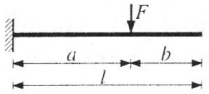
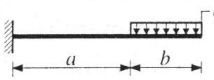
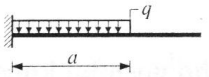
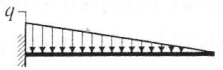
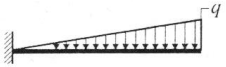
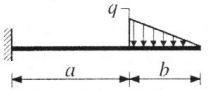
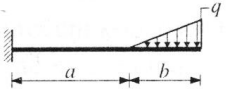
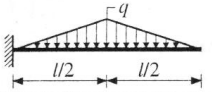
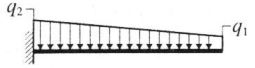
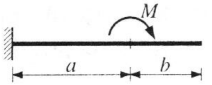
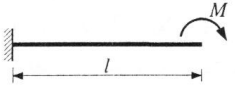
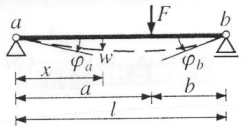
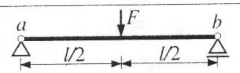
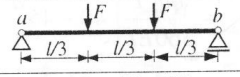
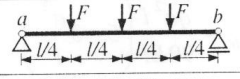
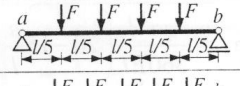
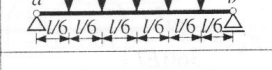
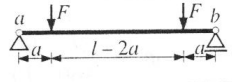
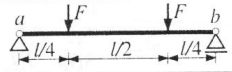
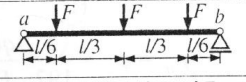
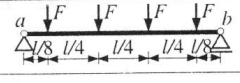
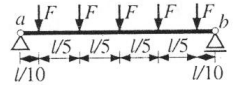
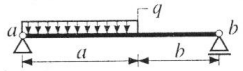
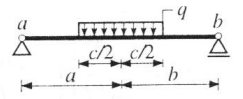
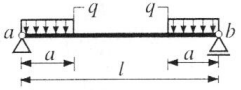
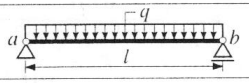
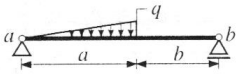
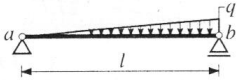
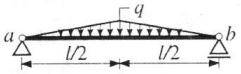
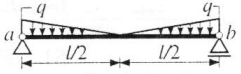
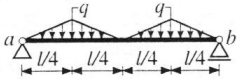
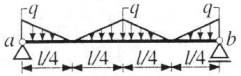
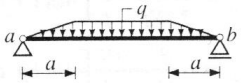
Tabulka 14.1. Deformace konzoly konstantního průřezu

Zatěž. případ	Schéma zatížení	Průhyb volného konce w	Pootočení volného konce φ
1		$\frac{Fa^2}{6EI}(3l-a)$	$\frac{Fa^2}{2EI}$
2		$\frac{Fl^3}{3EI}$	$\frac{Fl^2}{2EI}$
3		$\frac{q}{24EI}\left(3l^4-4a^3l+a^4\right)$	$\frac{q}{6EI}\left(l^3-a^3\right)$
4		$\frac{qa^3}{24EI}(4l-a)$	$\frac{qa^3}{6EI}$
5		$\frac{ql^4}{8EI}$	$\frac{ql^3}{6EI}$
6		$\frac{ql^4}{30EI}$	$\frac{ql^3}{24EI}$
7		$\frac{11}{120}\cdot\frac{ql^4}{EI}$	$\frac{ql^3}{8EI}$
8		$\frac{qb}{30EI}\left[5(l-b)l^2+b^3\right]$	$\frac{qb}{24EI}\left(6l^2-8lb+3b^2\right)$
9		$\frac{qb}{120EI}\left[10(2l-b)l^2+b^3\right]$	$\frac{qb}{24EI}\left(6l^2-4lb+b^2\right)$
10		$\frac{11}{192}\cdot\frac{ql^4}{EI}$	$\frac{7}{96}\cdot\frac{ql^3}{EI}$
11		$\frac{l^4}{120EI}(11q_1+4q_2)$	$\frac{l^3}{24EI}(3q_1+q_2)$
12		$\frac{Ma}{2EI}(l+b)$	$\frac{Ma}{EI}$
13		$\frac{Ml^2}{2EI}$	$\frac{Ml}{EI}$

