VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA STAVEBNÍ

BDA015 Stavební mechanika 1
7. přednáška

- Rovinný šikmý nosník

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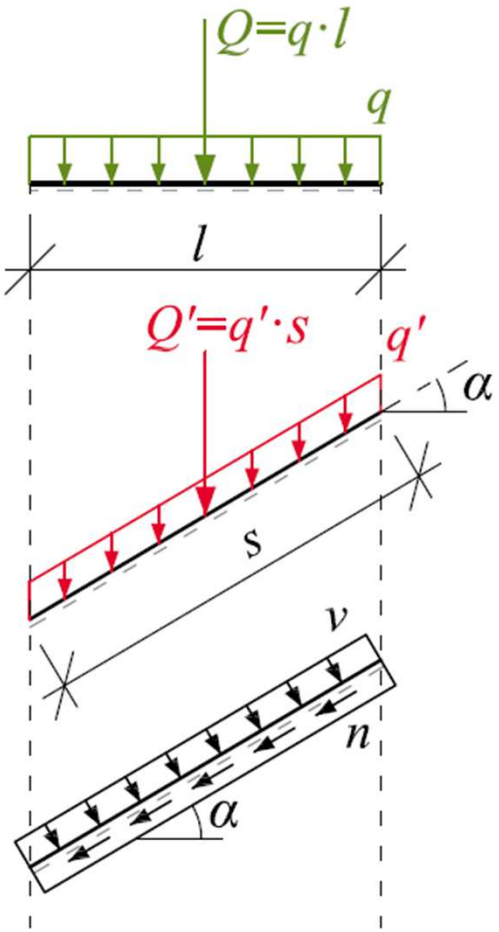
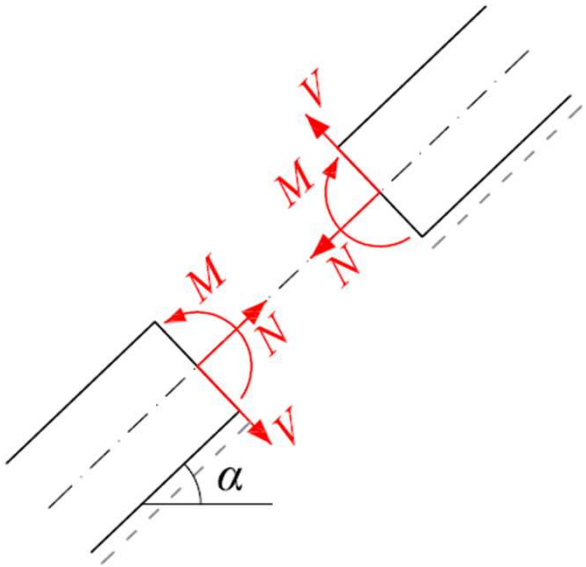
ŠIKMÝ NOSNÍK

Spojité zatížení



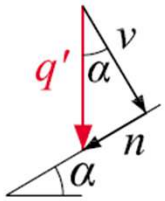


$$\cos\alpha = \frac{l}{s} \rightarrow s = \frac{l}{\cos\alpha}$$

$$Q = Q'$$

$$q \cdot l = q' \cdot s$$

$$q \cdot l = q' \cdot \frac{l}{\cos\alpha} \rightarrow q' = q \cdot \cos\alpha$$

