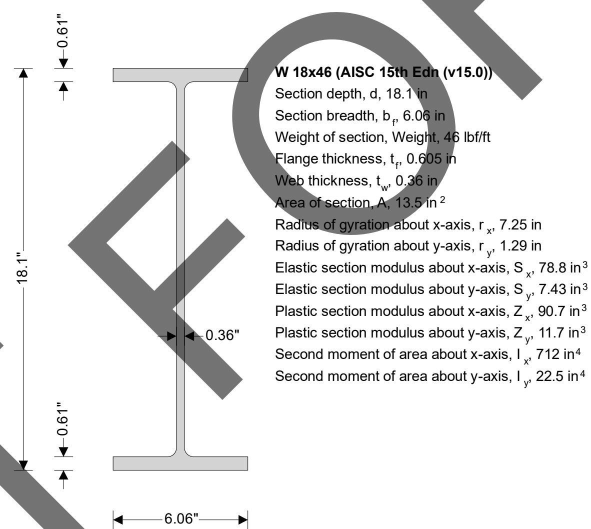
Resistance factors

Shear	ϕ_v = **1.00**
Flexure	ϕ_b = **0.90**
Tensile yielding	$\phi_{t,y}$ = **0.90**
Tensile rupture	$\phi_{t,r}$ = **0.75**
Compression	ϕ_c = **0.90**

Design section 1

Section details

Section type	W 18x46 (AISC 15th Edn (v15.0))
ASTM steel designation	A992
Steel yield stress	F_y = **50** ksi
Steel tensile stress	F_u = **65** ksi
Modulus of elasticity	E = **29000** ksi



Analysis results

Required flexural strength - Major axis	$M_{r,x}$ = **26.8** kips_ft
Required flexural strength - Minor axis	$M_{r,y}$ = **7.4** kips_ft
Required shear strength - Major axis	$V_{r,x}$ = **2.84** kips
Required shear strength - Minor axis	$V_{r,y}$ = **0.84** kips

Restraint spacing

Major axis lateral restraint	L_x = **35** ft
Minor axis lateral restraint	L_y = **35** ft
Torsional restraint	L_z = **35** ft

Classification of sections for local buckling - Section B4

Classification of flanges in flexure - Table B4.1b (case 10)

Width to thickness ratio	$b_f / (2 \times t_f)$ = **5.01**
Limiting ratio for compact section	$\lambda_{pff} = 0.38 \times \sqrt{[E / F_y]}$ = **9.15**

Limiting ratio for non-compact section $\lambda_{rff} = 1.0 \times \sqrt{[E / F_y]}$ = **24.08** Compact

Classification of web in flexure - Table B4.1b (case 15)

Width to thickness ratio $(d - 2 \times k) / t_w$ = **44.67**

Limiting ratio for compact section $\lambda_{pwf} = 3.76 \times \sqrt{[E / F_y]}$ = **90.55**

Limiting ratio for non-compact section $\lambda_{rwf} = 5.70 \times \sqrt{[E / F_y]}$ = **137.27** Compact

Section is compact in flexure

Design of members for shear - Chapter G

Required shear strength $V_{r,x}$ = **2.8** kips

Web area $A_w = d \times t_w$ = **6.516** in^2

Web plate buckling coefficient k_v = **5.34**

$(d - 2 \times k) / t_w <= 2.24 \times \sqrt{(E / F_y)}$

Web shear coefficient - eq G2-2 C_{v1} = **1.000**

Nominal shear strength - eq G2-1 $V_{n,x} = 0.6 \times F_y \times A_w \times C_{v1}$ = **195.5** kips

Resistance factor $\phi_v = 1.00$

Design shear strength $V_{c,x} = \phi_v \times V_{n,x}$ = **195.5** kips

$V_{r,x} / V_{c,x}$ = **0.015**

PASS - Design shear strength exceeds required shear strength

Required shear strength $V_{r,y}$ = **0.8** kips

Web area $A_w = 2 \times b_f \times t_f$ = **7.333** in^2

Web plate buckling coefficient k_v = **1.2**

$b_f / (2 \times t_f) <= 1.10 \times \sqrt{(k_v \times E / F_y)}$

Web shear coefficient - eq G2-9 C_{v2} = **1.000**

Nominal shear strength - eq G6-1 $V_{n,y} = 0.6 \times F_y \times A_w \times C_{v2}$ = **220** kips

Resistance factor $\phi_v = 0.90$

Design shear strength $V_{c,y} = \phi_v \times V_{n,y}$ = **198** kips

$V_{r,y} / V_{c,y}$ = **0.004**

PASS - Design shear strength exceeds required shear strength

Design of members for flexure - Chapter F

Required flexural strength $M_{r,x}$ = **26.8** kips_ft

Yielding - Section F2.1

Nominal flexural strength for yielding - eq F2-1 $M_{n,yld,x} = M_{p,x} = F_y \times Z_x$ = **377.9** kips_ft

Lateral-torsional buckling - Section F2.2

Unbraced length L_b = **35** ft

Limiting unbraced length for yielding - eq F2-5 $L_p = 1.76 \times r_y \times \sqrt{(E / F_y)}$ = **4.557** ft

Distance between flange centroids h_o = **17.5** in

c = **1**

r_{ts} = **1.58** in

Limiting unbraced length for inelastic LTB - eq F2-6 $L_r = 1.95 \times r_{ts} \times E / (0.7 \times F_y) \times \sqrt{((J \times c / (S_x \times h_o)) + \sqrt{((J \times c / (S_x \times h_o))^2 + 6.76 \times (0.7 \times F_y / E)^2)})}$ = **13.696** ft

LTB modification factor C_b = **1.000**

Critical flexural stress - eq F2-4 $F_{cr} = (C_b \times \pi^2 \times E / (L_b / r_{ts})^2) \times \sqrt{(1 + 0.078 \times (J \times c / (S_x \times h_o)) \times (L_b / r_{ts})^2)}$ = **9.8** ksi

Nominal flexural strength for lateral-torsional buckling - eq F2-3

$M_{n,ltb,x} = \min(F_{cr} \times S_x, M_{p,x})$ = **64.5** kips_ft

Design flexural strength - F1

Nominal flexural strength $M_{n,x} = \min(M_{n,yld,x}, M_{n,ltb,x}) = \mathbf{64.5}$ kips_ft

Design flexural strength $M_{c,x} = \phi_b \times M_{n,x} = \mathbf{58}$ kips_ft

$M_{r,x} / M_{c,x} = \mathbf{0.462}$

PASS - Design flexural strength exceeds required flexural strength

Design of members for flexure - Chapter F

Required flexural strength $M_{r,y} = \mathbf{7.4}$ kips_ft

Yielding - Section F6.1

Nominal flexural strength for yielding - eq F6-1 $M_{n,yld,y} = M_{p,y} = \min(F_y \times Z_y, 1.6 \times F_y \times S_y) = \mathbf{48.7}$ kips_ft

Compression flange local buckling - Section F6.2

$\lambda = b_f / (2 \times t_f) = \mathbf{5.008}$

Nominal flexural strength for compression flange local buckling - eq F6-2

$M_{n,flb,y} = M_{p,y} = \mathbf{48.7}$ kips_ft

Design flexural strength - F1

Nominal flexural strength $M_{n,y} = \min(M_{n,yld,y}, M_{n,flb,y}) = \mathbf{48.7}$ kips_ft

Design flexural strength $M_{c,y} = \phi_b \times M_{n,y} = \mathbf{43.9}$ kips_ft

$M_{r,y} / M_{c,y} = \mathbf{0.169}$

PASS - Design flexural strength exceeds required flexural strength

Design of members for combined forces - Chapter H

Combined flexure and axial force - eq H1-1b $M_{r,x} / M_{c,x} + M_{r,y} / M_{c,y} = \mathbf{0.630}$

PASS - Combined flexure and axial force is within acceptable limits

ROOF ANTENNAE CALCULATIONS

BUEHLER

PROJECT San Bernardino ITD

PROJECT NO. 2021-0014 DATE 08/03/2021

CLIENT BY EPV SHEET NO. B1

Wind Loading

Wind Loads on MWFRS Rooftop Equipment and Other Structures		
ASCE 7-16, Tb. 29.1-1		*Source*
1. Risk Cateogry?	II	
2. Basic wind speed, V	96 mph	*ATC Hazards by Location*
3. Wind load parameters:		
Wind directionality factor, Kd =	0.85	*Tb. 26.6-1*
Exposure cateogry =	C	*§26.7*
Topographic factor, Kzt =	1.0	*Fig. 26.8-1*
Ground elevation factor, Ke =	1.0	*Tb. 26.9-1*
Gust-effect facor, G =	0.85	*§26.11*
GCr =	1.9	*§29.4.1*
4. Velocity pressure exposure coeffecient, Kz =	1.09	*Tb. 26.10-1*
5. Velocity prsesure, qz =	21.86 psf	*Eq. (26.10-1)*
6. not applicable to rooftop equipment		
7. Wind pressure, p =	41.53 psf	*Eq. (29.4-2) and (29.4-3)*
Wind Pressure, *p* = 41.53 psf		

Antenna AREA

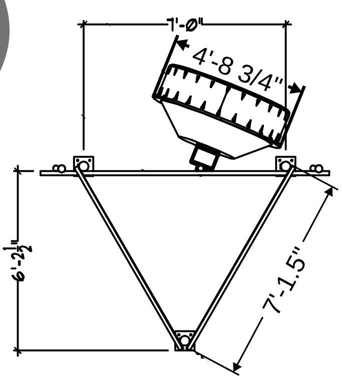
$d = 4.75'$

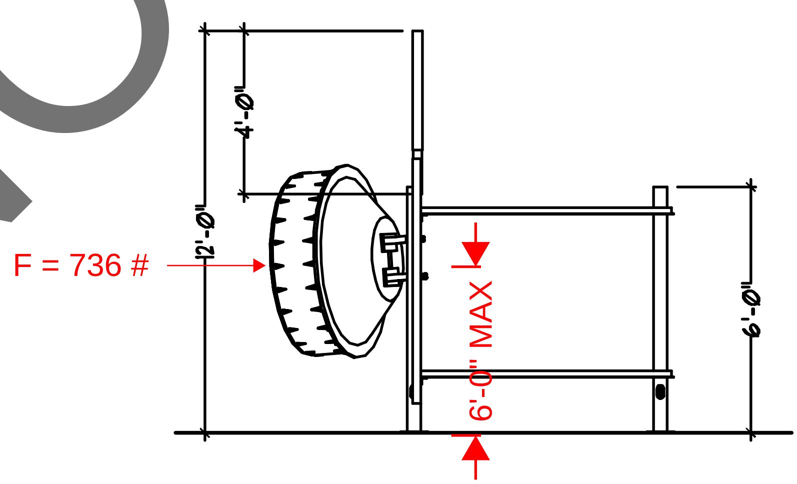
$A = \pi r^2 = 17.72 \text{ ft}^2$

WIND FORCE

$F = 41.53 \text{ psf } (17.72 \text{ ft}^2)$

$F = 736 \text{ lb}$



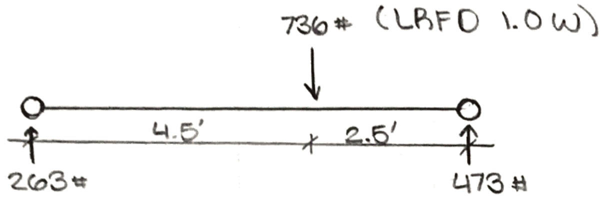


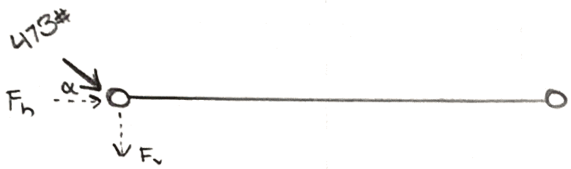
Antenna Loading

PROJECT San Bernardino ITD

PROJECT NO. 2021-0014 DATE 08/13/2021

CLIENT BY EPV SHEET NO. B2



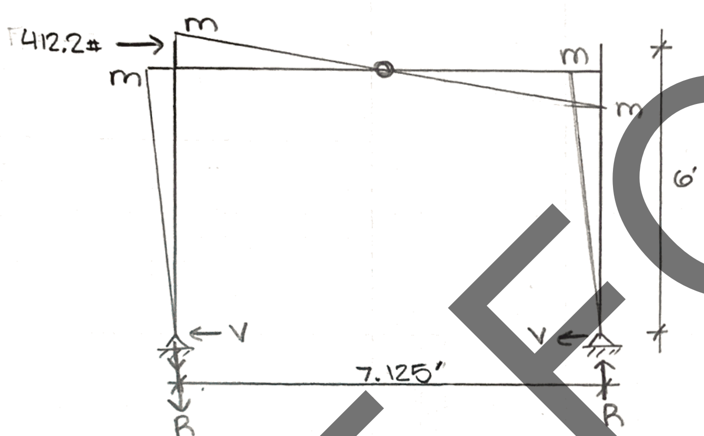


$\alpha = 90° - (\sin^{-1}(6.21'/7.125'))$

$\alpha = 29.36°$

$F_h = 412.2\ \#$

$F_v = 231.9\ \#$



$M = Ph/2$

$= (412.2\#)(6')/2$

$M = 1.24$ k-ft

$R = Ph/l = 347\ \#$

$V = P/2 = 206.1\ \#$

PROJECT San Bernardino ITD
PROJECT NO. 2021-0014 DATE 08/13/2021
CLIENT BY EPV SHEET NO. B3

Frame Design

Angle L3x3x1/4 (Lc = 8')

$\phi P_n = 12.1\ k \geq P_u = 0.4\ k$ DCR = 0.06

(AISC Tb. 4-11)

Angle to Pipe

$M_u = 1.24\ k\text{-}ft$

$\phi M_n = 3'' \phi R_n$

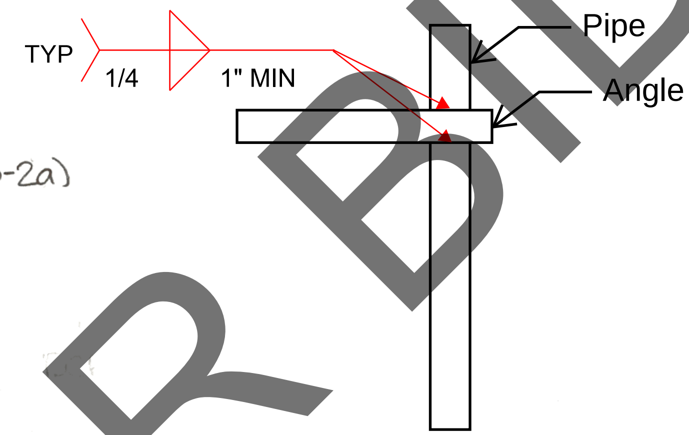
$\phi R_n = 1.392\ (4)(1'')$ (AISC 8-2a)

$\phi R_n = 5.568\ k$

$\phi M_n = 16.7\ k\text{-}in\ (1.392\ k\text{-}ft)$

$\phi M_n = 1.39\ k\text{-}ft \geq M_u = 1.24$

DCR = 0.89 ✓



PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

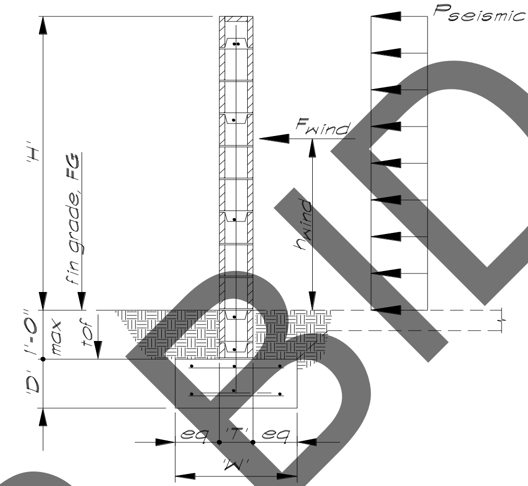
CLIENT Holt BY KRN SHEET NO.

CMU SCREEN WALL CALCULATIONS

CANTILEVERED MASONRY SCREEN WALL DESIGN

Generator Yard Enclosure

ASCE 7-16, TMS 402/602-16, ACI 318-14



Screen Wall Geometry

ASCE 7-16, Chapter 29

Height of Wall, h =	12.00 ft	Return Wall?	Yes
Vertical Dim. of Wall, s =	12.00 ft	Lr =	37.0 ft
Clearance Ratio s/h =	1.0	Lr/s =	3.08
Wall Length, B =	38.0 ft	R.W. Red. Factor =	0.600
Aspect Ratio, B/s =	3.17		
FG to tof =	0.00 ft		

Wind Design Inputs

ASCE 7-16, Chapter 26 & 29

Occupancy Category =	II				
Exposure Category =	C	(26.7.3)			
Exposure Coeff., K_z =	0.85	(Table 26.10-1)	$C_{f\ Case\ A/B}$ =	1.37	Case A and B (Figure 29.3-1)
Topo. Factor, K_{zt} =	1.0	(26.8.2)	$C_{f\ Case\ C}$ =	2.65	Case C (Figure 29.3-1)
Dir. Factor, K_d =	0.85	(Table 26.6-1)	G =	0.85	Gust-Effect Factor (26.11.1)
Ground Elev Fact, K_e =	1.00	(26.9)	A_s =	12.0 sq ft	Based on 1'-0" Width
Basic Wind Speed, V =	96 mph	(Figures 26.5-1A, B, C)			

q_h = 17.0 psf $= 0.00256\ K_z K_{zt} K_d K_e V^2\ I\ (lb/ft^2)$ [Eqn. 26.10-1]

Wind Design Force

ASCE 7-16, Section 29.3

$F = q_h G C_f A_s$ (lb) [Eqn. 29.3-1]

Case A & B:

f = **19.8 psf** Case A and B (Typical Wall)
F = **238.3 lb** Case A and B (Typical Wall)

Case C:

Reduction Factor, C = **0.80** (Table 29.3-1 Note 4)
f = **18.4 psf** Case C (End Wall)
F = **221.2 lb** Case C (End Wall)

Seismic Design Force

ASCE 7-16, Section 15.6.8 **(Walls 6 Feet and Over)**

S_{ds} =	1.540	Cs = Sds/(Rp/Ie)	F_p =	1.232 Wp	Eqn: 12.8-2 **Governs**
S_1 =	0.922	Cs min1 = 0.044 (Sds)(Ie)	F_p =	0.068 Wp	Eqn: 15.4-1
Actual t_{wall} =	11.625 in.	Cs min2 = 0.03	F_p =	0.030 Wp	Eqn: 15.4-1
W_p =	135 psf	Cs min3 = 0.8 (S1)/(Rp/Ie)	Fp =	0.590 Wp	Eqn: 15.4-2
Ie =	1.0 (Table 1.5-2)		F_p =	1.232 Wp	(@ Strength)
			F_p =	**166.3 psf**	(@ Strength)
R =	1.25 (Table 15.4-2, Cantilever Walls)				

Force Summary

F_{wind} = **238.3 lb** Case A and B (Typical Wall) (1.0W) CASE A/B GOVERNS

F_{wind} = **221.2 lb** Case C (End Wall) (1.0W)

h_{wind} = **6.60 ft** (Distance from Finished Grade, FG)

$F_{p\ seismic}$ = **166.3 psf** (1.0E)

CANTILEVERED MASONRY SCREEN WALL DESIGN

Generator Yard Enclosure

CMU Wall Design Criteria:

f'_m = 2000 psi | Bar Loc: Offset | $\phi_{bending}$ = 0.9 | # of Bars = 2 | A_s [in^2/ft] = 0.47

f_r = 133 psi | FB to CL Bar = 2.5 in. | E_s = 29000 ksi | Bar Size = #5 | ρ = 0.0042

Actual t_{wall} = 11.625 in. | d = 9.125 in. | E_m = 1800 ksi | Bar Spc'g = 16 cc | ε_{mu} = 0.0025

b = 12.0 in. | E_s/E_m= n = 16.1 | f_y = 60 ksi | ε_s = 0.0101

a = 1.45 in. | $\rho \times n$ = 0.06842 | ε_y = 0.0021 | ρ_{max} = 0.0095

c = 1.82 in.

CMU Wall Bending @ Base (Strength Design - TMS 402-16)

Case A and B (1.0W) P = 238.3 lb   Ht to Force from FG = 6.60 ft

Check if M_n > $1.3 \times M_{cr}$

Load Case: 1.2D + 1.0W

$M_{max\ @\ base\ wind}$ = 18.9 k-in. (Factored)

Load Case: 1.2D + 1.0E

$M_{max\ @\ base\ seismic}$ = 143.7 k-in. (Factored)

ϕM_n = 210.9 k-in.

M_u = 143.7 k-in. (Seismic)

D/C = 0.68

Check: OK

S_n = 270.3 in.^3

M_{cr} = 35.9 k-in.

M_n / M_{cr} = 6.5

Check: OK

Conclusions / Summary

Wall	
f'_m =	2000 psi
t_{wall} =	11.625 in.
Bar Loc:	Offset
d =	9.125 in.
Bar Size =	#5
Bar Spc'g =	16 cc

NOTE: FOR FOOTING DESIGN DESIGN SEE FOUNDATION SECTION OF CALCULATIONS

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

CLIENT Holt BY KRN SHEET NO.

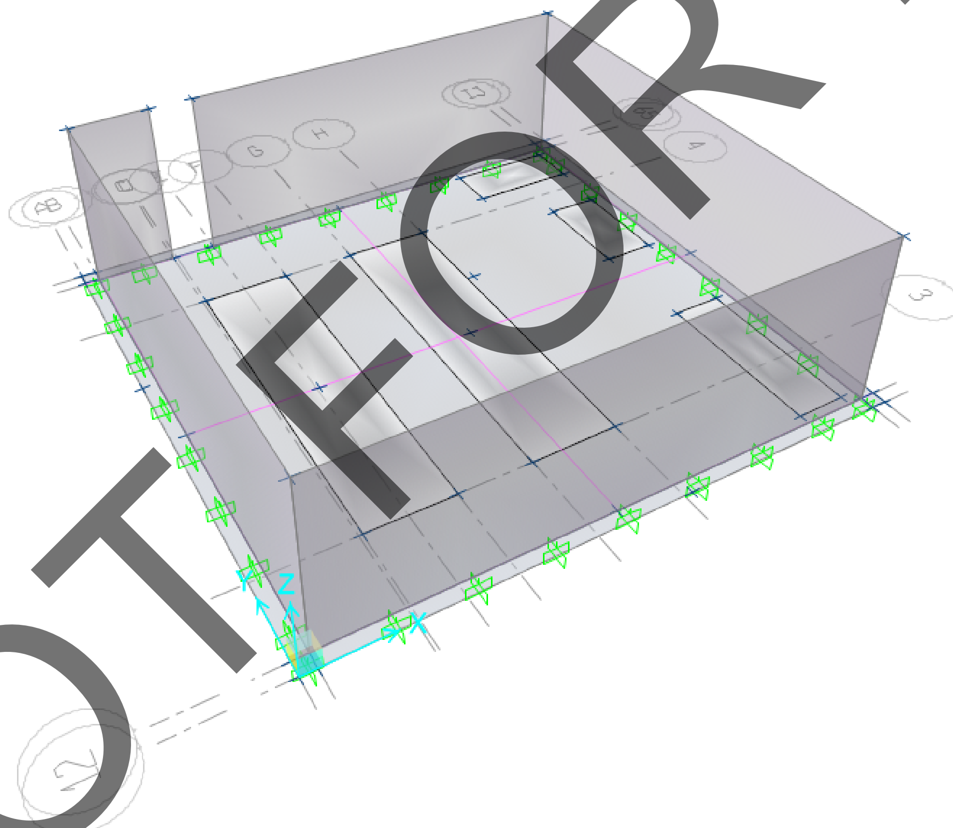
GENERATOR YARD FOUNDATION CALCULATIONS

BUEHLER

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

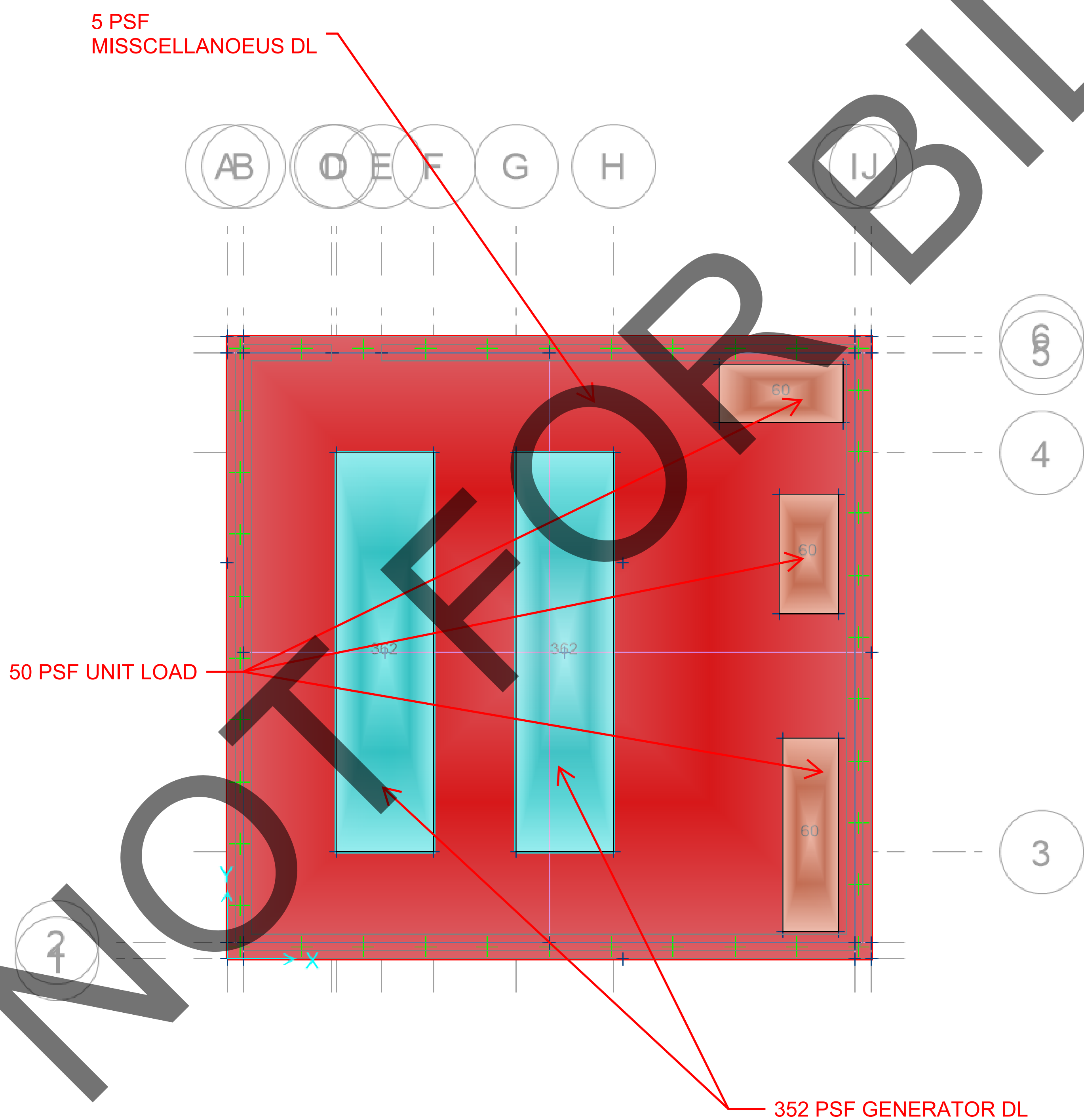
CLIENT HOLT BY KRN SHEET NO. D1



GENERATOR YARD - MAT SLAB SAFE MODEL

BUEHLER

PROJECT San Bernardino ISD
PROJECT NO. 2021-0014 DATE
CLIENT HOLT BY KRN SHEET NO. D2

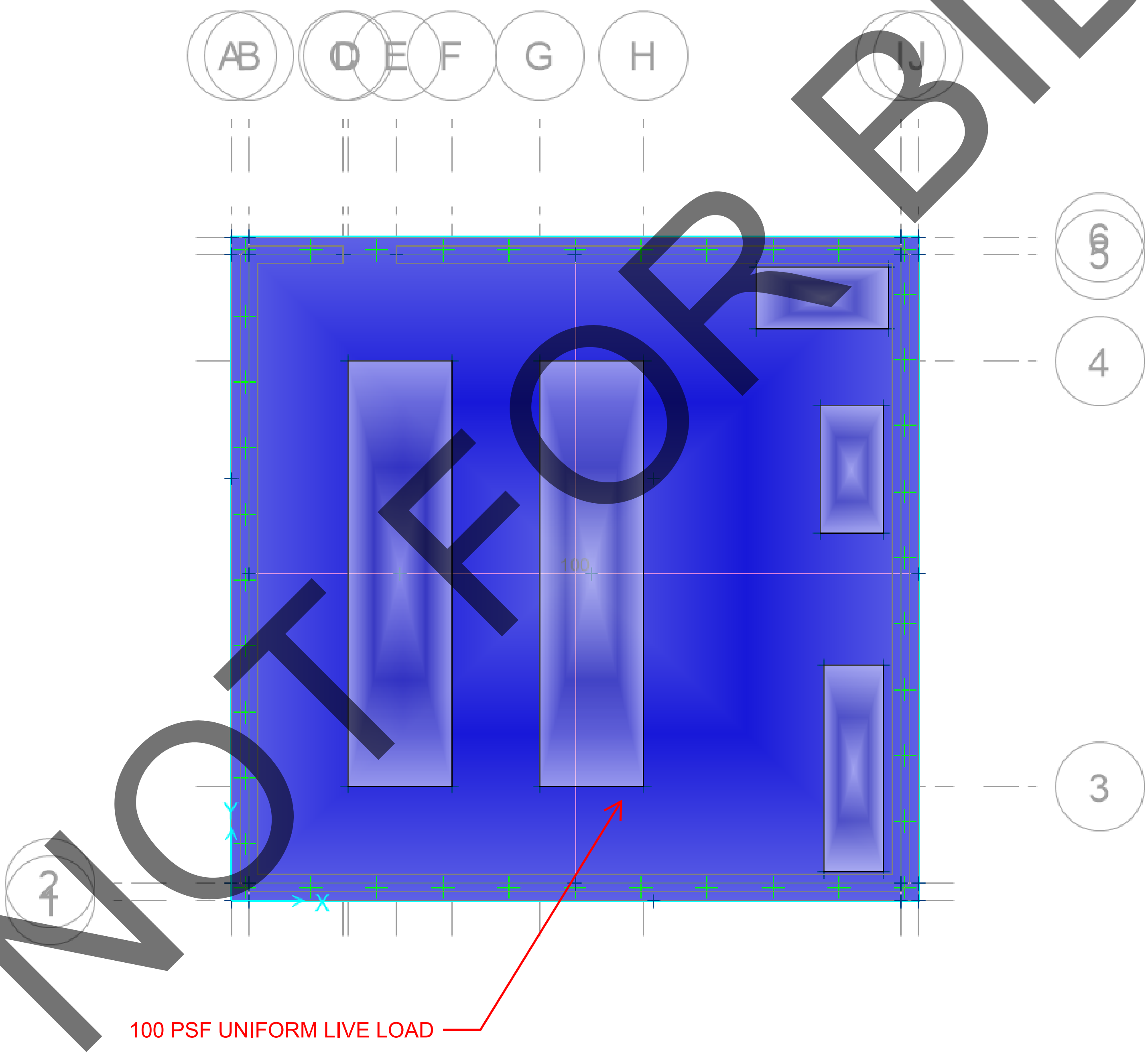


GENERATOR YARD - MAT SLAB SUMPERIMPOSED DEAD LOADS

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

CLIENT HOLT BY KRN SHEET NO. D3



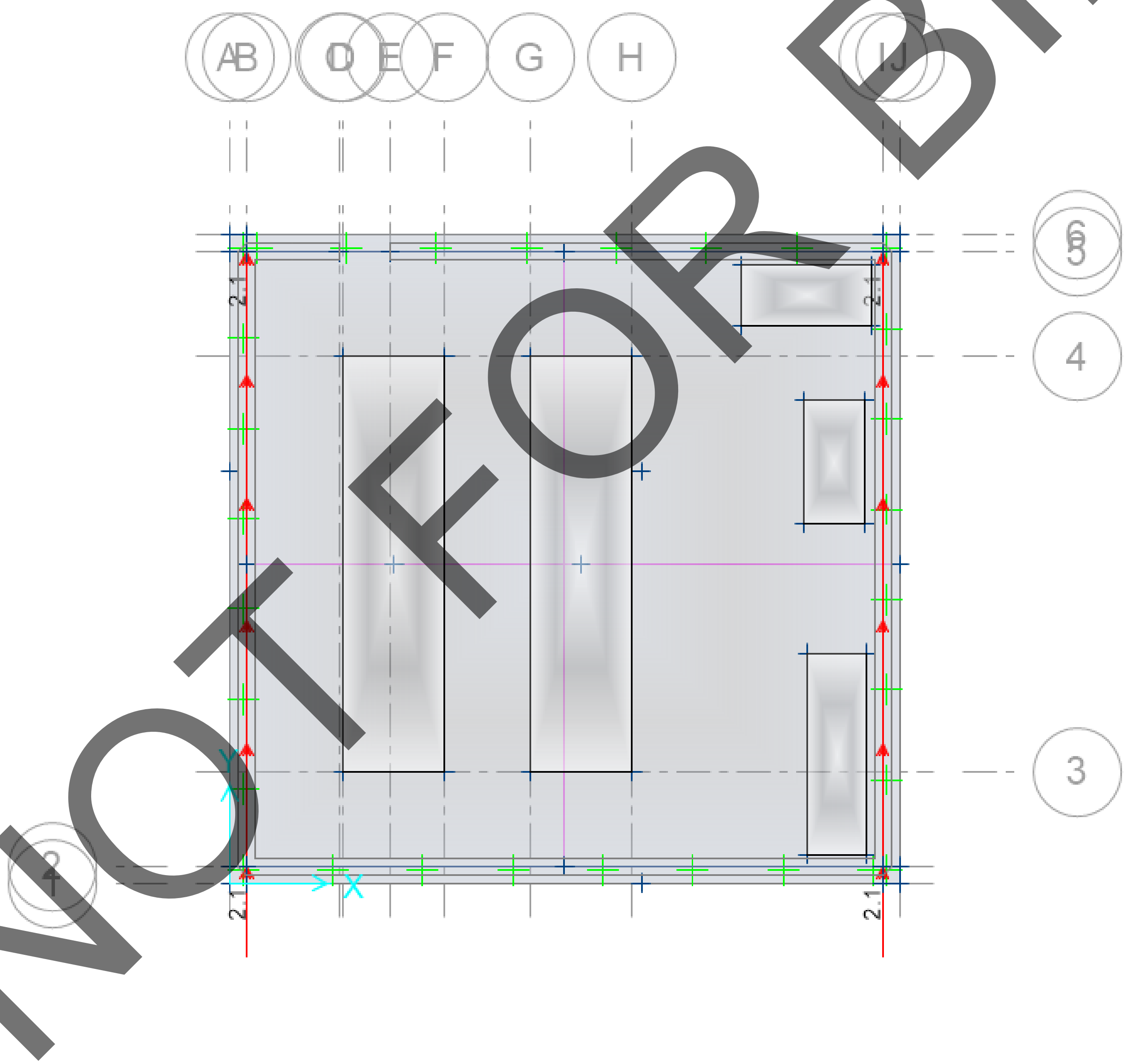
GENERATOR YARD - MAT SLAB LIVE LOADS

BUEHLER

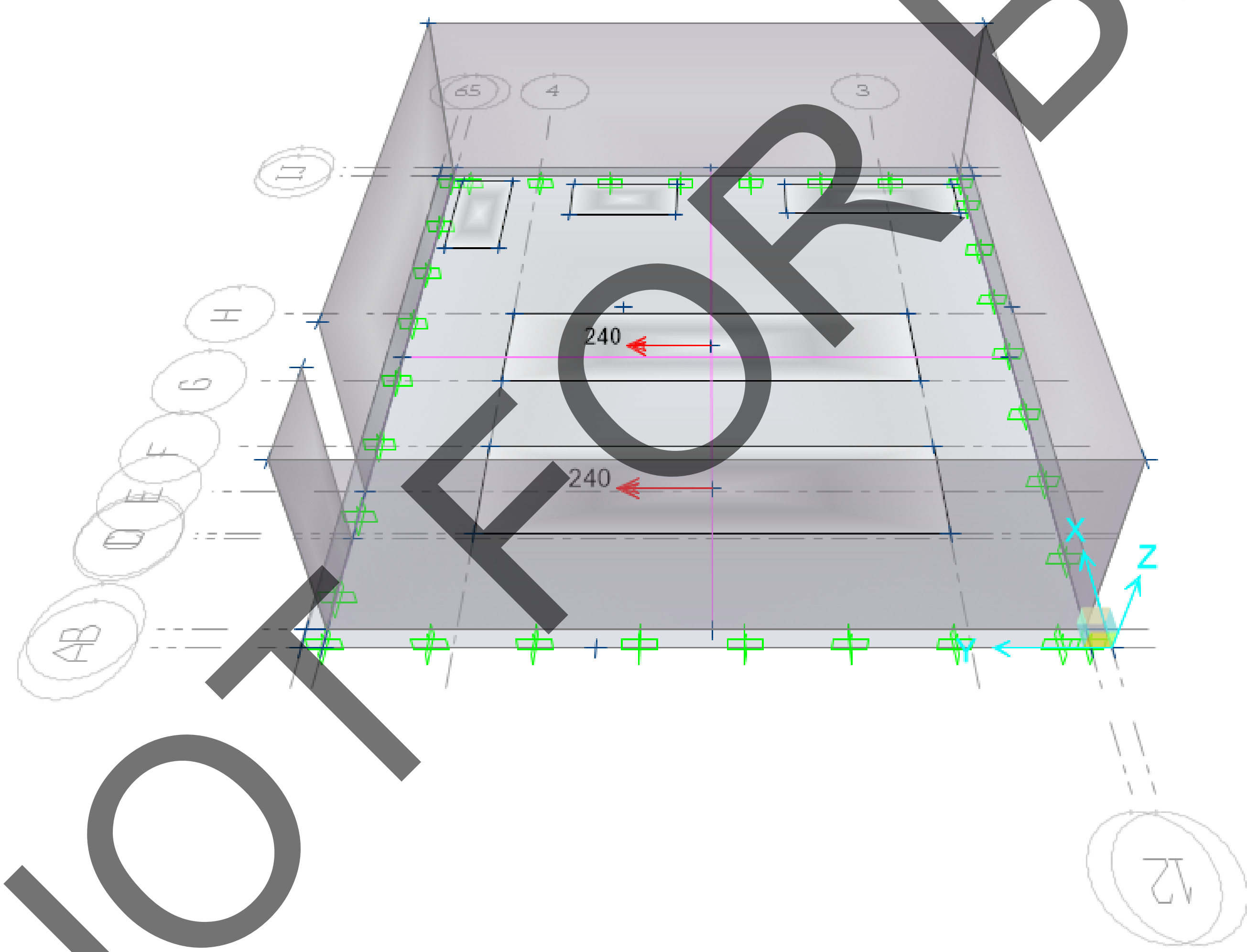
PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

CLIENT HOLT BY KRN SHEET NO. D4



GENERATOR YARD - MAT SLAB EQ X DIRECTION LINE LOADS



GENERATOR YARD - MAT SLAB EQ X DIRECTION POINT LOADS

BUEHLER

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

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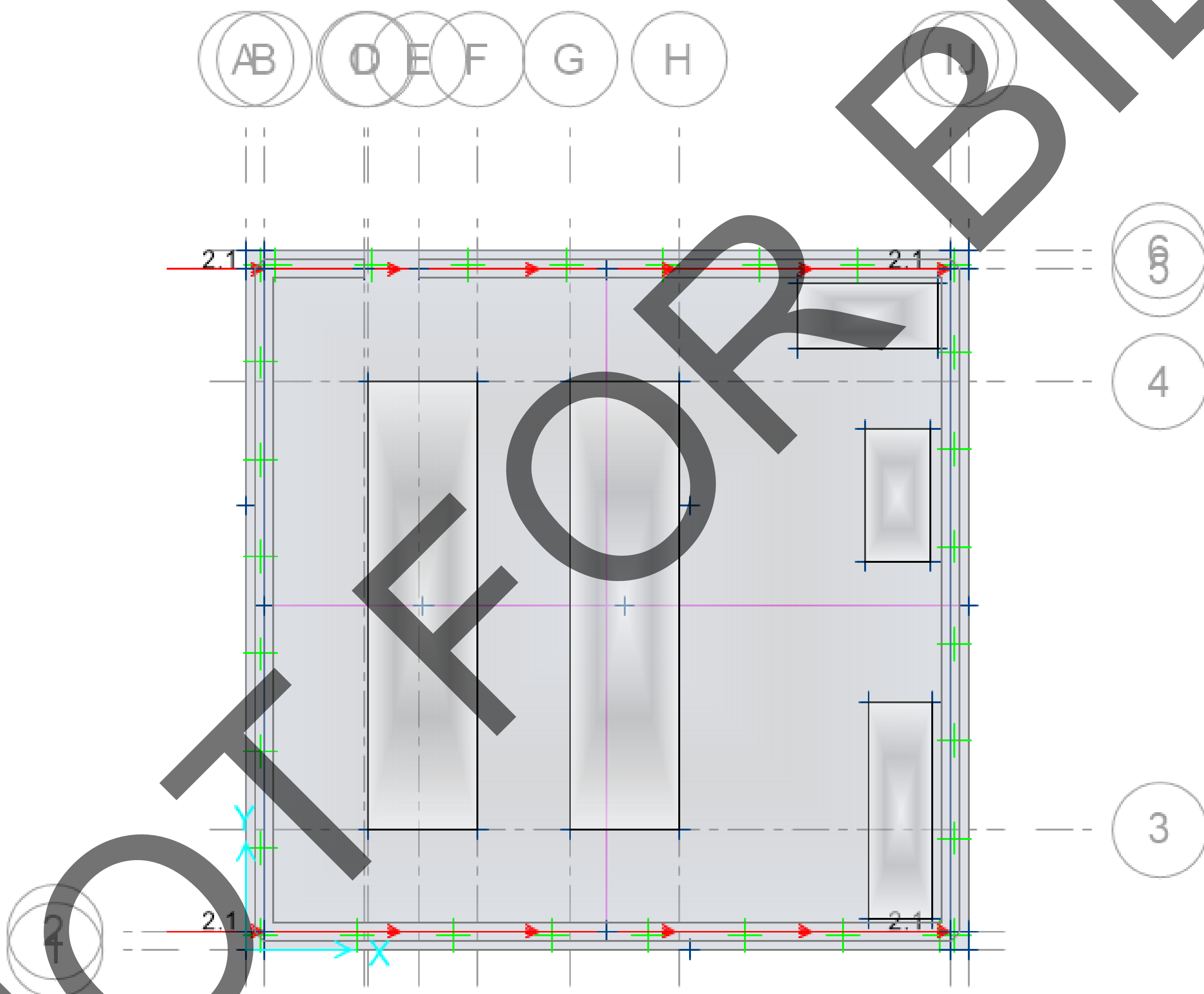

GENERATOR YARD - MAT SLAB EQ Y DIRECTION LINE LOADS

BUEHLER

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

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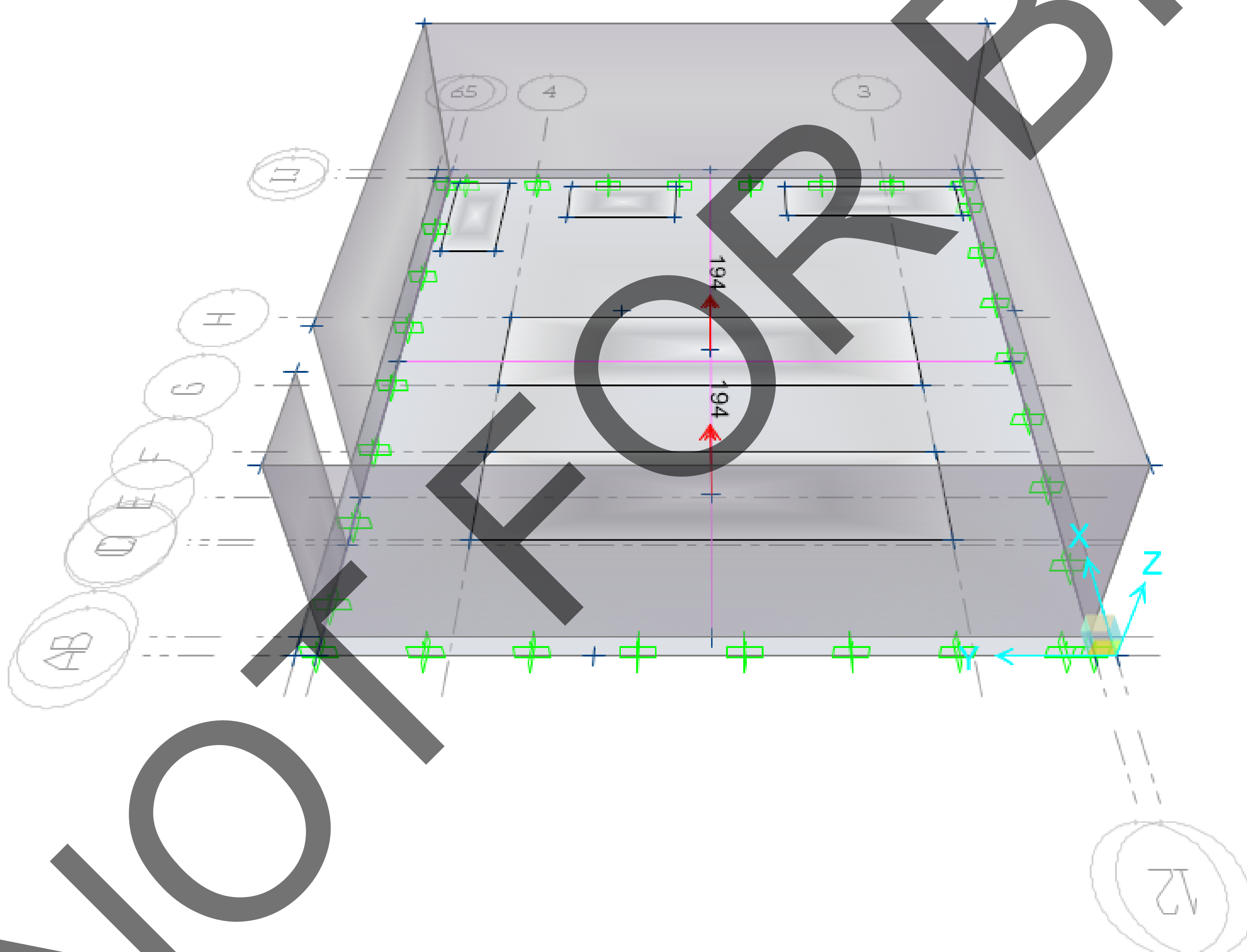
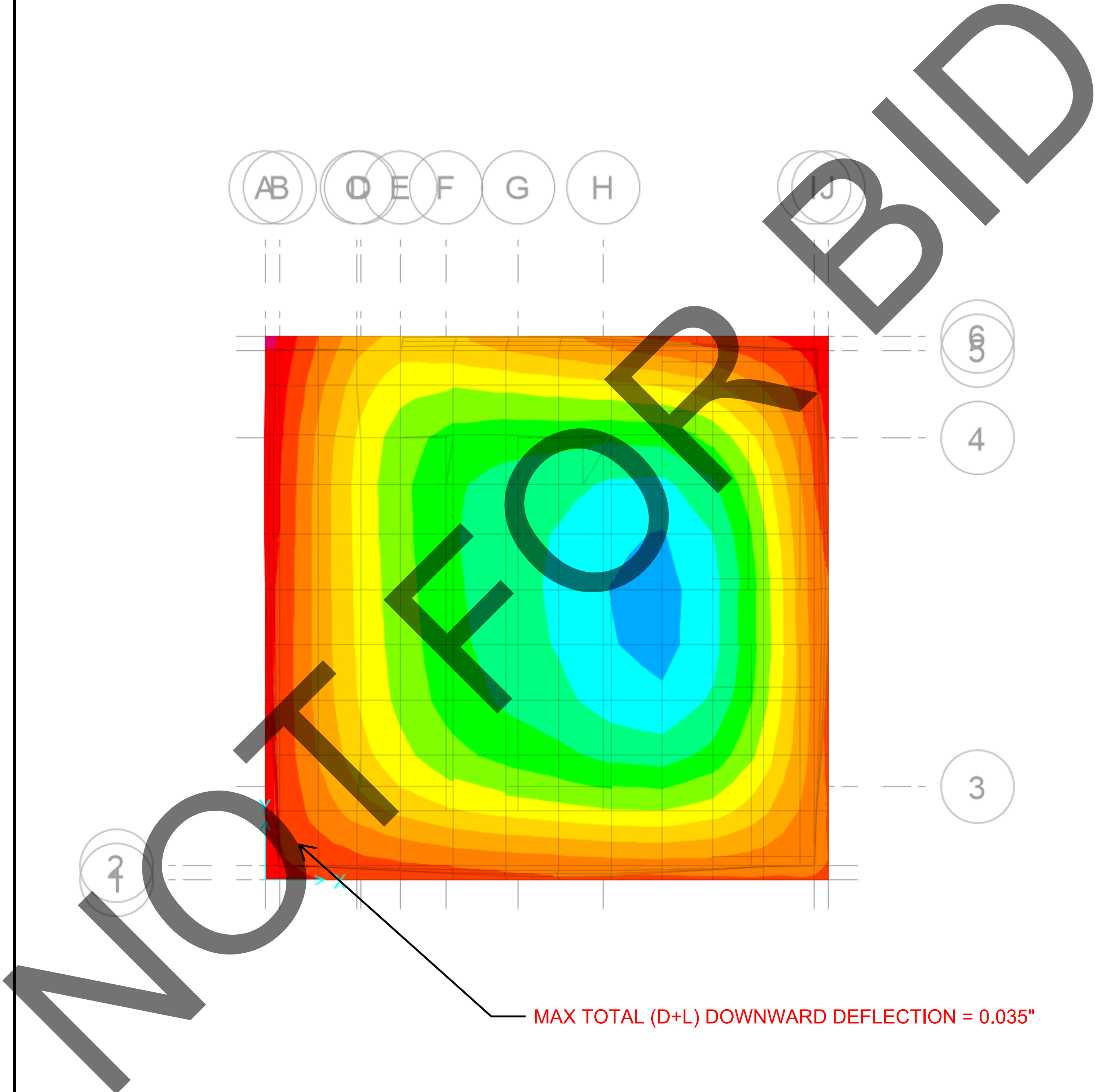
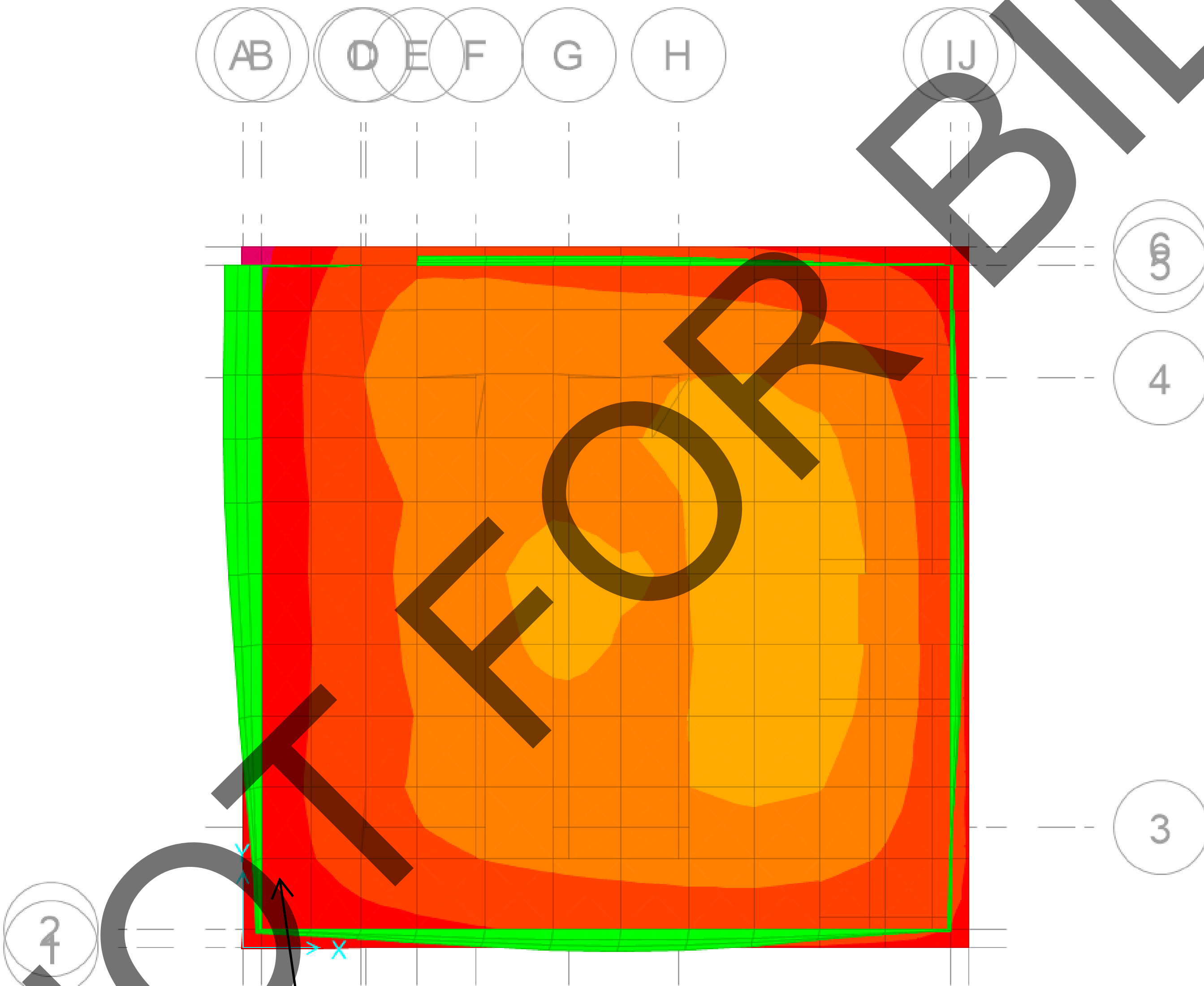


GENERATOR YARD - MAT SLAB EQ Y DIRECTION POINT LOADS



GENERATOR YARD - MAT SLAB MAX DEFLECTIONS



MAX SOIL PRESSURE = 860 PSF
ALLOWABLE SOIL PRESSURE (FROM GEOTECH SOILS REPORT) = 2500 PSF

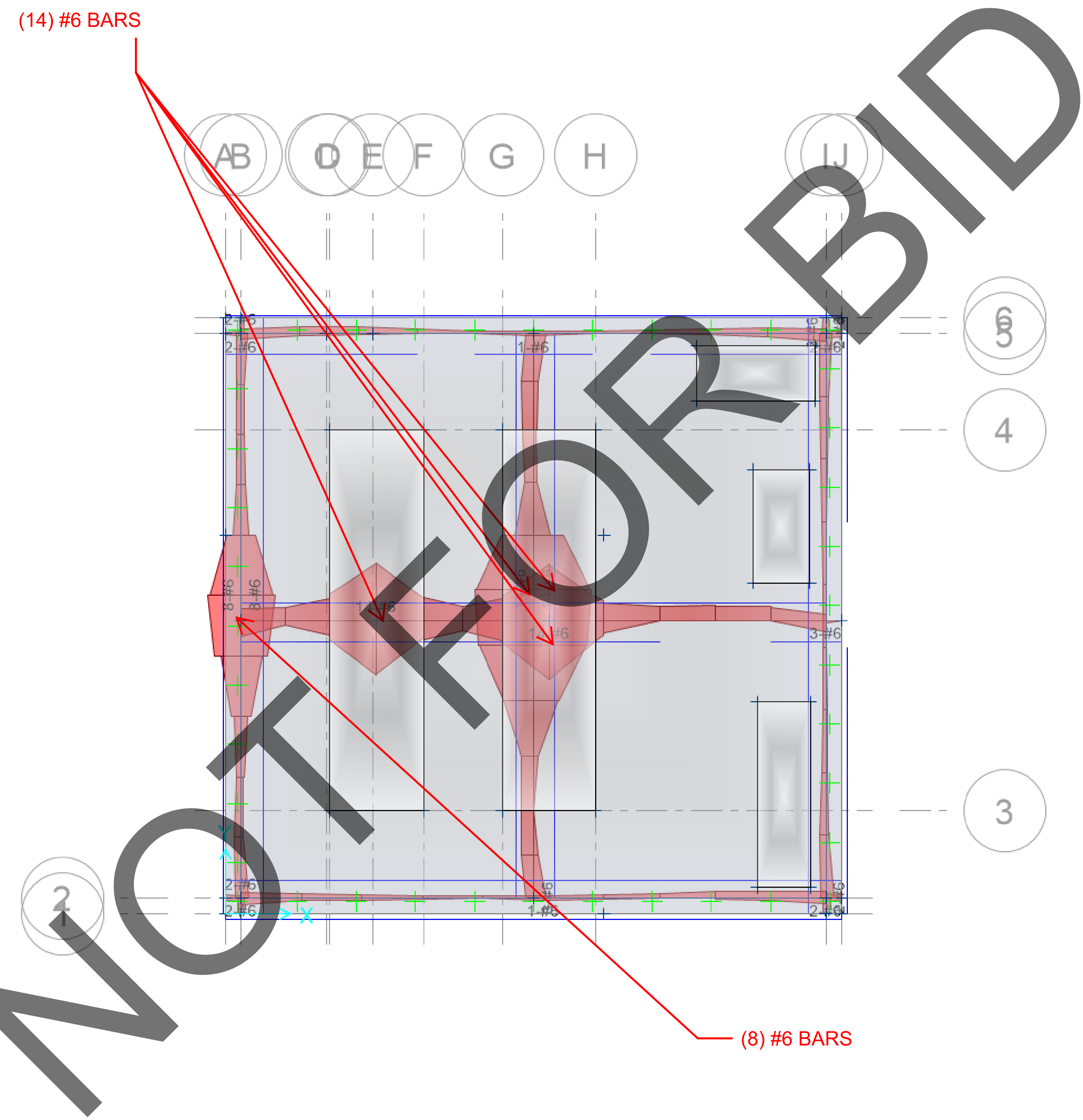
GENERATOR YARD - MAT SLAB SOIL PRESSURES

BUEHLER

PROJECT San Bernardino ISD

PROJECT NO. 2021-0014 DATE

CLIENT HOLT BY KRN SHEET NO. D10



GENERATOR YARD - MAT SLAB MAX DEFLECTIONS

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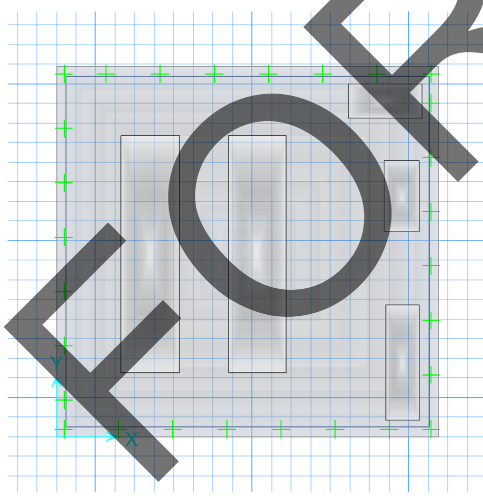


SAFE Analysis & Design Report

Prepared by

Buehler & Buehler Structural Engineers, Inc.

