Introduction

1

Concrete

1. Modulus of elasticity of concrete

$$E_c = 5000\sqrt{f_{ck}}$$

where f_{ck} = characteristic strength of concrete

2. Tensile strength of concrete in flexure

$$f_{cr} = 0.7\sqrt{f_{ck}}$$

Characteristic strength of concrete is the value of strength of concrete below which not more than 5% of test results are expected to fall.

3. Permissible value of strength in concrete

Grade	Direct tensile strength (f_{ctk})	Compression		Bondstress (τ_{bd})	
		Direct (σ_{cc})	Bending (σ_{cbc})	WSM	LSM
M15	2	4	5	0.6	1
M20	2.8	5	7	0.8	1.2
M25	3.2	6	8.5	0.9	1.4
M30	3.6	8	10.0	1.0	1.5
M35	4.0	9	11.5	1.1	1.7
M40	4.4	10	13.0	1.2	1.9

- τ_{bd} given in table is only for plain mild steel bar in tension.
- τ_{bd} value should be increased by 60% for deformed bars both LSM and WSM.
- For bars in compression the value should be increased by 25%.

Steel

1. Young's modulus of all type of steel is 2×10^5 N/mm^2.

2. HYSD bars
   Fe 415
   Fe 500
3. Permissible stresses in steel

Permissible Stresses in Steel Reinforcement

S. No.	Type of Stress in Steel Reinforcement	Permissible stresses in N/mm²	
		Mild steel bars (Fe250)	High yield strength deformed bars (Fe 415)
(1)	(2)	(3)	(4)
(i)	Tension (σ_{xt} or σ_{xv})		
	(a) Up to and including 20 mm	140	230
	(b) Over 20 mm	130	230
(ii)	Compression in column	130	190
(iii)	Compression in bars in a beam or slab when the compressive resistance of the concrete is taken into account	The calculated compressive stress in the surrounding concrete multiplied by 1.5 times the modular ratio or σ_{xc} whichever is lower	
(iv)	Compression in bars in a beam or slab where the compressive resistance of the concrete is not taken into account:		
	(a) Up to and including 20 mm	140	190
	(b) Over 20 mm	130	190

NOTE

1. For high yield strength deformed bars of Grade Fe 500 the permissible stress in direct tension and flexural tension shall be 0.55 f_y. The permissible stresses for shear and compression reinforcement shall be as for Grade Fe 415.
2. For welded wire fabric, the permissible value in tension σ_{yt}, is 230 N/mm².
3. For the purpose of this standard, the yield stress of steels for which there is no clearly defined yield point should be taken to be 0.2 percent proof stress.