STRUCTURAL CALCULATIONS

FOR

CYPRESS COLLEGE – AUTO TECH SERVICE BAY
CAR LIFT ANCHORAGE

Cypress, CA

KNA No. 259.159

October 2018

Prepared Under the Direction of:

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CYPRESS COLLEGE - AUTO TECH SERVICE BAY
NEW AUTO LIFTS
Cypress, California

KNA Job No. 259.159
October 2018

Design Maps Summary Report

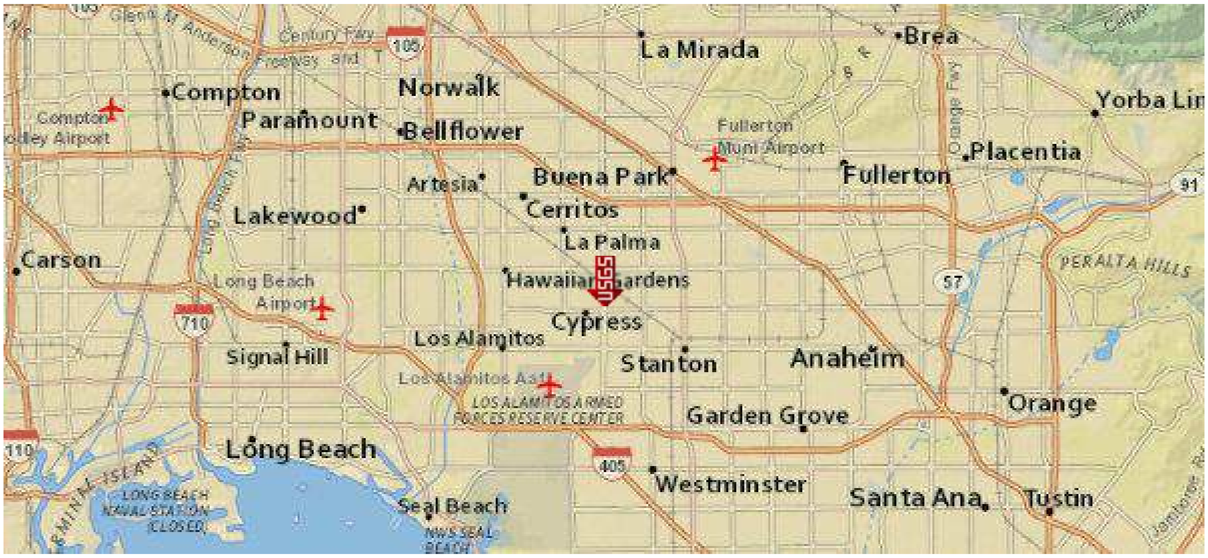
User–Specified Input

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 33.82839°N, 118.02822°W

Site Soil Classification Site Class D – "Stiff Soil"

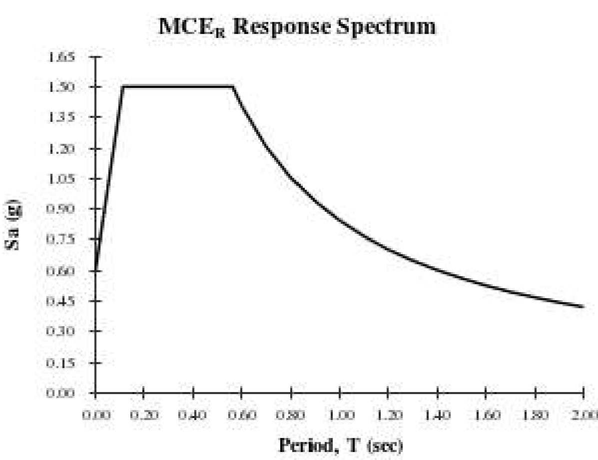
Risk Category I/II/III

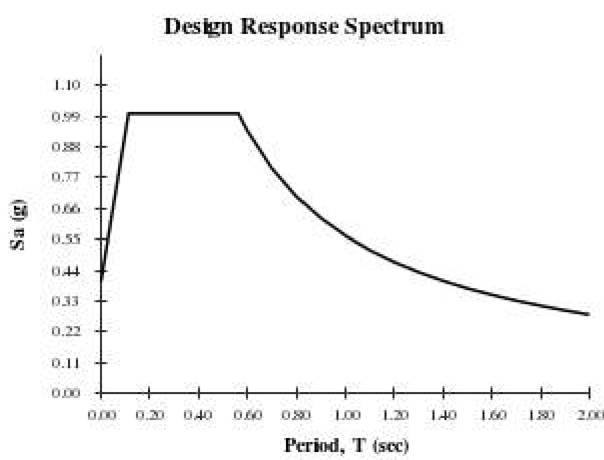


USGS–Provided Output

S_S =	1.500 g	S_{MS} =	1.500 g	S_{DS} =	1.000 g
S_1 =	0.563 g	S_{M1} =	0.844 g	S_{D1} =	0.563 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

KNA STRUCTURAL ENGINEERS knastructural.com

PROJECT	CYPRESS COLLEGE - AUTO TECH SERVICE BAY	SHEET ____ OF ____	
	SPOA10	JOB NO	259.159
CLIENT	WESTBERG & WHITE ARCHITECTS	DATE	10/18
		BY	MP

CLIENT NO. ____ REVIEWED BY JS DATE 10/30/18

EQUIPMENT ANCHORAGE

EQUIPMENT OVERTURNING CALCULATIONS ARE BASED ON A SEISMIC LOAD APPLIED AT A CRITICAL ANGLE

EQUIPMENT DESCRIPTION : SPOA10

OPERATING WEIGHT, W_p : 7000 # ← = AVG. PICKUP TRUCK WEIGHT + FRAME WEIGHT

SEISMIC HORIZONTAL FORCE, $$F_p = \frac{0.4(a_p)(S_{DS})(I_p)}{R_p}\left(1+2\frac{z}{h}\right)W_p$$

[ASCE 7-10 EQN. 13.3-1]

WHERE:

a_p = COMPONENT AMPLIFICATION FACTOR	:	2.5
R_p = COMPONENT RESPONSE FACTOR	:	6.0
S_{DS} = SEISMIC COEFFICIENT (ASSUME SITE CLASS D)	:	1.000
I_p = IMPORTANCE FACTOR	:	1.00
z = HEIGHT OF COMPONENT ATTACHMENT VS. GRADE	:	0 ft
h = HEIGHT OF ROOF VS. GRADE	:	1 ft

F_p SHALL NOT BE LESS THAN $0.3(S_{DS})(I_p)(W_p)$ [ASCE 7-10 EQN. 13.3-3]

F_p NEED NOT EXCEED $1.6(S_{DS})(I_p)(W_p)$ [ASCE 7-10 EQN. 13.3-2]

F_p	=	0.167 W_p	=	1167 #	
F_p MIN	=	0.300 W_p	=	2100 #	GOVERNS
F_p MAX	=	1.600 W_p	=	11200 #	

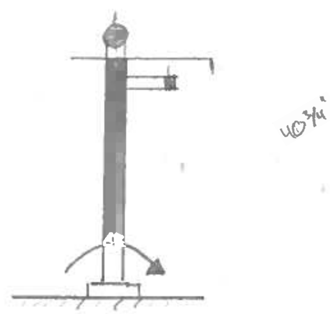
VERTICAL COMPONENT, $F_{pv} = 0.2(S_{DS})(W_p)$ [ASCE 7-10 §13.3.1]

F_{pv} = 0.200 W_p = 1400 #

F_p	=	2100 #
F_{pv}	=	1400 #

A

ACTO



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Address:		Sub-Project I Pos. No.:	SPOA10 - Post-Install
Phone I Fax:	|	Date:	10/30/2018
E-Mail:			