Model Name: Generator Yard_v2.fdb

7 January 2022

Model Definition

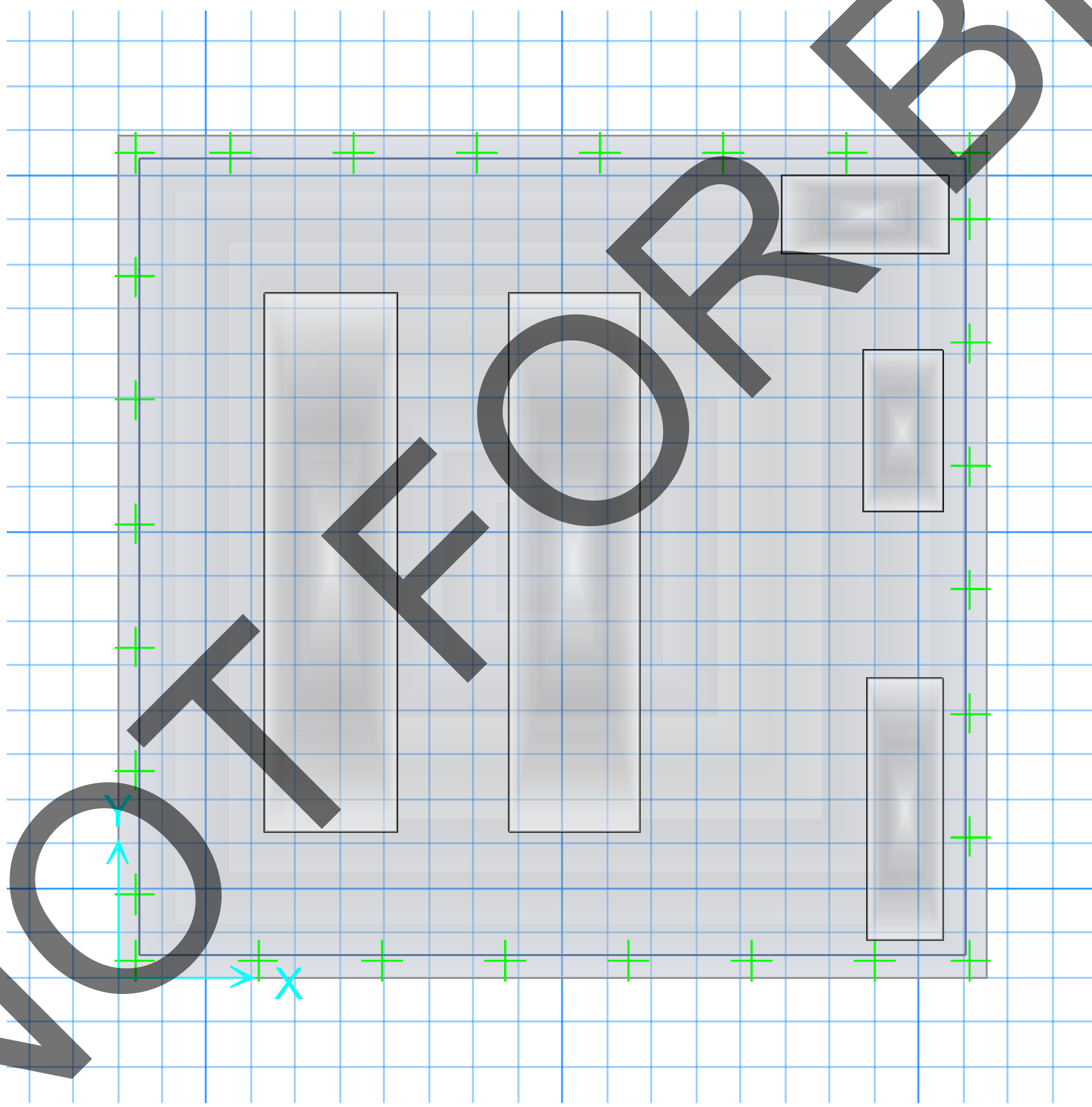


Figure 1: Finite element model

1. Model geometry

This section provides model geometry information, including items such as joint coordinates, joint restraints, and element connectivity.

1.1. Connectivity

Table 1: Concrete Slab Design Summary 02 - Span Definition Data

Table 1: Concrete Slab Design Summary 02 - Span Definition Data

Strip	SpanID	SpanLength	StartDist	GlobalX1	GlobalY1	GlobalX2	GlobalY2
		ft	ft	ft	ft	ft	ft
CSA4	Span 1	37.0800	1.0000	1.0000	36.7530	38.0800	36.7530
CSA5	Span 1	37.0800	1.0000	1.0000	1.0000	38.0800	1.0000
CSB1	Span 1	35.7530	1.0000	1.0000	36.7530	1.0000	1.0000
CSB2	Span 1	35.7530	1.0000	38.0800	36.7530	38.0800	1.0000
MSA3	Span 1	37.0800	0.0000	1.0000	18.5850	38.0800	18.5850
MSB2	Span 1	35.7530	0.0000	19.5400	36.7530	19.5400	1.0000

2. Model properties

This section provides model properties, including items such as material properties, section properties, and support properties.

2.1. Material properties

Table 2: Material Properties 03 - Concrete

Table 2: Material Properties 03 - Concrete

Material	E	U	A	UnitWt	Fc	LtWtConc	UserModRup
	kip/in2		1/F	lb/ft3	kip/in2		
Conc, 4000 PSI	3604.996	0.200000	5.5000E-06	1.5000E+02	4.000	No	No

Table 3: Material Properties 04 - Rebar

Table 3: Material Properties 04 - Rebar

Material	E	UnitWt	Fy	Fu
	kip/in2	lb/ft3	kip/in2	kip/in2
A615Gr60	29000.000	4.9000E+02	60.000	90.000

Table 4: Material Properties 05 - Tendon

Table 4: Material Properties 05 - Tendon

Material	E	UnitWt	Fy	Fu
	kip/in2	lb/ft3	kip/in2	kip/in2
A416Gr270	28500.000	4.9000E+02	245.100	270.000

Table 5: Material Properties 06 - Other

Table 5: Material Properties 06 - Other

Material	E	U	A	UnitWt
	kip/in2		1/F	lb/ft3
CMU, 135 PCF	1800.000	0.200000	5.5000E-06	1.3500E+02

2.2. Section properties

Table 6: Slab Properties 02 - Solid Slabs

Table 6: Slab Properties 02 - Solid Slabs

Slab	Type	MatProp	Thickness	Ortho
			in	
18" MAT, 4000 PSI	Mat	Conc, 4000 PSI	18.0000	No

Table 7: Beam Properties 02 - Rectangular Beam

Table 7: Beam Properties 02 - Rectangular Beam

Beam	MatProp	Depth	WidthTop	WidthBot
		in	in	in
BEAM1	Conc, 4000 PSI	24.0000	12.0000	12.0000

Table 8: Beam Properties 06 - Design Data

Table 8: Beam Properties 06 - Design Data

Beam	MatRebarL	MatRebarS	FlngWOpt	CoverTop	CoverBot	NoDesign
				in	in	
BEAM1	A615Gr60	A615Gr60	Analysis Property	3.0000	3.0000	No

Table 9: Tendon Properties

Table 9: Tendon Properties

TendonProp	MatProp	StrandArea
		in2
TENDON1	A416Gr270	0.15

Table 10: Column Properties 02 - Rectangular

Table 10: Column Properties 02 - Rectangular

Column	MatProp	SecDim2	SecDim3	AutoRigid	AutoDrop	IncludeCap
		in	in			
COL1	Conc, 4000 PSI	24.0000	12.0000	No	No	No

Table 11: Wall Properties

Table 11: Wall Properties

Wall	MatProp	Thickness	AutoRigid	OutOfPlane
		in		
CMU 12"	CMU, 135 PCF	12.0000	Yes	Yes

2.3. Support properties

Table 12: Soil Properties

Table 12: Soil Properties

Soil	Subgrade	NonlinOpt
	lb/ft3	
SOIL1	2.5920E+05	Compression Only

Table 13: Spring Properties - Point

Table 13: Spring Properties - Point

Spring	Ux	Uy	Uz	Rx	Ry	Rz	NonlinOpt
	kip/in	kip/in	kip/in	kip-in/rad	kip-in/rad	kip-in/rad	
PSPR1	0.0000	0.0000	0.0010	0.000	0.000	0.000	None (Linear)

Table 14: Spring Properties - Line

Table 14: Spring Properties - Line

Spring	VertStiff	RotStiff	NonlinOpt
	kip/in/in	kip/rad	
LSPR1	0.00100	0.0010	None (Linear)

3. Model assignments

This section provides model assignments, including assignments to slabs, beams, and joints.

3.1. Slab assignments

Table 15: Slab Property Assignments

Table 15: Slab Property Assignments

Area	SlabProp
1	None
6	18" MAT, 4000 PSI
15	None
16	None
25	None
26	None

3.2. Wall assignments

Table 16: Wall Property Assignments

Table 16: Wall Property Assignments

Area	WallProp
20	CMU 12"
21	CMU 12"
22	CMU 12"
23	CMU 12"
24	CMU 12"

3.3. Support assignments

Table 17: Soil Property Assignments

Table 17: Soil Property Assignments

Area	SoilProp
6	SOIL1

4. Model loading

This section provides model loading information, including load patterns, load cases, and load combinations.

4.1. Load patterns

Table 18: Load Patterns

Table 18: Load Patterns

LoadPat	Type	SelfWtMult
SELF WEIGHT	DEAD	1.000000
LIVE	LIVE	0.000000
EQ-X	QUAKE	0.000000
EQ-Y	QUAKE	0.000000
SUPER DEAD	SUPER DEAD	0.000000

Table 19: Load Assignments - Surface Loads

Table 19: Load Assignments - Surface Loads

Area	LoadPat	Dir	UnifLoad	A	B	C
			lb/ft2	lb/ft3	lb/ft3	lb/ft2
6	LIVE	Gravity	100.00	0.0000E+00	0.0000E+00	0.00
6	SUPER DEAD	Gravity	10.00	0.0000E+00	0.0000E+00	0.00
15	SUPER DEAD	Gravity	352.00	0.0000E+00	0.0000E+00	0.00
16	SUPER DEAD	Gravity	352.00	0.0000E+00	0.0000E+00	0.00
25	SUPER DEAD	Gravity	50.00	0.0000E+00	0.0000E+00	0.00
26	SUPER DEAD	Gravity	50.00	0.0000E+00	0.0000E+00	0.00
1	SUPER DEAD	Gravity	50.00	0.0000E+00	0.0000E+00	0.00

Table 20: Load Assignments - Line Objects - Distributed Loads, Part 1 of 2

Table 20: Load Assignments - Line Objects - Distributed Loads, Part 1 of 2

Line	LoadPat	Type	Dir	RelDistA	RelDistB	AbsDistA	AbsDistB
						ft	ft
9	EQ-Y	Moment	Global X	0.0000	1.0000	0.0000	37.0800
10	EQ-X	Moment	Global Y	0.0000	1.0000	0.0000	35.7530
11	EQ-Y	Moment	Global X	0.0000	1.0000	0.0000	37.0800
12	EQ-X	Moment	Global Y	0.0000	1.0000	0.0000	35.7530

Table 20: Load Assignments - Line Objects - Distributed Loads, Part 2 of 2

Table 20: Load Assignments - Line Objects - Distributed Loads, Part 2 of 2

Line	LoadPat	MOverLA	MOverLB
		kip-ft/ft	kip-ft/ft
9	EQ-Y	2.1000	2.1000
10	EQ-X	2.1000	2.1000
11	EQ-Y	2.1000	2.1000
12	EQ-X	2.1000	2.1000

Table 21: Load Assignments - Point Loads, Part 1 of 2

Table 21: Load Assignments - Point Loads, Part 1 of 2

Point	LoadPat	Fx	Fy	Fgrav
		kip	kip	kip
85	EQ-X	0.000	0.000	0.000
85	EQ-Y	0.000	0.000	0.000
86	EQ-X	0.000	0.000	0.000
86	EQ-Y	0.000	0.000	0.000

Table 21: Load Assignments - Point Loads, Part 2 of 2

Table 21: Load Assignments - Point Loads, Part 2 of 2

Point	Mx	My	Mz	XDim	YDim
	kip-ft	kip-ft	kip-ft	in	in
85	0.0000	240.0000	0.0000	0.0000	0.0000
85	194.0000	0.0000	0.0000	0.0000	0.0000
86	0.0000	240.0000	0.0000	0.0000	0.0000
86	194.0000	0.0000	0.0000	0.0000	0.0000

4.2. Load cases

Table 22: Load Cases 02 - Static

Table 22: Load Cases 02 - Static

LoadCase	InitialCond	AType
SELF WEIGHT	Zero	Linear
LIVE	Zero	Linear
EQ-X	Zero	Linear
EQ-Y	Zero	Linear
SUPER DEAD	Zero	Linear

Table 23: Load Cases 06 - Loads Applied

Table 23: Load Cases 06 - Loads Applied

LoadCase	LoadPat	SF
SELF WEIGHT	SELF WEIGHT	1.000000
LIVE	LIVE	1.000000
EQ-X	EQ-X	1.000000
EQ-Y	EQ-Y	1.000000
SUPER DEAD	SUPER DEAD	1.000000

4.3. Load combinations

Table 24: Load Combinations

Table 24: Load Combinations

Combo	Load	SF	Type	DSStrength	DSServInit	DSServNorm	DSServLong
ASD ENVELOPE	ASD1: D	1.000000	Envelope	No	No	No	No
ASD ENVELOPE	ASD2: D+L	1.000000					
ASD ENVELOPE	ASD8A: 1.0D+0.7(Ex+Ey)	1.000000					
ASD ENVELOPE	ASD8B: 1.0D+0.7(Ex-Ey)	1.000000					
ASD ENVELOPE	ASD8C: 1.0D+0.7(-Ex+Ey)	1.000000					
ASD ENVELOPE	ASD8D: 1.0D+0.7(-Ex-Ey)	1.000000					
ASD ENVELOPE	ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	1.000000					
ASD ENVELOPE	ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	1.000000					
ASD ENVELOPE	ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	1.000000					
ASD ENVELOPE	ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	1.000000					
ASD ENVELOPE	ASD10A: 0.6D+0.7(Ex+Ey)	1.000000					
ASD ENVELOPE	ASD10B: 0.6D+0.7(Ex-Ey)	1.000000					
ASD ENVELOPE	ASD10C: 0.6D+0.7(-Ex+Ey)	1.000000					
ASD ENVELOPE	ASD10D: 0.6D+0.7(-Ex-Ey)	1.000000					
ASD10A: 0.6D+0.7(Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD10A: 0.6D+0.7(Ex+Ey)	SUPER DEAD	0.600000					
ASD10A: 0.6D+0.7(Ex+Ey)	EQ-X	0.910000					
ASD10A: 0.6D+0.7(Ex+Ey)	EQ-Y	0.910000					
ASD10B: 0.6D+0.7(Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD10B: 0.6D+0.7(Ex-Ey)	SUPER DEAD	0.600000					
ASD10B: 0.6D+0.7(Ex-Ey)	EQ-X	0.910000					
ASD10B: 0.6D+0.7(Ex-Ey)	EQ-Y	-0.910000					
ASD10C: 0.6D+0.7(-Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No

Table 24: Load Combinations

Combo	Load	SF	Type	DSStrength	DSServInit	DSServNorm	DSServLong
ASD10C: 0.6D+0.7(-Ex+Ey)	SUPER DEAD	0.600000					
ASD10C: 0.6D+0.7(-Ex+Ey)	EQ-X	-0.910000					
ASD10C: 0.6D+0.7(-Ex+Ey)	EQ-Y	0.910000					
ASD10D: 0.6D+0.7(-Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD10D: 0.6D+0.7(-Ex-Ey)	SUPER DEAD	0.600000					
ASD10D: 0.6D+0.7(-Ex-Ey)	EQ-X	-0.910000					
ASD10D: 0.6D+0.7(-Ex-Ey)	EQ-Y	-0.910000					
ASD1: D	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD1: D	SUPER DEAD	1.000000					
ASD2: D+L	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD2: D+L	LIVE	1.000000					
ASD2: D+L	SUPER DEAD	1.000000					
ASD8A: 1.0D+0.7(Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD8A: 1.0D+0.7(Ex+Ey)	SUPER DEAD	1.000000					
ASD8A: 1.0D+0.7(Ex+Ey)	EQ-X	0.910000					
ASD8A: 1.0D+0.7(Ex+Ey)	EQ-Y	0.910000					
ASD8B: 1.0D+0.7(Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD8B: 1.0D+0.7(Ex-Ey)	SUPER DEAD	1.000000					
ASD8B: 1.0D+0.7(Ex-Ey)	EQ-X	0.910000					
ASD8B: 1.0D+0.7(Ex-Ey)	EQ-Y	-0.910000					
ASD8C: 1.0D+0.7(-Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD8C: 1.0D+0.7(-Ex+Ey)	SUPER DEAD	1.000000					
ASD8C: 1.0D+0.7(-Ex+Ey)	EQ-X	-0.910000					
ASD8C: 1.0D+0.7(-Ex+Ey)	EQ-Y	0.910000					

Table 24: Load Combinations

Combo	Load	SF	Type	DSStrength	DSServInit	DSServNorm	DSServLong
ASD8D: 1.0D+0.7(-Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD8D: 1.0D+0.7(-Ex-Ey)	SUPER DEAD	1.000000					
ASD8D: 1.0D+0.7(-Ex-Ey)	EQ-X	-0.910000					
ASD8D: 1.0D+0.7(-Ex-Ey)	EQ-Y	-0.910000					
ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	SUPER DEAD	1.000000					
ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	LIVE	0.750000					
ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	EQ-X	0.683000					
ASD9A: 1.0D+0.75L+0.525(Ex+Ey)	EQ-Y	0.683000					
ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	SUPER DEAD	1.000000					
ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	LIVE	0.750000					
ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	EQ-X	0.683000					
ASD9B: 1.0D+0.75L+0.525(Ex-Ey)	EQ-Y	-0.683000					
ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No
ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	SUPER DEAD	1.000000					
ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	LIVE	0.750000					
ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	EQ-X	-0.683000					
ASD9C: 1.0D+0.75L+0.525(-Ex+Ey)	EQ-Y	0.683000					
ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	SELF WEIGHT	1.000000	Linear Add	No	No	No	No

Table 24: Load Combinations

Combo	Load	SF	Type	DSStrength	DSServInit	DSServNorm	DSServLong
ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	SUPER DEAD	1.000000					
ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	LIVE	0.750000					
ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	EQ-X	-0.683000					
ASD9D: 1.0D+0.75L+0.525(-Ex-Ey)	EQ-Y	-0.683000					
LRFD ENVELOPE	LRFD1: 1.4D	1.000000	Envelope	Yes	No	No	No
LRFD ENVELOPE	LRFD2: 1.2D+1.6L	1.000000					
LRFD ENVELOPE	LRFD6A: 1.2D+L+Ex+Ey	1.000000					
LRFD ENVELOPE	LRFD6B: 1.2D+L+Ex-Ey	1.000000					
LRFD ENVELOPE	LRFD6C: 1.2D+L-Ex+Ey	1.000000					
LRFD ENVELOPE	LRFD6D: 1.2D+L-Ex-Ey	1.000000					
LRFD ENVELOPE	LRFD7A: 0.9D+Ex+Ey	1.000000					
LRFD ENVELOPE	LRFD7B: 0.9D+Ex-Ey	1.000000					
LRFD ENVELOPE	LRFD7C: 0.9D-Ex+Ey	1.000000					
LRFD ENVELOPE	LRFD7D: 0.9D-Ex-Ey	1.000000					
LRFD1: 1.4D	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD1: 1.4D	SUPER DEAD	1.400000					
LRFD2: 1.2D+1.6L	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD2: 1.2D+1.6L	SUPER DEAD	1.200000					
LRFD2: 1.2D+1.6L	LIVE	1.600000					
LRFD6A: 1.2D+L+Ex+Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD6A: 1.2D+L+Ex+Ey	SUPER DEAD	1.200000					
LRFD6A: 1.2D+L+Ex+Ey	LIVE	1.000000					
LRFD6A: 1.2D+L+Ex+Ey	EQ-X	1.300000					
LRFD6A: 1.2D+L+Ex+Ey	EQ-Y	1.300000					
LRFD6B: 1.2D+L+Ex-Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD6B: 1.2D+L+Ex-Ey	SUPER DEAD	1.200000					
LRFD6B: 1.2D+L+Ex-Ey	LIVE	1.000000					
LRFD6B: 1.2D+L+Ex-Ey	EQ-X	1.300000					

Table 24: Load Combinations

Combo	Load	SF	Type	DSStrength	DSServInit	DSServNorm	DSServLong
LRFD6B: 1.2D+L+Ex-Ey	EQ-Y	-1.300000					
LRFD6C: 1.2D+L-Ex+Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD6C: 1.2D+L-Ex+Ey	SUPER DEAD	1.200000					
LRFD6C: 1.2D+L-Ex+Ey	LIVE	1.000000					
LRFD6C: 1.2D+L-Ex+Ey	EQ-X	-1.300000					
LRFD6C: 1.2D+L-Ex+Ey	EQ-Y	1.300000					
LRFD6D: 1.2D+L-Ex-Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD6D: 1.2D+L-Ex-Ey	SUPER DEAD	1.200000					
LRFD6D: 1.2D+L-Ex-Ey	LIVE	1.000000					
LRFD6D: 1.2D+L-Ex-Ey	EQ-X	-1.300000					
LRFD6D: 1.2D+L-Ex-Ey	EQ-Y	-1.300000					
LRFD7A: 0.9D+Ex+Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD7A: 0.9D+Ex+Ey	SUPER DEAD	0.900000					
LRFD7A: 0.9D+Ex+Ey	EQ-X	1.300000					
LRFD7A: 0.9D+Ex+Ey	EQ-Y	1.300000					
LRFD7B: 0.9D+Ex-Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD7B: 0.9D+Ex-Ey	SUPER DEAD	0.900000					
LRFD7B: 0.9D+Ex-Ey	EQ-X	1.300000					
LRFD7B: 0.9D+Ex-Ey	EQ-Y	-1.300000					
LRFD7C: 0.9D-Ex+Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD7C: 0.9D-Ex+Ey	SUPER DEAD	0.900000					
LRFD7C: 0.9D-Ex+Ey	EQ-X	-1.300000					
LRFD7C: 0.9D-Ex+Ey	EQ-Y	1.300000					
LRFD7D: 0.9D-Ex-Ey	SELF WEIGHT	1.000000	Linear Add	Yes	No	No	No
LRFD7D: 0.9D-Ex-Ey	SUPER DEAD	0.900000					
LRFD7D: 0.9D-Ex-Ey	EQ-X	-1.300000					
LRFD7D: 0.9D-Ex-Ey	EQ-Y	-1.300000					

Analysis Results

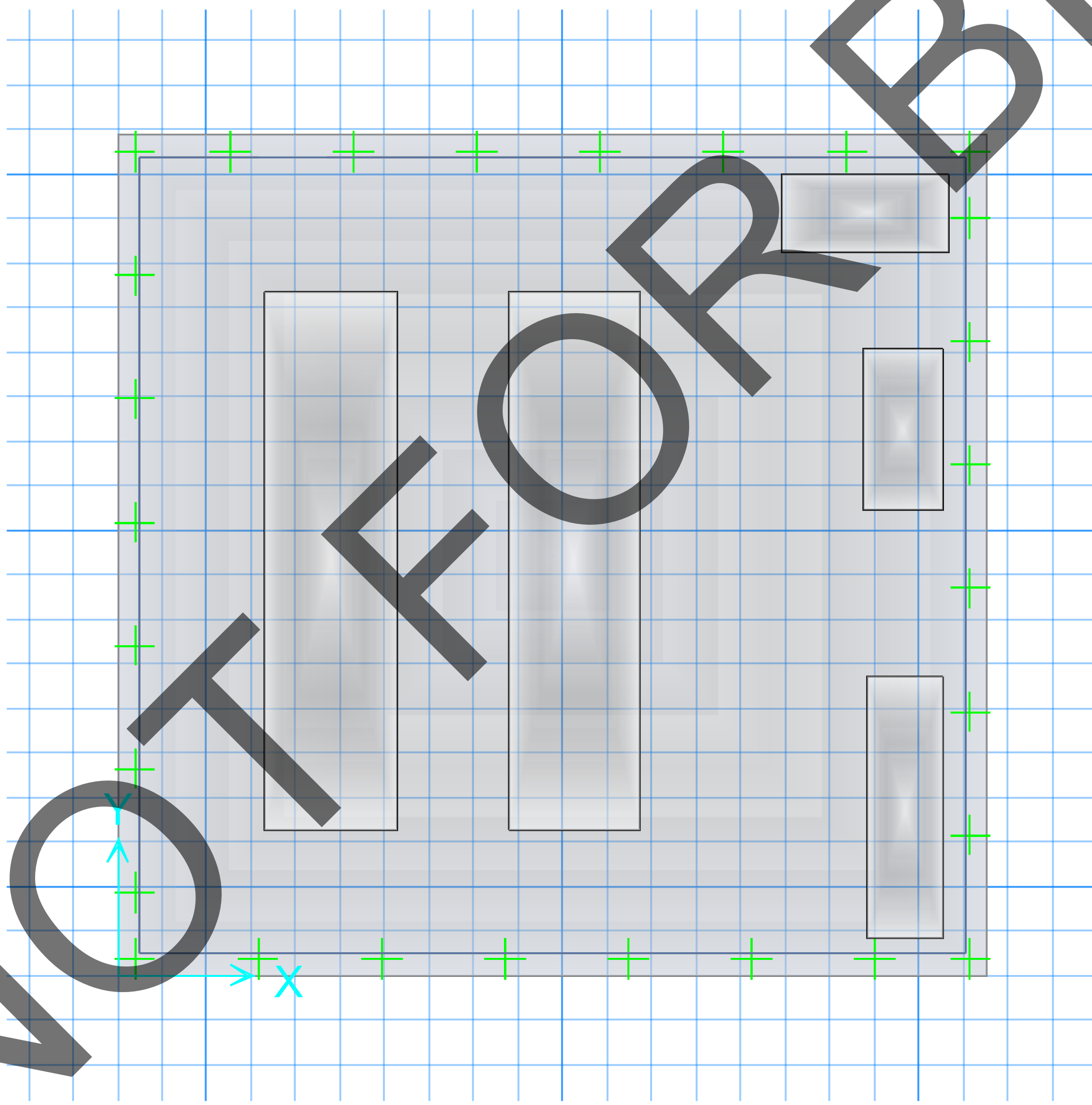


Figure 2: Deformed shape

5. Analysis results

5.1. Support results

This section provides support results, including items such as column, support, and spring reactions, .

Table 25: Soil Pressures - Summary

Table 25: Soil Pressures - Summary

Panel	OutputCase	MaxPress	MinPress	GlobalXMax	GlobalYMax	GlobalXMin	GlobalYMin
		kip/in2	kip/in2	ft	ft	ft	ft
1	SELF WEIGHT	-0.0040	-0.0041	0.0000	1.0000	0.0000	1.0000
2	SELF WEIGHT	-0.0039	-0.0041	0.0000	4.8333	0.0000	4.8333
3	SELF WEIGHT	-0.0039	-0.0044	0.0000	12.5000	0.0000	30.8765
4	SELF WEIGHT	-0.0041	-0.0045	0.0000	34.3148	0.0000	36.7530
5	SELF WEIGHT	-0.0043	-0.0045	0.0000	37.7530	0.0000	37.7530
6	SELF WEIGHT	-0.0038	-0.0040	3.6850	1.0000	1.0000	1.0000
7	SELF WEIGHT	-0.0032	-0.0040	3.6850	4.8333	1.0000	4.8333
8	SELF WEIGHT	-0.0023	-0.0041	3.6850	20.1667	1.0000	30.8765
9	SELF WEIGHT	-0.0027	-0.0043	3.6850	34.3148	1.0000	36.7530
10	SELF WEIGHT	-0.0033	-0.0043	3.6850	37.7530	1.0000	37.7530
13	SELF WEIGHT	-0.0027	-0.0030	6.6200	8.6667	6.6200	8.6667
16	SELF WEIGHT	-0.0038	-0.0040	6.3700	1.0000	6.3700	1.0000
17	SELF WEIGHT	-0.0026	-0.0038	6.4787	6.5000	6.3700	4.8333
18	SELF WEIGHT	-0.0018	-0.0029	6.6200	20.1667	6.6200	8.6667
19	SELF WEIGHT	-0.0023	-0.0033	6.3700	34.3148	6.3700	36.7530
20	SELF WEIGHT	-0.0031	-0.0035	6.3700	37.7530	6.3700	37.7530
21	SELF WEIGHT	-0.0038	-0.0040	9.3700	1.0000	9.3700	1.0000
22	SELF WEIGHT	-0.0024	-0.0038	9.3700	6.5000	9.3700	4.8333
23	SELF WEIGHT	-0.0014	-0.0026	9.3700	20.1667	9.3700	8.6667
24	SELF WEIGHT	-0.0020	-0.0032	9.3700	30.6700	9.3700	36.7530
25	SELF WEIGHT	-0.0031	-0.0034	9.3700	37.7530	9.3700	37.7530
26	SELF WEIGHT	-0.0037	-0.0040	13.0275	1.0000	13.0275	1.0000
27	SELF WEIGHT	-0.0023	-0.0038	16.6850	6.5000	13.0275	4.8333
28	SELF WEIGHT	-0.0012	-0.0028	16.6850	20.1667	13.0275	8.6667
29	SELF WEIGHT	-0.0020	-0.0034	13.0275	34.3148	13.0275	36.7530
30	SELF WEIGHT	-0.0032	-0.0036	13.0275	37.7530	13.0275	37.7530
31	SELF WEIGHT	-0.0037	-0.0040	16.6850	1.0000	16.6850	1.0000
32	SELF WEIGHT	-0.0023	-0.0037	17.5400	6.5000	16.6850	4.8333
33	SELF WEIGHT	-0.0011	-0.0023	20.3425	20.1667	20.3425	8.6667
34	SELF WEIGHT	-0.0020	-0.0036	17.5400	30.6700	20.3425	36.7530
35	SELF WEIGHT	-0.0034	-0.0039	16.6850	37.7530	20.3425	37.7530
36	SELF WEIGHT	-0.0037	-0.0040	24.0000	1.0000	24.0000	1.0000
37	SELF WEIGHT	-0.0023	-0.0039	23.4600	6.5000	37.0833	1.6667
38	SELF WEIGHT	-0.0012	-0.0041	23.4600	20.1667	37.0625	30.8765
39	SELF WEIGHT	-0.0022	-0.0043	24.0000	34.3148	37.3750	36.7530
40	SELF WEIGHT	-0.0036	-0.0043	24.0000	37.7530	34.5600	37.7530
41	SELF WEIGHT	-0.0039	-0.0040	38.0800	1.0000	38.0800	1.0000
42	SELF WEIGHT	-0.0039	-0.0040	38.0800	4.8333	38.0800	4.8333
43	SELF WEIGHT	-0.0038	-0.0043	38.0800	8.6667	38.0800	30.8765
44	SELF WEIGHT	-0.0041	-0.0043	38.0800	34.3148	38.0800	36.7530
45	SELF WEIGHT	-0.0043	-0.0044	38.0800	37.7530	38.0800	37.7530
1	LIVE	-6.944E-004	-6.944E-004	0.0000	1.0000	0.0000	1.0000
2	LIVE	-6.944E-004	-6.944E-004	0.0000	4.8333	0.0000	4.8333
3	LIVE	-6.944E-004	-6.944E-004	0.0000	24.0000	0.0000	30.8765

Table 25: Soil Pressures - Summary

Panel	OutputCase	MaxPress	MinPress	GlobalXMax	GlobalYMax	GlobalXMin	GlobalYMin
		kip/in2	kip/in2	ft	ft	ft	ft
4	LIVE	-6.944E-004	-6.944E-004	0.0000	34.3148	0.0000	34.3148
5	LIVE	-6.944E-004	-6.944E-004	0.0000	37.7530	0.0000	37.7530
6	LIVE	-6.944E-004	-6.944E-004	1.0000	1.0000	3.6850	1.0000
7	LIVE	-6.944E-004	-6.944E-004	1.0000	4.8333	3.6850	4.8333
8	LIVE	-6.944E-004	-6.944E-004	1.0000	8.6667	3.6850	27.4383
9	LIVE	-6.944E-004	-6.944E-004	1.0000	36.7530	3.6850	34.3148
10	LIVE	-6.944E-004	-6.944E-004	1.0000	37.7530	3.6850	37.7530
13	LIVE	-6.944E-004	-6.944E-004	6.6200	8.6667	6.6200	8.6667
16	LIVE	-6.944E-004	-6.944E-004	6.3700	1.0000	6.3700	1.0000
17	LIVE	-6.944E-004	-6.944E-004	6.3700	4.8333	6.4787	6.5000
18	LIVE	-6.944E-004	-6.944E-004	6.6200	8.6667	6.6200	27.4383
19	LIVE	-6.944E-004	-6.944E-004	6.3700	36.7530	6.3700	34.3148
20	LIVE	-6.944E-004	-6.944E-004	6.3700	37.7530	6.3700	37.7530
21	LIVE	-6.944E-004	-6.944E-004	9.3700	1.0000	9.3700	1.0000
22	LIVE	-6.944E-004	-6.944E-004	9.3700	4.8333	9.3700	6.5000
23	LIVE	-6.944E-004	-6.944E-004	9.3700	8.6667	12.5385	30.8489
24	LIVE	-6.944E-004	-6.944E-004	9.3700	36.7530	9.3700	30.6700
25	LIVE	-6.944E-004	-6.944E-004	9.3700	37.7530	9.3700	37.7530
26	LIVE	-6.944E-004	-6.944E-004	13.0275	1.0000	13.0275	1.0000
27	LIVE	-6.944E-004	-6.944E-004	13.0275	4.8333	12.5400	6.5000
28	LIVE	-6.944E-004	-6.944E-004	13.0275	8.6667	12.5385	30.8489
29	LIVE	-6.944E-004	-6.944E-004	13.0275	36.7530	13.0275	34.3148
30	LIVE	-6.944E-004	-6.944E-004	13.0275	37.7530	13.0275	37.7530
31	LIVE	-6.944E-004	-6.944E-004	16.6850	1.0000	20.3425	1.0000
32	LIVE	-6.944E-004	-6.944E-004	16.6850	4.8333	17.5400	6.5000
33	LIVE	-6.944E-004	-6.944E-004	20.3425	8.6667	17.5400	30.6700
34	LIVE	-6.944E-004	-6.944E-004	20.3425	36.7530	16.6850	34.3148
35	LIVE	-6.944E-004	-6.944E-004	20.3425	37.7530	16.6850	37.7530
36	LIVE	-6.944E-004	-6.944E-004	24.0000	1.0000	34.5600	1.0000
37	LIVE	-6.944E-004	-6.944E-004	23.4600	6.5000	37.0833	1.6667
38	LIVE	-6.944E-004	-6.944E-004	37.0625	30.8765	23.4600	29.7779
39	LIVE	-6.944E-004	-6.944E-004	37.3750	36.7530	24.0000	34.3148
40	LIVE	-6.944E-004	-6.944E-004	34.5600	37.7530	24.0000	37.7530
41	LIVE	-6.944E-004	-6.944E-004	38.0800	1.0000	38.0800	1.0000
42	LIVE	-6.944E-004	-6.944E-004	38.0800	4.8333	38.0800	4.8333
43	LIVE	-6.944E-004	-6.944E-004	38.0800	30.8765	38.0800	8.6667
44	LIVE	-6.944E-004	-6.944E-004	38.0800	36.7530	38.0800	34.3148
45	LIVE	-6.944E-004	-6.944E-004	38.0800	37.7530	38.0800	37.7530
1	EQ-X	5.696E-004	4.959E-004	0.0000	1.0000	0.0000	1.0000
2	EQ-X	6.576E-004	5.080E-004	0.0000	4.8333	0.0000	4.8333
3	EQ-X	9.560E-004	5.674E-004	0.0000	30.8765	0.0000	8.6667
4	EQ-X	9.560E-004	7.981E-004	0.0000	34.3148	0.0000	36.7530
5	EQ-X	9.445E-004	7.954E-004	0.0000	37.7530	0.0000	37.7530
6	EQ-X	5.080E-004	3.191E-004	1.0000	1.0000	3.6850	1.0000
7	EQ-X	5.674E-004	2.626E-004	1.0000	4.8333	3.6850	4.8333
8	EQ-X	8.525E-004	2.074E-004	1.0000	20.1667	3.6850	30.8765
9	EQ-X	8.030E-004	1.820E-004	1.0000	34.3148	3.6850	36.7530
10	EQ-X	7.981E-004	1.750E-004	1.0000	37.7530	3.6850	37.7530
13	EQ-X	2.607E-004	2.448E-004	6.6200	8.6667	6.6200	8.6667
16	EQ-X	3.316E-004	2.525E-004	6.3700	1.0000	6.3700	1.0000
17	EQ-X	3.191E-004	1.538E-004	6.3700	4.8333	6.4787	6.5000
18	EQ-X	7.796E-004	6.686E-005	6.6200	20.1667	6.6200	30.6700
19	EQ-X	2.074E-004	3.554E-005	6.3700	34.3148	6.3700	36.7530
20	EQ-X	1.820E-004	3.018E-005	6.3700	37.7530	6.3700	37.7530

Table 25: Soil Pressures - Summary

Panel	OutputCase	MaxPress	MinPress	GlobalXMax	GlobalYMax	GlobalXMin	GlobalYMin
		kip/in2	kip/in2	ft	ft	ft	ft
21	EQ-X	2.716E-004	1.794E-004	9.3700	1.0000	9.3700	1.0000
22	EQ-X	2.525E-004	7.341E-005	9.3700	4.8333	9.3700	6.5000
23	EQ-X	2.515E-004	-2.374E-004	9.3700	20.1667	9.3700	20.1667
24	EQ-X	6.686E-005	-3.045E-005	9.3700	34.3148	9.3700	34.3148
25	EQ-X	3.554E-005	-1.778E-006	9.3700	37.7530	9.3700	37.7530
26	EQ-X	2.009E-004	1.126E-004	13.0275	1.0000	13.0275	1.0000
27	EQ-X	1.794E-004	-2.833E-005	13.0275	4.8333	16.6850	6.5000
28	EQ-X	9.364E-005	-2.374E-004	13.0275	8.6667	12.5400	20.1667
29	EQ-X	-1.778E-006	-7.773E-005	13.0275	36.7530	13.0275	34.3148
30	EQ-X	3.049E-006	-9.905E-006	13.0275	37.7530	13.0275	37.7530
31	EQ-X	1.339E-004	-8.551E-006	16.6850	1.0000	20.3425	1.0000
32	EQ-X	1.126E-004	-1.195E-004	16.6850	4.8333	20.3425	6.5000
33	EQ-X	4.894E-005	-8.753E-004	17.5400	20.1667	20.3425	20.1667
34	EQ-X	-9.905E-006	-1.360E-004	16.6850	36.7530	22.0438	30.7661
35	EQ-X	5.520E-007	-3.650E-005	16.6850	37.7530	20.3425	37.7530
36	EQ-X	5.377E-006	-2.816E-004	24.0000	1.0000	34.5600	1.0000
37	EQ-X	-8.551E-006	-2.809E-004	24.0000	4.8333	37.0833	1.6667
38	EQ-X	-6.085E-005	-8.753E-004	31.0400	30.8765	23.4600	20.1667
39	EQ-X	-3.650E-005	-1.974E-004	24.0000	36.7530	37.3750	32.5000
40	EQ-X	-2.759E-005	-1.600E-004	24.0000	37.7530	34.5600	37.7530
41	EQ-X	-2.809E-004	-3.094E-004	38.0800	1.0000	38.0800	1.0000
42	EQ-X	-2.805E-004	-3.444E-004	38.0800	4.8333	38.0800	4.8333
43	EQ-X	-1.974E-004	-3.524E-004	38.0800	30.8765	38.0800	8.6667
44	EQ-X	-1.600E-004	-2.637E-004	38.0800	36.7530	38.0800	34.3148
45	EQ-X	-1.540E-004	-1.840E-004	38.0800	37.7530	38.0800	37.7530
1	EQ-Y	-3.403E-004	-3.870E-004	0.0000	1.0000	0.0000	1.0000
2	EQ-Y	-2.405E-004	-3.431E-004	0.0000	4.8333	0.0000	4.8333
3	EQ-Y	1.444E-004	-2.469E-004	0.0000	30.8765	0.0000	8.6667
4	EQ-Y	2.634E-004	1.144E-004	0.0000	36.7530	0.0000	34.3148
5	EQ-Y	3.091E-004	2.372E-004	0.0000	37.7530	0.0000	37.7530
6	EQ-Y	-3.431E-004	-4.019E-004	1.0000	1.0000	3.6850	1.0000
7	EQ-Y	-2.469E-004	-3.451E-004	1.0000	4.8333	1.0000	4.8333
8	EQ-Y	4.765E-004	-4.844E-004	3.6850	24.0000	3.6850	12.5000
9	EQ-Y	3.920E-004	1.444E-004	3.6850	36.7530	1.0000	34.3148
10	EQ-Y	4.638E-004	2.634E-004	3.6850	37.7530	1.0000	37.7530
13	EQ-Y	-2.877E-004	-3.639E-004	6.6200	8.6667	6.6200	8.6667
16	EQ-Y	-3.419E-004	-4.019E-004	6.3700	1.0000	6.3700	1.0000
17	EQ-Y	-2.587E-004	-3.440E-004	6.3700	4.8333	6.3700	4.8333
18	EQ-Y	6.651E-004	-6.313E-004	6.6200	24.0000	6.6200	12.5000
19	EQ-Y	4.258E-004	2.770E-004	6.3700	36.7530	6.3700	34.3148
20	EQ-Y	5.022E-004	3.920E-004	6.3700	37.7530	6.3700	37.7530
21	EQ-Y	-3.372E-004	-3.993E-004	9.3700	1.0000	9.3700	1.0000
22	EQ-Y	-2.734E-004	-3.419E-004	9.3700	6.5000	9.3700	4.8333
23	EQ-Y	6.651E-004	-6.313E-004	9.3700	24.0000	9.3700	12.5000
24	EQ-Y	4.258E-004	3.054E-004	9.3700	36.7530	9.3700	34.3148
25	EQ-Y	5.022E-004	4.129E-004	9.3700	37.7530	9.3700	37.7530
26	EQ-Y	-3.283E-004	-3.935E-004	13.0275	1.0000	13.0275	1.0000
27	EQ-Y	-2.661E-004	-3.398E-004	16.6850	6.5000	12.5400	6.5000
28	EQ-Y	6.303E-004	-6.156E-004	12.5400	24.0000	12.5400	12.5000
29	EQ-Y	4.129E-004	2.801E-004	13.0275	36.7530	13.0275	34.3148
30	EQ-Y	4.860E-004	3.817E-004	13.0275	37.7530	13.0275	37.7530
31	EQ-Y	-2.956E-004	-3.858E-004	20.3425	1.0000	16.6850	1.0000
32	EQ-Y	-1.831E-004	-3.283E-004	20.3425	4.8333	16.6850	4.8333
33	EQ-Y	6.679E-004	-6.231E-004	20.3425	24.0000	20.3425	12.5000

Table 25: Soil Pressures - Summary

Panel	OutputCase	MaxPress	MinPress	GlobalXMax	GlobalYMax	GlobalXMin	GlobalYMin
		kip/in2	kip/in2	ft	ft	ft	ft
34	EQ-Y	3.817E-004	1.932E-004	16.6850	36.7530	20.3425	34.3148
35	EQ-Y	4.525E-004	3.140E-004	16.6850	37.7530	20.3425	37.7530
36	EQ-Y	-2.095E-004	-3.647E-004	34.5600	1.0000	24.0000	1.0000
37	EQ-Y	-9.145E-005	-2.956E-004	31.0400	4.8333	24.0000	4.8333
38	EQ-Y	4.731E-004	-4.554E-004	23.4600	24.0000	23.4600	12.5000
39	EQ-Y	3.140E-004	5.976E-005	24.0000	36.7530	31.0400	32.5000
40	EQ-Y	3.904E-004	1.709E-004	24.0000	37.7530	34.5600	37.7530
41	EQ-Y	-2.041E-004	-2.348E-004	38.0800	1.0000	38.0800	1.0000
42	EQ-Y	-1.286E-004	-2.095E-004	38.0800	4.8333	38.0800	4.8333
43	EQ-Y	8.836E-005	-1.358E-004	38.0800	30.8765	38.0800	8.6667
44	EQ-Y	1.709E-004	8.260E-005	38.0800	36.7530	38.0800	34.3148
45	EQ-Y	1.927E-004	1.617E-004	38.0800	37.7530	38.0800	37.7530
1	SUPER DEAD	-2.767E-004	-2.907E-004	0.0000	1.0000	0.0000	1.0000
2	SUPER DEAD	-2.789E-004	-3.125E-004	0.0000	4.8333	0.0000	4.8333
3	SUPER DEAD	-1.578E-004	-3.258E-004	0.0000	30.8765	0.0000	12.5000
4	SUPER DEAD	-1.238E-004	-2.248E-004	0.0000	36.7530	0.0000	34.3148
5	SUPER DEAD	-1.099E-004	-1.541E-004	0.0000	37.7530	0.0000	37.7530
6	SUPER DEAD	-2.400E-004	-2.947E-004	3.6850	1.0000	1.0000	1.0000
7	SUPER DEAD	-2.884E-004	-4.965E-004	3.6850	4.8333	3.6850	4.8333
8	SUPER DEAD	-2.248E-004	-9.955E-004	1.0000	30.8765	3.6850	20.1667
9	SUPER DEAD	-1.541E-004	-6.056E-004	1.0000	36.7530	3.6850	34.3148
10	SUPER DEAD	-1.377E-004	-2.738E-004	1.0000	37.7530	3.6850	37.7530
13	SUPER DEAD	-6.019E-004	-7.355E-004	6.6200	8.6667	6.6200	8.6667
16	SUPER DEAD	-2.087E-004	-2.884E-004	6.3700	1.0000	6.3700	1.0000
17	SUPER DEAD	-2.777E-004	-7.124E-004	6.3700	4.8333	6.4787	6.5000
18	SUPER DEAD	-6.056E-004	-0.0012	6.6200	30.6700	6.6200	20.1667
19	SUPER DEAD	-2.738E-004	-7.345E-004	6.3700	36.7530	6.3700	34.3148
20	SUPER DEAD	-2.297E-004	-2.940E-004	6.3700	37.7530	6.3700	37.7530
21	SUPER DEAD	-1.767E-004	-2.777E-004	9.3700	1.0000	9.3700	1.0000
22	SUPER DEAD	-2.600E-004	-7.608E-004	9.3700	4.8333	9.3700	6.5000
23	SUPER DEAD	-7.124E-004	-0.0014	9.3700	8.6667	9.3700	20.1667
24	SUPER DEAD	-2.731E-004	-7.953E-004	9.3700	36.7530	9.3700	30.6700
25	SUPER DEAD	-1.943E-004	-2.940E-004	9.3700	37.7530	9.3700	37.7530
26	SUPER DEAD	-1.524E-004	-2.600E-004	13.0275	1.0000	13.0275	1.0000
27	SUPER DEAD	-2.392E-004	-7.629E-004	13.0275	4.8333	12.5400	6.5000
28	SUPER DEAD	-5.944E-004	-0.0014	13.0275	8.6667	13.0275	20.1667
29	SUPER DEAD	-2.398E-004	-7.789E-004	13.0275	36.7530	13.0275	34.3148
30	SUPER DEAD	-1.568E-004	-2.731E-004	13.0275	37.7530	13.0275	37.7530
31	SUPER DEAD	-1.231E-004	-2.392E-004	20.3425	1.0000	16.6850	1.0000
32	SUPER DEAD	-1.857E-004	-7.492E-004	20.3425	4.8333	17.5400	6.5000
33	SUPER DEAD	-5.800E-004	-0.0014	20.3425	8.6667	17.5400	20.1667
34	SUPER DEAD	-1.706E-004	-7.786E-004	20.3425	36.7530	17.5400	30.6700
35	SUPER DEAD	-1.094E-004	-2.398E-004	20.3425	37.7530	16.6850	37.7530
36	SUPER DEAD	-7.578E-005	-1.857E-004	34.5600	1.0000	24.0000	1.0000
37	SUPER DEAD	-7.715E-005	-5.800E-004	37.0833	1.6667	23.4600	6.5000
38	SUPER DEAD	-5.167E-005	-0.0010	37.0625	30.8765	23.4600	20.1667
39	SUPER DEAD	-3.927E-005	-5.558E-004	37.3750	36.7530	24.0000	34.3148
40	SUPER DEAD	-3.613E-005	-1.706E-004	34.5600	37.7530	24.0000	37.7530
41	SUPER DEAD	-6.867E-005	-7.715E-005	38.0800	1.0000	38.0800	1.0000
42	SUPER DEAD	-6.359E-005	-7.984E-005	38.0800	4.8333	38.0800	4.8333
43	SUPER DEAD	-2.844E-005	-7.984E-005	38.0800	24.0000	38.0800	8.6667
44	SUPER DEAD	-2.879E-005	-5.167E-005	38.0800	36.7530	38.0800	34.3148
45	SUPER DEAD	-2.665E-005	-3.927E-005	38.0800	37.7530	38.0800	37.7530

Design

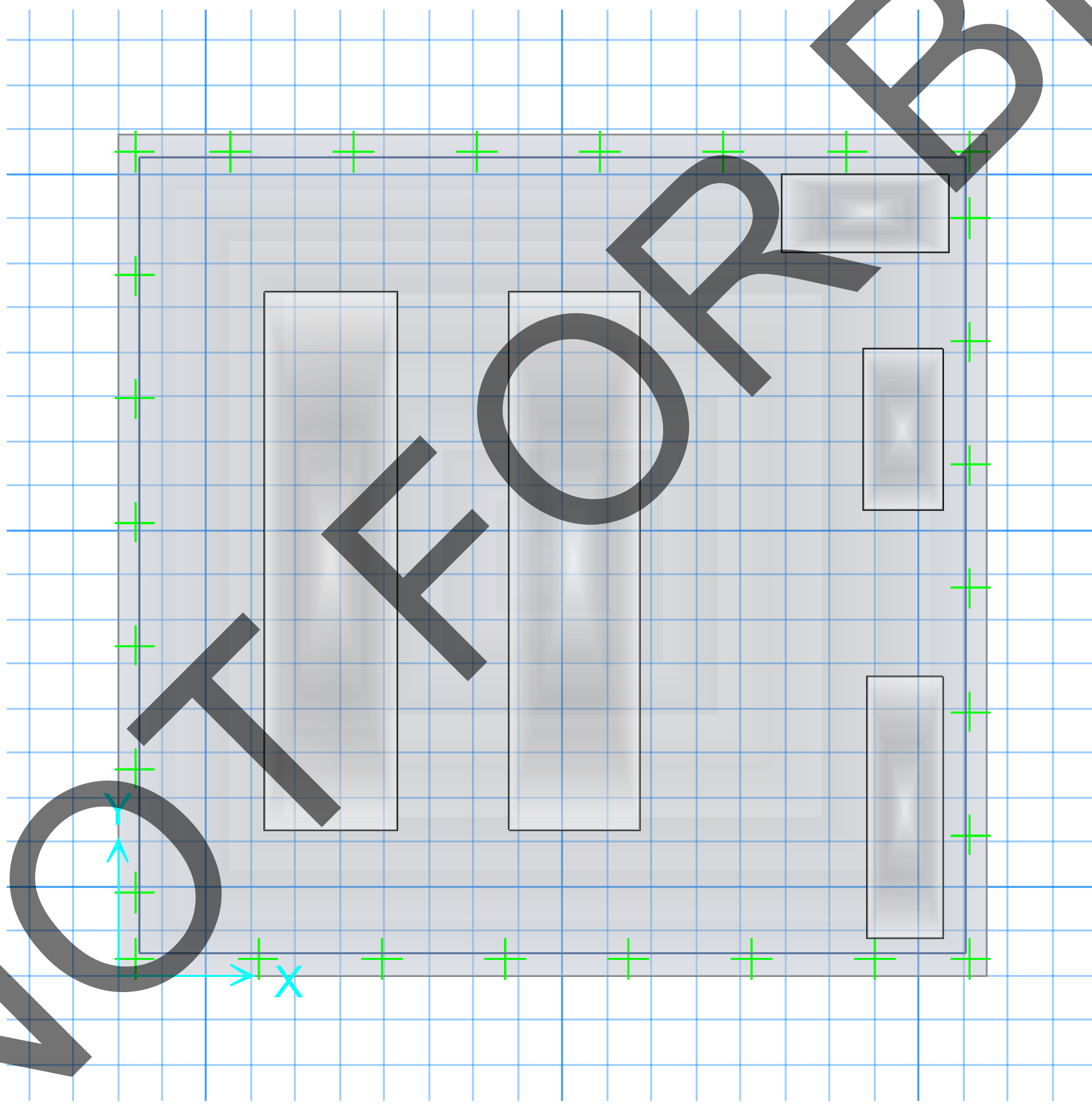


Figure 3: Finite element model

6. Design summary

This section provides design information for beams, strips, and punching checks.

