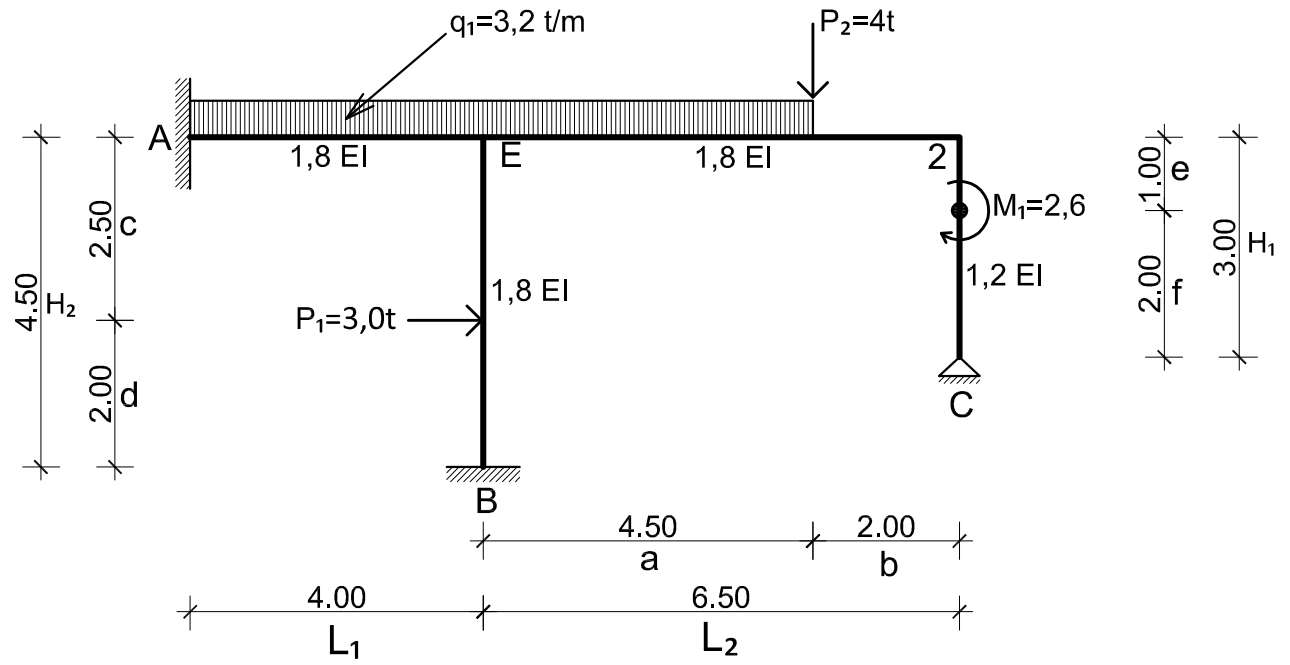


-Gambar Batang



A. Mencari Faktor Distribusi

Titik 1

$$\mu_{1-A} : \mu_{1-B} : \mu_{1-2}$$

$$\frac{4 (2 \text{ EI})}{L_1} : \frac{4 (1,8 \text{ EI})}{H_2} : \frac{4 (1,5 \text{ EI})}{L_2}$$

$$\frac{8}{4} : \frac{7,2}{4,5} : \frac{6,0}{6,5}$$

$$2 : 1,6 : 0,923$$

$$\mu_{1-A} : \frac{2}{(2+1,6+0,923)} = \frac{2}{4,523} = 0,442$$

$$\mu_{1-B} : \frac{1,6}{(2+1,6+0,923)} = \frac{1,6}{4,523} = 0,354$$

$$\mu_{1-2} : \frac{0,923}{(2+1,6+0,923)} = \frac{0,923}{4,523} = 0,204$$

Titik 2

$$\mu_{2-1} : \mu_{2-C}$$

$$\frac{4 (1,5 \text{ EI})}{L_2} : \frac{3 (1,2 \text{ EI})}{H_1}$$

$$\frac{6,0}{6,5} : \frac{3,6}{3,0}$$

$$0,923 : 1,2$$

$$\mu_{2-1} : \frac{0,923}{(0,923+1,2)} = \frac{0,923}{2,123} = 0,435$$

$$\mu_{2-C} : \frac{1,2}{(0,923+1,2)} = \frac{1,2}{2,123} = 0,564$$

Titik 1

$$\mu_{1-A} : 0,442$$

$$\mu_{1-B} : 0,354$$

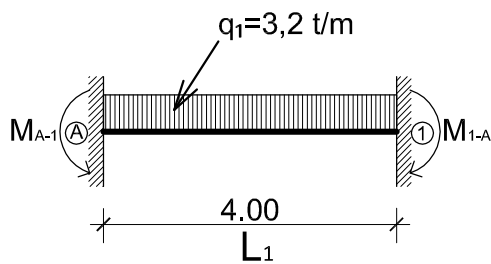
$$\mu_{1-2} : 0,204$$

Titik 2

$$\mu_{2-1} : 0,435$$

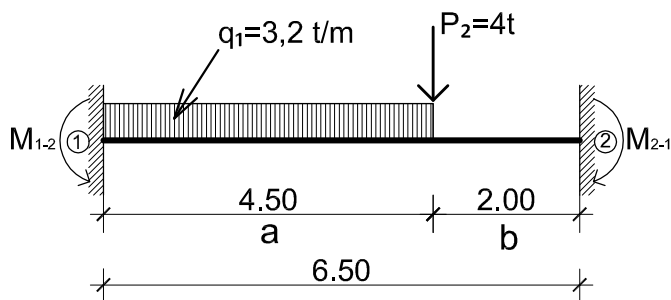
$$\mu_{2-C} : 0,564$$

B. Menghitung Momen Primer



$$M_{1A} = \frac{+q \cdot L_1^2}{12} = \frac{3,6 \cdot 4^2}{12} = 4,8 \text{ t.m}$$