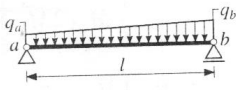
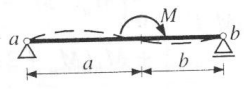
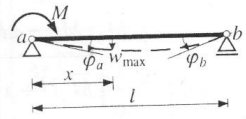
Tabulka 14.2. Deformace prostého nosníku konstantního průřezu

Zatěž. případ	Schéma zatížení	Průhyb w, w_{max}	Pootočení φ_a, φ_b podporových průřezů a, b
1		$w_{max}=\frac{Fab}{27EIl}\sqrt{3a(l+b)^3}$ v $x=\sqrt{\frac{1}{3}a(l+b)}$ pro $a\geq\frac{l}{2}$	$\varphi_a=\frac{Fab}{6EIl}(l+b)$ $\varphi_b=\frac{Fab}{6EIl}(l+a)$
2		$w_{max}=\frac{Fl^3}{48EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{Fl^2}{16EI}$
3		$w_{max}=\frac{23}{648}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{Fl^2}{9EI}$
4		$w_{max}=\frac{19}{384}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{5}{32}\cdot\frac{Fl^2}{EI}$
5		$w_{max}=\frac{63}{1000}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{1}{5}\cdot\frac{Fl^2}{EI}$
6		$w_{max}=\frac{11}{144}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{35}{144}\cdot\frac{Fl^2}{EI}$
7		$w_{max}=\frac{F}{24EI}\left(3al^2-4a^3\right)$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{Fa}{2EI}(l-a)$
8		$w_{max}=\frac{11}{384}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{3}{32}\cdot\frac{Fl^2}{EI}$
9		$w_{max}=\frac{53}{1296}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{19}{144}\cdot\frac{Fl^2}{EI}$
10		$w_{max}=\frac{41}{768}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{11}{64}\cdot\frac{Fl^2}{EI}$
11		$w_{max}=\frac{397}{6000}\cdot\frac{Fl^3}{EI}$ v $x=0{,}5l$	$\varphi_a=\varphi_b=\frac{51}{240}\cdot\frac{Fl^2}{EI}$
12		$w=\frac{qa^3b}{24EIl}(4l-3a)$ v $x=a$	$\varphi_a=\frac{qa^2}{24EIl}(2l-a)^2$ $\varphi_b=\frac{qa^2}{24EIl}(2l^2-a^2)$
13		$w=\frac{qc}{6EI}\left[\frac{ab}{l}\left(2al-2a^2-\frac{c^2}{4}\right)+\frac{c^3}{64}\right]$ v $x=a$	$\varphi_a=\frac{q}{24EI}\cdot\frac{bc}{l}\left[4a(l+b)-c^2\right]$ $\varphi_b=\frac{q}{24EI}\cdot\frac{ac}{l}\left[4b(l+a)-c^2\right]$

