



ARCHITECTURE ENGINEERING PLANNING INTERIORS

**Pima Community College
Downtown Campus – Transportation Center
Equipment Addition
Tucson, Arizona**

Structural Calculations
DLR Group Project No. 30-19128-04

March 29, 2024

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Calculations

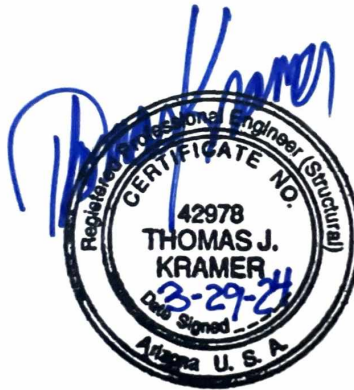


Date	
Subject	Exterior Vehicle Lift - Foundation
Computed	
Checked	
Project Name	PCC Transportation Center, Equipment Addition
Project Number	30-109128-04
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Foundation for Exterior Vehicle Lift

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Calculations



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Foundation for Exterior Vehicle Lift

Loading

- 10,000 lb capacity
- 76" max rise (6'-4")
- **loading assumed based unavailable Mnfr information for base anchorage. To be confirmed prior to installation

Vertical

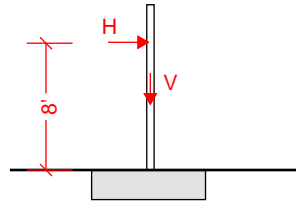
- Lift Self Weight, assume 1,000 lb

Lateral

- Assume 25% of lift capacity = 2,500 lb applied at ~ center of mass (max rise + 1'-8" = 8'-0")

Ram Element Loads (each post)

- (V)
 - DL 1,000/2 = 500 lb
 - LL 10,000/2 = 5,000
- (H)
 - LL 2,500/2 = 1,250 lb



ENGINEERED TO PERFORM. BUILT TO LAST.

Reliable lift systems for independent repair shops, car dealerships, bodyshops, home enthusiasts, and heavy-duty truck facilities.



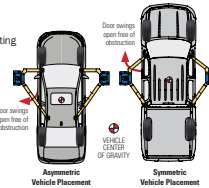
DP-10
LIGHT DUTY TWO POST LIFT
10,000 lbs. Capacity

- FEATURES:**
- Symmetrical column design
 - Spot-Rite™ 3-stage front arm design - spot vehicles asymmetrically or symmetrically
 - Top mounted Direct-Pull lifting technology
 - Cylinder rod concealed inside carriage
 - Adjustable width options
 - Single point lock release
 - Powder coated finish
 - Includes adapter storage bracket
 - ALI Certified

INCLUDES LOW-PROFILE THREADED ADAPTERS AND (4 each) ADAPTER EXTENSIONS AT 3.5" and 5"

Spot-Rite™ 3-Stage Front Arm Design

accommodates vehicle spotting both symmetrically and asymmetrically. Position the vehicle doors in front of or behind the lift columns to prevent door damage and allow easy technician access!

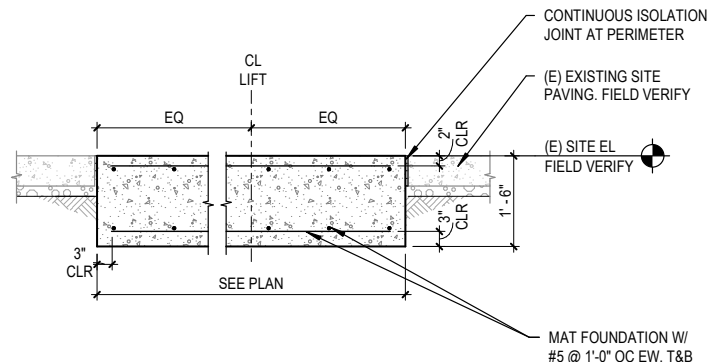


996 Industrial Drive
Madison, IN 47250
Phone: 800.423.1722
Fax: 812.273.7329

SPECIFICATIONS DP10AN0000L000	
Capacity	10,000 lbs. (4536kg)
Maximum rise	76" (1930mm) w/ extension
Overall Height	142" (3605mm)
Overall Width	127" w/ optional 127" (3227mm) (1200mm)
Drive through clearance	80" (2057mm) w/ optional 102" (2603mm)
Overhead track height	133" (3380mm)
Front track (BxMxH)	22" (44.5") (500mm) (1170mm)
Rear track (BxMxH)	26" (50.8") (500mm) (1432mm)
Min./Max. adapter height	2.3-3.4" (58mm) w/ adapter extension
Width inside column	16.5" w/ optional 115" (4190mm) (2025mm)
Vehicle weight	2000/2500, 11 tons
Manufacturer	DLR GROUP
Casting height required	144" (3658mm)

