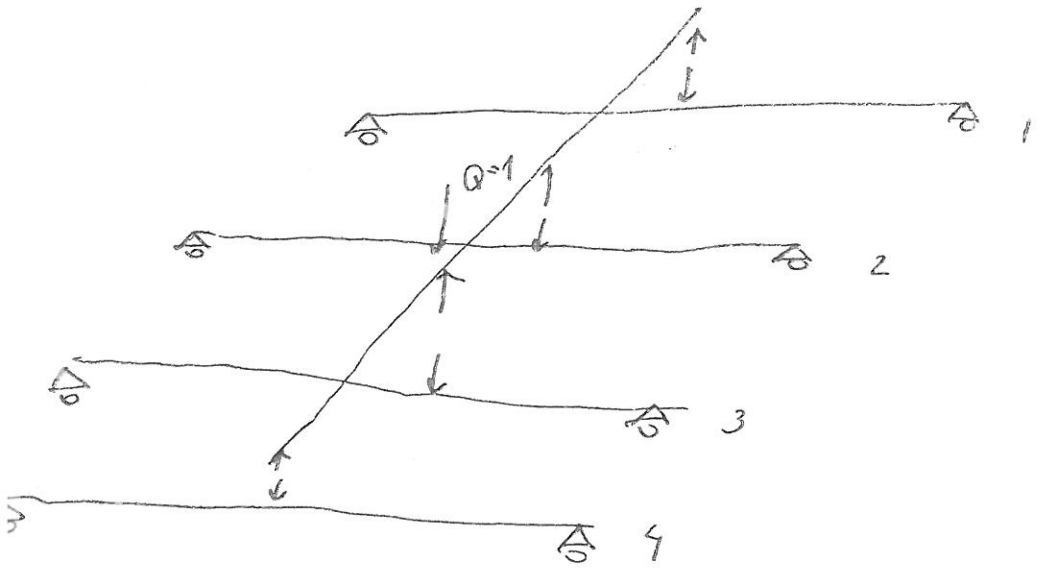
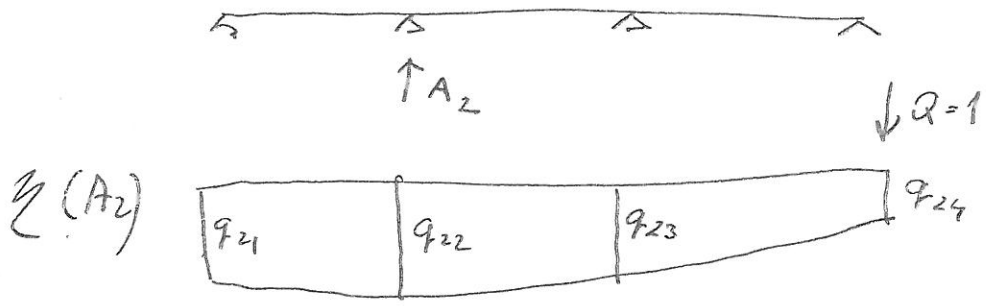
Cross-distribution





Def: The cross-distribution coefficient is the force q_{ik} which acts to the main girder i if the unit force stands on the k-th main girder above the transverse girder.

Calculation: based on the continuous beam (with elastic supports) calculation

$$\delta_i = \frac{l^3}{48 E J_i}$$

Controll: $-\sum_{i=1}^{n} q_{ik} = 1$

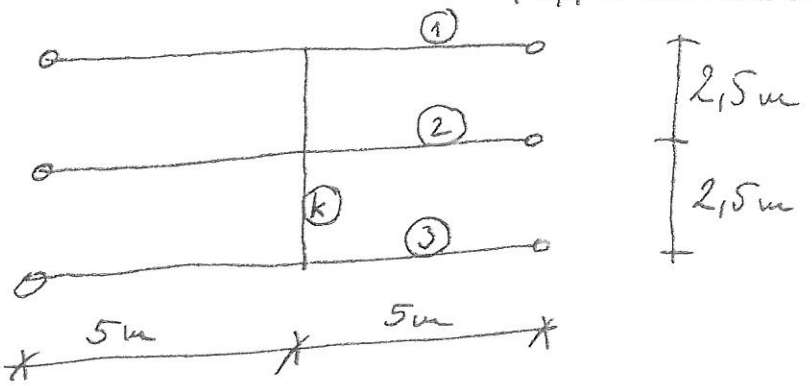
$-e_{kiy} = q_{ki} \cdot \delta_i = q_{ki} \frac{l^3}{48 E J_k}$

