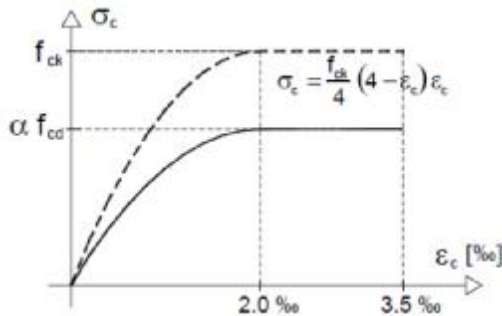


ARMATURA 01

Klase čvrstoće betona

Tabela 3.1: Čvrstoće i deformaciona svojstva betona (EN 1992-1-10)

Klase čvrstoće betona												Analitička veza /Objašnjenje				
f_{ck} (MPa)	12	16	20	25	30	35	40	45	50	55	60	70	80	90		
$f_{ck,cube}$ (MPa)	15	20	25	30	37	45	50	55	60	67	75	85	95	105	2.8	
f_{cm} (MPa)	20	24	28	33	38	43	48	53	58	63	68	78	88	98	$f_{cm} = f_{ck} + 8$ (MPa)	
f_{ctm} (MPa)	1.6	1.9	2.2	2.6	2.9	3.2	3.5	3.8	4.1	4.2	4.4	4.6	4.8	5.0	$f_{ctm} = 0.30 \times f_{ck}^{0.67} \leq C50/60$ $f_{ctm} = 2.12 \ln(1 + \frac{f_{cm}}{10}) > C50/60$	
$f_{ctk,0.05}$ (MPa)	1.1	1.3	1.5	1.8	2.0	2.2	2.5	2.7	2.9	3.0	3.1	3.2	3.4	3.5	$f_{ctk,0.05} = 0.7 \times f_{ctm}$ 5% fractile	
$f_{ctk,0.95}$ (MPa)	2.0	2.5	2.9	3.3	3.8	4.2	4.6	4.9	5.3	5.5	5.7	6.0	6.3	6.6	$f_{ctk,0.95} = 1.3 \times f_{ctm}$ 95% fractile	
E_{cm} (GPa)	27	29	30	31	33	34	35	36	37	38	39	41	42	44	$E_{cm} = 22 \left(\frac{f_{cm}}{10} \right)^{0.3}$ (f_{cm} in MPa)	
ϵ_{c1} (‰)	1.8	1.9	2.0	2.1	2.2	2.25	2.3	2.4	2.45	2.5	2.6	2.7	2.8	2.8	$\epsilon_{c1} (‰) = 0.7 f_{cm}^{0.31} \leq 2.8$	
ϵ_{cu1} (‰)					3.5					3.2	3.0	2.8	2.8	2.8	for $f_{ck} \geq 50$ MPa $\epsilon_{cu1} (‰) = 2.8 + 27 \left[\frac{98 - f_{cm}}{100} \right]$	
ϵ_{cu2} (‰)					2.0					2.2	2.3	2.4	2.5	2.6	for $f_{ck} \geq 50$ MPa $\epsilon_{cu2} (‰) = 2.0 + 0.085(f_{ck} - 50)^{0.53}$	
ϵ_{cu3} (‰)					3.5					3.1	2.9	2.7	2.6	6.6	for $f_{ck} \geq 50$ MPa $\epsilon_{cu3} (‰) = 2.6 + 35 \left[\frac{90 - f_{ck}}{100} \right]^4$	
n					2.0					1.75	1.6	1.45	1.4	1.4	for $f_{ck} \geq 50$ MPa $n = 1.4 + 23.4 \left[\frac{90 - f_{ck}}{100} \right]^4$	
ϵ_{c3} (‰)					1.75					1.8	1.9	2.0	2.2	2.3	for $f_{ck} \geq 50$ MPa $\epsilon_{c3} (‰) = 1.75 + 0.55 \left[\frac{f_{ck} - 50}{40} \right]$	
ϵ_{cu3} (‰)					3.5					3.1	2.9	2.7	2.6	2.6	for $f_{ck} \geq 50$ MPa $\epsilon_{cu3} (‰) = 2.0 + 35 \left[\frac{90 - f_{ck}}{100} \right]^4$	



