

1. Obliczenie stopnia statycznej niewyznaczalności.

$$n_s = r + s - 3 \cdot t = 4 + 2 - 3 \cdot 2 = 6 - 6 = 0$$

2. Obliczenie reakcji.

$$\sum M_C = 0: -4ql^2 + ql \cdot 1 + R_{Ey} \cdot 4l = 0 \quad (1)$$

$$-4ql^2 + ql^2 + R_{Ey} \cdot 4l = 0$$

$$4l \cdot R_{Ey} = 3ql^2 \quad /: 4l$$

$$\underline{R_{Ey} = \frac{3}{4} ql}$$

$$\sum Y = 0: -R_{Cy} + ql + R_{Ey} = 0$$

$$\sum X = 0: \underline{R_{Cx} = 0}$$

$$-R_{Cy} + ql + \frac{3}{4} ql = 0$$

$$\underline{R_{Cy} = \frac{7}{4} ql}$$

Sprawdzono:

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(data)

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(podpis)

$$\sum X = 0: R_{Ax} - R_{Cx} = 0$$

(2)

$$R_{Ax} = R_{Cx}$$

$$\underline{R_{Ax} = 0}$$

$$\sum Y = 0: R_{Ay} - 4ql + R_{Cy} = 0$$

$$R_{Ay} - 4ql + \frac{7}{4}ql = 0$$

$$\underline{R_{Ay} = \frac{9}{4}ql}$$

$$\sum M_A = 0: -M_A - 4ql^2 + R_{Cy} \cdot 3l = 0$$

$$-M_A - 4ql^2 + \frac{7}{4}ql \cdot 3l = 0$$

$$-M_A - 4ql^2 + \frac{21}{4}ql^2 = 0$$

$$-M_A - \frac{16}{4}ql^2 + \frac{21}{4}ql^2 = 0$$

$$\underline{M_A = \frac{5}{4}ql^2}$$

Sprawdzenie:

$$\sum M_E = 0: -ql \cdot 3l - 4ql^2 + 4ql \cdot 6l - \frac{9}{4}ql \cdot 7l - \frac{5}{4}ql^2 = 0$$

$$-3ql^2 - 4ql^2 + 24ql^2 - \frac{63}{4}ql^2 - \frac{5}{4}ql^2 = 0$$

$$17ql^2 - \frac{68}{4}ql^2 = 0$$

$$\frac{68}{4}ql^2 - \frac{68}{4}ql^2 = 0$$

$$\underline{0 = 0}$$

Sprawdzono:

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(data).....
(podpis)

3. Równania sił wewnętrznych w poszczególnych przedziałach

$$AB \quad 0 \leq x \leq 2l$$

Wyznaczenie ekstremum:

$$T(x) = 0 \Rightarrow \frac{9}{4}ql - 2q \cdot x = 0 \Rightarrow x = \frac{9}{8}l$$

$$T(x) = \frac{9}{4}ql - 2q \cdot x$$

$$M(x = \frac{9}{8}l) = \frac{5}{4}ql^2 + \frac{9}{4}ql \cdot \frac{9}{8}l - 2q \cdot \frac{9}{8}l \cdot \frac{1}{2} \cdot \frac{9}{8}l = \frac{161}{64}ql^2$$

$$M(x) = \frac{5}{4}ql^2 + \frac{9}{4}ql \cdot x - 2q \cdot x \cdot \frac{1}{2} \cdot x$$