$$M_{A1} = \frac{-q \cdot L_1^2}{12} = \frac{-3,6 \cdot 4^2}{12} = -4,8 \text{ t.m}$$



$$\alpha = \frac{a}{L_2}$$

$$\alpha = \frac{4,5}{6,5} = 0,692$$

$$M_{12} = \left[\frac{+q \cdot a \cdot L_2 \cdot \alpha}{12} (3\alpha^2 - 8\alpha + 6) \right] + \left[\frac{P_2 \cdot a \cdot b^2}{L_2^2} \right]$$

$$= \left[\frac{+3,6 \cdot 4,5 \cdot 6,5 \cdot 0,692}{12} (3 \cdot 0,692^2 - 8 \cdot 0,692 + 6) \right] + \left[\frac{4 \cdot 4,5 \cdot 2^2}{6,5^2} \right]$$

$$= (6,0723 (1,436 - 5,536 + 6)) + 1,704$$

$$= 11,537 = 1,704$$

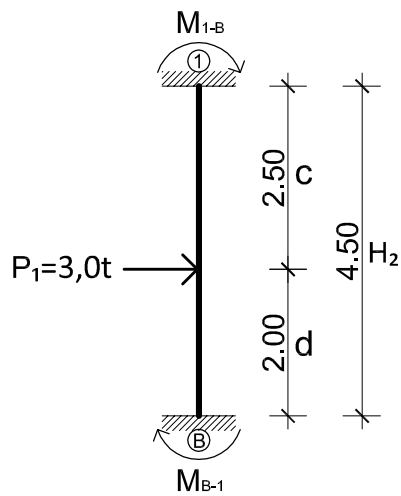
$$= 13,24 \text{ t.m}$$

$$M_{12} = \left[\frac{-q \cdot a \cdot L_2 \cdot \alpha^2}{12} (4 - \alpha) \right] + \left[\frac{-P_2 \cdot b \cdot a^2}{L_2^2} \right]$$

$$= \left[\frac{-3,6 \cdot 4,5 \cdot 6,5 \cdot 0,692^2}{12} (4 - 0,692) \right] + \left[\frac{4 \cdot 2 \cdot 4,5^2}{6,5^2} \right]$$

$$= -13,90 + (-3,83)$$

$$= -17,73 \text{ t.m}$$



$$M_{1B} = \frac{-P_1 \cdot c \cdot d^2}{H_2^2}$$

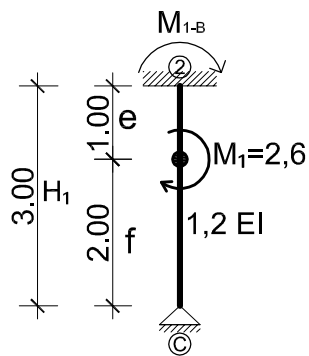
$$= \frac{-3 \cdot 2.5 \cdot 2^2}{4.5^2}$$

$$= -1.481 \text{ t.m}$$

$$M_{B1} = \frac{+P_1 \cdot d \cdot c^2}{H_2^2}$$

$$= \frac{+3 \cdot 2 \cdot 2.5^2}{4.5^2}$$

$$= 1.481 \text{ t.m}$$



$$\alpha = \frac{e}{H_1} = \frac{1.00}{3.00} = 0.33$$

$$M_{2C} = -\frac{M}{2} (2 - 6\alpha + 3\alpha^2)$$

$$= -\frac{3.4}{2} (2 - 6 \cdot 0.33 + 3 \cdot 0.33^2)$$

$$= -0.59 \text{ t.m}$$

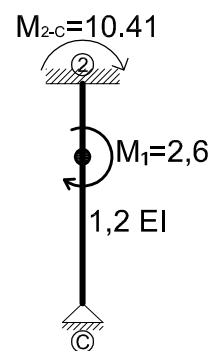
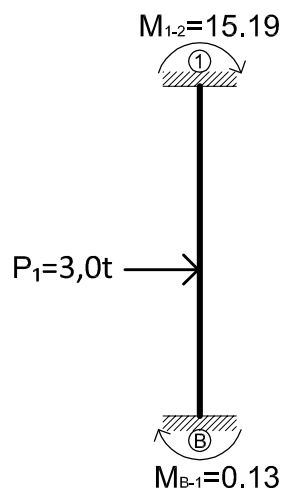
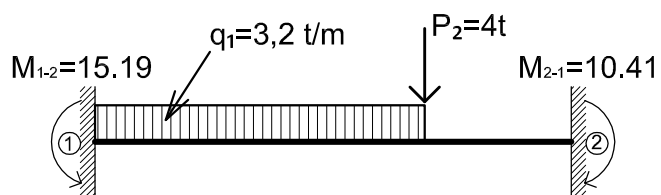
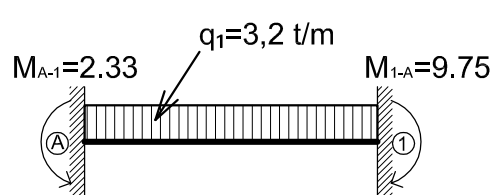
C. Tabel Perhitungan

