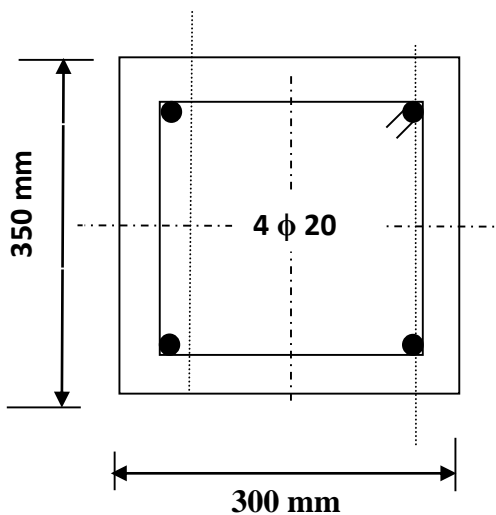


CE 363 – Dr. Mohammad Alhaddad
Example 1 on Columns (Check Design)

The short tied column shown in the Figure was designed and reinforced with $4\phi 20$ steel bars to support an axial service dead load of 700 kN, and a service axial live load of 220 kN. Using $f'_c = 25\text{MPa}$ and $f_y = 420\text{ MPa}$.

- Calculate the ultimate axial load applied on the column (applied design load)?
- Check the maximum load capacity according to SBC 304 provisions?
- Using 10 mm diameter ties, Calculate the ties spacings according to SBC 304 provisions?



Given:

$$A_g = 105000 \text{ mm}^2$$

$$A_s = 1256.6 \text{ mm}^2$$

Solution:

a) $P_u = 1.4*DL + 1.7LL = 1354 \text{ kN}$

b) Check if $P_u \leq \phi P_{n(\max)}$ $= 0.65 \times 0.80 \times P_0 = 0.65 [0.80 (0.85 f'_c (A_g - A_{st}) + f_y A_{st})]$
 $= 0.52 [0.85 f'_c (A_g - A_s) + f_y A_s] = 1420.8 \text{ kN}$

Applied $P_u = 1354 \text{ kN} < \phi P_n = 1420.8$ **Ok, Safe design**

c) Calculate S max as:

$$S_{\max} = \text{Min}[16d_b, 48d_s, \text{Min}(b, h)] \quad \therefore \quad S_{\max} = 300 \text{ mm}$$

d) Draw Detail (Cross Section and longt. Section and show details)