6.1. Preferences

Table 29: Design Preferences 01 - Resistance Factors

Table 29: Design Preferences 01 - Resistance Factors

PhiTen	PhiComp	PhiShear
0.900000	0.650000	0.750000

Table 30: Design Preferences 02 - Rebar Cover - Slabs

Table 30: Design Preferences 02 - Rebar Cover - Slabs

CoverTop	CoverBot	BarSize	InnerLayer	PTCGSTop	PTCGSBotExt	PTCGSBotInt	SlabType
in	in			in	in	in	
3.0000	3.0000	#6	B	1.0000	1.7500	1.0000	Two Way

Table 31: Design Preferences 03 - Rebar Cover - Beams

Table 31: Design Preferences 03 - Rebar Cover - Beams

CoverTop	CoverBot	BarSizeF	BarSizeS	PTCGSTop	PTCGSBot
in	in			in	in
1.5000	1.5000	#9	#4	2.0000	2.0000

Table 32: Design Preferences 04 - Prestress Data

Table 32: Design Preferences 04 - Prestress Data

UserStress	InitConcRat	LLFraction
No	0.800000	0.500000

6.2. Overwrites

Table 33: Slab Design Overwrites 01 - Strip Based

Table 33: Slab Design Overwrites 01 - Strip Based

Strip	Layer	DesignType	RLLF	IgnorePT	RebarMat
CSA4	A	Column	1.000000	No	A615Gr60
CSA5	A	Column	1.000000	No	A615Gr60
CSB1	B	Column	1.000000	No	A615Gr60
CSB2	B	Column	1.000000	No	A615Gr60
MSA3	A	Middle	1.000000	No	A615Gr60

Table 33: Slab Design Overwrites 01 - Strip Based

Strip	Layer	DesignType	RLLF	IgnorePT	RebarMat
MSB2	B	Middle	1.000000	No	A615Gr60

Table 34: Slab Design Overwrites 02 - Finite Element Based, Part 1 of 2

Table 34: Slab Design Overwrites 02 - Finite Element Based, Part 1 of 2

Area	RebarMat
1	A615Gr60
6	A615Gr60
15	A615Gr60
16	A615Gr60
25	A615Gr60
26	A615Gr60

Table 34: Slab Design Overwrites 02 - Finite Element Based, Part 2 of 2

Table 34: Slab Design Overwrites 02 - Finite Element Based, Part 2 of 2

Area	RLLF	Design	IgnorePT
1	1.000000	Yes	No
6	1.000000	Yes	No
15	1.000000	Yes	No
16	1.000000	Yes	No
25	1.000000	Yes	No
26	1.000000	Yes	No

6.3. Slab design

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 1 of 3

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 1 of 3

Strip	SpanID	Location	FTopCombo	FTopMoment	FTopArea
				kip-ft	in2
CSA4	Span 1	Start	LRFD ENVELOPE	-47.0774	0.7178
CSA4	Span 1	Middle	LRFD ENVELOPE	-29.7729	0.4534
CSA4	Span 1	End	LRFD7B: 0.9D+Ex-Ey	-39.1560	0.5967
CSA5	Span 1	Start	LRFD7D: 0.9D-Ex-Ey	-31.6606	0.4822
CSA5	Span 1	Middle	LRFD ENVELOPE	-29.5863	0.4505
CSA5	Span 1	End	LRFD ENVELOPE	-43.7183	0.6664
CSB1	Span 1	Start	LRFD7D: 0.9D-Ex-Ey	-33.0153	0.5302
CSB1	Span 1	Middle	LRFD ENVELOPE	-212.5666	3.4636
CSB1	Span 1	End	LRFD ENVELOPE	-48.2497	0.7757
CSB2	Span 1	Start	LRFD ENVELOPE	-38.7139	0.6220

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 1 of 3

Strip	SpanID	Location	FTopCombo	FTopMoment	FTopArea
				kip-ft	in2
CSB2	Span 1	Middle	LRFD ENVELOPE	-23.6262	0.3791
CSB2	Span 1	End	LRFD7A: 0.9D+Ex+Ey	-37.2935	0.5991
MSA3	Span 1	Start	LRFD ENVELOPE	-377.9328	5.8332
MSA3	Span 1	Middle	LRFD ENVELOPE	-369.5542	5.7019
MSA3	Span 1	End	LRFD ENVELOPE	-100.8239	1.5383
MSB2	Span 1	Start	LRFD6B: 1.2D+L+Ex-Ey	-80.5981	1.2991
MSB2	Span 1	Middle	LRFD ENVELOPE	-367.2701	5.9794
MSB2	Span 1	End	LRFD ENVELOPE	-77.0828	1.2387

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 2 of 3

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 2 of 3

Strip	SpanID	Location	FBotCombo	FBotMoment	FBotArea
				kip-ft	in2
CSA4	Span 1	Start	LRFD ENVELOPE	33.3042	0.5637
CSA4	Span 1	Middle	LRFD ENVELOPE	9.6147	0.1771
CSA4	Span 1	End	LRFD ENVELOPE	52.3833	0.8101
CSA5	Span 1	Start	LRFD ENVELOPE	46.5033	0.7466
CSA5	Span 1	Middle	LRFD ENVELOPE	16.4605	0.2709
CSA5	Span 1	End	LRFD7C: 0.9D-Ex+Ey	40.7069	0.6376
CSB1	Span 1	Start	LRFD ENVELOPE	38.5616	0.6535
CSB1	Span 1	Middle	LRFD ENVELOPE	207.8231	3.4670
CSB1	Span 1	End	LRFD7D: 0.9D-Ex-Ey	43.5027	0.7110
CSB2	Span 1	Start	LRFD7A: 0.9D+Ex+Ey	38.7286	0.6266
CSB2	Span 1	Middle	LRFD ENVELOPE	5.8698	0.0941
CSB2	Span 1	End	LRFD ENVELOPE	53.5898	0.8684
MSA3	Span 1	Start	LRFD ENVELOPE	359.2038	5.5698
MSA3	Span 1	Middle	LRFD ENVELOPE	391.3830	6.0443
MSA3	Span 1	End	LRFD7C: 0.9D-Ex+Ey	74.0408	1.1396
MSB2	Span 1	Start	LRFD ENVELOPE	74.8371	1.2129
MSB2	Span 1	Middle	LRFD ENVELOPE	358.2518	5.8306
MSB2	Span 1	End	LRFD ENVELOPE	72.7228	1.1982

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 3 of 3

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 3 of 3

Strip	SpanID	Location	VCombo	VForce	VArea	Status	Layer
				kip	in2/ft		
CSA4	Span 1	Start	LRFD ENVELOPE	8.370	0.0000	OK	A
CSA4	Span 1	Middle	LRFD ENVELOPE	6.992	0.0000	OK	A
CSA4	Span 1	End	LRFD ENVELOPE	2.816	0.0000	OK	A
CSA5	Span 1	Start	LRFD ENVELOPE	8.038	0.0000	OK	A
CSA5	Span 1	Middle	LRFD ENVELOPE	4.166	0.0000	OK	A
CSA5	Span 1	End	LRFD ENVELOPE	2.637	0.0000	OK	A
CSB1	Span 1	Start	LRFD ENVELOPE	6.206	0.0000	OK	B
CSB1	Span 1	Middle	LRFD ENVELOPE	9.950	0.0000	OK	B

Table 35: Concrete Slab Design Summary 01 - Flexural And Shear Data, Part 3 of 3

Strip	SpanID	Location	VCombo	VForce	VArea	Status	Layer
				kip	in2/ft		
CSB1	Span 1	End	LRFD ENVELOPE	7.551	0.0000	OK	B
CSB2	Span 1	Start	LRFD ENVELOPE	9.969	0.0000	OK	B
CSB2	Span 1	Middle	LRFD ENVELOPE	2.496	0.0000	OK	B
CSB2	Span 1	End	LRFD ENVELOPE	1.891	0.0000	OK	B
MSA3	Span 1	Start		0.000	0.0000	OK	A
MSA3	Span 1	Middle	LRFD ENVELOPE	116.371	0.0000	OK	A
MSA3	Span 1	End	LRFD ENVELOPE	12.582	0.0000	OK	A
MSB2	Span 1	Start		0.000	0.0000	OK	B
MSB2	Span 1	Middle	LRFD ENVELOPE	26.190	0.0000	OK	B
MSB2	Span 1	End	LRFD ENVELOPE	11.854	0.0000	OK	B

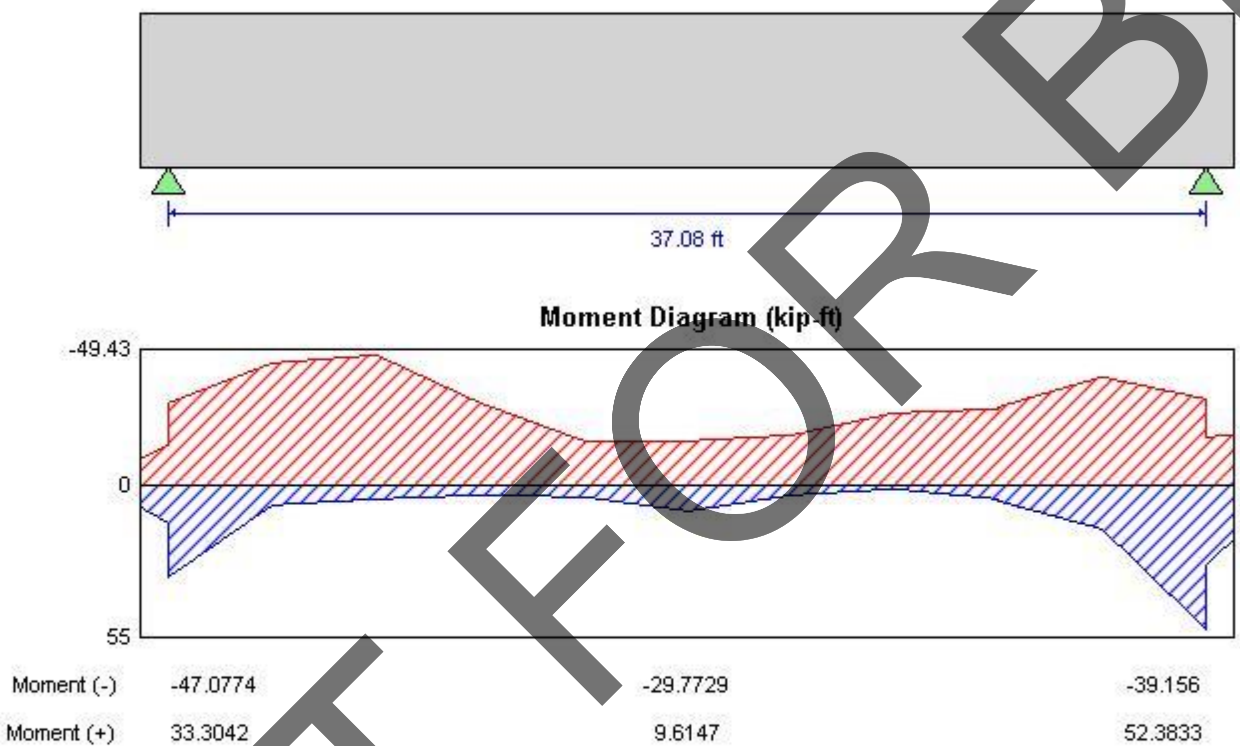
ACI 318-14 Concrete Strip Design

Geometric Properties

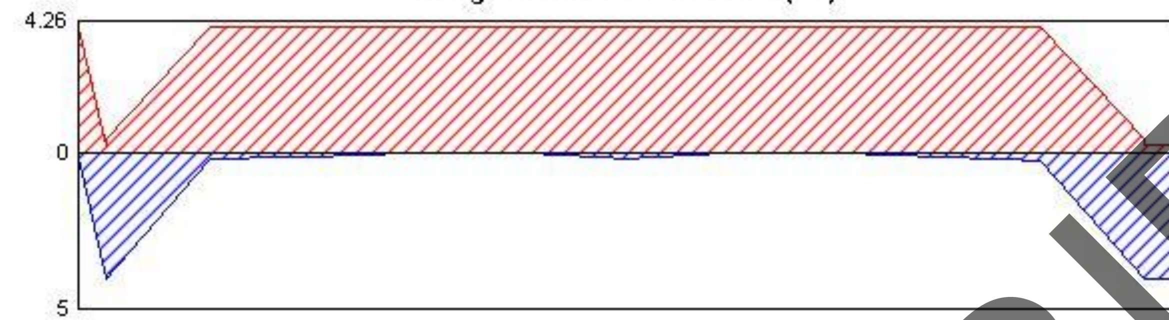
Combination = Overall Envelope
Strip Label = CSA4
Length = 39.08 ft
Distance to Top Rebar Center = 3.375 in
Distance to Bot Rebar Center = 3.375 in

Material Properties

Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2



Longitudinal Reinforcement (in2)



As (top)	0.7178	0.4534	0.5967
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD7B: 0.9D+Ex-Ey
As (bot)	0.5637	0.1771	0.8101
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD ENVELOPE

Shear Diagram (kip)

Shear	8.37	6.992	2.816

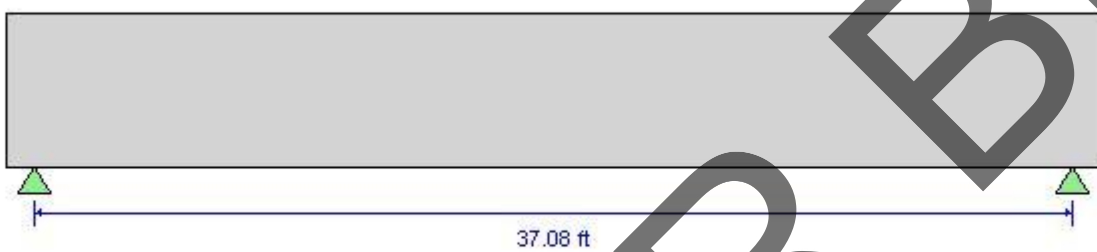
ACI 318-14 Concrete Strip Design

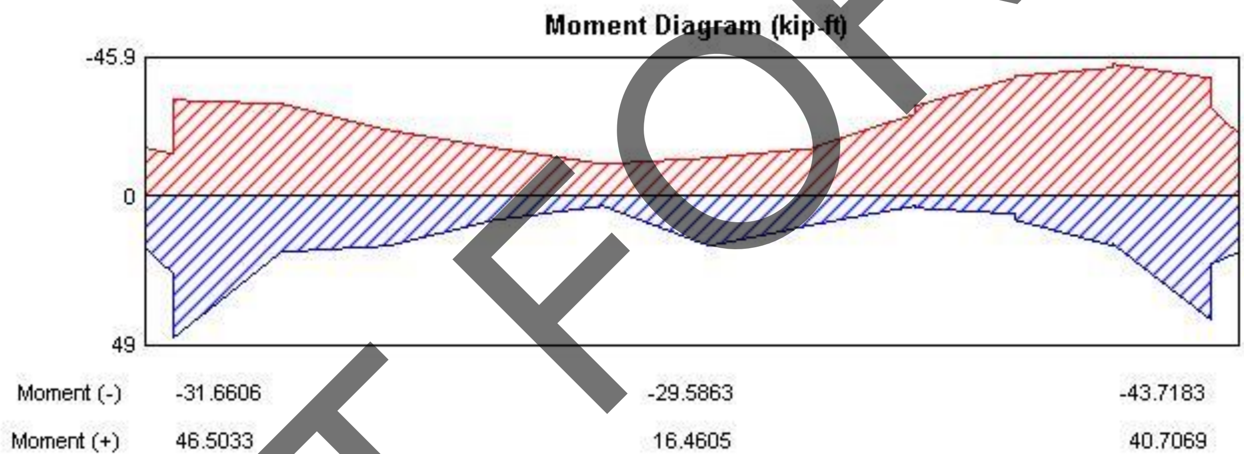
Geometric Properties

Combination = Overall Envelope
Strip Label = CSA5
Length = 39.08 ft
Distance to Top Rebar Center = 3.375 in
Distance to Bot Rebar Center = 3.375 in

Material Properties

Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2





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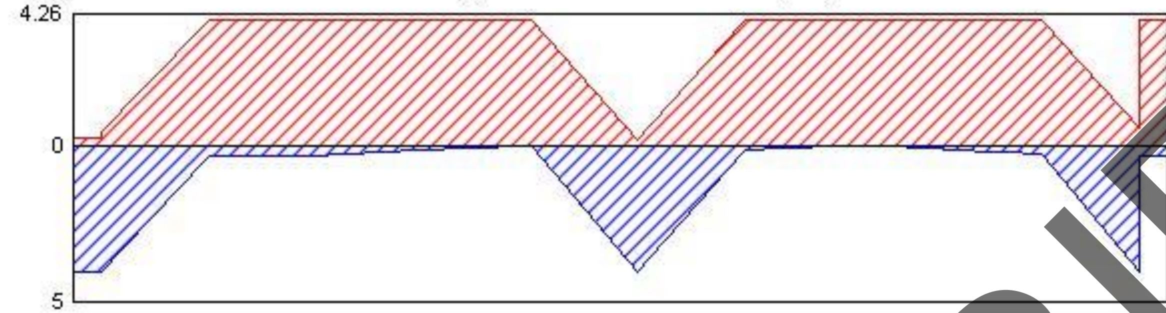
Longitudinal Reinforcement (in2)



As (top)	0.4822	0.4505	0.6664
Combo	LRFD7D: 0.9D-Ex-Ey	LRFD ENVELOPE	LRFD ENVELOPE
As (bot)	0.7466	0.2709	0.6376
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD7C: 0.9D-Ex+Ey

Shear Diagram (kip)

Shear	8.038	4.166	2.637

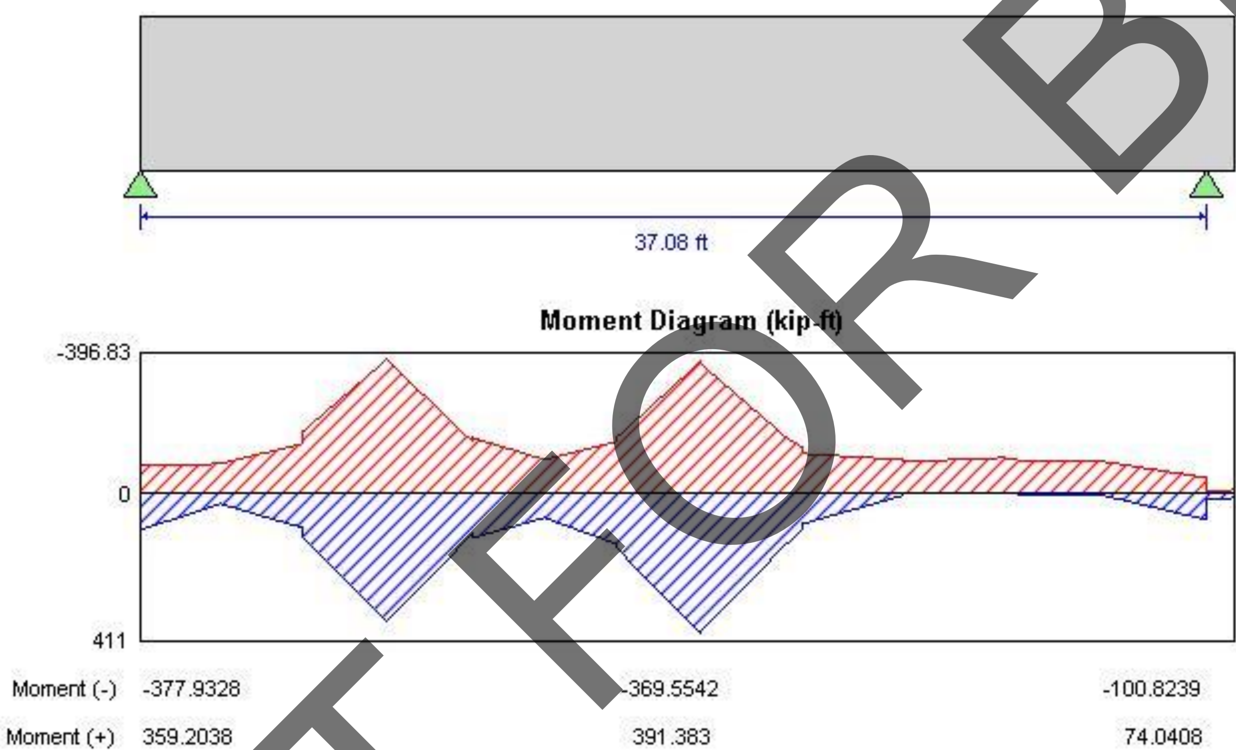
ACI 318-14 Concrete Strip Design

Geometric Properties

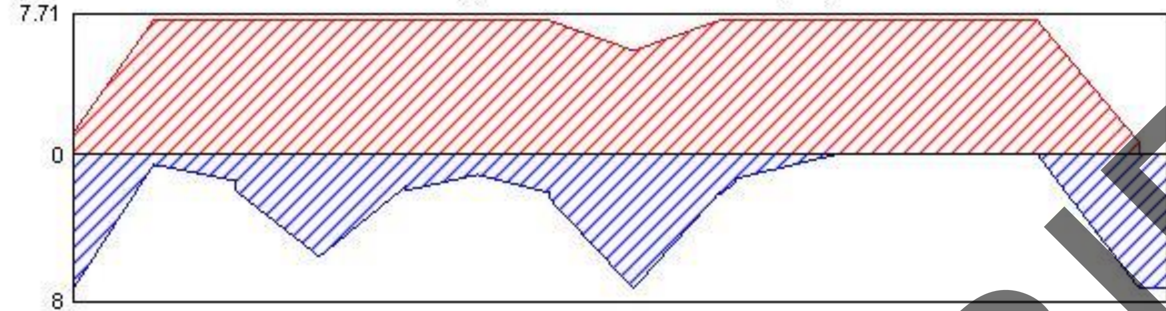
Combination = Overall Envelope
Strip Label = MSA3
Length = 38.08 ft
Distance to Top Rebar Center = 3.375 in
Distance to Bot Rebar Center = 3.375 in

Material Properties

Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2

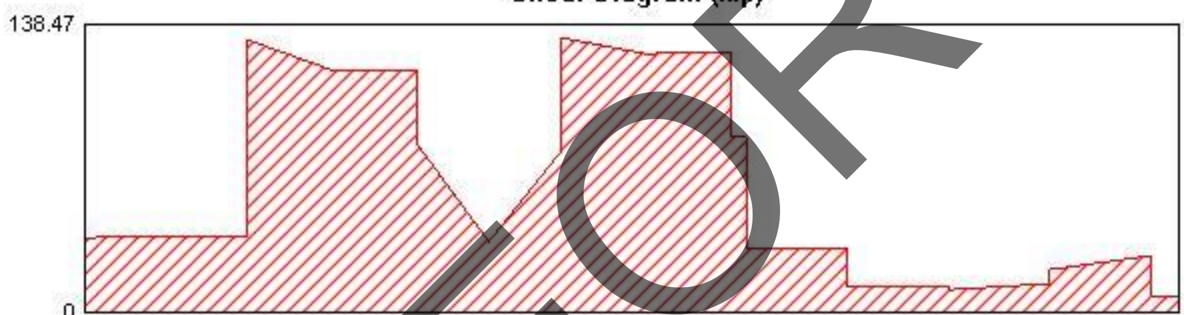


Longitudinal Reinforcement (in2)



As (top)	5.8332	5.7019	1.5383
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD ENVELOPE
As (bot)	5.5698	6.0443	1.1396
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD7C: 0.9D-Ex+Ey

Shear Diagram (kip)



Shear	0	116.371	12.582

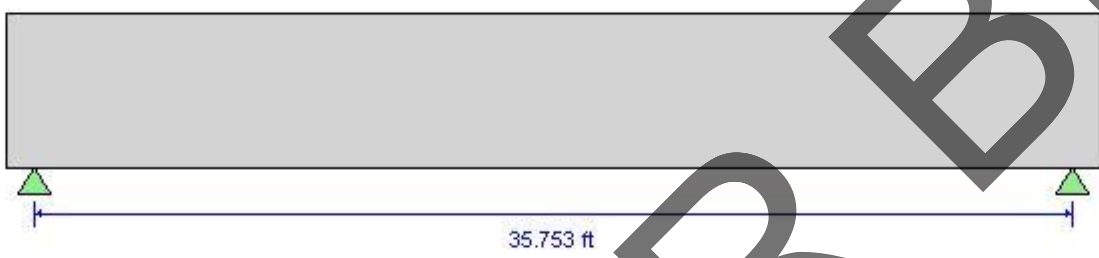
ACI 318-14 Concrete Strip Design

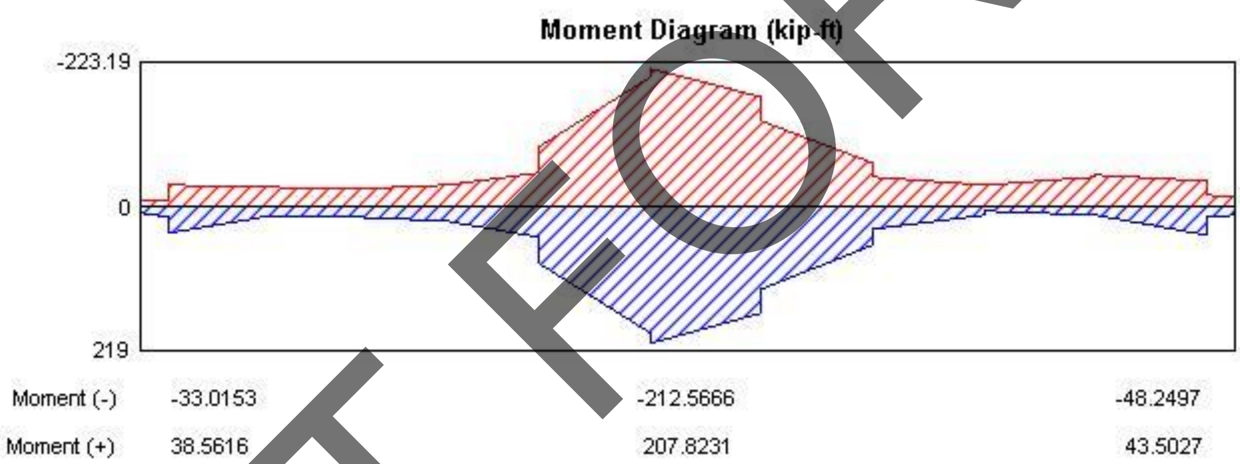
Geometric Properties

Combination = Overall Envelope
Strip Label = CSB1
Length = 37.753 ft
Distance to Top Rebar Center = 4.125 in
Distance to Bot Rebar Center = 4.125 in

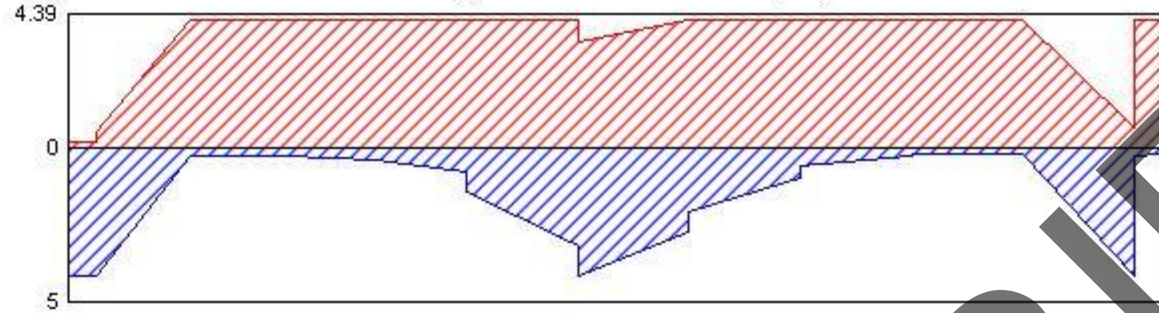
Material Properties

Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2



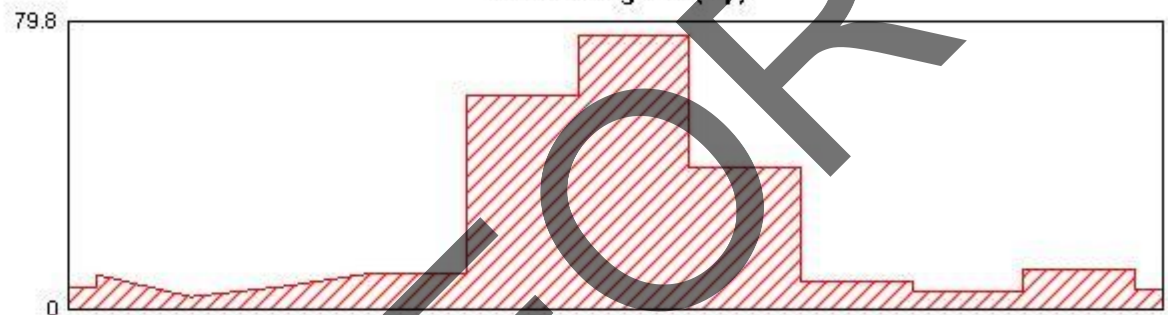


Longitudinal Reinforcement (in2)



As (top)	0.5302	3.4636	0.7757
Combo	LRFD7D: 0.9D-Ex-Ey	LRFD ENVELOPE	LRFD ENVELOPE
As (bot)	0.6535	3.467	0.711
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD7D: 0.9D-Ex-Ey

Shear Diagram (kip)



Shear	6.206	9.95	7.551

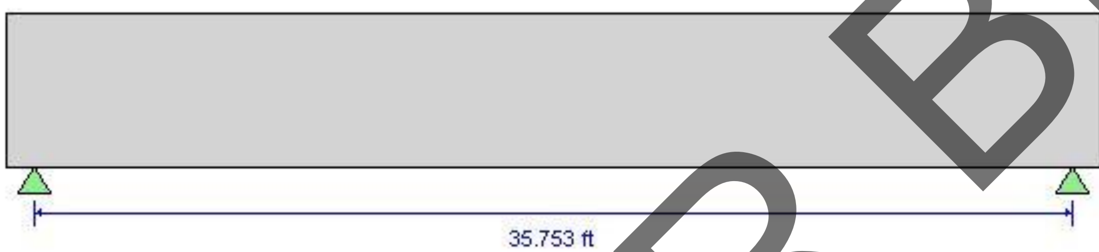
ACI 318-14 Concrete Strip Design

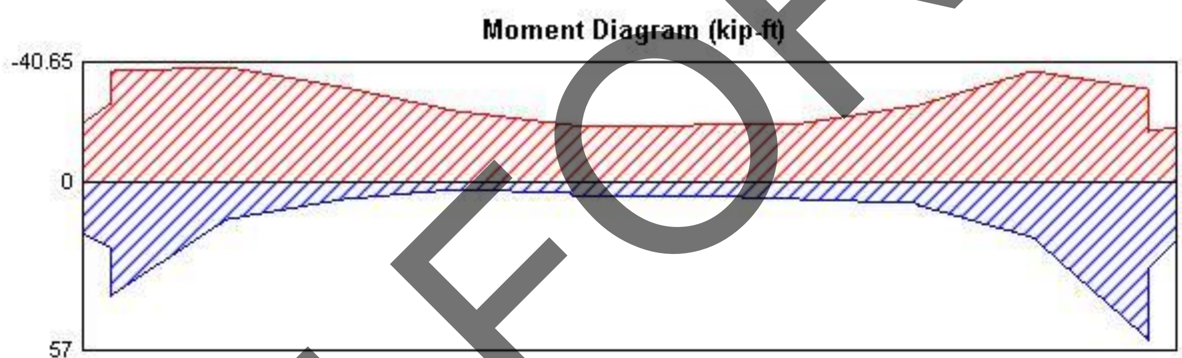
Geometric Properties

Combination = Overall Envelope
Strip Label = CSB2
Length = 37.753 ft
Distance to Top Rebar Center = 4.125 in
Distance to Bot Rebar Center = 4.125 in

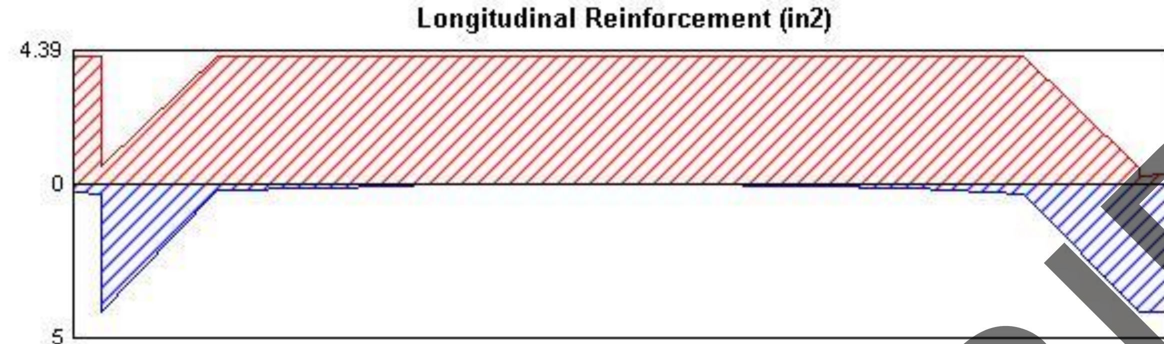
Material Properties

Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2

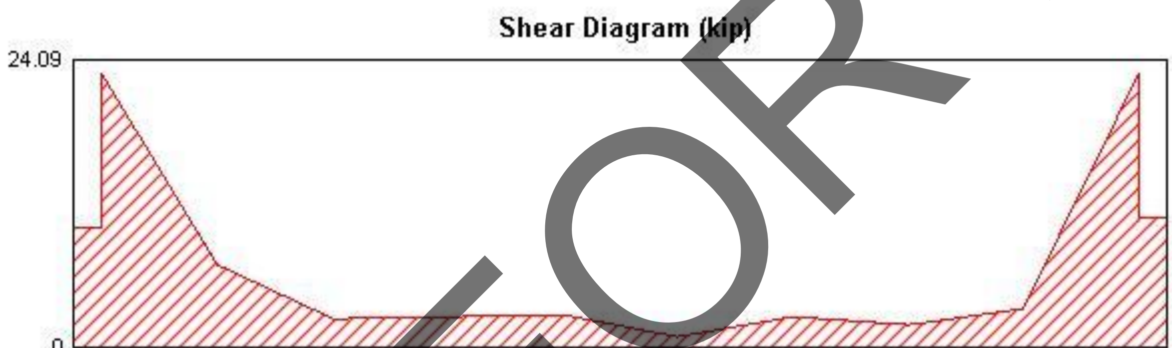




Moment (-)	-38.7139	-23.6262	-37.2935
Moment (+)	38.7286	5.8698	53.5898



As (top)	0.622	0.3791	0.5991
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD7A: 0.9D+Ex+Ey
As (bot)	0.6266	0.0941	0.8684
Combo	LRFD7A: 0.9D+Ex+Ey	LRFD ENVELOPE	LRFD ENVELOPE



Shear	9.969	2.496	1.891

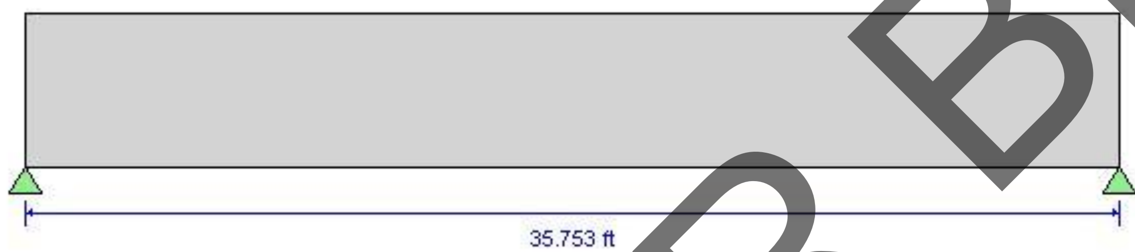
ACI 318-14 Concrete Strip Design

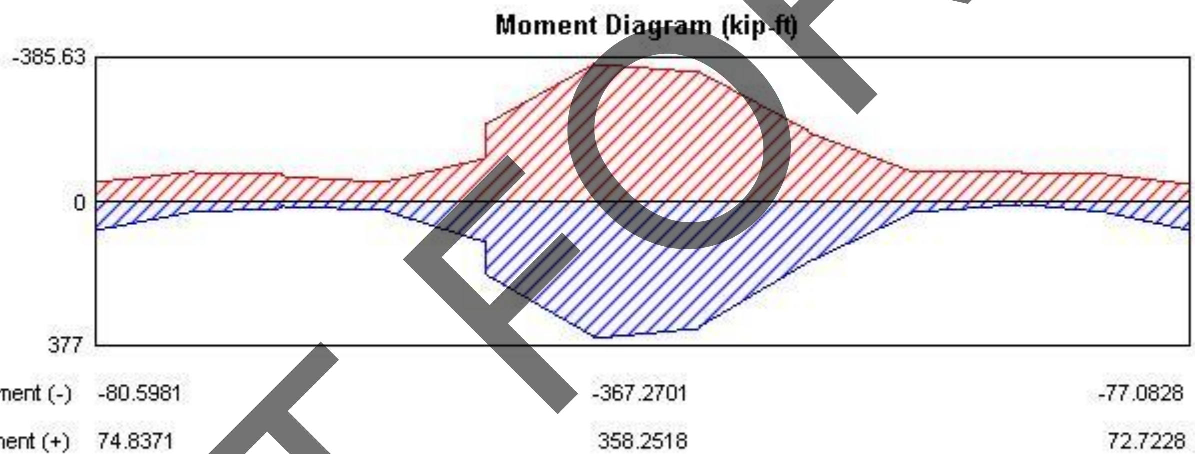
Geometric Properties

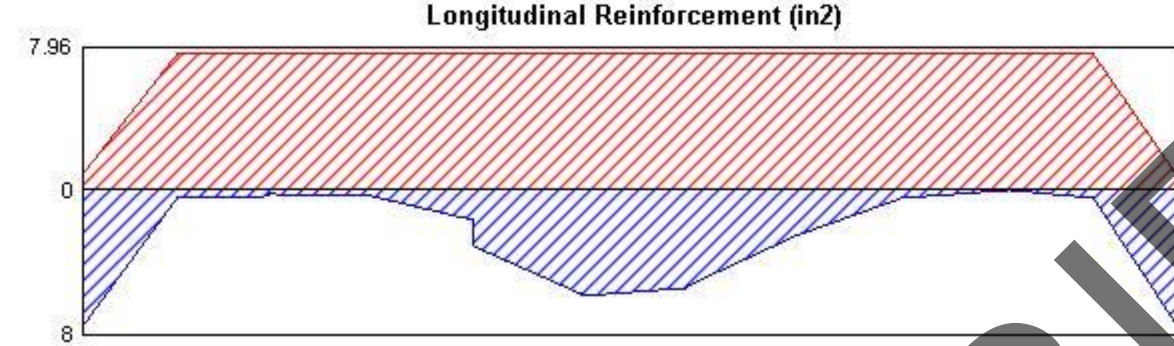
Combination = Overall Envelope
Strip Label = MSB2
Length = 35.753 ft
Distance to Top Rebar Center = 4.125 in
Distance to Bot Rebar Center = 4.125 in

Material Properties

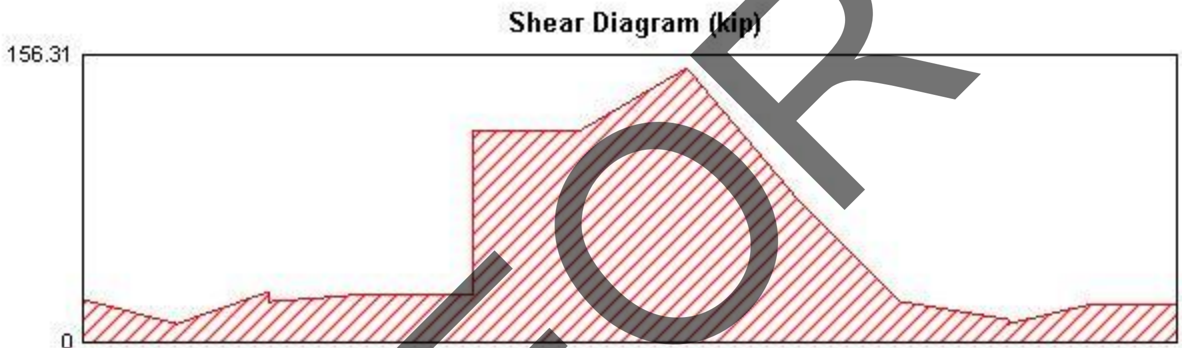
Concrete Comp. Strength = 4 kip/in2
Concrete Modulus = 3604.996 kip/in2
Longitudinal Rebar Yield = 60 kip/in2







As (top)	1.2991	5.9794	1.2387
Combo	LRFD6B: 1.2D+L+Ex-Ey	LRFD ENVELOPE	LRFD ENVELOPE
As (bot)	1.2129	5.8306	1.1982
Combo	LRFD ENVELOPE	LRFD ENVELOPE	LRFD ENVELOPE

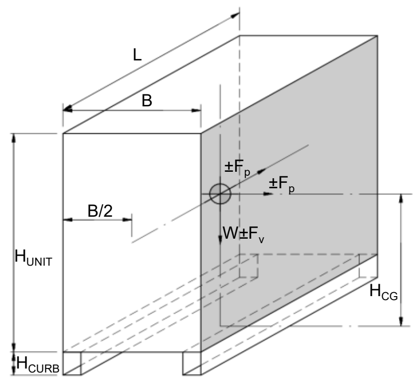


Shear	0	26.19	11.854

EQUIPMENT ANCHORAGE CALCULATIONS

Mechanical Equipment Anchorage Calc
BASE MOUNTED

Unit Identification: **Generator A&B**



W_p =	26000 lbs	unit weight
B =	49.20 in	unit width
$d_{B\ dir\ anchors}$ =	45.50 in	dist btwn anchors (B dir.)
L =	116.50 in	unit length
$d_{L\ dir\ anchors}$ =	108.70 in	dist btwn anchors (L dir.)
H_{UNIT} =	80.00 in	unit height
H_{CG_EQUIP} =	53.33 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	53.33 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p = 1.00	R_p = 2.50	I_p = 1.00	S_{DS} = 1.540
z = 0.00 ft	h = 1.00 ft	Ωo = 2.0	

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h))]/R_p) \times W_p =$ 0.246 Wp $F_v = 0.2(S_{DS})W_p =$ 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p =$ 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p) =$ 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**12012 lbs**	**$0.7F_p = V_h$ =**	**8408 lbs**
$F_v = V_v$ =	**8008 lbs**	**$0.7F_v = V_v$ =**	**5606 lbs**

Unit Anchorage:

Fp in "B" Direction

\# connections shear 12
\# connections tension 6

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	53383 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	106767 lb-ft	$M_{OT} = V_hH_{CG}$ =	37368 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	31554 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	31554 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(B/2)$ =	20489 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	5757 lbs	$T = (M_{OT} - M_R) / d_B$ =	19836 lbs	$T = (M_{OT} - M_R) / d_B$ =	4452 lbs
T_{conn} = T / # conn tension =	960 lbs	T_{conn} = T / # conn tension =	3306 lbs	T_{conn} = T / # conn tension =	742 lbs
$V_{conn} = V_h$ / # conn shear =	1001 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	2002 lbs	$V_{conn} = V_h$ / # conn shear =	701 lbs

Fp in "L" Direction

\# connections shear 12
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	53383 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	106767 lb-ft	$M_{OT} = V_hH_{CG}$ =	37368 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	74715 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	74715 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(L/2)$ =	48514 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	3538 lbs	$T = (M_{OT} - M_R) / d_L$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	1769 lbs	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	1001 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	2002 lbs	$V_{conn} = V_h$ / # conn shear =	701 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	960 lbs	Tmax =	3306 lbs	Tmax =	742 lbs
Vmax =	1001 lbs	Vmax =	2002 lbs	Vmax =	701 lbs

Connection/Anchorage Notes:

Anchor Description: 5/8"Ø Hilti KB-TZ2 SS304 w/ 4" Embed, 6" Edge Dist

ΦTn = 5591 lbs (per Hilti Profis) DCR = 0.59
ΦVn = 4262 lbs (per Hilti Profis) DCR = 0.47
Interaction = 0.59 + 0.47 = 1.06 < 1.2

www.hilti.com

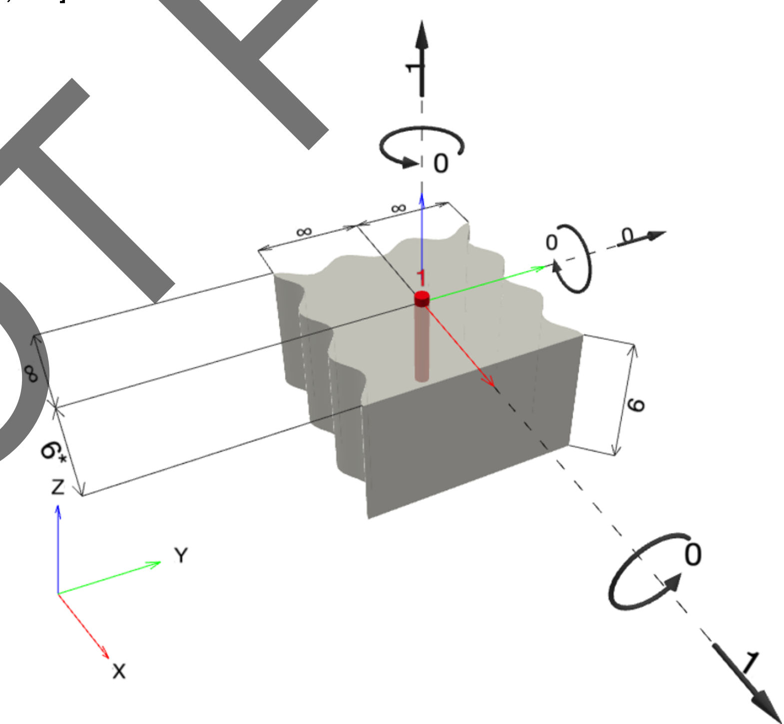
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 5/8 (4) hnom3**
Item number:	2210279 KB-TZ2 5/8x6 SS304
Effective embedment depth:	$h_{ef,act}$ = 4.000 in., h_{nom} = 4.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

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



Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 1; V_x = 1; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	no	1

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
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	1	5,591	1 / -	OK
Shear	Concrete edge failure in direction x+	1	4,262	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.000	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

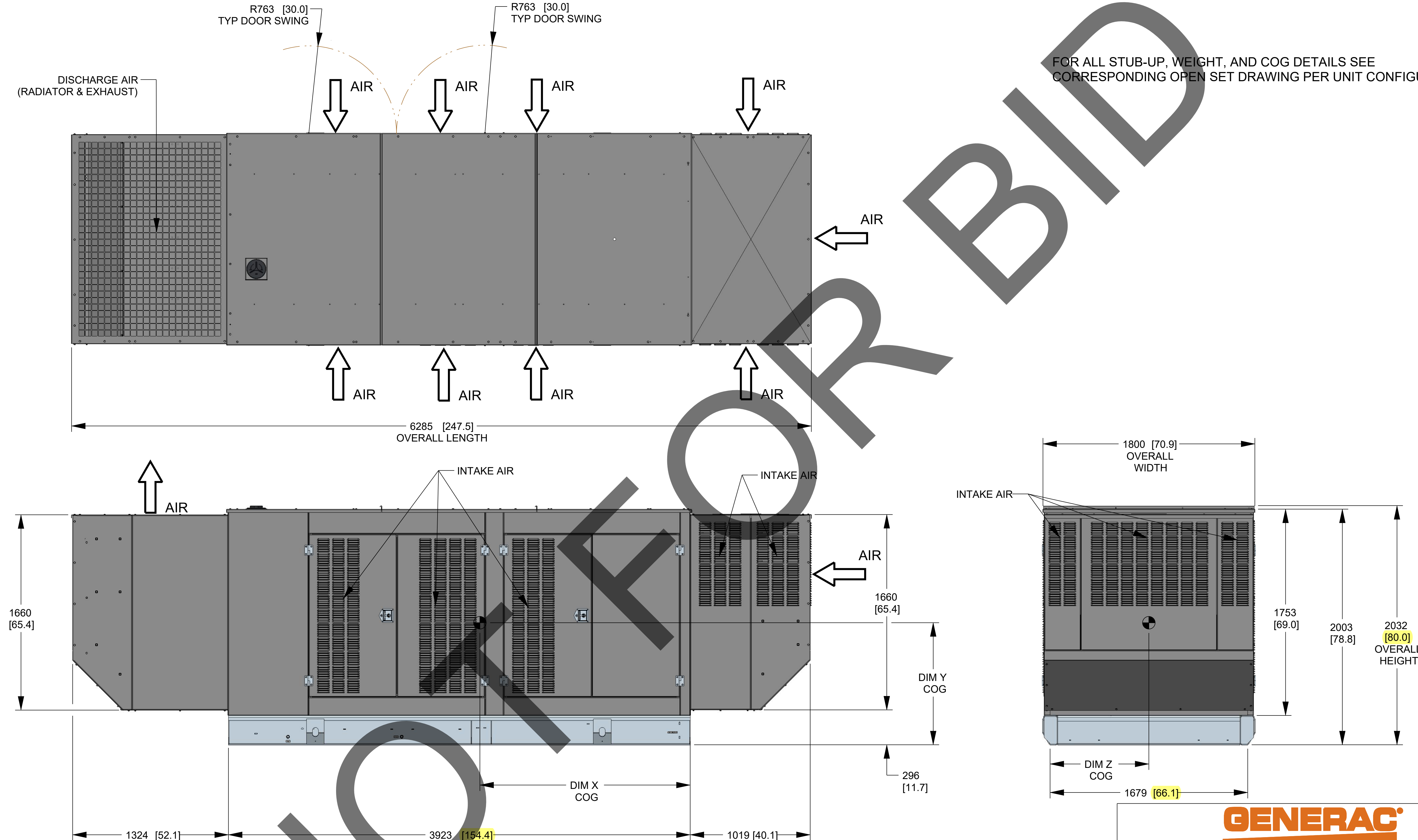
4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

18.1L

E6

FOR ALL STUB-UP, WEIGHT, AND COG DETAILS SEE CORRESPONDING OPEN SET DRAWING PER UNIT CONFIGURATION.



DRAWING CREATED FROM PRO/ENGINEER 3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

DIMENSIONS ARE IN MILLIMETERS [INCHES]

INSTALLATION DRAWING

GENERAC

TITLE
L1A ENCLOSURE
D18.1L SD/MD 600-750 & SB/MB 600
PD/MD 540-675 & PB/WB 540

ELECTRONICALLY APPROVED INSIDE WINDCHILL

ISSUE DATE: 03/14/14				
SIZE B	CAGE NO N/A	DWG NO	0K1501B	REV E
SCALE 0.030	WT-KG		SHEET 1 of 1	

18.1L

MD750 | 18.1L | 750 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC® INDUSTRIAL POWER

E7

Standby Power Rating
750 kW, 938 kVA, 60 Hz

Prime Power Rating*
675 kW, 844 kVA, 60 Hz

ISO 9001:2008

USA ENGINEERED & BUILT*
*Assembled in the USA using domestic and foreign parts

*EPA Certified Prime ratings are not available in the US or its Territories

Image used for illustration purposes only

Codes and Standards

Not all codes and standards apply to all configurations. Contact factory for details.

UL2200, UL6200, UL1236, UL489, UL142

CSA C22.2, ULC S601

BS5514 and DIN 6271

SAE J1349

NFPA 37, 70, 99, 110

NEC700, 701, 702, 708

ISO 3046, 7637, 8528, 9001

NEMA ICS10, MG1, 250, ICS6, AB1

ANSI C62.41

Powering Ahead

For over 60 years, Generac has provided innovative design and superior manufacturing.

Generac ensures superior quality by designing and manufacturing most of its generator components, including alternators, enclosures and base tanks, control systems and communications software.

Generac gensets utilize a wide variety of options, configurations and arrangements, allowing us to meet the standby power needs of practically every application.

Generac searched globally to ensure the most reliable engines power our generators. We choose only engines that have already been proven in heavy-duty industrial applications under adverse conditions.

Generac is committed to ensuring our customers' service support continues after their generator purchase.

MD750 | 18.1L | 750 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

E8

STANDARD FEATURES

ENGINE SYSTEM

- Oil Drain Extension
- Heavy Duty Air Cleaner
- Fan Guard
- Stainless Steel Flexible Exhaust Connection
- Critical Silencer (Enclosed Units Only)
- Factory Filled Oil and Coolant
- Radiator Duct Adapter (Open Set Only)
- Oil Temperature Indication and Alarm

Fuel System

- Primary Fuel Filter
- Secondary Fuel Filter

Cooling System

- Closed Coolant Recovery System
- UV/Ozone Resistant Hoses
- Factory-Installed Radiator
- 50/50 Ethylene Glycol Antifreeze
- Radiator Drain Extension

Electrical System

- Battery Charging Alternator
- Battery Cables
- Battery Tray
- Rubber-Booted Engine Electrical Connections
- Solenoid Activated Starter Motor

ALTERNATOR SYSTEM

- UL2200 GENprotect™
- 12 Leads (3-Phase, Non 600V)
- Class H Insulation Material
- Vented Rotor
- 2/3 Pitch
- Skewed Stator
- Auxiliary Voltage Regulator Power Winding
- Amortisseur Winding
- Permanent Magnet Excitation
- Sealed Bearings
- Full Load Capacity Alternator
- Protective Thermal Switch
- Main Line Circuit Breaker

GENERATOR SET

- Internal Genset Vibration Isolation
- Separation of Circuits - High/Low Voltage
- Separation of Circuits - Multiple Breakers
- Wrapped Exhaust Piping (Enclosed Units Only)
- Standard Factory Testing
- 2 Year Limited Warranty (Standby Rated Units)
- 1 Year Limited Warranty (Prime Rated Units)
- Silencer Mounted in the Discharge Hood (Enclosed Units Only)

ENCLOSURE (If Selected)

- Rust-Proof Fasteners with Nylon Washers to Protect Finish
- High Performance Sound-Absorbing Material (Sound Attenuated Enclosures)
- Gasketed Doors
- Upward Facing Discharge Hoods (Radiator and Exhaust)
- Stainless Steel Lift Off Door Hinges
- Stainless Steel Lockable Handles
- RhinoCoat™ - Textured Polyester Powder Coat Paint

FUEL TANKS (If Selected)

- UL 142/ULC S601 Tank
- Double Wall
- Vents
- Sloped Top
- Sloped Bottom
- Factory Pressure Tested (2 psi)
- Rupture Basin Alarm
- Fuel Level
- Check Valve in Supply and Return Lines
- RhinoCoat™ - Textured Polyester Powder Coat Paint

CONTROL SYSTEM

Power Zone® Pro Sync Controller

Program Functions

- NFPA 110 Level 1 Compliant
- Engine Protective Functions
- Alternator Protective Functions
- Digital Engine Governor Control
- Digital Voltage Regulator
- Multiple Programmable Inputs and Outputs
- Remote Display Capability
- Remote Communication via Modbus® RTU, Modbus TCP/IP, and Ethernet 10/100
- Alarm and Event Logging with Real Time Stamping
- Expandable Analog and Digital Inputs and Outputs
- On-Board Generator Paralleling Functionality
- Remote Wireless Software Update Capable
- Wi-Fi®, Bluetooth®, BMS and Remote Telemetry
- Built-In Programmable Logic Eliminates the Need for External Controllers Under Most Conditions
- Ethernet Based Communications Between Generators
- Programmable I/O Channel Properties
- Built-In Diagnostics
- On-Board Manual Storage

Protections

- Low Oil Pressure
- Low Coolant Level
- High/Low Coolant Temperature
- Sensor Failure
- Oil Temperature
- Over/Under Speed
- Over/Under Voltage
- Over/Under Frequency
- Over/Under Current
- Over Load
- High/Low Battery Voltage
- Battery Charger Current
- Phase to Phase and Phase to Neutral Short Circuits (I^2T Algorithm)

7 Inch Color Touch Screen Display

- Resistive Color Touch Screen
- Sunlight Readable (1400 NITS)
- Easily Identifiable Icons
- Multi-Lingual
- On Screen Editable Parameters
- Key Function Monitoring
- Three Phase Voltage, Amperage, kW, kVA, and kVAr
- Selectable Line to Line or Line to Neutral Measurements
- Frequency
- Engine Speed
- Engine Coolant Temperature
- Engine Oil Pressure
- Engine Oil Temperature
- Battery Voltage
- Hourmeter
- Warning and Alarm Indication
- Diagnostics
- Maintenance Events/Information

PARALLELING CONTROLS

- Auto-Synchronization Process
- Isochronous Load Sharing
- Reverse Power Protection
- Maximum Power Protection
- Electrically Operated, Mechanically Held Paralleling Switch
- Sync Check System
- Independent On-Board Paralleling
- Optional Programmable Logic Full Auto Back-Up Controls (PLS)
- Shunt Trip and Auxiliary Contact

CONFIGURABLE OPTIONS

ENGINE SYSTEM

- Engine Coolant Heater
- Oil Heater
- Critical Grade Silencers (Open Set Only)
- Level 1 Fan and Belt Guards (Enclosed Units Only)
- Radiator Stone Guard (Open Set Only)

ELECTRICAL SYSTEM

- 10A UL Listed Battery Charger
- Battery Warmer

ALTERNATOR SYSTEM

- Alternator Upsizing
- Anti-Condensation Heater

CIRCUIT BREAKER OPTIONS

- Shunt Trip and Auxiliary Contact
- Electronic Trip Breaker

GENERATOR SET

- 12 Position Load Center
- Extended Factory Testing

ENCLOSURE

- Weather Protected Enclosure
- Level 1 Sound Attenuated
- Level 2 Sound Attenuated
- Level 2 Sound Attenuated with Motorized Dampers
- Steel Enclosure
- Aluminum Enclosure
- Up to 200 MPH Wind Load Rating (Contact Factory for Availability)
- AC/DC Enclosure Lighting Kit
- Door Open Alarm Switch
- Enclosure Heater (with Motorized Dampers Only)

CONTROL SYSTEM

- NFPA 110 Compliant 21-Light Remote Annunciator
- Remote Relay Panel (8 or 16)
- Ground Fault Annunciator
- 10A Engine Run Relay
- 120V GFCI and 240V Outlets
- Remote E-Stop (Break Glass-Type, Surface Mount)
- Remote E-Stop (Red Mushroom-Type, Surface Mount)
- Remote E-Stop (Red Mushroom-Type, Flush Mount)
- Damper Alarm Contacts (with Motorized Dampers Only)
- 100 dB Alarm Horn

WARRANTY (Standby Gensets Only)

- 2 Year Extended Limited Warranty
- 5 Year Limited Warranty
- 5 Year Extended Limited Warranty
- 7 Year Extended Limited Warranty
- 10 Year Extended Limited Warranty

ENGINEERED OPTIONS

ENGINE SYSTEM

- Fluid Containment Pan
- Coolant Heater Ball Valves

GENERATOR SET

- Special Testing
- Battery Box

FUEL TANKS

- Overfill Protection Valve
- UL 2085 Tank
- Stainless Steel Tank
- Special Fuel Tanks
- Vent Extensions
- 5 Gallon Spill Containment Box
- Dealer Supplied AHJ Requirements

MD750 | 18.1L | 750 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC INDUSTRIAL POWER

E10

APPLICATION AND ENGINEERING DATA

ENGINE SPECIFICATIONS

General

Make	Perkins
Cylinder #	6
Type	In-Line
Displacement - In^3 (L)	1,105 (18.1)
Bore - in (mm)	5.71 (145)
Stroke - in (mm)	7.20 (183)
Compression Ratio	14.0:1
Intake Air Method	Turbocharged/Aftercooled
Number of Main Bearings	7
Cylinder Head Type	Cast Iron
Piston Type	Aluminum

Engine Governing

Governor	Electronic
Frequency Regulation (Steady State)	±0.25%

Lubrication System

Oil Pump Type	Gear Driven
Oil Filter Type	Full Flow Spin-On Cartridge
Crankcase Capacity - qt (L)	71.8 (68)

Cooling System

Cooling System Type	Pressurized Closed Recovery
Fan Type	Pusher
Fan Speed - RPM	1,440
Fan Diameter - in (mm)	45 (1,143)

Fuel System

Fuel Type	Ultra Low Sulfur Diesel #2
Fuel Filtering (Microns)	10 Primary and 2 Secondary
Injector Type	EUI
Fuel Supply Line - in (mm)	0.5 (12.7)
Fuel Return Line - in (mm)	0.5 (12.7)

Engine Electrical System

System Voltage	24 VDC
Battery Charger Alternator	50 A
Battery Size	See Battery Index 0161970SBY
Battery Voltage	(2) - 12 VDC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Standard Model	K0820124Y22
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<50

Standard Excitation	Permanent Magnet
Bearings	Seated Ball
Coupling	Direct via Flexible Disc
Prototype Short Circuit Test	Yes
Voltage Regulator Type	Digital
Number of Sensed Phases	All
Regulation Accuracy (Steady State)	±0.25%

MD750 | 18.1L | 750 kW

INDUSTRIAL DIESEL GENERATOR SET

EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

OPERATING DATA

POWER RATINGS - DIESEL

	Standby	
Three-Phase 277/480 VAC @0.8pf	750 kW	Amps: 1,129
Three-Phase 346/600 VAC @0.8pf	750 kW	Amps: 903

MOTOR STARTING CAPABILITIES (skVA)

skVA vs. Voltage Dip

277/480 VAC	30%
K0820124Y22	2,100
K0912124Y22	2,700
K1000124Y22	2,700

FUEL CONSUMPTION RATES*

Fuel Pump Lift - ft (m)
12 (3.7)

Total Fuel Pump Flow (Combustion + Return) gph (Lph)
111 (420)

Diesel - gph (Lph)

Percent Load	Standby
25%	14.3 (54.1)
50%	25.6 (97.0)
75%	38.0 (143.8)
100%	49.7 (188.0)

* Fuel supply installation must accommodate fuel consumption rates at 100% load.

COOLING

		Standby
Air Flow (Fan Air Flow Across Radiator) - Open Set	scfm (m^3/min)	27,376 (775.2)
Coolant Flow	gpm (Lpm)	128 (485)
Coolant System Capacity	gal (L)	27.3 (103.3)
Maximum Operating Ambient Temperature	°F (°C)	122 (50)
Maximum Operating Ambient Temperature (Before Derate)	See Bulletin No. 0199280SSD	
Maximum Additional Radiator Backpressure	in H_2O (kPa)	0.5 (0.12)

COMBUSTION AIR REQUIREMENTS

	Standby
Flow at Rated Power - scfm (m^3/min)	2,507 (71)

ENGINE

		Standby
Rated Engine Speed	RPM	1,800
Horsepower at Rated kW**	hp	1,112
Piston Speed	ft/min (m/min)	2,160 (658)
BMEP	psi (kPa)	443 (3,053)

** Refer to “Emissions Data Sheet” for maximum bHP for EPA and SCAQMD permitting purposes.

EXHAUST

		Standby
Exhaust Flow (Rated Output)	scfm (m^3/min)	6,397 (181)
Maximum Allowable Exhaust Backpressure (Post Silencer)	inHg (kPa)	2.95 (9.99)
Exhaust Temperature (Rated Output)	°F (°C)	918 (492)

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions.
Please contact a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528, and DIN6271 standards.
Standby - See Bulletin 0187500SSB
Prime - See Bulletin 0187510SSB

18.1L

MD750 | 18.1L | 750 kW

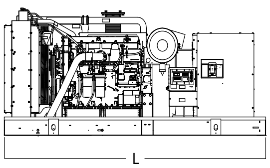
INDUSTRIAL DIESEL GENERATOR SET

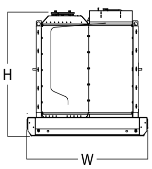
EPA Certified Stationary Emergency

GENERAC | INDUSTRIAL POWER

E12

DIMENSIONS AND WEIGHTS*

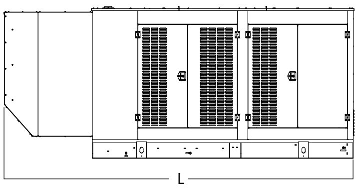


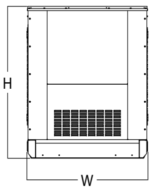


OPEN SET

Run Time - Hours	Usable Capacity - Gal (L)	L x W x H - in (mm)	Weight - lbs (kg)
No Tank	–	154.4 (3,923) x 71.0 (1,803) x 75.2 (1,911)	10,468 - 10,913 (4,748 - 4,950)
6	334 (1,264)	158.5 (4,025) x 71.0 (1,803) x 89.2 (2,267)	12,143 - 12,588 (5,508 - 5,710)
20	1,001 (3,789)	158.5 (4,025) x 71.0 (1,803) x 111.2 (2,825)	16,277 - 13,513 (7,383 - 6,129)
20	1,001 (3,789)	228.0 (5,791) x 71.0 (1,803) x 100.2 (2,546)	13,618 - 14,063 (6,177 - 6,379)
40	2,002 (7,578)	290.0 (7,366) x 71.0 (1,803) x 111.2 (2,825)	15,318 - 15,763 (6,948 - 7,150)

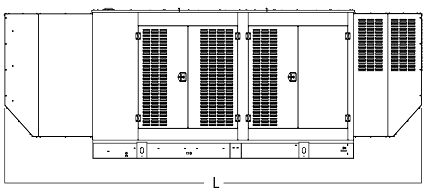
add

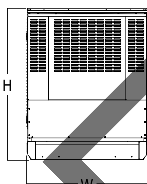




WEATHER PROTECTED ENCLOSURE

Run Time - Hours	Usable Capacity - Gal (L)	L x W x H - in (mm)	Weight (Enclosure Only) - lbs (kg) Steel	Aluminum
No Tank	–	207.4 (5,268) x 71.0 (1,803) x 80.0 (2,032)		
6	334 (1,264)	207.4 (5,268) x 71.0 (1,803) x 94.0 (2,388)		
20	1,001 (3,789)	207.4 (5,268) x 71.0 (1,803) x 116.0 (2,946)	2,467 (1,119)	1,380 (626)
20	1,001 (3,789)	228.0 (5,791) x 71.0 (1,803) x 105.0 (2,667)		
40	2,002 (7,578)	290.0 (7,366) x 71.0 (1,803) x 116.0 (2,946)		

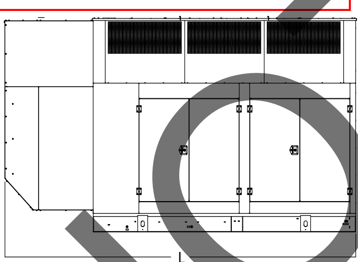


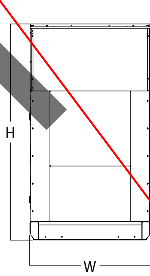


LEVEL 1 SOUND ATTENUATED ENCLOSURE

Run Time - Hours	Usable Capacity - Gal (L)	L x W x H - in (mm)	Weight (Enclosure Only) - lbs (kg) Steel	Aluminum
No Tank	–	247.5 (6,285) x 71.0 (1,803) x 80.0 (2,032)		
6	334 (1,264)	247.5 (6,285) x 71.0 (1,803) x 94.0 (2,388)		
20	1,001 (3,789)	247.5 (6,285) x 71.0 (1,803) x 116.0 (2,946)	3,472 (1,575)	1,812 (622)
20	1,001 (3,789)	247.5 (6,285) x 71.0 (1,803) x 105.0 (2,667)		
40	2,002 (7,578)	290.0 (7,366) x 71.0 (1,803) x 116.0 (2,946)		

note the length dimensions decrease with a 20hr tank on level 2, but height goes up to 140" tall





LEVEL 2 SOUND ATTENUATED ENCLOSURE

Run Time - Hours	Usable Capacity - Gal (L)	L x W x H - in (mm)	Weight (Enclosure Only) - lbs (kg) Steel	Aluminum
No Tank	–	207.4 (5,268) x 71.0 (1,803) x 114.1 (2,899)		
6	334 (1,264)	207.4 (5,268) x 71.0 (1,803) x 128.1 (3,255)		
20	1,001 (3,789)	207.4 (5,268) x 71.0 (1,803) x 150.1 (3,813)	3,809 (1,728)	1,955 (887)
20	1,001 (3,789)	228.0 (5,791) x 71.0 (1,803) x 139.1 (3,534)		
40	2,002 (7,578)	290.0 (7,366) x 71.0 (1,803) x 150.1 (3,813)		

* All measurements are approximate and for estimation purposes only.