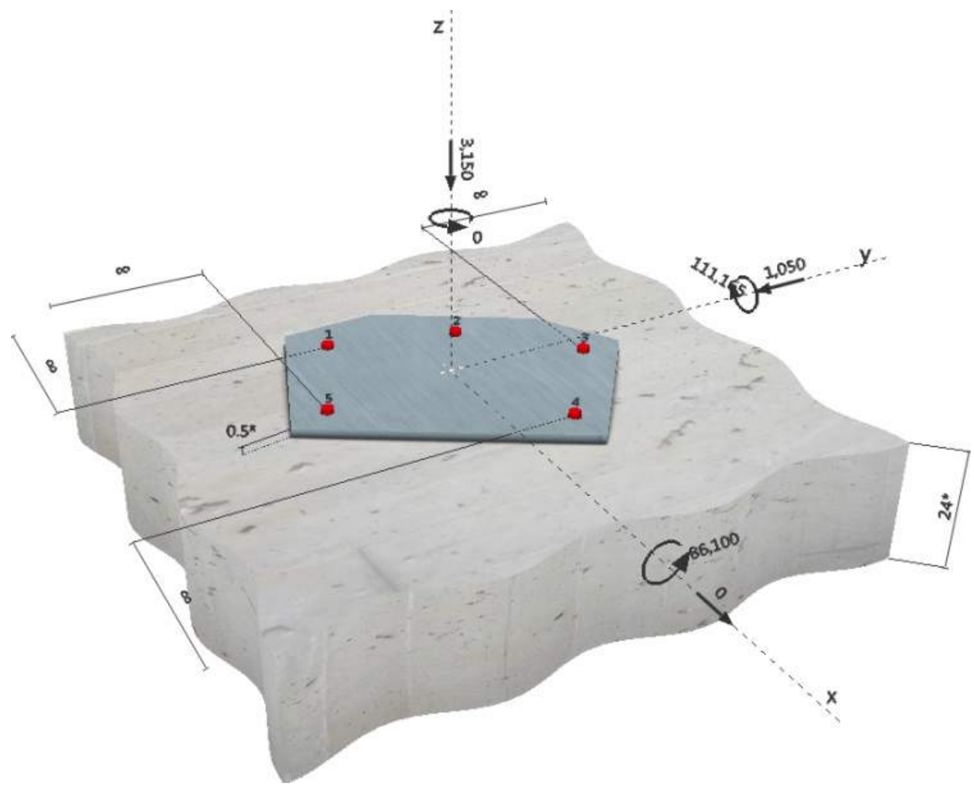
Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ - SS 304 3/4 (3 3/4)**
Effective embedment depth:	$h_{ef,act}$ = 3.750 in., h_{nom} = 4.313 in.
Material:	AISI 304
Evaluation Service Report:	ESR-1917
Issued I Valid:	5/1/2017 | 5/1/2019
Proof:	Design method ACI 318-14 / Mech.
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate:	l_x x l_y x t = 19.669 in. x 22.099 in. x 0.500 in.; (Recommended plate thickness: not calculated
Profile:	no profile
Base material:	cracked concrete, , f_c' = 4,500 psi; h = 24.000 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present
	edge reinforcement: >= 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))

[R] - user is responsible to ensure a rigid base plate for the entered thickness with appropriate solutions (stiffeners,...)

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



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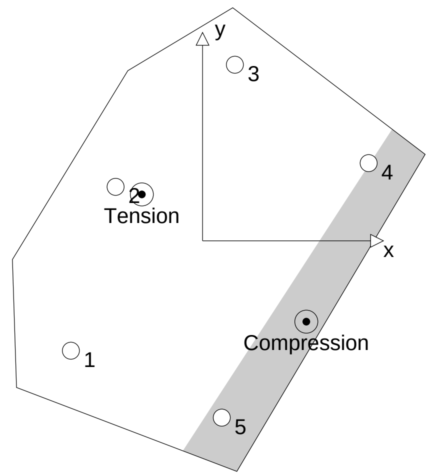
2 Load case/Resulting anchor forces



Load case: Design loads

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	3,502	210	0	-210
2	4,727	210	0	-210
3	3,939	210	0	-210
4	27	210	0	-210
5	0	210	0	-210

max. concrete compressive strain:	0.19 [‰]
max. concrete compressive stress:	844 [psi]
resulting tension force in (x/y)=(-2.894/2.211):	12,195 [lb]
resulting compression force in (x/y)=(4.945/-3.853):	15,345 [lb]

Anchor forces based on a rigid base plate assumption!

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	4,727	18,041	27	OK
Pullout Strength*	4,727	5,304	90	OK
Concrete Breakout Strength**	12,195	12,311	100	OK

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

N_{sa} = ESR value	refer to ICC-ES ESR-1917
$\phi\ N_{sa} \geq N_{ua}$	ACI 318-14 Table 17.3.1.1

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.24	101,500

Calculations

N_{sa} [lb]
24,055

Results

N_{sa} [lb]	ϕ_{steel}	$\phi_{nonductile}$	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
24,055	0.750	1.000	18,041	4,727

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3.2 Pullout Strength

$N_{pn,f'_c} = N_{p,2500}\ \lambda_a \sqrt{\frac{f'_c}{2500}}$ refer to ICC-ES ESR-1917

$\phi\ N_{pn,f'_c} \geq N_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

f'_c [psi]	λ_a	$N_{p,2500}$ [lb]
4,500	1.000	8,110

Calculations

$\sqrt{\frac{f'_c}{2500}}$
1.342

Results

N_{pn,f'_c} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ N_{pn,f'_c}$ [lb]	N_{ua} [lb]
10,881	0.650	0.750	1.000	5,304	4,727

3.3 Concrete Breakout Strength

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ 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.]	$\psi_{c,N}$
3.750	2.652	0.146	∞	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
7.000	24	1.000	4,500

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
412.68	126.56	0.680	0.975	1.000	1.000	11,691

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
25,253	0.650	0.750	1.000	12,311	12,195

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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	210	8,379	3	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	1,050	65,321	2	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa,eq}$ = ESR value refer to ICC-ES ESR-1917

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

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.24	101,500

Calculations

$V_{sa,eq}$ [lb]
12,890

Results

$V_{sa,eq}$ [lb]	ϕ_{steel}	$\phi_{nonductile}$	$\phi\ V_{sa}$ [lb]	V_{ua} [lb]
12,890	0.650	1.000	8,379	210

4.2 Pryout Strength

$V_{cpg} = k_{cp}\left[\left(\frac{A_{Nc}}{A_{Nc0}}\right)\psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b\right]$ 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	3.750	0.010	0.000	∞

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	7.000	24	1.000	4,500

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
505.99	126.56	0.998	1.000	1.000	1.000	11,691

Results

V_{cpg} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ V_{cpg}$ [lb]	V_{ua} [lb]
93,316	0.700	1.000	1.000	65,321	1,050

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5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.991	0.025	1.000	85	OK

$\beta_{NV} = (\beta_N + \beta_V) / 1.2 <= 1$

6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (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 Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-14, Chapter 17, Section 17.2.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.2.3.4.3 (b), Section 17.2.3.4.3 (c), or Section 17.2.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.2.3.5.3 (a), Section 17.2.3.5.3 (b), or Section 17.2.3.5.3 (c).
- Section 17.2.3.4.3 (b) / Section 17.2.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.2.3.4.3 (c) / Section 17.2.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.2.3.4.3 (d) / Section 17.2.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by ω_0.
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-14, Section 17.8.1.

Fastening meets the design criteria!