- f_{ck} - karakteristična čvrstoća betona na pritisak ispitana na valjku 15x30
- $f_{ck,cube}$ - karakteristična čvrstoća betona na pritisak ispitana na kocki 15x15x15
- f_{cm} - srednja karakteristična čvrstoća betona na pritisak
- f_{ctm} - karakteristična čvrstoća betona pri aksijalnom zatezanju
- $f_{ctk,0.05}$ - donja karakteristična čvrstoća betona pri aksijalnom zatezanju
- $f_{ctk,0.95}$ - gornja karakteristična čvrstoća betona pri aksijalnom zatezanju
- E_{cm} - srednja vrijednost sekantnog modula elastičnosti

Klase čvrstoće armature

Čvrstoće i deformaciona svojstva čelika (EN 1992-1-10 Aneks c)

Product form	Bars and de-coiled rods			Wire Fabrics		
Class	A	B	C	A	B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)	400 to 600					
$k = (f_t/f_y)_k$	≥1,05	≥1,08	≥1,15 <1,35	≥1,05	≥1,08	≥1,15 <1,35
Characteristic strain at maximum force, ϵ_{tk} (%)	≥2,5	≥5,0	≥7,5	≥2,5	≥5,0	≥7,5
Fatigue stress range ($N = 2 \times 10^6$) (MPa) with an upper limit of $0.6f_{yk}$	150			100		

B 500 B			Površina poprečnog presjeka za n komada											
Prečnik	kg/m	Obim	1	2	3	4	5	6	7	8	9	10	11	12
6	0.222	1.88	0.28	0.57	0.85	1.13	1.41	1.70	1.98	2.26	2.54	2.83	3.11	3.39
8	0.405	2.51	0.50	1.00	1.51	2.01	2.51	3.01	3.52	4.02	4.52	5.02	5.53	6.03
10	0.634	3.14	0.79	1.57	2.36	3.14	3.93	4.71	5.50	6.28	7.07	7.85	8.64	9.42
12	0.911	3.77	1.13	2.26	3.39	4.52	5.65	6.78	7.91	9.04	10.17	11.30	12.43	13.56
14	1.242	4.40	1.54	3.08	4.62	6.15	7.69	9.23	10.77	12.31	13.85	15.39	16.92	18.46
16	1.621	5.02	2.01	4.02	6.03	8.04	10.05	12.06	14.07	16.08	18.09	20.10	22.11	24.12
18	2.170	5.65	2.54	5.09	7.63	10.17	12.72	15.26	17.80	20.35	22.89	25.43	27.98	30.52
19	2.229	5.97	2.83	5.67	8.50	11.34	14.17	17.00	19.84	22.67	25.50	28.34	31.17	34.01
20	2.288	6.28	3.14	6.28	9.42	12.56	15.70	18.84	21.98	25.12	28.26	31.40	34.54	37.68
22	2.536	6.91	3.80	7.60	11.40	15.20	19.00	22.80	26.60	30.40	34.19	37.99	41.79	45.59
25	3.652	7.85	4.91	9.81	14.72	19.63	24.53	29.44	34.34	39.25	44.16	49.06	53.97	58.88
28	4.956	8.79	6.15	12.31	18.46	24.62	30.77	36.93	43.08	49.24	55.39	61.54	67.70	73.85
32	6.474	10.05	8.04	16.08	24.12	32.15	40.19	48.23	56.27	64.31	72.35	80.38	88.42	96.46
36	8.200	11.30	10.17	20.35	30.52	40.69	50.87	61.04	71.22	81.39	91.56	101.74	111.91	122.08

