

PERHITUNGAN PEMBEBANAN (Persamaan TALBOT)

A. Kecepatan 80 km/jam

1. Beban dinamis

$$\begin{aligned} P_d &= P_s \left(1 + 0,01 \left(\frac{1,25 \times V}{1,609} \right) - 5 \right) \\ &= 9000 \left(1 + 0,01 \left(\frac{1,25 \times 80}{1,609} \right) - 5 \right) \\ &= 14.143,536 \text{ Kg} \end{aligned}$$

2. Pembebanan pada rel

Diketahui :

$$k = 180 \text{ Kg/cm}^2$$

$$I_x = 2.346 \text{ cm}^4$$

$$P = 18 \text{ Ton}$$

R54

$$E = 2,1 \times 10^6$$

a. Faktor Induksi

$$\lambda = \sqrt[4]{\frac{k}{4EI}}$$

$$\lambda = \sqrt[4]{\frac{180}{4 \times 2,1 \times 10^6 \times 2.346}} = 0,009776 \text{ cm}^{-1}$$

b. Momen Maksimum

$$M_n = \frac{P_d}{4\lambda}$$

$$M_n = \frac{14.143,536}{4 \times 0,009776} = 361.690,271 \text{ Kgcm}$$

3. Pembebanan pada bantalan (Persamaan BoEF)

$$Q_1 = 0,786 \times \left(\frac{Pd \times S}{X_1} \right) \quad \text{Untuk ; } X_1 = \frac{\pi}{4 \times \lambda} = \frac{\pi}{4 \times 0,009776} = 80,3394 \text{ cm}$$

$$Q_1 = 0,786 \times \left(\frac{14.143,536 \times 60}{80,3394} \right) = 8302,39 \text{ kg} \approx 83,0239 \text{ kN/m}$$

B. Kecepatan 100 km/jam

1. Beban dinamis

$$Pd = Ps \left(1 + 0,01 \left(\frac{1,25 \times V}{1,609} \right) - 5 \right)$$

$$= 9000 \left(1 + 0,01 \left(\frac{1,25 \times 100}{1,609} \right) - 5 \right) = 15.541,92 \text{ Kg}$$

2. Pembebanan pada rel

Diketahui :

$$k = 180 \text{ Kg/cm}^2$$

$$I_x = 2.346 \text{ cm}^4$$

$$P = 18 \text{ Ton}$$

R54

$$E = 2,1 \times 10^6$$

a. Faktor Induksi

$$\lambda = \sqrt[4]{\frac{k}{4 EI}}$$

$$\lambda = \sqrt[4]{\frac{180}{4 \times 2,1 \times 10^6 \times 2.346}} = 0,009776 \text{ cm}^{-1}$$

b. Momen Maksimum

$$Mn = \frac{Pd}{4 \lambda}$$

$$Mn = \frac{15.541,92}{4 \times 0,009776} = 397.450,9 \text{ Kgcm}$$

3. Pembebanan pada bantalan (Persamaan BoEF)

$$Q_1 = 0,786 \times \left(\frac{Pd \times S}{X_1} \right) \quad \text{Untuk ; } X_1 = \frac{\pi}{4 \times \lambda} = \frac{\pi}{4 \times 0,009776} = 80,3394 \text{ cm}$$

$$Q_1 = 0,786 \times \left(\frac{15.541,92 \times 60}{80,3394} \right) = 9123,39 \text{ kg} \approx 91,2339 \text{ kN/m}$$

C. Kecepatan 120 km/jam

1. Beban dinamis

$$\begin{aligned} Pd &= Ps \left(1 + 0,01 \left(\frac{1,25 \times V}{1,609} \right) - 5 \right) \\ &= 9000 \left(1 + 0,01 \left(\frac{1,25 \times 120}{1,609} \right) - 5 \right) = 16.940,3 \text{ Kg} \end{aligned}$$

2. Pembebanan pada rel

Diketahui :

$$k = 180 \text{ Kg/cm}^2$$

$$I_x = 2.346 \text{ cm}^4$$

$$P = 18 \text{ Ton}$$

R54

$$E = 2,1 \times 10^6$$

a. Faktor Induksi

$$\lambda = \sqrt[4]{\frac{k}{4 EI}}$$

$$\lambda = \sqrt[4]{\frac{180}{4 \times 2,1 \times 10^6 \times 2.346}} = 0,009776 \text{ cm}^{-1}$$

b. Momen Maksimum

$$Mn = \frac{Pd}{4 \lambda}$$

$$Mn = \frac{16.940,3}{4 \times 0,009776} = 433.211,4362 \text{ Kgcm}$$

3. Pembebanan pada bantalan (Persamaan BoEF)

$$Q_1 = 0,786 \times \left(\frac{Pd \times S}{X_1} \right) \quad \text{Untuk ; } X_1 = \frac{\pi}{4 \times \lambda} = \frac{\pi}{4 \times 0,009776} = 80,3394 \text{ cm}$$

$$Q_1 = 0,786 \times \left(\frac{16.940,3 \times 60}{80,3394} \right) = 9944,236 \text{ kg} \approx 99,44236 \text{ kN/m}$$

Tabel Nilai Q_1 dengan kelas jalan I dalam satuan beban (kN/m)

Kecepatan (km/jam)	Tipe Rel	Q1 (kN/m)
80	R54	83,0239
100	R54	91,2339
120	R54	99,4424