Maxwel-theory

$e_{iky} = q_{ik} \cdot \delta_i = q_{ik} \cdot \frac{l^3}{48 E J_i}$

(1)

Leonhardt-method
(approximation)

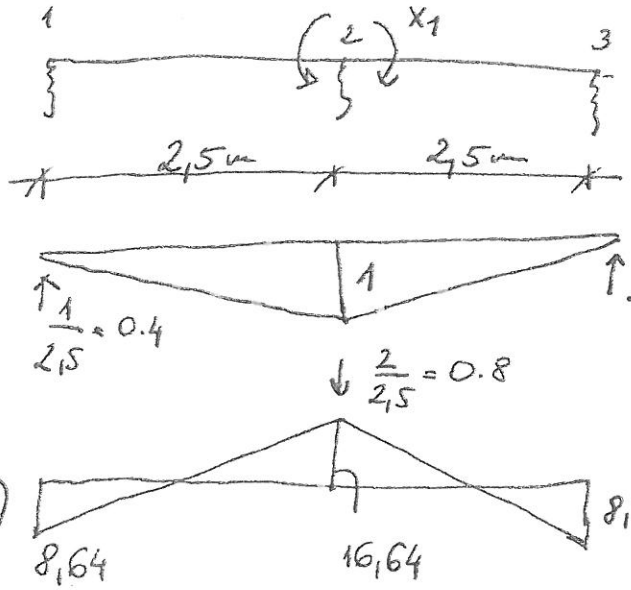


$\tau_0 = \tau_1 = \tau_2 = \tau_3 = 1$

$\tau_k = 0.4$

$EJ\varphi_i = \frac{l^3}{48} = \frac{10^3}{48} = 20.8$

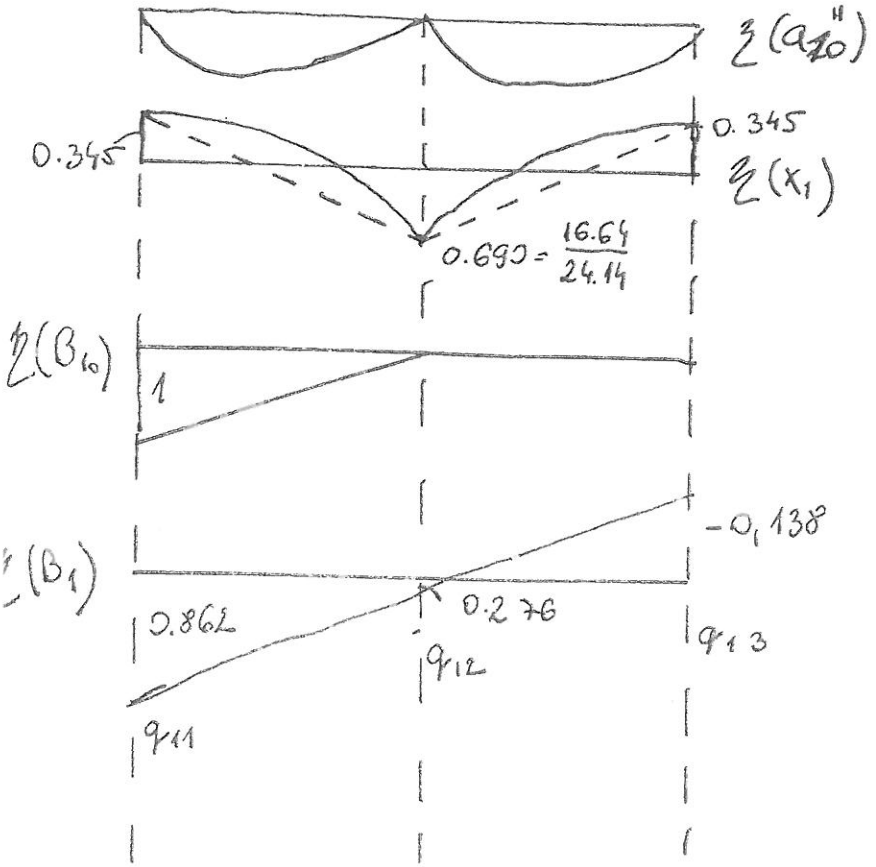
Analysis of the transverse girder



$a'_{11} = 2\,\frac{16,64 + 8,32}{2,5} = 19,9$

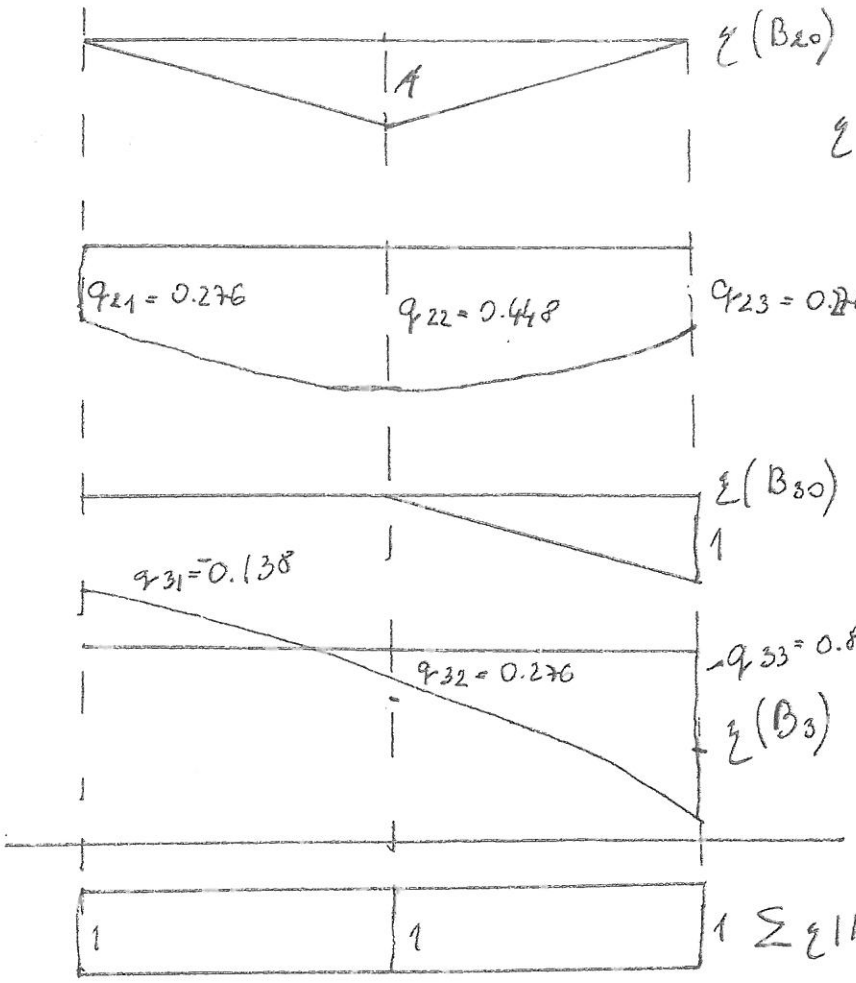
$a''_{11} = 2 \cdot \frac{1 \cdot 2,5}{2} \cdot 0,4 \cdot \frac{2}{3} = 4,7$

