BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIBBED BEAMS FOR TEST IN CHINA

BEAM : RIB BEAM 300-120

DESIGN DATA

$fc = 32$ MPa

$fsy = 500$ MPa $\quad Es := 200000$ MPa

$D := 470$ mm $\quad dsc := 60$ mm

$b := 1200$ mm $\quad dst := 422$ mm

$Ast := 402$ mm^2

$Asc := 0$ mm^2

DESIGN FOR BENDING

Compressive strain $\quad \varepsilon u := 0.003$

$\gamma := 0.85 - 0.007(fc - 28)$ $\quad \gamma = 0.822$ $\quad 0.65 \le \gamma \le 0.85$

Neutral axis depth $\quad dn := fsy \cdot (Ast - Asc) \cdot \left(\frac{1}{0.85 fc \cdot b \cdot \gamma} \right)$ $\quad dn = 7.5$ mm

Lever arm distance $\quad z := dst - 0.5 \cdot \gamma \cdot dn$ $\quad z = 418.9$ mm

$ku := \frac{dn}{dst}$ $\quad ku = 0.018$

Check yield Assumptions

Yeild strain of steel $\quad \varepsilon sy := \frac{fsy}{Es}$ $\quad \varepsilon sy = 0.0025$

Strain in the tensile steel $\quad \varepsilon st := \varepsilon u \cdot \frac{dst - dn}{dn}$ $\quad \varepsilon st = 0.166$

Strain in the compressive steel $\quad \varepsilon sc := \varepsilon u \cdot \frac{dn - dsc}{dn}$ $\quad \varepsilon sc = -0.021$

Concrete Compressive Force $\quad Cc := 0.85 \cdot fc \cdot \gamma \cdot b \cdot dn \cdot 10^{-3}$ $\quad Cc = 201$ kN

Compressive steel force $\quad Cs := Asc \cdot fsy \cdot 10^{-3}$ $\quad Cs = 0$ kN

Tensile steel force $\quad T := Ast \cdot fsy \cdot 10^{-3}$ $\quad T = 201$ kN

Moment Capacity $\quad Mu := \left[fsy \cdot Asc \cdot (dst - dsc) + 0.85 \cdot fc \cdot b \cdot \gamma \cdot dn \cdot z \right] \cdot 10^{-6}$ $\quad Mu = 84.2$ kNm

Note : if steel not yielded go to next page

$\phi := 0.8$

Design Bending strength $\quad \phi \cdot Mu = 67.4$ kNm

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIBBED BEAMS FOR TEST IN CHINA

BEAM : RIB BEAM 250-100

DESIGN DATA

$f_c = 32$ MPa

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

$D := 400$ mm $\quad d_{sc} := 60$ mm

$b := 1200$ mm $\quad d_{st} := 366$ mm

$A_{st} := 402$ mm^2

$A_{sc} := 0$ mm^2

DESIGN FOR BENDING

Compressive strain $\quad \varepsilon_u := 0.003$

$\gamma := 0.85 - 0.007(f_c - 28)$ $\quad \gamma = 0.822$ $\quad 0.65 \le \gamma \le 0.85$

Neutral axis depth $\quad d_n := f_{sy}\cdot(A_{st} - A_{sc})\cdot\left(\frac{1}{0.85 f_c \cdot b \cdot \gamma}\right)$ $\quad d_n = 7.5$ mm

Lever arm distance $\quad z := d_{st} - 0.5\cdot\gamma\cdot d_n$ $\quad z = 362.9$ mm

$k_u := \frac{d_n}{d_{st}}$ $\quad k_u = 0.02$

Check yield Assumptions

Yeild strain of steel $\quad \varepsilon_{sy} := \frac{f_{sy}}{E_s}$ $\quad \varepsilon_{sy} = 0.0025$

Strain in the tensile steel $\quad \varepsilon_{st} := \varepsilon_u \cdot \frac{d_{st} - d_n}{d_n}$ $\quad \varepsilon_{st} = 0.1436$

Strain in the compressive steel $\quad \varepsilon_{sc} := \varepsilon_u \cdot \frac{d_n - d_{sc}}{d_n}$ $\quad \varepsilon_{sc} = -0.021$

Concrete Compressive Force $\quad C_c := 0.85\cdot f_c \cdot \gamma \cdot b \cdot d_n \cdot 10^{-3}$ $\quad C_c = 201$ kN