YOUR FACTORY RECOGNIZED GENERAC INDUSTRIAL DEALER

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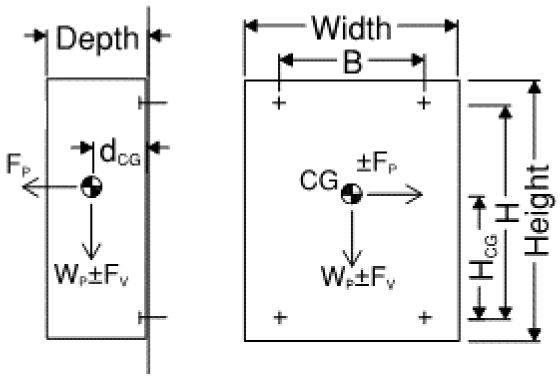
SPEC SHEET

Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please contact a Generac Power Systems Industrial Dealer for detailed installation drawings.

BUEHLER

PROJECT San Bernardino ISD
PROJECT NO. 2021-0014 DATE
CLIENT Holt BY KRN PAGE NO. E13

EQUIPMENT ANCHORAGE CALCULATION (ASCE 7-16)



Unit Identification	UnitID = **"2-EM"**
Unit Height	Height = **62** in
Unit Width	Width = **20** in
Unit Depth	Depth = **6** in
Unit Weight	W_p = **300** lb
Width Between Connections	B = **15** in
Height Between Connections	H = **50** in
Height to Center of Gravity	H_{CG} = **25** in
Depth to Center of Gravity	d_{CG} = **6** in

Seismic Load Parameters (ASCE 7-16)

a_p = **2.5**	R_p = **6.0**	Ω_0 = **2.0**	I_p = **1.00**
S_{ds} = **1.540**	z = **0.5** ft	h = **1** ft	

Seismic Forces

$F_{pcalc} = 0.4*a_p*S_{ds}*I_p*(1+2*(z/h))/R_p$ = **0.513** * W_p

$F_{pmin} = 0.3*S_{ds}*I_p$ = **0.462** * W_p — $F_{pmax} = 1.6*S_{ds}*I_p$ = **2.464** * W_p

Controlling Horizontal Force — F_p = **0.513** * W_p

Vertical Force — $F_v = 0.2*S_{ds}$ = **0.308** * W_p

<u>Check Connections of Equipment to Wall</u>

Load Combination	D_F = **1.2**	$E_H = \Omega_0$ = **2.0**	E_V = **1.0**

Total Number of Connections to Backing	N = **4**
Number of Connections in Top Row	N_T = **2**
Number of Connections Each Side	N_S = **2**
Increase to Loads to Connections Due to CG Offset	Inc = abs((H_{CG}/H - 0.5)/0.5) = **0**
Tension from Dead Loads	$T_D = D_F*W_p*d_{CG}/(H*N_T)$ = **22** lbs
Tension from Fv	$T_{Fv} = E_V*F_v*W_p*d_{CG}/(H*N_T)$ = **6** lb
Tension from Fp acting Front to Back	$T_1 = E_H*F_p*W_p/N*(1+Inc)$ = **77** lb
Tension from Fp acting Side to Side	$T_2 = E_H*F_p*W_p*d_{CG}/(B*N_S)*(1+Inc)$ = **62** lb
Controlling Tension	$T_{conn} = T_D + T_{Fv} + max(T_1+0.3*T_2, 0.3*T_1+T_2)$ = **123** lb
Shear from Dead Loads	$V_D = D_F*W_p/N*(1+Inc)$ = **90** lb
Shear from Fv	$V_{Fv} = E_V*F_v*W_p/N*(1+Inc)$ = **23** lb
Shear from Fp acting Front to Back	V_1 = 0 lb
Shear from Fp acting Side to Side	$V_2 = (E_H*F_p*W_p)/N*(1+Inc)$ = **77** lb
Controlling Shear	$V_{conn} = sqrt((V_D + V_{Fv})^2+(max(V_1+0.3*V_2, 0.3*V_1+V_2))^2)$ = **137** lb

PROJECT	San Bernardino ISD		
PROJECT NO.	2021-0014	DATE	
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PAGE NO.	~~E14~~		

Check Connection to Wall

Connection Conn = **"3/8" DIA HILTI KH-EZ SCREW ANCHORS w/ 2" EMBED"**

Tension Capacity $\phi T =$ **245** lb

Shear Capacity $\phi V =$ **345** lb

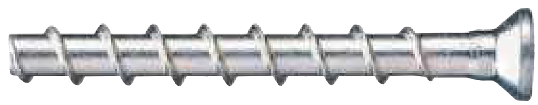
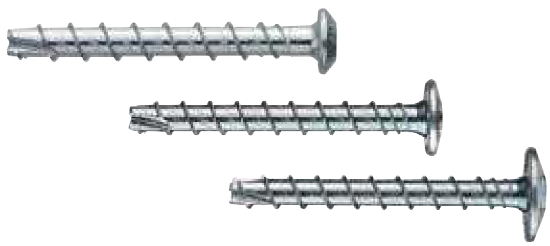
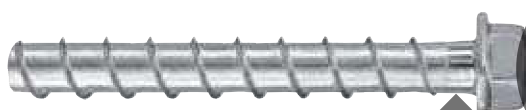
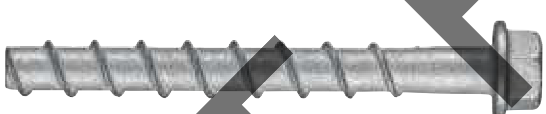
Demand Capacity Ratio

DCR = $V_{conn}/\phi V + T_{conn}/\phi T =$ **0.90** Check = **"OK"**

3.3.6 KWIK HUS-EZ SCREW ANCHOR

PRODUCT DESCRIPTION

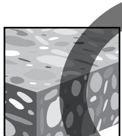
KWIK HUS EZ carbon steel anchors

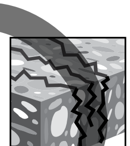
Anchor System	
	Carbon Steel KH-EZ C 1/4" and 3/8"
	Carbon Steel 1/4" KH-EZ P, PM, PL
	Carbon Steel KH EZ 1/4"-3/4"
	Carbon Steel KH-EZ CRC 3/8"-3/4"

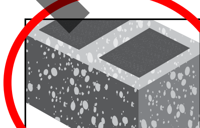
Features and Benefits

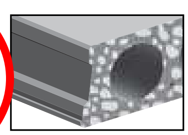
- OSHA Table 1926.1153 Table 1 complaint installation when installed with Hilti vacuum and DRS system or Hilti SafeSet™ hollow drill bit technology
- Easy installation using impact tool or torque wrench
- Product and length identification marks helps facilitate quality control after installation
- Through fixture installation improves productivity and more accurate installation.
- Thread design helps enable quality setting and exceptional load values in wide variety of base material strengths.
- 1/4" diameter available in hex head countersunk head and pan head styles.
- Anchor is fully removable.
- Anchor diameter is same as drill bit diameter. No special diameter bit required.
- Suitable for reduced edge distances and spacing.
- Corrosion resistant coating allows for use in outdoor moderate corrosive environments (KH-EZ CRC only).
- Installation process allows for adjustability.

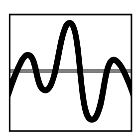
3.3.6


Uncracked concrete


Cracked concrete


Grout-filled concrete masonry


Hollowcore concrete


Seismic Design Categories A-F

SafeSet™ System with Hollow Drill Bit

Profis Anchor design software

Approvals/Listings	
ICC-ES (International Code Council)	ESR-3027 in concrete per ACI 318 Ch. 17 / ACI 355.2/ ICC-ES AC193 ESR-3056 in grout-filled CMU per ICC-ES AC106
City of Los Angeles	City of Los Angeles 2020 LABC Supplement (within ESR-3027 and ESR-3056)
Florida Building Code	2020 FBC w/ HVHZ (within ESR-3027 and ESR-3056)
FM (Factory Mutual)	Pipe hanger components for automatic sprinkler systems for KH-EZ I and KH-EZ E

DESIGN INFORMATION IN MASONRY

Table 30 — Allowable tension loads for Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC installed in grout-filled masonry walls (lb)[1,2,3,4,5]

Nominal anchor diameter in.	Embedment in.[6]	Loads @ c_{cr} and s_{cr}	Spacing			Edge distance
			Critical - s_{cr} in.[7]	Minimum - s_{min} in.[7]	Load reduction factor at s_{min}[8]	Critical - c_{cr} Minimum- c_{min} in.[9]
1/4	1-5/8	530[10]	4	2	0.70	4
	2-1/2	910[11]		4	1.00	
3/8	1-5/8	535[11]	4	2	0.70	4
	2-1/2	895	6	4	0.80	
	3-1/4	1,210				
1/2	2-1/4	710	4	2	0.60	4
	3	1,110	8	4		
	4-1/4	1,515				
5/8	3-1/4	1,155	10	4	0.60	4
	5	1,735				
3/4	4	1,680	12	4	0.60	4
	6-1/4	2,035				

Table 31 — Allowable shear loads for Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC installed in grout-filled masonry walls (lb)[1,2,3,4,5]

Nominal anchor diameter in.	Embedment in.[6]	Load at c_{cr} and s_{cr}	Spacing			Edge distance			
			Critical - s_{cr} in.[7]	Minimum - s_{min} in.[7]	Load reduction factor at s_{min}[8]	Critical - c_{cr} in.[9]	Minimum - c_{min} in.[9]	Load reduction factor at c_{min}	
								perpendicular to edge	parallel to edge
1/4	1-5/8	675[10]	4	4	1.00	4	4	1.00	1.00
	2-1/2	840[11]						1.00	1.00
3/8	1-5/8	1,140[11]	6	4	0.94	6	4	0.61	1.00
	2-1/2	1,165						0.70	1.00
	3-1/4	1,190						0.70	1.00
1/2	2-1/4	1,845	8	4	0.88	8	4	0.50	1.00
	3	2,055						0.45	0.94
	4-1/4	2,745						0.40	0.89
5/8	3-1/4	3,040	10	4	0.36	10	4	0.36	0.82
	5	3,485						0.34	0.92
3/4	4	3,040	10	4	0.36	10	4	0.36	0.82
	6-1/4	3,485						0.34	0.92

1 All values are for anchors installed in fully grouted masonry with minimum masonry prism strength of 1,500 psi. Concrete masonry units may be lightweight, medium-weight or normal-weight.

2 Anchors may not be installed within one inch in any direction of a vertical joint.

3 Linear interpolation of load values between minimum spacing s_{min} and critical spacing s_{cr} and between minimum edge distance c_{min} and critical edge distance c_{cr} is permitted.

4 For combined loading: For 1/4-in. - $\frac{T_{applied}}{T_{allowable}} + \frac{V_{applied}}{V_{allowable}} \leq 1$ For 3/8- through 3/4-in. - $\left(\frac{T_{applied}}{T_{allowable}}\right)^{5/3} + \left(\frac{V_{applied}}{V_{allowable}}\right)^{5/3} \leq 1$

5 See Figure 5 on Page 21 of this document for anchor locations.

6 Embedment depth is measured from the outside face of the concrete masonry embedment.

7 Critical spacing s_{cr} is the anchor spacing where full load values may be used. The minimum spacing s_{min} is the minimum spacing for which values are available and installation is recommended. Spacing is measured from the center of one anchor to the center of the adjacent anchor.

8 Load reduction factors are multiplicative, both spacing and edge distance load reduction factors must be considered. Load values for anchors installed at less than c_{cr} or s_{cr} must be multiplied by the appropriate load reduction factor based on actual edge distance (c) or spacing (s).

9 The critical edge distance c_{cr} is the edge distance where full load values may be used. The minimum edge distance c_{min} is the minimum edge distance for which values are available and installation is recommended. For tension, c_{cr} equals c_{min}. Edge distance is measured from the center of the anchor to the closest edge.

10 Load values must be reduced by 21% for installations within 1-1/4 inches of the bed joint.

11 Load values must be reduced by 13% for installations within 1-1/4 inches of the bed joint.

Table 32 — Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC allowable loads installed in top-of-grout-filled concrete masonry walls or horizontal members of wall openings[1,2,3]

Nominal anchor diameter in.	Minimum embedment depth in.	Edge distance[4] in.	Critical spacing[5] in.	Minimum end distance[6] in.	Tension lb	Shear lb Load direction Parallel to edge of masonry wall	Shear lb Load direction Perpendicular to edge of masonry wall
1/4	1 5/8	1 1/2	4	4	205	180	135
		3 3/4			205	275	275
	2 1/2	1 1/2			355	345	155
		3 3/4			390	415	330
3/8	1 5/8	1 1/2	6	6	245	345	175
		3 3/4			245	345	345
	3 1/4	1 1/2			465	490	200
		3 3/4			540	800	625
1/2	2 1/4	1 3/4	8	8	390	460	200
		3 3/4			610	525	500
	4 1/4	1 3/4			540	885	245
		3 3/4			750	1275	550
5/8	5	1 3/4	10	10	975	930	245
		3 3/4			975	2190	630
3/4	6 1/4	3 3/4	12	12	975	2430	630

Table 33 — Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC allowable loads installed in end-of-wall or vertical members of wall openings[1,2]

Nominal anchor diameter in.	Minimum embedment depth in.	Edge distance[4] in.	Critical spacing[5] in.	Minimum end distance[6] in.	Tension lb	Shear lb Load direction Parallel to edge of masonry wall	Shear lb Load direction Perpendicular to edge of masonry wall
1/4	1 5/8	1 1/2	4	4	360	525	205
		3 3/4			380	595	585
	2 1/2	1 1/2			590	610	225
		3 3/4			755	635	585
3/8	1 5/8	1 1/2	6	6	355	725	215
		3 3/4			465	1010	825
	3 1/4	1 1/2			565	875	240
		3 3/4			1020	1195	1050
1/2	2 1/4	1 3/4	8	8	500	855	260
		3 3/4			525	1100	1050
	4 1/4	1 3/4			650	925	280
		3 3/4			1150	1240	1050
5/8	5	3 3/4	10	10	1605	2215	1050
3/4	6 1/4	3 3/4	12	12	1865	2550	1050

1 All values are for anchors installed in fully grouted concrete masonry with minimum masonry prism strength of 1,500 psi. Concrete masonry units may be lightweight, medium-weight or normal-weight conforming to ASTM C90. Allowable loads are calculated using safety factor of 5.
2 See figure 6 and 7 for allowable anchor installation locations on the top of grout-filled concrete masonry walls. Anchors may not be installed within one inch of a vertical joint. See figure 7 for anchor installation locations in end-of-wall and vertical members of wall openings.
3 Anchors may not be installed within 1-1/4" in any direction of a head joint.
4 For load values at edge distances between listed values linear interpolation is permitted.
5 Critical spacing equals minimum spacing.
6 Minimum end distance applicable to top-of-wall and end-of-wall and does not apply for wall openings such as windows.

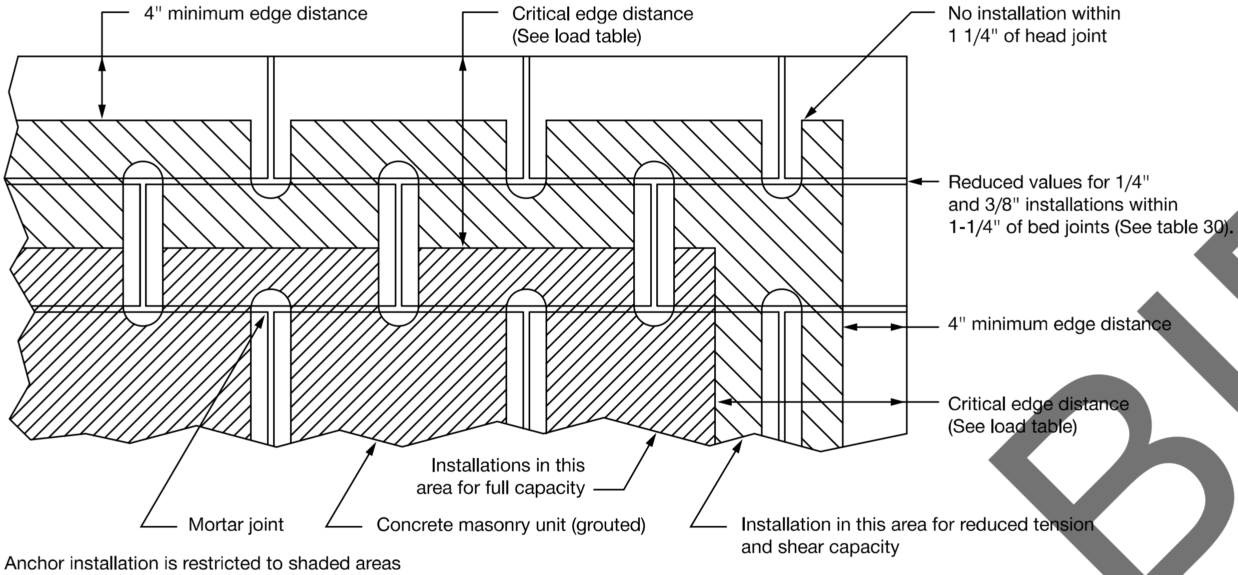


Figure 5 — Acceptable locations (shaded areas) for Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC anchors in grout-filled concrete masonry

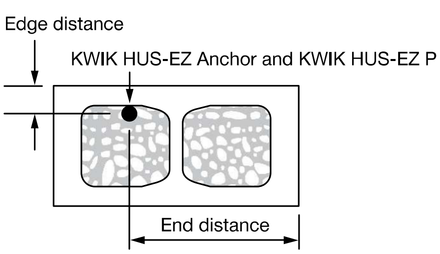


Figure 6 — Edge and end distances for the Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC anchor installed in the top of CMU masonry wall construction

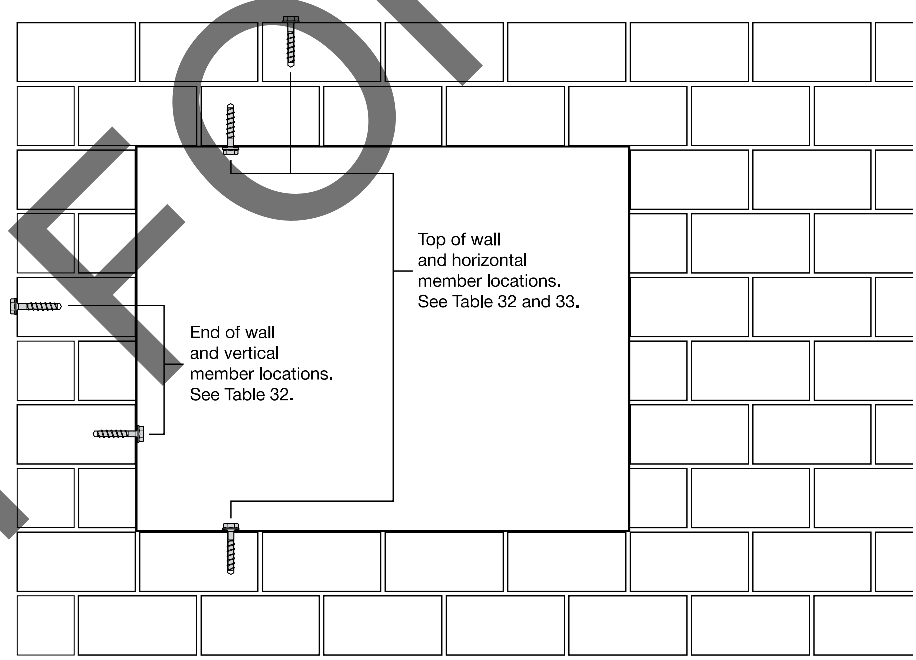
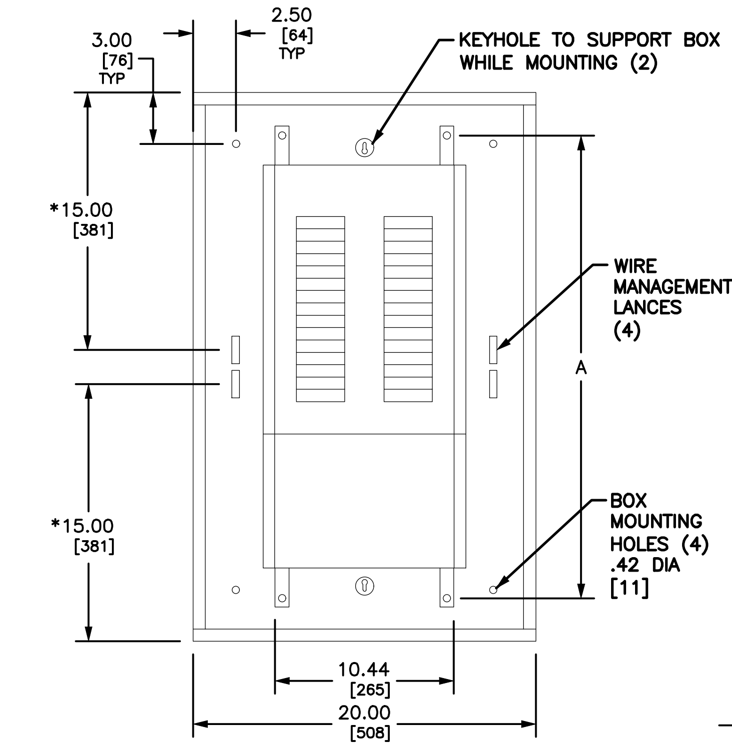
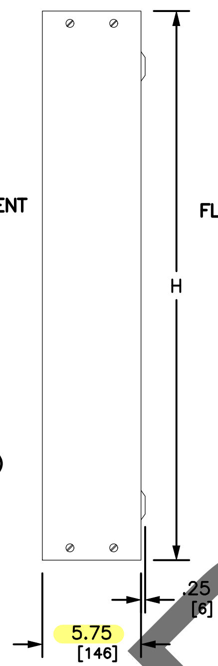


Figure 7 — Anchor locations in end of wall or wall opening applications

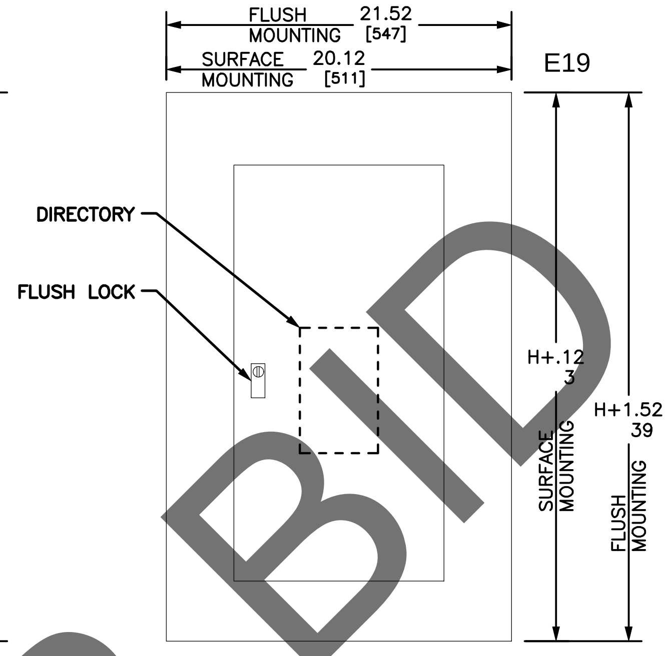
REV	DESCRIPTION	BY	DATE	—	————	——	——/——
—	————	——	——/——	—	————	——	——/——



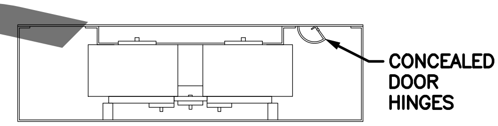
TYPICAL BOX WITH INTERIOR



TYPICAL BOX SIDE VIEW

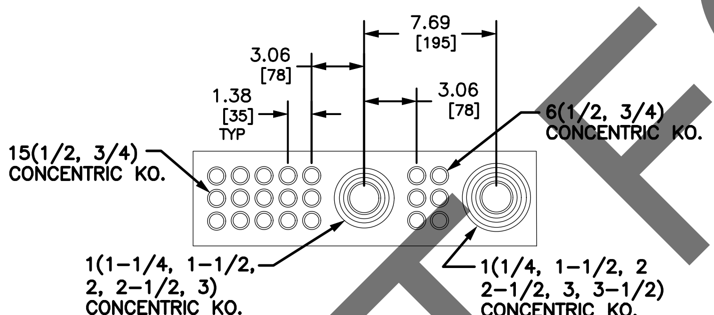


TYPICAL FRONT



TYPICAL MOUNTING OF EDB OR ECB–G3 BREAKERS

*FOR ENCLOSURES WHERE DIMENSION "H" IS 26.00/[660], THIS DIMENSION IS 11.00/[279]



ENDWALL WITH KNOCKOUTS
(OTHER ENDWALL IS BLANK)

DUAL DIMENSIONS: INCHES / MILLIMETERS

MAXIMUM MAIN LUG AMPERE RATING	MAXIMUM NUMBER OF CIRCUITS	H		A	
		IN	MM	IN	MM
125	18	26.00	660	21.00	533
	30	32.00	813	27.00	686
250	30	38.00	965	33.00	838
	42	44.00	1118	39.00	991
	54	50.00	1270	45.00	1143
	66	62.00	1575	57.00	1448
125 WITH SUB–FEED LUGS	18	26.00	660	21.00	533
	30	32.00	813	27.00	686
250 WITH SUB–FEED LUGS	30	38.00	965	33.00	838
	42	44.00	1118	39.00	991
	54	50.00	1270	45.00	1143
	66	62.00	1575	57.00	1448
125 WITH FEED–THRU LUGS	18	32.00	813	27.00	686
	30	38.00	965	33.00	838
250 WITH FEED–THRU LUGS	30	50.00	1270	45.00	1143
	42	56.00	1422	51.00	1295
	54	62.00	1575	57.00	1448
	66	74.00	1880	69.00	1753
250 WITH SUB–FEED BREAKERS	30	56.00	1422	51.00	1295
	42	62.00	1575	57.00	1448
	54	68.00	1727	63.00	1600
	66	74.00	1880	69.00	1753

REFER TO DP CATALOG CLASS 1670 FOR ADDITIONAL INFORMATION

FOR NEMA TYPE 3R APPLICATIONS USE IN CONJUNCTION WITH PBA555

NF PANELBOARDS MEET THE APPLICABLE REQUIREMENTS OF UL AND CSA.

BOX: CODE GAUGE GALVANIZED STEEL. ONE ENDWALL IS BLANK, THE OTHER HAS KNOCKOUTS.

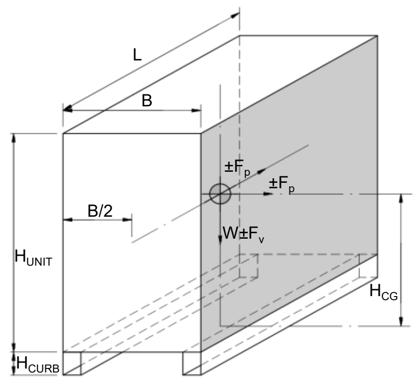
FRONT: MONO–FLAT CONSTRUCTION WITH CONCEALED TRIM SCREWS AND DOOR HINGES. ANSI 49 GRAY BAKED ENAMEL FINISH ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.

LOCK: FLUSH LOCK WITH BRUSHED STAINLESS STEEL ESCUTCHEON. NSR–251 KEY.

JOB NAME:	———	EQUIPMENT DESIGNATION:	———
JOB LOCATION:	———	EQUIPMENT TYPE:	NF 125A/250A MLO TYPE 1
DRAWN BY:	———	DRAWING TYPE:	———
ENGR:	———	SQUARE D Schneider Electric	
DATE:	JULY 2008		
DRAWING STATUS:	———	DWG# PBA550	PG 01 OF 01 REV —

Mechanical Equipment Anchorage Calc
BASE MOUNTED

Unit Identification: **T-2EM**



W_p =	500 lbs	unit weight
B =	21.00 in	unit width
$d_{B\ dir\ anchors}$ =	19.00 in	dist btwn anchors (B dir.)
L =	26.00 in	unit length
$d_{L\ dir\ anchors}$ =	24.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	36.00 in	unit height
H_{CG_EQUIP} =	19.26 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	19.26 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p =	1.00	R_p =	2.50	I_p =	1.00	S_{DS} =	1.540
z =	0.00 ft	h =	1.00 ft	Ωo =	2.0		

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h)]/R_p) \times W_p$ = 0.246 Wp $F_v = 0.2(S_{DS})W_p$ = 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p$ = 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p)$ = 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**231 lbs**	**$0.7F_p = V_h$ =**	**162 lbs**
$F_v = V_v$ =	**154 lbs**	**$0.7F_v = V_v$ =**	**108 lbs**

Unit Anchorage:

Fp in "B" Direction

\# connections shear 4

\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	371 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	742 lb-ft	$M_{OT} = V_hH_{CG}$ =	260 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	259 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	259 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(B/2)$ =	168 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	71 lbs	$T = (M_{OT} - M_R) / d_B$ =	305 lbs	$T = (M_{OT} - M_R) / d_B$ =	58 lbs
T_{conn} = T / # conn tension =	35 lbs	T_{conn} = T / # conn tension =	152 lbs	T_{conn} = T / # conn tension =	29 lbs
$V_{conn} = V_h$ / # conn shear =	58 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	116 lbs	$V_{conn} = V_h$ / # conn shear =	40 lbs

Fp in "L" Direction

\# connections shear 4

\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	371 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	742 lb-ft	$M_{OT} = V_hH_{CG}$ =	260 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	321 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	321 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(L/2)$ =	208 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	25 lbs	$T = (M_{OT} - M_R) / d_L$ =	210 lbs	$T = (M_{OT} - M_R) / d_L$ =	26 lbs
T_{conn} = T / # conn tension =	13 lbs	T_{conn} = T / # conn tension =	105 lbs	T_{conn} = T / # conn tension =	13 lbs
$V_{conn} = V_h$ / # conn shear =	58 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	116 lbs	$V_{conn} = V_h$ / # conn shear =	40 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	35 lbs	Tmax =	152 lbs	Tmax =	29 lbs
Vmax =	58 lbs	Vmax =	116 lbs	Vmax =	40 lbs

Connection/Anchorage Notes:

Anchor Description: 1/2"Ø Hilti KB-TZ2 SS304 w/ 2" Embed, 6" Edge Dist

ΦTn = 1977 lbs (per Hilti Profis) DCR = 0.08

ΦVn = 3470 lbs (per Hilti Profis) DCR = 0.03

Interaction = 0.08 + 0.03 = 0.11 < 1.2

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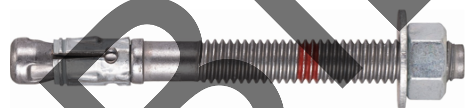
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

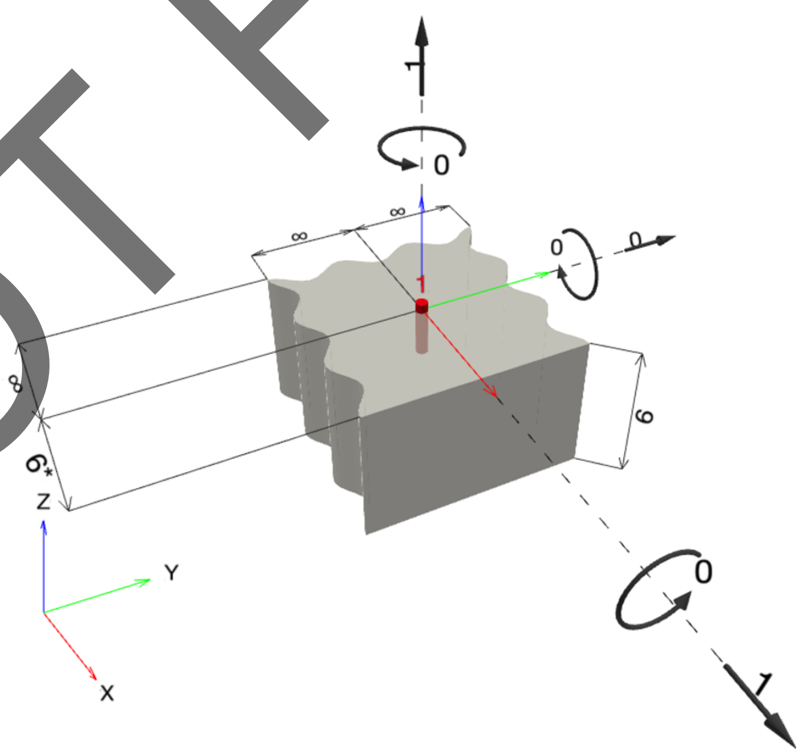
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 1/2 (2) hnom1**
Item number:	2210260 KB-TZ2 1/2x3 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar

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



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1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	no	1

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Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [lb] Load	Capacity	Utilization β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	1,977	1 / -	OK
Shear	Concrete edge failure in direction x+	1	3,470	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.001	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
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Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

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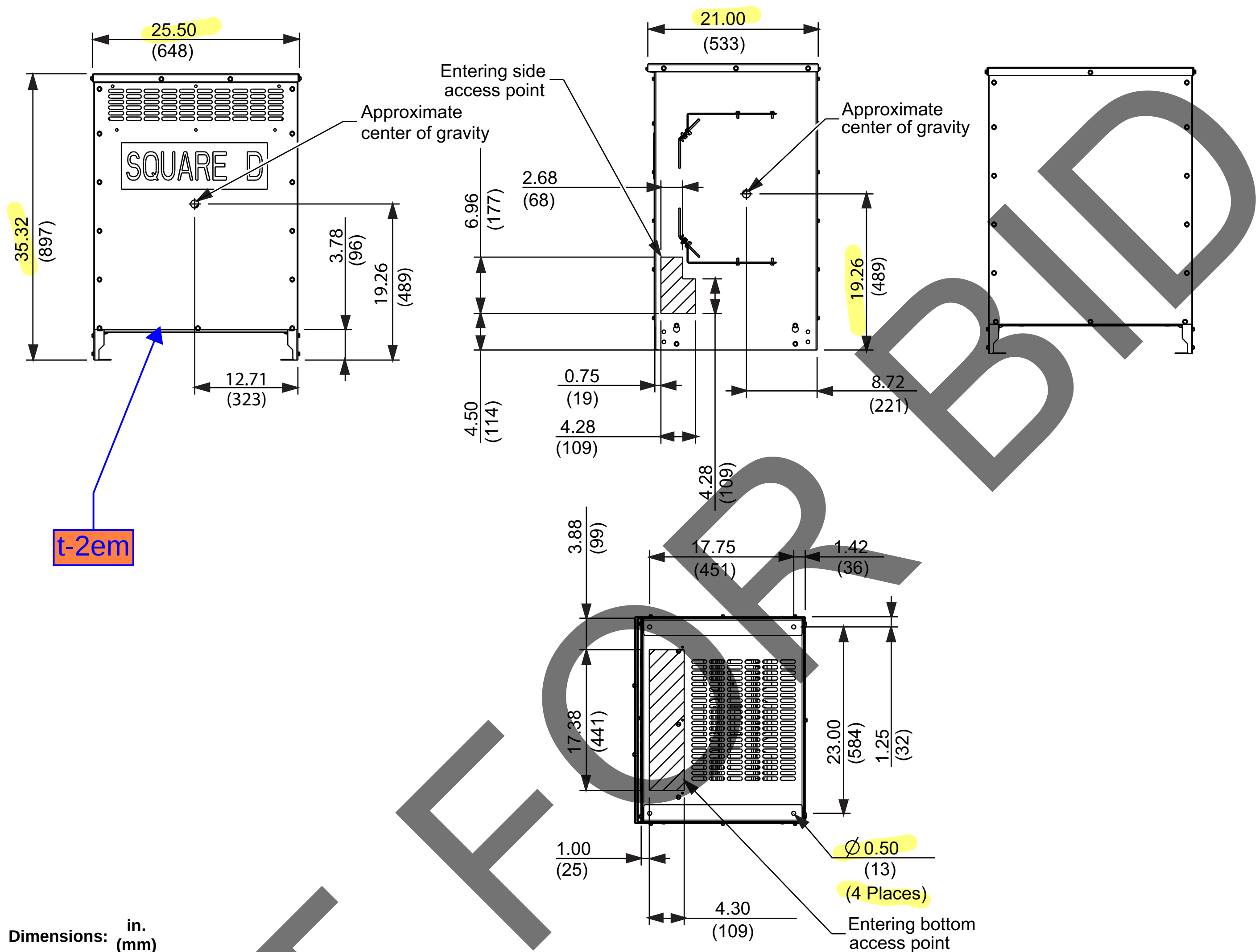
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Figure 8: Enclosure 18K



Dimensions: in. (mm)

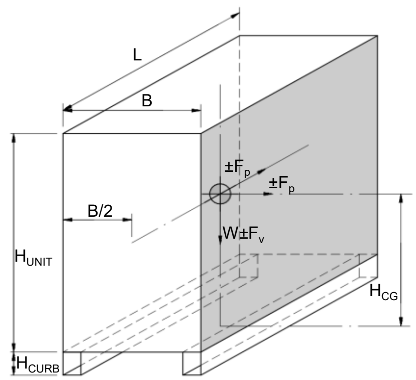
Accessories	
Weathershield	7400WS18K
Wall mounting bracket	7400WMB18K20K
Ceiling mounting bracket	7400CMB18K
Floor mounting bracket	7400FBM
State of CA only (OSP label)	7400CAOSHPDK
Enclosure Parts (Replacement Parts)	
Top cover	NHA48593
Side panel	NHA48584
Front cover with labels	NHA48587
Rear cover	NHA53881
Base assembly	NHA48364

When ordering front cover with labels, Catalog No., Serial No., and Date Code in Engineering Notes must be supplied (see Figure 4 for location information on Namplate). Serial number may also be obtained from Core and Coils.

SQUARE D by Schneider Electric

Mechanical Equipment Anchorage Calc
BASE MOUNTED

Unit Identification: **CH-1 CHILLER**



W_p =	17000 lbs	unit weight
B =	88.00 in	unit width
$d_{B\ dir\ anchors}$ =	70.00 in	dist btwn anchors (B dir.)
L =	327.00 in	unit length
$d_{L\ dir\ anchors}$ =	76.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	99.00 in	unit height
H_{CG_EQUIP} =	46.00 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	46.00 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p = 1.00	R_p = 2.50	I_p = 1.00	S_{DS} = 1.540
z = 0.00 ft	h = 1.00 ft	Ωo = 2.0	

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h))]/R_p) \times W_p =$ 0.246 Wp $F_v = 0.2(S_{DS})W_p =$ 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p =$ 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p) =$ 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**7854 lbs**	**$0.7F_p = V_h$ =**	**5498 lbs**
$F_v = V_v$ =	**5236 lbs**	**$0.7F_v = V_v$ =**	**3665 lbs**

Unit Anchorage:

Fp in "B" Direction

connections shear 10
connections tension 5

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	30107 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	60214 lb-ft	$M_{OT} = V_hH_{CG}$ =	21075 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	36901 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	36901 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(B/2)$ =	23961 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	no net uplift	$T = (M_{OT} - M_R) / d_B$ =	3996 lbs	$T = (M_{OT} - M_R) / d_B$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	799 lbs	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	785 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	1571 lbs	$V_{conn} = V_h$ / # conn shear =	550 lbs

Fp in "L" Direction

connections shear 10
connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	30107 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	60214 lb-ft	$M_{OT} = V_hH_{CG}$ =	21075 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	137122 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	137122 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(L/2)$ =	89037 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	785 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	1571 lbs	$V_{conn} = V_h$ / # conn shear =	550 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	0 lbs	Tmax =	799 lbs	Tmax =	0 lbs
Vmax =	785 lbs	Vmax =	1571 lbs	Vmax =	550 lbs

Connection/Anchorage Notes:

Anchor Description: 3/4"Ø Hilti KB-TZ2 SS304 w/ 3.25" Embed, 6" Edge Dist

ΦTn = 3794 lbs (per Hilti Profis) DCR = 0.21

ΦVn = 4318 lbs (per Hilti Profis) DCR = 0.36

Interaction = 0.21 + 0.36 = 0.57 < 1.2

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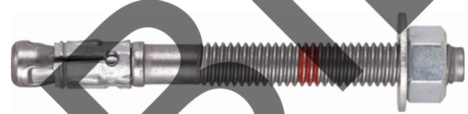
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

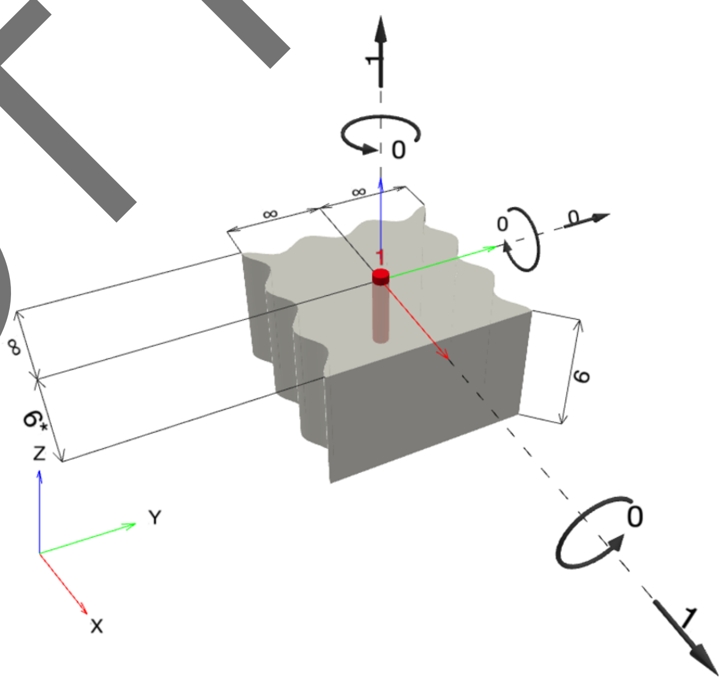
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/4 (3 1/4) hnom1**
Item number:	2210285 KB-TZ2 3/4x4 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 4.000 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d))
	Shear load: yes (17.2.3.5.3 (c))

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



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Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	yes	1

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
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	1	3,794	1 / -	OK
Shear	Concrete edge failure in direction x+	1	4,318	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.000	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

E31

Unit Overview

Chiller Model	Ascend(TM) Air-Cooled Chiller Model ACR
Unit Nominal Tonnage	250 Nominal Tons
Refrigeration Capacity	238.01 tons
Cooling Efficiency	10.000 EER (Btu/W-h)
NPLV.IP	21.870 EER (Btu/W-h)
IPLV.IP	21.034 EER (Btu/W-h)
Elevation	0.00 ft
Unit Voltage	460 volt/60Hz/3 phase
Refrigerant Type	HFC-134a
Agency Listing	UL Listed-US/Canadian Safety Standard
Pressure Vessel Code	ASME Pressure Vessel Code
Model Number	ACRB2505EUA*XUUCXNC2XHN XCREV1TACXXXAAXXXXX0X

Evaporator Information

Evaporator Application	Standard Cooling	Entering Temperature	62.00 F
Fouling Factor	0.000100 hr-sq ft-deg F/ Btu	Leaving Temperature	46.00 F
Pass Configuration	Chil 2-pass	Design Flow	355.86 gpm
Flow Sense Set Point	Flow Switch Set Point 45cm/sec	Design PD	5.50 ft H2O

Chilled Fluid	
Fluid Type	Water
Fluid Freeze Point	32.00 F

Condenser Information

Condenser Application	Standard Ambient	Number of Fans	12.00 Each
Condenser Type	Round Copper Tube, Al Plate Fin	Ambient Air Temperature	105.00 F
Condenser Size	6V Condenser Coil Modules		

Electrical Information

Unit Voltage	460 volt/60Hz/3 phase
Frequency	60 Hertz Rated Frequency
Incoming Line Connection	Single Point Unit Power Connection
Incoming Connection Type	Terminal Block
Short Circuit Current Rating	10000 A
Compressor Starter	Variable Frequency Drive (1 Compr/CKT)
Harmonic Filter	Reactor (>30% TDD)
Total Power	285.60 kW

RLA	
Compressor 1A - VFD Input	168.00 A
Compressor 2A - VFD Input	168.00 A
MCA	
Single Point Power	414.00 A
MOP	
Single Point Power	500.00 A

Physical Information

Dimensions		Weights	
Length	335.750 in	Operating Weight	16500 lb
Width	87.813 in	Shipping Weight	16300 lb
Height	98.375 in		

Charge	Circuit 1	Circuit 2
Oil	4.00 gal	4.00 gal
Refrigerant	261 lb	261 lb
Drive Cooling	1.50 gal	2.10 gal

Warranty

Standard Warranty

Regulatory Compliance

E32

ASHRAE 90.1

This unit complies with the efficiency requirements of ASHRAE 90.1 and CSA C743 - all versions up to 2016.

AHRI Standard 550/590

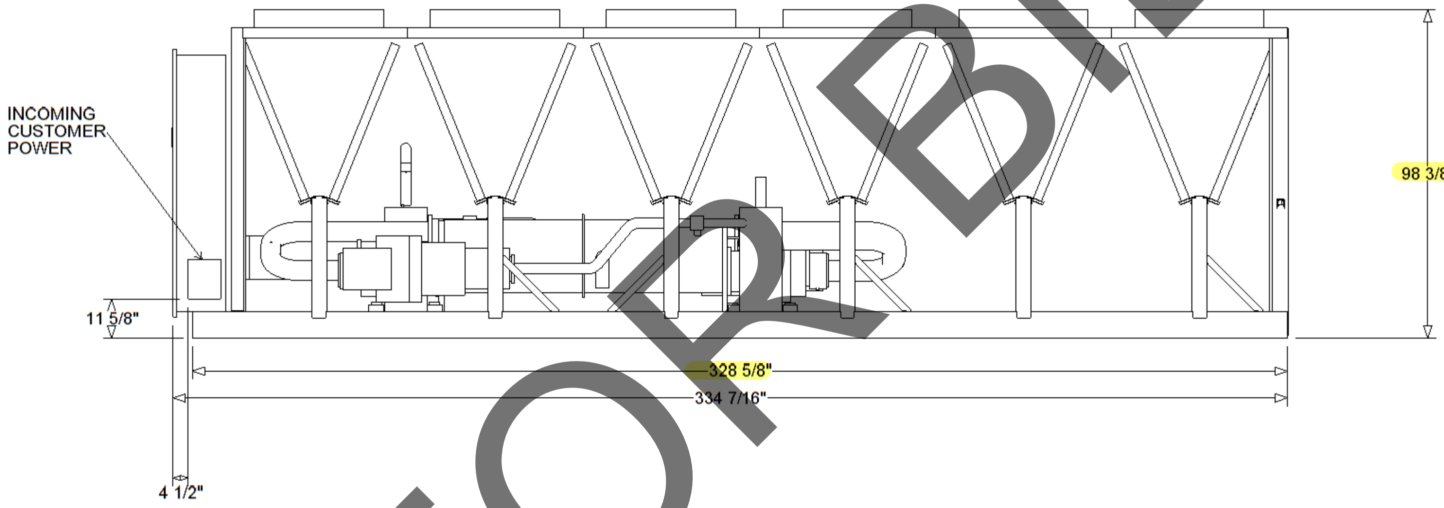
Certified in accordance with Air-Cooled Water-Chilling Packages Certification Program, which is based on AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI). Certified units may be found in the AHRI Directory at www.ahridirectory.org

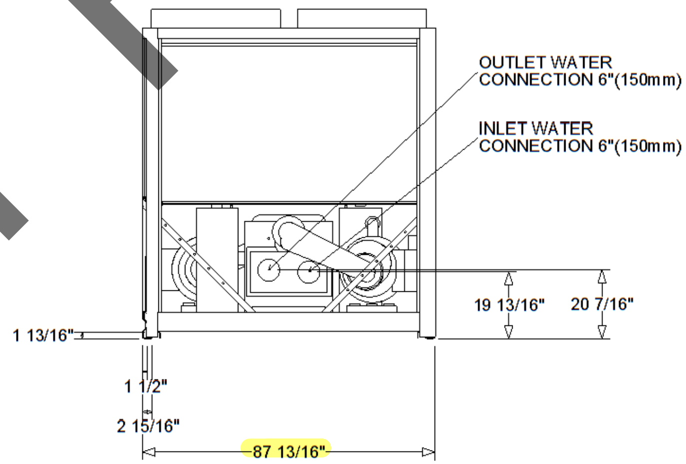
Information for LEED Projects

Refrigerant Charge Ckt 1	261 lb	ASHRAE 90.1 - all versions up to 2016
Refrigerant Charge Ckt 2	261 lb	This product meets the minimum efficiency requirements of ASHRAE Standard 90.1 and CANS/CSA C743 for all versions (which are based on AHRI standard rating conditions) and, therefore, also meets the LEED "Minimum Energy Performance" prerequisite in the Energy and Atmosphere section.
Rated Capacity (AHRI)	245.22 tons	
Rated Efficiency (AHRI)	11.511 EER (Btu/W-h)	
IPLV	21.034 EER (Btu/W-h)	
Refrigeration Capacity	238.01 tons	The LEED Green Building Rating System™, developed by the U.S. Green Building Council, provides indepenent, third-party verification that a building project meets green building and performance measures.
Cooling Efficiency	10.000 EER (Btu/W-h)	
Compressor Power	265.15 kW	
Fan Power	20.05 kW	

Trane Select Assist Version Number:	250
Data Generation Date:	8/16/2021

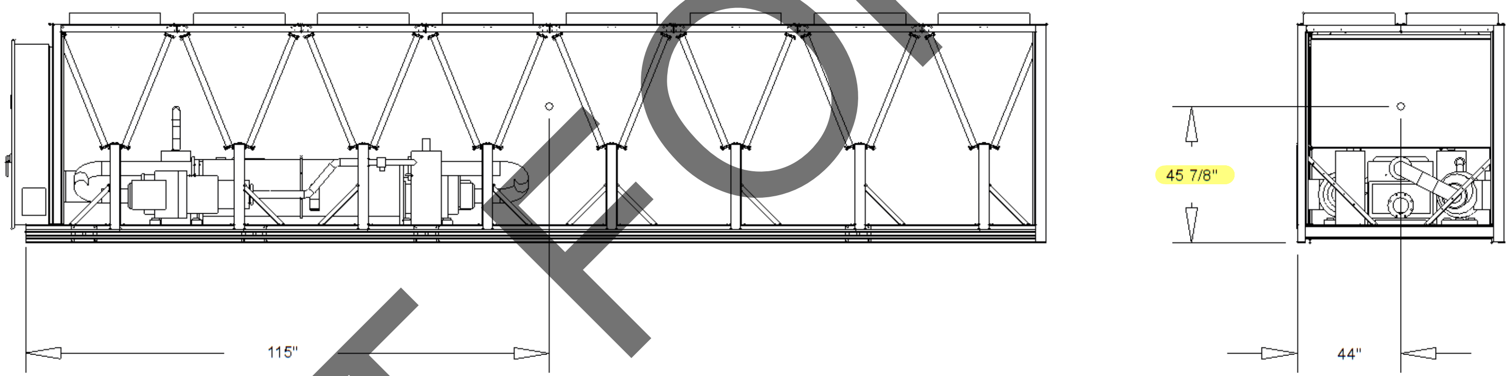
250 NOMINAL TONS
Water Volume 28.7 Gallons/108.8 L
Mounting Hole Diameter 9/16"
Incoming Power Dimensions 11 13/16" X 9 13/16"
Data Generation <<2081198~FV>>
Dimensional Tolerance +/- 1/4"





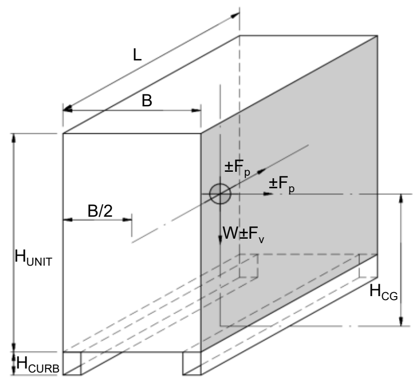
CENTER OF GRAVITY

Different unit configurations and options may cause a variation in the center of gravity from what is shown. Refer to the Installation, Operating and Maintenance manual for specific lifitng instructions.



PROJECT	San Bernardino ISD			
PROJECT NO.	2021-0014		DATE	
CLIENT	Holt	BY KRN	SHEET NO.	

Mechanical Equipment Anchorage Calc
BASE MOUNTED



Unit Identification: **B-1 & B-2 BOILER**

W_p =	620 lbs	unit weight
B =	26.80 in	unit width
$d_{B\ dir\ anchors}$ =	20.80 in	dist btwn anchors (B dir.)
L =	32.80 in	unit length
$d_{L\ dir\ anchors}$ =	26.80 in	dist btwn anchors (L dir.)
H_{UNIT} =	59.80 in	unit height
H_{CG_EQUIP} =	39.90 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	39.90 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p =	1.00	R_p =	2.50	I_p =	1.00	S_{DS} =	1.540
z =	0.00 ft	h =	1.00 ft	Ωo =	2.0		

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h))]/R_p) \times W_p$ = 0.246 Wp $F_v = 0.2(S_{DS})W_p$ = 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p$ = 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p)$ = 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**286 lbs**	**$0.7F_p = V_h$ =**	**201 lbs**
$F_v = V_v$ =	**191 lbs**	**$0.7F_v = V_v$ =**	**134 lbs**

Unit Anchorage:

Fp in "B" Direction

\# connections shear 4
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_h H_{CG}$ =	952 lb-ft	$M_{OT} = \Omega V_h H_{CG}$ =	1905 lb-ft	$M_{OT} = V_h H_{CG}$ =	667 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	410 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	410 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(B/2)$ =	266 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	313 lbs	$T = (M_{OT} - M_R) / d_B$ =	862 lbs	$T = (M_{OT} - M_R) / d_B$ =	231 lbs
T_{conn} = T / # conn tension =	157 lbs	T_{conn} = T / # conn tension =	431 lbs	T_{conn} = T / # conn tension =	116 lbs
$V_{conn} = V_h$ / # conn shear =	72 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	143 lbs	$V_{conn} = V_h$ / # conn shear =	50 lbs

Fp in "L" Direction

\# connections shear 4
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_h H_{CG}$ =	952 lb-ft	$M_{OT} = \Omega V_h H_{CG}$ =	1905 lb-ft	$M_{OT} = V_h H_{CG}$ =	667 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	502 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	502 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(L/2)$ =	326 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	202 lbs	$T = (M_{OT} - M_R) / d_L$ =	628 lbs	$T = (M_{OT} - M_R) / d_L$ =	153 lbs
T_{conn} = T / # conn tension =	101 lbs	T_{conn} = T / # conn tension =	314 lbs	T_{conn} = T / # conn tension =	76 lbs
$V_{conn} = V_h$ / # conn shear =	72 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	143 lbs	$V_{conn} = V_h$ / # conn shear =	50 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	157 lbs	Tmax =	431 lbs	Tmax =	116 lbs
Vmax =	72 lbs	Vmax =	143 lbs	Vmax =	50 lbs

Connection/Anchorage Notes:

Anchor Description: 3/8"Ø Hilti KB-TZ2 SS304 w/ 2" Embed, 6" Edge Dist

ΦTn =	1831	lbs (per Hilti Profis)	DCR =	0.24
ΦVn =	3183	lbs (per Hilti Profis)	DCR =	0.04
Interaction = 0.24 + 0.04 =		0.28 < 1.2		

Hilti PROFIS Engineering 3.0.74

E36

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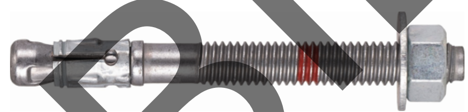
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

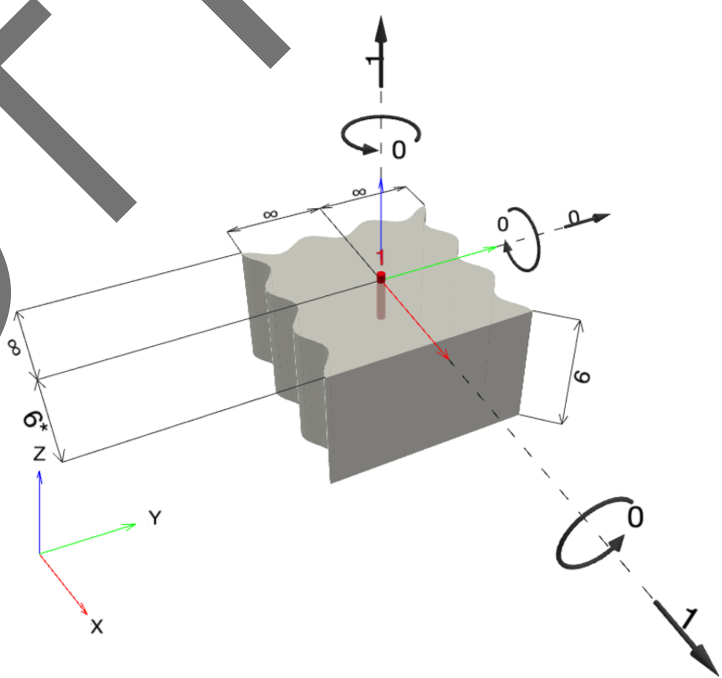
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/8 (2) hnom2**
Item number:	2210242 KB-TZ2 3/8x3 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

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



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Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0; M_x = 0; M_y = 0; M_z = 0;$	yes	1

Company:		Page:	3
Address:		Specifier:	
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Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [lb] Load	Capacity	Utilization β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	1,831	1 / -	OK
Shear	Concrete edge failure in direction x+	1	3,183	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.001	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Raypak®
A Rheem® Company

Product Submittal for XVers L™ - Type H Heating Boiler

E40

Models 406L-856L

Date: ______________________ Job: ______________________ Location: ______________________

Equipment Tags: ______________ Engineer: ______________________ Contractor: ______________________

Model: ______________________ Notes: ______________________

Prepared by: ________________ Indoor ☐ Outdoor ☒ Gas Type: Natural Gas ☒ Propane ☐

Stainless steel vertical fire-tube construction with versatile and adaptive controls.