Reference RAM Element for footing design

Provide 5'-0"x14'-0"x1'-6" thick mat foundation w/ (7) #5 longitudinal (T&B) and #5 @ 1'-0" oc, (T&B) transverse

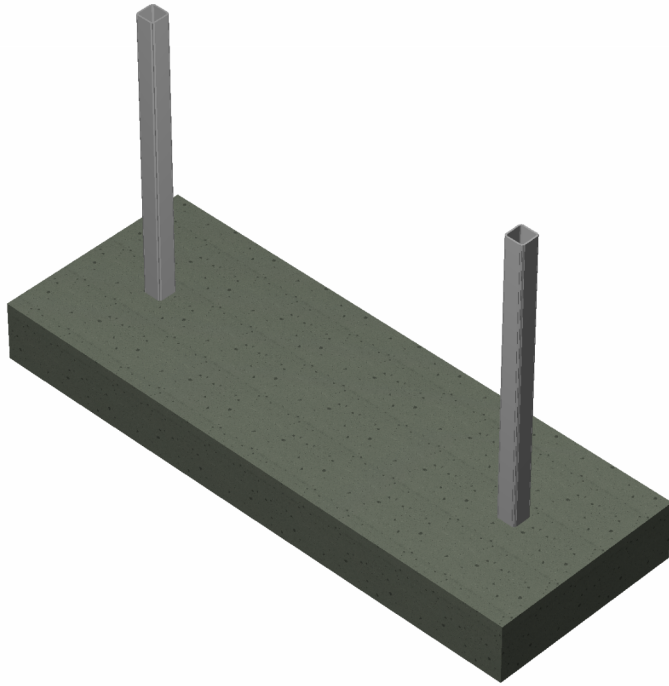




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Units system: English

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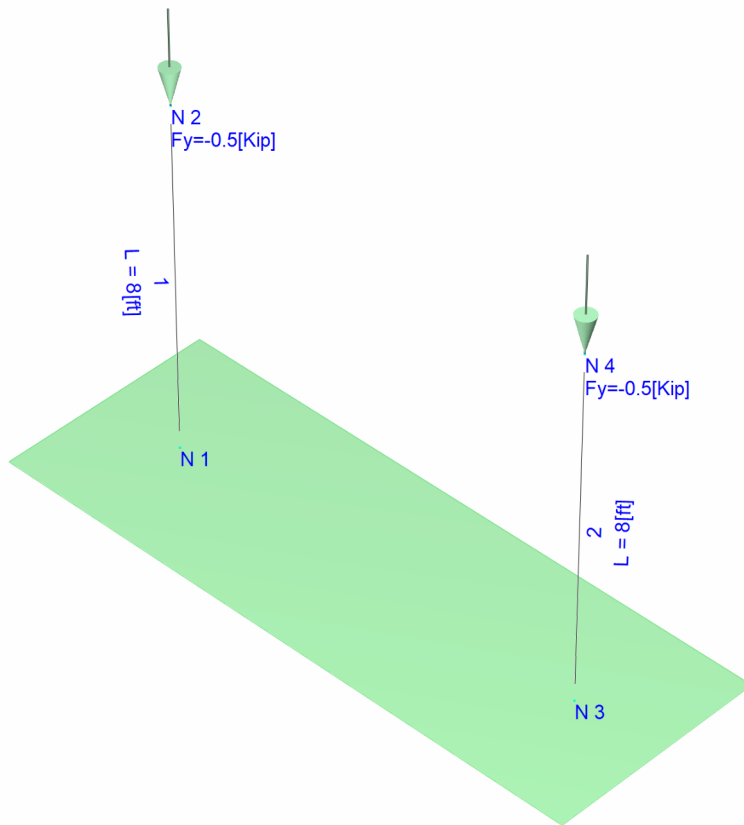
Units system: English

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Load condition: DL=Dead Load