$$N(x) = 0$$

$$CB \quad 0 \leq x_1 \leq l$$

$$T(x_1) = -\frac{7}{4}ql$$

$$M(x_1) = \frac{7}{4}q \cdot x_1$$

$$N(x_1) = 0$$

$$CD \quad 0 \leq x_2 \leq l$$

$$T(x_2) = -\frac{7}{4}ql$$

$$M(x_2) = -\frac{7}{4}ql \cdot x_2 + 4ql^2$$

$$N(x_2) = 0$$

$$ED \quad 0 \leq x_3 \leq 3l$$

$$T(x_3) = -\frac{3}{4}ql$$

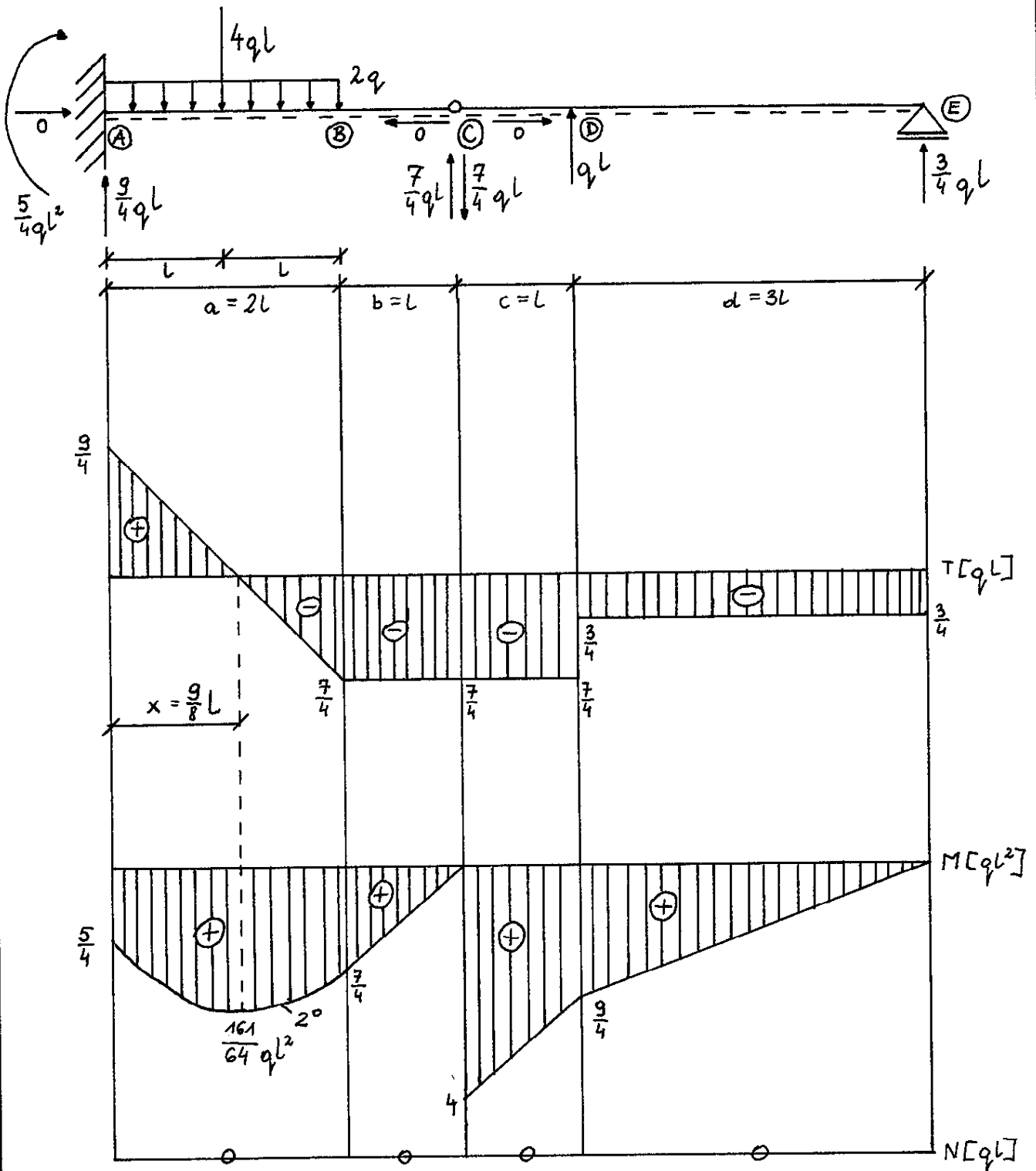
$$M(x_3) = \frac{3}{4}ql \cdot x_3$$

$$N(x_3) = 0$$

Sprawdzono:

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(data).....
(podpis)