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7 Installation data

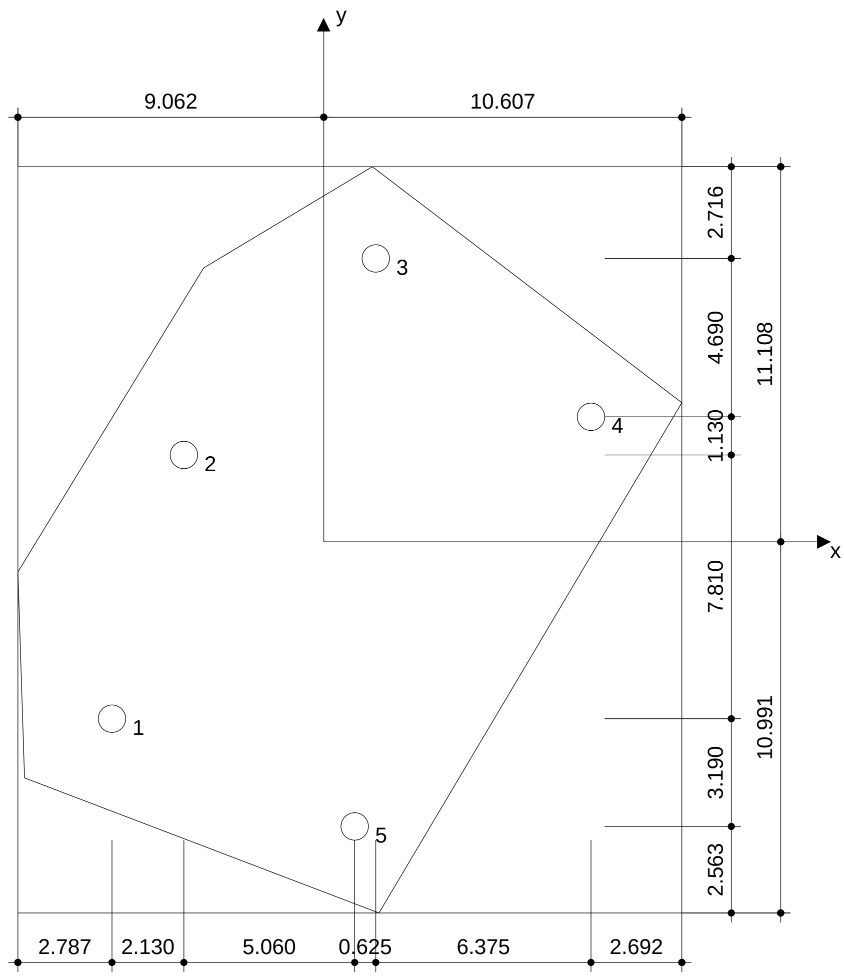
Anchor plate, steel: -
Profile: no profile
Hole diameter in the fixture: d_f = 0.813 in.
Plate thickness (input): 0.500 in.
Recommended plate thickness: not calculated
Drilling method: Hammer drilled
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - SS 304 3/4 (3 3/4)
Installation torque: 1,320.002 in.lb
Hole diameter in the base material: 0.750 in.
Hole depth in the base material: 4.500 in.
Minimum thickness of the base material: 8.000 in.

[R] - user is responsible to ensure a rigid base plate for the entered thickness with appropriate solutions (stiffeners,...)

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer	• Manual blow-out pump	• Torque wrench
• Properly sized drill bit		• Hammer



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-6.275	-5.238	-	-	-	-
2	-4.145	2.572	-	-	-	-
3	1.540	8.392	-	-	-	-

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
4	7.915	3.702	-	-	-	-
5	0.915	-8.428	-	-	-	-

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8 Remarks; Your Cooperation Duties

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ASYMMETRICLIFTS *PERFECT DESIGN FOR CARS and LIGHT TRUCKS*

Model shown: SPOA10U5G5RD
SHOCKWAVE equipped asymmetric lift

SPOA10-SW 10,000 LBS. CAPACITY

SHOCKWAVE-EQUIPPED TWO-POST LIFTS; STANDARD WITH SPEED, CHOICE & R.O.I.

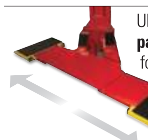
These are the fastest lifts in the world specifically designed for service bays where speed is essential. Achieve your goals of greater technician productivity and higher profits with exclusive lift technology available only from Rotary.

- 2X faster rise and decent
- DC Power with onboard 110v charger
- Spotline™ motion activated laser
- ALI Gold Certified

SHOWN WITH: **Three-stage FRONT arms** with **round (RA) adapters**

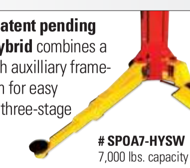
Perfect for uni-body construction and low profile vehicles. **# SPOA10-RASW** 10,000 lbs. capacity

ADDITIONAL SHOCKWAVE LIFT OPTIONS - CUSTOMIZE WITH YOUR CHOICE OF ADAPTERS, ARMS AND SUPERSTRUCTURES



Ultra low profile **movable pad** slides easily into place for lifting unibody vehicles

 # SPOA7-MPSW 7,000 lbs. capacity



Exclusive patent pending pad / arm hybrid combines a front pad with auxillary frame-engaging arm for easy spotting and three-stage rear arms for versatility.

 # SPOA7-HYSW 7,000 lbs. capacity

Standard with three-stage FRONT arms and polymer truck adapters primarily used on framed vehicles. Adapters thread-up or have optional stackable inserts.

 # SPOA10-TASW 10,000 lbs. capacity

Model shown: SPOA10N700BL
Shown with optional accessories and additional equipment

SPOA10 10,000 LBS. CAPACITY

THE INDUSTRY STANDARD

Trust the industry's original and proven Asymmetrical lift. Why go anywhere else?

- True asymmetrical rotated column design
- Performance tested to 20,000 lift cycles
- Customize with your choice of arms and adapters
- ALI Gold Certified

For over 30 years, Rotary Lift has built 2-post lifts with the engineering, quality and attention to manufacturing detail that can't be found anywhere else. With true asymmetric rotated column design and numerous other design advantages, the original Rotary SPOA10 can't be beat…by anyone.

Available with SHOCKWAVE™

SHOWN WITH: **Three-stage flip-up adapters** with **built-in height adapters** on **standard 2-stage arms**
 # SPOA10 10,000 lbs. capacity

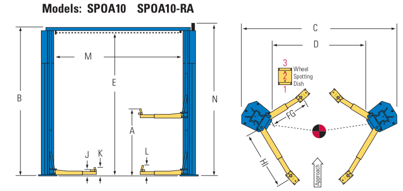
ALSO AVAILABLE WITH
- ***Three-stage arms with RA Adapters / #SPOA10-RA /** 10,000 lbs. capacity*
- ***Three-stage arms with Truck Adapters / SPOA10-TA /** 10,000 lbs. capacity*

