

Autodesk Robot Structural Analysis Professional 2020

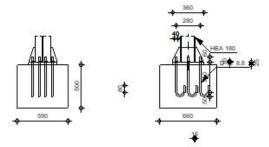
# Fixed column base design

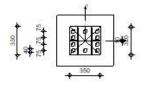
Eurocode 3: NF EN 1993-1-8:2005/NA:2007/AC:2009 + CEB

Design Guide: Design of fastenings in concrete



Ratio **0.83** 





# **GENERAL**

Connection no.: 14

Connection name: Fixed column base

Structure node: 37 Structure bars: 39

# **GEOMETRY**

# **COLUMN**

Section:	HEA 180		
Bar no.:	39		
Lc =	4.50	[m]	Column length
α =	0.0	[Deg]	Inclination angle
hc =	171	[mm]	Height of column section
$b_{fc} =$	180	[mm]	Width of column section
$t_{\text{wc}} =$	6	[mm]	Thickness of the web of column section
$t_{fc} =$	10	[mm]	Thickness of the flange of column section
$r_c =$	15	[mm]	Radius of column section fillet
$A_c =$	45.25	[cm <sup>2</sup> ]	Cross-sectional area of a column
$I_{yc} =$	2510.29	[cm <sup>4</sup> ]	Moment of inertia of the column section
Material:	ACIER		
$f_{yc} =$	235.00	[MPa]	Resistance
$f_{uc} =$	365.00	[MPa]	Yield strength of a material

# **COLUMN BASE**

Material: ACIER E24

 $f_{ypd} = 235.00$  [MPa] Resistance

 $f_{upd} = 365.00$  [MPa] Yield strength of a material

### **ANCHORAGE**

The shear plane passes through the UNTHREADED portion of the bolt.

Class =	8.8		Anchor class		
$f_{yb} =$	550.00	[MPa]	Yield strength of the anchor material		
$f_{ub} =$	800.00	[MPa]	Tensile strength of the anchor material		
d =	18	[mm]	Bolt diameter		
$A_s =$	1.92	[cm <sup>2</sup> ]	Effective section area of a bolt		
$A_v =$	2.54	[cm <sup>2</sup> ] Area of bolt section			
n <sub>H</sub> =	3	Number of bolt columns			
n∨ =	4		Number of bolt rows		
Horizontal spacing e <sub>Hi</sub> = 140 [mm]					
Vertical spacing e <sub>Vi</sub> = 75;75 [mm]					

#### **Anchor dimensions**

$L_1 =$	60	[mm]
$L_2 =$	350	[mm]
$L_3 =$	100	[mm]
L <sub>4</sub> =	80	[mm]

#### **STIFFENER**

$I_s =$	350	[mm]	Length
$W_S =$	320	[mm]	Width
hs =	171	[mm]	Height
$t_s =$	10	[mm]	Thickness
$d_1 =$	20	[mm]	Cut
$d_2 =$	20	[mm]	Cut

### **LOADS**

```
16: ULS /142/ 1*1.35 + 2*1.35 + 3*1.35 + 4*1.35 + 5*1.35 + 6*1.35 + 7*1.05 +
       9*1.05 + 15*1.50
         -54.82
N_{j,Ed} =
                   [kN]
                          Axial force
V_{j,Ed,y} =
         0.00
                   [kN]
                          Shear force
V_{j,Ed,z} = -22.59
                   [kN]
                          Shear force
        43.94 [kN*m]
M_{j,Ed,y} =
                          Bending moment
          -0.00 [kN*m]
                          Bending moment
M_{j,Ed,z} =
```

#### **RESULTS**

### **CONNECTION CAPACITY CHECK**

$N_{j,Ed} / N_{j,R}$	d ≤ 1,0 (6.	24)	0.02 < 1.00	verified	(0.02)
$e_y =$	802	[mm]	Axial force eccentricity		[6.2.8.3]
$z_{c,y} =$	90	[mm]	Lever arm F <sub>C,Rd,y</sub>		[6.2.8.1.(2)]
$z_{t,y} =$	140	[mm]	Lever arm F <sub>T,Rd,y</sub>		[6.2.8.1.(3)]
$M_{j,Rd,y} =$	55.24	[kN*m]	Connection resistance for bending		[6.2.8.3]