Up to 98% thermal efficiency at full rate

100% factory fire-tested

VERSA IC® modulating controller with 4.3" color touchscreen display

Raymote™ remote connectivity provided standard

Up to 10:1 turndown

Fault history with full diagnostics

Status display lighting in logo on front panel

Cascade up to 8 heaters - no external sequencer required

Cascade in parallel or sequential modulation modes

Modbus RTU BMS port

Maximum outlet water temperature: 200ºF

Minimum continuous inlet water temperature: 40ºF

Supports primary/secondary and primary piping

PVC, CPVC, polypropylene or stainless steel venting certified

Vent protection with vent temperature sensor

Zero side clearance to combustibles

Indoor/outdoor construction - standard

Limited 25-year thermal shock warranty

Limited 10-year heat exchanger warranty

SCAQMD Rule 1146.2 certified, Low NOx < 20 ppm

Proudly assembled in the USA

ENERGY STAR

AHRI CERTIFIED™ www.ahridirectory.org

DESIGN CERTIFIED

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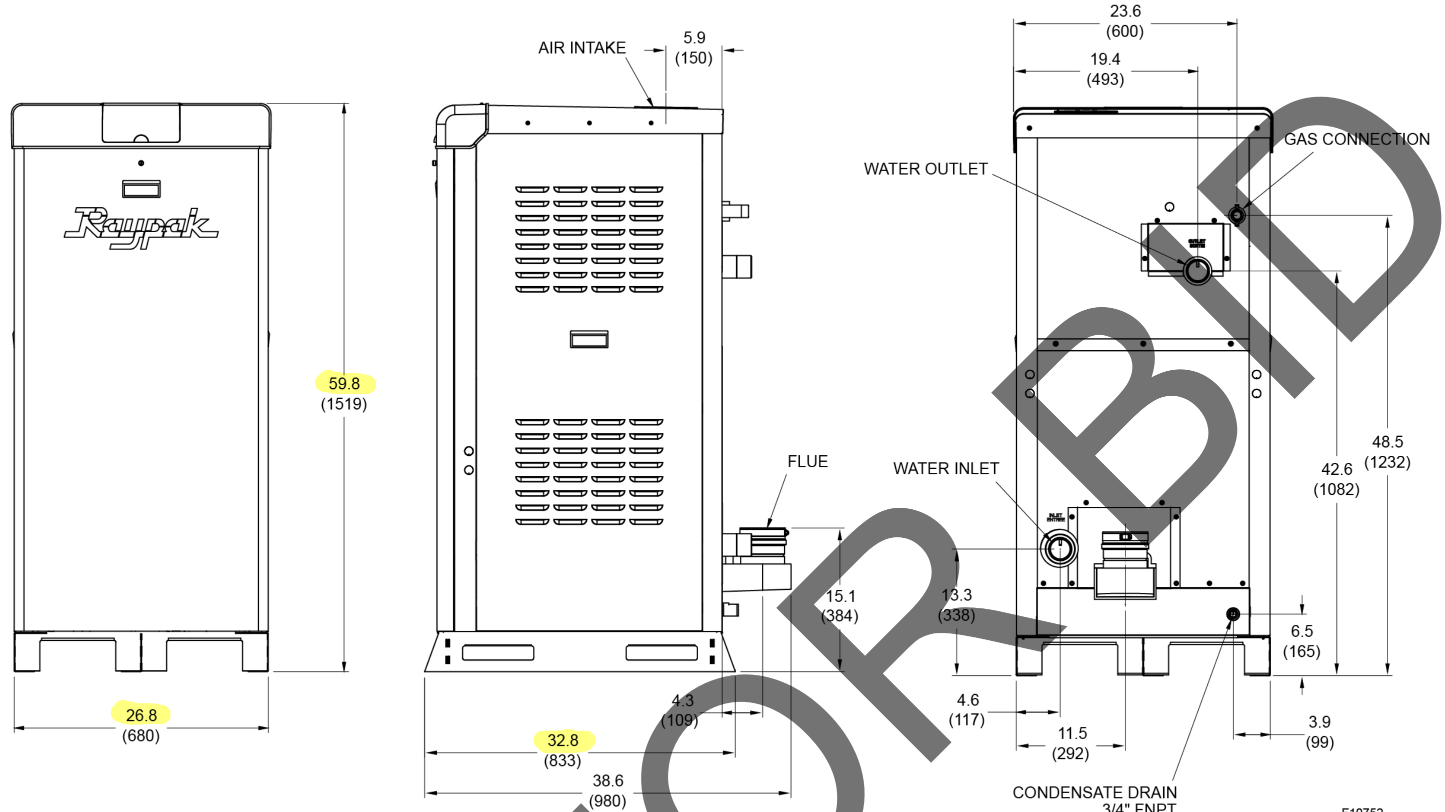
CERTIFIED

® LLC



Dimensions are shown in inches (mm)

Model H7-	MBTUH (kW/h)		Turn Down	AHRI Thermal Efficiency	Dimensions - Inches (mm)				Operating Weight lbs. (kg)	Water Content Gal (L)
	Input	Output			Water Inlet/Outlet NPT	Flue Ø*	Air Intake Ø	Gas Connection NPT		
☐ 406L	399 (117)	391 (115)	10 to 1	98.0%	2 (50)	4 (100)	4 (100)	1 (25)	547 (248)	13 (50)
■ 506L	500 (147)	489 (143)	10 to 1	97.8%	2 (50)	4 (100)	4 (100)	1 (25)	611 (277)	12 (46)
☐ 606L	600 (176)	586 (172)	7 to 1	97.6%	2 (50)	4 (100)	4 (100)	1-1/4 (31)	603 (274)	12 (46)
☐ 726L	725 (213)	705 (207)	7 to 1	97.3%	2.5 (65)	6 (152)	6 (152)	1-1/4 (31)	710 (322)	17 (66)
☐ 856L	850 (250)	826 (242)	7 to 1	97.2%	2.5 (65)	6 (152)	6 (152)	1-1/4 (31)	720 (326)	16 (62)

* PVC/CPVC

Clearances - Inches (mm)

	Floor	Rear	Right	Left	Top	Front	Vent
Certified Minimum to Combustibles	0	24 (610)	0	0	0	Open	1 (25)
Minimum Service Clearance	0	24 (610)	0	0	24 (610)	30 (762)	1 (25)

*WARNING: Do not install on carpeting.

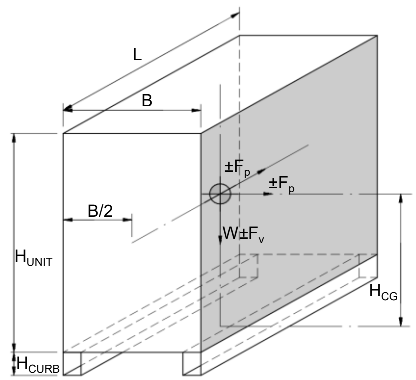
Model H7-	Boiler Current Draw	
	■ 120VAC	☐ 208VAC
☐ 406L	<7.5 A	<5.0 A
■ 506L	<5.0 A	<5.0 A
☐ 606L	<5.0 A	<5.0 A
☐ 726L	<5.0 A	<5.0 A
☐ 856L	<7.5 A	<7.5 A

Single-phase power. Current draw is for boiler only (supply breaker must have delayed trip).

PROJECT	San Bernardino ISD		
PROJECT NO.	2021-0014	DATE	
CLIENT	Holt	BY KRN	SHEET NO.

Mechanical Equipment Anchorage Calc
BASE MOUNTED

Unit Identification: **CHWP SUCTION PUMP**



W_p =	450 lbs	unit weight
B =	16.00 in	unit width
$d_{B\ dir\ anchors}$ =	14.00 in	dist btwn anchors (B dir.)
L =	42.25 in	unit length
$d_{L\ dir\ anchors}$ =	16.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	22.00 in	unit height
H_{CG_EQUIP} =	14.70 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	14.70 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p =	1.00	R_p =	2.50	I_p =	1.00	S_{DS} =	1.540
z =	0.00 ft	h =	1.00 ft	Ωo =	2.0		

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h)]/R_p) \times W_p =$ 0.246 Wp $F_v = 0.2(S_{DS})W_p =$ 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p =$ 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p) =$ 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**208 lbs**	**$0.7F_p = V_h$ =**	**146 lbs**
$F_v = V_v$ =	**139 lbs**	**$0.7F_v = V_v$ =**	**97 lbs**

Unit Anchorage:

Fp in "B" Direction

\# connections shear 6
\# connections tension 3

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	255 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	509 lb-ft	$M_{OT} = V_hH_{CG}$ =	178 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	178 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	178 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(B/2)$ =	115 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	66 lbs	$T = (M_{OT} - M_R) / d_B$ =	284 lbs	$T = (M_{OT} - M_R) / d_B$ =	54 lbs
T_{conn} = T / # conn tension =	22 lbs	T_{conn} = T / # conn tension =	95 lbs	T_{conn} = T / # conn tension =	18 lbs
$V_{conn} = V_h$ / # conn shear =	35 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	69 lbs	$V_{conn} = V_h$ / # conn shear =	24 lbs

Fp in "L" Direction

\# connections shear 6
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	255 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	509 lb-ft	$M_{OT} = V_hH_{CG}$ =	178 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	469 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	469 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(L/2)$ =	305 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	30 lbs	$T = (M_{OT} - M_R) / d_L$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	15 lbs	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	35 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	69 lbs	$V_{conn} = V_h$ / # conn shear =	24 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	22 lbs	Tmax =	95 lbs	Tmax =	18 lbs
Vmax =	35 lbs	Vmax =	69 lbs	Vmax =	24 lbs

Connection/Anchorage Notes:

Anchor Description: 3/4"Ø Hilti KB-TZ2 SS304 w/ 3.25" Embed, 6" Edge Dist

ΦTn = 3794 lbs (per Hilti Profis) DCR = 0.02

ΦVn = 4318 lbs (per Hilti Profis) DCR = 0.02

Interaction = 0.02 + 0.02 = 0.04 < 1.2

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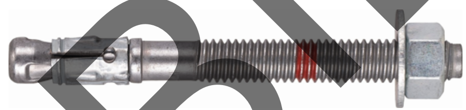
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

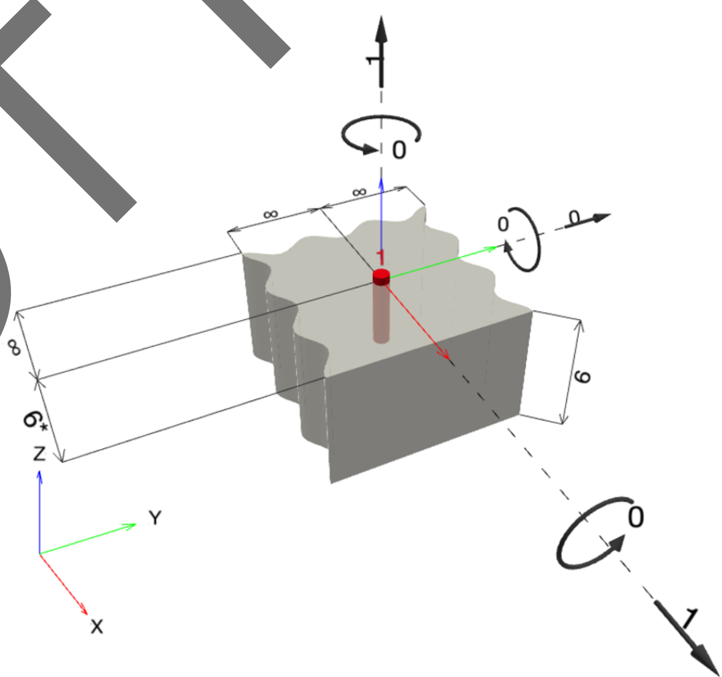
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/4 (3 1/4) hnom1**
Item number:	2210285 KB-TZ2 3/4x4 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 4.000 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d))
	Shear load: yes (17.2.3.5.3 (c))

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



Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1$; $V_x = 1$; $V_y = 0$; $M_x = 0$; $M_y = 0$; $M_z = 0$;	yes	1

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [lb] Load	Capacity	Utilization β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	3,794	1 / -	OK
Shear	Concrete edge failure in direction x+	1	4,318	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.000	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Bell & Gossett
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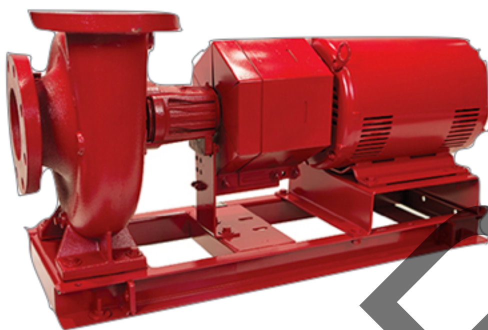
Submittal
E47

Job/Project:	Representative: Dawson Company	
ESP-Systemwize: WIZE-8450E9 Created On: 09/17/2021	Phone: (626) 797-9710	
Location/Tag:	Email: sales@dawsonco.com	
Engineer:	Submitted By:	Date:
Contractor:	Approved By:	Date:

Base Mounted End Suction Pump

Series: e-1510

Model: 2EB



Features & Design

Features & Design
ANSI/OSHA Coupling Guard
Center Drop Out Spacer Coupling
Fabricated Heavy Duty Baseplate
Internally Self-Flushing Mechanical Seal

*The Bell & Gossett Series e-1510 is available in 26 sizes and a variety of configuration options that enable customization and flexibility to fit a broad range of operating conditions.

http://bellgossett.com/pumps-circulators/end-suction-pumps/e-1510/

Pump Selection Summary

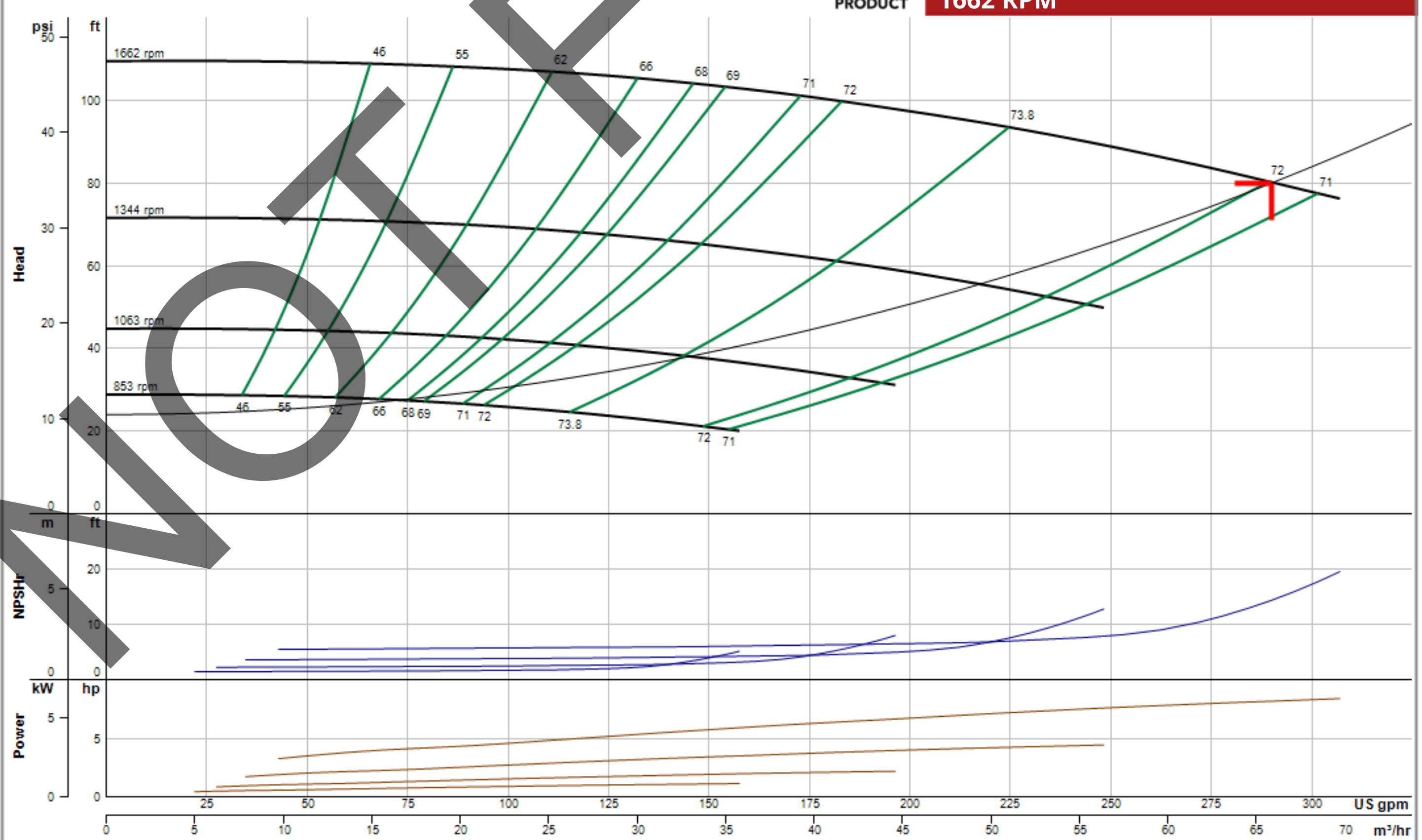
Pump Selection Summary	
Duty Point Flow	290 US gpm
Duty Point Head	80 ft
Control Head	24 ft
Duty Point Pump Efficiency	71.6 %
Part Load Efficiency Value (PLEV)	72.6 %
Impeller Diameter	10.625 in
Motor Power	10 hp
Duty Point Power	8.17 bhp
Motor Speed	1800 rpm
RPM @ Duty Point	1662 rpm
NPSHr	14.9 ft
Minimum Shutoff Head	109 ft
Minimum Flow at RPM	44.9 US gpm
Flow @ BEP	225 US gpm
Fluid Temperature	46 °F
Fluid Type	Water
Weight *(approx. - consult rep for exact)*	413 lbs
Pump Floor Space Calculation	5.53 ft²

Performance Curve

Energy Efficiency Ratings:
Pump & Motor PEIcl: 0.86 ERcl: 14
Pump, Motor & Drive: PEIvl: 0.43 ERvl: 57

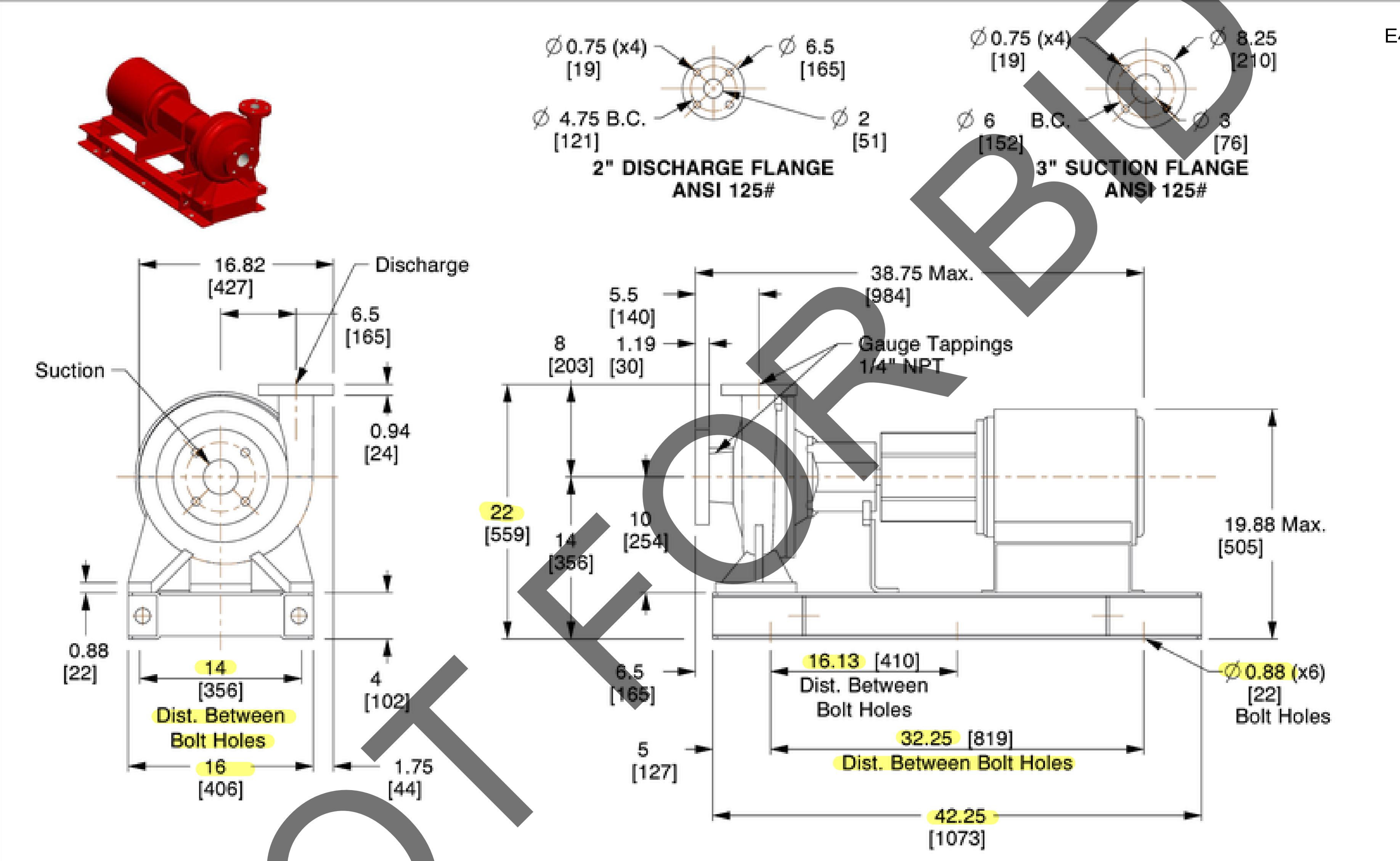
PREMIUM EFFICIENCY PRODUCT

e-1510
2EB
1662 RPM



Performance curve meets 14.6 / ISO 9906 acceptance criteria

WIZE-8450E9



Bell & Gossett
a xylem brand

8200 N. Austin Ave.
Morton Grove, IL 60053, USA

Dimensions are subject to change

Not to be used for construction unless certified

BG-E1510-2EB-SS-215T-S

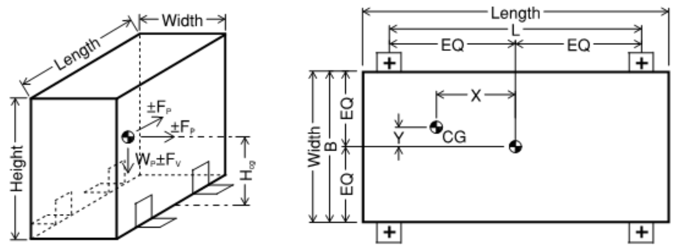
Series e-1510 Centrifugal Pumps - Base Mounted

Seal Type: Standard Seal | Motor Frame: 215T | Frame Type: S | Flange: ANSI 125#

Dimensions : IN (mm)	Scale : N.T.S.	Submittal # : B-880.30C

EQUIPMENT ANCHORAGE CALCULATION (ASCE 7-16)

BASE ANCHORED WITH SIDE ANGLES AND ANCHORS TO CONCRETE SUBSTRATE



UnitID = **"ET-1"**

Unit Dimensions	Width = **24** in	Length = **24** in
	Height = **37** in	H_{cg} = **24.67** in
Unit Weight	W_p = **630** lb	
Anchor Dims	B = **18** in	L = **18** in
	X = **1** in	Y = **1** in

Seismic Forces (ASCE 7-16, Ch 13)

Unit Parameters	a_p = **1.0**	R_p = **2.5**	Ω_0 = **2.0**
Building Parameters	S_{ds} = **1.54**	I_p = **1.0**	
Location within Building	z = **0** ft	h = **1** ft	

$F_{pcalc} = 0.4*a_p*S_{ds}*I_p*(1+2*(z/h))/R_p$ = **0.246** * W_p

$F_{pmin} = 0.3*S_{ds}*I_p$ = **0.462** * W_p $F_{pmax} = 1.6*S_{ds}*I_p$ = **2.464** * W_p

Controlling Seismic Horizontal Force	F_p = **0.462** * W_p	$Fp = F_p*W_p$ = **291** lb
Seismic Vertical Force	$F_v = 0.2*S_{ds}$ = **0.308** * W_p	$Fv = F_v*W_p$ = **194** lb

<u>Check Anchors to Concrete</u>

Load Combination	D_F = **0.9**	$E_F = \Omega_0$ = **2.0**	E_{FV} = **1.0**
# Resisting Shear and Tension in “B” Direction	N_{VB} = **2**	N_{TB} = **2**	
# Resisting Shear and Tension in “L” Direction	N_{VL} = **2**	N_{TL} = **2**	

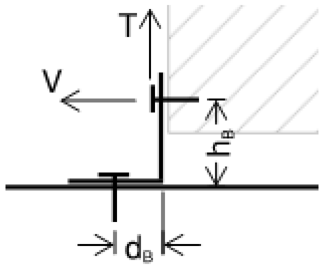
Overturning Moment in “B” Direction	$M_{OB} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(B/2-Y)$ = **15913** lb_in
Resisting Moment in “B” Direction	$M_{RB} = D_F*W_p*(B/2-Y)$ = **4536** lb_in
Anchor Tension in “B” Direction	$T_B = \max((M_{OB} - M_{RB})/(B*N_{TB}), 0\ lb)$ = **316** lb
Anchor Shear in “B” Direction	$V_B = E_F*F_p*W_p/N_{VB}$ = **291** lb
Overturning Moment in “L” Direction	$M_{OL} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(L/2 -Y)$ = **15913** lb_in
Resisting Moment in “L” Direction	$M_{RL} = D_F*W_p*(L/2-X)$ = **4536** lb_in
Anchor Tension in “L” Direction	$T_L = \max((M_{OL} - M_{RL})/(L*N_{TL}), 0\ lb)$ = **316** lb
Anchor Shear in “L” Direction	$V_L = E_F*F_p*W_p/N_{VL}$ = **291** lb

<u>Maximum Anchor Demands based on 100% / 30% Loading in Orthogonal Directions</u>

Tension Neglecting Dead Load	$T_{ND} = \max(M_{OB}/(B*N_{TB})+0.3*M_{OL}/(L*N_{TL}),0.3*M_{OB}/(B*N_{TB})+M_{OL}/(L*N_{TL}))$
	T_{ND} = **575** lb
Assumed % Resisting DL @ Critical Anchor	$P_C = (B/2-Y)/B*(L/2-X)/L$ = **20** %
Tension Demand to Anchor	$T = \max(0\ lb, T_{ND} - D_F*P_C*W_p)$ = **463** lb
Shear Demand to Anchors	$V = \max(V_B, V_L)$ = **291** lb

Anchor Description	$Anchor_C$ = **"1/2" DIA HILTI KB-TZ w/ 2.5" EMBED"**	
Tension Capacity	ϕT_n = **2559** lb	$T/\phi T_n$ = **0.18**
Shear Capacity	ϕV_n = **3628** lb	$V/\phi V_n$ = **0.08**
Demand Capacity Ratio	$DCR = V/\phi V_n + T/\phi T_n$ = **0.26**	<u>Check</u> = **"OK, DCR < 1.2"**

Check Non-Concrete Connections



Max Height to Applied Shear h_B = **1** in

Distance to Anchor d_B = **1** in

ASD Load Combination	D_F = **0.6**	E_F = **0.7**	E_{FV} = **0.7**
# Resisting Shear and Tension in “B” Direction	N_{VB} = **2**	N_{TB} = **2**	
# Resisting Shear and Tension in “L” Direction	N_{VL} = **2**	N_{TL} = **2**	

Overturning Moment in “B” Direction	$M_{OB} = E_F{*}F_p{*}W_p{*}H_{cg} + E_{FV}{*}F_v{*}W_p{*}(B/2\text{-}Y)$ = **6113** lb_in
Resisting Moment in “B” Direction	$M_{RB} = D_F{*}W_p{*}(B/2\text{-}Y)$ = **3024** lb_in
Anchor Tension in “B” Direction	$T_B = \max((M_{OB} - M_{RB})/(B{*}N_{TB}),\ 0\text{ lb})$ = **86** lb
Anchor Shear in “B” Direction	$V_B = E_F{*}F_p{*}W_p/N_{VB}$ = **102** lb
Overturning Moment in “L” Direction	$M_{OL} = E_F{*}F_p{*}W_p{*}H_{cg} + E_{FV}{*}F_v{*}W_p{*}(L/2\text{ -}Y)$ = **6113** lb_in
Resisting Moment in “L” Direction	$M_{RL} = D_F{*}W_p{*}(L/2\text{-}X)$ = **3024** lb_in
Anchor Tension in “L” Direction	$T_L = \max((M_{OL} - M_{RL})/(L{*}N_{TL}),\ 0\text{ lb})$ = **86** lb
Anchor Shear in “L” Direction	$V_L = E_F{*}F_p{*}W_p/N_{VL}$ = **102** lb

<u>Maximum Connection Demands based on 100% / 30% Loading in Orthogonal Directions</u>

Tension Neglecting Dead Load	$T_{ND} = \max(M_{OB}/(B{*}N_{TB})+0.3{*}M_{OL}/(L{*}N_{TL}), 0.3{*}M_{OB}/(B{*}N_{TB})+M_{OL}/(L{*}N_{TL}))$
	T_{ND} = **221** lb
Assumed % Resisting DL @ Critical Anchor	$P_C = (B/2\text{-}Y)/B{*}(L/2\text{-}X)/L$ = **20** %
Tension Demand to Anchor	$T = \max(0\text{ lb},\ T_{ND} - D_F{*}P_C{*}W_p)$ = **146** lb
Shear Demand to Anchors	$V = \max(V_B,\ V_L)$ = **102** lb

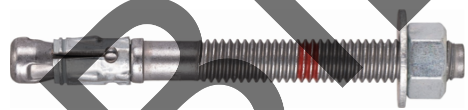
<u>Check L-Bracket in Bending</u>

Plate/Bracket Length	L_B = **2** in	
Plate/Bracket Yield Strength	fy_B = **36** ksi	
Bending Moment Demand	$M = T{*}d_B + V{*}h_B$ = **248** lb_in	
Required Plate/Bracket Thickness	$t_{req} = \text{sqrt}(4{*}1.67{*}M/(fy_B{*}L_B))$ = **0.152** in	
Provided Plate/Bracket Thickness	t_B = **0.25** in	<u>Check</u> = **"OK, $t_{req} < t_B$"**

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

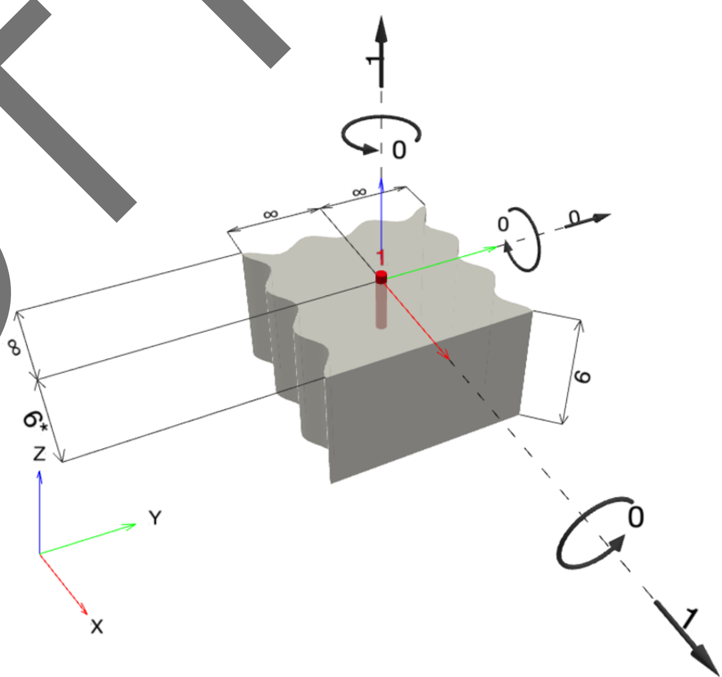
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 1/2 (2 1/2) hnom2**
Item number:	2210260 KB-TZ2 1/2x3 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.500 in., h_{nom} = 3.000 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d))
	Shear load: yes (17.2.3.5.3 (c))

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



Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 1; V_x = 1; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	1

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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [lb] Load	Capacity	Utilization β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	2,559	1 / -	OK
Shear	Concrete edge failure in direction x+	1	3,628	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.000	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

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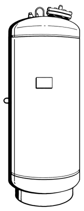
SUBMITTAL

A-342G

E55

JOB:	**REPRESENTATIVE:**	
UNIT TAG:	**ORDER NO.**	**DATE:**
ENGINEER:	**SUBMITTED BY:**	**DATE:**
CONTRACTOR:	**APPROVED BY:**	**DATE:**



Series "B" (ASME) Pressurized Expansion Tanks Vertical

Not For Potable Water Systems

DESCRIPTION

Series "B" expansion tanks are ASME rated precharged bladder-type pressure vessels. The Series "B" tank is designed to absorb the expansion forces of heating/cooling system water while maintaining proper system pressurization under varying operating conditions. The heavy duty bladder contains system water thereby eliminating tank corrosion and waterlogging problems.

CONSTRUCTION

System Connection: Forged Steel
Shell: Carbon Steel
Bladder: Heavy Duty Butyl Rubber
Designed and Constructed per ASME Section VIII, Division 1

MAXIMUM OPERATING LIMITS

Maximum Design Pressure: 125 PSI (862kPa)
Design Temperature: 240°F (115°C)

SCHEDULE

PART NUMBER					
PRESSURIZED EXPANSION TANKS	WITH SEISMIC RESTRAINTS	MODEL NO.	TANK AND ACCEPTANCE VOLUME GALLONS (LITERS)	TAGGING INFORMATION	QUANTITY
116550	116923	B-200	53 (200)		
116551	116924	B-300	80 (300)		
116552	116925	B-400	106 (400)		
116553	116926	B-500	132 (500)		
116554	116927	B-600	158 (600)		
116555	116928	B-800	211 (800)		
116556	116929	B-1000	264 (1000)		
116557	116930	B-1200	317 (1200)		
116558	116931	B-1400	370 (1400)		
116559	116932	B-1600	422 (1600)		
116560	116933	B-2000	528 (2000)		
116793	116934	B-2500	660 (2500)		
116794	116935	B-3000	792 (3000)		
116795	116936	B-3500	925 (3500)		
116796	116937	B-4000	1057 (4000)		
116819	116938	B-5000	1321 (5000)		
116841	116939	B-7500	1980 (7500)		
116842	116940	B-10000	2640 (10000)		
116843	116941	B-15000	3963 (15000)		

TYPICAL SPECIFICATION

Furnish and install as shown on plans a _____ gallon (_____ liter) _____" (_____ mm) diameter x _____" (_____ mm) high pre-charged steel expansion tank with replaceable heavy duty Butyl rubber bladder. The tank shall have a _____" NPT system connection, _____" NPT drain, and a .302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.

The tank shall be fitted with lifting rings and a floor mounting skirt for vertical installation.

The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped 125 PSI (862 kPa) working pressure.

Each tank shall be Xylem − Bell & Gossett Model No. _______

xylem
Let's Solve Water

NOTE: Tanks are factory pre-charged at 12 psi (83 kPa)

Allow a minimum of 18"(457.2mm) clearance for system piping.

Sight glass and seismic restraints available on request.

E56

Tanks can be installed in the horizontal position with the system connection located below the horizontal centerline of the tank.

FIG. 1

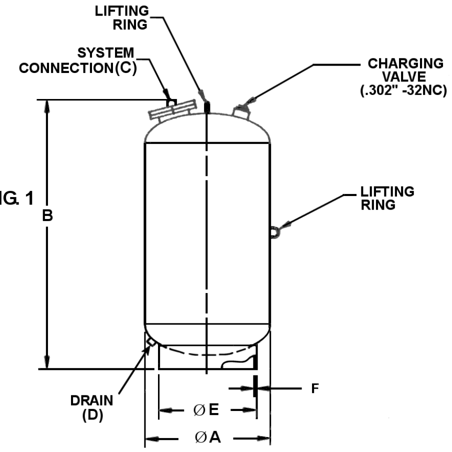


FIG. 2

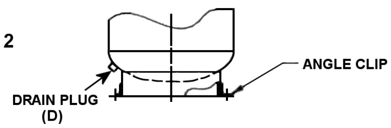
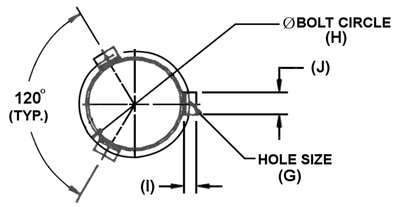


FIG. 3



OPTIONAL SEISMIC RESTRAINTS (FIG.2 & 3) – DIMENSIONS IN INCHES (MM)

TANK DIAMETER	G	H	I	J
24"	9/16 (14)	21 (533)	2 (51)	2 (51)
30"	7/8 (22)	28 (711)	4 (102)	4 (102)
36"	7/8 (22)	34 (864)	4 (102)	4 (102)
48"	7/8 (22)	46 (1168)	4 (102)	4 (102)
54"	7/8 (22)	46 (1168)	4 (102)	4 (102)
60"	7/8 (22)	46 (1168)	4 (102)	4 (102)
72"	1 (25)	58 (1473)	4 (102)	4 (102)

DIMENSIONS IN INCHES (MM) AND WEIGHTS IN LBS. (KG) (FIG. 1)

PART NUMBER		MODEL NUMBER	A	B	C NPTF	D	E	F	APPROX. SHPG. WT.	APPROX. WT* 100% FULL
PRESSURIZED EXPANSION TANKS	WITH SEISMIC RESTRAINTS									
116550	116923	B-200	24 (610)	36-7/8 (936)	1	3/4	19 (483)	3/16 (5)	192 (87)	629 (285)
116551	116924	B-300	24 (610)	50-7/8 (1292)	1	3/4	19 (483)	3/16 (5)	268 (122)	928 (421)
116552	116925	B-400	24 (610)	64-3/4 (1644)	1	3/4	19 (483)	3/16 (5)	309 (140)	1184 (537)
116553	116926	B-500	24 (610)	78 (1981)	1	3/4	19 (483)	3/16 (5)	328 (149)	1417 (643)
116554	116927	B-600	30 (762)	63-3/4 (1619)	1-1/2	1	24 (610)	3/16 (5)	510 (232)	1814 (823)
116555	116928	B-800	30 (762)	81-3/4 (2076)	1-1/2	1	24 (610)	3/16 (5)	656 (297)	2306 (1046)
116556	116929	B-1000	36 (914)	73 (1854)	1-1/2	1-1/4	30 (762)	3/16 (5)	691 (313)	2869 (1301)
116557	116930	B-1200	36 (914)	85-3/8 (2169)	1-1/2	1-1/4	30 (762)	3/16 (5)	779 (353)	3394 (1539)
116558	116931	B-1400	36 (914)	97-3/4 (2483)	1-1/2	1-1/4	30 (762)	3/16 (5)	905 (410)	3958 (1795)
116559	116932	B-1600	48 (1219)	69-1/8 (1756)	1-1/2	1-1/2	42 (1067)	1/4 (6)	1183 (537)	4665 (2116)
116560	116933	B-2000	48 (1219)	84 (2145)	1-1/2	1-1/2	42 (1067)	1/4 (6)	1264 (573)	5620 (2549)
116793	116934	B-2500	48 (1219)	100-7/8 (2562)	2	1-1/2	42 (1067)	1/4 (6)	1445 (655)	6890 (3125)
116794	116935	B-3000	48 (1219)	118-1/8 (2562)	2	1-1/2	42 (1067)	1/4 (6)	1630 (739)	8164 (3703)
116795	116936	B-3500	54 (1372)	111 (2820)	2	1-1/2	42 (1067)	1/4 (6)	2110 (957)	9741 (4418)
116796	116937	B-4000	54 (1372)	124-1/2 (3163)	2	1-1/2	42 (1067)	1/4 (6)	2230 (1011)	10950 (4967)
116819	116938	B-5000	60 (1524)	128 (3251)	2	1-1/2	42 (1067)	1/4 (6)	2450 (1111)	13403 (6079)
116841	116939	B-7500	72 (1829)	127 (3326)	3	1-1/2	54 (1372)	3/8 (10)	4000 (1814)	20500 (9299)
116842	116940	B-10000	72 (1829)	159 (4039)	3	1-1/2	54 (1372)	3/8 (10)	4900 (2223)	26890 (12197)
116843	116941	B-15000	72 (1829)	233 (5918)	3	1-1/2	54 (1372)	3/8 (10)	6000 (2721)	39010 (17695)

Dimensions are subject to change. Not to be used for construction purposes unless certified.

*Approximate weight 100% full occurs if bag fails or if air charge is lost.

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, IL 60053
Phone: (847)966-3700 Fax: (847)965-8379
www.bellgossett.com

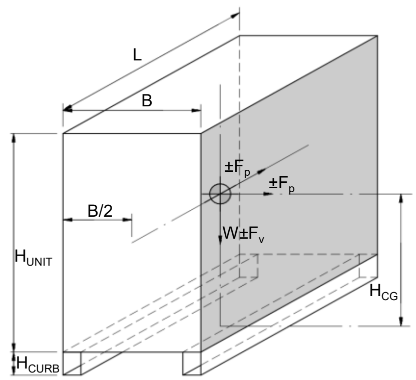
xylem
Let's Solve Water

BUEHLER

PROJECT	San Bernardino ISD		
PROJECT NO.	2021-0014	DATE	
CLIENT	Holt	BY KRN	SHEET NO.

Mechanical Equipment Anchorage Calc
BASE MOUNTED

Unit Identification: **HHWP SUCTION PUMP**



W_p =	250 lbs	unit weight
B =	14.63 in	unit width
$d_{B\ dir\ anchors}$ =	12.88 in	dist btwn anchors (B dir.)
L =	31.00 in	unit length
$d_{L\ dir\ anchors}$ =	25.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	18.75 in	unit height
H_{CG_EQUIP} =	12.50 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	12.50 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p = 1.00	R_p = 2.50	I_p = 1.00	S_{DS} = 1.540
z = 0.00 ft	h = 1.00 ft	Ωo = 2.0	

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h))]/R_p) \times W_p =$ 0.246 Wp $F_v = 0.2(S_{DS})W_p =$ 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p =$ 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p) =$ 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h =$	**116 lbs**	**$0.7F_p = V_h =$**	**81 lbs**
$F_v = V_v =$	**77 lbs**	**$0.7F_v = V_v =$**	**54 lbs**

Unit Anchorage:

Fp in "B" Direction

\# connections shear 2
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	120 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	241 lb-ft	$M_{OT} = V_hH_{CG}$ =	84 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	90 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	90 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(B/2)$ =	59 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	28 lbs	$T = (M_{OT} - M_R) / d_B$ =	140 lbs	$T = (M_{OT} - M_R) / d_B$ =	24 lbs
T_{conn} = T / # conn tension =	14 lbs	T_{conn} = T / # conn tension =	70 lbs	T_{conn} = T / # conn tension =	12 lbs
$V_{conn} = V_h$ / # conn shear =	58 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	116 lbs	$V_{conn} = V_h$ / # conn shear =	40 lbs

Fp in "L" Direction

\# connections shear 2
\# connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	120 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	241 lb-ft	$M_{OT} = V_hH_{CG}$ =	84 lb-ft
$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	191 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	191 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(L/2)$ =	124 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	24 lbs	$T = (M_{OT} - M_R) / d_L$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	12 lbs	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	58 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	116 lbs	$V_{conn} = V_h$ / # conn shear =	40 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	14 lbs	Tmax =	70 lbs	Tmax =	12 lbs
Vmax =	58 lbs	Vmax =	116 lbs	Vmax =	40 lbs

Connection/Anchorage Notes:

Anchor Description: 3/4"Ø Hilti KB-TZ2 SS304 w/ 3.25" Embed, 6" Edge Dist

ΦTn =	3794 lbs (per Hilti Profis)	DCR =	0.02
ΦVn =	4318 lbs (per Hilti Profis)	DCR =	0.03
Interaction = 0.02 + 0.03 =	0.05 < 1.2		

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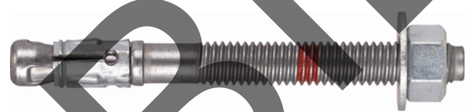
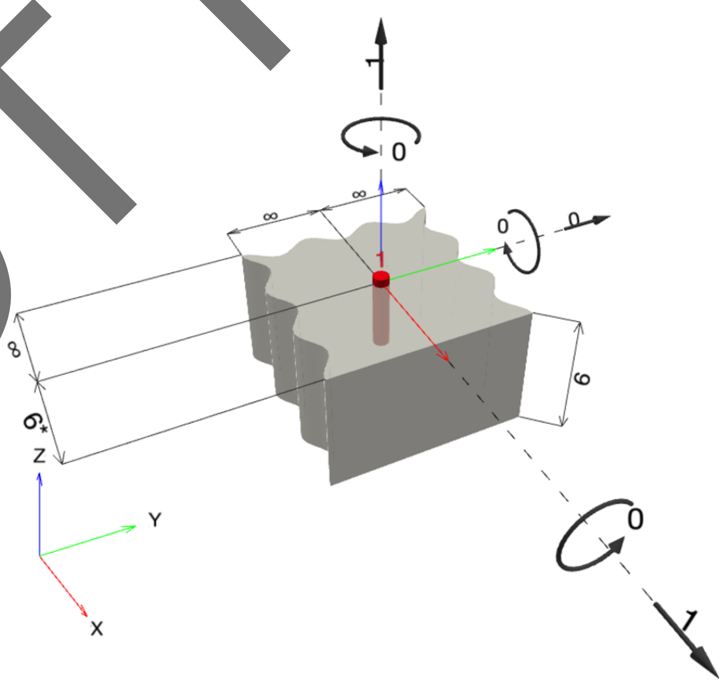
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/4 (3 1/4) hnom1**
Item number:	2210285 KB-TZ2 3/4x4 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 3.250 in., h_{nom} = 4.000 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d))
	Shear load: yes (17.2.3.5.3 (c))

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



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1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	yes	1

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2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	Proof	Load	Capacity	β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	3,794	1 / -	OK
Shear	Concrete edge failure in direction x+	1	4,318	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.000	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

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Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Bell & Gossett
a xylem brand

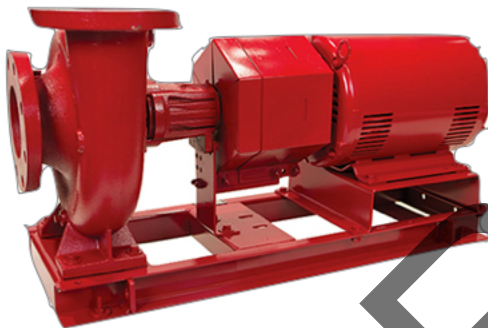
Submittal
E62

Job/Project:	Representative: Dawson Company	
ESP-Systemwize: WIZE-EC4315 Created On: 09/13/2021	Phone: (626) 797-9710	
Location/Tag:	Email: sales@dawsonco.com	
Engineer:	Submitted By:	Date:
Contractor:	Approved By:	Date:

Base Mounted End Suction Pump

Series: e-1510

Model: 1.25BC



Features & Design

- ANSI/OSHA Coupling Guard
- Center Drop Out Spacer Coupling
- Fabricated Heavy Duty Baseplate
- Internally Self-Flushing Mechanical Seal

*The Bell & Gossett Series e-1510 is available in 26 sizes and a variety of configuration options that enable customization and flexibility to fit a broad range of operating conditions.

http://bellgossett.com/pumps-circulators/end-suction-pumps/e-1510/

Pump Selection Summary

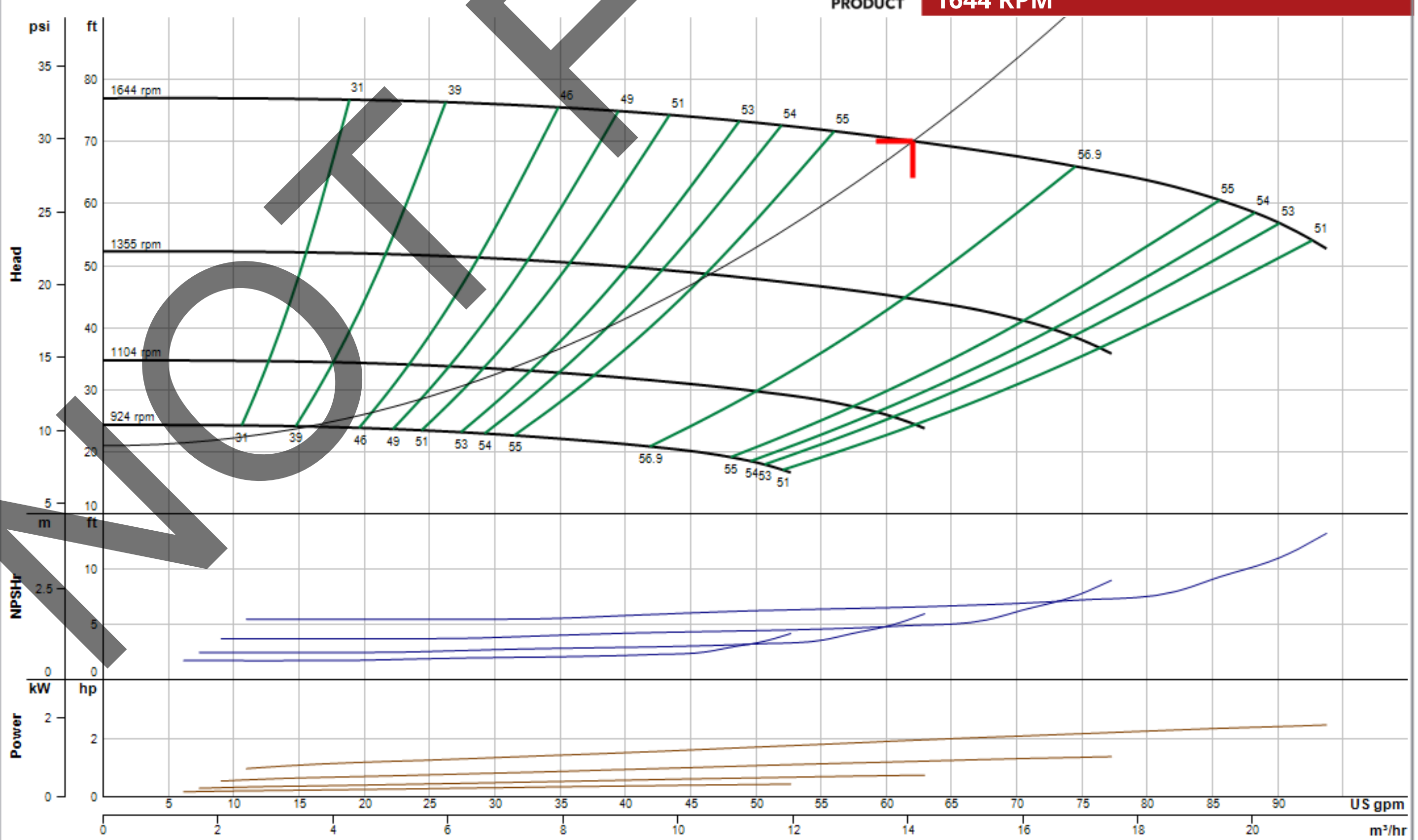
Duty Point Flow	62 US gpm
Duty Point Head	70 ft
Control Head	21 ft
Duty Point Pump Efficiency	55.4 %
Part Load Efficiency Value (PLEV)	51.4 %
Impeller Diameter	8.875 in
Motor Power	3 hp
Duty Point Power	1.93 bhp
Motor Speed	1800 rpm
RPM @ Duty Point	1644 rpm
NPSHr	6.58 ft
Minimum Shutoff Head	77 ft
Minimum Flow at RPM	11.2 US gpm
Flow @ BEP	74.5 US gpm
Fluid Temperature	140 °F
Fluid Type	Water
Weight *(approx. - consult rep for exact)*	216 lbs
Pump Floor Space Calculation	3.4 ft²

Performance Curve

Energy Efficiency Ratings:
Pump & Motor PEIcl: 0.81 ERcl: 19
Pump, Motor & Drive: PEIvl: 0.43 ERvl: 57

PREMIUM EFFICIENCY PRODUCT

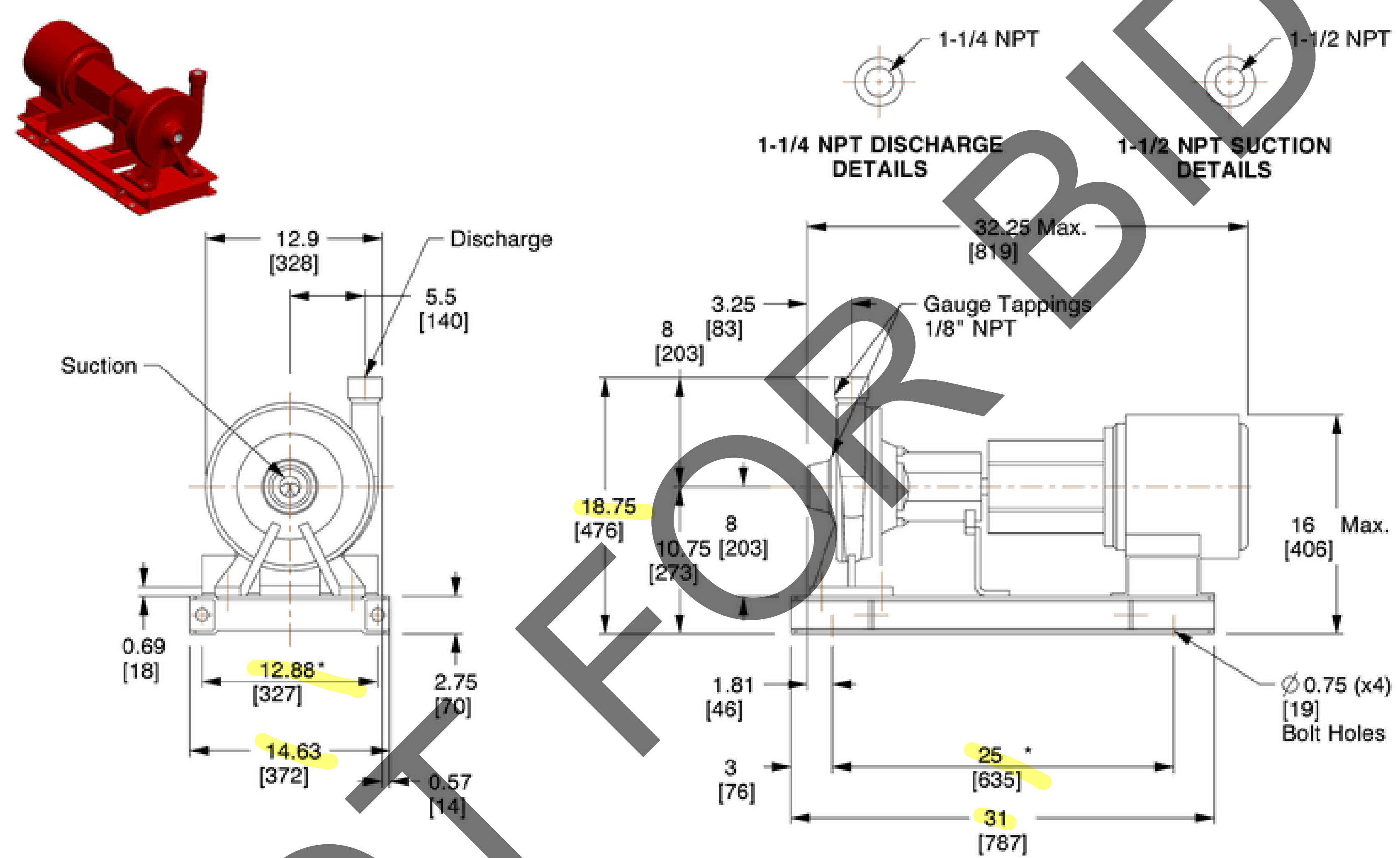
e-1510
1.25BC
1644 RPM



Performance curve meets 14.6 / ISO 9906 acceptance criteria

WIZE-EC4315

E63



* Dist. Between Bolt Holes

Bell & Gossett
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8200 N. Austin Ave.
Morton Grove, IL 60053, USA

Dimensions are subject to change

Not to be used for construction unless certified

BG-E1510-1P25BC-SS-182T-S

Series e-1510 Centrifugal Pumps - Base Mounted

Seal Type: Standard Seal | Motor Frame: 182T | Frame Type:S

Dimensions : IN (mm)	Scale : N.T.S.	Submittal # : B-880.14B

BUEHLER

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CLIENT	Holt	BY	KRN
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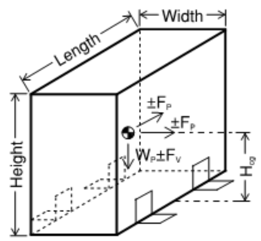
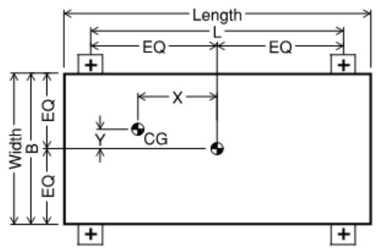
EQUIPMENT ANCHORAGE CALCULATION (ASCE 7-16)

BASE ANCHORED WITH SIDE ANGLES AND ANCHORS TO CONCRETE SUBSTRATE





UnitID = **"Air Separator"**

Unit Dimensions	Width = **18** in	Length = **18** in
	Height = **46** in	H_{cg} = **31** in
Unit Weight	W_p = **580** lb	
Anchor Dims	B = **15** in	L = **15** in
	X = **1** in	Y = **1** in

Seismic Forces (ASCE 7-16, Ch 13)