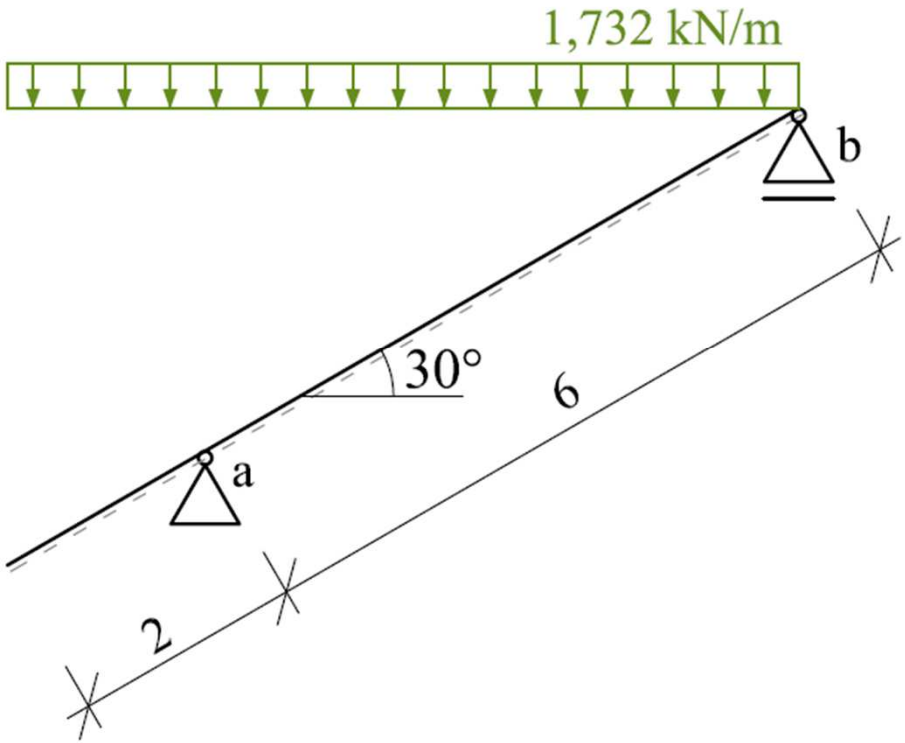


$$\cos\alpha = \frac{v}{q'} \rightarrow v = \cos\alpha \cdot q'$$

$$\sin\alpha = \frac{n}{q'} \rightarrow n = \sin\alpha \cdot q'$$

ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

Vykreslete průběhy vnitřních sil



ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

1) Výpočet reakcí

- $\sum F_{i,x} = 0$ ⊕ →

  $R_{a,x} = 0$

- $\sum M_{i,a} = 0$ ⊕

  $-12 \cdot 1{,}732 + R_{b,z} \cdot 5{,}196 = 0$

  $R_{b,z} = 4\ \text{kN}$

- $\sum M_{i,b} = 0$

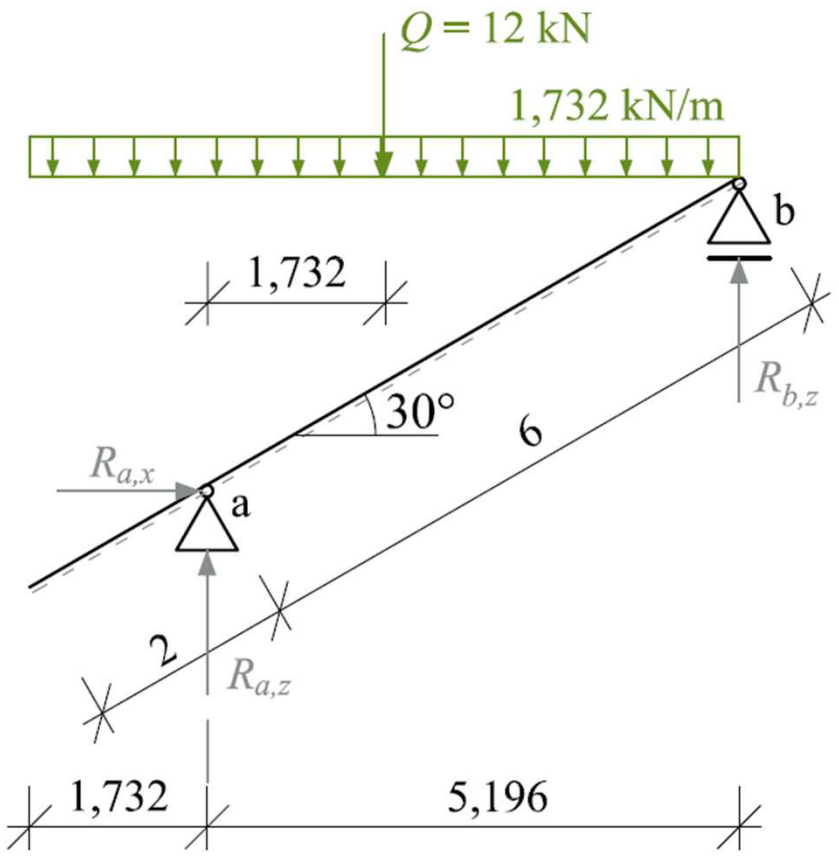
  $-R_{a,z} \cdot 5{,}196 + 12 \cdot 3{,}464 = 0$