$$(-4.8) + (-1.48) + 13.24 = 6.96$$

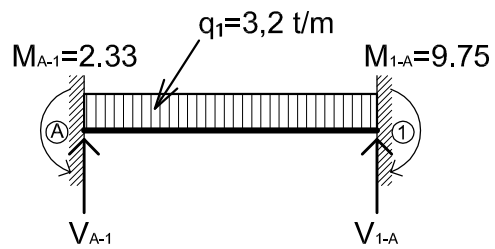
$$(-17.73) + (-0.59) + (-0.7102) = -19.030$$

		6.96			-19.030	
Titik	A	1			2	
Batas	A-1	1-A	1-B	1-2	2-1	2-C
μ		-0.442	-0.354	-0.204	-0.434	-0.565
Momen P	4.8	-4.8	-1.48	13.24	-17.73	-0.59
Tahap 1	<u>-1.5388</u>	-3.0776	-2.4621	-1.4203	<u>-0.7102</u>	
				<u>4.1367</u>	8.2736	10.7565
Tahap 2	<u>-0.9146</u>	-1.8292	-1.4633	-0.8442	<u>-0.4221</u>	
				<u>-0.0917</u>	0.1835	0.2385
Tahap 3	<u>-0.0203</u>	-0.0405	-0.0324	-0.0187	<u>-0.0094</u>	
				<u>-0.0020</u>	-0.0041	0.0053
Tahap 4	<u>-0.0004</u>	-0.0009	-0.0007	-0.0004	<u>-0.0002</u>	
				<u>-0.0004</u>	-0.0001	-0.0001
Total	2.33	-9.75	-5.44	-5.44	-10.41	-5.44
		0			0	

B
B-1
1.85
<u>-1.2310</u>
<u>-0.7317</u>
<u>-0.0162</u>
<u>-0.0003</u>
-0.13



D. Gaya Luar



$$\Sigma M1 = 0$$

$$V_{A1} \cdot L_1 - q_1 \cdot L_1 \left(\frac{1}{2} L_1 \right) + M_{A1} + M_{1A} = 0$$

$$V_{A1} \cdot 4 - 3,6 \cdot 4 \left(\frac{1}{2} \cdot 4 \right) - 2,33 + 9,75 = 0$$

$$V_{A1} \cdot 4 - 28,8 - 2,33 + 9,75 = 0$$

$$V_{A1} = \frac{21,38}{4} = 5,34 \text{ Ton } (\uparrow)$$

$$\Sigma MA = 0$$

$$-V_{1A} \cdot L_1 + q_1 \cdot L_1 \left(\frac{1}{2} L_1 \right) + M_{1A} - M_{A1} = 0$$

$$-V_{1A} \cdot 4 + 3,6 \cdot 4 \left(\frac{1}{2} \cdot 4 \right) + 9,75 - 2,33 = 0$$

$$-V_{1A} \cdot 4 + 28,8 + 9,75 - 2,33 = 0$$

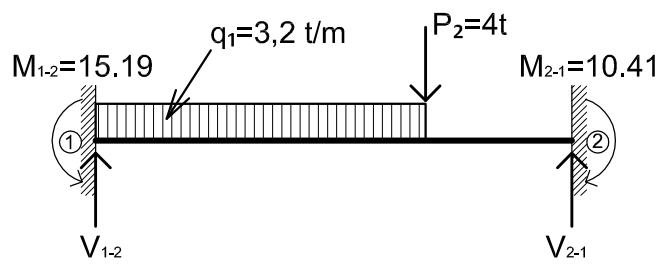
$$V_{1A} = \frac{-36,22}{-4} = 9,06 \text{ Ton } (\uparrow)$$

Kontrol:

$$V_{A1} + V_{1A} - q_1 \cdot L_1 = 0$$

$$5,34 + 9,06 - 3,6 \cdot 4 = 0$$

$$14,4 - 14,4 = 0$$



$$\Sigma M_2 = 0$$

$$V_{12} \cdot L_2 - q_1 \cdot a \left(\frac{1}{2}a + b \right) - P_2 \cdot b - M_{12} + M_{21} = 0$$

$$V_{12} \cdot 6,5 - 3,6 \cdot 4,5 \left(\frac{1}{2} \cdot 4,5 + 2 \right) - 4 \cdot 2 - 15,19 + 10,41 = 0$$

$$6,5V_{12} - 68,85 - 8 - 15,19 + 10,41 = 0$$

$$V_{12} = \frac{81,63}{6,5} = 12,56 \text{ Ton } (\uparrow)$$

$$\Sigma M_1 = 0$$

$$-V_{21} \cdot L_2 + P_2 \cdot a + q_1 \cdot a \left(\frac{1}{2}a \right) + M_{21} - M_{12} = 0$$