Available with SHOCKWAVE™

	Model	SPOA10 Standard Arms Flip Up Adapters	SPOA10-TA Three-Stage Arms Truck Adapters	SPOA10-RA Three-Stage Arms Round Adapters	SPOA7-HYSW Fixed Front Pads with 3-Stage Rear Arms SHOCKWAVE LIFT
	SHOCKWAVE Models	SPOA10-SW SHOCKWAVE LIFT	SPOA10-TASW SHOCKWAVE LIFT	SPOA10-RASW SHOCKWAVE LIFT	
	Capacity	10,000 lbs. (4536kg)	10,000 lbs. (4536kg)	10,000 lbs. (4536kg)	7,000 lbs.
A.	Rise*	72 3/4" - 78 1/4" (4536 - 2226mm)	71 9/16" - 82 1/16" (4536 - 2226mm)	71 1/2" - 73 3/4" (4536 - 2226mm)	76 7/8" (1953mm)
	WITH SHOCKWAVE	75 3/4" - 81 1/4" (4536 - 2226mm)	74 9/16" - 85 1/16" (4536 - 2226mm)	74 1/2" - 76 3/4" (4536 - 2226mm)	
B.	Height Overall	11' 8 1/2" (3569mm)	11' 8 1/2" (3569mm)	11' 8 1/2" (3569mm)	11' 8 1/2" (3569mm)
C.	Width Overall** (outside of base plate)	11' 5 3/8" (3489mm)	11' 5 3/8" (3489mm)	11' 5 3/8" (3489mm)	11' 5 3/8" (3489mm)
D.	Drive-Thru Clearance	95 1/4" (2416mm)	95 1/4" (2416mm)	95 1/4" (2416mm)	83 3/8" (2118mm)
E.	Floor To Overhead Switch	11' 2 3/4" (3423mm)	11' 2 3/4" (3423mm)	11' 2 3/4" (3423mm)	11' 2 3/4" (3423mm)
F.	Reach (front arm min.)	24" (610mm)	21 3/4" (552mm)	21 3/4" (552mm)	N/A
G.	Reach (front arm max.)	40 3/4" (1036mm)	43 1/2" (1105mm)	43 1/2" (1105mm)	N/A
H.	Reach (rear arm min.)	40 1/4" (1019mm)	34 1/2" (876mm)	34 1/2" (876mm)	64 1/2" (1638mm)
I.	Reach (rear arm max.)	61" (1548mm)	58" (1473mm)	58" (1473mm)	30-3/8" (771mm)
J.	Min. Adapter Height / Max. Adapter Height	4 3/4" (121mm) / N/A	4 3/4" (121mm) / 7" (178mm)	3 5/8" (92mm) / 6 1/2" (165mm)	Rear arm: 3 3/4" (95mm) Front pad: 2 7/8" (73mm) Front arm: 5 1/4" (133mm)
K.	Low Step Height	7" (178mm)	N/A	N/A	N/A
L.	High Step Height	10 1/4" (260mm)	N/A	N/A	N/A
M.	Inside Columns	107 1/4" (2727mm)	107 1/4" (2727mm)	107 1/4" (2727mm)	107 1/4" (2727mm)
N.	Cylinder Height	11' 10 1/2" (3619mm)	11' 10 1/2" (3619mm)	11' 10 1/2" (3619mm)	12' 4 1/2" (3772mm)
	WITH SHOCKWAVE	12' 4 1/2" (3772mm)	12' 4 1/2" (3772mm)	12' 4 1/2" (3772mm)	
	Motor / Voltage 1Ø***	2 HP / 208v-230v	2 HP / 208v-230v	2 HP / 208v-230v	5 HP / 110 v
	WITH SHOCKWAVE	5 HP / 110v	5 HP / 110v	5 HP / 110v	
	Time of Full Rise / Descent	45 / 40 seconds	45 / 40 seconds	45 / 40 seconds	25 / 19 seconds
	WITH SHOCKWAVE	25 / 19 seconds	25 / 19 seconds	25 / 19 seconds	
	Ceiling Height Required:	12' (3658mm)	12' (3658mm)	12' (3658mm)	12' 6" (3810mm)
	WITH SHOCKWAVE	12' 6" (3810mm)	12' 6" (3810mm)	12' 6" (3810mm)	
	Min. Bay Size	12' x 24' (3658 x 7315mm)	12' x 24' (3658 x 7315mm)	12' x 24' (3658 x 7315mm)	12' x 24' (3658 x 7315mm)

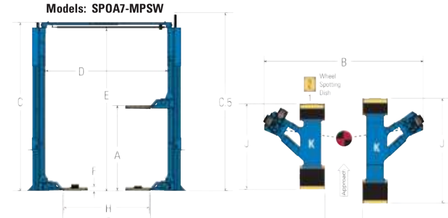
	SPOA7-MPSW Drive-Over Moveable Pads SHOCKWAVE LIFT	
	Lifting Capacity Per Platform	7,000 lbs. (3157kg) 3,500 lbs. (1588kg)
A.	Rise*	74"-77" (1880-1956mm)
B.	Width Overall**	11' 5 3/8" (3489mm)
C.	Floor to Top of Overhead	11' 8 1/2" (3569mm)
C.5	Cylinder at Full Rise	12' 4 1/2" (3772mm)
D.	Width Between Columns	107" 1/4" (2724mm)
E.	Floor to Overhead Switch	11' 2 3/4" (3423mm)
F.	Drive Over Clearance	2 5/8" (67mm)
G.	Drive-Thru Clearance	79" (2007mm)
H.	Outside of Pad to Outside of Pad	78 1/2" (1994mm)
I.	Inside of Pad to Inside of Pad	37 1/8" (968mm)
J.	Overall Pad Length Retracted Extended	70 13/16" (1799mm) 86 13/16" (2205mm)
K.	Min. / Max. Distance Between Pads	39 9/16" (1004mm) 55 9/16" (1411mm)
	Min. Adapter Height	2 5/8" (67mm)
	Motor / Voltage***	5hp / 110v
	Time of Full Rise / Descent	25 / 19 seconds
	Ceiling Height Required	12' 6" (3810mm)
	Min. Bay Size	12' x 24' (3658 x 7315mm)

Models: SPOA10 SPOA10-RA



* Rise measures lowest or highest position of the supplied adapters from floor to full cylinder stroke.
** Overall heights and widths reflect standard settings. Alternate settings may be available, refer to Installation Instruction Manual or consult factory for details.
***Optional 3-phase electrical available.

Models: SPOA7-MPSW



* Rise is measured to top of pad / Rise dimensions increase by 3" with extended rise options: NO PAD: 74" 1 1/2" PAD: 75 1/2" 3" PAD: 77"
** Overall heights and widths reflect standard settings. *** Optional 3-phase electric available

Standard color of lifts are blue and red unless otherwise noted. Gray and black are available at no additional charge. Additional colors are available, consult your Rotary® representative for details. RAL5005 RAL3002 RAL7040 RAL9005