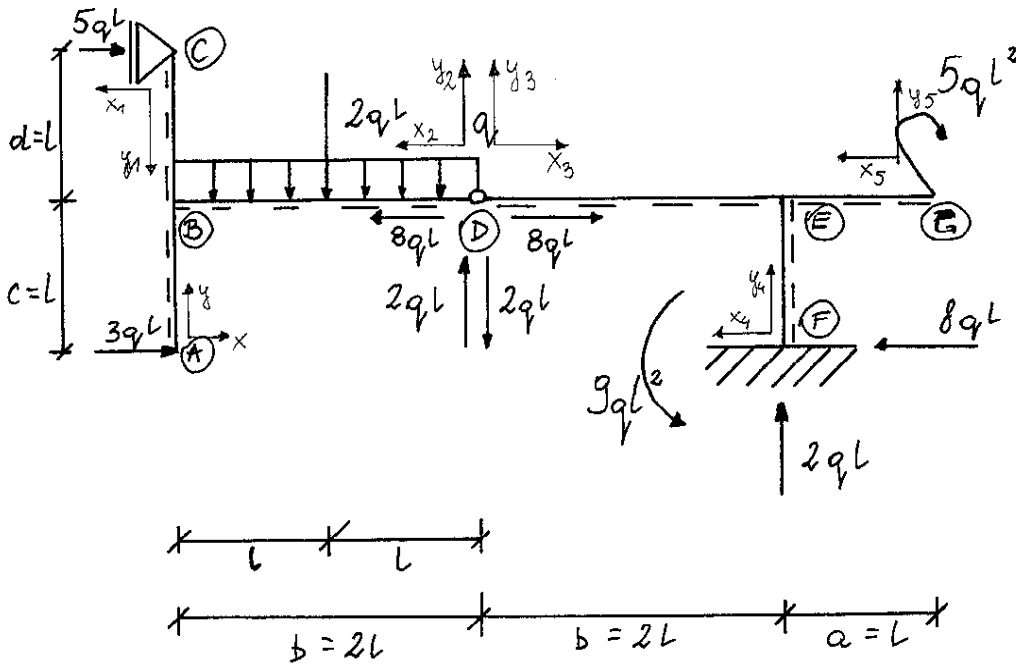
4. Wykresy sił wewnętrznych



Sprawdzono:

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(data)

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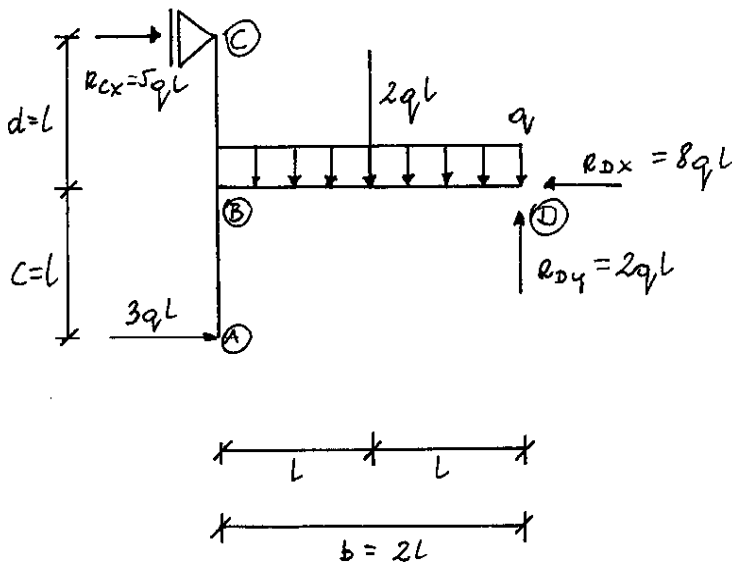


1. Obliczenie stopnia statycznej niewyznaczalności.

$$n_s = r + s - 3 \cdot t = 4 + 2 - 3 \cdot 2 = 6 - 6 = 0$$

2. Obliczenie reakcji.

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Sprawdzono:

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(data)

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(podpis)

