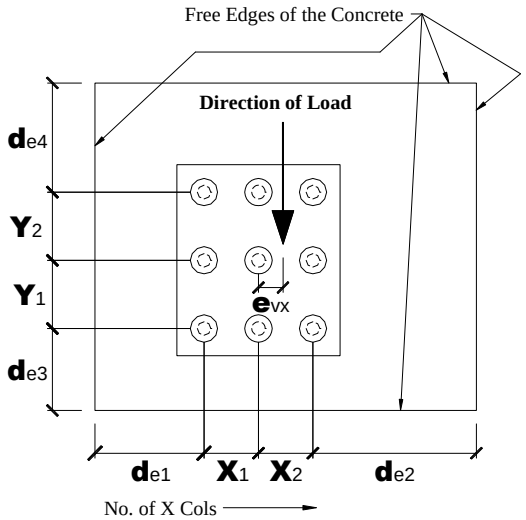
DESIGN DATA

Design Criteria : PCI Design Handbook, 6th Ed.
H.A.S. Properties : Type = Custom
d_s = 0.500 in d_h = 1.000 in
l_e = 5.688 in A_s = 0.196 in^2
f_y = 50.0 ksi f_u = 65.0 ksi
Plate Thk = 0.500 in
No. of Studs : X-rows = 2 Y-rows = 2
Total = 4
Edge dist. : d_{e1} = 6.000 in d_{e3} =100.000 in
Stud Spac'g X_1 = 6.000 in Y_1 = 3.000 in
d_{e2} = 6.000 in d_{e4} =100.000 in
Fig. 6.5.4.2, PCI Hdbk (6th Ed) Case = 3
Y-rows included in group pullout = 2
Load Eccentr'y : e_{nx} = 0.00 in e_{ny} = 0.00 in
e_{vx} = 0.00 in
Concrete Member Thickness = 18.00 in
Material Properties : f'$_c$ = 6.00 ksi λ = 1.00
Concrete = Normal Wt.
ϕ factors : Tension: ϕ_s = 0.75 ϕ_c = 0.75
Shear : ϕ_s = 0.65 ϕ_c = 0.75
Pullout / Pryout : ϕ_p = 0.70
Tension/Shear Modifiers : No Cracking at service load level (Fig 6.5.5.2)
Supplementary Reinf. for Tension & Shear Loads (§ 6.2.1.3)



Applied Loads : V_u = 12.5 k N_u = 4.0 k
M = 0.0 in-k M_u= 150.0 ft-k

Bracket dimensions : Depth = 10.00 in Width = 10.00 in
e = 12.0 in α = 0.0 deg

OUTPUT

A) Tension capacity for group of 4 studs; ϕ_s = 0.75; ϕ_c = 0.75

Steel Stud Strength	: ϕN_s = 0.75 * 51.05 =	38.3 k	(Eq 6.5.2.1)
Concrete Breakout Strength (1)	: ϕN_{cb} = 0.75 * 35.88 =	26.9 k	(Eq 6.5.4.1)
Concrete Pullout Strength (2)	: ϕN_{png}= 0.70 * 158.34 =	110.8 k	(Eq 6.5.4.5*)
Concrete Side Face Blowout (3)	: ϕN_{sb} (Not Calculated)		(Eq 6.5.4.6)

Group tensile strength based on:
(1) Projected Surface Area, A_N = 381.40 in^2 (Fig 6.5.4.1)
Modifiers : C_{bs} = 104.755 (Eq 6.5.4.2) C_{crb} = 1.000 (p 6-14)
ψ_{ed} = 0.898 (Eq 6.5.4.3) ψ_{ec} = 1.000 (Eq 6.5.4.4)
(2) Modifier : C_{crp} = 1.000 (p 6-17)
(*) No equation is given for pullout of a group. We use n_g*N_{pn} where n_g is the number of studs in the group.
(3) All edge distances > 0.4 * h_{ef} (§ 6.5.4.3)

B) Shear capacity for group of 4 studs; ϕ_s = 0.65; ϕ_c = 0.75

Steel Stud Strength	: ϕV_s = 0.65 * 51.05 =	33.2 k	(Eq 6.5.2.1)
Concrete Front Edge Breakout(1)	: ϕV_{c3} (Not Calculated)		(Eq 6.5.5.1)
Concrete Side Edge Breakout (2)	: ϕV_{c1} = 0.75 * 50.79 =	38.1 k	(Eq 6.5.5.12)
Concrete Pryout Strength (3)	: ϕV_{cp} (Not Calculated)		(Eq 6.5.7.1)

Group shear strength based on:
(1) SED < 0.2 * BED (Eq. 6.5.5.7)
(2) One fastener in concrete V_{co1} = 43.4 k
Modifiers : C_{x1} = 2.000 (Eq 6.5.5.14) C_{y1} = 0.585 (Eq 6.5.5.16)

C_{ev1} = 1.000 (Eq 6.5.5.17) C_{vcr} = 1.000 (Fig 6.5.5.2)

(3) $\lambda h_{ef} > 4.5 * d_s$ (§ 6.5.7)

C) Combined tension and shear for bracket

Lever arm j_u*d = 9.85 in
$T_u = M_u/j_ud$ = 15.2 k
$N_u = T_u + N_{uh}$ = 19.2 k, group of 4
V_u = 12.5 k, group of 4
From (A), N_n = 35.9 k, group of 4
From (B), V_n = 51.1 k, group of 4

Interaction ratios:
N_u/N_n = 19.2 / 35.9 = 0.54
V_u/V_n = 12.5 / 51.1 = 0.24

Interaction Eqns. (needs to satisfy one):
$(0.54)/\phi + (0.24)/\phi =$ (Eq 6.5.8.1)
0.54/0.75 + 0.24/0.65 = 1.09 < 1.2 OK
$(0.54/\phi)^{5/3} + (0.24/\phi)^{5/3} =$ (Eq 6.5.8.2)
0.57 + 0.20 = 0.77 < 1.0 OK