Unit Parameters	a_p = **1.0**	R_p = **2.5**	Ω_0 = **2.0**
Building Parameters	S_{ds} = **1.54**	I_p = **1.0**	
Location within Building	z = **0** ft	h = **1** ft	

F_{pcalc} = 0.4*a_p*S_{ds}*I_p*(1+2*(z/h))/R_p = **0.246** * W_p

F_{pmin} = 0.3*S_{ds}*I_p = **0.462** * W_p | F_{pmax} = 1.6*S_{ds}*I_p = **2.464** * W_p

Controlling Seismic Horizontal Force	F_p = **0.462** * W_p	Fp = F_p*W_p = **268** lb
Seismic Vertical Force	F_v = 0.2* S_{ds} = **0.308** * W_p	Fv = F_v*W_p = **179** lb

Check Anchors to Concrete

Load Combination	D_F = **0.9**	E_F = Ω_0 = **2.0**	E_{FV} = **1.0**
# Resisting Shear and Tension in “B” Direction	N_{VB} = **1**	N_{TB} = **1**	
# Resisting Shear and Tension in “L” Direction	N_{VL} = **2**	N_{TL} = **2**	

Overturning Moment in “B” Direction	M_{OB} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(B/2-Y) = **17775** lb_in
Resisting Moment in “B” Direction	M_{RB} = D_F*W_p*(B/2-Y) = **3393** lb_in
Anchor Tension in “B” Direction	T_B = max((M_{OB} - M_{RB})/(B*N_{TB}), 0 lb) = **959** lb
Anchor Shear in “B” Direction	V_B = E_F*F_p*W_p/N_{VB} = **536** lb

Overturning Moment in “L” Direction	M_{OL} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(L/2 -Y) = **17775** lb_in
Resisting Moment in “L” Direction	M_{RL} = D_F*W_p*(L/2-X) = **3393** lb_in
Anchor Tension in “L” Direction	T_L = max((M_{OL} - M_{RL})/(L*N_{TL}), 0 lb) = **479** lb
Anchor Shear in “L” Direction	V_L = E_F*F_p*W_p/N_{VL} = **268** lb

Maximum Anchor Demands based on 100% / 30% Loading in Orthogonal Directions

Tension Neglecting Dead Load	T_{ND} = max(M_{OB}/(B*N_{TB})+0.3*M_{OL}/(L*N_{TL}),0.3*M_{OB}/(B*N_{TB})+M_{OL}/(L*N_{TL}))
	T_{ND} = **1363** lb
Assumed % Resisting DL @ Critical Anchor	P_C = (B/2-Y)/B*(L/2-X)/L = **19** %
Tension Demand to Anchor	T = max (0 lb, T_{ND} - D_F*P_C*W_p) = **1265** lb
Shear Demand to Anchors	V = max(V_B, V_L) = **536** lb

Anchor Description	$Anchor_C$ = **"3/8" DIA HILTI KB-TZ w/ 2.5" EMBED"**	
Tension Capacity	ϕT_n = **1831** lb	$T/\phi T_n$ = **0.69**
Shear Capacity	ϕV_n = **5305** lb	$V/\phi V_n$ = **0.10**

Demand Capacity Ratio | DCR = $V/\phi V_n$ + $T/\phi T_n$ = **0.79** | Check = **"OK, DCR < 1.2"**

BUEHLER

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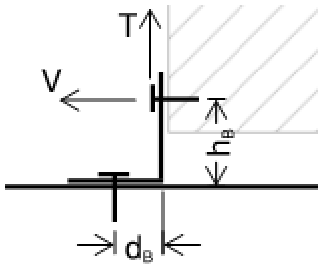
Check Non-Concrete Connections



Max Height to Applied Shear h_B = **1** in

Distance to Anchor d_B = **1** in

ASD Load Combination D_F = **0.6** E_F = **0.7** E_{FV} = **0.7**

Resisting Shear and Tension in "B" Direction N_{VB} = **1** N_{TB} = **1**

Resisting Shear and Tension in "L" Direction N_{VL} = **2** N_{TL} = **2**

Overturning Moment in "B" Direction	$M_{OB} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(B/2-Y)$ = **6628** lb_in
Resisting Moment in "B" Direction	$M_{RB} = D_F*W_p*(B/2-Y)$ = **2262** lb_in
Anchor Tension in "B" Direction	$T_B = \max((M_{OB} - M_{RB})/(B*N_{TB}), 0\ lb)$ = **291** lb
Anchor Shear in "B" Direction	$V_B = E_F*F_p*W_p/N_{VB}$ = **188** lb
Overturning Moment in "L" Direction	$M_{OL} = E_F*F_p*W_p*H_{cg} + E_{FV}*F_v*W_p*(L/2 -Y)$ = **6628** lb_in
Resisting Moment in "L" Direction	$M_{RL} = D_F*W_p*(L/2-X)$ = **2262** lb_in
Anchor Tension in "L" Direction	$T_L = \max((M_{OL} - M_{RL})/(L*N_{TL}), 0\ lb)$ = **146** lb
Anchor Shear in "L" Direction	$V_L = E_F*F_p*W_p/N_{VL}$ = **94** lb

Maximum Connection Demands based on 100% / 30% Loading in Orthogonal Directions

Tension Neglecting Dead Load	$T_{ND} = \max(M_{OB}/(B*N_{TB})+0.3*M_{OL}/(L*N_{TL}),0.3*M_{OB}/(B*N_{TB})+M_{OL}/(L*N_{TL}))$
	T_{ND} = **508** lb
Assumed % Resisting DL @ Critical Anchor	$P_C = (B/2-Y)/B*(L/2-X)/L$ = **19** %
Tension Demand to Anchor	$T = \max(0\ lb, T_{ND} - D_F*P_C*W_p)$ = **443** lb
Shear Demand to Anchors	$V = \max(V_B, V_L)$ = **188** lb

Check Connection Bracket to Equipment (Brackets on Long "L" Side of Equipment)

Number of Connections per Bracket	N_{BR} = **1**
Fastener Shear	$V_{Conn} = \text{sqrt}(T^2 + V_L^2)/N_{BR}$ = **453** lb
Fastener Tension	$T_{Conn} = V_B /N_{BR}$ = **188** lb
Fastener	$Conn_B$ = **"1"**
Allowable Shear	Va = **1** lb
Allowable Tension	Ta = **1** lb
Demand Capacity Ratio	$DCR = V_{Conn}/Va + T_{Conn}/Ta$ = **640.16** Check = **"No Good, V_{Conn} /Va > 1.0"**

Check L-Bracket in Bending

Plate/Bracket Length	L_B = **2** in
Plate/Bracket Yield Strength	fy_B = **36** ksi
Bending Moment Demand	$M = T*d_B + V*h_B$ = **630** lb_in
Required Plate/Bracket Thickness	$t_{req} = \text{sqrt}(4*1.67*M/(fy_B* L_B))$ = **0.242** in
Provided Plate/Bracket Thickness	t_B = **0.25** in Check = **"OK, $t_{req}< t_B$"**

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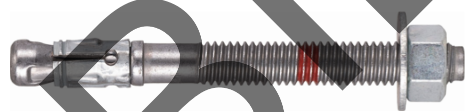
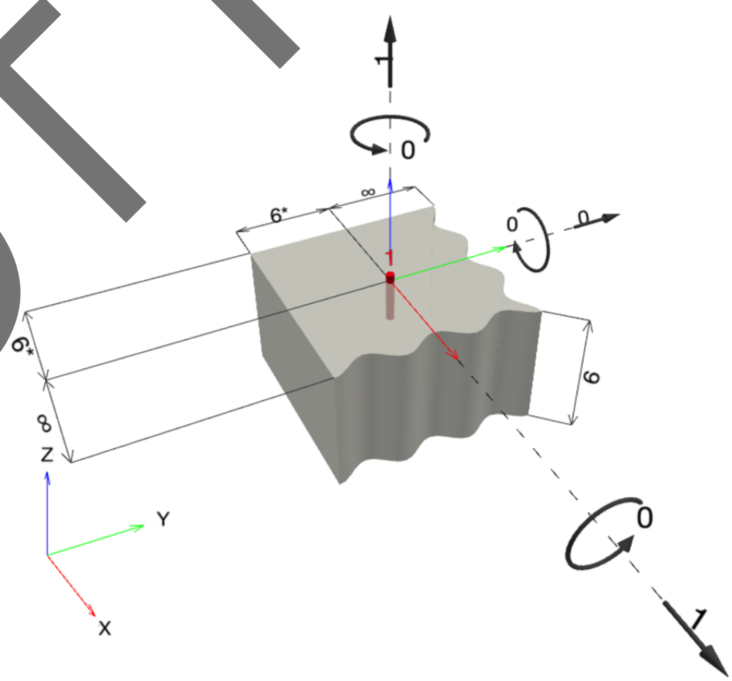
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/8 (2) hnom2**
Item number:	2210242 KB-TZ2 3/8x3 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d))
	Shear load: yes (17.2.3.5.3 (c))

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



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1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	yes	1

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2 Proof I Utilization (Governing Cases)

		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Failure	1	1,831	1 / -	OK
Shear	Concrete edge failure in direction y-	1	5,305	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.001	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

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4 Remarks; Your Cooperation Duties

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SUBMITTAL

A-326.8F

JOB: **REPRESENTATIVE:**

UNIT TAG: **ORDER NO.** **DATE:**

ENGINEER: **SUBMITTED BY:** **DATE:**

CONTRACTOR: **APPROVED BY:** **DATE:**

ROLAIRTROL®

Air Separator

Flanged Less Strainer

Air Control and Elimination

DESCRIPTION

The Rolairtrol Air Separator is an ASME vessel designed with tangential openings to create a low velocity vortex where air is separated and removed from the circulating water.

MAXIMUM WORKING PRESSURE

125 PSIG (862 kPa)

MAXIMUM OPERATING TEMPERATURE

350°F (177°C)

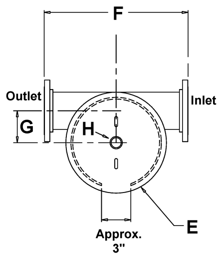
Consult factory for higher working pressures and temperatures.

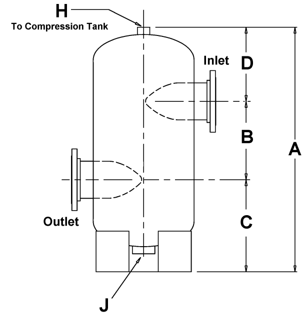
CONSTRUCTION MATERIALS

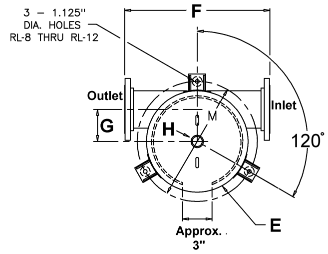
- Designed and constructed per ASME Section VIII, Division 1
- Shell: Carbon Steel

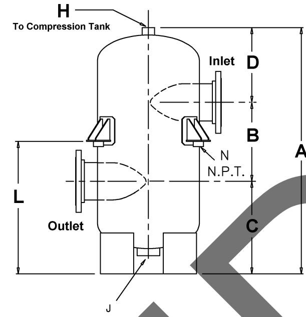
PART NUMBER	MODEL NUMBER	Capacity GPM (m^3/hr)	Flanged Tangential Opening in. (mm)	TAGGING INFORMATION	QUANTITY
5363-03F-12-003	RL−3F	190 (43.2)	3 (76.2)		
5363-04F-12-003	RL−4F	300 (68.1)	4 (101.6)		
5363-05F-12-003	RL−5F	530 (120.4)	5 (127.0)		
5363-06F-12-003	RL−6F	850 (193.0)	6 (150.0)		
5363-08F-12-004	RL−8F	1,900 (431.5)	8 (203.2)		
5363-10F-12-003	RL−10F	3,600 (817.6)	10 (254.0)		
5363-12F-12-003	RL−12F	4,800 (1090.1)	12 (300.0)		
5363-03F-12-004	RL−3FB	190 (43.2)	3 (76.2)		
5363-04F-12-004	RL−4FB	300 (68.1)	4 (101.6)		
5363-05F-12-004	RL−5FB	530 (120.4)	5 (127.0)		
5363-06F-12-004	RL−6FB	850 (193.0)	6 (150.0)		
5363-08F-12-005	RL−8FB	1,900 (431.5)	8 (203.2)		
5363-10F-12-004	RL−10FB	3,600 (817.6)	10 (254.0)		
5363-12F-12-004	RL−12FB	4,800 (1090.1)	12 (300.0)		

Model numbers with a B suffix include bracket supports.









DIMENSIONS in Inches (mm) AND WEIGHTS in Lbs (kg.)

MODEL NUMBER	A	B	C	D	E	F	G	H	J	L*	M*	N*	Cv	Approx. Volume in Gallons (Ltr.)	Approx. Shpg. Wt. in Lbs. (Kg)	Flood Wt.Less Bracket in Lbs. (Kg)	Bracket Wt. in Lbs. (Kg)†
RL-3F (B)	26-7/8 (683)	8 (203)	10-13/16 (275)	8-1/16 (205)	10-3/4 (273)	22-3/4 (578)	3-5/8 (92)	1-1/4 (32)	2 (51)	13-3/8 (340)	14 (356)	2 (51)	215	7 (26)	115 (52)	173 (79)	9 (4)
RL-4F (B)	31-7/16 (799)	10 (254)	11-15/16 (303)	9-1/2 (241)	12-3/4 (324)	20-1/2 (521)	4-1/8 (105)	1-1/2 (38)	2 (51)	15-3/8 (391)	16 (406)	2 (51)	370	13 (49)	155 (70)	263 (119)	9 (4)
RL-5F (B)	37 (940)	12 (305)	14-1/16 (357)	10-15/16 (278)	16 (406)	23-3/4 (603)	5-1/4 (133)	1-1/2 (38)	2 (51)	18-1/2 (470)	19-3/8 (492)	2 (51)	580	25 (95)	205 (93)	414 (188)	9 (4)
RL-6F (B)	44-1/16 (1119)	14 (356)	16-13/16 (427)	13-1/4 (337)	18 (457)	25-3/4 (654)	5-11/16 (144)	1-1/2 (38)	2 (51)	22-1/8 (562)	21-1/4 (540)	2 (51)	850	34 (129)	280 (127)	564 (256)	9 (4)
RL-8F (B)	54 (1372)	18 (457)	19-7/16 (494)	16-9/16 (421)	24 (610)	31-3/4 (806)	7-11/16 (195)	2 (51)	2 (51)	26 (660)	29-1/2 (749)	2 (51)	1,445	90 (341)	420 (190)	1,171 (531)	30 (14)
RL-10F (B)	64-11/16 (1643)	22 (559)	22-5/8 (575)	20-1/16 (510)	30 (762)	37-3/4 (959)	9-5/8 (244)	2 (51)	2 (51)	31-5/8 (803)	35-1/2 (902)	2 (51)	2,340	150 (568)	800 (363)	2,052 (930)	30 (14)
RL-12F (B)	75-3/8 (1915)	27 (586)	25-3/4 (654)	22-5/8 (575)	36 (914)	46-3/4 (1187)	11-5/8 (295)	2 (51)	2 (51)	37-5/8 (956)	41-1/2 (1054)	2 (51)	3,300	291 (1,101)	1,110 (503)	3,538 (1,605)	30 (14)

*Indicates measurements for models that have optional support brackets
†Bracket weight should be added to flood weight and approximate shipping weight for models that are being supplied with optional support brackets.

Important Note: Dimensions not to be used for construction.

IMPORTANT NOTES:

1. Consult IOM A85524 for safety and service instructions.

2. Lifting lugs are for the transportation and installation of the empty vessel, and are not to be used for complete or partial support of the flood vessel.

3. The RL skirt can support flooded vessel weight.

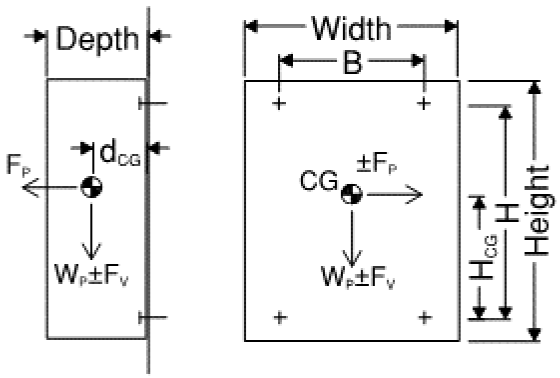
4. Welding to the pressure vessel boundary will void the ASME stamp.

5. Standard Rolairtrol design up to 12" can be hung from the nozzles using hangers. Optional, factory welded, support brackets are available for an additional cost.

BUEHLER

PROJECT San Bernardino ISD
PROJECT NO. 2021-0014 DATE
CLIENT Holt BY KRN PAGE NO.

EQUIPMENT ANCHORAGE CALCULATION (ASCE 7-16)



Unit Identification UnitID = **"2-DC Distribution Board"**

Unit Height Height = **59** in
Unit Width Width = **42** in
Unit Depth Depth = **9.5** in
Unit Weight W_p = **560** lb

Width Between Connections B = **30** in
Height Between Connections H = **47** in
Height to Center of Gravity H_{CG} = **23.5** in
Depth to Center of Gravity d_{CG} = **6** in

Seismic Load Parameters (ASCE 7-16)

a_p = **2.5** R_p = **6.0** Ω_0 = **1.0** I_p = **1.00**
S_{ds} = **1.540** z = **0.5** ft h = **1** ft

Seismic Forces

$F_{pcalc} = 0.4*a_p*S_{ds}*I_p*(1+2*(z/h))/R_p$ = **0.513** * W_p
$F_{pmin} = 0.3*S_{ds}*I_p$ = **0.462** * W_p $F_{pmax} = 1.6*S_{ds}*I_p$ = **2.464** * W_p
Controlling Horizontal Force F_p = **0.513** * W_p
Vertical Force $F_v = 0.2*S_{ds}$ = **0.308** * W_p

<u>Check Connections of Equipment to Wall</u>

ASD Load Combination D_F = **1.0** E_H = **0.7** E_V = **0.7**

Total Number of Connections to Backing N = **6**
Number of Connections in Top Row N_T = **2**
Number of Connections Each Side N_S = **3**
Increase to Loads to Connections Due to CG Offset Inc = abs((H_{CG}/H - 0.5)/0.5) = **0**

Tension from Dead Loads $T_D = D_F*W_p*d_{CG}/(H*N_T)$ = **36** lbs
Tension from Fv $T_{Fv} = E_V*F_v*W_p*d_{CG}/(H*N_T)$ = **8** lb
Tension from Fp acting Front to Back $T_1 = E_H*F_p*W_p/N*(1+Inc)$ = **34** lb
Tension from Fp acting Side to Side $T_2 = E_H*F_p*W_p*d_{CG}/(B*N_S)*(1+Inc)$ = **13** lb
Controlling Tension $T_{conn} = T_D + T_{Fv} + \max(T_1+0.3*T_2, 0.3*T_1+T_2)$ = **81** lb

Shear from Dead Loads $V_D = D_F*W_p/N*(1+Inc)$ = **93** lb
Shear from Fv $V_{Fv} = E_V*F_v*W_p/N*(1+Inc)$ = **20** lb
Shear from Fp acting Front to Back V_1 = 0 lb
Shear from Fp acting Side to Side $V_2 = (E_H*F_p*W_p)/N*(1+Inc)$ = **34** lb
Controlling Shear $V_{conn} = \mathrm{sqrt}((V_D + V_{Fv})^2+(\max(V_1+0.3*V_2, 0.3*V_1+V_2))^2)$ = **118** lb

Check Connection to Backing

Connection	Conn = **"1/4" SMS"**
Allowable Tension	T_{all} = **180** lb
Allowable Shear	V_{all} = **424** lb
Utilization	$U = V_{conn}/V_{all} + T_{conn}/T_{all}$ = **0.73** Check = **"OK"**

Check Backing

Stud Spacing	Spacing = **16** in
Moment Demands	$M_{ymax} = T_{conn}$*Spacing/4 = **324** lb_in
	$M_{xmax} = V_{conn}$*Spacing/4 = **473** lb_in
Backing	Backing = **"6"x16GA Backing Track"**
Allowable Moment Y	M_{yall} = **1100** lb_in M_{ymax}/M_{yall} = **0.29**
Allowable Moment X	M_{xall} = **6500** lb_in M_{xmax}/M_{xall} = **0.07**

Check Backing to Stud Connection

Number of Connections Backing to Stud	N_{StoS} = **4**
Demands	$T = T_{conn}/N_{StoS}$ = **20** lb
	$V = V_{conn}/N_{StoS}$ = **30** lb
Connection	ScrewTStud = **"(4)#10 SMS"**
Allowable Tension	$T_{StoSall}$ = **109** lb
Allowable Shear	$V_{StoSall}$ = **263** lb
Utilization	$U = V/V_{StoSall} + T/T_{StoSall}$ = **0.30** Check = **"OK"**

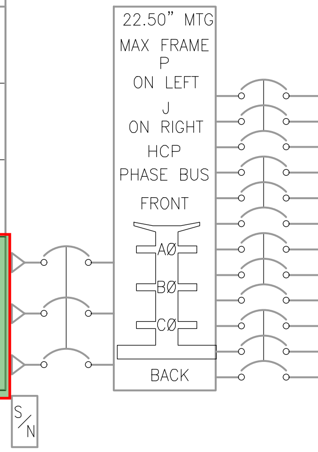
Check Wall Studs

Stud Length	L_{stud} = **15** ft
Number Studs Resisting Equipment Seismic	N_{studs} = **1**
Stud Information	Stud = **"3-5/8"x16 GA @ 16"cc"**
Allowable Moment	$M_{studall}$ = **13280** lb_in
Moment due to Dead Load	$M_D = D_F*W_p*d_{CG}/N_{studs}$ = **3360** lb_in
Moment due to Fv	$M_{Fv} = ((E_V*F_v*W_p)*d_{CG})/N_{studs}$ = **724** lb_in
Moment Fp acting Front to Back	$M_{FTB} = (E_H*F_p*W_p*L_{stud}/4)/N_{studs}$ = **9055** lb_in
Moment Fp acting Side to Side	$M_{STS} = (E_H*F_p*W_p*d_{CG}*L_{stud}/(4*B))/N_{studs}$ = **1811** lb_in
Controlling Moment from Seismic	$M_E = \max(M_{FTB}, M_{STS}) + M_{Fv}$ = **9780** lb_in
Moment Wall Live Load	M_{LL} = (5 psf*Spacing*L_{stud}^2/8)/N_{studs} = **2250** lb_in
Controlling Moment Demand	$M_{max} = \max(M_D+M_E, M_D+M_{LL}, M_D+0.75*M_{LL}+0.75*M_E)$ = **13140** lb_in
Demand Capacity Ratio	$DCR = M_{max}/M_{studall}$ = **0.99** Check = **"OK"**

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

E74

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	PHASE BUS CONN
	4.50" BLANK			
	4.50" BLANK			
	4.50" BLANK			
	BRANCH MOUNTED MAIN Ammeter LSI 100%	PG	400AS 400AT/3	A B C



PHASE BUS CONN	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
			4.50" BLANK	
C B A	150 /3	QD		2
C B A	225 /3	QD		4
C B A	225 /3	QD		6
C B A	225 /3	QD		8

PHYSICAL DATA

ENCLOSURE Type 1
Surface with Door
FRONT CAT#: HCW59TSD
BOX CAT#: HC4259DB
DIMENSIONS:
59''(1499mm)Hx42"(1067mm)Wx9.5''(286mm)D
WIRE BENDING SPACE:
TOP – 11.66"(296mm)
BOTTOM – 17.50"(445mm)
LEFT SIDE – 8.66"(220mm)
RIGHT SIDE – 8.77"(223mm)
PBA: 418
BUSSING: 400A RATED COPPER BUS
Tin Plated
OPTIONAL FEATURES:
SEISMICALLY QUALIFIED : IBC/ASCE7/CBC/NBCC
BRANCH USER PLACEMENT
Copper GROUND BAR
COPPER SOLID NEUTRAL
Maximum Panel Weight 554.

ELECTRICAL DATA

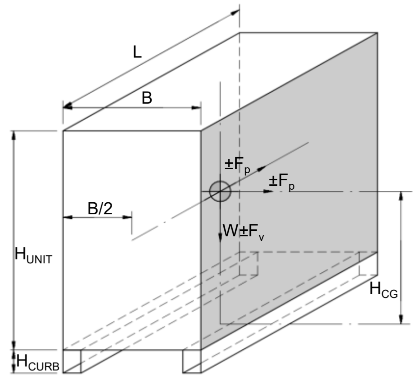
SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 400A
22kA SYMS. SCCR
MAIN: MAIN BREAKER PG 400AS/400AT
ACC: AMM LSI
Bottom FEED
65kA AIR
INCOMING CONDUCTORS(S) PER NEC, CEC, NOM:
Wire Bending Space:
Phase Lugs:1 – (3) 3/0 – 500 kcmil
-----------BRANCH SUMMATION-----------
1 – 150A/3P QD
3 – 225A/3P QD

Depth Center of Gravity 9.5
Elevation Center of Gravity 29.5
Vertical Center of Gravity 21.0

JOB NAME:	Mt SAC Campus Store Instruction Offices	EQUIPMENT DESIGNATION:	2DP2 400A 208V N1
JOB LOCATION:		EQUIPMENT TYPE:	I-Line (Circuit Breaker Type) PANEL 1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			SQUARE D by Schneider Electric
DATE:	October 25 2020		
DRAWING STATUS:	QUOTE	DWG# 0Q-2086616-56659517-01	PG 1 OF 2 REV –

PROJECT	San Bernardino ISD		
PROJECT NO.	2021-0014	DATE	
CLIENT	Holt	BY KRN	SHEET NO.

Mechanical Equipment Anchorage Calc
BASE MOUNTED



Unit Identification: **Chemical Pot Feeder**

W_p =	200 lbs	unit weight
B =	10.00 in	unit width
$d_{B\ dir\ anchors}$ =	10.00 in	dist btwn anchors (B dir.)
L =	10.00 in	unit length
$d_{L\ dir\ anchors}$ =	10.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	30.00 in	unit height
H_{CG_EQUIP} =	13.00 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	13.00 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p = 1.00	R_p = 2.50	I_p = 1.00	S_{DS} = 1.540
z = 0.00 ft	h = 1.00 ft	Ωo = 2.0	

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h)]/R_p) \times W_p$ = 0.246 Wp $F_v = 0.2(S_{DS})W_p$ = 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p$ = 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p)$ = 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**92 lbs**	**$0.7F_p = V_h$ =**	**65 lbs**
$F_v = V_v$ =	**62 lbs**	**$0.7F_v = V_v$ =**	**43 lbs**

Unit Anchorage:

Fp in "B" Direction

connections shear 1
connections tension 1

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	100 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	200 lb-ft	$M_{OT} = V_hH_{CG}$ =	70 lb-ft
M_R= $(0.9\text{-}0.2S_{ds})W_p(B/2)$ =	49 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(B/2)$ =	49 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(B/2)$ =	32 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	61 lbs	$T = (M_{OT} - M_R) / d_B$ =	181 lbs	$T = (M_{OT} - M_R) / d_B$ =	46 lbs
T_{conn} = T / # conn tension =	61 lbs	T_{conn} = T / # conn tension =	181 lbs	T_{conn} = T / # conn tension =	46 lbs
$V_{conn} = V_h$ / # conn shear =	92 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	185 lbs	$V_{conn} = V_h$ / # conn shear =	65 lbs

Fp in "L" Direction

connections shear 1
connections tension 1

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	100 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	200 lb-ft	$M_{OT} = V_hH_{CG}$ =	70 lb-ft
M_R= $(0.9\text{-}0.2S_{ds})W_p(L/2)$ =	49 lb-ft	$M_R = (0.9\text{-}0.2S_{ds})W_p(L/2)$ =	49 lb-ft	$M_R = (0.6\text{-}0.14S_{ds})W_p(L/2)$ =	32 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	61 lbs	$T = (M_{OT} - M_R) / d_L$ =	181 lbs	$T = (M_{OT} - M_R) / d_L$ =	46 lbs
T_{conn} = T / # conn tension =	61 lbs	T_{conn} = T / # conn tension =	181 lbs	T_{conn} = T / # conn tension =	46 lbs
$V_{conn} = V_h$ / # conn shear =	92 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	185 lbs	$V_{conn} = V_h$ / # conn shear =	65 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	61 lbs	Tmax =	181 lbs	Tmax =	46 lbs
Vmax =	92 lbs	Vmax =	185 lbs	Vmax =	65 lbs

Connection/Anchorage Notes:

Anchor Description: 3/8"Ø Hilti KB-TZ2 SS304 w/ 2" Embed, 6" Edge Dist

ΦTn = 1831 lbs (per Hilti Profis) DCR = 0.10

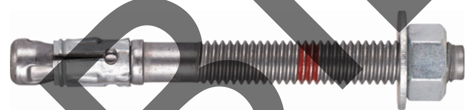
ΦVn = 3183 lbs (per Hilti Profis) DCR = 0.06

Interaction = 0.1 + 0.06 = 0.16 < 1.2

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

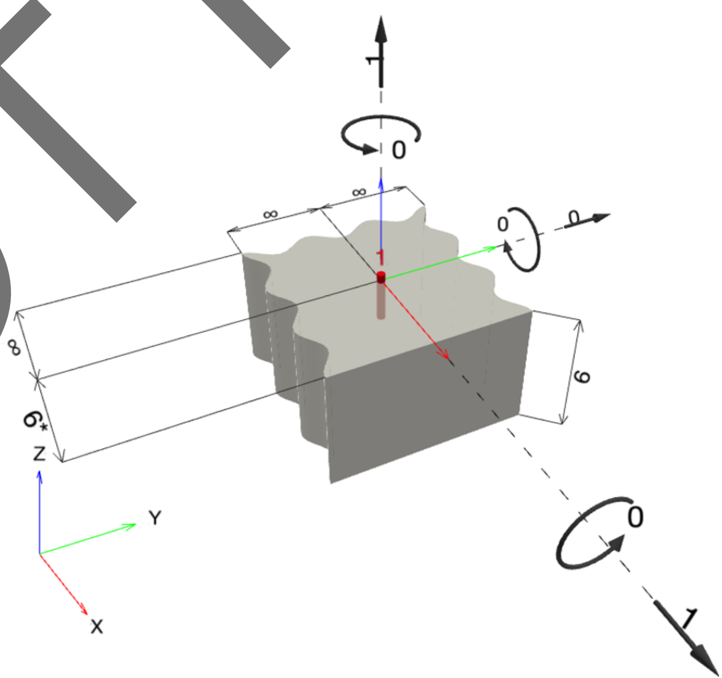
Specifier's comments:

1 Input data



Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 3/8 (2) hnom2**
Item number:	2210242 KB-TZ2 3/8x3 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

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



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Company:
Address:
Phone I Fax: |
Design: Concrete - Jan 10, 2022
Fastening point:

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	yes	1

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
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	1	1,831	1 / -	OK
Shear	Concrete edge failure in direction x+	1	3,183	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.001	0.000	5/3	1	OK

3 Warnings

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

Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/12/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

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E80

By-Pass & Filter Feeders

Neptune
CHEMICAL PUMP CO., INC.

By-Pass Feeders

Neptune By-Pass Feeders are a convenient method of introducing treatment chemicals into closed circulating water systems.

Neptune By-Pass Feeders are ideal for use with chilled water treatment such as air conditioning systems or hot water treatment in heating systems or large engine water jackets.

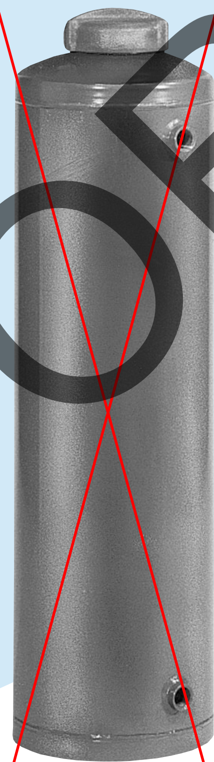
Neptune offers two styles of By-Pass Feeders: A vertical style with dish bottom in and a vertical style with dish bottom out.

Filters are available for system cleanup and monitoring.

A new high pressure cap rated to 300 psi is now available. The first closure improvement in over a decade.

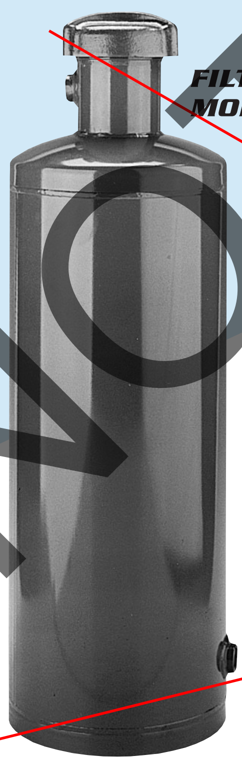
BY-PASS FEEDERS – VERTICAL STYLE

DISH BOTTOM IN
MODEL VTF-10HP



DISH BOTTOM OUT
MODEL DBF-5HP

FILTER FEEDER
MODEL FTF-5HP



Filter Feeders

The Neptune Filter Feeder combines chemical addition and high capacity filtering in one piece of equipment. It is a convenient way to introduce powders or liquid chemicals into hot or cold water closed circulating systems.

- Eliminates need for separate By-Pass Feeder and filter.
- Filtration can be achieved at the same time as chemical addition.
- Extended neck with top inlet allows simple installation of filter or dissolving basket.
- Filter bags are available in coarse, medium and fine grades. (Order separately.)
- Filter bags are quickly and easily replaced.

NEW! The first closure improvement in over a decade!

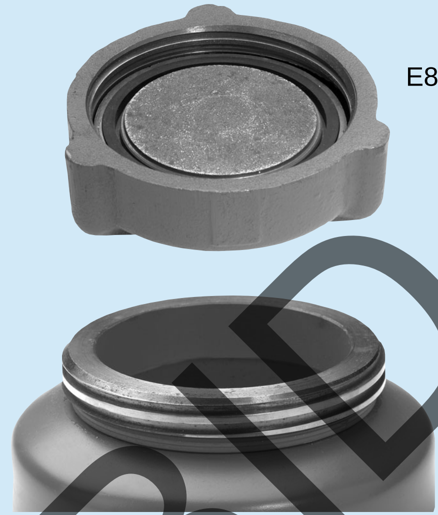
Caps

All Neptune By-Pass Feeders offer the new style, quick opening, high pressure closure.

These closures offer better sealing with less force and eliminate the need for tools. Design binds cap tightly when under pressure making it necessary to bleed pressure from tank before removing cap.

Underside of cap which contacts liquid is *epoxy-coated.*

OLD STYLE CAP
Three lug, ⅓ turn design rated to 200 psi.



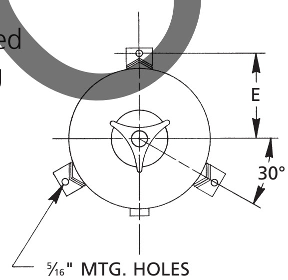
NEW HIGH PRESSURE CAP
Coarse thread, 2½ turn design rated to 300 psi.

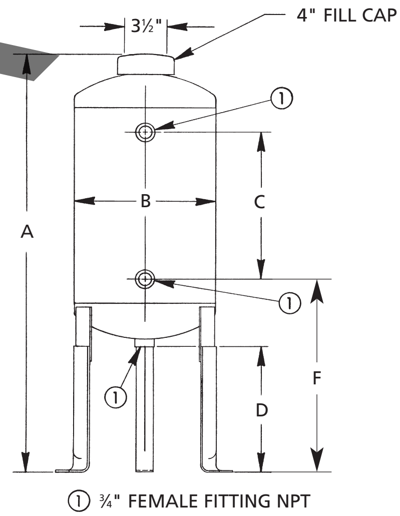
Vertical Style – Dish Bottom Out

The **"DBF"** series features wide-mouth caps manufactured by Neptune. These caps utilize a square section "O" ring seal and will ***close easily by hand.*** Advantages of this series are demountable leg extensions and a ***full bottom drain.*** Optional Filter Bag Kit may be added.

"DBFC" models include a built-in support and mounting for a cartridge filter (order cartridge separately).

See page 3 for specifications.





MODEL NUMBER	FILTER	APPROX. CAPACITY	MAX. PRESSURE*	A	B	C	D	E	F	SHIP WEIGHT
DBF-2HP	Optional†	2 Gallons	300 psi	31¼"	6"	12¾"	8⅝"	4⅛"	13¼"	23 lbs.
DBFC-2	Cartridge	2 Gallons	300 psi	31¼"	6"	12¾"	8⅝"	4⅛"	13¼"	23 lbs.
DBF-5HP	Optional†	5 Gallons	300 psi	29¾"	10"	10½"	8"	6⅛"	13"	38 lbs.
DBFC-5	Cartridge	5 Gallons	300 psi	29¾"	10"	10½"	8"	6⅛"	13"	38 lbs.
DBF-10HP	Optional†	10 Gallons	300 psi	45¾"	10"	26½"	8"	6⅛"	13"	61 lbs.

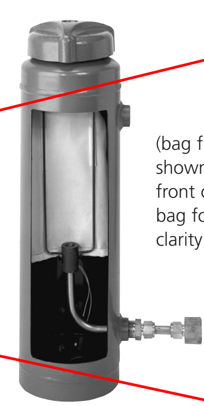
*At 200°F Max. †No filter included with base unit. Purchase optional filter bag kit.

Filter Bag Kits

Available for all **"VTF"** and **"DBF"** models up to 10 gallons. Kit includes bag, bag frame, tubing and connectors. The addition of a filter bag allows the By-Pass Feeder to function simultaneously as a side stream filter. (A clean bag is rated at approximately 30 microns.) Cannot be used with VTFC & DBFC models.

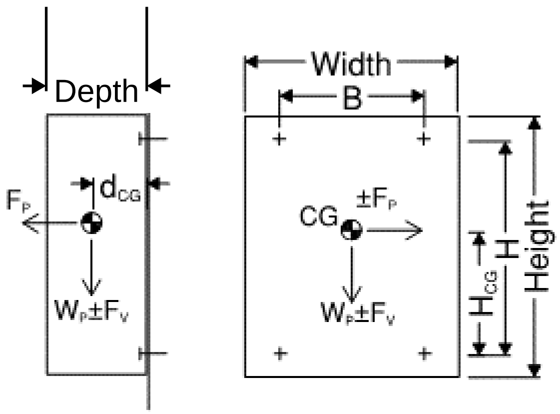
VTF-2HP with filter bag kit installed

MODEL	FOR USE ON
FBK-2	VTF-2HP, DBF-2HP
FBK-5	VTF-5HP, DBF-5HP
FBK-10	VTF-10HP, DBF-10HP



(bag frame shown in front of bag for clarity only)

EQUIPMENT ANCHORAGE CALCULATION (ASCE 7-16)



Unit Identification — UnitID = **"Surface Mounted Panelboard"**

Unit Height — Height = **62** in
Unit Width — Width = **20** in
Unit Depth — Depth = **6** in
Unit Weight — W_p = **300** lb

Width Between Connections — B = **15** in
Height Between Connections — H = **50** in
Height to Center of Gravity — H_{CG} = **25** in
Depth to Center of Gravity — d_{CG} = **6** in

Seismic Load Parameters (ASCE 7-16)

a_p = **2.5**	R_p = **6.0**	Ω_0 = **1.0**	I_p = **1.00**
S_{ds} = **1.540**	z = **0.5** ft	h = **1** ft	

Seismic Forces

$F_{pcalc} = 0.4*a_p*S_{ds}*I_p*(1+2*(z/h))/R_p$ = **0.513** * W_p

$F_{pmin} = 0.3*S_{ds}*I_p$ = **0.462** * W_p — $F_{pmax} = 1.6*S_{ds}*I_p$ = **2.464** * W_p

Controlling Horizontal Force — F_p = **0.513** * W_p

Vertical Force — $F_v = 0.2*S_{ds}$ = **0.308** * W_p

Check Connections of Equipment to Wall

ASD Load Combination — D_F = **1.0** — E_H = **0.7** — E_V = **0.7**

Total Number of Connections to Backing	N = **6**
Number of Connections in Top Row	N_T = **2**
Number of Connections Each Side	N_S = **3**
Increase to Loads to Connections Due to CG Offset	Inc = abs((H_{CG}/H - 0.5)/0.5) = **0**
Tension from Dead Loads	$T_D = D_F*W_p*d_{CG}/(H*N_T)$ = **18** lbs
Tension from Fv	$T_{Fv} = E_V*F_v*W_p*d_{CG}/(H*N_T)$ = **4** lb
Tension from Fp acting Front to Back	$T_1 = E_H*F_p*W_p/N*(1+Inc)$ = **18** lb
Tension from Fp acting Side to Side	$T_2 = E_H*F_p*W_p*d_{CG}/(B*N_S)*(1+Inc)$ = **14** lb
Controlling Tension	$T_{conn} = T_D + T_{Fv} + \max(T_1+0.3*T_2,\ 0.3*T_1+T_2)$ = **44** lb
Shear from Dead Loads	$V_D = D_F*W_p/N*(1+Inc)$ = **50** lb
Shear from Fv	$V_{Fv} = E_V*F_v*W_p/N*(1+Inc)$ = **11** lb
Shear from Fp acting Front to Back	V_1 = 0 lb
Shear from Fp acting Side to Side	$V_2 = (E_H*F_p*W_p)/N*(1+Inc)$ = **18** lb
Controlling Shear	$V_{conn} = \mathrm{sqrt}((V_D+V_{Fv})^2+(\max(V_1+0.3*V_2,\ 0.3*V_1+V_2))^2)$ = **63** lb

Check Connection to Backing

Connection	Conn = **"1/4" SMS "**
Allowable Tension	T_{all} = **180** lb
Allowable Shear	V_{all} = **424** lb
Utilization	$U = V_{conn}/V_{all} + T_{conn}/T_{all}$ = **0.39** Check = **"OK"**

Check Backing

Stud Spacing	Spacing = **16** in
Moment Demands	$M_{ymax} = T_{conn}$*Spacing/4 = **177** lb_in
	$M_{xmax} = V_{conn}$*Spacing/4 = **254** lb_in
Backing	Backing = **"6"x16 GA MTL BACKING TRACK"**
Allowable Moment Y	M_{yall} = **1100** lb_in M_{ymax}/M_{yall} = **0.16**
Allowable Moment X	M_{xall} = **6500** lb_in M_{xmax}/M_{xall} = **0.04**

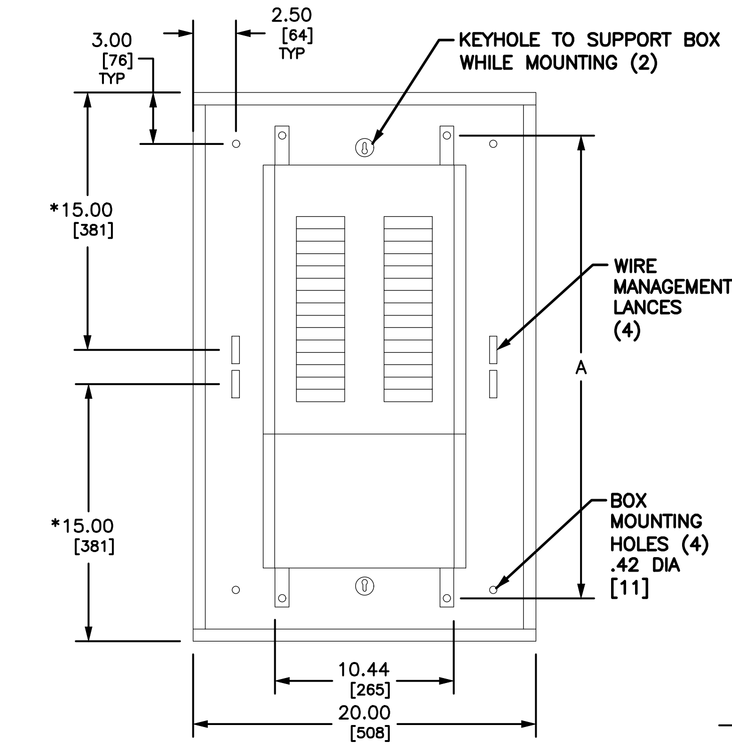
Check Backing to Stud Connection

Number of Connections Backing to Stud	N_{StoS} = **4**
Demands	$T = T_{conn}/N_{StoS}$ = **11** lb
	$V = V_{conn}/N_{StoS}$ = **16** lb
Connection	ScrewTStud = **"(4)#10 SMS"**
Allowable Tension	$T_{StoSall}$ = **109** lb
Allowable Shear	$V_{StoSall}$ = **263** lb
Utilization	$U = V/V_{StoSall} + T/T_{StoSall}$ = **0.16** Check = **"OK"**

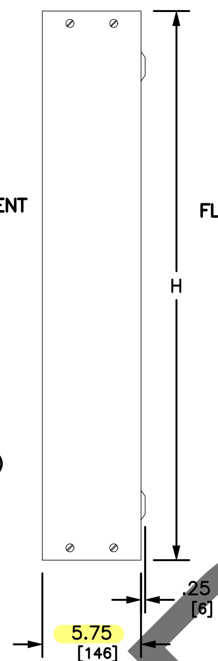
Check Wall Studs

Stud Length	L_{stud} = **15** ft
Number Studs Resisting Equipment Seismic	N_{studs} = **1**
Stud Information	Stud = **"3-5/8"x16 GA @ 16" CC"**
Allowable Moment	$M_{studall}$ = **13280** lb_in
Moment due to Dead Load	$M_D = D_F*W_p*d_{CG}/N_{studs}$ = **1800** lb_in
Moment due to Fv	$M_{Fv} = ((E_V*F_v*W_p)*d_{CG})/N_{studs}$ = **388** lb_in
Moment Fp acting Front to Back	$M_{FTB} = (E_H*F_p*W_p*L_{stud}/4)/N_{studs}$ = **4851** lb_in
Moment Fp acting Side to Side	$M_{STS} = (E_H*F_p*W_p*d_{CG}*L_{stud}/(4*B))/N_{studs}$ = **1940** lb_in
Controlling Moment from Seismic	$M_E = \max(M_{FTB}, M_{STS}) + M_{Fv}$ = **5239** lb_in
Moment Wall Live Load	M_{LL} = (5 psf*Spacing*L_{stud}^2/8)/N_{studs} = **2250** lb_in
Controlling Moment Demand	$M_{max} = \max(M_D+M_E, M_D+M_{LL}, M_D+0.75*M_{LL}+0.75*M_E)$ = **7417** lb_in
Demand Capacity Ratio	$DCR = M_{max}/M_{studall}$ = **0.56** Check = **"OK"**

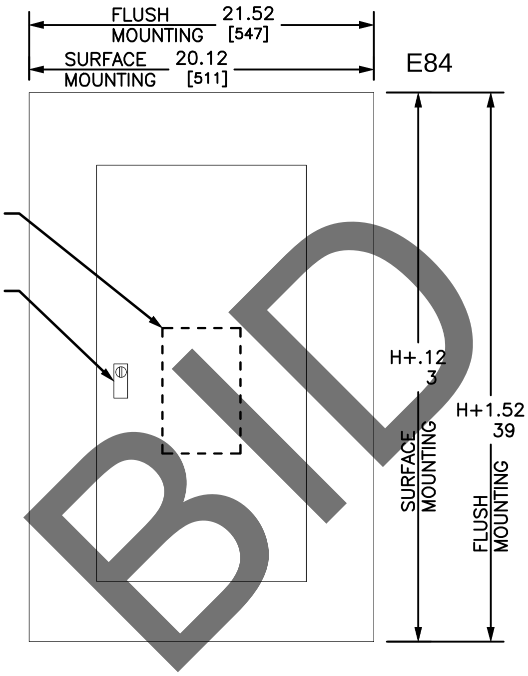
REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE
—	————	——	——/——	—	————	——	——/——
				—	————	——	——/——



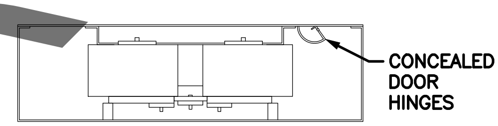
TYPICAL BOX WITH INTERIOR



TYPICAL BOX SIDE VIEW

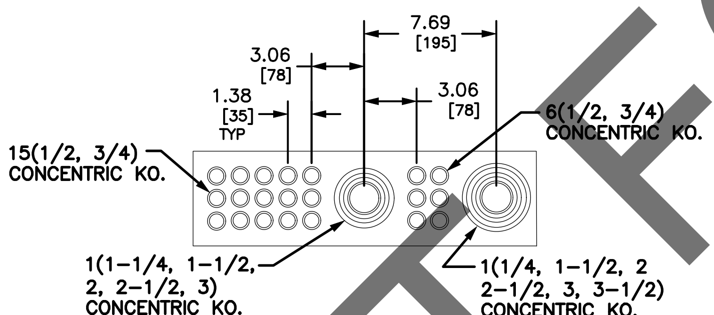


TYPICAL FRONT



TYPICAL MOUNTING OF EDB OR ECB–G3 BREAKERS

*FOR ENCLOSURES WHERE DIMENSION "H" IS 26.00/[660], THIS DIMENSION IS 11.00/[279]



ENDWALL WITH KNOCKOUTS
(OTHER ENDWALL IS BLANK)

DUAL DIMENSIONS: INCHES / MILLIMETERS

MAXIMUM MAIN LUG AMPERE RATING	MAXIMUM NUMBER OF CIRCUITS	H		A	
		IN	MM	IN	MM
125	18	26.00	660	21.00	533
	30	32.00	813	27.00	686
250	30	38.00	965	33.00	838
	42	44.00	1118	39.00	991
	54	50.00	1270	45.00	1143
	66	62.00	1575	57.00	1448
125 WITH SUB–FEED LUGS	18	26.00	660	21.00	533
	30	32.00	813	27.00	686
250 WITH SUB–FEED LUGS	30	38.00	965	33.00	838
	42	44.00	1118	39.00	991
	54	50.00	1270	45.00	1143
	66	62.00	1575	57.00	1448
125 WITH FEED–THRU LUGS	18	32.00	813	27.00	686
	30	38.00	965	33.00	838
250 WITH FEED–THRU LUGS	30	50.00	1270	45.00	1143
	42	56.00	1422	51.00	1295
	54	62.00	1575	57.00	1448
	66	74.00	1880	69.00	1753
250 WITH SUB–FEED BREAKERS	30	56.00	1422	51.00	1295
	42	62.00	1575	57.00	1448
	54	68.00	1727	63.00	1600
	66	74.00	1880	69.00	1753

REFER TO DP CATALOG CLASS 1670 FOR ADDITIONAL INFORMATION

FOR NEMA TYPE 3R APPLICATIONS USE IN CONJUNCTION WITH PBA555

NF PANELBOARDS MEET THE APPLICABLE REQUIREMENTS OF UL AND CSA.

BOX: CODE GAUGE GALVANIZED STEEL. ONE ENDWALL IS BLANK, THE OTHER HAS KNOCKOUTS.

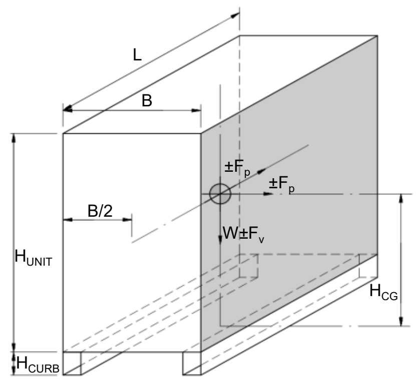
FRONT: MONO–FLAT CONSTRUCTION WITH CONCEALED TRIM SCREWS AND DOOR HINGES. ANSI 49 GRAY BAKED ENAMEL FINISH ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.

LOCK: FLUSH LOCK WITH BRUSHED STAINLESS STEEL ESCUTCHEON. NSR–251 KEY.

JOB NAME:	———	EQUIPMENT DESIGNATION:	———
JOB LOCATION:	———	EQUIPMENT TYPE:	NF 125A/250A MLO TYPE 1
DRAWN BY:	———	DRAWING TYPE:	———
ENGR:	———	SQUARE D Schneider Electric	
DATE:	JULY 2008		
DRAWING STATUS:	———	DWG# PBA550	PG 01 OF 01 REV —

PROJECT	San Bernardino ISD
PROJECT NO.	2021-0014
DATE	
CLIENT	Holt
BY	KRN
SHEET NO.	

Mechanical Equipment Anchorage Calc
BASE MOUNTED



Unit Identification: **T-2C**

W_p =	2000 lbs	unit weight
B =	33.00 in	unit width
$d_{B\ dir\ anchors}$ =	17.00 in	dist btwn anchors (B dir.)
L =	41.00 in	unit length
$d_{L\ dir\ anchors}$ =	22.00 in	dist btwn anchors (L dir.)
H_{UNIT} =	58.00 in	unit height
H_{CG_EQUIP} =	20.60 in	center of gravity height (equip)
H_{CURB} =	0.00 in	curb height
H_{CG} =	20.60 in	(includes curb height)

Seismic Load (ASCE 7-16, Ch. 13)

a_p and R_p obtained from ASCE 7-16, Tables 13.5-1 and 13.6-1

a_p = 1.00	R_p = 2.50	I_p = 1.00	S_{DS} = 1.540
z = 0.00 ft	h = 1.00 ft	Ωo = 2.0	

$F_p = (0.4[(a_p)(S_{DS})(I_p)(1+2(z/h)]/R_p) \times W_p =$ 0.246 Wp $F_v = 0.2(S_{DS})W_p =$ 0.308 Wp

$F_{p\text{-}MIN} = 0.3(S_{DS})(I_p) \times W_p =$ 0.462 Wp

$F_{p\text{-}MAX} = 1.6(S_{DS})(I_p) \times (W_p) =$ 2.464 Wp

STRENGTH		SERVICE	
$F_p = V_h$ =	**924 lbs**	**$0.7F_p = V_h$ =**	**647 lbs**
$F_v = V_v$ =	**616 lbs**	**$0.7F_v = V_v$ =**	**431 lbs**

Unit Anchorage:

Fp in "B" Direction

connections shear 4

connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	1586 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	3172 lb-ft	$M_{OT} = V_hH_{CG}$ =	1110 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	1628 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(B/2)$ =	1628 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(B/2)$ =	1057 lb-ft
$T = (M_{OT} - M_R) / d_B$ =	no net uplift	$T = (M_{OT} - M_R) / d_B$ =	1090 lbs	$T = (M_{OT} - M_R) / d_B$ =	38 lbs
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	545 lbs	T_{conn} = T / # conn tension =	19 lbs
$V_{conn} = V_h$ / # conn shear =	231 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	462 lbs	$V_{conn} = V_h$ / # conn shear =	162 lbs

Fp in "L" Direction

connections shear 4

connections tension 2

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
$M_{OT} = V_hH_{CG}$ =	1586 lb-ft	$M_{OT} = \Omega V_hH_{CG}$ =	3172 lb-ft	$M_{OT} = V_hH_{CG}$ =	1110 lb-ft
$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	2023 lb-ft	$M_R = (0.9-0.2S_{ds})W_p(L/2)$ =	2023 lb-ft	$M_R = (0.6-0.14S_{ds})W_p(L/2)$ =	1313 lb-ft
$T = (M_{OT} - M_R) / d_L$ =	no net uplift	$T = (M_{OT} - M_R) / d_L$ =	627 lbs	$T = (M_{OT} - M_R) / d_L$ =	no net uplift
T_{conn} = T / # conn tension =	no net uplift	T_{conn} = T / # conn tension =	314 lbs	T_{conn} = T / # conn tension =	no net uplift
$V_{conn} = V_h$ / # conn shear =	231 lbs	$V_{conn} = \Omega V_h$ / # conn shear =	462 lbs	$V_{conn} = V_h$ / # conn shear =	162 lbs

Max Connection Forces:

STRENGTH @ 1.0E		STRENGTH @ Ω		SERVICE	
Tmax =	0 lbs	Tmax =	545 lbs	Tmax =	19 lbs
Vmax =	231 lbs	Vmax =	462 lbs	Vmax =	162 lbs

Connection/Anchorage Notes:

Anchor Description: 1/2"Ø Hilti KB-TZ2 SS304 w/ 2" Embed, 6" Edge Dist

ΦTn = 1977 lbs (per Hilti Profis)   DCR = 0.28

ΦVn = 3470 lbs (per Hilti Profis)   DCR = 0.13

Interaction = 0.28 + 0.13 = 0.41 < 1.2

www.hilti.com

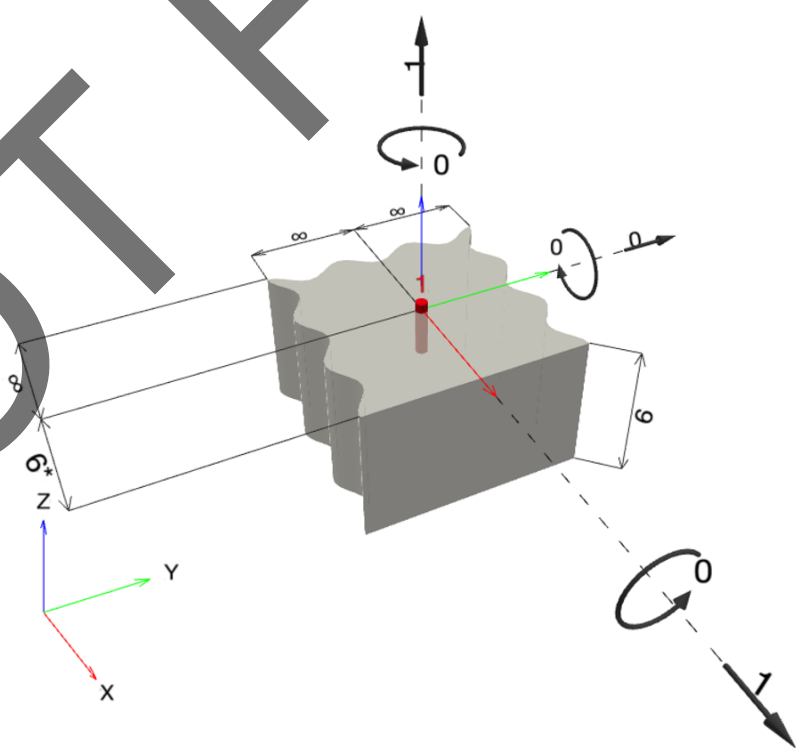
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - SS 304 1/2 (2) hnom1**
Item number:	2210260 KB-TZ2 1/2x3 3/4 SS304
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.500 in.
Material:	AISI 304
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318-14 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 6.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar

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



Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	$N = 1; V_x = 1; V_y = 0;$ $M_x = 0; M_y = 0; M_z = 0;$	no	1

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

2 Proof I Utilization (Governing Cases)

Loading	Proof	Design values [lb] Load	Design values [lb] Capacity	Utilization β_N / β_V [%]	Status
Tension	Concrete Breakout Failure	1	1,977	1 / -	OK
Shear	Concrete edge failure in direction x+	1	3,470	- / 1	OK

Loading	β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
Combined tension and shear loads	0.001	0.000	5/3	1	OK

3 Warnings

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

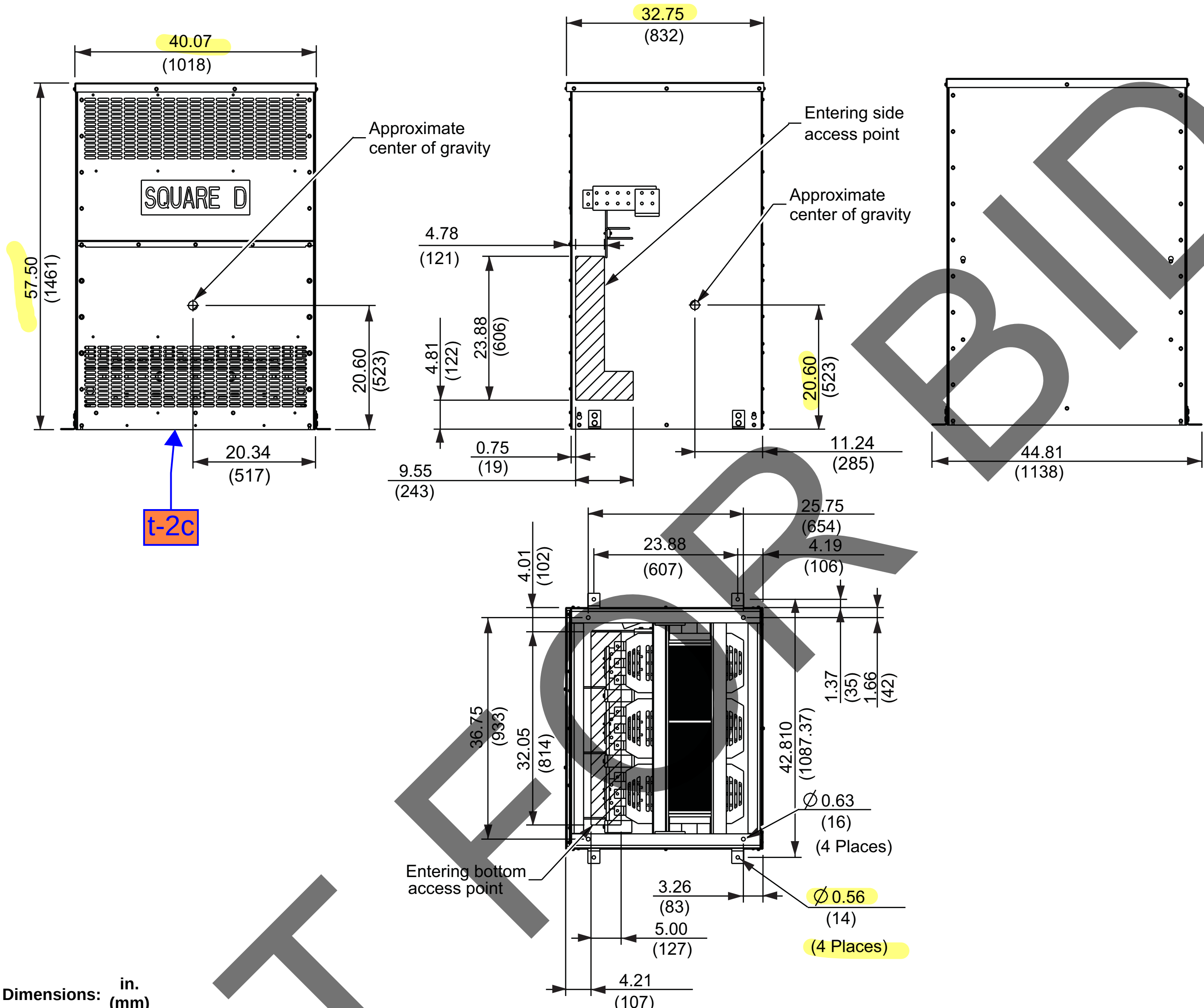
Fastening meets the design criteria!