$$-V_{21} \cdot 6,5 + 4 \cdot 4,5 + 3,6 \cdot 4,5 \left(\frac{1}{2} \cdot 4,5 \right) + 10,41 - 15,19 = 0$$

$$-6,5V_{21} + 18 + 36,45 + 10,41 - 15,19 = 0$$

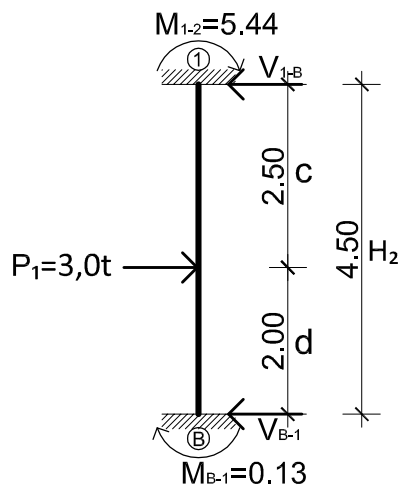
$$V_{21} = \frac{49,67}{6,5} = 7,64 \text{ Ton } (\uparrow)$$

Kontrol:

$$V_{12} + V_{21} - q_1 \cdot a - P_2 = 0$$

$$12,56 + 7,64 - 3,6 \cdot 4,5 - 4 = 0$$

$$20,2 - 20,2 = 0$$



$$\Sigma M1 = 0$$

$$H_{B1} \cdot H_2 - P_1 \cdot c + M_{B1} + M_{1B} = 0$$

$$H_{B1} \cdot 4,5 - 3 \cdot 2,5 + 0,13 + 5,44 = 0$$

$$4,5H_{B1} - 7,5 + 0,13 + 5,44 = 0$$

$$H_{B1} = \frac{-1,93}{-4,5} = 0,43 \text{ Ton } (\leftarrow)$$

$$\Sigma MB = 0$$

$$-H_{1B} \cdot H_2 + P_1 \cdot d + M_{1B} + M_{B1} = 0$$

$$-H_{B1} \cdot 4,5 + 3 \cdot 2 + 5,44 + 0,13 = 0$$

$$-4,5H_{B1} + 6 + 5,44 + 0,13 = 0$$

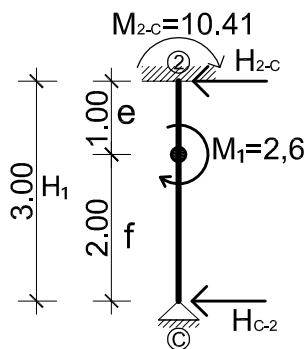
$$H_{1B} = \frac{-11,57}{-4,5} = 2,57 \text{ Ton } (\leftarrow)$$

Kontrol:

$$H_{B1} + H_{1B} - P_1 = 0$$

$$0,43 + 2,57 - 3 = 0$$

$$3 - 3 = 0$$



$$\Sigma MC = 0$$

$$-H_{2C} \cdot H_1 - M_{21} + M_1 = 0$$

$$-H_{2C} \cdot 3 - 10,41 + 3,4 = 0$$

$$-3H_{2C} = -13,81$$

$$H_{2C} = \frac{-13,81}{-3} = 4,60 \text{ Ton } (\leftarrow)$$

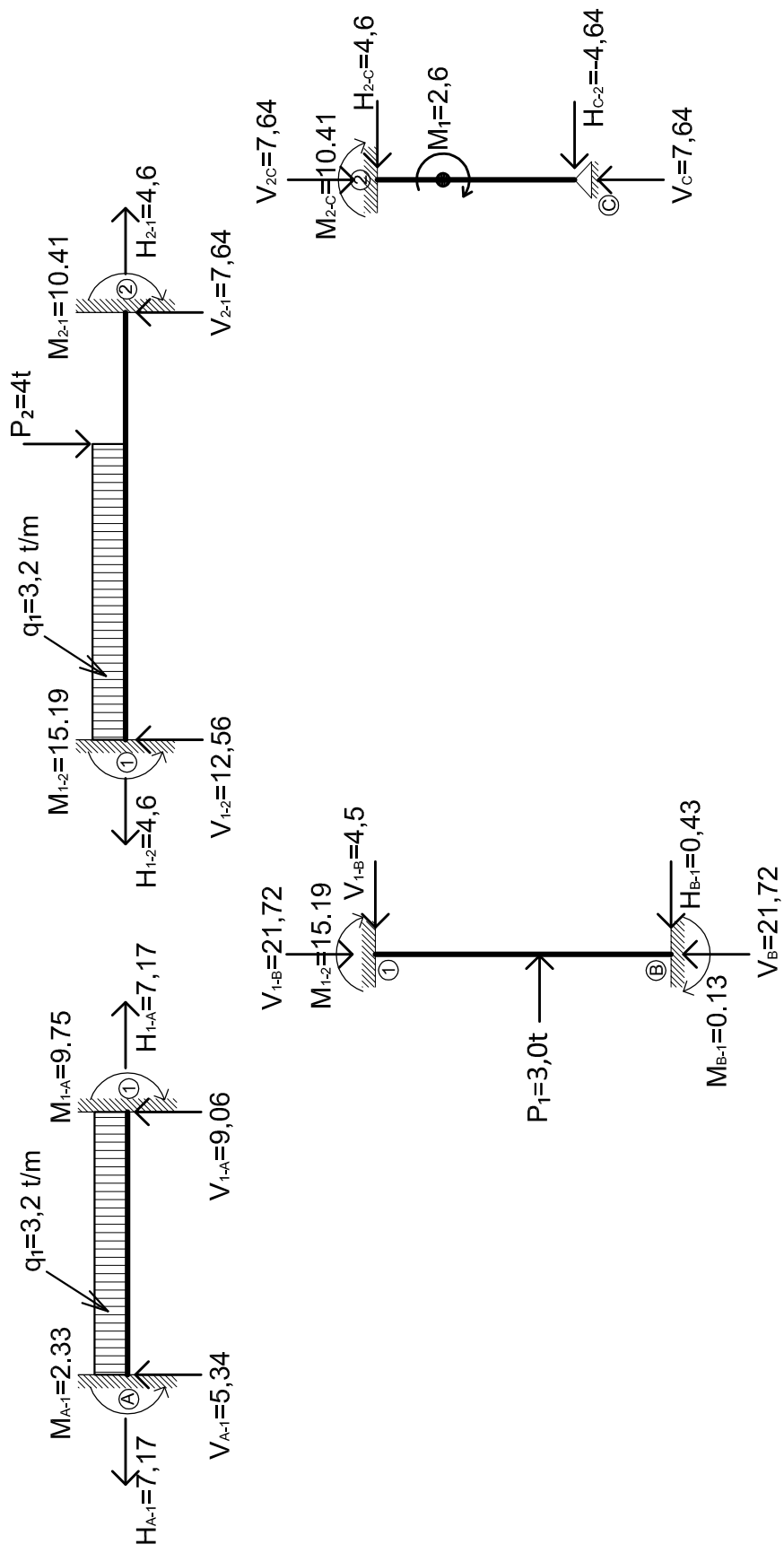
$$\Sigma M2 = 0$$

$$H_{C2} \cdot H_1 + M_1 - M_{21} = 0$$

$$H_{C2} \cdot 3 + 3,4 + 10,41 = 0$$

$$3H_{C2} = -13,81$$

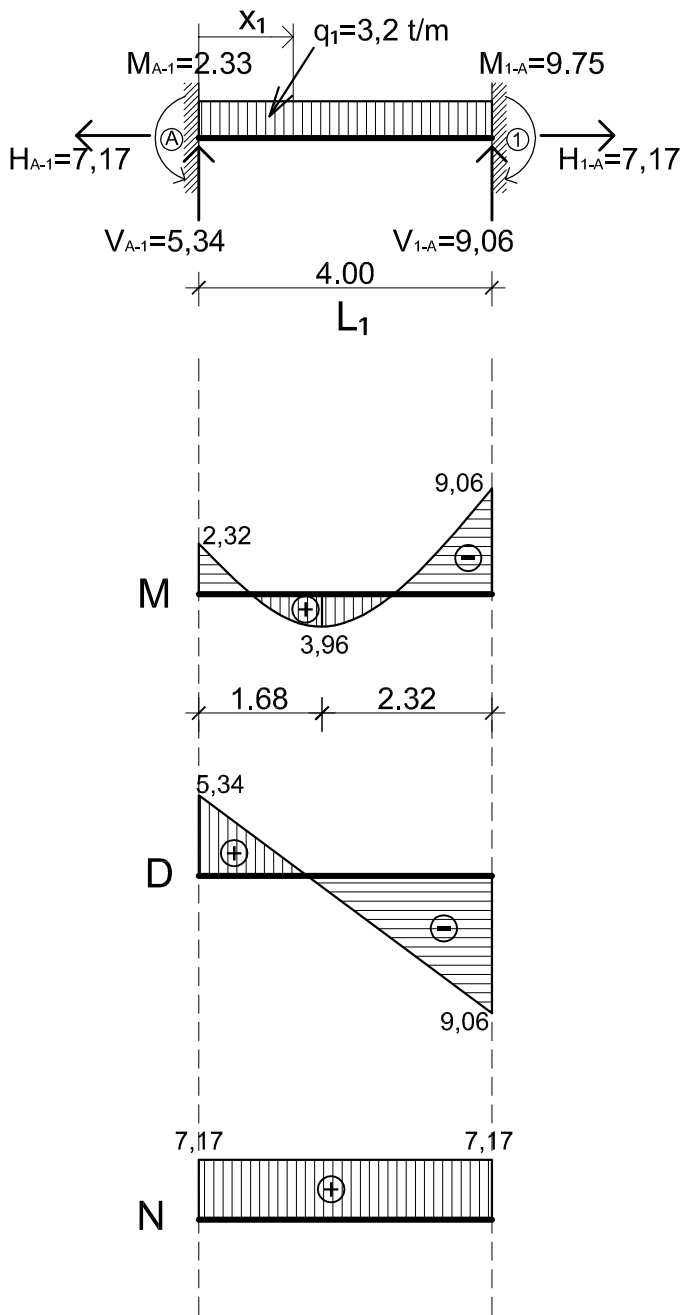
$$H_{2C} = \frac{-13,81}{-3} = -4,60 \text{ Ton } (\rightarrow)$$