$a_{11} = a'_{11} + a''_{11} = 24,14$



$\zeta(B_1) = \zeta(B_{10}) + \underset{\uparrow}{B_{12}} \cdot \zeta(X_1)$

0.4



$$\xi(B_2) = \xi(B_{20}) + B_{21} \cdot \xi(X_1)$$

$B_{21} = -0.8$

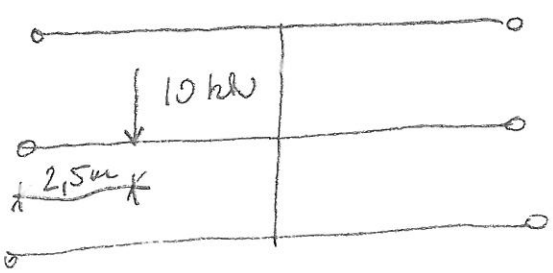
$$\xi(B_3) = \xi(B_{30}) + B_{32} \cdot \xi(X_1)$$

Cross - distribution coefficients

$q_{11} = 0.862$	$q_{12} = 0.276$	$q_{13} = -0.138$
$q_{21} = 0.276$	$q_{22} = 0.448$	$q_{23} = 0.276$
$q_{31} = -0.138$	$q_{32} = 0.276$	$q_{33} = 0.862$
1.00	1.00	1.00

Σ 0

a)



Calculate the bending-moments

(M) = ?