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jan 10, 2022	Date:	1/11/2022
Fastening point:			

4 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

Figure 12: Enclosure 25J



Dimensions: in. (mm)

Accessories	
Weathershield	7400WS25J
Floor mounting bracket	7400FBM
State of CA only (OSP label)	7400CAOSHPDJ
Enclosure Parts (Replacement Parts)	
Top cover	NHA24800
Side panel	NHA24307
Front cover with labels	NHA96025
Rear cover	NHA24801
Rear shield	NHA24878

When ordering front cover with labels, Catalog No., Serial No., and Date Code in Engineering Notes must be supplied (see Figure 4 for location information on Namplate). Serial number may also be obtained from Core and Coils.

PV CANOPY CALCULATIONS

BUEHLER

JOB	San Bernardino ISD		
JOB NO.	2021-0014	DATE	1/17/2022
CLIENT	Holt BY SRM	SHEET NO.	M1

Table 1. Array Weights

Dead Load	Beams	Girders	Posts
Panels =	2.5 psf	2.5 psf	2.5 psf
Rails @ 3'-4" cc max =	2.5 psf	2.5 psf	2.5 psf
Beams @ 36'-0" =		3.0 psf	3.0 psf
Columns @ 36'-0" =			3.0 psf
Misc =	1.0 psf	1.0 psf	1.0 psf
Total =	6.0 psf	9.0 psf	12.0 psf

Live Load = 12.0 psf (Not applied at panels)
Snow Load = 0.0 psf
EQ Load = 0.0 psf

Table 2. Load Combination Summary

Combination	Dead Load	Live Load	Snow Load	Wind $\gamma = 0$		Wind $\gamma = 180$		Wind	Quake		ASCE 7-10 code reference
				L..C A	L.C. B	L.C. A	L.C. B	$\gamma = 90$	N-S	E-W	
1	1.4										ASCE 2.3.2 - Eq. 1
2	1.2	0.5									ASCE 2.3.2 - Eq. 2
3	1.2		0.5								ASCE 2.3.2 - Eq. 2
4a	1.2	1.6		0.5							ASCE 2.3.2 - Eq. 3
4b	1.2	1.6			0.5						ASCE 2.3.2 - Eq. 3
4c	1.2	1.6				0.5					ASCE 2.3.2 - Eq. 3
4d	1.2	1.6					0.5				ASCE 2.3.2 - Eq. 3
4e	1.2	1.6						0.5			ASCE 2.3.2 - Eq. 3
5a	1.2		1.6	0.5							ASCE 2.3.2 - Eq. 4
5b	1.2		1.6		0.5						ASCE 2.3.2 - Eq. 4
5c	1.2		1.6			0.5					ASCE 2.3.2 - Eq. 4
5d	1.2		1.6				0.5				ASCE 2.3.2 - Eq. 4
5e	1.2		1.6					0.5			ASCE 2.3.2 - Eq. 4
6a	1.2	0.5		1							ASCE 2.3.2 - Eq. 4
6b	1.2	0.5			1						ASCE 2.3.2 - Eq. 4
6c	1.2	0.5				1					ASCE 2.3.2 - Eq. 4
6d	1.2	0.5					1				ASCE 2.3.2 - Eq. 4
6e	1.2	0.5						1			ASCE 2.3.2 - Eq. 4
7a	1.2		0.5	1							ASCE 2.3.2 - Eq. 4
7b	1.2		0.5		1						ASCE 2.3.2 - Eq. 4
7c	1.2		0.5			1					ASCE 2.3.2 - Eq. 4
7d	1.2		0.5				1				ASCE 2.3.2 - Eq. 4
7e	1.2		0.5					1			ASCE 2.3.2 - Eq. 4
8a	1.51		0.2						1.0		ASCE 12.4.2.3 Eq. 5
8b	1.51		0.2							1.0	ASCE 12.4.2.3 Eq. 5
8c	0.59								1.0		ASCE 12.4.2.3 Eq. 6
8d	0.59									1.0	ASCE 12.4.2.3 Eq. 6
9a	0.90			1							ASCE 2.3.2 - Eq. 6
9b	0.90				1						ASCE 2.3.2 - Eq. 6
9c	0.90					1					ASCE 2.3.2 - Eq. 6
9d	0.90						1				ASCE 2.3.2 - Eq. 6
9e	0.90							1			ASCE 2.3.2 - Eq. 6

Note: 1.) S_{DS} = 1.537

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ASCE 7-16, Chapter 27 - Design Wind Loads on Open Buildings with Monoslope, Pitched, or Troughed Roofs (Method 2)

V = 96 mph
Exposure = C
Risk Category = II

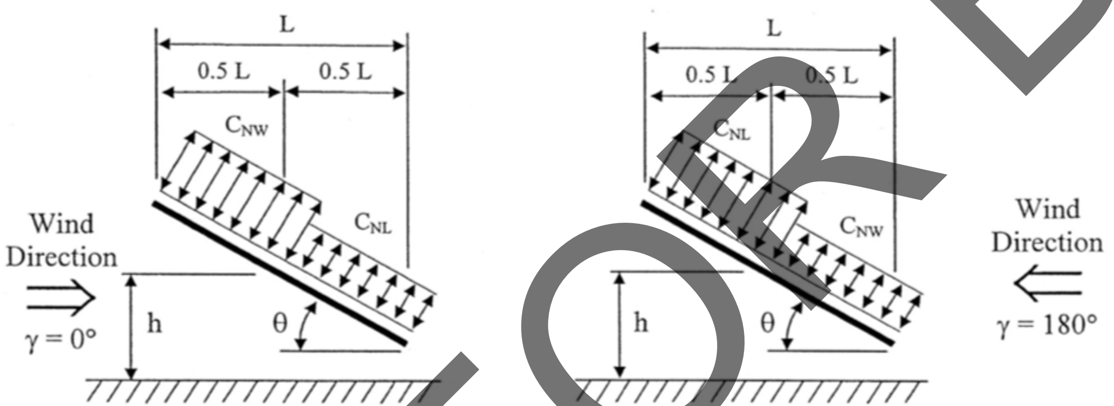
Roof Slope = 5.0°
h = 17.0 ft

ASCE 7-16, 26.10.2 - Velocity Pressure

q_z = 0.00256 $K_z K_{zt} K_d$ Ke V^2 I (lb/ft^2) [eqn: 26.10-1]

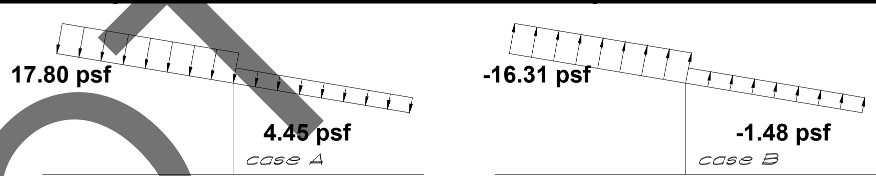
K_z = 0.87 C&C exposeure coefficient per 26.10.1
Kz = 0.87 MWFRS (Girders)
K_{zt} = 1.0 topographic factor per 26.8.2
K_d = 0.85 directionality factor per 26.6
K_e = 1.0 ground elevation factor per 26.9
V = 96 mph basic wind speed
$q_{z\,(C\&C)}$ = 17.4 psf
$q_{z\,(MWRS)}$ = 17.4 psf
G = 0.85 gust-effect factor per 26.11

ASCE 7-16, Figure 27.3-4

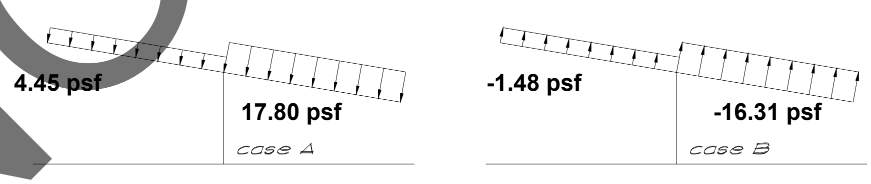


p = q_h G C_n (lb/ft^2) [eqn: 27.3-2]

Array Angle θ	Load Case	Wind Direction, γ = 0° Clear Wind Flow C_{NW}	Clear Wind Flow C_{NL}	Wind Force, p (psf) C_{NW}	Wind Force, p (psf) C_{NL}	Wind Direction, γ = 180° Clear Wind Flow C_{NW}	Clear Wind Flow C_{NL}	Wind Force, p (psf) C_{NW}	Wind Force, p (psf) C_{NL}
5.0°	A	1.200	0.300	**17.80**	**4.45**	1.200	0.300	**17.80**	**4.45**
	B	-1.100	-0.100	**-16.31**	**-1.48**	-1.100	-0.100	**-16.31**	**-1.48**

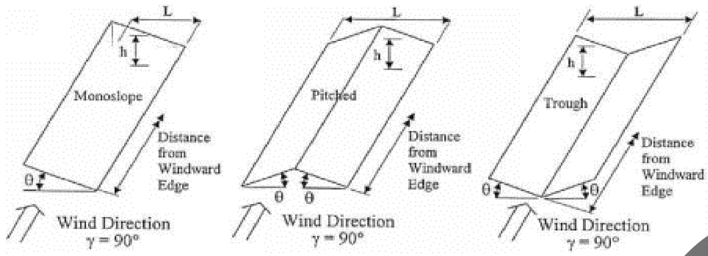


Wind direction = 0°



Wind direction = 180°

Diagrams



Notation

L = Horizontal dimension of roof, measured in the along-wind direction, ft (m).
h = Mean roof height, ft (m). See Figs. 27.3-4, 27.3-5, or 27.3-6 for a graphical depiction of this dimension.
γ = Direction of wind, degrees.
θ = Angle of plane of roof from horizontal, degrees.

Net Pressure Coefficient, C_N

Horizontal Distance from Windward Edge	Roof Angle θ	Load Case	Clear Wind Flow C_N	Obstructed Wind Flow C_N
$<h$	All shapes	A	−0.8	−1.2
	$\theta < 45°$	B	0.8	0.5
$>h, <2h$	All shapes	A	−0.6	−0.9
	$\theta < 45°$	B	0.5	0.5
$>2h$	All shapes	A	−0.3	−0.6
	$\theta < 45°$	B	0.3	0.3

Notes

1. C_N denotes net pressures (contributions from top and bottom surfaces).
2. Clear wind flow denotes relatively unobstructed wind flow with blockage less than or equal to 50%. Obstructed wind flow denotes objects below roof inhibiting wind flow (>50% blockage).
3. Plus and minus signs signify pressures acting toward and away from the top roof surface, respectively.
4. All load cases shown for each roof angle shall be investigated.
5. For monoslope roofs with θ less than 5 degrees, C_N values shown apply also for cases where $\gamma = 0$ degrees and 0.05 less than or equal to h/L less than or equal to 0.25. See Fig. 27.3-4 for other h/L values.

FIGURE 27.3-7 Main Wind Force Resisting System, Part 1 ($0.25 \le h/L \le 1.0$): Net Pressure Coefficient, C_N, for Open Buildings with Free Roofs, $\theta \le 45°$, $\gamma = 90°, 270°$

$p = q_h G C_n$ (lb/ft^2) [eqn: 27.3-2]

q_h = 17.4 psf G = 0.85

	Clear Wind Flow		Obstructed Wind Flow	
	Case A	Case B	Case A	Case B
C_n =	-0.6	0.5	-0.9	0.5
p =	**-8.9 psf**	**7.4 psf**	-13.3 psf	7.4 psf

Wind Forces Perpendicular to Array

ASCE 7-16, 27.3.4- Design Wind Loads on Open Buildings on Perpendicular Face

- Angle of array perpendicular to panel tilt is 0 degrees (less than 5 degrees)
- Design "fasica" members perpendicular to array tilt per Parapet requirements of Section 27.3.2

$P_p = q_p\ G\ C_{pn}$ (Eq. 27.3-3)

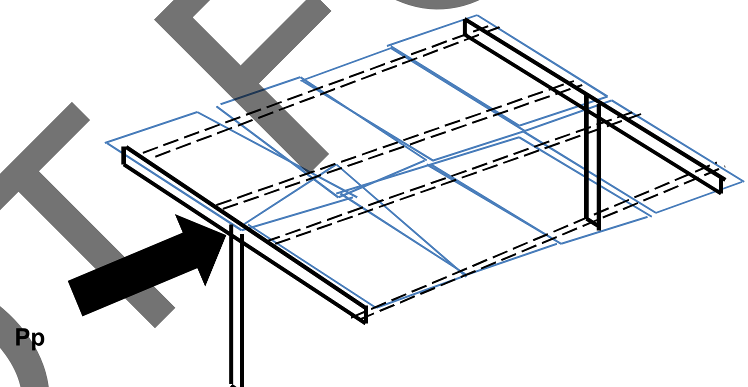
V = 96 mph
Exposure = C
Risk Category = II

Roof Slope = 5.0°
Max. Array Hieght = 17.0 ft

q_z = 0.00256 $K_z\ K_{zt}\ K_d$ Ke V^2 I (lb/ft^2) [eqn: 26.10-1]
K_z = 0.87 exposeure coefficient per 26.10-1
K_{zt} = 1.0 topographic factor per 26.8.2
K_d = 0.85 directionality factor per 26.6
K_e = 1.0 ground elevation factor per 26.9
V = 96 mph basic wind speed
q_z = 17.4 psf

G Cpn = 2.5 Section 27.3.4

Pp = 43.6 psf ***- Pressure to be applied at γ = 90 Load Conditions***



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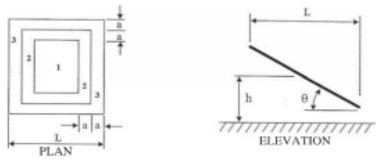
Diagrams



Notation

a = 10% of least horizontal dimension or $0.4h$, whichever is smaller but not less than 4% of least horizontal dimension or 3 ft (0.9 m).
h = Mean roof height, in ft (m).
L = Horizontal dimension of building, measured in along-wind direction, in ft (m).
θ = Angle of plane of roof from horizontal, in degrees.

Net Pressure Coefficients, C_N

Roof Angle, θ	Effective Wind Area	Clear Wind Flow					
		Zone 3		Zone 2		Zone 1	
0°	$\le a^2$	2.4	−3.3	1.8	−1.7	1.2	−1.1
	$> a^2, \le 4.0a^2$	1.8	−1.7	1.8	−1.7	1.2	−1.1
	$> 4.0a^2$	1.2	−1.1	1.2	−1.1	1.2	−1.1
7.5°	$\le a^2$	3.2	−4.2	2.4	−2.1	1.6	−1.4
	$> a^2, \le 4.0a^2$	2.4	−2.1	2.4	−2.1	1.6	−1.4
	$> 4.0a^2$	1.6	−1.4	1.6	−1.4	1.6	−1.4
15°	$\le a^2$	3.6	−3.8	2.7	−2.9	1.8	−1.9
	$> a^2, \le 4.0a^2$	2.7	−2.9	2.7	−2.9	1.8	−1.9
	$> 4.0a^2$	1.8	−1.9	1.8	−1.9	1.8	−1.9
30°	$\le a^2$	5.2	−5	3.9	−3.8	2.6	−2.5
	$> a^2, \le 4.0a^2$	3.9	−3.8	3.9	−3.8	2.6	−2.5
	$> 4.0a^2$	2.6	−2.5	2.6	−2.5	2.6	−2.5
45°	$\le a^2$	5.2	−4.6	3.9	−3.5	2.6	−2.3
	$> a^2, \le 4.0a^2$	3.9	−3.5	3.9	−3.5	2.6	−2.3
	$> 4.0a^2$	2.6	−2.3	2.6	−2.3	2.6	−2.3
		Obstructed Wind Flow					
		Zone 3		Zone 2		Zone 1	
0°	$\le a^2$	1	−3.6	0.8	−1.8	0.5	−1.2
	$> a^2, \le 4.0a^2$	0.8	−1.8	0.8	−1.8	0.5	−1.2
	$> 4.0a^2$	0.5	−1.2	0.5	−1.2	0.5	−1.2
7.5°	$\le a^2$	1.6	−5.1	1.2	−2.6	0.8	−1.7
	$> a^2, \le 4.0a^2$	1.2	−2.6	1.2	−2.6	0.8	−1.7
	$> 4.0a^2$	0.8	−1.7	0.8	−1.7	0.8	−1.7
15°	$\le a^2$	2.4	−4.2	1.8	−3.2	1.2	−2.1
	$> a^2, \le 4.0a^2$	1.8	−3.2	1.8	−3.2	1.2	−2.1
	$> 4.0a^2$	1.2	−2.1	1.2	−2.1	1.2	−2.1
30°	$\le a^2$	3.2	−4.6	2.4	−3.5	1.6	−2.3
	$> a^2, \le 4.0a^2$	2.4	−3.5	2.4	−3.5	1.6	−2.3
	$> 4.0a^2$	1.6	−2.3	1.6	−2.3	1.6	−2.3
45°	$\le a^2$	4.2	−3.8	3.2	−2.9	2.1	−1.9
	$> a^2, \le 4.0a^2$	3.2	−2.9	3.2	−2.9	2.1	−1.9
	$> 4.0a^2$	2.1	−1.9	2.1	−1.9	2.1	−1.9

Notes

1. C_N denotes net pressures (contributions from top and bottom surfaces).
2. Clear wind flow denotes relatively unobstructed wind flow with blockage less than or equal to 50%. Obstructed wind flow denotes objects below roof inhibiting wind flow (>50% blockage).
3. For values of θ other than those shown, linear interpolation is permitted.
4. Plus and minus signs signify pressures acting toward and away from the top roof surface, respectively.
5. Components and cladding elements shall be designed for positive and negative pressure coefficients shown.

FIGURE 30.7-1 Components and Cladding ($0.25 \le h/L \le 1.0$): Net Pressure Coefficient, C_N, for Open Buildings—Monoslope Free Roofs, $\theta \le 45°$

$p = q_h G C_n$ (lb/ft^2) [eqn: 30.7-1]
q_h = 17.4 psf
G = 0.85

	Roof Angle	Effective Wind Area	Clear Wind Flow					
			Zone 3		Zone 2		Zone 1	
	0.0°	$\le a^2$	2.4	-3.3	1.8	-1.7	1.2	-1.1
		$>a^2 \le 4.0a^2$	1.8	-1.7	1.8	-1.7	1.2	-1.1
		$>4.0a^2$	1.2	-1.1	1.2	-1.1	1.2	-1.1
user angle	**5.00**	$\le a^2$	2.93	-3.90	2.20	-1.97	1.47	-1.30
		$>a^2 \le 4.0a^2$	2.20	-1.97	2.20	-1.97	1.47	-1.30
		$>4.0a^2$	1.47	-1.30	1.47	-1.30	1.47	-1.30
	7.5°	$\le a^2$	3.2	-4.2	2.4	-2.1	1.6	-1.4
		$>a^2 \le 4.0a^2$	2.4	-2.1	2.4	-2.1	1.6	-1.4
		$>4.0a^2$	1.6	-1.4	1.6	-1.4	1.6	-1.4
		$\le a^2$						
		$>a^2 \le 4.0a^2$						
		$>4.0a^2$						
	15.0°	$\le a^2$	3.6	-3.8	2.7	-2.9	1.8	-1.9
		$>a^2 \le 4.0a^2$	2.7	-2.9	2.7	-2.9	1.8	-1.9
		$>4.0a^2$	1.8	-1.9	1.8	-1.9	1.8	-1.9

Load (P)	Zone 3		Zone 2		Zone 1	
$\le a^2$	43.5 psf	-57.8 psf	32.6 psf	-29.2 psf	21.8 psf	-19.3 psf
$>a^2 \le 4.0a^2$	32.6 psf	-29.2 psf	32.6 psf	-29.2 psf	21.8 psf	-19.3 psf
$>4.0a^2$	21.8 psf	-19.3 psf	21.8 psf	-19.3 psf	21.8 psf	-19.3 psf

Determination of 'a' Width (ASCE 7-16, Figure 30.7-1)

Least Array Dimension =	40.0 feet
Mean Array Height =	17.0 feet
a = 0.10 x (least horiz. Dimension) =	4.0 feet
a = 0.4 x (mean building height) =	6.8 feet
Least Value =	*4.0 feet*
a min = 0.04 x (least horiz. Distance) =	1.6 feet
a min = 3'-0"	3.0 feet
USE 'a' =	**4.0 feet**

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ASCE 7-16 Seismic Base Shear Calculation

Location: Colton, CA — Mapped MCE Spectral Acceleration (from Lat/Long using USGS program):

Height (hn): 17.0 ft — Latitude = 34.0563 — Longitude = -117.3000 — Ss= 2.305g

Regularity: regular — S1= 0.922g

Seismic Force-Resisting Sys. (Table 12.2-1): Cantilevered Column — R= 1.25

Period Coefficients: 0.028 (0.8) for steel MRF, 0.016 (0.9) for concrete MRF — Ct= 0.020

listed as Ct (x) 0.030 (0.75) for steel EBF, 0.020 (0.75) for all others — x= 0.75

Building Period: per formula 12.8-7 — Ta = Ct*hn^x= 0.17 sec

by computer: (overrides above) — Tcomp= 0.00 sec — Cu= 1.7

see Table 12.8-1 for upper limit on calculated T: T <= Cu*Ta — T= 0.17 sec

Risk Category (RC): Secs. 1.5&11.5 & Tabs. 1-1&11.5-1 — RC= 2 — I= 1.00

Site Class Section 20.3 — Site Class D

Per sections 11.4.2 & 20.1, Site Class D may be used if soil properties are not known.

			User Defined
Site coefficients Fa & Fv — Sec. 11.4.3; Tables 11.4-1 & 11.4-2	Fa=	1.60	1.00
(straight line interpolation used)	Fv=	2.40	1.70

Adjusted Maximum Spectral Response Parameters — Section 11.4.3

Sms = Fa x Ss= — Sms= 2.305g

Sm1 = Fv x S1= — Sm1= 1.567g

Design Spectral Response Acceleration Parameters — Section 11.4.4

11.4.5: Ts = Sd1 / Sds = 0.680 — Sds = 2/3 x Sms= — **Sds= 1.537g**

0.8*Ts = 0.544 — Sd1 = 2/3 x Sm1= — **Sd1= 1.045g**

Seismic Design Category — Section 11.6 — per Table 11.6-1, A

per Table 11.6-2, A

per section 11.6, is S1>=0.75? **yes, SDC 'E' for OC 1, 2, or 3 overrides Tables 11.6-1 & 11.6-2**
(exceptions below do not apply)

Exc #1: In both orthogonal directions, is Ta < 0.8*Ts ? — no

Exc #2: In both orthogonal directions, is T used for drift < 1.0*Ts ? — no

Exc #3: Is formula 12.8-2 used to determine Cs ? — no

Exc #4: Are diaphragms rigid ? Or for flexible diaphragms, are the vertical elements of LFRS spaced closer than 40 ft apart ? — no

Are all exceptions met ? NA — **exceptions do not apply, use SDC per note above**

Seismic Design Category — **SDC= E**

Equivalent Lateral Force Procedure — Section 12.8

See Table 12.6-1 for selection of analysis procedure

			For Force Calculations	For Drift Calculations*
per formula 12.8-2		Cs= Sds / (R/I)	1.2293	1.2293
per formula 12.8-3 for $T < T_L$		Cs< Sd1 / (R/I) / T	<4.9924	<4.9924
per formula 12.8-5		Cs> 0.044 Sds I > 0.01	>0.0676	NA
(formula 12.8-5 Incorporates proposed change of Suppl. #2)				
Does 1614A.1.7 apply?	no	-	NA	NA
per formula 12.8-6, if S1>=0.6g	TRUE	Cs> 0.5 S1 / (R/I)	>0.3688	>0.3688
		Cs=	1.2293	1.2293

Ultimate Strength Base Shear for FORCE Calculations: Vult= 1.2293 W

Ultimate Strength Base Shear for DRIFT Calculations*: Vult= 1.2293 W

(* For drift calculation, section 12.8.6.2 allows use of Twithout limit of T <= Cu*Ta)

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SNOW LOADING (ASCE 7-16, Chapter 7)

Ground Snow Loading (p_g) = 0.0 psf

Exposure Factor (Ce) =	0.9	(ASCE 7-16, Table 7.3-1)
Thermal Factor (Ct) =	1.2	(ASCE 7-16, Table 7.3-2)
Importance Factor (I) =	1.0	(ASCE 7-16, Table 1.5-2)
Array Slope Angle =	5.0°	
Roof Slope Factor (Cs) =	1.0	(ASCE 7-16, Figure 7.4-1)

Flat Roof Snow Load

p_f = 0.7 Ce Ct I pg (ASCE 7-16, Section 7.3)

p_f = 0.0 psf

p_f min = I (pg)

p_f min = 0.0 psf (ASCE 7-16, Section 7.3.4)

Use p_f = 0.0 psf

Sloped Roof Snow Load

$p_s = C_s\, p_f$ (ASCE 7-16, Section 7.4)

p_s = 0.0 psf

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SHEET NO.	M8		

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Panel & Connection Design

Panel Dimensions

Panel Length 6.56 ft
Panel Width 3.33 ft
Panel Area 21.84 sq-ft **>a2 ≤4.0a2**

Panel Weight = 47.7 lbs

Loading	Loading (ULT)	Loading (ASD)
w_{DL} =	2.2 psf	2.2 psf
w_{LL} =	12.0 psf	12.0 psf
$w_{WIND\ I}$=	32.6 psf	19.6 psf
$w_{WIND\ O}$=	-29.2 psf	-17.5 psf
w_{snow} =	0.0 psf	0.0 psf

Panel & Connection Loads

Combination	Panel psf	Panel Connection Force (ASD)
Fg = 0.6Wo-D	-15.3 psf	421 lbs @ bolt
Fg = 0.6Wi+D+.5S	21.8 psf	
Fg = 0.3Wi + D + S	12.0 psf	

Panel loadings are between -75 psf & 75 psf per the manufacturer data sheet. Therefore, Modules are OK

1/4-20 - 304 SS bolts

fy =	30000 psi	
A bolt =	0.05 in2	
T bolt (ASD) =	884 lbs	**1/4-20 304 SS BOLT OK**

2404.2 Sloped glass. Glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunrooms, sloped roofs and other exterior applications shall be designed to resist the most critical combinations of loads determined by Equations 24-2, 24-3 and 24-4.

$F_g = 0.6W_o - D$ **(Equation 24-2)**

$F_g = 0.6W_i + D + 0.5\,S$ **(Equation 24-3)**

$F_g = 0.3\,W_i + D + S$ **(Equation 24-4)**

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where:

D = Glass dead load psf (kN/m^2).
For glass sloped 30 degrees (0.52 rad) or less from horizontal,
= $13\,t_g$ (For SI: $0.0245\,t_g$).
For glass sloped more than 30 degrees (0.52 rad) from horizontal,
= $13\,t_g \cos\theta$ (For SI: $0.0245\,t_g \cos\theta$).

F_g = Total load, psf (kN/m^2) on glass.

S = Snow load, psf (kN/m^2) as determined in Section 1608.

t_g = Total glass thickness, inches (mm) of glass panes and plies.

W_i = Inward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult}, as calculated in Section 1609.

W_o = Outward wind force, psf (kN/m^2) due to ultimate design wind speed, V_{ult}, as calculated in Section 1609.

θ = Angle of slope from horizontal.

BUEHLER

JOB	San Bernardino ISD				
JOB NO.	2021-0014			DATE	1/17/2022
CLIENT	Holt	BY	SRM	SHEET NO.	M9

Rail Design

Array Geometery

Rail Span 36.00 ft
Rail Cantilever 9.00 ft
Avg Rail Spacing 3.33 ft
Purlin Size = C12x3.5x1 x 10ga
E = 29000 ksi
Fy = 50 ksi

Sx = 8.35 in3
Sy = 1.45 in3
Ix = 50.85 in4
Iy = 3.26 in4
trib area = 119.88 sq-ft **>4.0a2**

Distributed Loading (	Loading	w_u
w_{DL} =	6.0 psf	19.98 lb/ft
w_{LL} =	12.0 psf	39.96 lb/ft
$w_{WIND\ \gamma=0\ MAX}$ =	21.75 lb/ft	72.43 lb/ft
$w_{WIND\ \gamma=0\ MIN}$ =	-19.28 lb/ft	-64.20 lb/ft
-------	0.0 psf	0.00 lb/ft
-------	0.0 psf	0.00 lb/ft
w_{snow} =	0.0 psf	0.00 lb/ft

Rail Strength

Taking the worst shear and moment from both simple span and cantilever cases

ϕMnx-x = **325 k-in** **(See CFS Output)**

Combination	Shear ϕVux-x	Shear ϕVuy-y	Moment ϕMux-x	Combined Bending
1	0.5 k	0.0 k	54.4 k-in	0.17
2	0.8 k	0.0 k	85.5 k-in	0.26
3	0.4 k	0.0 k	46.6 k-in	0.14
4a	2.2 k	0.0 k	241.3 k-in	0.74
4b	1.0 k	0.0 k	108.5 k-in	0.33
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
5a	1.1 k	0.0 k	117.0 k-in	0.36
5b	-0.1 k	0.0 k	-3.9 k-in	0.01
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
6a	2.1 k	0.0 k	226.3 k-in	0.70
6b	-0.4 k	0.0 k	-39.4 k-in	0.12
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
7a	1.7 k	0.0 k	187.4 k-in	0.58
7b	-0.7 k	0.0 k	-78.2 k-in	0.24
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
8a	0.4 k	0.0 k	48.1 k-in	0.15
8b	0.5 k	0.0 k	57.2 k-in	0.18
8c	0.3 k	0.0 k	33.5 k-in	0.10
8d	0.3 k	0.0 k	33.5 k-in	0.10
9a	1.6 k	0.0 k	175.8 k-in	0.54
9b	-0.8 k	0.0 k	-89.8 k-in	0.28
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
			MAX =	**0.74**
				OK

CHECK DEFLECTION

		Cantilever	
Δ_{DL}=	0.51 in	0.02 in	
Δ_{LL}=	1.02 in	0.04 in	
Δ_{WIND}=	0.78 in	0.07 in	(= 0.42 x Wwind)
Δ_{SNOW}=	0.00 in	0.00 in	
Δ_{TOTAL}=	**2.32 in**	**L / 187**	OK
Δ_{CANT}=	**0.09 in**	**2L / 900**	OK

CHECK CONNECTION

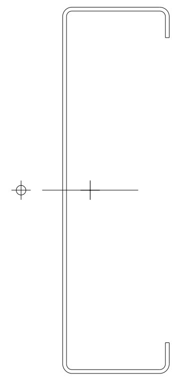
Connector = **(2) 1/2 dia bolts on bm flange & (4) 1/2" dia bolts on purlin**
Tensile Capacity = 6637 lbs (13274 total cap)
Shear Capacity = 3534 lbs (14136 total cap)
Pu rail = 1664 lb

D/C = **0.13** **OK**

NOT FOR BID

CFS Version 12.0.2
Section: Section 1.cfss ScottM
Channel 12x3.5x1-10 Gage BBASAC

Rev. Date: 1/11/2022 1:21:20 PM
By: ScottM
Printed: 1/11/2022 1:29:21 PM



Section Inputs

Material: A653 SS Grade 50/1
No cold work of forming strength increase.
No inelastic reserve strength increase.

Modulus of Elasticity, E	29500	ksi
Yield Strength, Fy	50	ksi
Tensile Strength, Fu	65	ksi
Torsion Constant Override, J	0	in^4
Warping Constant Override, Cw	0	in^6

Stiffened Channel, Thickness 0.1242 in (10 Gage)
Placement of Part from Origin:

X to center of gravity	0	in
Y to center of gravity	0	in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.000	270.000	0.18630	None	0.000	0.000	0.500
2	3.500	180.000	0.18630	Single	0.000	0.000	1.750
3	12.000	90.000	0.18630	Cee	0.000	0.000	6.000
4	3.500	0.000	0.18630	Single	0.000	0.000	1.750
5	1.000	-90.000	0.18630	None	0.000	0.000	0.500

Fully Braced Strength - AISI S100-16/S1-18, US, LRFD

Material Type: A653 SS Grade 50/1, Fy=50 ksi

Axial		Positive Bending		Positive Bending	
ϕPno	69.12 k	ϕMnxo	375.75 k-in	ϕMnyo	65.07 k-in
Ae	1.6265 in^2	Ixe	50.847 in^4	Iye	3.746 in^4
ϕTn	112.21 k	Sxe(t)	8.3500 in^3	Sye(l)	4.1198 in^3
		Sxe(b)	8.6029 in^3	Sye(r)	1.4459 in^3
Shear					
ϕVny	22.77 k	Negative Bending		Negative Bending	
ϕVnx	20.38 k	ϕMnxo	375.75 k-in	ϕMnyo	62.16 k-in
		Ixe	50.847 in^4	Iye	3.263 in^4
Torsion		Sxe(t)	8.6029 in^3	Sye(l)	2.8683 in^3
ϕBn	292.69 k-in^2	Sxe(b)	8.3500 in^3	Sye(r)	1.3812 in^3

Rev. Date: 1/11/2022 1:21:20 PM
By: ScottM
Printed: 1/11/2022 1:29:21 PM

Member Check - AISI S100-16/S1-18, US, LRFD

```
Material Type: A653 SS Grade 50/1, Fy=50 ksi
Design Parameters:
Lx          9.000 ft     Ly          9.000 ft     Lt          9.000 ft
Kx         1.0000        Ky         1.0000        Kt         1.0000
Cbx        1.0000        Cby        1.0000        ex         0.0000 in
Cmx        1.0000        Cmy        1.0000        ey         0.0000 in
Braced Flange: None      kφ              0 k
Red. Factor, R: 0        Lm         36.000 ft

Loads:             P         Mx          Vy         My          Vx
                  (k)     (k-in)        (k)     (k-in)         (k)
Entered        0.000       0.00       0.000       0.00       0.000
Applied        0.000       0.00       0.000       0.00       0.000
Strength      45.823     325.75      22.773      64.29      20.382

Interaction Equations
Eq. H1.2-1   (P, Mx, My)  0.000 + 0.000 + 0.000 = 0.000 <= 1.0
Eq. H2-1        (Mx, Vy)     Sqrt(0.000 + 0.000)= 0.000 <= 1.0
Eq. H2-1        (My, Vx)     Sqrt(0.000 + 0.000)= 0.000 <= 1.0
```

BUEHLER

JOB	San Bernardino ISD				
JOB NO.	2021-0014			DATE	1/17/2022
CLIENT	Holt	BY	SRM	SHEET NO.	M12

GIRDER & COLUMN DESIGN

Array Angle = 5.0 degrees
Frame Tributary Width = *36.00 ft*
Column Height (H) = 17.00 ft
Girder Length (L1) = *20.00 ft*
Girder Length (L2)= *20.00 ft*

Girder Section = **W16x77**
d = **16 in**

Column Section = **W12x96**

Seismic Base Shear Coefficient = *1.2293 W* *= Vult x Redunancy Factor*

Assumed Panel Height = *1.6 in*

$q_{z\,(MWRS)}$ = *17.4 PSF*

Distributed Loading

P_{DL} = 6.0 psf
P_{LL} = 12.0 psf
P_{SNOW}= 0.0 psf

Wind Loading

Load Case	γ = 0		γ = 180		γ = 90
	C_{NW}	C_{NL}	C_{NW}	C_{NL}	
A	17.8 psf	4.4 psf	17.8 psf	4.4 psf	*-8.9 psf*
B	-16.3 psf	-1.5 psf	-16.3 psf	-1.5 psf	

Perpendicular Face Loading 'Wp' = 43.6 psf (Ref. Pg. 6)

Girder Loading

	P
W_{DL} =	216.0 plf
W_{LL} =	432.0 plf
W_{SNOW}=	0.0 plf

Wind Loading

Load Case	γ = 0		γ = 180		γ = 90
	C_{NW}	C_{NL}	C_{NW}	C_{NL}	
W_A	640.7 plf	160.2 plf	640.7 plf	160.2 plf	*-320.3 plf*
W_B	-587.3 plf	-53.4 plf	-587.3 plf	-53.4 plf	

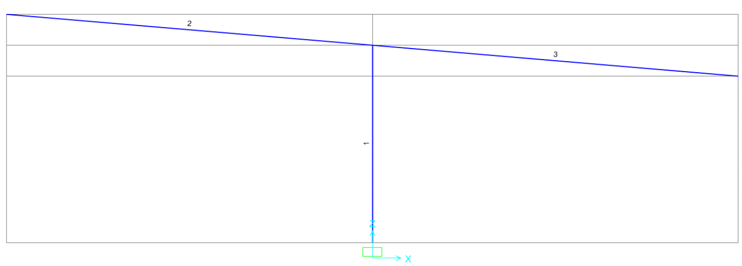
Perp. Face Ht = *17.6 in* = (PV Panel Height + Girder Height)

$W_{P\text{-}WIND}$ = 64.0 plf

Seismic Trib Width= *36.0 ft*

$W_{P\text{-}EQ}$ = 531.1 plf

Sum of Ratio		
Frame	DesignSect	Total
1	W12X96	0.977431616
2	W16X77	0.811430774
3	W16X77	0.811149114



GIRDER TO COLUMN CONNECTION

Girder Member = W16x77
Column Member = W12x96

BOLTED CONNECTION DESIGN

Load Case	NECTION DEMANDS					
	Shear		Axial (F3)	Moments		
	Vx-shear (F1) kips	Vy-shear (F2) kips	Comp +, Tension - kips	Mx (M3) k-in	My (M2) k-in	Torsion (M1) k-in
1	0.00	0.00	12.14	0.00	0.00	0.00
2	0.00	0.00	19.08	0.00	0.00	0.00
3	0.00	0.00	10.41	0.00	0.00	0.00
4A	-0.70	0.00	46.17	-581.01	0.00	0.00
4B	0.56	0.00	31.75	645.59	0.00	0.00
4C	-0.70	0.00	46.17	581.01	0.00	0.00
4D	0.56	0.00	31.75	-645.59	0.00	0.00
4E	0.56	1.28	31.76	0.00	0.00	0.00
5A	-0.70	0.00	18.42	-581.01	0.00	0.00
5B	0.56	0.00	4.00	645.59	0.00	0.00
5C	-0.70	0.00	18.42	581.01	0.00	0.00
5D	0.56	0.00	4.00	-645.59	0.00	0.00
5E	0.56	1.28	4.00	0.00	0.00	0.00
6A	-1.40	0.00	35.10	-1162.03	0.00	0.00
6B	1.12	0.00	6.27	1291.17	0.00	0.00
6C	-1.40	0.00	35.10	1162.03	0.00	0.00
6D	1.12	0.00	6.27	-1291.17	0.00	0.00
6E	1.12	2.57	6.27	0.00	0.00	0.00
7A	-1.40	0.00	26.43	-1162.03	0.00	0.00
7B	1.12	0.00	-2.41	1291.17	0.00	0.00
7C	-1.40	0.00	26.43	1162.03	0.00	0.00
7D	1.12	0.00	-2.41	-1291.17	0.00	0.00
7E	1.12	2.57	-2.40	0.00	0.00	0.00
8A	21.94	0.00	13.10	0.00	0.00	0.00
8B	0.00	21.94	13.10	0.00	0.00	0.00
8C	21.94	0.00	5.12	0.00	0.00	0.00
8D	0.00	21.94	5.12	0.00	0.00	0.00
9A	-1.40	0.00	23.82	-1162.03	0.00	0.00
9B	1.12	0.00	-5.01	1291.17	0.00	0.00
9C	-1.40	0.00	23.82	1162.03	0.00	0.00
9D	1.12	0.00	-5.01	-1291.17	0.00	0.00
9E	1.12	2.57	-5.01	0.00	0.00	0.00
MAX =	**21.94**	**21.94**	**-5.01** **46.17**	**1291.17**	**0.00**	**0.00**

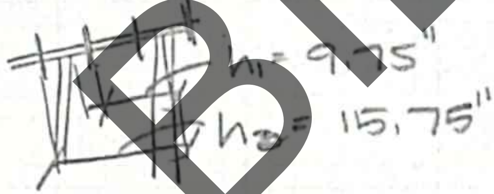
PROJECT	San Bernardino ISD
PROJECT NO.	2021-0014
DATE	1/17/22
CLIENT	Holt
BY	SRM
SHEET NO.	M14

Bolted moment connection

$M_{top} = 1291^{k''}$, $T = 5.0^{k}$ (see spreadsheet)

use 4 bolt unstiffened. per table 6.2

$$d_b = \sqrt{\frac{2M_f}{\pi \phi F_{nt}(h_o + h_1)}}$$



$h_1 = 9.75''$, $h_o = 15.75''$

$F_{nt} = 90ksi$ (A325-SC)

$$d_b = \sqrt{2(1291^{k''}) / \pi(.75)(90)(15.75'' + 9.75'')}$$

$= .69''$ ∴ use (4) $3/4''\phi$ A325-SC bolts min

$$t_{PL} = \sqrt{\frac{1.11 M_f}{\phi F_{yp} Y_p}}$$

$s = \frac{1}{2}\sqrt{b_p g} = \frac{1}{2}\sqrt{(13'')(5.5'')} = 4.23'' \geq p_{fi} = 3'' - \frac{.90''}{2} = 2.55''$ use as s

$Y_p = \frac{b_p}{2}\left(h_1\left(\frac{1}{p_{fi}} + \frac{1}{s}\right) + h_o\left(\frac{1}{p_{fo}}\right) - \frac{1}{2}\right) + \frac{2}{g}\left(h_1(p_{fi} + s)\right)$

$p_{fi} = p_{fo} = s = 2.55''$

$Y_p = \frac{13''}{2}\left[15.75''\left(\frac{1}{2.55} + \frac{1}{2.55}\right) + 9.75''\left(\frac{1}{2.55}\right) - \frac{1}{2}\right] + \frac{2}{5.5''}\left(9.75''(2.55'' + 2.55'')\right)$

$= 6.5''(15.68) + .364(49.73) = 120$

$$t_{PL} = \sqrt{\frac{1.11(1291^{k''})}{.9(36)(120)}} = .60''$$ ∴ use 1" x 13" wide PL

BUEHLER	JOB	San Bernardino ISD
	JOB NO.	2021-0014
	DATE	1/17/2022
	CLIENT	Holt
	BY	SRM
	SHEET NO.	M15

BASE PLATE CONNECTION

Column Member = W12x96

Anchor Bolt Information
Row Quantity = 2 rows
Bolts per Row = 3 bolts
6 Bolts Total
Bolt Diameter = 1.25 in
Bolt Grade = A449
Bolt Fy = 105 ksi

ϕVn = *46.6 kips*
ϕTn = *87.5 kips*

Spacing between Bolts 'x' = 18.00 in
Spacing between Rows 'y' = 9.00 in

Base Plate 'x-width' = 22.00 in
Base Plae 'y-width' = 22.00 in

Base Plate Thickness (t) = 1.63 in
Plate Yeild Strength (Fy) = 50 ksi

Concrete Foundation Strength (f'c) = 3.00 ksi

T / C couple Distance
dx = 18.00 in
dy = 18.00 in

Column to Base Plate Weld Width (w) = CJP

BOLTED CONNECTION DESIGN

	CONNECTION DEMANDS					
	Shear		Axial (F3)	Moments		
Load Case	Vx-shear (F1) kips	Vy-shear (F2) kips	Comp +, Tension - kips	Mx (M3) k-in	My (M2) k-in	Torsion (M1) k-in
1	0.0	0.0	12.1	0	0	0
2	0.0	0.0	19.1	0	0	0
3	0.0	0.0	10.4	0	0	0
4A	-0.7	0.0	46.2	-675	0	0
4B	0.6	0.0	31.8	721	0	0
4C	-0.7	0.0	46.2	487	0	0
4D	0.6	0.0	31.8	-570	0	0
4E	0.6	1.3	31.8	75	173	0
5A	-0.7	0.0	18.4	-675	0	0
5B	0.6	0.0	4.0	721	0	0
5C	-0.7	0.0	18.4	487	0	0
5D	0.6	0.0	4.0	-570	0	0
5E	0.6	1.3	4.0	75	173	0
6A	-1.4	0.0	35.1	-1351	0	0
6B	1.1	0.0	6.3	1442	0	0
6C	-1.4	0.0	35.1	974	0	0
6D	1.1	0.0	6.3	-1140	0	0
6E	1.1	2.6	6.3	151	346	0
7A	-1.4	0.0	26.4	-1351	0	0
7B	1.1	0.0	-2.4	1442	0	0
7C	-1.4	0.0	26.4	974	0	0
7D	1.1	0.0	-2.4	-1140	0	0
7E	1.1	2.6	-2.4	151	346	0
8A	21.9	0.0	13.1	2951	0	0
8B	0.0	21.9	13.1	0	2951	0
8C	21.9	0.0	5.1	2951	0	0
8D	0.0	21.9	5.1	0	2951	0
9A	-1.4	0.0	23.8	-1351	0	0
9B	1.1	0.0	-5.0	1442	0	0
9C	-1.4	0.0	23.8	974	0	0
9D	1.1	0.0	-5.0	-1140	0	0
9E	1.1	2.6	-5.0	151	346	0
	-1.4	**21.9**	**5.0**	**2951**	**2951**	**0**

BUEHLER	JOB	San Bernardino ISD	
	JOB NO.	2021-0014	DATE 1/18/2022
	CLIENT	Holt	BY SRM SHEET NO. M16

Canopy Base Plate & Anchor Bolt Design

Base Plate & Anchor Bolts

	Ab =	1.48 in2	(1.375 in dia)	# bolts =	*6*	Base PL Dimensions	
	Fu =	*105 ksi*	A449	B =	*18 in*	22 in	
Fnt =	0.75 x Fu x Ab=	116.6 kips		D =	*18 in*	22 in	
ΦFnv =	Φ x 0.4 x Fu x Ab=	46.6 kips		Base plate width =	22 in		
				Fy PL =	*50 ksi*		

My max =	245.9 k-ft	T/bolt =	55.5 kips	ΦFnt' =	65.6 kips	**ANCHOR BOLTS OK**	AISC 16.1 Section J3
Vx =	21.9 kips	V/bolt =	3.7 kips				
Tup =	5.0 kips						
Mx max =	245.9 k-ft	T/bolt =	55.5 kips	ΦFnt' =	65.6 kips	**ANCHOR BOLTS OK**	AISC 16.1 Section J3
Vy =	21.9 kips	V/bolt =	3.7 kips				

M PL = Comp*(2/3)*x =	579 k-in	
Zreq =	12.8 in^3	
treq =	1.52 in	1.625 in

Use: (6) 1.375 in diameter grade A449 anchor bolts and base plate 1.625 x 22 x 22

PROJECT San Bernardino ISD
PROJECT NO. 2021-0014 DATE 1/17/22
CLIENT Holt BY SRM SHEET NO. M17

Development of rods in ftg

$$l_d = \left[\left(\frac{3}{40}\right)\left(\frac{f_y}{\sqrt{f'_c}}\right)\frac{\psi_t \psi_e \psi_s}{\frac{c_b + k_{tr}}{d_b}}\right] d_b$$

$$c_b = 3'' + \frac{1.125''}{2} = 3.56''$$

$$k_{tr} = \frac{40 A_{tr}}{sn} = \frac{40\,(.12\#)}{(5''oc)(6)} = .267''$$

$$\frac{c_b + k_{tr}}{d_b} = \frac{3.56'' + .267''}{1.125''} = 3.40'' > 2.5''$$

$$l_d = \frac{3}{40}\left(\left(\frac{f_y}{\sqrt{f'_c}}\right)\left(\frac{1.0 \times 1.0 \times 1.0}{2.5}\right)\right) d_b = .03\left(\frac{f_y}{\sqrt{f'_c}}\right) d_b$$

w/ 1 3/8 A449: $.03\left(\frac{92ksi}{\sqrt{3000}}\right)(1.375'') = 61''$

$l_d = 1.3\left(61'' \times \frac{55.5^k}{65.16^k}\right) = 67.1''$ → 68" + 9" projection = 77" long total

$\frac{55.5^k}{65.16^k}$: ϕP_n

∴ use (6) 1 3/8 x 77" long AB A449 (9" projection)

JOB	San Bernardino ISD				
JOB NO.	2021-0014			DATE	1/18/2022
CLIENT	Holt	BY	SRM	SHEET NO.	M18

BUEHLER

PV Canopy Concrete Pier Footing Design - Unconstrained Condition

(COLUMN REACTIONS: X & Y - Direction)

DESIGN LOADS FROM SAP

X-DIRECTION				
	Shear	**Moment**	**Pmax**	**Pmin**
DL =	0.00 k	0.00 k-in	8.67 k	8.67 k
LL =	0.00 k	0.00 k-in	17.35 k	17.35 k
SNOW =	0.00 k	0.00 k-in	0.00 k	0.00 k
W =	1.40 k	1453.75 k-in	16.02 k	-12.81 k
EQ =	21.94 k	3181.32 k-in	0.00 k	0.00 k

ALLOWABLE LOAD COMBINATIONS

	DL	**LL**	**Snow**	**Wind down**	**EQ[1]**
LC1	1	0			
LC2	1		1		
LC3a	1			0.6	
LC4	1				0.7
LC5a	1	0		0.45	
LC6a	1		0.75	0.45	
LC7	1	0			0.525
LC8	1		0.75		0.525
LC9a	0.6			0.6	
LC10	0.6				0.7

FACTORED LOADING

	Shear	**Moment**	**Pmax**	**Pmin**
LC1	0.0 k	0.0 k-in	8.7 k	8.7 k
LC2	0.0 k	0.0 k-in	8.7 k	8.7 k
LC3a	0.8 k	872.2 k-in	18.3 k	1.0 k
LC4	15.4 k	2226.9 k-in	8.7 k	8.7 k
LC5a	0.6 k	654.2 k-in	15.9 k	2.9 k
LC6a	0.6 k	654.2 k-in	15.9 k	2.9 k
LC7	11.5 k	1670.2 k-in	8.7 k	8.7 k
LC8	11.5 k	1670.2 k-in	8.7 k	8.7 k
LC9a	0.8 k	872.2 k-in	14.8 k	-2.5 k
LC10	15.4 k	2226.9 k-in	5.2 k	5.2 k

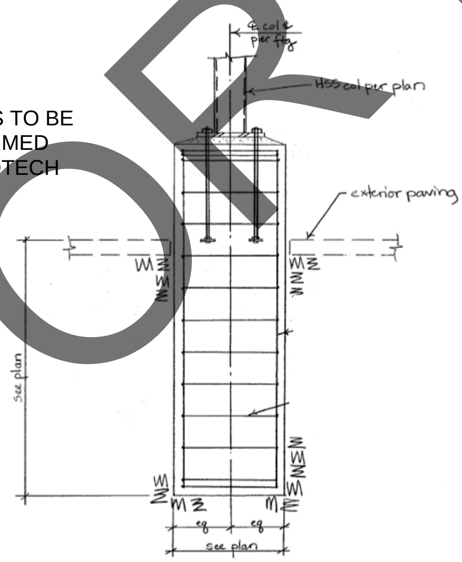
Input

P_C = 18284 lbs
P_T = 2485 lbs
M = 185577 ft-lbs
V = *15358* lbs
h_{equiv} = 12.1 ft
(wind 'M' governs, use Ω_o = 1.0)

VALUES TO BE CONFIRMED BY GEOTECH

Allowable Soil Pressure

passive pressure = *233* pcf
end bearing pressure = *3333* psf
friction resistance (downward)= *100* psf
friction resistance (uplift)= *50* psf
(includes 1/3 increase for wind/seismic)



SECTION @ FOUNDATION

Assumptions/Iterations

d = *13.5* ft
b = *3* ft
pedestal height = *4.5* ft
h = h_{col} + pedestal height = 16.6 ft
$\pi(b/2)^2$ = 7.07 ft²
$2\pi(b/2)d$ = 127.23 ft²
b design= 2x b = 6 ft
S1 = passive pressure x d/3 = 1049 psf

Design Checks

friction res x 2π(b/2)d + π*d^2/4 x end bearing = 36283 lbs > P_C? **YES - OK**

friction resistance x 2π(b/2)d + ftg wt = 25447 lbs > P_T? **YES - OK**

d=0.5A {1+[1+(4.36h)/A]^(1/2)}
A=(2.34P)/S1(b)
A = 5.7126
d req'd = 13.41 ft.

Is 'd req'd' < d assumed? **YES - OK**

Therefore concrete pier foundation shall be
3 ft diameter pier x 14.5 ft deep

Notes:
1. Foundation must resist Ω° level seismic overturning forces (ASCE 7-10 12.2.5.2). Values have been factored by (0.7 x 1.25) to obtain an allowable equivanlent to compare to the allowable geotechnical values
2. Final pier depth includes upper 1 foot of soil, which was ignored in design calcs

BUEHLER

PROJECT San Bernardino ISD
PROJECT NO. 2021-0014 DATE 1/17/22
CLIENT HoH BY SPM SHEET NO. M19

Conc ftg design

$A_{s\,min} = .01 A_g = .01\,(36^2\pi/4) = 10.2$ #

∴ use 11-#9 min ($11\times1.0\# = 11\#$)

ties @ top

(a) $d/4 = 36''/4 = 9''$
(b) $6\times1.125'' = 6.75''$
(c) $s_o = 4 + \left(\frac{14-5}{3}\right) = 7''$, 6" max

$\rho_s = .12 f'_c/f_{yt} = .12(3)/60 = .006$

$.006\,((36-6'')^2\pi/4) = 4.24$

vol #4 tie $= 30\pi \times .2\# = 18.8$

max spacing $= 18.8\#/4.24 = 4.43''$

∴ use #4 ties @ 4" cc (top @ ABs)

ties @ bottom

$16d_b = 16\times1.125'' = 18''$ ← governs (#4 @ 18" cc max)
$48d_b = 48\times.5\# = 24''$
dim mbr = 36"

License #aNYhPMB1EL75y8rNbllo

SAP2000 Analysis Report

Prepared by

Buehler & Buehler, Structural Engineers, Inc.

Model Name: Canopy Frame - 6 module - Steel.sdb

18 January 2022

1. Model geometry

This section provides model geometry information, including items such as joint coordinates, joint restraints, and element connectivity.

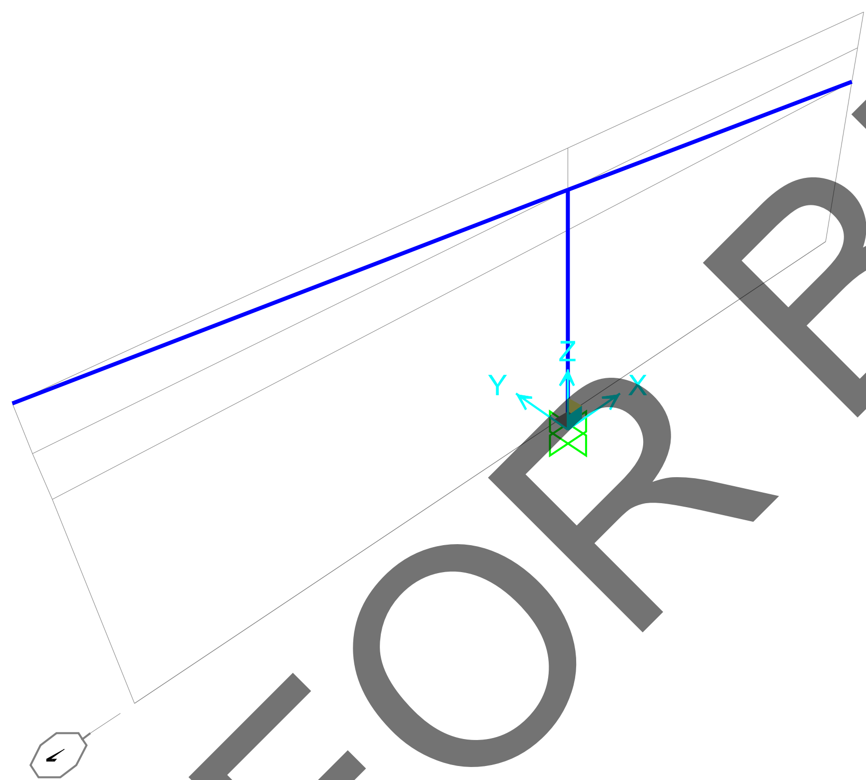


Figure 1: Finite element model

1.1. Joint coordinates

Table 1: Joint Coordinates

Table 1: Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			in	in	in
1	GLOBAL	Cartesian	0.	0.	10.5
2	GLOBAL	Cartesian	0.	0.	145.
3	GLOBAL	Cartesian	-240.	0.	166.
4	GLOBAL	Cartesian	240.	0.	124.