  $R_{a,z} = 8\ \text{kN}$

- $\sum F_{i,z} = 0$ ⊕ ↓

  $12 - R_{a,z} - R_{b,z} = 0$

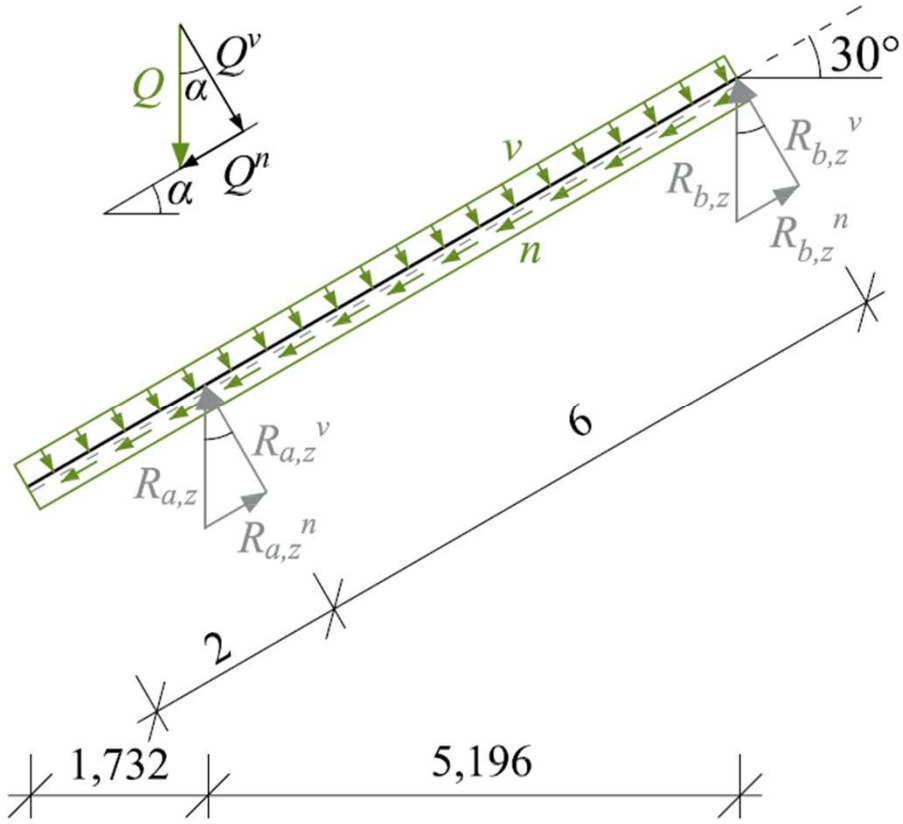
  $0 = 0 \rightarrow \text{VYHOVÍ}$



ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

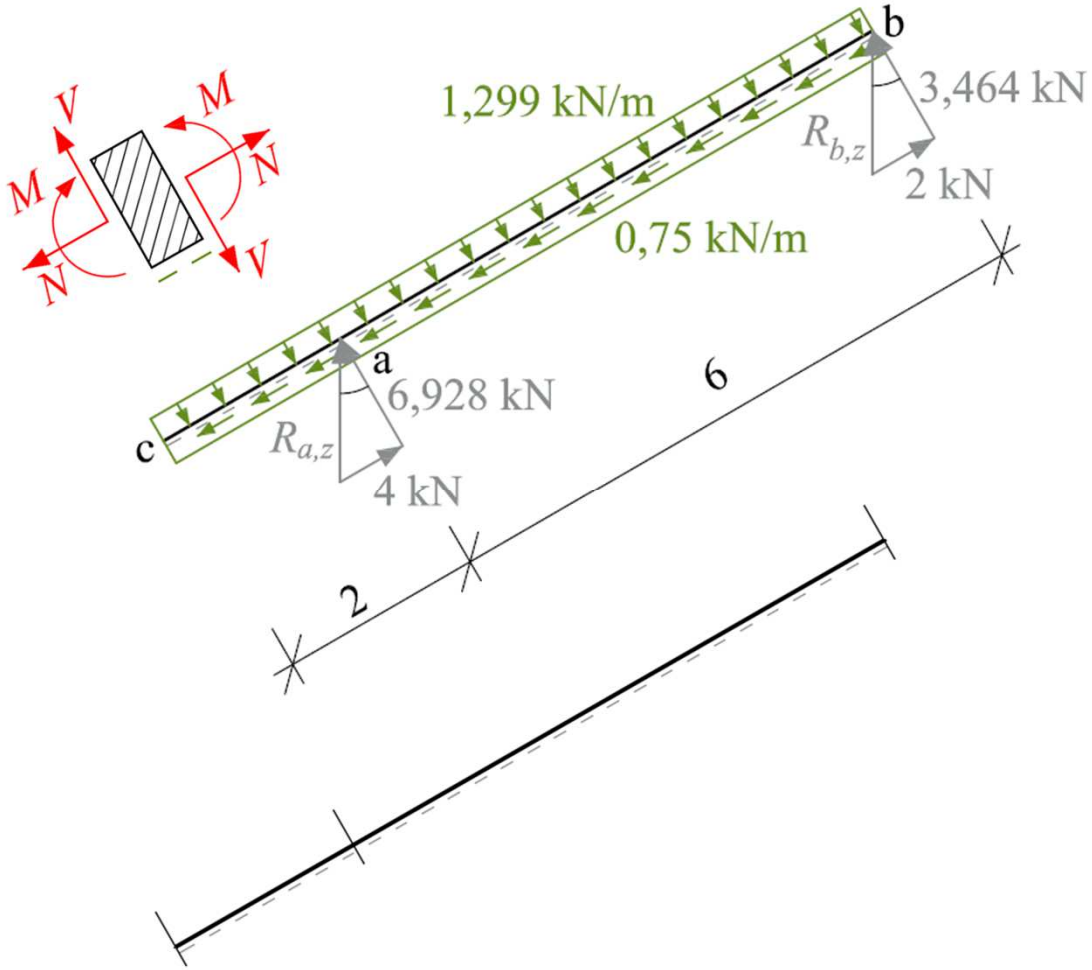
2) Rozklad reakcí a zatížení

- $R_{a,z}^{v} = \cos 30 \cdot R_{a,z} = 6{,}928\ \text{kN}$
- $R_{a,z}^{n} = \sin 30 \cdot R_{a,z} = 4\ \text{kN}$
- $R_{b,z}^{v} = \cos 30 \cdot R_{b,z} = 3{,}464\ \text{kN}$
- $R_{b,z}^{n} = \sin 30 \cdot R_{b,z} = 2\ \text{kN}$
- $Q^{v} = \cos 30 \cdot Q = 10{,}392\ \text{kN}$
- $v = \frac{Q^{v}}{8} = 1{,}299\ \text{kN/m}$
- $Q^{n} = \sin 30 \cdot Q = 6\ \text{kN}$
- $n = \frac{Q^{n}}{8} = 0{,}75\ \text{kN/m}$