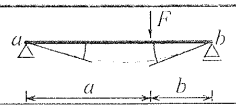
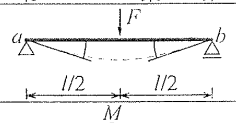
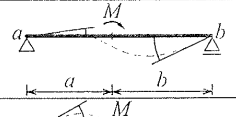
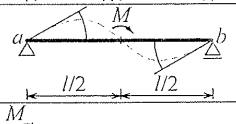
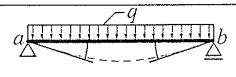
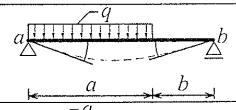
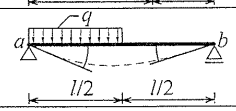
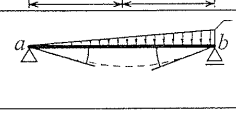
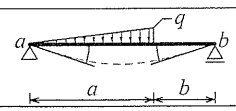
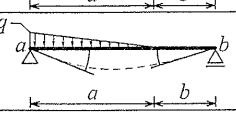
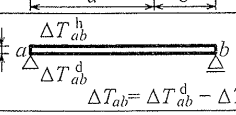
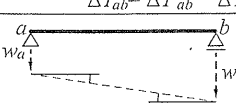
Tabulka 14.2. Deformace prostého nosníku konstantního průřezu (pokračování)

Zatěž. případ	Schéma zatížení	Průhyb w, w_{max}	Pootočení φ_a, φ_b podporových průřezů a, b
14		$w_{max} = \frac{ql^4}{48EI} \cdot \frac{a^2}{l^2}\left(3 - 2\frac{a^2}{l^2}\right)$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{qa^2}{12EI}(3l - 2a)$
15		$w_{max} = \frac{5}{384} \cdot \frac{ql^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{1}{24} \cdot \frac{ql^3}{EI}$
16		$w = \frac{qa^3 l}{45EI}\left(5 - 9\frac{a}{l} + 4\frac{a^2}{l^2}\right)$ v $x = a$	$\varphi_a = \frac{qa^2 l}{360EI}\left(40 - 45\frac{a}{l} + 12\frac{a^2}{l^2}\right)$ $\varphi_b = \frac{qa^2 l}{90EI}\left(5 - 3\frac{a^2}{l^2}\right)$
17		$w = \frac{qa^2 bl}{360EI}\left(20\frac{a}{l} - 13\frac{a^2}{l^2}\right)$ v $x = a$	$\varphi_a = \frac{qa^2 l}{360EI}\left(20 - 15\frac{a}{l} + 3\frac{a^2}{l^2}\right)$ $\varphi_b = \frac{qa^2 l}{360EI}\left(10 - 3\frac{a^2}{l^2}\right)$
18		$w_{max} = 0{,}006522\frac{ql^4}{EI}$ v $x = 0{,}5193l$	$\varphi_a = \frac{7}{360} \cdot \frac{ql^3}{EI}$ $\varphi_b = \frac{8}{360} \cdot \frac{ql^3}{EI}$
19		$w_{max} = \frac{1}{120} \cdot \frac{ql^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{5}{192} \cdot \frac{ql^3}{EI}$
20		$w_{max} = \frac{3}{640} \cdot \frac{ql^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{1}{64} \cdot \frac{ql^3}{EI}$
21		$w_{max} = \frac{7}{1024} \cdot \frac{ql^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{17}{768} \cdot \frac{ql^3}{EI}$
22		$w_{max} = \frac{19}{3072} \cdot \frac{ql^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{5}{256} \cdot \frac{ql^3}{EI}$
23		$w_{max} = \frac{5}{384} \cdot \frac{ql^4}{EI} \cdot \left(1 - \frac{8}{5}\frac{a^2}{l^2} + \frac{16}{25}\frac{a^4}{l^4}\right)$ v $x = 0{,}5l$	$\varphi_a = \varphi_b = \frac{ql^3}{24EI}\left(1 - 2\frac{a^2}{l^2} + \frac{a^3}{l^3}\right)$

