**ALGORITHEMS**

**SINGLE REINFORCEMENT**

*Area of Steel*

**b d Mu fc fy**

****

**Check Max(take minimum of max)**

**Check Ast min**

Area of Steel

**xu** known

**Balance steel limit Max**

**Number of Bars**

Check

**xu As** unknown

*Area of Steel* Method 2

**b d Mu fc fy**

****

**Check Max(take minimum of max)**

**Check Ast min**

Area of Steel

**Balance steel limit Max**

**Number of Bars**

Check

**check**

d min from equilibrium

***percentage of Steel limit***

**b d Mu fc fy**

***Xu / d Limit***

**b d Mu fc fy**

***X / d Ratio beam***

**b d Mu**

***X / d Ratio beam***

**b d Ast fc fy**

**ALGORITHEMS**

**DOUBLE REINFORCEMENT**

**b d Mu fc fy**

**** *Area of Steel*

d=d-cc-Dia/2

Mu limit

Balance Steel

d’=cc+D/2

**Min Ast min Compression**

**Min Ast min Tensile**

**Balance steel limit Max**

Ast maxTension

Ast max compression

**(take minimum of max)**

**As** = Max of Min and min of max Ast

**Number of Bars As1+**

***Min area of steel Tension***

**b d fy**

***Min area of steel Compression***

**b d**

****

***Max area of steel Tension***

**b d**

***Max area of steel Compression***

**b d**

***Balance area of steel***

**b d Mu fc fy**

***Resisting Moment of Single Reinforcement Beam Mu Tensile Concrete***

**b d As fc fy Xu**

***Resisting Moment of Single Reinforcement Beam Mu Compression Concrete***

**b d fc Xu**

***Resisting Moment of Doule Reinforcement Beam Mu Compression Concrete***

**b d fc fy xu**

***fsc Compression steel***

**Es d d’ fc Xumax**

***Min Shear reinforcement***

**b d fy**

**Asv**= area of stirrups legs

***Shear Strength of Concrete Tc***

**b d fy fc As**

**Βut not lessthan 1**

**Asv**= area of stirrups legs

***Shear Strength of Concrete Tcmax***

**f**c

**Asv**= area of stirrups legs

**Minimum *Skin Reinforcement Area/Spacing***

**b d**

**d >= 750**

**Steel Must be at tensile part below the neutral axis ?**

***Shear Reinforcement***

**b d As fc fy**

****

Table 19 20

**Number of Bars**

**d = D-cc- d/2**

**Check Tcmax llimits**

**Asv**= 2 \* pi \* 10 \* 10 / 4 = 157

**Asv**= area of stirrups legs

**N no of legs**

**Sv Spacing**

**Ø Diameter**

**T BEAM**

**Neutral axis is within the flange xu ≤ Df**

**Area of Steel**

**bw d Mu fc fy**

****

**Check Max(take minimum of max)**

**Check Ast min**

Area of Steel

**xu** known

**Balance steel limit Max**

**Number of Bars**

Check

**xu As** unknown

*Area of Steel* Method 2

**bw d Mu fc fy**

****

**Check Max(take minimum of max)**

**Check Ast min**

Area of Steel

**Balance steel limit Max**

**Number of Bars**

Check

**check**

d min from equilibrium

x/d from function where b is bw

**T BEAM**

**Neutral axis is within the flange xu > Df &Df/ d ≤ 0.2**

**Area of Steel**

**bw d tf bf Mu fc fy**

****

**Check Max(take minimum of max)**

**Number of Bars**

**xu As** unknown

**xu** known

CLARIFY THIS OR THIS AS IS BW

Dosent matter because

We calculate 0.87 and fy

And distribute in the web beam

Ask

Lhs is rt

Clause 26.5.1.1

Check

Area of Steel

**Check Ast min**

**Balance steel limit Max**

**T BEAM**

**Neutral axis is within the flange xu > Df &Df/ d > 0.2**

**Area of Steel**

**bw d tf bf Mu fc fy**

****

**Check Max(take minimum of max)**

**Number of Bars**

**xu As** unknown

**Df = Yf**

**Yf = (0.15 xu + 0.65 Df)**

**xu** known

Check

Area of Steel

**Check Ast min**

**Balance steel limit Max**

***Limiting Moment of Beam Single***

**b d As fy xumax fc**

***Limiting Moment of T-Beam***

**xu > Df &Df/ d ≤ 0.2**

**bf Df  bw d As fy xumax fc**

***Limiting Moment of T-Beam***

**xu < Df**

**bf Df  bw d As fy xumax fc**

***Limiting Moment of T-Beam***

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

**bf Df  bw d As fy xumax fc**

**Yf = (0.15 xu + 0.65 Df)**

**T-BEAM DOUBLE REINFORCEMENT**

**b d Mu fc fy**

**** *Area of Steel*

**Only Moments Calculation changes**

**Remaining calculation same**

**As per case 1 or 2 or 3**

**Mlimits <= Mugiven**

or

d=d-cc-Dia/2

Mu limit

Balance Steel

d’=cc+D/2

**Min Ast min Compression**

**Min Ast min Tensile**

**Balance steel limit Max**

Ast maxTension

Ast max compression

**(take minimum of max)**

**As** = Max of Min and min of max Ast

**Number of Bars As1+**

**Cracking Moment**

**fc**

****

**Yt = d/2**

**Δ**

**Deflection Limits**

**E DL LL b d fc fy**

***X / d Ratio T- beam***

**bf bw Df Mu**

***.***

***Tensile force beam***

**Ast fy**

**T = 0.87 fy As**

**Steel yield or write in terms of some factor ?**

***Compression force beam***

**b d x fc**

**C = 0.36 fc b x**

***Tensile force T-beam***

**Ast fy**

**T = 0.87 fy As**

**Steel yield or write in terms of some factor ?**

***Compression force T- beam***

**Df bf bw d x fc**

**C = 0.36 fc bw x + 0.45 fc (bf - bw) Df**

***DEEP BEAM***

***FOR MAIN AST***

**Mu Z fy**

**Ast=**

**Z as per IS 456 [ 29.2 ]**

***DEEP BEAM***

***Mu check***

**Ast Z fy**

**= Ast**

**Z as per IS 456 [ 29.2 ]**

**DESIGN ALGORITHEMS**

**INPUTS**

****

Area of Steel

**xu** known

Check

**Rectangle T L**

**Increase b or d**

X > Xu limit

**Check with Xulimit**

**Find Neutral Axis**

X <= Xu limit

**IF EXCEEDING LIMITS**

**FOR MORE THAN 100**

**INTERATION**

**THEN INCREASE B**

**CALCULATE**

**AST (REQUIRE, MIN, MAX, PROVIDED)**

**CALCULATE SPACING AND NUMBER OF BARS**

**CHANGE BAR DIAMETER**

**OR INCREASE LAYERS**

Exceed sapcing limit

**CHECK SPACING**

With the limits of spacing

**OUTPUT**