CATATAN:

$$\begin{aligned}
 H_A &= -P_1 + H_{B1} - H_{C2} \\
 &= -3 + 0,43 - 4,6 \\
 &= -7,1 \text{ Ton} \\
 V_B &= V_{1A} + V_{12} \\
 &= 9,16 + 12,56 \\
 &= 21,72 \text{ Ton} \\
 \Sigma H &= 0 \\
 P1 &= H_A + H_{B1} - H_{C2} \\
 3 &= 7,17 + 0,43 - 4,6 \\
 3 &= 3
 \end{aligned}$$

E. Gaya Dalam



$$0 \leq x_1 \leq L_1$$

$$M_{x_1} = V_{A1} \cdot x_1 - q_1 \cdot x_1 \left(\frac{1}{2} x_1 \right) - M_{A1}$$

$$D_{x_1} = V_{A1} - q_1 \cdot x_1$$

$$M_{x_1} = H_A$$

$$x_1 = 0$$

$$M_{A1} = 5,34 \cdot 0 - 3,6 \cdot 0 \left(\frac{1}{2} \cdot 0 \right) - 2,33 = -2,33 \text{ Ton.m}$$

$$D_{A1} = 5,34 - 3,6 \cdot 0 = 5,34 \text{ Ton}$$

$$N_{A1} = 7,17 \text{ Ton}$$

$$x_1 = L_1 (4,00)$$

$$M_{1A} = 5,34 \cdot 4 - 3,6 \cdot 4 \left(\frac{1}{2} \cdot 4 \right) - 2,33 = 21,2 - 28,8 - 2,33 = -9,06 \text{ Ton.m}$$

$$D_{1A} = 5,34 - 3,6 \cdot 4 = -9,06$$

$$N_{1A} = 7,17 \text{ Ton}$$

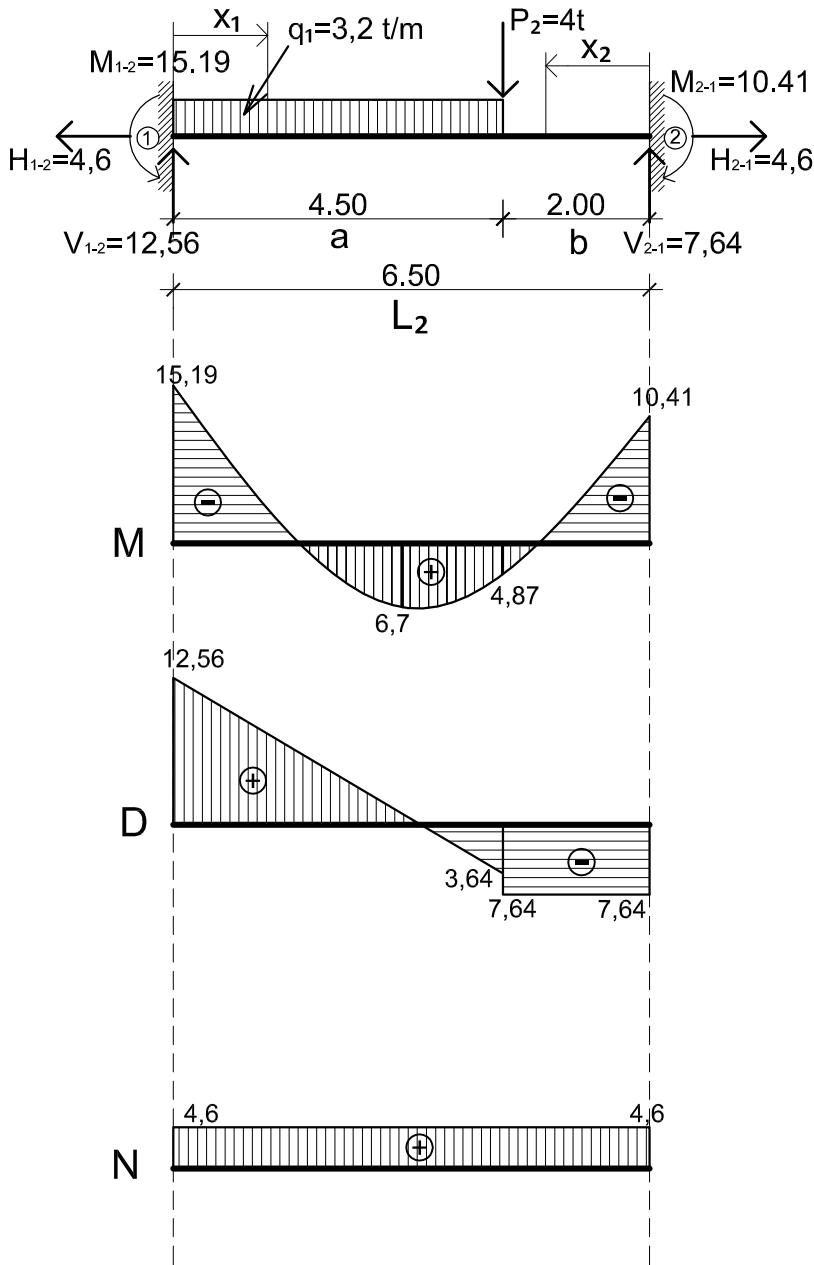
$$D_{x_1} = 0$$

$$V_{A1} - q_1 \cdot x_1 = 0$$

$$x_1 = \frac{V_{A1}}{q_1} = \frac{5,34}{3,6} = 1,48 \text{ m}$$

$$x_1 = 1,48$$

$$M_F = 5,34 \cdot 1,48 - 3,6 \cdot 1,48 \left(\frac{1}{2} \cdot 1,48 \right) - 2,33 = 7,90 - 3,94 - 2,33 = 1,63 \text{ Ton.m}$$



