***IS 456 BEAM CODE PROVISIONS .***

Minimum ratio of reinforcement (flexural) **[26.5.1.1]**

Check ratio of tensile reinforcement

Calculate Neutral axis  **[ANNEX G]**

Calculate Moment Capacity  **[ANNEX G]**

Concrete Shear Capacity   **[40.4 c] [T table 19]**

Reinforce Shear Capacity

Shear strength by stirrup  **[40.4 c]**

Max area of Compression Reinforcement **0.04 b d**  **[26.5.1.2]**

Max compression + Tensile steel **0.08 b d**

Calculate Moment Capacity compression steel  **[ANNEX G 1-2]**

xu.max the limiting value of xU **xu.max**  **[38.1]**

***Stress in Compression Steel fsc*  [Annex G 1.2]**

Minimum shear reinforcement **[26.5.1.6]**

Design Shear Strength of Concrete ***Tc [Table 19]***

***Shear Strength of Concrete Tc [sp 24 39.2.1]***

*Shear Strength of Concrete Tcmax*  *[Table 20 , sp 16 pno124]*

Design of Shear Reinforcement **[40.4]**

***Xu / d Limit [Table 20 , sp 16 pno124]***

***Effective Width of Flange [*23.1.2*]***

lo = 0.7 Effective length

***Beam limiting Moments [Annex G]***

***Beam***  ***[Annex G 1.1]***

**T beam**

***Case 1* xu ≤ Df**

***T-Beam***  ***[Annex G 2.1]***

***Case 2* xu > Df &Df/ d ≤ 0.2**

***T-Beam***  ***[Annex G 2.2.1]***

***Case 3* xu > Df &Df/ d > 0.2**

Yf = (0.15 xu + 0.65 Df)

***Use if xu > xumax use xu = max in case 2 and 3 [Annex G 2.3]***

**Torsion**  **[41.3]**

Ve = Vu + 1.6 Tu /b

Shear equivalent

Equivalent Bending Moment

Me = Mu  + Tu(1 + D/b)/1.7

Mu > Mt

Mu < Mt (Reverse of Moment)

Me = Mu  - Tu(1 + D/b)/1.7

Asv Traverse Reinforcement **[41.4.3]**

**Distribution of Torsional Reinforcement Spacing [26.5.1.7]**

**Least of below (Spacing should not Exceed Least of below)**

**X1**

**(X1+Y1)/4**

**300**

**X1 short dimension Y1 large dimension**

**Splicing [26.5.5.1]**

Lap splices

Ø ≤ 36 mm

If ø ≥ 36 mm provide spirals around lapped bar

++

**Maximum Allowable Spacing of shear steel [26.5.1.5]**

Min of below

0.75 d

300

***Minimum Distance between Individual Bars [*26.3.2]**

Max of below 2:

Dia of Large Bar

5mm + 20aggregate size

**SPACING OF STIRRUPS IN DOUBLY REINFORCED BEAMS [26.5.3.2 c1]**

Min of below 3:

Min (b,d)

16 Dia(longitutional)

300

**Dia tie must be grater that 0.25 of Dia main bar [26.5.3.2 c2]**

**DEFLECTION**

Long-term deflection/final deflection  **Span/250**  **[23.2 a]**

Short-term Deflection Factor **Span/350 or 20mm** (which ever is less) **[23.2 b ]**

**Span to effective depth [23.2.1]**

For span <=10 cantilever 7

Simply supported 20

Continuous 26

For span >10 **[23.2.1 \_b]**

cantilever 7 x 10/span

Simply supported 20 x 10/span

Continuous 26 x 10/span

L/deff = (Basic ratio)\*(F1)\*(F2)\*(F3) // F1 F2 F3 Modification factors

**Minimum bar spacing Horizontally and vertically [IS 456 26.3.1]**

- Grater of Below

( Max size of aggregate + 5 ) // Max size of aggregate =20

Diameter of larger bar

**Corner Distance Rule [Table 15 26.3.3]**

Not more than one half the clear distance form Is 456 table 15

**Check space of skin bar [26.5.1.3]**

(Vertical spacing)(pg no 157 pc v) d >= 750

Area of As>= 0.001 d\* bw(0.001)% web Area

Reinforcement equally must be distributed equal

Steel Must be at tensile part below the neutral axis ?

**// Cracking**

cracking moment of section

[6.2.2]

[C-2.1]

* + - * + [C-2.1]

**Creep Coefficient (Theta) [6.2.5.1]**

7 days 2.2

28 days 1.6

1 Year 1.1

**DEEP BEAM [29]**

SPAN TO DEPTH L/D

SIMPLY SUPPORT L/D < 2

CONTINUOUS L/D < 2

**Effective Span [29.2]**

Least of Below :

Center – Center

1.15 x ClearSpan

**Lever Arm [29.2]**

Simply Support

Z= 0.2x(L+2D) 1 <= L/D <= 2

Z= 0.6 x L L/D < 1

Continuous

Z= 0.2x(L+1.5D) 1 <= L/D <= 2.5

Z= 0.5 x L L/D < 1

**Detailing Steel**  **[29.3]**  
 Reinforcement Positive

0.25 D – 0.05 L

Without Curtailment

Reinforcement Negative

Only one half allowed to terminate at distance 0.5 D From face of the Support

D<1

Rainforcement Evenly distributed at adepth 0.8 D

1<=L/D<=2.5

Depth 0.2 D adjacent to tensile face Ast = 0.5( L’/D – 0.5 )

Depth 0.3 D mid depth emainder of tensile steel\

**Web Steel**  **[32.5]**

Minimum Vertical Steel

0.15% Fe 250

0.12% Fe 415

Dia Bar <= 14 mm

**Spacing**  3 \* thicktess\_beam or 450

Minimum Horizontal Steel

0.25% Fe 250

0.20% 3Fe 415

**Minimum Steel for Crack Control**

0.2% - 0.3% of Area b x d

**BEAM 13920 2016 [6.1]**

b/D >= 0.3

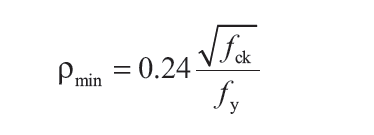
b >= 200

D <= ¼\* Clear span

Beam b <= width of support + width of support or width of support + 0.75\* breadth of support

**Longitudinal Reinforcement**

Min 12 mm diameter

Minimum area of steel 

Maximum area 0.025 \* b d

**Transverse**

Diameter >= 8

Ast bottom end face >= ½ Ast top at end

Mid steel >= ¼ ast of top end section steel

**SPLICING**

**Transverse**

Diameter >= 8

SPACING AT END FACES (UP TO 2XD) SHELL NOT EXCEED MAX OF BELOW

D/4

8 X DIAMETER SMALL BAR

100

MIN

135 degree bent hook

Extend 6 D or >= 65 mm

CONSIDERED EQUILENT SHEAR FOR SWAY DUE TO EARTH QUAKE