BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIB DESIGN FOR TEST IN CHINA

BEAM : RIB BEAM 300-120

DESIGN DATA

$f_c = 32$ MPa

$f_{sy} = 500$ MPa $\quad E_s := 200000$ MPa $\quad f_{syf} = 250$ MPa

$D := 470$ mm $\quad d_o := 422$ mm $\quad A_{sv} := 56$ mm^2

$b := 75$ mm $\quad b_t := 208$ mm $\quad A_g := 0$ mm^2

$A_{st} := 402$ mm^2 $\quad \phi := 0.7$

$N := 0$ kN $\quad V := 48.5$ kN (Factored shear force V*)

Design for Shear

(a) Calculation of Vuc

$$\beta_1 := 1.1\cdot\left(1.6 - \frac{d_o}{1000}\right) \qquad \beta_1 = 1.296$$

$$\beta_2 := 1 + \frac{N\cdot 10^3}{14\cdot A_g}$$ For members with Compressive axial force

$$\beta_2 := 1 - \frac{N\cdot 10^3}{3.5\cdot A_g}$$ For members with tensile axial force

$\beta_2 = 1$

$\beta_3 := 1$ (As there is no Concentrated load near the support)

$$b_v := 0.5\cdot(b + b_t)$$

$$V_{uc} := \beta_1\cdot\beta_2\cdot\beta_3\cdot b_v\cdot d_o\left(\frac{A_{st}\cdot f_c}{b_v\cdot d_o}\right)^{\frac{1}{3}}\cdot 10^{-3} \qquad V_{uc} = 46.4 \text{ kN}$$

$0.5\cdot\phi\cdot V_{uc} = 16.2$ kN

Greater than applied shear force
Therefore, it is necessary to design shear reinforements.

Calculate Vu.min

$V_{u.min} := V_{uc} + 0.6 \cdot b_v \cdot d_o \cdot 10^{-3}$ $V_{u.min} = 82.2$ kN

$\phi \cdot V_{u.min} = 57.5$ kN > V* Therefore, provide min. shear r/f.

250 mm<D

$s_{min} := \frac{A_{sv} \cdot f_{sy}}{0.35 \cdot b_v}$ $s_{min} = 565$ mm

Maximum shear link spacing is $s_{max} := 0.75 \cdot D$ $s_{max} = 352.5$ mm

Hence provide R6-350 c/c shear links

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIB DESIGN FOR TEST IN CHINA

BEAM : RIB BEAM 250-100

DESIGN DATA

$f_c = 32$ MPa

$f_{sy} = 500$ MPa $\quad E_s := 200000$ MPa $\quad f_{syf} = 250$ MPa

$D := 400$ mm $\quad d_o := 366$ mm $\quad A_{sv} := 56$ mm^2

$b := 75$ mm $\quad b_t := 211$ mm $\quad A_g := 0$ mm^2

$A_{st} := 402$ mm^2 $\quad \phi := 0.7$

$N := 0$ kN $\quad V := 47.4$ kN (Factored shear force V*)

Design for Shear

(a) Calculation of Vuc

$$\beta_1 := 1.1 \cdot \left(1.6 - \frac{d_o}{1000}\right) \qquad \beta_1 = 1.357$$

$$\beta_2 := 1 + \frac{N \cdot 10^3}{14 \cdot A_g}$$ For members with Compressive axial force

$$\beta_2 := 1 - \frac{N \cdot 10^3}{3.5 \cdot A_g}$$ For members with tensile axial force

$\beta_2 = 1$

$\beta_3 := 1$ (As there is no Concentrated load near the support)

$b_v := 0.5 \cdot (b + b_t)$

$$V_{uc} := \beta_1 \cdot \beta_2 \cdot \beta_3 \cdot b_v \cdot d_o \left(\frac{A_{st} \cdot f_c}{b_v \cdot d_o}\right)^{\frac{1}{3}} \cdot 10^{-3} \qquad V_{uc} = 44.5 \text{ kN}$$

$0.5 \cdot \phi \cdot V_{uc} = 15.6$ kN

Greater than applied shear force
Therefore, it is necessary to design shear reinforements.

Calculate Vu.min

$V_{u.min} := V_{uc} + 0.6 \cdot b_v \cdot d_o \cdot 10^{-3}$ $V_{u.min} = 75.9$ kN

$\phi \cdot V_{u.min} = 53.1$ kN > V* Therefore, provide min. shear r/f.

250 mm<D

$s_{min} := \frac{A_{sv} \cdot f_{sy}}{0.35 \cdot b_v}$ $s_{min} = 559$ mm

Maximum shear link spacing is $s_{max} := 0.75 \cdot D$ $s_{max} = 300$ mm

Hence provide R6-300 c/c shear links

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIB DESIGN FOR TEST IN CHINA

BEAM : RIB BEAM 150-85

DESIGN DATA

$f_c = 32$ MPa

$f_{sy} = 500$ MPa $E_s := 200000$ MPa $f_{syf} = 250$ MPa

$D := 285$ mm $d_o := 251$ mm $A_{sv} := 56$ mm^2

$b := 75$ mm $b_t := 236$ mm $A_g := 0$ mm^2

$A_{st} := 402$ mm^2 $\phi := 0.7$

$N := 0$ kN $V := 41.7$ kN   (Factored shear force V*)

Design for Shear

(a) Calculation of Vuc

$$\beta_1 := 1.1 \cdot \left(1.6 - \frac{d_o}{1000}\right) \qquad \beta_1 = 1.484$$

$$\beta_2 := 1 + \frac{N \cdot 10^3}{14 \cdot A_g}$$ For members with Compressive axial force

$$\beta_2 := 1 - \frac{N \cdot 10^3}{3.5 \cdot A_g}$$ For members with tensile axial force

$\beta_2 = 1$

$\beta_3 := 1$ (As there is no Concentrated load near the support)

$$b_v := 0.5 \cdot (b + b_t)$$

$$V_{uc} := \beta_1 \cdot \beta_2 \cdot \beta_3 \cdot b_v \cdot d_o \left(\frac{A_{st} \cdot f_c}{b_v \cdot d_o}\right)^{\frac{1}{3}} \cdot 10^{-3} \qquad V_{uc} = 40 \text{ kN}$$

$0.5 \cdot \phi \cdot V_{uc} = 14$ kN

Greater than applied shear force
Therefore, it is necessary to design shear reinforements.