Compressive steel force $\quad C_s := A_{sc}\cdot f_{sy}\cdot 10^{-3}$ $\quad C_s = 0$ kN

Tensile steel force $\quad T := A_{st}\cdot f_{sy}\cdot 10^{-3}$ $\quad T = 201$ kN

Moment Capacity $\quad M_u := \left[f_{sy}\cdot A_{sc}\cdot(d_{st} - d_{sc}) + 0.85\cdot f_c \cdot b \cdot \gamma \cdot d_n \cdot z\right]\cdot 10^{-6}$ $\quad M_u = 72.9$ kNm

Note : if steel not yielded go to next page

$\phi := 0.8$

Design Bending strength $\quad \phi\cdot M_u = 58.4$ kNm

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIBBED BEAMS FOR TEST IN CHINA

BEAM : RIB BEAM 150-85

DESIGN DATA

$f_c = 32$ MPa

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

$D := 285$ mm $\quad d_{sc} := 60$ mm

$b := 1200$ mm $\quad d_{st} := 251$ mm

$A_{st} := 402$ mm^2

$A_{sc} := 0$ mm^2

DESIGN FOR BENDING

Compressive strain $\quad \varepsilon_u := 0.003$

$\gamma := 0.85 - 0.007(f_c - 28)$ $\quad \gamma = 0.822$ $\quad 0.65 \le \gamma \le 0.85$

Neutral axis depth $\quad d_n := f_{sy}\cdot(A_{st} - A_{sc})\cdot\left(\frac{1}{0.85 f_c \cdot b \cdot \gamma}\right)$ $\quad d_n = 7.5$ mm

Lever arm distance $\quad z := d_{st} - 0.5\cdot\gamma\cdot d_n$ $\quad z = 247.9$ mm

$k_u := \frac{d_n}{d_{st}}$ $\quad k_u = 0.03$

Check yield Assumptions

Yeild strain of steel $\quad \varepsilon_{sy} := \frac{f_{sy}}{E_s}$ $\quad \varepsilon_{sy} = 0.0025$

Strain in the tensile steel $\quad \varepsilon_{st} := \varepsilon_u\cdot\frac{d_{st} - d_n}{d_n}$ $\quad \varepsilon_{st} = 0.0975$

Strain in the compressive steel $\quad \varepsilon_{sc} := \varepsilon_u\cdot\frac{d_n - d_{sc}}{d_n}$ $\quad \varepsilon_{sc} = -0.021$

Concrete Compressive Force $\quad C_c := 0.85\cdot f_c\cdot\gamma\cdot b\cdot d_n\cdot 10^{-3}$ $\quad C_c = 201$ kN

Compressive steel force $\quad C_s := A_{sc}\cdot f_{sy}\cdot 10^{-3}$ $\quad C_s = 0$ kN

Tensile steel force $\quad T := A_{st}\cdot f_{sy}\cdot 10^{-3}$ $\quad T = 201$ kN

Moment Capacity $\quad M_u := \left[f_{sy}\cdot A_{sc}\cdot(d_{st} - d_{sc}) + 0.85\cdot f_c\cdot b\cdot\gamma\cdot d_n\cdot z\right]\cdot 10^{-6}$ $\quad M_u = 49.8$ kNm

Note : if steel not yielded go to next page

$\phi := 0.8$

Design Bending strength $\quad \phi\cdot M_u = 39.9$ kNm

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIBBED BEAMS FOR TEST IN CHINA

BEAM : RIB BEAM 90-50

DESIGN DATA

$f_c = 32$ MPa

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

$D := 190$ mm $\quad d_{sc} := 60$ mm

$b := 900$ mm $\quad d_{st} := 164$ mm

$A_{st} := 226$ mm^2

$A_{sc} := 0$ mm^2

DESIGN FOR BENDING

Compressive strain $\quad \varepsilon_u := 0.003$

$\gamma := 0.85 - 0.007(f_c - 28)$ $\quad \gamma = 0.822$ $\quad 0.65 \le \gamma \le 0.85$

Neutral axis depth $\quad d_n := f_{sy}\cdot(A_{st} - A_{sc})\cdot\left(\frac{1}{0.85 f_c \cdot b \cdot \gamma}\right)$ $\quad d_n = 5.6$ mm

Lever arm distance $\quad z := d_{st} - 0.5\cdot\gamma\cdot d_n$ $\quad z = 161.7$ mm