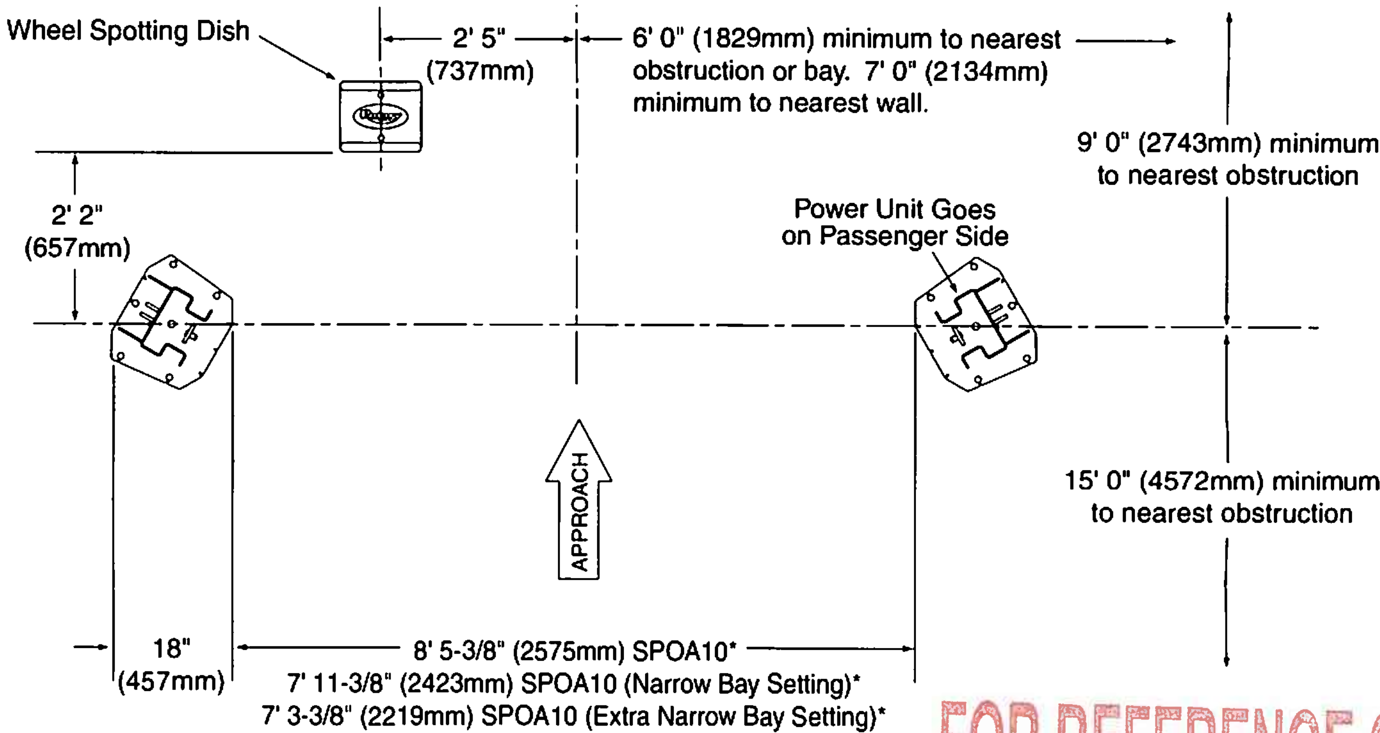


Fig. 1a

*NOTE: Dimension is from Inside of Baseplate to Inside of Baseplate.

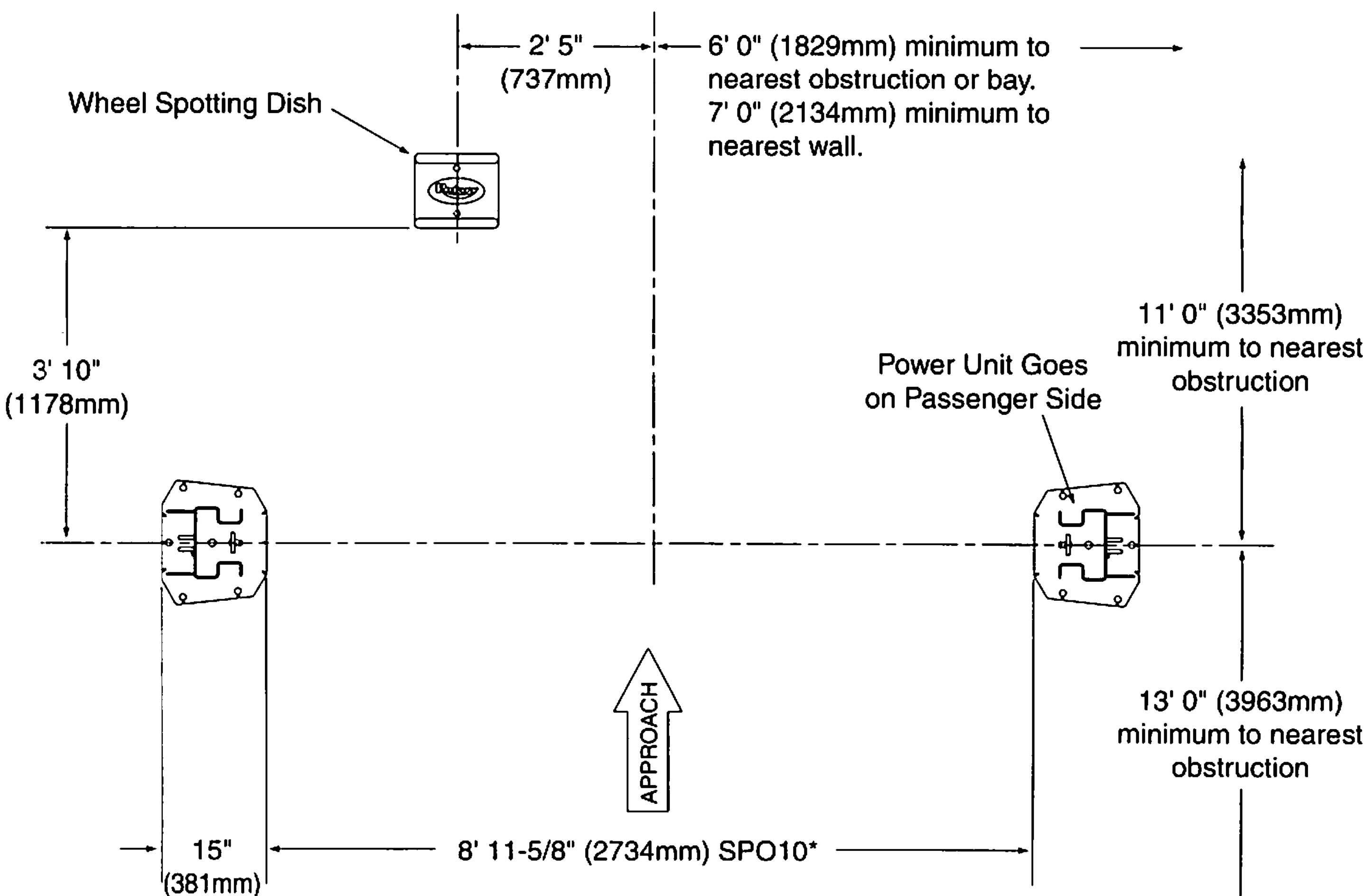
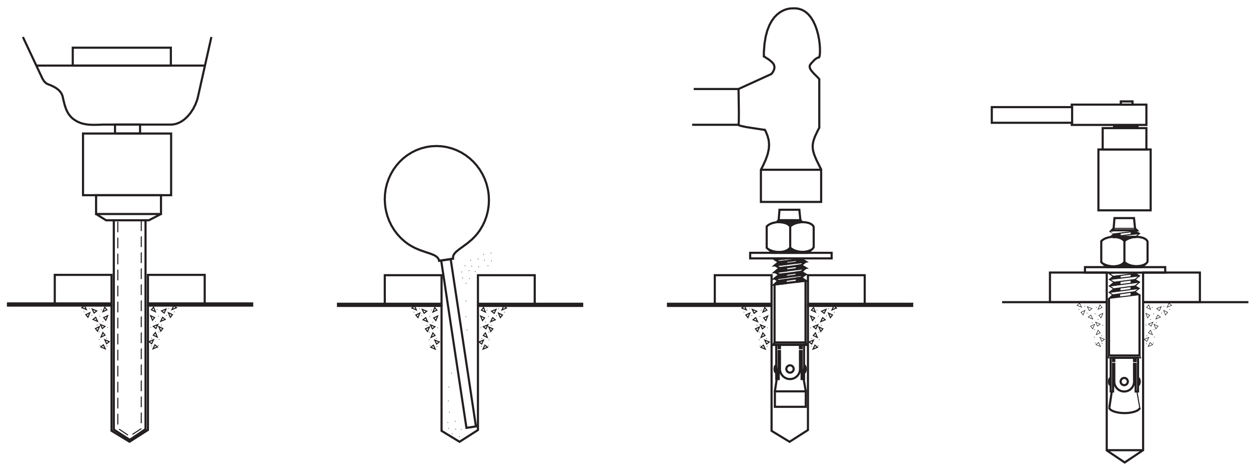


Fig. 1b

*NOTE: Dimension is from Inside of Baseplate to Inside of Baseplate.

Concrete and Anchoring:
If you are installing a seismic lift, consult with your structural engineer and manufacturer's representative for concrete and anchoring requirements (varies by location). Fig. 4 and the below table apply to non-seismic lifts only.



Drill holes using 3/4" carbide tipped masonry drill bit per ANSI B212.15-1994 (R2000)

Clean hole.

Run nut down just below impact section of bolt. Drive anchor into hole until nut and washer contact base.

Tighten nut with Torque wrench to 110 ft.-lbs.

