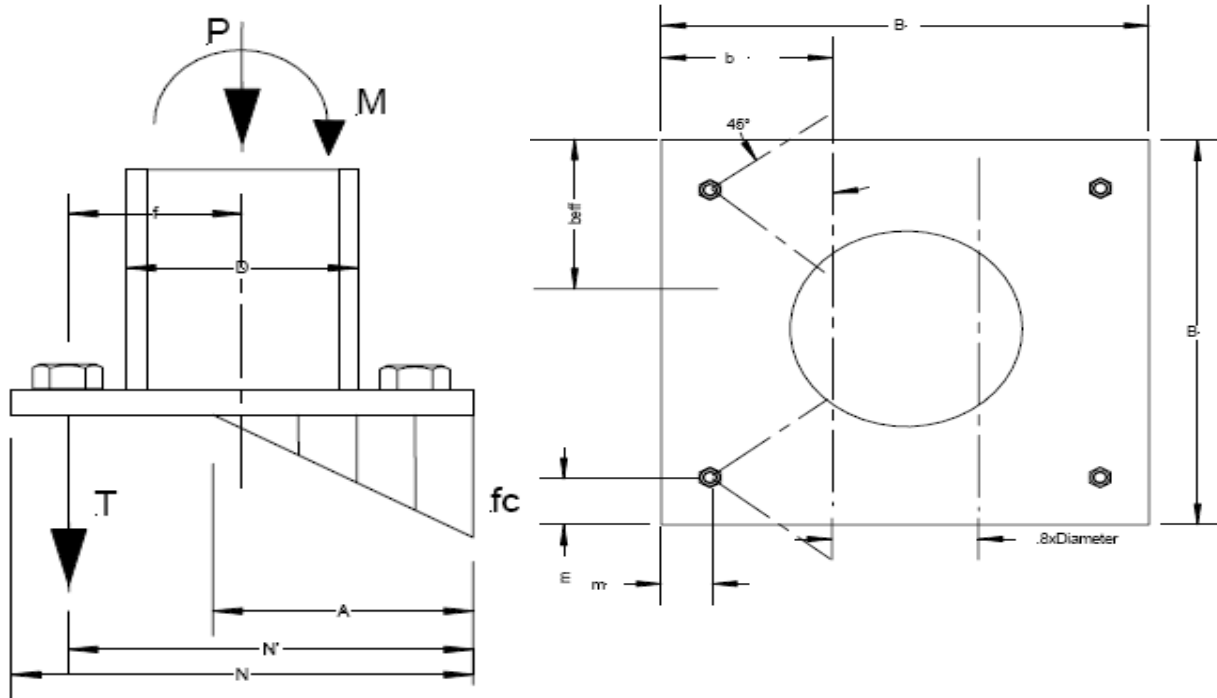


CALCULATION OF BASE PLATE CONNECTION

Analyze Square Base Plate using the STIFF PLATE APPROACH Methode (Example 1.3)



1. Steel Bar (f_y) = **2400 kg/cm²**
 Concrete K-225 = **225 kg/cm²** (0.35 f_c)

2. Maximum force at tower Base
 P = **18850.06 kg**
 T = **18850.47 kg**
 S = **6443.79 kg**
 M = **370629750.31 kg-mm**

3. Requirement Area of Base Plate =
- | | | | |
|-------------------------|----------|-----------------|---|
| Type LEG | = CHS 8" | Inchi | (Diameter Pipe of Member) |
| D | = | 203.2 mm | (Depth of Section) |
| Dimensi Plate B or N | = | 355.6 mm | (PXL=14'x14') |
| m | = | 38.1 mm | (Distance from bolt center line to the edges of) |
| f | = | 139.7 mm | (Distance from bolt center line to the center of) |
| d = D _{Bolt} | = | 30 mm | (Diameter of Bolt) |
| Dimensi Pedestal B or N | = | 405.6 mm | |

4. Checking Allowable Stress of Base Plate

$$F_p = 0.85 \cdot f'_c \sqrt{\frac{A_s}{A_p}} = 204.25 \text{ kg/cm}^2$$

$$e = \frac{M}{P} = 19661.99 \text{ mm}$$

$$e_{kern} = \frac{N}{6} = 59.27 \text{ mm}$$

...[$e > e_{kern}$], Large Moment base, and must designed for tension anchorage

$$n = \frac{E_s}{E_c \cdot \text{or} \cdot (57 \sqrt{f_c'})} = = 10.67$$

$$d_s = 1000 \cdot n = = 48.00 \text{ mm}$$

$$K_1 = 3 \cdot \left(e - \frac{N}{2} \right) = = 58452.57 \text{ mm}$$

$$K_2 = \frac{6 \cdot n \cdot A_s}{B} (f + e) = = 171065.23 \text{ mm}$$

$$K_3 = -K_2 \left(\frac{N}{2} + f \right) = = -54313209.48 \text{ mm}$$

Solving for A by Trial, $A^3 + K_1 \cdot A^2 + K_2 \cdot A + K_3 = 0$

$$A = = 25.84 \text{ mm}$$

-10830900.00 ...Trial OK

$$T = -P \frac{\left[\frac{N}{2} - \frac{A}{3} - e \right]}{\left[\frac{N}{2} - \frac{A}{3} + f \right]} = = 1189570.74 \text{ kg}$$

$$= 594785.37 \text{ kg/bolt}$$

$$f_c = \frac{T \cdot A}{A_s \cdot n \cdot \left(\frac{N}{2} - A + f \right)} = = \begin{matrix} 2058.85 \text{ kg/cm}^2 \\ 2058.85 \end{matrix} \begin{matrix} \dots \text{NOT OK} \\ > 204.25 \end{matrix}$$

5. Thickness of the plate is determined by checking both the compression and tension sides. The critical section is at,

$$b = \frac{B - 0.8 \cdot D}{2} = = 96.52 \text{ mm}$$

$$f_{cpl} = \frac{A - b}{A} \cdot x f_c = = 5630.11 \text{ kg/cm}^2$$

$$M_{PL} = \frac{f_{cpl} \cdot x b^2}{2} + \frac{(f_c - f_{cpl}) b^2}{3} = = 151352.96 \text{ kg-mm}$$

$$S_{reqd} = \frac{M}{F_b} = \frac{W \cdot x t_{PL}^2}{6} = = \text{dimana } W=1$$

$$F_b = 0.75 \cdot F_y$$

$$t_{PL} = \sqrt{\frac{6 \cdot x M}{F_b}} = = 224.61 \text{ mm}$$

Critical width on the tension side is defined by AISC :

$$M_{pl} = T \cdot x (b - m) = = 34747361.34 \text{ kg-mm}$$

$$(b - m) = r = = 58.42 \text{ mm}$$

Used = = 38.10 mm

$$b_{eff} = r + (b - m) = = 96.52 \text{ mm}$$

$$t_{PL} = \sqrt{\frac{6 \cdot x M}{b_{eff} \cdot x F_b}} = = \begin{matrix} 346.41 \\ 346.41 \end{matrix} \begin{matrix} \dots \text{OK} \\ > 224.61 \end{matrix}$$