$k_u := \frac{d_n}{d_{st}}$ $\quad k_u = 0.034$

Check yield Assumptions

Yeild strain of steel $\quad \varepsilon_{sy} := \frac{f_{sy}}{E_s}$ $\quad \varepsilon_{sy} = 0.0025$

Strain in the tensile steel $\quad \varepsilon_{st} := \varepsilon_u\cdot\frac{d_{st} - d_n}{d_n}$ $\quad \varepsilon_{st} = 0.0846$

Strain in the compressive steel $\quad \varepsilon_{sc} := \varepsilon_u\cdot\frac{d_n - d_{sc}}{d_n}$ $\quad \varepsilon_{sc} = -0.0291$

Concrete Compressive Force $\quad C_c := 0.85\cdot f_c\cdot\gamma\cdot b\cdot d_n\cdot 10^{-3}$ $\quad C_c = 113$ kN

Compressive steel force $\quad C_s := A_{sc}\cdot f_{sy}\cdot 10^{-3}$ $\quad C_s = 0$ kN

Tensile steel force $\quad T := A_{st}\cdot f_{sy}\cdot 10^{-3}$ $\quad T = 113$ kN

Moment Capacity $\quad M_u := \left[f_{sy}\cdot A_{sc}\cdot(d_{st} - d_{sc}) + 0.85\cdot f_c\cdot b\cdot\gamma\cdot d_n\cdot z\right]\cdot 10^{-6}$ $\quad M_u = 18.3$ kNm

Note : if steel not yielded go to next page

$\phi := 0.8$

Design Bending strength $\quad \phi\cdot M_u = 14.6$ kNm

BEAM DESIGN [AS3600- Normal Strength Concrete]

PROJECT : CORCON RIBBED BEAMS FOR TEST IN CHINA

BEAM : RIB BEAM 00-65

DESIGN DATA

$f_c = 32$ MPa

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

$D := 115$ mm $\quad d_{sc} := 60$ mm

$b := 600$ mm $\quad d_{st} := 89$ mm

$A_{st} := 226$ mm^2

$A_{sc} := 0$ mm^2

DESIGN FOR BENDING

Compressive strain $\quad \varepsilon_u := 0.003$

$\gamma := 0.85 - 0.007(f_c - 28)$ $\quad \gamma = 0.822$ $\quad 0.65 \le \gamma \le 0.85$

Neutral axis depth $\quad d_n := f_{sy}\cdot(A_{st} - A_{sc})\cdot\left(\frac{1}{0.85 f_c \cdot b \cdot \gamma}\right)$ $\quad d_n = 8.4$ mm

Lever arm distance $\quad z := d_{st} - 0.5\cdot\gamma\cdot d_n$ $\quad z = 85.5$ mm

$k_u := \frac{d_n}{d_{st}}$ $\quad k_u = 0.095$

Check yield Assumptions

Yeild strain of steel $\quad \varepsilon_{sy} := \frac{f_{sy}}{E_s}$ $\quad \varepsilon_{sy} = 0.0025$

Strain in the tensile steel $\quad \varepsilon_{st} := \varepsilon_u\cdot\frac{d_{st} - d_n}{d_n}$ $\quad \varepsilon_{st} = 0.0287$

Strain in the compressive steel $\quad \varepsilon_{sc} := \varepsilon_u\cdot\frac{d_n - d_{sc}}{d_n}$ $\quad \varepsilon_{sc} = -0.0184$

Concrete Compressive Force $\quad C_c := 0.85\cdot f_c\cdot\gamma\cdot b\cdot d_n\cdot 10^{-3}$ $\quad C_c = 113$ kN

Compressive steel force $\quad C_s := A_{sc}\cdot f_{sy}\cdot 10^{-3}$ $\quad C_s = 0$ kN

Tensile steel force $\quad T := A_{st}\cdot f_{sy}\cdot 10^{-3}$ $\quad T = 113$ kN

Moment Capacity $\quad M_u := \left[f_{sy}\cdot A_{sc}\cdot(d_{st} - d_{sc}) + 0.85\cdot f_c\cdot b\cdot\gamma\cdot d_n\cdot z\right]\cdot 10^{-6}$ $\quad M_u = 9.7$ kNm

Note : if steel not yielded go to next page

$\phi := 0.8$

Design Bending strength $\quad \phi\cdot M_u = 7.7$ kNm