Loads

Concentrated - Nodes





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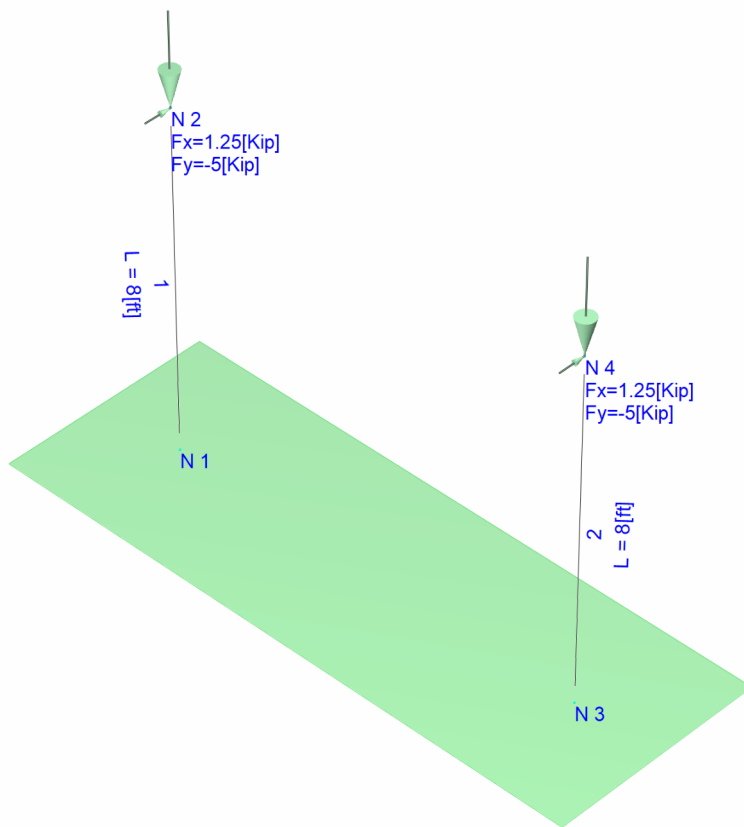
Units system: English

File name: P:\PHX\30-19128-04\+Design\St\07Analysis\RAM Element\Exterior Lift Foundation.retx

Load condition: LL=Live Load

Loads

Concentrated - Nodes





ENGINEERED TO PERFORM. BUILT TO LAST.

Reliable lift systems for independent repair shops, car dealerships, bodyshops, home enthusiasts, and heavy-duty truck facilities.



FWD DP10AN400BL

DP-10

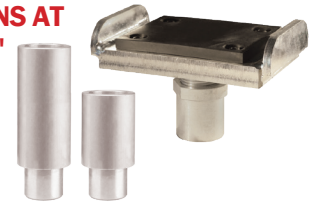
LIGHT DUTY TWO POST LIFT
10,000 lbs. Capacity

FEATURES:

Symmetrical column design
Spot-Rite™ 3-stage front arm design - spot vehicles asymmetrically or symmetrically

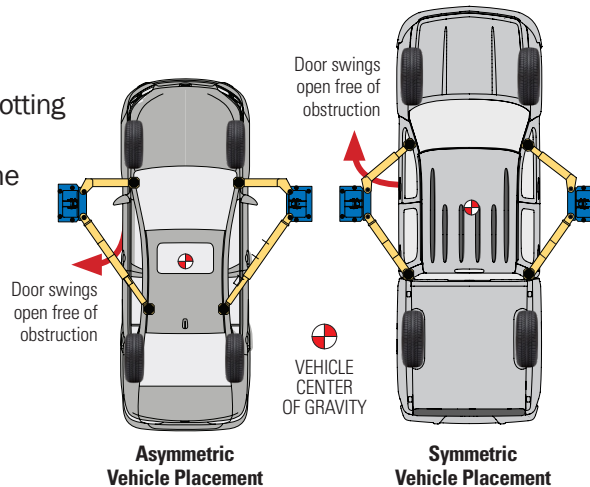
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INCLUDES LOW-PROFILE THREADED ADAPTERS AND (4 each) ADAPTER EXTENSIONS AT 3.5" and 5"



Spot-Rite™ 3-Stage Front Arm Design

accommodates vehicle spotting both symmetrically and asymmetrically. Position the vehicle doors in front of or behind the lift columns to prevent door damage and allow easy technician access!