Tip	Profili (mm)	Razmaci (mm)	Dimenzije (m)	kg/m ²	kg/kom
R 131	5,0x4,2	150x250	6,00x2,20	1,50	19,80
R 131	5,0x4,6	150x250	6,00x2,20	1,63	21,50
R 139	4,2x4,2	100x250	6,00x2,20	1,55	20,50
R 166	4,6x4,2	100x250	6,00x2,20	1,76	23,30
R 166	4,6x4,6	100x250	6,00x2,20	1,85	24,50
R 188	6,0x4,2	150x250	6,00x2,20	1,96	26,00
R 188	6,0x4,6	150x250	6,00x2,20	2,08	27,50
R 196	6,0x4,2	150x250	6,00x2,20	2,00	26,50
R 226	6,0x4,2	125x250	6,00x2,20	2,27	30,00
R 257	7,0x5,0	150x250	6,00x2,20	2,72	35,80
R 283	6,0x4,6	100x250	6,00x2,20	2,77	36,60
R 283	6,0x5,0	100x250	6,00x2,20	2,88	38,00
R 335	8,0x5,0	150x250	6,00x2,20	3,33	44,00
R 335	8,0x6,0	150x250	6,00x2,20	3,63	48,00
R 385	7,0x5,0	100x250	6,00x2,20	3,68	48,60
R 424	9,0x6,0	150x250	6,00x2,20	4,34	57,30
R 503	8,0x5,0	100x200	6,00x2,20	4,77	63,00
R 503	8,0x5,0	100x250	6,00x2,20	4,58	60,50
R 503	8,0x6,0	100x250	6,00x2,20	4,89	64,60
R 524	10,0x6,0	150x250	6,00x2,15	5,15	68,00
R 636	9,0x6,0	100x250	6,00x2,15	5,96	78,50
R 785	10,0x6,0	100x250	6,00x2,15	7,36	97,00
R 785	10,0x6,0	100x200	6,00x2,20	7,39	97,50

Tip	Profili (mm)	Razmaci (mm)	Dimenzija (m)	kg/m ²	kg/kom
O 069	4,2x4,2	200x200	6,00x2,20	1,10	14,50
O 131	5,0x5,0	150x150	6,00x2,20	2,12	28,00
O 139	4,2x4,2	100x100	6,00x2,20	2,20	29,05
O 166	4,6x4,6	100x100	6,00x2,20	2,64	34,90
O 188	6,0x6,0	150x150	6,00x2,20	3,06	40,40
O 196	5,0x5,0	100x100	6,00x2,15	3,07	40,50
O 226	6,0x6,0	125x125	6,00x2,20	3,63	48,00
O 257	7,0x7,0	150x150	6,00x2,20	4,16	55,00
O 283	6,0x6,0	100x100	6,00x2,20	4,48	59,15
O 335	8,0x8,0	150x150	6,00x2,20	5,45	72,00
O 385	7,0x7,0	100x100	6,00x2,20	6,10	80,60
O 424	9,0x9,0	150x150	6,00x2,20	6,81	90,00
O 503	8,0x8,0	100x100	6,00x2,20	8,03	105,00
O 524	10,0x10,0	150x150	6,00x2,20	8,40	110,00
O 636	9,0x9,0	100x100	6,00x2,20	10,08	133,05
O 785	10,0x10,0	100x100	6,00x2,20	12,46	164,50

Položaj armature u poprečnom presjeku

Minimalni dozvoljeni razmak između šipki u poprečnom presjeku, tj. čisto rastojanje između pojedinih šipki armature, posmatrano u vertikalnom i horizontalnom pravcu, se usvaja na osnovu sljedećeg uslova:

$$s_{\min} = \max \left\{ \begin{array}{l} k_1 \varnothing \\ d_g + k_2 \\ 20 \text{ mm} \end{array} \right\}$$

gdje se koeficijenti k_1 i k_2 propisuju nacionalnim aneksima a preporučene vrijednosti su:

$$k_1 = 1$$

$$k_2 = 5 \text{ mm}$$

d_g – prečnik maksimalnog zrna agregata betonske mješavine

\varnothing – najveći prečnik armature u presjeku. Ukoliko se armatura grupiše u svežnjeve prečnik se usvaja na osnovu zamjenjujućeg prečnika svežnja armature $\varnothing_n = \varnothing \sqrt{n_b} \leq 55 \text{ mm}$, gdje je n_b broj armaturnih šipki u svežnju.