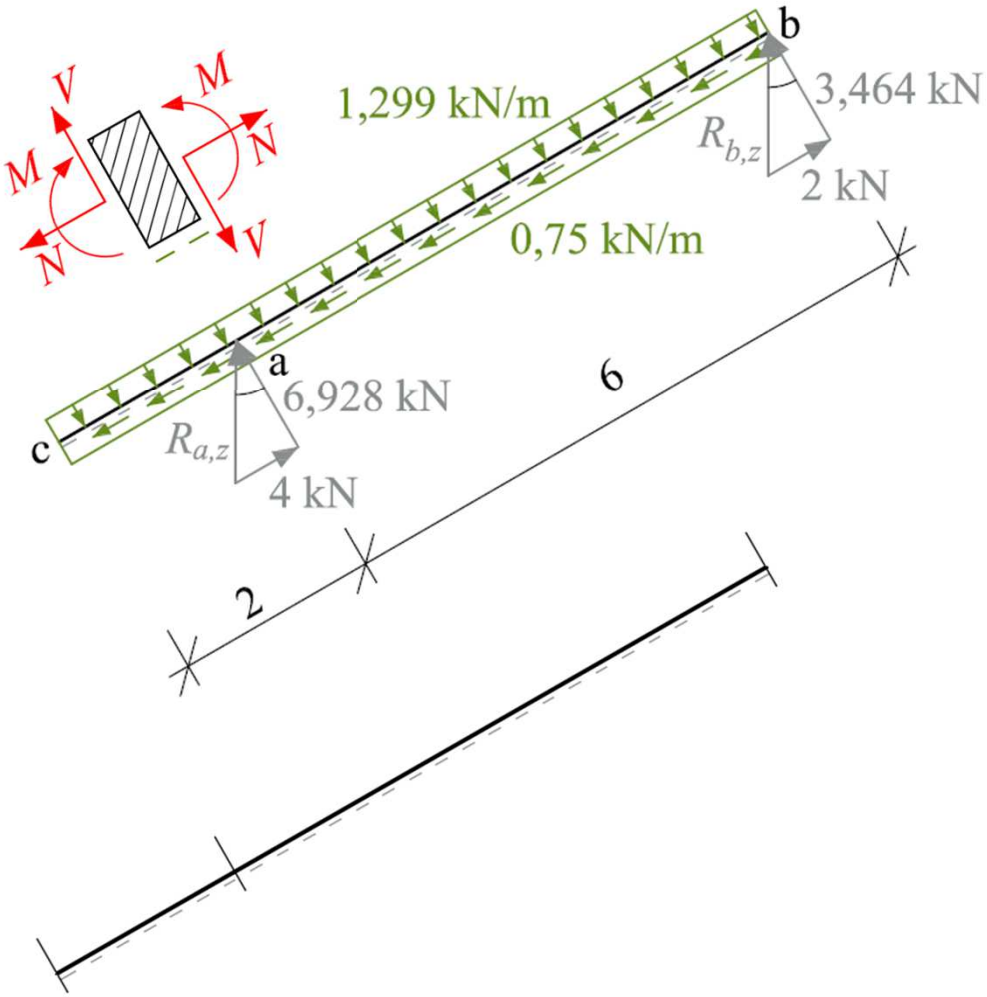
ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

3) Normálové síly



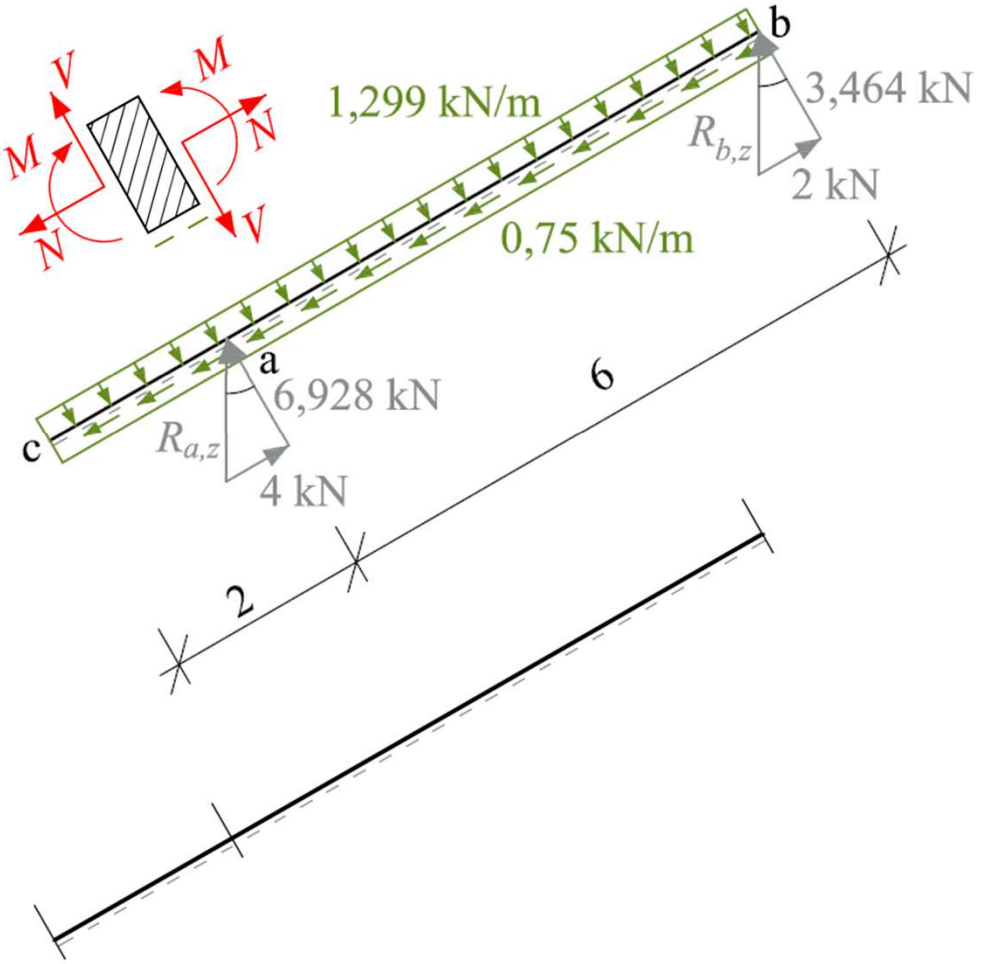
ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