$$\sum M_D = 0: 2ql \cdot 1 + 3ql \cdot 1 - R_{Cx} \cdot 1 = 0$$

$$5ql^2 - R_{Cx} \cdot 1 = 0$$

$$-R_{Cx} \cdot 1 = -5ql^2 \quad /: (-1)$$

$$\underline{R_{Cx} = 5ql}$$

$$\sum Y = 0: -2ql + R_{Dy} = 0$$

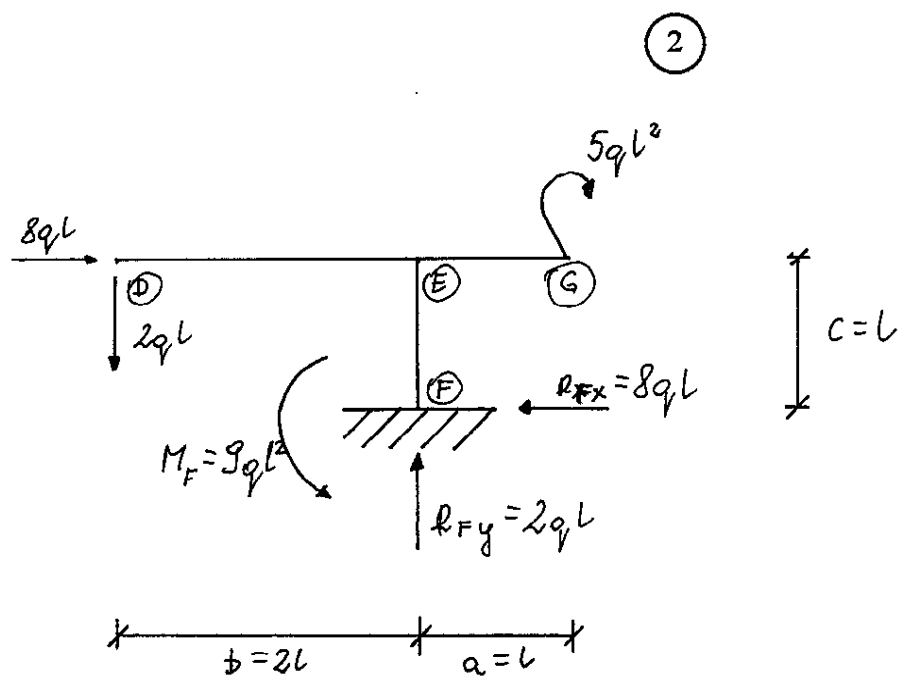
$$\underline{R_{Dy} = 2ql}$$

$$\sum X = 0: R_{Cx} + 3ql - R_{Dx} = 0$$

$$5ql + 3ql - R_{Dx} = 0$$

$$-R_{Dx} = -8ql \quad /: (-1)$$

$$\underline{R_{Dx} = 8ql}$$



Sprawdzono:

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(data).....
(podpis)

$$\sum X = 0: 8ql - R_{Fx} = 0$$

$$-R_{Fx} = -8ql \quad /: (-1)$$

$$\underline{R_{Fx} = 8ql}$$

$$\sum Y = 0: R_{Fy} - 2ql = 0$$

$$\underline{R_{Fy} = 2ql}$$

$$\sum M_D = 0: 2ql \cdot 1 - 8ql \cdot 1 - 5ql^2 + M_F = 0$$

$$4ql^2 - 8ql^2 - 5ql^2 + M_F = 0$$

$$-9ql^2 + M_F = 0$$

$$\underline{M_F = 9ql^2}$$

Sprawdzenie:

$$\sum M_G = 0: 3ql \cdot 1 - 5ql \cdot 1 + 2ql \cdot 4l + 9ql^2 - 2ql \cdot 1 - 8ql \cdot 1 - 5ql^2 = 0$$

$$3ql^2 - 5ql^2 + 8ql^2 + 9ql^2 - 2ql^2 - 8ql^2 - 5ql^2 = 0$$

$$\underline{0 = 0}$$

3. Równania sił wewnętrznych w poszczególnych przedziałach

AB $x = 0$

CB $x_1 = 0$

$$0 \leq y \leq 2l$$

$$0 \leq y_1 \leq l$$

$$T(x, y) = -3ql$$

$$T(x_1, y_1) = 5ql$$

$$M(x, y) = 3ql \cdot y$$

$$M(x_1, y_1) = 5ql \cdot y_1$$

$$N(x, y) = 0$$

$$N(x_1, y_1) = 0$$

Sprawdzono:

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(data)

