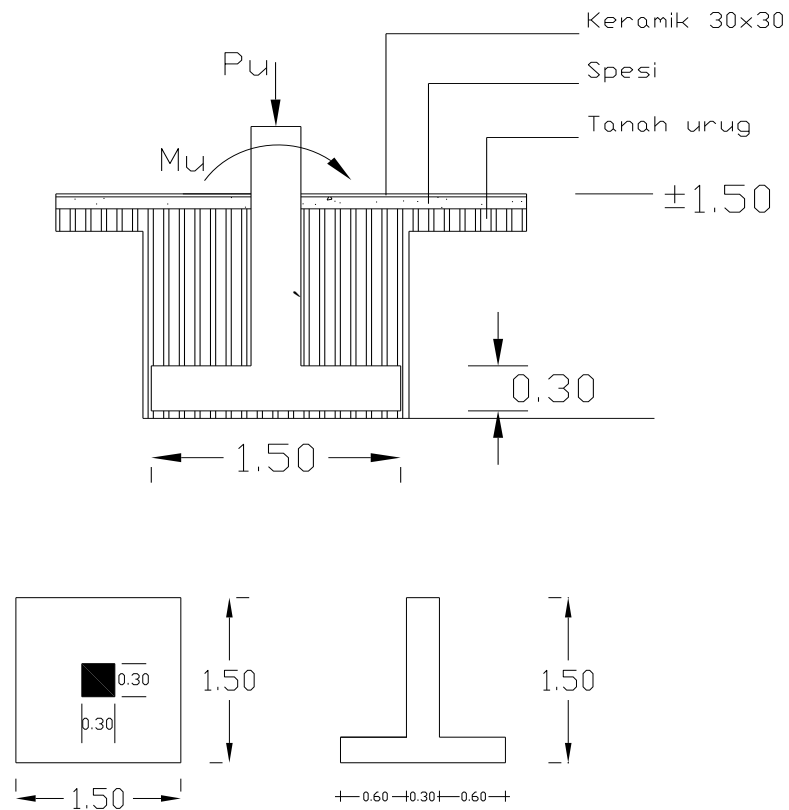


## BAB 7 PERENCANAAN PONDASI



Gambar 8.1 Perencanaan Pondasi

Direncanakan pondasi telapak dengan kedalaman 1,5 m dan panjang 1,0 m dan lebar 1,0 m

- $f'_c$  = 30 MPa
- $f_y$  = 360 MPa
- $\sigma_{\text{tanah}}$  =  $2 \text{ kg/cm}^2 = 20.000 \text{ kg/m}^2$
- $\gamma_{\text{tanah}}$  =  $1,7 \text{ t/m}^3 = 1700 \text{ kg/m}^3$
- $\gamma_{\text{beton}}$  =  $2,4 \text{ t/m}^3$

Dari perhitungan SAP 2000 pada diperoleh :

- Pu = 28057,99 kg (**frame 19**)
- Mu = 461,25 kgm (**frame 13**)

Dimensi Pondasi

$$\Sigma_{\text{tanah}} \frac{Pu}{A} =$$

$$A = \frac{Pu}{\sigma_{\text{tanah}}} = \frac{28057,99}{20000} = 1,402 \text{ m}^2$$

$$B=L=\sqrt{A} = \sqrt{1,402} = 1,18 \sim 1,2 \text{ m}$$

Chek Ketebalan

$$d \geq \frac{Pu}{\phi \frac{1}{6} \sqrt{f'_{cb}}} = \frac{28057,99}{0,6 \cdot \frac{1}{6} \sqrt{30} \cdot 1200} = 42,688 \sim 50 \text{ mm}$$

Tebal telapak pondasi 50 + 250 = 300 mm

## 7.1. Perencanaan kapasitas dukung pondasi

### 7.1.1. Perhitungan kapasitas dukung pondasi

➤ Pembebanan pondasi

Berat telapak pondasi	= 1,5 x 1,5 x 0,3 x 2400	= 1620	kg
Berat tanah	= (1,5.1,5.1,5)-(0,3.0,3.1,5).1700	= 3442,5	kg
Berat kolom pondasi	= 0,3 x 0,3 x 1,2 x 2400	= 259,2	kg
Berat Spesi	= (0,02 x 1,5 x 1,5) x 2100	= 94,5	kg
Berat Keramik (0,5 cm)		= 15	kg
Pu		= 28057,99	kg
	V total	=	<u>33489,19</u> kg