4) Posouvající síly



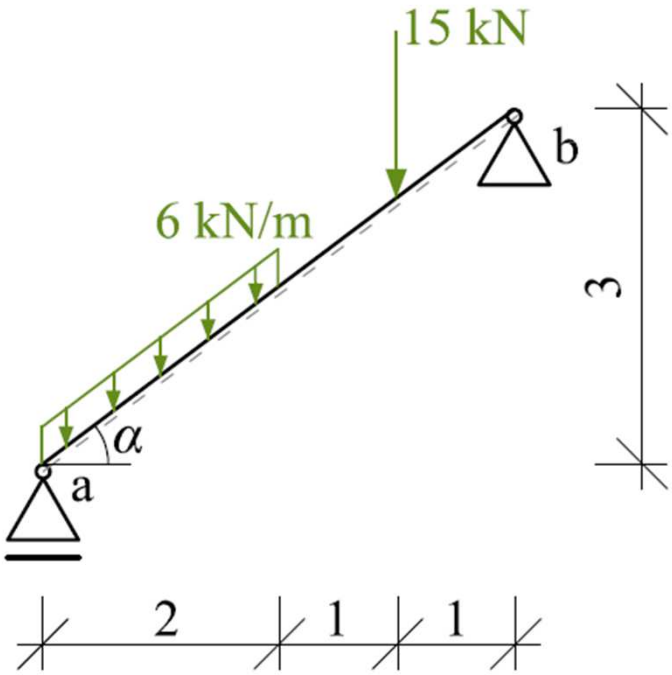
ŠIKMÝ NOSNÍK – SPOJITÉ ZATÍŽENÍ

5) Ohybové momenty



ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

Vykreslete průběhy vnitřních sil



ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

1) Výpočet reakcí

- $\sum F_{i,x} = 0$ ⊕ →

  $R_{b,x} = 0$

- $\sum M_{i,a} = 0$ ⊕

  $-15 \cdot 1 - 15 \cdot 3 + R_{b,z} \cdot 4 = 0$

  $R_{b,z} = 15\ \text{kN}$

- $\sum M_{i,b} = 0$

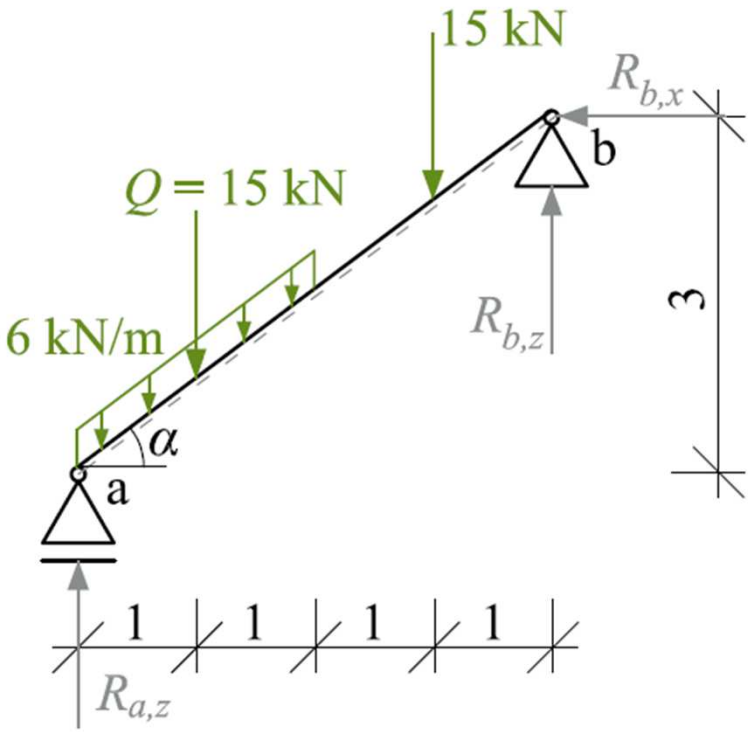
  $-R_{a,z} \cdot 4 + 15 \cdot 1 + 15 \cdot 1 = 0$