$$D_{x_1} = 0$$

$$V_{12} - q_1 \cdot x_1 = 0$$

$$x_1 = \frac{V_{12}}{q_1}$$

$$x_1 = \frac{12,19}{3,6} = 3,38 \text{ m}$$

Mmax

$$x_1 = 3,38$$

$$M_{x_1} = V_{12} \cdot x_1 - q_1 \cdot x_1 \left(\frac{1}{2} x_1 \right) - M_{12}$$

$$M_H = 12,56 \cdot 3,38 - 3,6 \cdot 3,38 \left(\frac{1}{2} \cdot 3,38 \right) - 15,19$$

$$= 42,45 - 20,56 - 16,28$$

$$= 6,70 \text{ Ton.m}$$

$$0 \leq x_1 \leq a$$

$$M_{x_1} = V_{12} \cdot x_1 - q_1 \cdot x_1 \left(\frac{1}{2} x_1 \right) - M_{12}$$

$$D_{x_1} = V_{12} - q_1 \cdot x_1$$

$$M_{x_1} = H_{12}$$

$$x_1 = 0$$

$$M_{12} = 12,56 \cdot 0 - 3,6 \cdot 0 \left(\frac{1}{2} \cdot 0 \right) - 15,19$$

$$= -15,19 \text{ Ton.m}$$

$$D_{12} = 12,56 - 3,6 \cdot 0$$

$$= 12,56 \text{ Ton}$$

$$N_{12} = 5,76 \text{ Ton}$$

$$x_1 = a (4,50)$$

$$M_D = 12,56 \cdot 4,5 - 3,6 \cdot 4,5 \left(\frac{1}{2} \cdot 4,5 \right) - 15,19$$