1.2. Joint restraints

Table 2: Joint Restraint Assignments

Table 2: Joint Restraint Assignments

Joint	U1	U2	U3	R1	R2	R3
1	Yes	Yes	Yes	Yes	Yes	Yes

1.3. Element connectivity

Table 3: Connectivity - Frame

Table 3: Connectivity - Frame

Frame	JointI	JointJ	Length in
1	1	2	134.5
2	3	2	240.917
3	2	4	240.917

Table 4: Frame Section Assignments

Table 4: Frame Section Assignments

Frame	AnalSect	DesignSect	MatProp
1	W12X96	W12X96	Default
2	W16X77	W16X77	Default
3	W16X77	W16X77	Default

2. Material properties

This section provides material property information for materials used in the model.

Table 5: Material Properties 02 - Basic Mechanical Properties

Table 5: Material Properties 02 - Basic Mechanical Properties

Material	UnitWeight Kip/in3	UnitMass Kip-s2/in4	E1 Kip/in2	G12 Kip/in2	U12	A1 1/F
4000Psi	8.6806E-05	2.2483E-07	3604.997	1502.082	0.2	5.5000E-06
A416Gr270	2.8356E-04	7.3446E-07	28500.			6.5000E-06
A500 Gr B 46ksi	2.8356E-04	7.3446E-07	29000.	11153.846	0.3	6.5000E-06
A500GrC	2.8356E-04	7.3446E-07	29000.	11153.846	0.3	6.5000E-06
A992Fy50	2.8356E-04	7.3446E-07	29000.	11153.846	0.3	6.5000E-06

Table 6: Material Properties 03a - Steel Data

Table 6: Material Properties 03a - Steel Data

Material	Fy	Fu	FinalSlope	CoupModType
	Kip/in2	Kip/in2		
A500 Gr B 46ksi	46.	58.	-0.1	Von Mises
A500GrC	50.	62.	-0.1	Von Mises
A992Fy50	50.	65.	-0.1	Von Mises

Table 7: Material Properties 03b - Concrete Data

Table 7: Material Properties 03b - Concrete Data

Material	Fc	eFc	FinalSlope	CoupModType
	Kip/in2	Kip/in2		
4000Psi	4.	4.	-0.1	Modified Darwin-Pecknold

Table 8: Material Properties 03f - Tendon Data

Table 8: Material Properties 03f - Tendon Data

Material	Fy	Fu	FinalSlope	CoupModType
	Kip/in2	Kip/in2		
A416Gr270	245.1	270.	-0.1	Von Mises

3. Section properties

This section provides section property information for objects used in the model.

3.1. Frames

Table 9: Frame Section Properties 01 - General, Part 1 of 5

Table 9: Frame Section Properties 01 - General, Part 1 of 5

SectionName	Material	Shape	t3	t2	FilletRadius	tf	tw
			in	in	in	in	in
HSS 14x6x3/8	A992Fy50	Box/Tube	14.	6.	0.349	0.349	0.349
HSS10x6x3/8	A992Fy50	Box/Tube	10.	6.	0.349	0.349	0.349
HSS12X12X1/2	A992Fy50	Box/Tube	12.	12.	0.	0.465	0.465
HSS12X12X5/8	A992Fy50	Box/Tube	12.	12.	0.	0.581	0.581
HSS12X6X3/8	A500 Gr B 46ksi	Box/Tube	12.	6.	0.	0.349	0.349
HSS14X10X1/2	A992Fy50	Box/Tube	14.	10.	0.	0.465	0.465
HSS14X10X5/8	A992Fy50	Box/Tube	14.	10.	0.	0.581	0.581
HSS4X4X.125	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.116	0.116
HSS4X4X.188	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.174	0.174
HSS4X4X.250	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.233	0.233
HSS4X4X.313	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.291	0.291

Table 9: Frame Section Properties 01 - General, Part 1 of 5

SectionName	Material	Shape	t3	t2	FilletRadius	tf	tw
			in	in	in	in	in
HSS4X4X.375	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.349	0.349
HSS4X4X.500	A500 Gr B 46ksi	Box/Tube	4.	4.	0.	0.465	0.465
HSS5X5X.250	A500 Gr B 46ksi	Box/Tube	5.	5.	0.	0.233	0.233
HSS5X5X.375	A500 Gr B 46ksi	Box/Tube	5.	5.	0.	0.349	0.349
HSS5X5X.500	A500 Gr B 46ksi	Box/Tube	5.	5.	0.	0.465	0.465
HSS6x5x1/4	A992Fy50	Box/Tube	6.	5.	0.25	0.25	0.25
HSS6X6X.250	A500 Gr B 46ksi	Box/Tube	6.	6.	0.	0.233	0.233
HSS6X6X.313	A500 Gr B 46ksi	Box/Tube	6.	6.	0.	0.291	0.291
HSS6X6X.375	A500 Gr B 46ksi	Box/Tube	6.	6.	0.	0.349	0.349
HSS6X6X.500	A500 Gr B 46ksi	Box/Tube	6.	6.	0.	0.465	0.465
HSS6X6X.625	A500 Gr B 46ksi	Box/Tube	6.	6.	0.	0.581	0.581
HSS8X6X.250	A500 Gr B 46ksi	Box/Tube	8.	6.	0.	0.233	0.233
HSS8X6X.375	A500 Gr B 46ksi	Box/Tube	8.	6.	0.	0.349	0.349
HSS8X8X1/2	A992Fy50	Box/Tube	8.	8.	0.	0.465	0.465
HSS8X8X1/4	A992Fy50	Box/Tube	8.	8.	0.	0.233	0.233
HSS8X8X1/8	A992Fy50	Box/Tube	8.	8.	0.	0.116	0.116
HSS8X8X3/16	A992Fy50	Box/Tube	8.	8.	0.	0.174	0.174
HSS8X8X3/8	A992Fy50	Box/Tube	8.	8.	0.	0.349	0.349
HSS8X8X5/16	A500 Gr B 46ksi	Box/Tube	8.	8.	0.	0.291	0.291
HSS8X8X5/8	A992Fy50	Box/Tube	8.	8.	0.	0.581	0.581
W10X26	A992Fy50	I/Wide Flange	10.3	5.77	0.3	0.44	0.26
W12X106	A992Fy50	I/Wide Flange	12.9	12.2	0.6	0.99	0.61
W12X120	A992Fy50	I/Wide Flange	13.1	12.3	0.59	1.11	0.71
W12X58	A992Fy50	I/Wide Flange	12.2	10.	0.6	0.64	0.36
W12X65	A992Fy50	I/Wide Flange	12.1	12.	0.595	0.605	0.39
W12X72	A992Fy50	I/Wide Flange	12.3	12.	0.6	0.67	0.43
W12X79	A992Fy50	I/Wide Flange	12.4	12.1	0.595	0.735	0.47
W12X87	A992Fy50	I/Wide Flange	12.5	12.1	0.6	0.81	0.515
W12X96	A992Fy50	I/Wide Flange	12.7	12.2	0.6	0.9	0.55
W16X50	A992Fy50	I/Wide Flange	16.3	7.07	0.4	0.63	0.38
W16X57	A992Fy50	I/Wide Flange	16.4	7.12	0.405	0.715	0.43
W16X67	A992Fy50	I/Wide Flange	16.3	10.2	0.405	0.665	0.395
W16X77	A992Fy50	I/Wide Flange	16.5	10.3	0.4	0.76	0.455
W16X89	A992Fy50	I/Wide Flange	16.8	10.4	0.405	0.875	0.525
W6X25	A992Fy50	I/Wide Flange	6.38	6.08	0.705	0.455	0.32
W8X10	A992Fy50	I/Wide Flange	7.89	3.94	0.505	0.205	0.17
W8X13	A992Fy50	I/Wide Flange	7.99	4.	0.555	0.255	0.23
W8X15	A992Fy50	I/Wide Flange	8.11	4.015	0.615	0.315	0.245
W8X18	A992Fy50	I/Wide Flange	8.14	5.25	0.63	0.33	0.23
W8X24	A992Fy50	I/Wide Flange	7.93	6.5	0.794	0.4	0.245
W8X31	A992Fy50	I/Wide Flange	8.	8.	0.829	0.435	0.285
W8X35	A992Fy50	I/Wide Flange	8.12	8.02	0.889	0.495	0.31
W8X40	A992Fy50	I/Wide Flange	8.25	8.07	0.954	0.56	0.36
W8X48	A992Fy50	I/Wide Flange	8.5	8.11	1.08	0.685	0.4
W8X58	A992Fy50	I/Wide Flange	8.75	8.22	1.2	0.81	0.51

Table 9: Frame Section Properties 01 - General, Part 2 of 5

Table 9: Frame Section Properties 01 - General, Part 2 of 5

SectionName	t2b	tfb
	in	in
HSS 14x6x3/8		
HSS10x6x3/8		

Table 9: Frame Section Properties 01 - General, Part 2 of 5

SectionName	t2b	tfb
	in	in
HSS12X12X1/2		
HSS12X12X5/8		
HSS12X6X3/8		
HSS14X10X1/2		
HSS14X10X5/8		
HSS4X4X.125		
HSS4X4X.188		
HSS4X4X.250		
HSS4X4X.313		
HSS4X4X.375		
HSS4X4X.500		
HSS5X5X.250		
HSS5X5X.375		
HSS5X5X.500		
HSS6x5x1/4		
HSS6X6X.250		
HSS6X6X.313		
HSS6X6X.375		
HSS6X6X.500		
HSS6X6X.625		
HSS8X6X.250		
HSS8X6X.375		
HSS8X8X1/2		
HSS8X8X1/4		
HSS8X8X1/8		
HSS8X8X3/16		
HSS8X8X3/8		
HSS8X8X5/16		
HSS8X8X5/8		
W10X26	5.77	0.44
W12X106	12.2	0.99
W12X120	12.3	1.11
W12X58	10.	0.64
W12X65	12.	0.605
W12X72	12.	0.67
W12X79	12.1	0.735
W12X87	12.1	0.81
W12X96	12.2	0.9
W16X50	7.07	0.63
W16X57	7.12	0.715
W16X67	10.2	0.665
W16X77	10.3	0.76
W16X89	10.4	0.875
W6X25	6.08	0.455
W8X10	3.94	0.205
W8X13	4.	0.255
W8X15	4.015	0.315
W8X18	5.25	0.33
W8X24	6.5	0.4
W8X31	8.	0.435
W8X35	8.02	0.495
W8X40	8.07	0.56
W8X48	8.11	0.685

Table 9: Frame Section Properties 01 - General, Part 2 of 5

SectionName	t2b	tfb
	in	in
W8X58	8.22	0.81

Table 9: Frame Section Properties 01 - General, Part 3 of 5

Table 9: Frame Section Properties 01 - General, Part 3 of 5

SectionName	Area	TorsConst	I33	I22	I23	AS2	AS3
	in2	in4	in4	in4	in4	in2	in2
HSS 14x6x3/8	13.47	215.2	332.06	86.78	0.	9.77	4.19
HSS10x6x3/8	10.68	135.68	144.38	64.46	0.	6.98	4.19
HSS12X12X1/2	20.9	728.	457.	457.	0.	11.16	11.16
HSS12X12X5/8	25.7	885.	548.	548.	0.	13.94	13.94
HSS12X6X3/8	11.8	178.	215.	72.9	0.	8.38	4.19
HSS14X10X1/2	20.9	685.	573.	341.	0.	13.02	9.3
HSS14X10X5/8	25.7	832.	687.	407.	0.	16.27	11.62
HSS4X4X.125	1.77	6.91	4.4	4.4	0.	0.93	0.93
HSS4X4X.188	2.58	10.	6.21	6.21	0.	1.39	1.39
HSS4X4X.250	3.37	12.8	7.8	7.8	0.	1.86	1.86
HSS4X4X.313	4.1	15.3	9.14	9.14	0.	2.33	2.33
HSS4X4X.375	4.78	17.5	10.3	10.3	0.	2.79	2.79
HSS4X4X.500	6.02	21.	11.9	11.9	0.	3.72	3.72
HSS5X5X.250	4.3	25.8	16.	16.	0.	2.33	2.33
HSS5X5X.375	6.18	36.1	21.7	21.7	0.	3.49	3.49
HSS5X5X.500	7.88	44.6	26.	26.	0.	4.65	4.65
HSS6x5x1/4	5.25	35.52	27.61	20.73	0.	3.	2.5
HSS6X6X.250	5.24	45.6	28.6	28.6	0.	2.8	2.8
HSS6X6X.313	6.43	55.4	34.3	34.3	0.	3.49	3.49
HSS6X6X.375	7.58	64.6	39.5	39.5	0.	4.19	4.19
HSS6X6X.500	9.74	81.1	48.3	48.3	0.	5.58	5.58
HSS6X6X.625	11.7	94.9	55.2	55.2	0.	6.97	6.97
HSS8X6X.250	6.17	70.3	56.6	36.4	0.	3.73	2.8
HSS8X6X.375	8.97	100.	79.1	50.6	0.	5.58	4.19
HSS8X8X1/2	13.5	204.	125.	125.	0.	7.44	7.44
HSS8X8X1/4	7.1	111.	70.7	70.7	0.	3.73	3.73
HSS8X8X1/8	3.62	57.3	37.4	37.4	0.	1.86	1.86
HSS8X8X3/16	5.37	84.5	54.4	54.4	0.	2.78	2.78
HSS8X8X3/8	10.4	160.	100.	100.	0.	5.58	5.58
HSS8X8X5/16	8.76	136.	85.6	85.6	0.	4.66	4.66
HSS8X8X5/8	16.4	244.	146.	146.	0.	9.3	9.3
W10X26	7.61	0.4	144.	14.1	0.	2.68	4.23
W12X106	31.2	9.13	933.	301.	0.	7.87	20.13
W12X120	35.2	12.9	1070.	345.	0.	9.3	22.76
W12X58	17.	2.1	475.	107.	0.	4.39	10.67
W12X65	19.1	2.18	533.	174.	0.	4.72	12.1
W12X72	21.1	2.93	597.	195.	0.	5.29	13.4
W12X79	23.2	3.84	662.	216.	0.	5.83	14.82
W12X87	25.6	5.1	740.	241.	0.	6.44	16.34
W12X96	28.2	6.85	833.	270.	0.	6.99	18.3
W16X50	14.7	1.52	659.	37.2	0.	6.19	7.42
W16X57	16.8	2.22	758.	43.1	0.	7.05	8.48
W16X67	19.6	2.39	954.	119.	0.	6.44	11.31
W16X77	22.6	3.57	1110.	138.	0.	7.51	13.05
W16X89	26.2	5.45	1300.	163.	0.	8.82	15.17
W6X25	7.34	0.46	53.4	17.1	0.	2.04	4.61

Table 9: Frame Section Properties 01 - General, Part 3 of 5

SectionName	Area	TorsConst	I33	I22	I23	AS2	AS3
	in2	in4	in4	in4	in4	in2	in2
W8X10	2.96	4.260E-02	30.8	2.09	0.	1.34	1.35
W8X13	3.84	8.710E-02	39.6	2.73	0.	1.84	1.7
W8X15	4.44	0.14	48.	3.41	0.	1.99	2.11
W8X18	5.26	0.17	61.9	7.97	0.	1.87	2.89
W8X24	7.08	0.35	82.7	18.3	0.	1.94	4.33
W8X31	9.12	0.54	110.	37.1	0.	2.28	5.8
W8X35	10.3	0.77	127.	42.6	0.	2.52	6.62
W8X40	11.7	1.12	146.	49.1	0.	2.97	7.53
W8X48	14.1	1.96	184.	60.9	0.	3.4	9.26
W8X58	17.1	3.33	228.	75.1	0.	4.46	11.1

Table 9: Frame Section Properties 01 - General, Part 4 of 5

Table 9: Frame Section Properties 01 - General, Part 4 of 5

SectionName	S33	S22	Z33	Z22	R33	R22
	in3	in3	in3	in3	in	in
HSS 14x6x3/8	47.44	28.93	59.46	32.52	4.9645	2.538
HSS10x6x3/8	28.88	21.49	35.31	24.63	3.6766	2.4567
HSS12X12X1/2	76.17	76.17	89.6	89.6	4.6761	4.6761
HSS12X12X5/8	91.33	91.33	109.	109.	4.6177	4.6177
HSS12X6X3/8	35.83	24.3	44.8	27.7	4.2685	2.4856
HSS14X10X1/2	81.86	68.2	98.8	78.5	5.2361	4.0393
HSS14X10X5/8	98.14	81.4	120.	95.1	5.1703	3.9795
HSS4X4X.125	2.2	2.2	2.56	2.56	1.5767	1.5767
HSS4X4X.188	3.11	3.11	3.67	3.67	1.5514	1.5514
HSS4X4X.250	3.9	3.9	4.69	4.69	1.5214	1.5214
HSS4X4X.313	4.57	4.57	5.59	5.59	1.4931	1.4931
HSS4X4X.375	5.15	5.15	6.39	6.39	1.4679	1.4679
HSS4X4X.500	5.95	5.95	7.7	7.7	1.406	1.406
HSS5X5X.250	6.4	6.4	7.61	7.61	1.929	1.929
HSS5X5X.375	8.68	8.68	10.6	10.6	1.8739	1.8739
HSS5X5X.500	10.4	10.4	13.1	13.1	1.8165	1.8165
HSS6x5x1/4	9.2	8.29	10.97	9.66	2.2932	1.9873
HSS6X6X.250	9.53	9.53	11.2	11.2	2.3362	2.3362
HSS6X6X.313	11.43	11.43	13.6	13.6	2.3096	2.3096
HSS6X6X.375	13.17	13.17	15.8	15.8	2.2828	2.2828
HSS6X6X.500	16.1	16.1	19.8	19.8	2.2269	2.2269
HSS6X6X.625	18.4	18.4	23.2	23.2	2.1721	2.1721
HSS8X6X.250	14.15	12.13	16.9	13.9	3.0288	2.4289
HSS8X6X.375	19.77	16.87	24.1	19.8	2.9696	2.3751
HSS8X8X1/2	31.25	31.25	37.5	37.5	3.0429	3.0429
HSS8X8X1/4	17.67	17.67	20.5	20.5	3.1556	3.1556
HSS8X8X1/8	9.35	9.35	10.7	10.7	3.2143	3.2143
HSS8X8X3/16	13.6	13.6	15.7	15.7	3.1828	3.1828
HSS8X8X3/8	25.	25.	29.4	29.4	3.1009	3.1009
HSS8X8X5/16	21.4	21.4	25.1	25.1	3.126	3.126
HSS8X8X5/8	36.5	36.5	44.7	44.7	2.9837	2.9837
W10X26	27.96	4.89	31.3	7.5	4.35	1.3612
W12X106	144.65	49.34	164.	75.1	5.4684	3.106
W12X120	163.36	56.1	186.	85.4	5.5134	3.1307
W12X58	77.87	21.4	86.4	32.5	5.2859	2.5088
W12X65	88.1	29.	96.8	44.1	5.2826	3.0183
W12X72	97.07	32.5	108.	49.2	5.3192	3.04

Table 9: Frame Section Properties 01 - General, Part 4 of 5

SectionName	S33	S22	Z33	Z22	R33	R22
	in3	in3	in3	in3	in	in
W12X79	106.77	35.7	119.	54.3	5.3418	3.0513
W12X87	118.4	39.83	132.	60.4	5.3765	3.0682
W12X96	131.18	44.26	147.	67.5	5.435	3.0943
W16X50	80.86	10.52	92.	16.3	6.6955	1.5908
W16X57	92.44	12.11	105.	18.9	6.7171	1.6017
W16X67	117.06	23.33	130.	35.5	6.9766	2.464
W16X77	134.55	26.8	150.	41.1	7.0082	2.4711
W16X89	154.76	31.35	175.	48.1	7.044	2.4943
W6X25	16.74	5.63	18.9	8.56	2.6973	1.5263
W8X10	7.81	1.06	8.87	1.66	3.2257	0.8403
W8X13	9.91	1.37	11.4	2.15	3.2113	0.8432
W8X15	11.84	1.7	13.6	2.67	3.288	0.8764
W8X18	15.21	3.04	17.	4.66	3.4305	1.2309
W8X24	20.86	5.63	23.1	8.57	3.4177	1.6077
W8X31	27.5	9.27	30.4	14.1	3.473	2.0169
W8X35	31.28	10.62	34.7	16.1	3.5114	2.0337
W8X40	35.39	12.17	39.8	18.5	3.5325	2.0486
W8X48	43.29	15.02	49.	22.9	3.6124	2.0783
W8X58	52.11	18.27	59.8	27.9	3.6515	2.0957

Table 9: Frame Section Properties 01 - General, Part 5 of 5

Table 9: Frame Section Properties 01 - General, Part 5 of 5

SectionName	AMod	A2Mod	A3Mod	JMod	I2Mod	I3Mod	MMod	WMod
HSS 14x6x3/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS10x6x3/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS12X12X1/2	1.	1.	1.	1.	1.	1.	1.	1.
HSS12X12X5/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS12X6X3/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS14X10X1/2	1.	1.	1.	1.	1.	1.	1.	1.
HSS14X10X5/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.125	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.188	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.250	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.313	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.375	1.	1.	1.	1.	1.	1.	1.	1.
HSS4X4X.500	1.	1.	1.	1.	1.	1.	1.	1.
HSS5X5X.250	1.	1.	1.	1.	1.	1.	1.	1.
HSS5X5X.375	1.	1.	1.	1.	1.	1.	1.	1.
HSS5X5X.500	1.	1.	1.	1.	1.	1.	1.	1.
HSS6x5x1/4	1.	1.	1.	1.	1.	1.	1.	1.
HSS6X6X.250	1.	1.	1.	1.	1.	1.	1.	1.
HSS6X6X.313	1.	1.	1.	1.	1.	1.	1.	1.
HSS6X6X.375	1.	1.	1.	1.	1.	1.	1.	1.
HSS6X6X.500	1.	1.	1.	1.	1.	1.	1.	1.
HSS6X6X.625	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X6X.250	0.92	0.92	0.92	1.	0.89	0.89	1.	1.
HSS8X6X.375	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X1/2	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X1/4	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X1/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X3/16	1.	1.	1.	1.	1.	1.	1.	1.

Table 9: Frame Section Properties 01 - General, Part 5 of 5

SectionName	AMod	A2Mod	A3Mod	JMod	I2Mod	I3Mod	MMod	WMod
HSS8X8X3/8	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X5/16	1.	1.	1.	1.	1.	1.	1.	1.
HSS8X8X5/8	1.	1.	1.	1.	1.	1.	1.	1.
W10X26	1.	1.	1.	1.	1.	1.	1.	1.
W12X106	1.	1.	1.	1.	1.	1.	1.	1.
W12X120	1.	1.	1.	1.	1.	1.	1.	1.
W12X58	1.	1.	1.	1.	1.	1.	1.	1.
W12X65	1.	1.	1.	1.	1.	1.	1.	1.
W12X72	1.	1.	1.	1.	1.	1.	1.	1.
W12X79	1.	1.	1.	1.	1.	1.	1.	1.
W12X87	1.	1.	1.	1.	1.	1.	1.	1.
W12X96	1.	1.	1.	1.	1.	1.	1.	1.
W16X50	1.	1.	1.	1.	1.	1.	1.	1.
W16X57	1.	1.	1.	1.	1.	1.	1.	1.
W16X67	1.	1.	1.	1.	1.	1.	1.	1.
W16X77	1.	1.	1.	1.	1.	1.	1.	1.
W16X89	1.	1.	1.	1.	1.	1.	1.	1.
W6X25	1.	1.	1.	1.	1.	1.	1.	1.
W8X10	1.	1.	1.	1.	1.	1.	1.	1.
W8X13	1.	1.	1.	1.	1.	1.	1.	1.
W8X15	1.	1.	1.	1.	1.	1.	1.	1.
W8X18	1.	1.	1.	1.	1.	1.	1.	1.
W8X24	1.	1.	1.	1.	1.	1.	1.	1.
W8X31	1.	1.	1.	1.	1.	1.	1.	1.
W8X35	1.	1.	1.	1.	1.	1.	1.	1.
W8X40	1.	1.	1.	1.	1.	1.	1.	1.
W8X48	1.	1.	1.	1.	1.	1.	1.	1.
W8X58	1.	1.	1.	1.	1.	1.	1.	1.

Table 10: Frame Property Modifiers, Part 1 of 2

Table 10: Frame Property Modifiers, Part 1 of 2

Frame	AMod	AS2Mod	AS3Mod	JMod	I22Mod	I33Mod	MassMod	WeightMod
1	1.	1.	1.	1.	1.	1.	1.	1.
2	1.	1.	1.	1.	1.	1.	1.	1.
3	1.	1.	1.	1.	1.	1.	1.	1.

Table 10: Frame Property Modifiers, Part 2 of 2

Table 10: Frame Property Modifiers, Part 2 of 2

Frame	EAModifier	EIModifier
1	0.8	0.8
2	0.8	0.8
3	0.8	0.8

3.2. Solids

Table 11: Solid Property Definitions

Table 11: Solid Property Definitions

SolidProp	Material	MatAngleA	MatAngleB	MatAngleC
		Degrees	Degrees	Degrees
Solid1	4000Psi	0.	0.	0.

4. Load patterns

This section provides loading information as applied to the model.

4.1. Definitions

Table 12: Load Pattern Definitions

Table 12: Load Pattern Definitions

LoadPat	DesignType	SelfWtMult	AutoLoad
DEAD	Dead	0.	
ROOF LIVE	Roof Live	0.	
SNOW	Snow	0.	
WIND Y0 LCA	Wind	0.	None
WIND Y0 LCB	Wind	0.	None
WIND Y180 LCA	Wind	0.	None
WIND Y180 LCB	Wind	0.	None
WIND Y90	Wind	0.	None
EQ N-S	Quake	0.	None
EQ E-W	Quake	0.	None

5. Load cases

This section provides load case information.

5.1. Definitions

Table 13: Load Case Definitions, Part 1 of 2

Table 13: Load Case Definitions, Part 1 of 2

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesActOpt
DEAD	LinStatic	Zero				Prog Det
LIVE	LinStatic	Zero				Prog Det
SNOW	LinStatic	Zero				Prog Det
WIND Y0 LCA	LinStatic	Zero				Prog Det
WIND Y0 LCB	LinStatic	Zero				Prog Det
WIND Y180 LCA	LinStatic	Zero				Prog Det

Table 13: Load Case Definitions, Part 1 of 2

Case	Type	InitialCond	ModalCase	BaseCase	MassSource	DesActOpt
WIND Y180 LCB	LinStatic	Zero				Prog Det
WIND Y90	LinStatic	Zero				Prog Det
EQ N-S	LinStatic	Zero				Prog Det
EQ E-W	LinStatic	Zero				Prog Det

Table 13: Load Case Definitions, Part 2 of 2

Table 13: Load Case Definitions, Part 2 of 2

Case	DesignAct
DEAD	Non-Composite
LIVE	Short-Term Composite
SNOW	Short-Term Composite
WIND Y0 LCA	Short-Term Composite
WIND Y0 LCB	Short-Term Composite
WIND Y180 LCA	Short-Term Composite
WIND Y180 LCB	Short-Term Composite
WIND Y90	Short-Term Composite
EQ N-S	Short-Term Composite
EQ E-W	Short-Term Composite

5.2. Static case load assignments

Table 14: Case - Static 1 - Load Assignments

Table 14: Case - Static 1 - Load Assignments

Case	LoadType	LoadName	LoadSF
DEAD	Load pattern	DEAD	1.
LIVE	Load pattern	ROOF LIVE	1.
SNOW	Load pattern	SNOW	1.
WIND Y0 LCA	Load pattern	WIND Y0 LCA	1.
WIND Y0 LCB	Load pattern	WIND Y0 LCB	1.
WIND Y180 LCA	Load pattern	WIND Y180 LCA	1.
WIND Y180 LCB	Load pattern	WIND Y180 LCB	1.
WIND Y90	Load pattern	WIND Y90	1.
EQ N-S	Load pattern	EQ N-S	1.
EQ E-W	Load pattern	EQ E-W	1.

5.3. Response spectrum case load assignments

Table 15: Function - Response Spectrum - User

Table 15: Function - Response Spectrum - User

Name	Period Sec	Accel	FuncDamp
UNIFRS	0.	1.	0.05
UNIFRS	1.	1.	

6. Load combinations

This section provides load combination information.

Table 16: Combination Definitions

Table 16: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
1	Linear Add	DEAD	1.4
2	Linear Add	DEAD	1.2
2		LIVE	0.5
3	Linear Add	DEAD	1.2
3		SNOW	0.5
4A	Linear Add	DEAD	1.2
4A		WIND Y0 LCA	0.5
4A		LIVE	1.6
4B	Linear Add	DEAD	1.2
4B		WIND Y0 LCB	0.5
4B		LIVE	1.6
4C	Linear Add	DEAD	1.2
4C		WIND Y180 LCA	0.5
4C		LIVE	1.6
4D	Linear Add	DEAD	1.2
4D		WIND Y180 LCB	0.5
4D		LIVE	1.6
4E	Linear Add	DEAD	1.2
4E		WIND Y90	0.5
4E		LIVE	1.6
5A	Linear Add	DEAD	1.2
5A		WIND Y0 LCA	0.5
5A		SNOW	1.6
5B	Linear Add	DEAD	1.2
5B		WIND Y0 LCB	0.5
5B		SNOW	1.6
5C	Linear Add	DEAD	1.2
5C		WIND Y180 LCA	0.5
5C		SNOW	1.6
5D	Linear Add	DEAD	1.2
5D		WIND Y180 LCB	0.5
5D		SNOW	1.6
5E	Linear Add	DEAD	1.2
5E		WIND Y90	0.5

Table 16: Combination Definitions

ComboName	ComboType	CaseName	ScaleFactor
5E		SNOW	1.6
6A	Linear Add	DEAD	1.2
6A		WIND Y0 LCA	1.
6A		LIVE	0.5
6B	Linear Add	DEAD	1.2
6B		WIND Y0 LCB	1.
6B		LIVE	0.5
6C	Linear Add	DEAD	1.2
6C		WIND Y180 LCA	1.
6C		LIVE	0.5
6D	Linear Add	DEAD	1.2
6D		WIND Y180 LCB	1.
6D		LIVE	0.5
6E	Linear Add	DEAD	1.2
6E		WIND Y90	1.
6E		LIVE	0.5
7A	Linear Add	DEAD	1.2
7A		WIND Y0 LCA	1.
7A		SNOW	0.5
7B	Linear Add	DEAD	1.2
7B		WIND Y0 LCB	1.
7B		SNOW	0.5
7C	Linear Add	DEAD	1.2
7C		WIND Y180 LCA	1.
7C		SNOW	0.5
7D	Linear Add	DEAD	1.2
7D		WIND Y180 LCB	1.
7D		SNOW	0.5
7E	Linear Add	DEAD	1.2
7E		WIND Y90	1.
7E		SNOW	0.5
8A	Linear Add	DEAD	1.51
8A		EQ N-S	1.
8A		SNOW	0.2
8B	Linear Add	DEAD	1.51
8B		EQ E-W	1.
8B		SNOW	0.2
8D	Linear Add	DEAD	0.59
8D		EQ E-W	1.
8C	Linear Add	DEAD	0.59
8C		EQ N-S	1.
9A	Linear Add	DEAD	0.9
9A		WIND Y0 LCA	1.
9B	Linear Add	DEAD	0.9
9B		WIND Y0 LCB	1.
9C	Linear Add	DEAD	0.9
9C		WIND Y180 LCA	1.
9D	Linear Add	DEAD	0.9
9D		WIND Y180 LCB	1.
9E	Linear Add	DEAD	0.9
9E		WIND Y90	1.

7. Structure results

This section provides structure results, including items such as structural periods and base reactions.

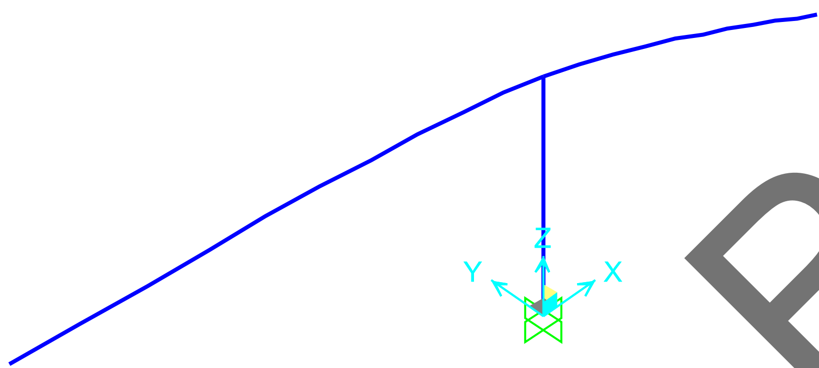


Figure 2: Deformed shape

7.1. Mass summary

Table 17: Assembled Joint Masses, Part 1 of 2

Table 17: Assembled Joint Masses, Part 1 of 2

Joint	MassSource	U1	U2	U3	R1	R2	R3	CenterX
		Kip-s2/in	Kip-s2/in	Kip-s2/in	Kip-in-s2	Kip-in-s2	Kip-in-s2	in
1	MSSSRC1	0.0014	0.0014	0.0014	0.	0.	0.	0.
2	MSSSRC1	0.0054	0.0054	0.0054	0.	0.	0.	0.
3	MSSSRC1	0.002	0.002	0.002	0.	0.	0.	-240.
4	MSSSRC1	0.002	0.002	0.002	0.	0.	0.	240.
SumAccelUX	MSSSRC1	0.0108	0.	0.	0.	0.	0.	-6.435E-16
SumAccelUY	MSSSRC1	0.	0.0108	0.	0.	0.	0.	-6.435E-16
SumAccelUZ	MSSSRC1	0.	0.	0.0108	0.	0.	0.	-6.435E-16

Table 17: Assembled Joint Masses, Part 2 of 2

Table 17: Assembled Joint Masses, Part 2 of 2

Joint	MassSource	CenterY	CenterZ
		in	in
1	MSSSRC1	0.	10.5
2	MSSSRC1	0.	145.
3	MSSSRC1	0.	166.
4	MSSSRC1	0.	124.
SumAccelUX	MSSSRC1	0.	127.627
SumAccelUY	MSSSRC1	0.	127.627
SumAccelUZ	MSSSRC1	0.	127.627

7.2. Base reactions

Table 18: Base Reactions

Table 18: Base Reactions

OutputCase	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY	GlobalMZ
	Kip	Kip	Kip	Kip-in	Kip-in	Kip-in
DEAD	8.327E-17	0.	8.673	0.	-1.016E-13	0.
LIVE	1.665E-16	0.	17.346	0.	-2.032E-13	0.
SNOW	0.	0.	0.	0.	0.	0.
WIND Y0 LCA	1.402	0.	16.018	0.	1365.258	0.
WIND Y0 LCB	-1.121	0.	-12.814	0.	-1453.748	0.
WIND Y180 LCA	1.402	0.	16.018	0.	-958.801	0.
WIND Y180 LCB	-1.121	0.	-12.814	0.	1128.593	0.
WIND Y90	-1.121	-2.57	-12.812	372.618	-162.552	2.167E-14
EQ N-S	-21.94	0.	-8.095E-16	0.	-3181.325	0.
EQ E-W	0.	-21.94	0.	3181.325	0.	-5.763E-14

8. Joint results

This section provides joint results, including items such as displacements and reactions.

Table 19: Joint Displacements

Table 19: Joint Displacements

Joint	OutputCase	U1	U2	U3	R1	R2	R3
		in	in	in	Radians	Radians	Radians
1	DEAD	0.	0.	0.	0.	0.	0.
1	LIVE	0.	0.	0.	0.	0.	0.
1	SNOW	0.	0.	0.	0.	0.	0.
1	WIND Y0 LCA	0.	0.	0.	0.	0.	0.
1	WIND Y0 LCB	0.	0.	0.	0.	0.	0.
1	WIND Y180 LCA	0.	0.	0.	0.	0.	0.
1	WIND Y180 LCB	0.	0.	0.	0.	0.	0.
1	WIND Y90	0.	0.	0.	0.	0.	0.
1	EQ N-S	0.	0.	0.	0.	0.	0.
1	EQ E-W	0.	0.	0.	0.	0.	0.
2	DEAD	4.957E-17	0.	-0.001783	0.	7.523E-19	0.
2	LIVE	9.914E-17	0.	-0.003566	0.	1.505E-18	0.
2	SNOW	0.	0.	0.	0.	0.	0.
2	WIND Y0 LCA	-0.605115	0.	-0.003293	0.	-0.008743	0.
2	WIND Y0 LCB	0.653308	0.	0.002634	0.	0.009511	0.
2	WIND Y180 LCA	0.482634	0.	-0.003293	0.	0.007431	0.
2	WIND Y180 LCB	-0.555327	0.	0.002634	0.	-0.008461	0.
2	WIND Y90	0.048983	0.334422	0.002634	-0.003711	0.000525	-3.815E-17
2	EQ N-S	0.95865	0.	1.664E-19	0.	0.010269	0.
2	EQ E-W	0.	2.855213	0.	-0.031681	0.	1.014E-16
3	DEAD	-0.026014	0.	-0.30008	0.	-0.001623	0.
3	LIVE	-0.052028	0.	-0.600159	0.	-0.003246	0.
3	SNOW	0.	0.	0.	0.	0.	0.
3	WIND Y0 LCA	-0.866439	0.	-2.989862	0.	-0.013575	0.
3	WIND Y0 LCB	0.924275	0.	3.099394	0.	0.01394	0.
3	WIND Y180 LCA	0.619261	0.	1.558157	0.	0.006223	0.
3	WIND Y180 LCB	-0.726538	0.	-1.954066	0.	-0.008059	0.
3	WIND Y90	0.098853	1.114884	0.572575	-0.004049	0.00294	-0.003867
3	EQ N-S	1.182342	0.	2.528485	0.	0.010618	0.
3	EQ E-W	0.	9.350482	0.	-0.03449	0.	-0.032094

Table 19: Joint Displacements

Joint	OutputCase	U1	U2	U3	R1	R2	R3
		in	in	in	Radians	Radians	Radians
4	DEAD	-0.026014	0.	-0.30008	0.	0.001623	0.
4	LIVE	-0.052028	0.	-0.600159	0.	0.003246	0.
4	SNOW	0.	0.	0.	0.	0.	0.
4	WIND Y0 LCA	-0.440936	0.	1.873033	0.	-0.007535	0.
4	WIND Y0 LCB	0.460056	0.	-2.205959	0.	0.009108	0.
4	WIND Y180 LCA	0.248861	0.	-2.674986	0.	0.012263	0.
4	WIND Y180 LCB	-0.306401	0.	2.847501	0.	-0.01289	0.
4	WIND Y90	0.076816	0.959034	0.320721	-0.003372	-0.001891	0.003867
4	EQ N-S	0.75105	0.	-2.40056	0.	0.00992	0.
4	EQ E-W	0.	8.019868	0.	-0.028873	0.	0.032094

Table 20: Joint Reactions

Table 20: Joint Reactions

Joint	OutputCase	F1	F2	F3	M1	M2	M3
		Kip	Kip	Kip	Kip-in	Kip-in	Kip-in
1	DEAD	8.327E-17	0.	8.673	0.	-1.025E-13	0.
1	LIVE	1.665E-16	0.	17.346	0.	-2.050E-13	0.
1	SNOW	0.	0.	0.	0.	0.	0.
1	WIND Y0 LCA	1.402	0.	16.018	0.	1350.541	0.
1	WIND Y0 LCB	-1.121	0.	-12.814	0.	-1441.975	0.
1	WIND Y180 LCA	1.402	0.	16.018	0.	-973.517	0.
1	WIND Y180 LCB	-1.121	0.	-12.814	0.	1140.366	0.
1	WIND Y90	-1.121	-2.57	-12.812	345.636	-150.781	2.167E-14
1	EQ N-S	-21.94	0.	-8.095E-16	0.	-2950.953	0.
1	EQ E-W	0.	-21.94	0.	2950.953	0.	-5.763E-14

9. Frame results

This section provides frame force results.

Table 21: Element Forces - Frames, Part 1 of 2

Table 21: Element Forces - Frames, Part 1 of 2

Frame	Station	OutputCase	P	V2	V3
	in		Kip	Kip	Kip
1	0.	DEAD	-8.673	-8.327E-17	0.
1	67.25	DEAD	-8.673	-8.327E-17	0.
1	134.5	DEAD	-8.673	-8.327E-17	0.
1	0.	LIVE	-17.346	-1.665E-16	0.
1	67.25	LIVE	-17.346	-1.665E-16	0.
1	134.5	LIVE	-17.346	-1.665E-16	0.
1	0.	SNOW	0.	0.	0.
1	67.25	SNOW	0.	0.	0.
1	134.5	SNOW	0.	0.	0.
1	0.	WIND Y0 LCA	-16.018	-1.402	0.
1	67.25	WIND Y0 LCA	-16.018	-1.402	0.
1	134.5	WIND Y0 LCA	-16.018	-1.402	0.
1	0.	WIND Y0 LCB	12.814	1.121	0.
1	67.25	WIND Y0 LCB	12.814	1.121	0.

Table 21: Element Forces - Frames, Part 1 of 2

Frame	Station	OutputCase	P	V2	V3
	in		Kip	Kip	Kip
1	134.5	WIND Y0 LCB	12.814	1.121	0.
1	0.	WIND Y180 LCA	-16.018	-1.402	0.
1	67.25	WIND Y180 LCA	-16.018	-1.402	0.
1	134.5	WIND Y180 LCA	-16.018	-1.402	0.
1	0.	WIND Y180 LCB	12.814	1.121	0.
1	67.25	WIND Y180 LCB	12.814	1.121	0.
1	134.5	WIND Y180 LCB	12.814	1.121	0.
1	0.	WIND Y90	12.812	1.121	2.57
1	67.25	WIND Y90	12.812	1.121	2.57
1	134.5	WIND Y90	12.812	1.121	2.57
1	0.	EQ N-S	8.095E-16	21.94	0.
1	67.25	EQ N-S	8.095E-16	21.94	0.
1	134.5	EQ N-S	8.095E-16	21.94	0.
1	0.	EQ E-W	0.	0.	21.94
1	67.25	EQ E-W	0.	0.	21.94
1	134.5	EQ E-W	0.	0.	21.94
2	0.	DEAD	5.884E-15	5.829E-16	0.
2	120.458	DEAD	-0.189	2.16	0.
2	240.917	DEAD	-0.378	4.32	0.
2	0.	LIVE	1.177E-14	1.166E-15	0.
2	120.458	LIVE	-0.378	4.32	0.
2	240.917	LIVE	-0.756	8.64	0.
2	0.	SNOW	0.	0.	0.
2	120.458	SNOW	0.	0.	0.
2	240.917	SNOW	0.	0.	0.
2	0.	WIND Y0 LCA	-2.274E-13	3.553E-15	0.
2	120.458	WIND Y0 LCA	-2.274E-13	6.431	0.
2	240.917	WIND Y0 LCA	-2.274E-13	12.863	0.
2	0.	WIND Y0 LCB	-2.274E-13	-1.421E-14	0.
2	120.458	WIND Y0 LCB	-2.274E-13	-5.895	0.
2	240.917	WIND Y0 LCB	-2.274E-13	-11.791	0.
2	0.	WIND Y180 LCA	0.	0.	0.
2	120.458	WIND Y180 LCA	0.	1.608	0.
2	240.917	WIND Y180 LCA	0.	3.216	0.
2	0.	WIND Y180 LCB	-2.274E-13	0.	0.
2	120.458	WIND Y180 LCB	-2.274E-13	-0.536	0.
2	240.917	WIND Y180 LCB	-2.274E-13	-1.072	0.
2	0.	WIND Y90	1.421E-14	-8.882E-16	2.220E-16
2	120.458	WIND Y90	1.421E-14	-3.215	0.642
2	240.917	WIND Y90	1.421E-14	-6.43	1.285
2	0.	EQ N-S	0.	-1.776E-14	0.
2	120.458	EQ N-S	-5.311	-0.465	0.
2	240.917	EQ N-S	-10.622	-0.929	0.
2	0.	EQ E-W	0.	0.	3.553E-15
2	120.458	EQ E-W	0.	0.	5.331
2	240.917	EQ E-W	0.	0.	10.663
3	0.	DEAD	0.378	-4.32	0.
3	120.458	DEAD	0.189	-2.16	0.
3	240.917	DEAD	-5.765E-15	-1.049E-16	0.
3	0.	LIVE	0.756	-8.64	0.
3	120.458	LIVE	0.378	-4.32	0.
3	240.917	LIVE	-1.153E-14	-2.098E-16	0.
3	0.	SNOW	0.	0.	0.
3	120.458	SNOW	0.	0.	0.

Table 21: Element Forces - Frames, Part 1 of 2

Frame	Station	OutputCase	P	V2	V3
	in		Kip	Kip	Kip
3	240.917	SNOW	0.	0.	0.
3	0.	WIND Y0 LCA	0.	-3.216	0.
3	120.458	WIND Y0 LCA	0.	-1.608	0.
3	240.917	WIND Y0 LCA	0.	1.455E-14	0.
3	0.	WIND Y0 LCB	0.	1.072	0.
3	120.458	WIND Y0 LCB	0.	0.536	0.
3	240.917	WIND Y0 LCB	0.	-6.031E-15	0.
3	0.	WIND Y180 LCA	0.	-12.863	0.
3	120.458	WIND Y180 LCA	0.	-6.431	0.
3	240.917	WIND Y180 LCA	0.	2.143E-15	0.
3	0.	WIND Y180 LCB	2.274E-13	11.791	0.
3	120.458	WIND Y180 LCB	2.274E-13	5.895	0.
3	240.917	WIND Y180 LCB	2.274E-13	3.817E-15	0.
3	0.	WIND Y90	-1.421E-14	6.43	-1.285
3	120.458	WIND Y90	-1.421E-14	3.215	-0.642
3	240.917	WIND Y90	-1.421E-14	1.588E-15	-1.831E-16
3	0.	EQ N-S	10.622	0.929	0.
3	120.458	EQ N-S	5.311	0.465	0.
3	240.917	EQ N-S	2.983E-13	-1.242E-14	0.
3	0.	EQ E-W	0.	0.	-10.663
3	120.458	EQ E-W	0.	0.	-5.331
3	240.917	EQ E-W	0.	0.	1.549E-15

Table 21: Element Forces - Frames, Part 2 of 2

Table 21: Element Forces - Frames, Part 2 of 2

Frame	Station	OutputCase	T	M2	M3
	in		Kip-in	Kip-in	Kip-in
1	0.	DEAD	0.	0.	1.025E-13
1	67.25	DEAD	0.	0.	1.081E-13
1	134.5	DEAD	0.	0.	1.137E-13
1	0.	LIVE	0.	0.	2.050E-13
1	67.25	LIVE	0.	0.	2.162E-13
1	134.5	LIVE	0.	0.	2.274E-13
1	0.	SNOW	0.	0.	0.
1	67.25	SNOW	0.	0.	0.
1	134.5	SNOW	0.	0.	0.
1	0.	WIND Y0 LCA	0.	0.	-1350.541
1	67.25	WIND Y0 LCA	0.	0.	-1256.285
1	134.5	WIND Y0 LCA	0.	0.	-1162.029
1	0.	WIND Y0 LCB	0.	0.	1441.975
1	67.25	WIND Y0 LCB	0.	0.	1366.573
1	134.5	WIND Y0 LCB	0.	0.	1291.17
1	0.	WIND Y180 LCA	0.	0.	973.517
1	67.25	WIND Y180 LCA	0.	0.	1067.773
1	134.5	WIND Y180 LCA	0.	0.	1162.029
1	0.	WIND Y180 LCB	0.	0.	-1140.366
1	67.25	WIND Y180 LCB	0.	0.	-1215.768
1	134.5	WIND Y180 LCB	0.	0.	-1291.17
1	0.	WIND Y90	-2.167E-14	345.636	150.781
1	67.25	WIND Y90	-2.167E-14	172.818	75.391
1	134.5	WIND Y90	-2.167E-14	1.014E-13	1.699E-13
1	0.	EQ N-S	0.	0.	2950.953

Table 21: Element Forces - Frames, Part 2 of 2

Frame	Station	OutputCase	T	M2	M3
	in		Kip-in	Kip-in	Kip-in
1	67.25	EQ N-S	0.	0.	1475.476
1	134.5	EQ N-S	0.	0.	4.448E-12
1	0.	EQ E-W	5.763E-14	2950.953	0.
1	67.25	EQ E-W	5.763E-14	1475.476	0.
1	134.5	EQ E-W	5.763E-14	-2.487E-14	0.
2	0.	DEAD	0.	0.	-3.730E-14
2	120.458	DEAD	0.	0.	-130.095
2	240.917	DEAD	0.	0.	-520.381
2	0.	LIVE	0.	0.	-7.461E-14
2	120.458	LIVE	0.	0.	-260.19
2	240.917	LIVE	0.	0.	-1040.761
2	0.	SNOW	0.	0.	0.
2	120.458	SNOW	0.	0.	0.
2	240.917	SNOW	0.	0.	0.
2	0.	WIND Y0 LCA	0.	0.	4.547E-13
2	120.458	WIND Y0 LCA	0.	0.	-387.363
2	240.917	WIND Y0 LCA	0.	0.	-1549.453
2	0.	WIND Y0 LCB	0.	0.	-1.819E-12
2	120.458	WIND Y0 LCB	0.	0.	355.078
2	240.917	WIND Y0 LCB	0.	0.	1420.312
2	0.	WIND Y180 LCA	0.	0.	-4.547E-13
2	120.458	WIND Y180 LCA	0.	0.	-96.856
2	240.917	WIND Y180 LCA	0.	0.	-387.424
2	0.	WIND Y180 LCB	0.	0.	-9.095E-13
2	120.458	WIND Y180 LCB	0.	0.	32.285
2	240.917	WIND Y180 LCB	0.	0.	129.141
2	0.	WIND Y90	-4.441E-15	0.	-2.842E-14
2	120.458	WIND Y90	-4.441E-15	-38.694	193.651
2	240.917	WIND Y90	-4.441E-15	-154.776	774.606
2	0.	EQ N-S	0.	0.	0.
2	120.458	EQ N-S	0.	0.	27.989
2	240.917	EQ N-S	0.	0.	111.957
2	0.	EQ E-W	-3.553E-14	2.274E-13	0.
2	120.458	EQ E-W	-3.553E-14	-321.1	0.
2	240.917	EQ E-W	-3.553E-14	-1284.399	0.
3	0.	DEAD	0.	0.	-520.381
3	120.458	DEAD	0.	0.	-130.095
3	240.917	DEAD	0.	0.	-1.609E-13
3	0.	LIVE	0.	0.	-1040.761
3	120.458	LIVE	0.	0.	-260.19
3	240.917	LIVE	0.	0.	-3.218E-13
3	0.	SNOW	0.	0.	0.
3	120.458	SNOW	0.	0.	0.
3	240.917	SNOW	0.	0.	0.
3	0.	WIND Y0 LCA	0.	0.	-387.424
3	120.458	WIND Y0 LCA	0.	0.	-96.856
3	240.917	WIND Y0 LCA	0.	0.	-3.652E-13
3	0.	WIND Y0 LCB	0.	0.	129.141
3	120.458	WIND Y0 LCB	0.	0.	32.285
3	240.917	WIND Y0 LCB	0.	0.	-5.814E-14
3	0.	WIND Y180 LCA	0.	0.	-1549.453
3	120.458	WIND Y180 LCA	0.	0.	-387.363
3	240.917	WIND Y180 LCA	0.	0.	-2.089E-12
3	0.	WIND Y180 LCB	0.	0.	1420.312

Table 21: Element Forces - Frames, Part 2 of 2

Frame	Station	OutputCase	T	M2	M3
	in		Kip-in	Kip-in	Kip-in
3	120.458	WIND Y180 LCB	0.	0.	355.078
3	240.917	WIND Y180 LCB	0.	0.	1.964E-12
3	0.	WIND Y90	-3.886E-15	-154.776	774.606
3	120.458	WIND Y90	-3.886E-15	-38.694	193.651
3	240.917	WIND Y90	-3.886E-15	2.873E-14	-6.107E-14
3	0.	EQ N-S	0.	0.	111.957
3	120.458	EQ N-S	0.	0.	27.989
3	240.917	EQ N-S	0.	0.	-2.647E-13
3	0.	EQ E-W	-3.464E-14	-1284.399	0.
3	120.458	EQ E-W	-3.464E-14	-321.1	0.
3	240.917	EQ E-W	-3.464E-14	-2.201E-13	0.

10. Material take-off

This section provides a material take-off.

Table 22: Material List 2 - By Section Property

Table 22: Material List 2 - By Section Property

Section	ObjectType	NumPieces	TotalLength	TotalWeight
			in	Kip
W16X77	Frame	2	481.834	3.088
W12X96	Frame	1	134.5	1.076

11. Design preferences

This section provides the design preferences for each type of design, which typically include material reduction factors, framing type, stress ratio limit, deflection limits, and other code specific items.

11.1. Steel design

Table 23: Preferences - Steel Design - AISC 360-16, Part 1 of 4

Table 23: Preferences - Steel Design - AISC 360-16, Part 1 of 4

THDesign	FrameType	PatLLF	SRatioLimit	MaxIter	SDC	SeisCode	SeisLoad	ImpFactor
Envelopes	OMF	0.75	1.	1	E	Yes	Yes	1.

Table 23: Preferences - Steel Design - AISC 360-16, Part 2 of 4

Table 23: Preferences - Steel Design - AISC 360-16, Part 2 of 4

SystemRho	SystemSds	SystemR	SystemCd	Omega0	Provision	AMethod	SOMethod	SRMethod
1.	1.537	1.25	1.25	1.25	LRFD	Direct Analysis	General 2nd Order	Tau-b Fixed

Table 23: Preferences - Steel Design - AISC 360-16, Part 3 of 4

Table 23: Preferences - Steel Design - AISC 360-16, Part 3 of 4

NLCoeff	PhiB	PhiC	PhiTY	PhiTF	PhiV	PhiVRolledI	PhiVT	PlugWeld
0.002	0.9	0.9	0.9	0.75	0.9	1.	0.9	Yes

Table 23: Preferences - Steel Design - AISC 360-16, Part 4 of 4

Table 23: Preferences - Steel Design - AISC 360-16, Part 4 of 4

HSSWelding	HSSReduceT	CheckDefl	DLRat	SDLAndLLRat	LLRat	TotalRat	NetRat
ERW	No	No	120.	120.	360.	240.	240.

11.2. Concrete design

Table 24: Preferences - Concrete Design - ACI 318-11, Part 1 of 2

Table 24: Preferences - Concrete Design - ACI 318-11, Part 1 of 2

THDesign	NumCurves	NumPoints	MinEccen	PatLLF	UFLimit	SeisCat	Rho	Sds
Envelopes	24	11	Yes	0.75	0.95	D	1.	0.5

Table 24: Preferences - Concrete Design - ACI 318-11, Part 2 of 2

Table 24: Preferences - Concrete Design - ACI 318-11, Part 2 of 2

PhiT	PhiCTied	PhiCSpiral	PhiV	PhiVSeismic	PhiVJoint
0.9	0.65	0.75	0.75	0.6	0.85

11.3. Aluminum design

Table 25: Preferences - Aluminum Design - AA 2015, Part 1 of 2

Table 25: Preferences - Aluminum Design - AA 2015, Part 1 of 2

THDesign	SRatioLimit	Provision	LatFact	UseLatFact	Bridge	OmegaTy	OmegaTr	OmegaC
Envelopes	1.	ASD	1.333333	No	No	1.65	1.95	1.65

Table 25: Preferences - Aluminum Design - AA 2015, Part 2 of 2

Table 25: Preferences - Aluminum Design - AA 2015, Part 2 of 2

OmegaBo	OmegaBr	OmegaVo	OmegaVr
1.65	1.95	1.65	1.95

11.4. *Cold formed design*

Table 26: Preferences - Cold Formed Design - AISI-ASD96

Table 26: Preferences - Cold Formed Design - AISI-ASD96

FrameType	SRatioLimit	OmegaBS	OmegaBUS	OmegaBLTB	OmegaVS	OmegaVNS	OmegaT	OmegaC
Braced Frame	1.	1.67	1.67	1.67	1.67	1.5	1.67	1.8

12. Design overwrites

This section provides the design overwrites for each type of design, which are assigned to individual members of the structure.

12.1. *Steel design*

Table 27: Overwrites - Steel Design - AISC 360-16, Part 1 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 1 of 7

Frame	DesignSect	FrameType	Fy Kip/in2	RLLF	AreaRatio	XLMajor
1	Program Determined	Program Determined	0.	0.	0.	0.
2	Program Determined	Program Determined	0.	0.	0.	0.
3	Program Determined	Program Determined	0.	0.	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 2 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 2 of 7

Frame	XLMinor	XLLTB	K1Major	K1Minor	K2Major	K2Minor	KLTB
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 3 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 3 of 7

Frame	CmMajor	CmMinor	Cb	B1Major	B1Minor	B2Major	B2Minor
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 4 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 4 of 7

Frame	HSSReduceT	HSSWelding	Omega0	Ry	Pnc	Pnt	Mn3
					Kip	Kip	Kip-in
1	Program Determined	Program Determined	0.	0.	0.	0.	0.
2	Program Determined	Program Determined	0.	0.	0.	0.	0.
3	Program Determined	Program Determined	0.	0.	0.	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 5 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 5 of 7

Frame	Mn2	Vn2	Vn3	CheckDefl	DeflType	DLRat	SDLAndLLRat
	Kip-in	Kip	Kip				
1	0.	0.	0.	Program Determined	Program Determined	0.	0.
2	0.	0.	0.	Program Determined	Program Determined	0.	0.
3	0.	0.	0.	Program Determined	Program Determined	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 6 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 6 of 7

Frame	LLRat	TotalRat	NetRat	DLAbs	SDLAndLLAbs	LLAbs	TotalAbs
				in	in	in	in
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.

Table 27: Overwrites - Steel Design - AISC 360-16, Part 7 of 7

Table 27: Overwrites - Steel Design - AISC 360-16, Part 7 of 7

Frame	NetAbs	SpecCamber	DCLimit
	in	in	
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.

13. Design summary

This section provides the design summary for each type of design, which highlights the controlling demand/capacity ratio and it's associated combination and location in each member.

13.1. Steel design

Table 28: Steel Design 1 - Summary Data - AISC 360-16, Part 1 of 2

Table 28: Steel Design 1 - Summary Data - AISC 360-16, Part 1 of 2

Frame	DesignSect	DesignType	Status	Ratio	RatioType
1	W12X96	Column	No Messages	0.977432	PMM
2	W16X77	Brace	No Messages	0.811431	PMM
3	W16X77	Brace	No Messages	0.811149	PMM

Table 28: Steel Design 1 - Summary Data - AISC 360-16, Part 2 of 2

Table 28: Steel Design 1 - Summary Data - AISC 360-16, Part 2 of 2

Frame	Combo	Location in	ErrMsg	WarnMsg
1	8B	0.	No Messages	No Messages
2	8B	240.917	No Messages	No Messages
3	8B	0.	No Messages	No Messages