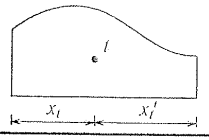
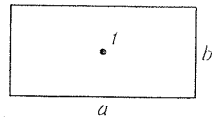
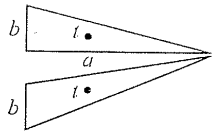
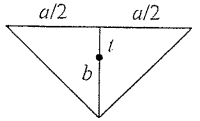
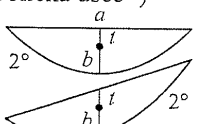
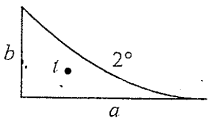
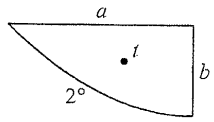
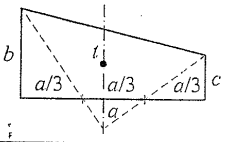
Tabulka 14.2. Deformace prostého nosníku konstantního průřezu (pokračování)

Zatěž. případ	Schéma zatížení	Průhyb w, w_{max}	Pootočení φ_a, φ_b podporových průřezů a, b
24		$w = \frac{5}{768}(q_a + q_b)\frac{l^4}{EI}$ v $x = 0{,}5l$	$\varphi_a = \frac{l^3}{360EI}(8q_a + 7q_b)$ $\varphi_b = \frac{l^3}{360EI}(7q_a + 8q_b)$
25		$w = -\frac{Mab}{3EI} \cdot \frac{a-b}{l}$ v $x = a$	$\varphi_a = \frac{-Ml}{6EI}\left(1 - 3\frac{b^2}{l^2}\right)$ $\varphi_b = \frac{Ml}{6EI}\left(1 - 3\frac{a^2}{l^2}\right)$
26		$w_{max} = 0{,}06415\frac{Ml^2}{EI}$ v $x = 0{,}42265l$	$\varphi_a = \frac{Ml}{3EI}$, $\varphi_b = \frac{Ml}{6EI}$

Tabulka 5.2 Pootočení u prostého nosníku konstantní ohybové tuhosti

Pootočení φ_{ab} podporového průřezu a		Pootočení φ_{ba} podporového průřezu b
$\varphi_{ab}^{F} = \frac{1}{6}\frac{F}{EI}\frac{ab}{l}(l+b)$ (5.8a)		$\varphi_{ba}^{F} = \frac{1}{6}\frac{F}{EI}\frac{ab}{l}(l+a)$ (5.8b)
$\varphi_{ab}^{F} = \frac{1}{16}\frac{F}{EI}l^2$ (5.9a)		$\varphi_{ba}^{F} = \frac{1}{16}\frac{F}{EI}l^2$ (5.9b)
$\varphi_{ab}^{M} = -\frac{1}{6}\frac{M}{EI}\frac{1}{l}(l^2-3b^2)$ (5.10a)		$\varphi_{ba}^{M} = \frac{1}{6}\frac{M}{EI}\frac{1}{l}(l^2-3a^2)$ (5.10b)
$\varphi_{ab}^{M} = -\frac{1}{24}\frac{M}{EI}l$ (5.11a)		$\varphi_{ba}^{M} = \frac{1}{24}\frac{M}{EI}l$ (5.11b)
$\varphi_{ab}^{M} = \frac{1}{3}\frac{M}{EI}l$ (5.12a)		$\varphi_{ba}^{M} = \frac{1}{6}\frac{M}{EI}l$ (5.12b)
$\boldsymbol{\alpha_{ab} = \frac{1}{3}\frac{I}{EI}}$ **(5.13a)**		$\boldsymbol{\beta_{ba} = \frac{1}{6}\frac{I}{EI}}$ **(5.13b)**
$\varphi_{ab}^{q} = \frac{1}{24}\frac{q}{EI}l^3$ (5.14a)		$\varphi_{ba}^{q} = \frac{1}{24}\frac{q}{EI}l^3$ (5.14b)
$\varphi_{ab}^{q} = \frac{1}{24}\frac{q}{EI}\frac{a^2}{l}(2l-a)^2$ (5.15a)		$\varphi_{ba}^{q} = \frac{1}{24}\frac{q}{EI}\frac{a^2}{l}(2l^2-a^2)$ (5.15b)
$\varphi_{ab}^{q} = \frac{9}{384}\frac{q}{EI}l^3$ (5.16a)		$\varphi_{ba}^{q} = \frac{7}{384}\frac{q}{EI}l^3$ (5.16b)
$\varphi_{ab}^{q} = \frac{7}{360}\frac{q}{EI}l^3$ (5.17a)		$\varphi_{ba}^{q} = \frac{8}{360}\frac{q}{EI}l^3$ (5.17b)
$\varphi_{ab}^{q} = \frac{1}{360}\frac{q}{EI}\frac{a^2}{l}(40l^2-45al+12a^2)$ (5.18a)		$\varphi_{ba}^{q} = \frac{1}{90}\frac{q}{EI}\frac{a^2}{l}(5l^2-3a^2)$ (5.18b)
$\varphi_{ab}^{q} = \frac{1}{360}\frac{q}{EI}\frac{a^2}{l}(20l^2-15al+3a^2)$ (5.19a)		$\varphi_{ba}^{q} = \frac{1}{360}\frac{q}{EI}\frac{a^2}{l}(10l^2-3a^2)$ (5.19b)
$\varphi_{ab}^{T} = \frac{1}{2}\alpha_T\,\Delta T_{ab}\frac{l}{h}$ (5.20a)	 $\Delta T_{ab} = \Delta T_{ab}^{d} - \Delta T_{ab}^{h}$	$\varphi_{ba}^{T} = \frac{1}{2}\alpha_T\,\Delta T_{ab}\frac{l}{h}$ (5.20b)
$\varphi_{ab}^{w} = \frac{w_b - w_a}{l}$ (5.21a)		$\varphi_{ba}^{w} = \frac{w_a - w_b}{l}$ (5.21b)