– calculation of B

$$\xi(B) = 3\alpha - 4\alpha^3$$

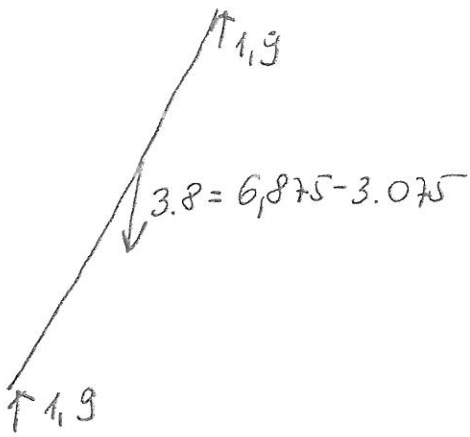
where $\alpha = \frac{x}{l} = \frac{2,5}{10} = 0.25$

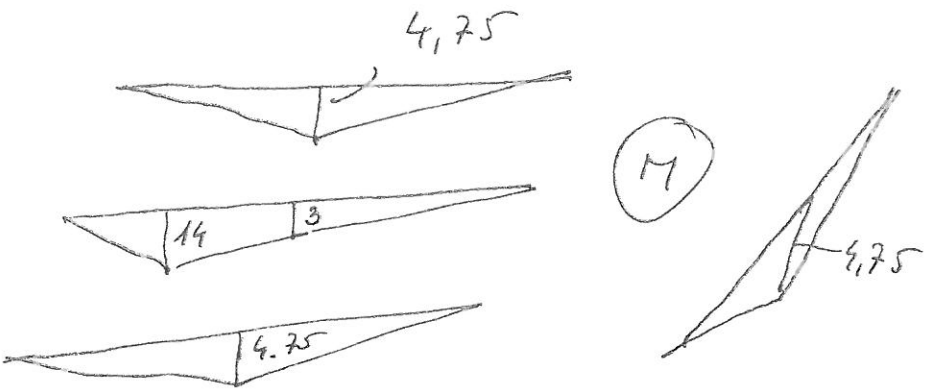
$q_{12} \cdot B = 0.276 \cdot 6{,}875 = 1.9$

10 $\quad q_{22} \cdot B = 0.448 \cdot 6{,}875 = 3{,}075$

6.875

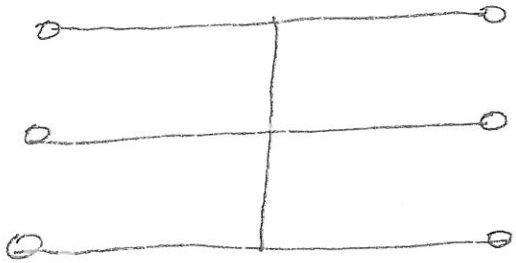
$q_{32} \cdot B = 0.276 \cdot 6{,}875 = 1.9$





M

b

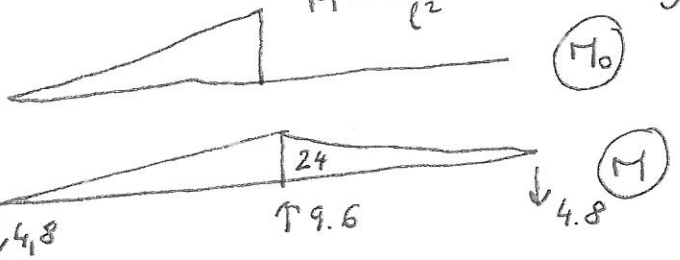


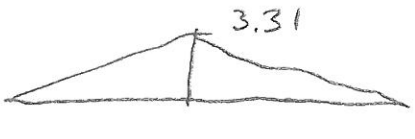
$EJ = 4 \cdot 10^4 \, kNm^2$

M = ?

$\downarrow \Delta e = 1 cm$

$M = \frac{3EJ}{l^2} \cdot \Delta e = \frac{3 \cdot 4 \cdot 10^4}{5^2} \cdot 10^{-2} = 48$





$\uparrow q_{13} \cdot B = 0.138 \cdot 9{,}6 = 1{,}32$

$\downarrow q_{23} \cdot B = 0.276 \cdot 9{,}6 = 2{,}64$

$\downarrow q_{33} \cdot B$

$\uparrow B \quad \Big\} = 1{,}32$