  $R_{a,z} = 15\ \text{kN}$

- $\sum F_{i,z} = 0$ ⊕ ↓

  $15 + 15 - R_{a,z} - R_{b,z}$

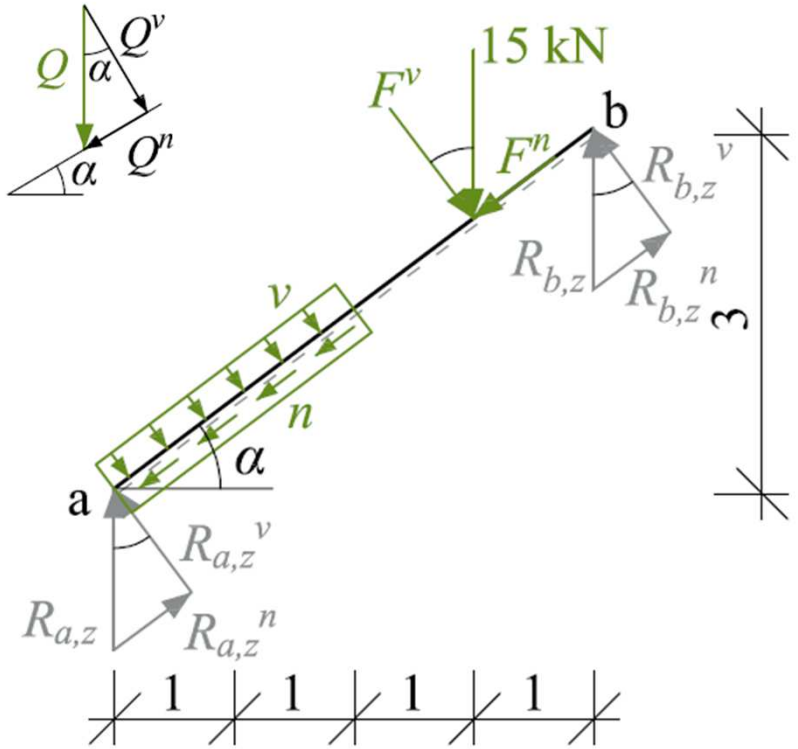
  $0 = 0 \rightarrow \text{VYHOVÍ}$



ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

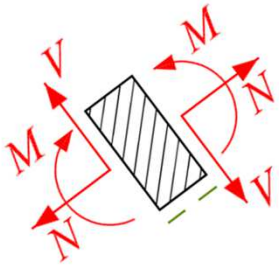
2) Rozklad reakcí a zatížení

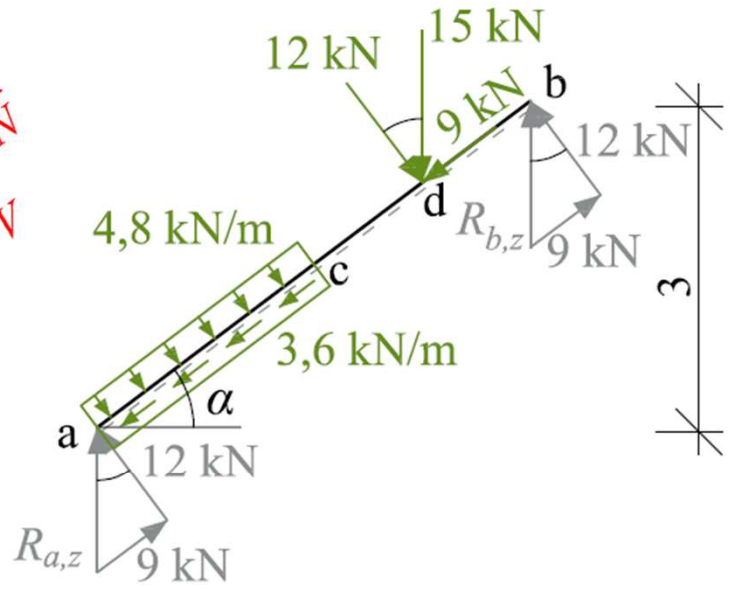
- $\cos\alpha = \frac{4}{5};\ \sin\alpha = \frac{3}{5}$
- $R_{a,z}^{v} = \cos\alpha \cdot R_{a,z} = 12\ \text{kN}$
- $R_{a,z}^{n} = \sin\alpha \cdot R_{a,z} = 9\ \text{kN}$
