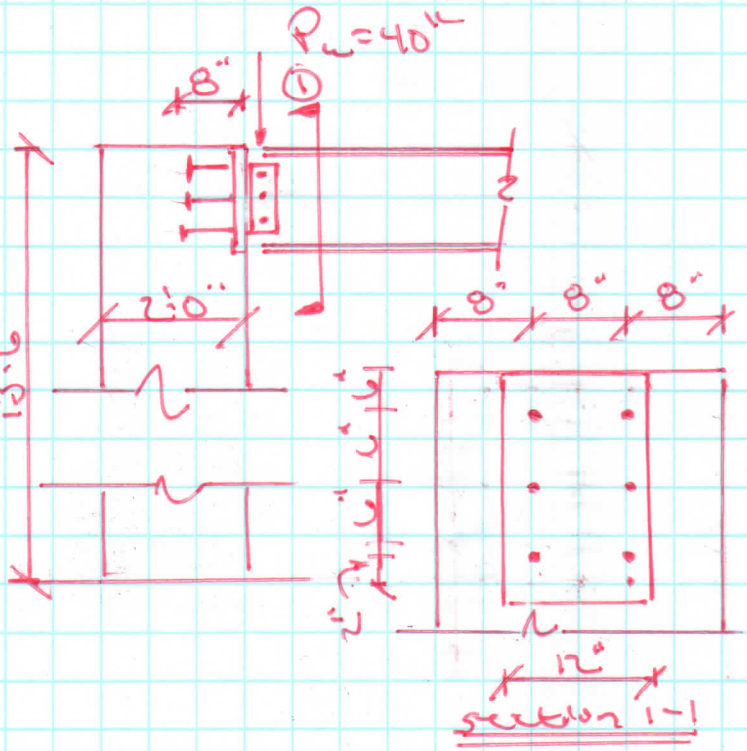
Design of embedded plate for shear



PCI Design Handbook

$\phi V_c = \phi V_c' \zeta_w \zeta_e \zeta_z$

$\phi V_c' = \phi 12.5 d_e^{1.5} \lambda (f'_c)^{1/2}$

$\lambda = 1.0 \quad f'_c = 3{,}000$

$d_e = 13'0"$

$\therefore \phi V_c' = (.85)(12.5)(13\times12)^{1.5}(1)(3000)^{1/2}$

$\therefore \phi V_c' = 1{,}133$ kips

$\zeta_w = 1 + b/3.5 d_e \le n_s \quad \therefore$ any $\zeta_w = 1.0$ (conservative)

$\zeta_e = n/1.3 d_e \le 1.0 = 24/(1.3)(13\times12) = .118$

$\zeta_z = .4 + .7\, d_z/d_e \le 1.0 = .4 + .7\,(8/(13)(12)) = .435$

$\therefore \phi V_c = (1{,}133)(1)(.118)(.435) = \underline{58.1 \text{ kips}}$

$\phi V_y = \phi .9 f_y A_s n = (.9)(.9)(34{,}000)(.44)n$

$= 12830n$

$\therefore n = 40{,}000/12830 = 3.11 \quad \therefore$ any 4 $\frac{3}{4}$" ϕ bolts

weight of plate $\approx$ 68# + studs

$\therefore$ use 6 - $\frac{3}{4}$" ϕ bolts $\quad \phi V_y = 74.9$ kips

58.1 kips > 40 kips $\therefore$ O.K.