Fig. 4

7-10K 2-Post Lift Anchor Installation Reference Guide

Anchor:	Min Concrete Thickness	Min Edge Distance	Min Anchor Embedment	Installation Anchor Torque Ft-lbs	Min Concrete PSI Strength - For All Standards	Concrete pad Size If Concrete Does Not Meet Requirements	Maintenance Torque Values	SEISMIC
Hilti Kwik Bolt III (3/4" x 5-1/2")	4-1/4" (108mm)	3-3/8" (86mm)	3-1/4" (83mm)	110	3000	4'x4'x6"	65	Varies by location consult with your structural engineer and manufacturer's representative.
Hilti HY200 (with HAS threaded rod)	6-7/16" (164mm)	1-3/4" (45mm)	4-1/2" (115mm)	100 / less than 3-3/4" edge distance use Torque Value of 30 FT/LBS	3000	4'x4'x6"	N/A	
Hilti HY200 (with HAS threaded rod)	5-1/4" (134mm)	3" (77mm)	3-1/2" (89mm)	100 / less than 3-3/4" edge distance use Torque Value of 30 FT/LBS	3000	4'x4'x6"	N/A	

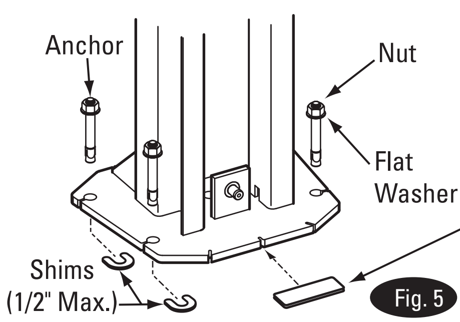
***The supplied concrete fasteners meet the criteria of the American National Standard "Automotive Lifts - Safety Requirements for Construction, Testing, and Validation" ANSI/ALI ALCTV-2011, and the lift owner is responsible for all charges related to any additional anchoring requirements as specified by local codes. Contact customer service for further information at: 800.640.5438**

Non-Seismic Lifts:
Drill (10) 3/4" dia. holes in concrete floor using holes in column base plate as a guide. See Fig. 4 for hole depth, hole spacing, and edge distance requirements.

⚠CAUTION DO NOT install on asphalt or other similar unstable surfaces. Columns are supported only by anchors in floor.

IMPORTANT Using the horse shoe shims provided, shim each column base until each column is plumb. If one column has to be elevated to match the plane of the other column, full size base shim plates should be used (Reference FA5112 Shim Kit or FA5208 for seismic lift shims). Recheck columns for plumb. Tighten anchor bolts to an installation torque of 110 ft-lbs. Shim thickness MUST NOT exceed 1/2" when using the 5-1/2" long anchors provided with the standard lifts, Fig. 5. Adjust the column extensions plumb.

If anchors do not tighten to 110 ft-lbs. installation torque, replace concrete under each column base with a 4' x 4' x 6" thick 3000 PSI minimum concrete pad keyed under and flush with the top of existing floor. Let concrete cure before installing lifts and anchors. For seismic lifts, contact customer service.



NOTE: Use rectangular shims at inside edge of baseplate. Use constructions adhesive or silicon cement to hold shim in place. INSURE shims are held tightly between base plate and floor after torquing anchors.

Fig. 5

NOTE: If more than 2 horse shoe shims are used at any of the column anchor bolts, pack non-shrink grout under the unsupported area of the column base. Insure shims are held tightly between the baseplate and floor after torquing anchors.

7a. Overhead Assembly: Fig. 11: Adjust overhead to appropriate dimension. Install (4) 3/8"-16NC x 3/4" HHCS & 3/8"-16NC Flanged Locknuts, do not tighten. Slide Switch Box over switch bar ensuring knock out holes face the power unit column. Use (2) 1/4"-20NC x 3/4" lg. HHCS, 1/4"-20NC Nuts and 1/4" Star Washers to mount switch box to overhead, see Fig. 7. For SPOA10 Extra Narrow Bay Setting installation, see step 7b, all others go to step 7c.
7b. For Extra Narrow Bay installation only: Cut off 11" from the length of the bar and cushion on the end opposite the 1/4" mounting hole(s). Continue to step 7c.

7c. Continued Overhead Assembly:
For single phase and three phase lifts with push button control box: Insert 1/4"-20NC x 2-3/4" HHCS through pivot hole in end of switch bar. Insert opposite end of bar through slot in switch mounting bracket. Then secure HHCS and Switch Bar to overhead as shown, Fig. 11, using (2) 3/4" spacers and 1/4"-20NC Locknut. Tighten Hex bolt leaving 1/16" gap between the spacer and the overhead assembly.

For three phase lifts with drum switch: Remove Limit Switch cover, Fig. 8. Insert Actuator end of Switch Bar into slot located inside Limit Switch, Fig. 8. A small amount of silicone sealant on the lower part of the actuator will help hold it in place. Insert 1/4"-20NC x 2-3/4" HHCS through pivot hole in end of Switch Bar. NOTE which hole to use, Fig. 11. Then secure HHCS and Switch Bar to overhead as shown, using (2) 3/4" spacers and 1/4"-20NC Locknut. Tighten Hex bolt leaving 1/16" gap between the spacer and the overhead assembly, Fig. 11. Replace limit switch cover.

8. Overhead Installation: Install overhead assembly to Mounting Bracket with (2) 3/8"-16NC x 3/4" Flanged HHCS, (2) 3/8"-16NC Flanged Serrated Locknut, Fig. 6. Use middle holes for SPO9/SPO10 and outside holes (marked L for Left and R for Right) for SPOA7/SPOA9/SPOA10NB/SPOA10. Tighten bolts at center of overhead assembly.

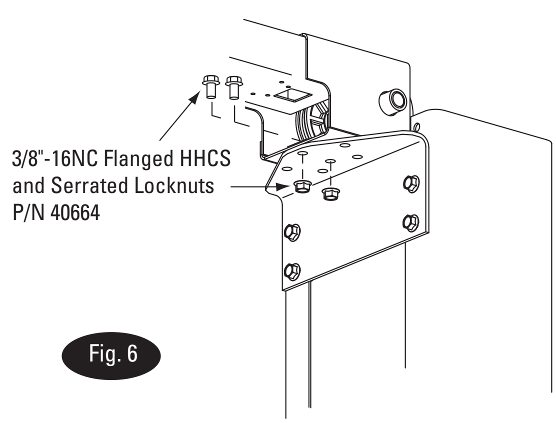
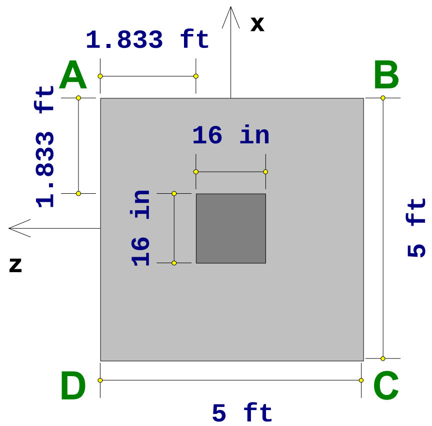
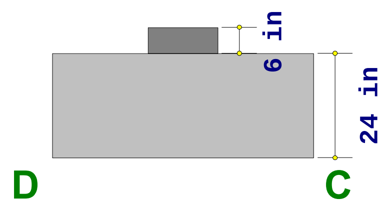