Tabulka 5.1 Obsahy a těžiště vybraných obrazců

Poloha těžiště x_t		Plošný obsah A	Poloha těžiště x_t'
			
$x_t = \frac{1}{2}a$ (5.1b)	obdélník 	$A = ab$ (5.1a)	$x_t' = \frac{1}{2}a$ (5.1c)
$x_t = \frac{1}{3}a$ (5.2b)	trojúhelník 	$A = \frac{1}{2}ab$ (5.2a)	$x_t' = \frac{2}{3}a$ (5.2c)
$x_t = \frac{1}{2}a$ (5.3b)	rovnoramenný trojúhelník [1] 	$A = \frac{1}{2}ab$ (5.3a)	$x_t' = \frac{1}{2}a$ (5.3c)
$x_t = \frac{1}{2}a$ (5.4b)	parabolická úseč [2] 	$A = \frac{2}{3}ab$ (5.4a)	$x_t' = \frac{1}{2}a$ (5.4c)
$x_t = \frac{1}{4}a$ (5.5b)	parabolický trojúhelník 	$A = \frac{1}{3}ab$ (5.5a)	$x_t' = \frac{3}{4}a$ (5.5c)
$x_t = \frac{5}{8}a$ (5.6b)	polovina parabolické úseče 	$A = \frac{2}{3}ab$ (5.6a)	$x_t' = \frac{3}{8}a$ (5.6c)
$x_t = \frac{1}{3}a\frac{b+2c}{b+c}$ (5.7b)	lichoběžník 	$A = \frac{1}{2}(b+c)\,a$ (5.7a)	$x_t' = \frac{1}{3}a\frac{2b+c}{b+c}$ (5.7c)

[1]) vzniká u obrazce ohybových momentů, působí-li síla uprostřed nosníku
[2]) vzniká u obrazce ohybových momentů, působí-li plné spojité rovnoměrné zatížení