SPECIFICATIONS	DP10AN400MBL/RD*
Capacity	10,000 lbs. (4535kg)
Maximum rise	76 -1/4" (1937mm) w/5" extension
Overall Height	143" (3632mm)
Overall Width	131" or optional 137" (3327mm/4380mm)
Drive through clearance	99" (2515mm) or optional 105" (2667mm)
Overhead switch height	137-5/8" (3496mm)
Front reach (Min/Max)	23" / 44-3/8" (584mm/1127mm)
Rear reach (Min/Max)	36" / 58" (914mm/1473mm)
Min/Max adapter height	3-3/4" (95mm) w/o adapter extension 8-3/4" (222mm) w/ 5" adapter extension
Width inside column	109" or optional 115" (2769mm/2921mm)
Voltage/ Amps	208V/230V, 17 amps
Motor/Phase	1ph/2HP/60Hz
Ceiling height required	144" (3658mm)



996 Industrial Drive
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www.forwardlift.com



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*Lifts available in blue and red
Specifications subject to change without notice or liability.



Current Date: 3/16/2024 3:36 PM

Units system: English

Design Results

Reinforced Concrete Footings

General Information

Global status : OK
 Design Code : ACI 318-2014
 Footing type : Combined
 Column type : Steel

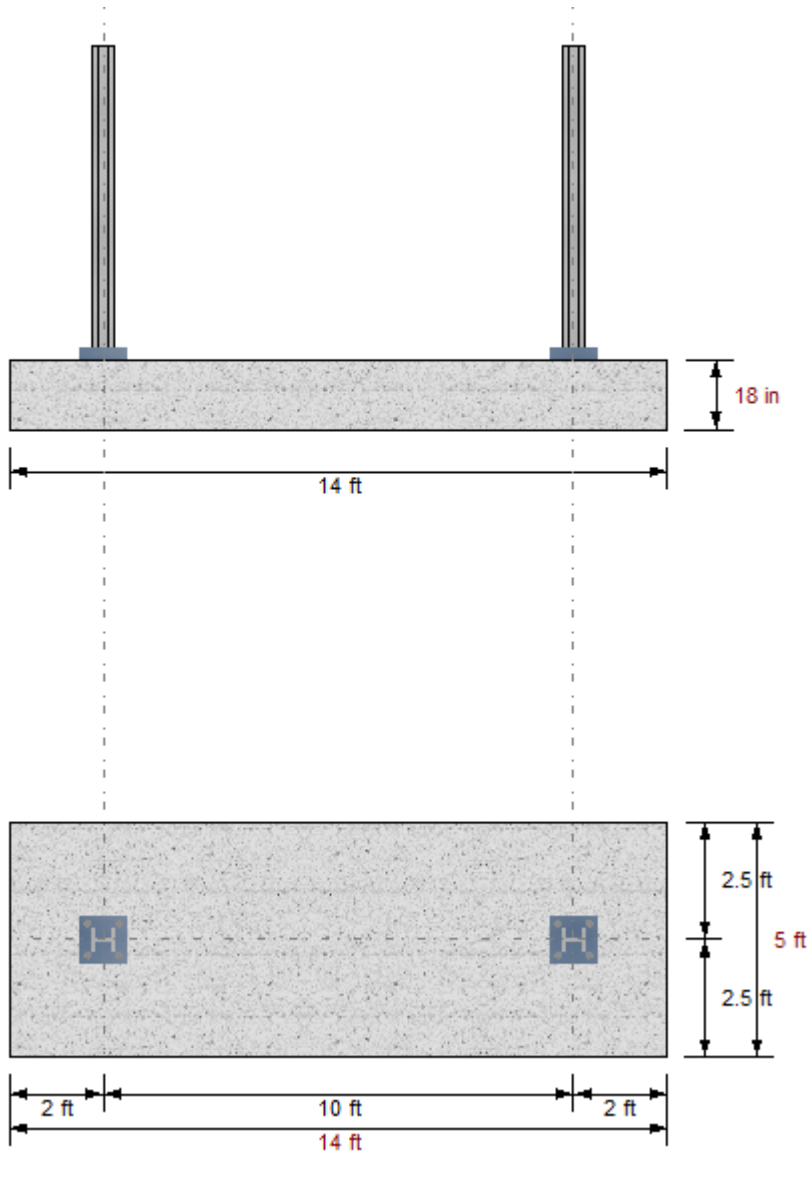
Materials

Concrete, f _c	:	3.00 [Kip/in ²]	Steel, f _y	:	60.00 [Kip/in ²]
Concrete type	:	Normal	Epoxy coated	:	No
Concrete elasticity modulus	:	3122.02 [Kip/in ²]	Steel elasticity modulus	:	29000.00 [Kip/in ²]
Unit weight	:	0.15 [Kip/ft ³]			