Calculate Vu.min

$V_{u.min} := V_{uc} + 0.6 \cdot b_v \cdot d_o \cdot 10^{-3}$ $\quad V_{u.min} = 63.4$ kN

$\phi \cdot V_{u.min} = 44.4$ kN $\quad$ > V* Therefore, provide min. shear r/f.

250 mm<D

$s_{min} := \frac{A_{sv} \cdot f_{sy}}{0.35 \cdot b_v}$ $\quad s_{min} = 514$ mm

Maximum shear link spacing is $\quad s_{max} := 0.75 \cdot D$ $\quad s_{max} = 213.75$ mm

Hence provide R6-200 c/c shear links

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIB DESIGN FOR TEST IN CHINA

**BEAM : ** RIB BEAM 90-50

DESIGN DATA

$f_c = 32$ MPa

$f_{sy} = 500$ MPa $E_s := 200000$ MPa $f_{syf} = 250$ MPa

$D := 190$ mm $d_o := 164$ mm $A_{sv} := 56$ mm^2

$b := 75$ mm $b_t := 254$ mm $A_g := 0$ mm^2

$A_{st} := 226$ mm^2 $\phi := 0.7$

$N := 0$ kN $V := 20$ kN (Factored shear force V*)

Design for Shear

(a) Calculation of Vuc

$$\beta_1 := 1.1 \cdot \left(1.6 - \frac{d_o}{1000}\right) \qquad \beta_1 = 1.58$$

$$\beta_2 := 1 + \frac{N \cdot 10^3}{14 \cdot A_g}$$ For members with Compressive axial force

$$\beta_2 := 1 - \frac{N \cdot 10^3}{3.5 \cdot A_g}$$ For members with tensile axial force

$\beta_2 = 1$

$\beta_3 := 1$ (As there is no Concentrated load near the support)

$$b_v := 0.5 \cdot (b + b_t)$$

$$V_{uc} := \beta_1 \cdot \beta_2 \cdot \beta_3 \cdot b_v \cdot d_o \left(\frac{A_{st} \cdot f_c}{b_v \cdot d_o}\right)^{\frac{1}{3}} \cdot 10^{-3} \qquad V_{uc} = 27.5 \text{ kN}$$

$0.5 \cdot \phi \cdot V_{uc} = 9.6$ kN

Greater than applied shear force
Therefore, it is necessary to design shear reinforements.

Calculate Vu.min

$V_{u.min} := V_{uc} + 0.6 \cdot b_v \cdot d_o \cdot 10^{-3}$ $V_{u.min} = 43.7$ kN

$\phi \cdot V_{u.min} = 30.6$ kN > V* and Depth < 250 Therefore, provision of min. shear r/f. is not required

Shear links not required

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIB DESIGN FOR TEST IN CHINA

BEAM : RIB BEAM 00-65

DESIGN DATA

$f_c = 32$ MPa

$f_{sy} = 500$ MPa $\quad E_s := 200000$ MPa $\quad f_{syf} = 250$ MPa

$D := 115$ mm $\quad d_o := 89$ mm $\quad A_{sv} := 56$ mm^2

$b := 200$ mm $\quad b_t := 332$ mm $\quad A_g := 0$ mm^2

$A_{st} := 226$ mm^2 $\quad \phi := 0.7$

$N := 0$ kN $\quad V := 20$ kN (Factored shear force V*)

Design for Shear

(a) Calculation of Vuc

$$\beta_1 := 1.1 \cdot \left(1.6 - \frac{d_o}{1000}\right) \qquad \beta_1 = 1.662$$

$$\beta_2 := 1 + \frac{N \cdot 10^3}{14 \cdot A_g}$$ For members with Compressive axial force

$$\beta_2 := 1 - \frac{N \cdot 10^3}{3.5 \cdot A_g}$$ For members with tensile axial force

$\beta_2 = 1$

$\beta_3 := 1$ (As there is no Concentrated load near the support)

$$b_v := 0.5 \cdot (b + b_t)$$

$$V_{uc} := \beta_1 \cdot \beta_2 \cdot \beta_3 \cdot b_v \cdot d_o \left(\frac{A_{st} \cdot f_c}{b_v \cdot d_o}\right)^{\frac{1}{3}} \cdot 10^{-3} \qquad V_{uc} = 26.5 \text{ kN}$$

$0.5 \cdot \phi \cdot V_{uc} = 9.3$ kN

Greater than applied shear force
Therefore, it is necessary to design shear reinforements.

Calculate Vu.min

$V_{u.min} := V_{uc} + 0.6 \cdot b_v \cdot d_o \cdot 10^{-3}$ $V_{u.min} = 40.7$ kN

$\phi \cdot V_{u.min} = 28.5$ kN > V* and Depth < 250 Therefore, provision of min. shear r/f. is not required

Shear links not required