- $v = \cos\alpha \cdot 6 = 4{,}8\ \text{kN/m}$
- $n = \sin\alpha \cdot 6 = 3{,}6\ \text{kN/m}$

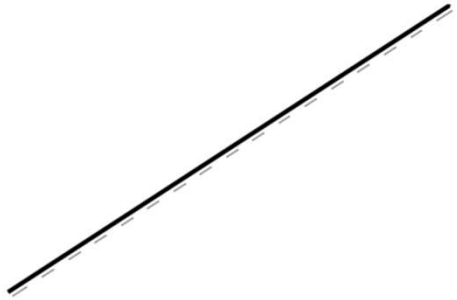


ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

3) Normálové síly

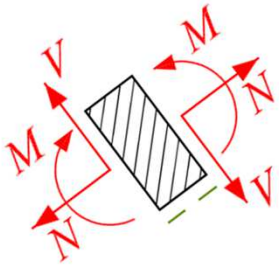


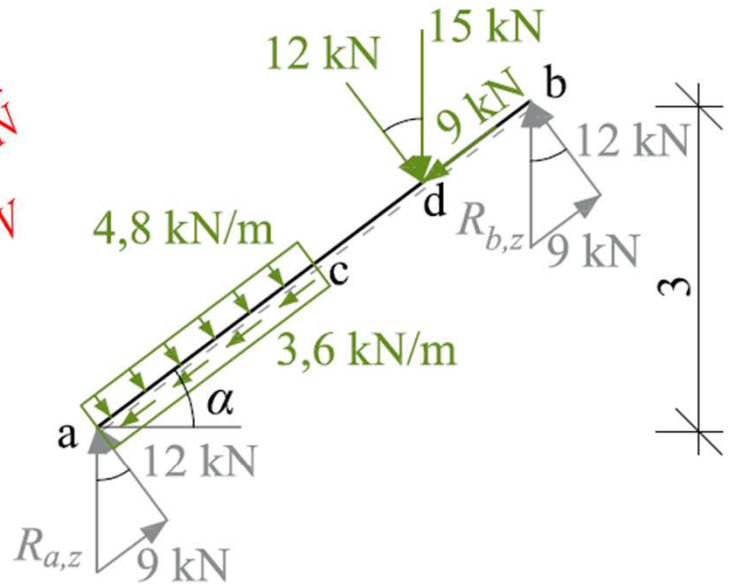


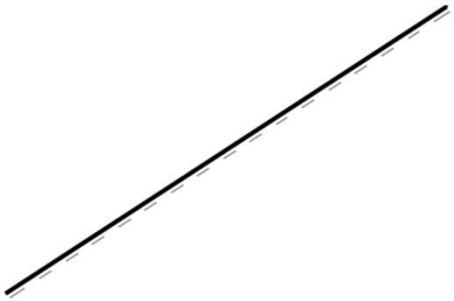


ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

4) Posouvající síly







ŠIKMÝ NOSNÍK – KOMBINACE ZATÍŽENÍ

5) Ohybové momenty