Soil

Modulus of subgrade reaction : 200.00 [Kip/ft³]
 Unit weight (wet) : 0.11 [Kip/ft³]

Geometry



Length	:	14.00 [ft]	
Width	:	5.00 [ft]	
Thickness	:	1.50 [ft]	
Base depth	:	1.50 [ft]	
Base area	:	70.00 [ft ²]	
Footing volume	:	105.00 [ft ³]	
Base plate length 1	:	12.00 [in]	
Base plate width 1	:	12.00 [in]	
Column length 1	:	6.00 [in]	
Column width 1	:	6.00 [in]	
Base plate length 2	:	12.00 [in]	
Base plate width 2	:	12.00 [in]	
Column length 2	:	6.00 [in]	
Column width 2	:	6.00 [in]	
Distance between columns	:	10.00 [ft]	
Column location relative to footing g.c.	:	Centered	

Reinforcement

Longitudinal reinforcement

Free cover : 3.00 [in]
 Maximum Rho/Rho balanced ratio : 0.75
 Bottom reinforcement // to L (xx) : 7-#5 @ 9.00"
 Top reinforcement // to L (xx) : 7-#5 @ 9.00"
 Bottom reinforcement // to B (zz) : 2-#5 @ 6.00" (Zone 1)
 Bottom reinforcement // to B (zz) : 3-#5 @ 14.00" (Zone 2)
 Bottom reinforcement // to B (zz) : 10-#5 @ 10.00" (Zone 3)
 Bottom reinforcement // to B (zz) : 3-#5 @ 14.00" (Zone 4)
 Bottom reinforcement // to B (zz) : 2-#5 @ 6.00" (Zone 5)

Load Conditions

Service loads:

S1 : DL
 S2 : DL+LL
 S3 : DL+0.75LL

Design strength loads:

D1 : 1.4DL
 D2 : 1.2DL+1.6LL

Loads

Condition	Footing	Node	Column	Axial [Kip]	Mxx [Kip*ft]	Mzz [Kip*ft]	Vx [Kip]	Vz [Kip]
DL	1	1	1	0.76	0.00	0.00	0.00	0.00
LL	1	1	1	5.00	-10.00	0.00	0.00	1.25
DL	1	3	2	0.76	0.00	0.00	0.00	0.00
LL	1	3	2	5.00	-10.00	0.00	0.00	1.25

Design

Status : OK

Soil Foundation Interaction

Allowable stress : 2E03 [Lb/ft2]
 Min. safety factor for sliding : 1.00
 Min. safety factor for overturning : 1.00
 Controlling condition : S2 - 1

Condition	qmean [Lb/ft2]	qmax [Lb/ft2]	Δmax [in]	Area in compression [ft2]	(%)	Overturning FSx	FSz	FS slip
S2 - 1	398	797	0.0478	68.41	98	2.87	1000.00	5.00

Bending

Factor ϕ : 0.90
 Min rebar ratio : 0.00180

Development length

Axis	Pos.	ld [in]	lhd [in]	Dist1 [in]	Dist2 [in]
z	Bot.	24.04	8.42	22.50	22.50
x	Bot.	24.53	8.59	16.50	16.50
x	Top	12.00	6.00	18.00	18.00

Axis	Pos.	Condition Footing	Mu [Kip*ft]	ϕ *Mn [Kip*ft]	Asreq [in ²]	Asprov [in ²]	Asreq/Asprov	Mu/(ϕ *Mn)	
zz	Top	D2 - 1	-13.37	-139.27	0.20	2.17	0.094	0.096	
zz	Bot.	D2 - 1	1.68	139.27	1.74	2.17	0.802	0.012	
Zone 1 xx	Top	D1 - 1	0.00	0.00	0.00	0.00	0.000	0.000	
Zone 1 xx	Bot.	D1 - 1	0.00	37.15	0.32	0.62	0.510	0.000	
Zone 2 xx	Top	D1 - 1	0.00	0.00	0.00	0.00	0.000	0.000	
Zone 2 xx	Bot.	D2 - 1	1.90	57.24	0.92	0.93	0.993	0.033	
Zone 3 xx	Top	D1 - 1	0.00	0.00	0.00	0.00	0.000	0.000	
Zone 3 xx	Bot.	D1 - 1	0.00	190.61	2.96	3.10	0.956	0.000	
Zone 4 xx	Top	D1 - 1	0.00	0.00	0.00	0.00	0.000	0.000	
Zone 4 xx	Bot.	D2 - 1	1.90	57.24	0.92	0.93	0.993	0.033	
Zone 5 xx	Top	D1 - 1	0.00	0.00	0.00	0.00	0.000	0.000	
Zone 5 xx	Bot.	D1 - 1	0.00	37.15	0.32	0.62	0.510	0.000	