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(podpis)

$$\text{DB} \quad 0 \leq x_2 \leq 2l$$

$$y_2 = 0$$

$$T(x_2, y_2) = q \cdot x_2 - 2ql$$

$$M(x_2, y_2) = -ql \cdot x_2 - \frac{1}{2} \cdot x_2 + 2ql \cdot x_2$$

$$N(x_2, y_2) = -8ql$$

$$\text{DE} \quad 0 \leq x_3 \leq 2l$$

$$y_3 = 0$$

$$T(x_3, y_3) = -2ql$$

$$M(x_3, y_3) = -2ql \cdot x_3$$

$$N(x_3, y_3) = -8ql$$

$$\text{FE} \quad x_4 = 0$$

$$0 \leq y_4 \leq l$$

$$T(x_4, y_4) = 8ql$$

$$M(x_4, y_4) = 8ql \cdot y_4 - 9ql^2$$

$$N(x_4, y_4) = -2ql$$

$$\text{GE} \quad 0 \leq x_5 \leq l$$

$$y_5 = 0$$

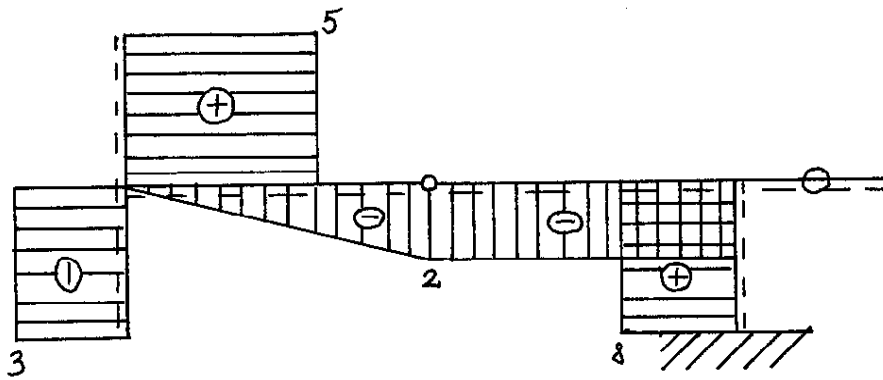
$$T(x_5, y_5) = 0$$

$$M(x_5, y_5) = -5ql$$

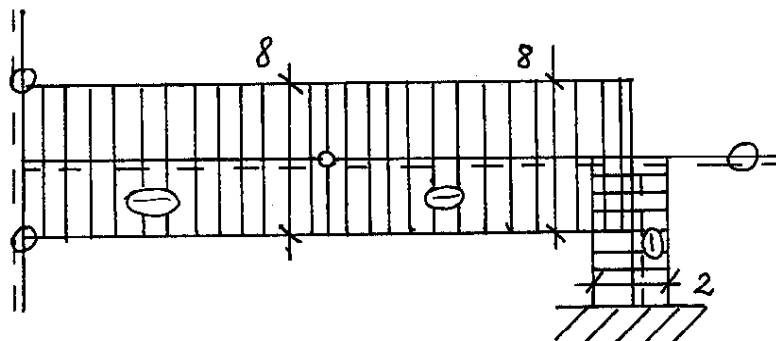
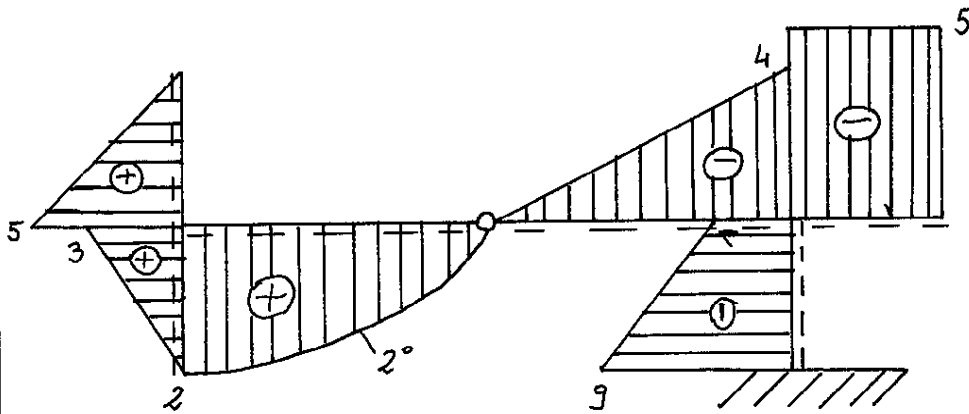
$$N(x_5, y_5) = 0$$

Sprawdzono:

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(data).....
(podpis)



$T [qL]$



Sprawdzono:

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(data)

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(podpis)