$$\sigma_{\text{yang terjadi}} = \frac{V_{\text{tot}}}{A} \pm \frac{M_{\text{tot}}}{\frac{1}{6} \cdot b \cdot L^2}$$

$$\sigma_{\text{tan ahl}} = \frac{33489,19}{1,5 \cdot 1,5} + \frac{461,25}{1/6 \cdot 1,5 \cdot (1,5)^2} = 15704,08 \text{ kg/m}^2$$

$$\sigma_{\text{tan ahl}} = \frac{33489,19}{1,5 \cdot 1,5} - \frac{461,25}{1/6 \cdot 1,5 \cdot (1,5)^2} = 14884,08 \text{ kg/m}^2$$

$$= \sigma_{\text{tan ahterjadi}} < \sigma_{\text{ijin tanah}} \dots \dots \dots \text{Ok!}$$

## 7.2 Penulangan Pondasi

### 7.2.1. Perhitungan Tulangan Lentur

$$M_u = \frac{1}{2} \cdot q_u \cdot t^2 = \frac{1}{2} \cdot 15704,08 \cdot (0,35)^2 = 961,87 \text{ kgm} = 0,96187 \cdot 10^6 \text{ Nmm}$$

$$M_n = \frac{0,96187 \cdot 10^6}{0,8} = 1,2 \cdot 10^6 \text{ Nmm}$$

$$m = \frac{f_y}{0,85 \cdot 30} = \frac{360}{0,85 \cdot 30} = 14,1176$$

$$\rho_b = \frac{0,85 \cdot f_c}{f_y} \beta \left( \frac{600}{600 + f_y} \right)$$

$$= \frac{0,85 \cdot 30}{360} \cdot 0,85 \cdot \left( \frac{600}{600 + 360} \right) = 0,0376$$

$$R_n = \frac{M_n}{b \cdot d^2} = \frac{1,2 \cdot 10^6}{1000(250)^2} = 0,0192$$

$$\rho_{\text{max}} = 0,75 \cdot \rho_b$$

$$= 0,028$$

$$\rho_{\text{min}} = \frac{1,4}{f_y} = \frac{1,4}{360} = 0,0038$$

$$\rho_{\text{perlu}} = \frac{1}{m} \left( 1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right) = \frac{1}{14,1176} \cdot \left( 1 - \sqrt{1 - \frac{2 \cdot 14,1176 \cdot 0,0192}{360}} \right)$$

$$= 0,000533$$

$$\rho_{\text{perlu}} < \rho_{\text{max}}$$

$$< \rho_{\text{min}}$$

$$\begin{aligned} A_{s \text{ perlu}} &= \rho_{\text{min}} \cdot b \cdot d \\ &= 0,0038 \cdot 1000 \cdot 250 \\ &= 950 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} \text{digunakan tul } \varnothing 16 &= \frac{1}{4} \cdot \pi \cdot d^2 \\ &= \frac{1}{4} \cdot 3,14 \cdot (16)^2 \\ &= 200,96 \text{ mm}^2 \end{aligned}$$

$$\text{Jumlah tulangan (n)} = \frac{950}{200,96} = 4,72 \sim 5 \text{ buah}$$

$$\text{Jarak tulangan} = \frac{1000}{5} = 200 \text{ mm}$$

Sehingga dipakai tulangan  **$\varnothing 16 - 200 \text{ mm}$**

$$A_s \text{ yang timbul} = 5 \times 200,96 = 1004,8 > A_s \dots \dots \dots \text{ok!}$$

### **7.2.2. Perhitungan Tulangan Geser**

$$\begin{aligned} V_u &= \sigma \times A_{\text{efektif}} \\ &= 15704,08 \times (0,3 \times 1,5) \\ &= 7066,83 \text{ kg} \\ &= 70668,3 \text{ N} \end{aligned}$$

$$\begin{aligned} V_c &= \frac{1}{6} \cdot \sqrt{f_c} \cdot b \cdot d \\ &= 228217,73 \text{ N} \end{aligned}$$

$$\begin{aligned} \varnothing V_c &= 0,6 \cdot V_c \\ &= 136930,63 \text{ N} \end{aligned}$$

$$\begin{aligned} 3\varnothing V_c &= 3 \cdot \varnothing V_c \\ &= 410791,91 \text{ N} \end{aligned}$$

$V_u < \varnothing V_c < 3\varnothing V_c$  tidak perlu tulangan geser

Tulangan geser minimum  **$\varnothing 8 - 200 \text{ mm}$**