Shear

Factor ϕ	:	0.75
Shear area (plane zz)	:	6.12 [ft ²]
Shear area (plane xx)	:	16.41 [ft ²]

Plane	Condition Footing	Vu [Kip]	Vc [Kip]	Vu/(ϕ *Vn)	
xy	D2 - 1	10.60	258.80	0.055	
yz	D2 - 1	4.33	96.54	0.060	

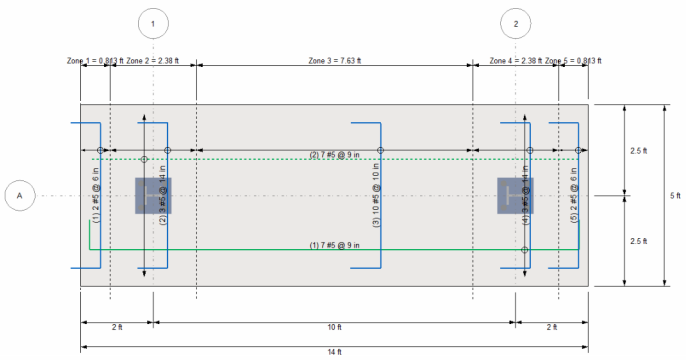
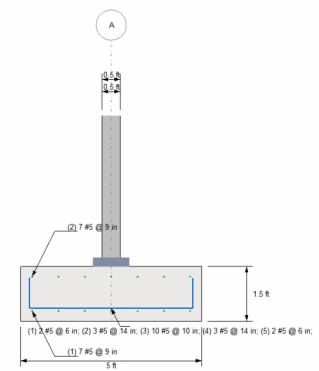
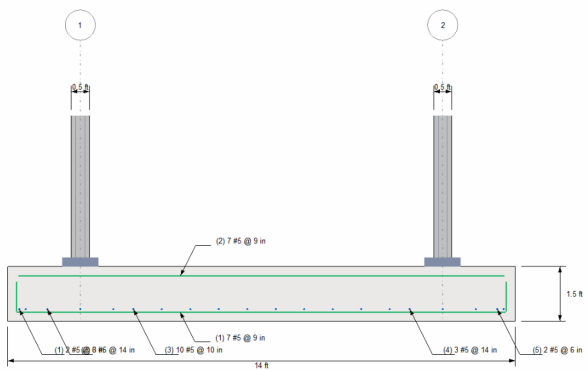
Punching shear

Factor ϕ	:	0.75
Perimeter of critical section (b...	:	7.79 [ft]
Punching shear area	:	9.33 [ft ²]
Perimeter of critical section (b...	:	7.79 [ft]
Punching shear area	:	9.33 [ft ²]

Column	Condition Footing	Vu [Kip]	Vc [Kip]	Vu/(ϕ *Vn)	
column 1	D2 - 1	7.99	294.47	0.036	
column 2	D2 - 1	7.99	294.47	0.036	

Notes

- * Soil under the footing is considered elastic and homogeneous. A linear soil pressure variation is assumed.
- * The required flexural reinforcement considers at least the minimum reinforcement
- * The design bending moment is calculated at the critical sections located at the support faces
- * Only rectangular footings with uniform sections and rectangular columns are considered.
- * The nominal shear strength is calculated in critical sections located at a distance d from the support face
- * The punching shear strength is calculated in a perimetral section located at a distance $d/2$ from the support faces
- * Transverse reinforcement is not considered in footings
- * Values shown in red are not in compliance with a provision of the code
- * q_{prom} = Mean compression pressure on soil.
- * q_{max} = Maximum compression pressure on soil.
- * Δ_{max} = maximum total settlement (considering an elastic soil modeled by the subgrade reaction modulus).
- * M_n = Nominal moment strength
- * $M_u/(\phi M_n)$ = Strength ratio.
- * V_n = Nominal shear or punchure force (for footings $V_n=V_c$).
- * $V_u/(\phi V_n)$ = Shear or punching shear strength ratio.





Stresses
[Lb/ft²]