Fig. 6

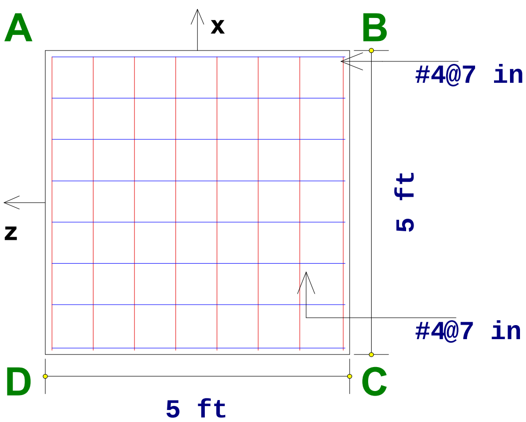
Company : **KNA Structural Engineers** October 30, 2018
Designer : **MP**
Job Number : **259.159** **SPOA10 Footing** Checked By:_____

Sketch





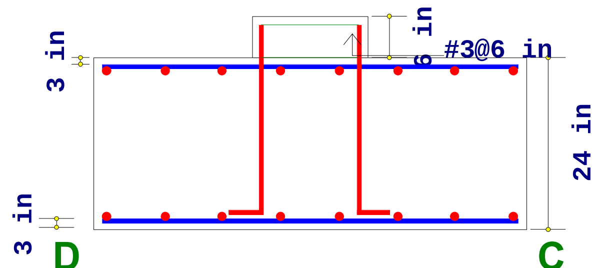
Details



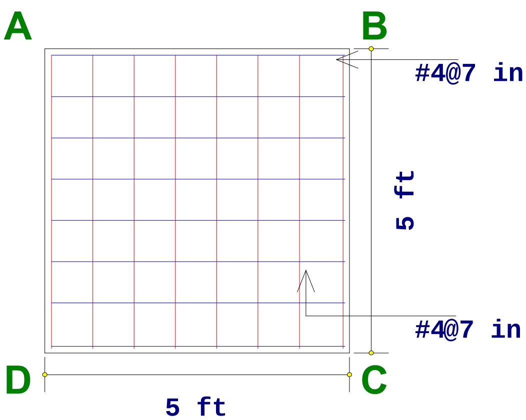
x Dir. Steel: 1.57 in^2 (8 #4)

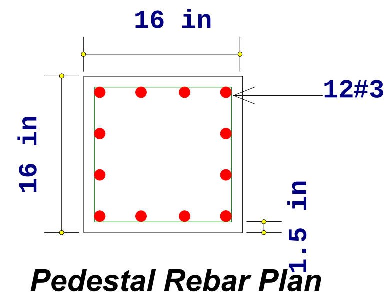
z Dir. Steel: 1.57 in^2 (8 #4)

Bottom Rebar Plan



Footing Elevation





Pedestal Rebar Plan

x Dir. Steel: 1.57 in^2 (8 #4)
z Dir. Steel: 1.57 in^2 (8 #4)

Top Rebar Plan

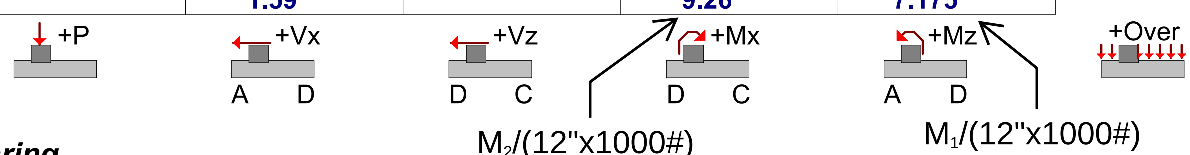
Geometry, Materials and Criteria

Length	: **5 ft**	eX	: **0 in**	Gross Allow. Bearing	: **2125 psf (gross)**	Steel fy	: **60 ksi**
Width	: **5 ft**	eZ	: **0 in**	Concrete Weight	: **145 pcf**	Minimum Steel	: **.002**
Thickness	: **24 in**	pX	: **16 in**	Concrete f'c	: **4.5 ksi**	Maximum Steel	: **.0075**
Height	: **6 in**	pZ	: **16 in**	Design Code	: **ACI 318-11**		

Footing Top Bar Cover	: **3 in**	Overturning / Sliding SF	: **1.5**	Phi for Flexure	: **0.9**
Footing Bottom Bar Cover	: **3 in**	Coefficient of Friction	: **0.25**	Phi for Shear	: **0.75**
Pedestal Longitudinal Bar Cover	: **1.5 in**	Passive Resistance of Soil	: **0 k**	Phi for Bearing	: **0.65**

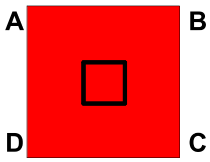
Loads

	P (k)	Vx (k)	Vz (k)	Mx (k-ft)	Mz (k-ft)	Overburden (psf)
DL	**4.2**					**100**
EL		**1.59**		**9.26**	**7.175**	

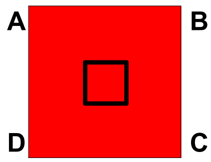


Soil Bearing

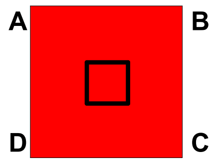
Description	Categories and Factors	Gross Allow.(psf)	Max Bearing (psf)	Max/Allowable Ratio
ASCE 2.4.1-1	**1DL**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-2	**1DL+1LL+.75LLS**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-3a	**1DL+1RLL+1SL+1SLN+1RL**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-4	**1DL+.75LL+.75LLS+.75..**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-5a	**1DL+1WL**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-5b	**1DL+.7EL**	**2125**	**1245.67 (B)**	**.586**
ASCE 2.4.1-6a	**1DL+.75WL+.75LL+.75L..**	**2125**	**556.044 (A)**	**.262**
ASCE 2.4.1-6b	**1DL+.525EL+.75LL+.75..**	**2125**	**1070.38 (B)**	**.504**
ASCE 2.4.1-7	**.6DL+1WL**	**2125**	**333.627 (A)**	**.157**
ASCE 2.4.1-8	**.6DL+.7EL**	**2125**	**1137.42 (B)**	**.535**



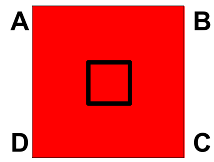
1DL
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



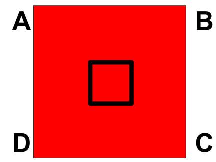
1DL+1LL+.75LLS
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



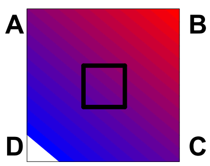
1DL+1RLL+1SL+1SLN+1RL
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



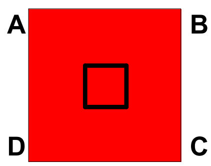
1DL+.75LL+.75LLS+.75
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



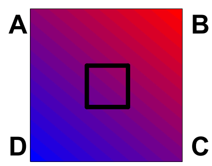
1DL+1WL
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



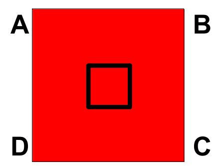
1DL+.7EL
QA: 618.722 psf
QB: 1245.67 psf
QC: 491.619 psf
QD: 0 psf
NAZ: 119.213 in
NAX: 99.118 in



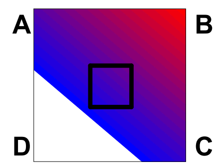
1DL+.75WL+.75LL+.75L
QA: 556.044 psf
QB: 556.044 psf
QC: 556.044 psf
QD: 556.044 psf
NAZ: -1 in
NAX: -1 in



1DL+.525EL+.75LL+.75
QA: 603.672 psf
QB: 1070.38 psf
QC: 508.416 psf
QD: 41.712 psf
NAZ: 137.609 in
NAX: 114.283 in



.6DL+1WL
QA: 333.627 psf
QB: 333.627 psf
QC: 333.627 psf
QD: 333.627 psf
NAZ: -1 in
NAX: -1 in



.6DL+.7EL
QA: 364.582 psf
QB: 1137.42 psf
QC: 224.919 psf
QD: 0 psf
NAZ: 88.305 in
NAX: 74.789 in