$$= 56,52 - 36,45 - 16,28$$

$$= 4,88 \text{ Ton.m}$$

$$D_D = 12,56 - 3,6 \cdot 4,5$$

$$= -3,64 \text{ Ton}$$

$$N_D = 5,76 \text{ Ton}$$

$$0 \leq x_2 \leq b$$

$$M_{x_2} = V_{21} \cdot x_2 - M_{21}$$

$$D_{x_2} = -V_{21}$$

$$M_{x_1} = H_{21}$$

$$x_2 = 0$$

$$M_{21} = 7,64 \cdot 0 - 10,41$$

$$= -10,41 \text{ Ton.m}$$

$$D_{21} = -7,64 \text{ Ton}$$

$$N_{21} = 5,76 \text{ Ton}$$

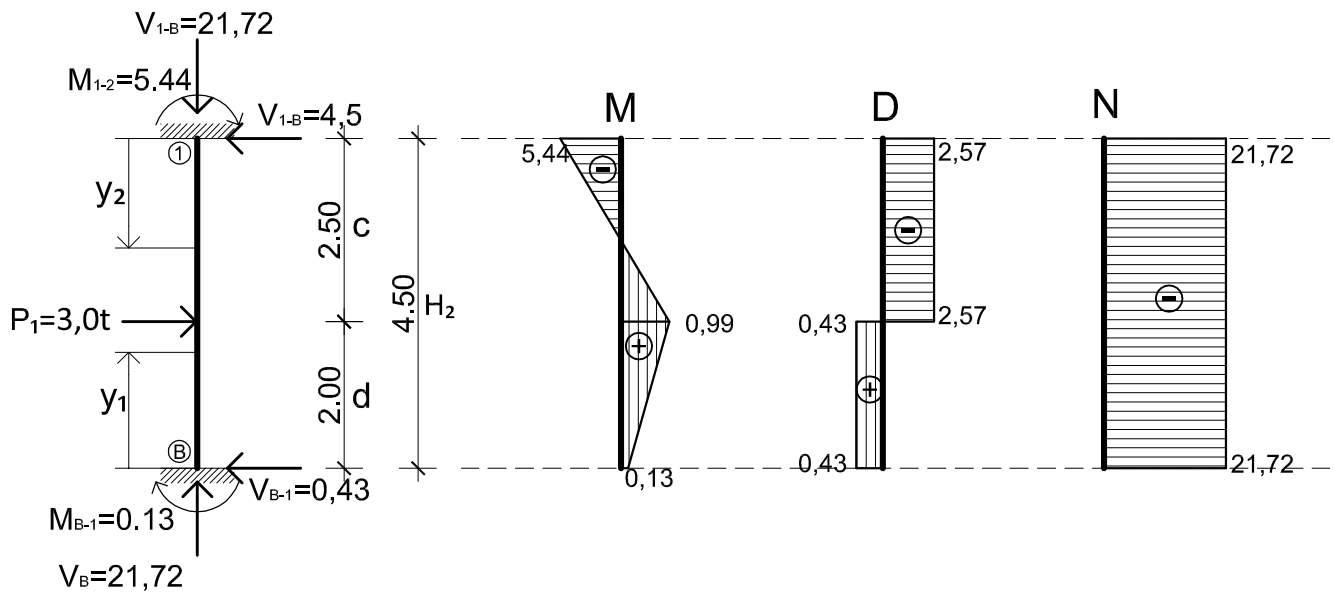
$$x_2 = b (2,00)$$

$$M_D = 7,64 \cdot 2 - 10,41$$

$$= 4,87 \text{ Ton.m}$$

$$D_D = -7,64 \text{ Ton}$$

$$N_D = 5,76 \text{ Ton}$$



$$0 \leq y_1 \leq d$$

$$M_{y_1} = H_{B1} \cdot y_1 + M_{B1}$$

$$D_{y_1} = H_{B1}$$

$$N_{y_1} = -V_{B1}$$

$$y_1 = 0$$

$$M_{B1} = 0,13 \text{ Ton.m}$$

$$D_{B1} = 0,43 \text{ Ton}$$

$$N_{B1} = -21,72 \text{ Ton}$$

$$y_1 = d \text{ (2,00)}$$

$$M_E = 0,43 \cdot 2 + 0,13$$

$$= 0,99 \text{ Ton.m}$$

$$D_{B1} = 0,43 \text{ Ton}$$

$$N_{B1} = -21,72 \text{ Ton}$$

$$0 \leq y_2 \leq c$$

$$M_{y_2} = H_{1B} \cdot y_2 - M_{1B}$$

$$D_{y_2} = -H_{1B}$$

$$N_{y_2} = -V_{1B}$$

$$y_2 = 0$$

$$M_{B1} = -5,44 \text{ Ton.m}$$

$$D_{B1} = -2,57 \text{ Ton}$$

$$N_{B1} = -21,72 \text{ Ton}$$

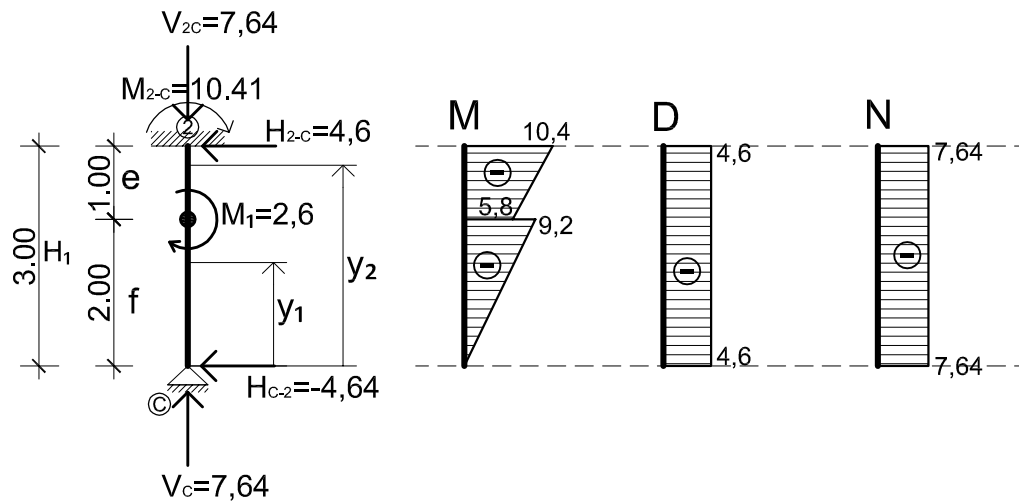
$$y_2 = c \text{ (2,50)}$$

$$M_E = 2,57 \cdot 2,5 - 5,44$$

$$= 0,99 \text{ Ton.m}$$

$$D_E = -2,57 \text{ Ton}$$

$$N_E = -21,72 \text{ Ton}$$



$$0 \leq y_1 \leq f$$

$$M_{y_1} = H_{c2} \cdot y_1$$

$$D_{y_1} = H_{c2}$$

$$M_{y_1} = -V_{c2}$$

$$y_1 = 0$$

$$M_{c2} = 0 \text{ Ton.m}$$

$$D_{c2} = -4.60 \text{ Ton}$$

$$N_{c2} = -7.64 \text{ Ton}$$

$$y_1 = f (2.00)$$

$$M_E = -4.6 \cdot 2$$

$$= -9.2 \text{ Ton.m}$$

$$D_{B1} = -4.6 \text{ Ton}$$

$$N_{B1} = -7.64 \text{ Ton}$$

$$f \leq y_2 \leq H_1$$

$$M_{y_2} = H_{c2} \cdot y_1 + M_1$$

$$D_{y_2} = H_{c2}$$

$$M_{y_2} = -V_{c2}$$

$$y_2 = c (2.00)$$

$$M_G = -4.6 \cdot 2 + 3.4$$

$$= -5.8 \text{ Ton.m}$$

$$D_G = -4.60 \text{ Ton}$$

$$N_G = -7.64 \text{ Ton}$$

$$y_2 = H_1 (3.00)$$

$$M_{2c} = -4.6 \cdot 3 + 3.4$$

$$= -10.4 \text{ Ton.m}$$

$$D_{2c} = -4.6 \text{ Ton}$$

$$N_{2c} = -7.64 \text{ Ton}$$

F. Diagram Gaya Dalam