Footing Flexure Design (Bottom Bars)

As-min x-dir (Top Flexure): **4.126 in^2**
As-min z-dir (Top Flexure): **4.126 in^2**
As-min x-dir (Bot Flexure): **4.126 in^2**
As-min z-dir (Bot Flexure): **4.126 in^2**

As-min x-dir (T & S): **2.592 in^2**
As-min z-dir (T & S): **2.592 in^2**

Description	Categories and Factors	Mu-xx UC Max	Mu-xx (k-ft)	z-Dir As Required (in^2)	z-Dir As Provided (in^2)	Mu-zz UC Max	Mu-zz (k-ft)	x-Dir As Required (in^2)	x-Dir As Provided (in^2)
ACI-2005 9-1	1.4DL	.01362	1.95	.021	1.571	.01362	1.95	.021	1.571
ACI-2008 9-2	1.2DL+1.6LL+1.6LL..	.01167	1.67	.018	1.571	.01167	1.67	.018	1.571
ACI-2008 9-3a	1.5DL+1LL+1LLS+1...	.01459	2.09	.023	1.571	.01459	2.09	.023	1.571
ACI-2008 9-3b	1.2DL+.8WL+1.6RL..	.01167	1.67	.018	1.571	.01167	1.67	.018	1.571
ACI-2008 9-4	1.2DL+1.6WL+1LL+1..	.01167	1.67	.018	1.571	.01167	1.67	.018	1.571
ACI-2008 9-5	1.2DL+1EL+1LL+1LL..	.0317	4.55	.049	1.571	.03575	5.13	.056	1.571
ACI-2008 9-6	.9DL+1.6WL	.00875	1.26	.014	1.571	.00875	1.26	.014	1.571
ACI-2008 9-7	.9DL+1EL	.02974	4.27	.046	1.571	.03405	4.88	.053	1.571

Footing Flexure Design (Top Bars)

Description	Categories and Factors	Mu-xx (k-ft)	z Dir As (in^2)	Mu-zz (k-ft)	x Dir As (in^2)
SW+OB	1SW+1OB-(ACI-2008 9-..,ACI-2008 9-..)	1.685	0	2.189	0

Moment Capacity of Plain Concrete Section Along xx and zz= **74.405k-ft,74.405k-ft** Per Chapter 22 of ACI 318.

Footing Shear Check

Two Way (Punching) Vc: **803.106 k** One Way (x Dir. Cut) Vc **165.022 k** One Way (z Dir. Cut) Vc: **165.022 k**

Description	Categories and Factors	Punching Vu(k)	Punching Vu/⌀Vc	x Dir. Cut Vu(k)	x Dir. Cut Vu/⌀Vc	z Dir. Cut Vu(k)	z Dir. Cut Vu/⌀Vc
ACI-2005 9-1	1.4DL	3.661	.006	.145	.001	.145	.001
ACI-2008 9-2	1.2DL+1.6LL+1.6LLS+.5R..	3.138	.005	.125	.001	.125	.001
ACI-2008 9-3a	1.5DL+1LL+1LLS+1.6RLL+1..	3.922	.007	.156	.001	.156	.001
ACI-2008 9-3b	1.2DL+.8WL+1.6RLL+1.6S..	3.138	.005	.125	.001	.125	.001
ACI-2008 9-4	1.2DL+1.6WL+1LL+1LLS+...	3.138	.005	.125	.001	.125	.001
ACI-2008 9-5	1.2DL+1EL+1LL+1LLS+.2S..	3.206	.005	.402	.003	.457	.004
ACI-2008 9-6	.9DL+1.6WL	2.353	.004	.093	0	.093	0
ACI-2008 9-7	.9DL+1EL	2.707	.004	.39	.003	.45	.004

Pedestal Design

Shear Check Results (Envelope):

	Vc	Vs	Vu	Vu/phi*Vn	phi
Shear Along x Direction:	29.919	30.787	1.59	.035	.75
Shear Along z Direction:	29.919	30.787	0	0	.75

Pedestal Ties : **#3 @ 6 in**

Bending Check Results (Envelope): PCA Load Contour Method (for biaxial)

Unity Check	: .149	Phi	: .9	Parme Beta	: .65
Pu	: 0 k	Mux	: 9.26 k-ft	Muz	: 7.97 k-ft
Pn	: 0 k	Mnx	: 10.289 k-ft	Mnz	: 8.856 k-ft
Governing LC	: 16	Mnox	: 48.116 k-ft	Mnoz	: 48.116 k-ft
Pedestal Bars	: 12 #3	% Steel	: .5177		

Concrete Bearing Check (Vertical Loads Only)

Bearing Bc : **1958.4 k**

Description	Categories and Factors	Bearing Bu (k)	Bearing Bu/⌀Bc
ACI-2005 9-1	1.4DL	6.06	.005
ACI-2008 9-2	1.2DL+1.6LL+1.6LLS+.5R..	5.195	.004
ACI-2008 9-3a	1.5DL+1LL+1LLS+1.6RLL+1..	6.493	.005
ACI-2008 9-3b	1.2DL+.8WL+1.6RLL+1.6S..	5.195	.004
ACI-2008 9-4	1.2DL+1.6WL+1LL+1LLS+...	5.195	.004
ACI-2008 9-5	1.2DL+1EL+1LL+1LLS+.2S..	5.195	.004
ACI-2008 9-6	.9DL+1.6WL	3.896	.003
ACI-2008 9-7	.9DL+1EL	3.896	.003

Overturning Check (Service)

Description	Categories and Factors	Mo-xx (k-ft)	Ms-xx (k-ft)	Mo-zz (k-ft)	Ms-zz (k-ft)	OSF-xx	OSF-zz
ASCE 2.4.1-1	1DL	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-2	1DL+1LL+.75LLS	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-3a	1DL+1RLL+1SL+1SLN..	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-4	1DL+.75LL+.75LL..	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-5a	1DL+1WL	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-5b	1DL+.7EL	6.604	34.875	7.927	34.875	5.281	4.399
ASCE 2.4.1-6a	1DL+.75WL+.75LL..	.122	34.875	.122	34.875	285.341	285.341
ASCE 2.4.1-6b	1DL+.525EL+.75L..	4.984	34.875	5.976	34.875	6.998	5.836
ASCE 2.4.1-7	.6DL+1WL	.073	20.925	.073	20.925	285.341	285.341
ASCE 2.4.1-8	.6DL+.7EL	6.555	20.925	7.878	20.925	3.192	2.656

Mo-xx: Governing Overturning Moment about AD or BC
Ms-xx: Governing Stablizing Moment about AD or BC
OSF-xx: Ratio of Ms-xx to Mo-xx

Sliding Check (Service)

Description	Categories and Factors	Va-xx (k)	Vr-xx (k)	Va-zz (k)	Vr-zz (k)	SR-xx	SR-zz
ASCE 2.4.1-1	1DL	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-2	1DL+1LL+.75LLS	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-3a	1DL+1RLL+1SL+1SLN..	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-4	1DL+.75LL+.75LL..	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-5a	1DL+1WL	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-5b	1DL+.7EL	1.113	3.475	0	3.475	3.122	NA
ASCE 2.4.1-6a	1DL+.75WL+.75LL..	0	3.475	0	3.475	NA	NA
ASCE 2.4.1-6b	1DL+.525EL+.75L..	.835	3.475	0	3.475	4.163	NA
ASCE 2.4.1-7	.6DL+1WL	0	2.085	0	2.085	NA	NA
ASCE 2.4.1-8	.6DL+.7EL	1.113	2.085	0	2.085	1.873	NA

Va-xx: Applied Lateral Force to Cause Sliding Along xx Axis
Vr-xx: Resisting Lateral Force Against Sliding Along xx Axis
SR-xx: Ratio of Vr-xx to Va-xx