$M_{j,Ed,y} / M_{j,Rd,y} \le 1,0 (6.23)$	0.80 < 1.00	verified	(0.80)
$e_z = 0$ [mm]	Axial force eccentricity		[6.2.8.3]
$z_{c,z} = 83$ [mm]	Lever arm F <sub>C,Rd,z</sub>		[6.2.8.1.(2)]
$z_{t,z} = 113 $ [mm]	Lever arm F <sub>T,Rd,z</sub>		[6.2.8.1.(3)]
$M_{j,Rd,z} = 0.00 [kN*m]$			[6.2.8.3]
$M_{j,Ed,z} / M_{j,Rd,z} \le 1,0 (6.23)$	0.04 < 1.00	verified	(0.04)
$M_{j,Ed,y} / M_{j,Rd,y} + M_{j,Ed,z} / M_{j,Rd}$	$y_{z} \le 1,0$ 0.83 < 1.00	verified	(0.83)
CHEAD			
<u>SHEAR</u>			
SHEAR CHECK			
$V_{j,Rd,y} = n_b * min(F_{1,vb,Rd,y}, F_{2,v})$	b,Rd, Fv,Rd,cp, Fv,Rd,c,y) + Ff,Rd		
$V_{j,Rd,y} = 206.31$ [kN]	Connection resistance for shear		CEB [9.3.1]
$V_{j,Ed,y} / V_{j,Rd,y} \le 1,0$	0.00 < 1.00	verified	(0.00)
$V_{j,Rd,z} = n_b * min(F_{1,vb,Rd,z}, F_{2,v})$	vb,Rd, Fv,Rd,cp, Fv,Rd,c,z) + Ff,Rd		
$V_{j,Rd,z} = 206.31$ [kN]	Connection resistance for shear		CEB [9.3.1]
$V_{j,Ed,z} / V_{j,Rd,z} \le 1,0$	0.11 < 1.00	verified	(0.11)
$V_{j,Ed,y}$ / $V_{j,Rd,y}$ + $V_{j,Ed,z}$ / $V_{j,Rd,z}$	<b>≤ 1,0</b> 0.11 < 1.00	verified	(0.11)
OTIFFENED OUE			
STIFFENER CHEC	<u>;K</u>		
Stiffener narallel to the we	eb (along the extension of the column	wah)	
	ending moment acting on a stiffener	Webj	
	near force acting on a stiffener		
	ocation of the neutral axis (from the plate	base)	
	oment of inertia of a stiffener		
$\sigma_d = 2.20$ [MPa] No	ormal stress on the contact surface between	an stiffener and plate	EN 1002 1 1:[6 2 1 /5]]
		sen suitener and plate	EN 1993-1-1:[6.2.1.(5)]
$\sigma_g = 84.65$ [MPa] No	ormal stress in upper fibers	sen suitenet and plate	EN 1993-1-1:[6.2.1.(5)]
$\tau = 99.19 \text{ [MPa] Ta}$	ormal stress in upper fibers angent stress in a stiffener		EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\tau = 99.19$ [MPa] Ta $\sigma_z = 171.81$ [MPa] Ed	ormal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be	etween stiffener and plate	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\tau = 99.19 \text{ [MPa] Ta}$	ormal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be		EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\tau$ = 99.19 [MPa] Ta $\sigma_z$ = 171.81 [MPa] Eq max ( $\sigma_g$ , $\tau$ / (0.58), $\sigma_z$ ) / ( $f_{yp}$ / Stiffener perpendicular to	ormal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $(\gamma_{M0}) \le 1.0 \ (6.1) \qquad 0.73 < 1.00$ the web (along the extension of the co	etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\tau = 99.19 \text{ [MPa] Ta}$ $\sigma_z = 171.81 \text{ [MPa] Ed}$ $\max (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}$ Stiffener perpendicular to $M_1 = 1.73 \text{ [kN*m] Be}$	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\gamma M0} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the conding moment acting on a stiffener	etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\begin{array}{lll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ec} \\ \text{max} \left(\sigma_9, \tau  /  (0.58),  \sigma_z  \right)  /  (f_{yp/} \\ \text{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 \text{ [kN*m] Be} \\ \text{Q}_1 = & 46.07 \text{ [kN] Sh} \end{array}$	ormal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\gamma M0} \le 1.0 \ (6.1)  0.73 < 1.00$ the web (along the extension of the conding moment acting on a stiffener near force acting on a stiffener	etween stiffener and plate verified blumn flanges)	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\begin{array}{lll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ed} \\ \text{max} \left(\sigma_g, \tau / (0.58), \sigma_z\right) / (f_{yp}/60.58), \sigma_z) & \text{[KN*m] Be} \\ \text{Stiffener perpendicular to} \\ M_1 = & 1.73 \text{ [kN*m] Be} \\ Q_1 = & 46.07 \text{ [kN] Sh} \\ Z_s = & 39 \text{ [mm] Lo} \\ \end{array}$	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\rm YMO} \leq 1.0~(6.1)~0.73 < 1.00$ the web (along the extension of the conding moment acting on a stiffener near force acting on a stiffener ocation of the neutral axis (from the plate	etween stiffener and plate verified blumn flanges)	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
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$\begin{array}{llll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp} \\ \text{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 \text{ [kN*m] Be} \\ \text{Q}_1 = & 46.07 \text{ [kN] Sh} \\ \text{Z}_s = & 39 \text{ [mm] Lo} \\ \text{I}_s = & 1630.18 \text{ [cm}^4 \text{] Mo} \\ \sigma_d = & 1.54 \text{ [MPa] No} \\ \sigma_g = & 16.59 \text{ [MPa] No} \\ \end{array}$	ormal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $/\gamma_{M0}$ $\leq 1.0$ (6.1) $0.73 < 1.00$ The web (along the extension of the conding moment acting on a stiffener near force acting on a stiffener ocation of the neutral axis (from the plate formal stress on the contact surface between the stress in upper fibers	etween stiffener and plate verified blumn flanges) base)	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
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$\begin{array}{llll} \tau = & 99.19 \ [\text{MPa}] \ \text{Ta} \\ \sigma_z = & 171.81 \ [\text{MPa}] \ \text{Eo} \\ \text{max} & (\sigma_g, \tau  /  (0.58),  \sigma_z )  /  (f_{yp}) \\ \text{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 \ [\text{kN}^*\text{m}] \ \text{Be} \\ \text{Q}_1 = & 46.07 \ [\text{kN}] \ \text{Sh} \\ \text{Z}_s = & 39 \ [\text{mm}] \ \text{Lo} \\ \text{I}_s = & 1630.18 \ [\text{cm}^4] \ \text{Mo} \\ \text{G}_d = & 1.54 \ [\text{MPa}] \ \text{No} \\ \text{G}_g = & 16.59 \ [\text{MPa}] \ \text{No} \\ \tau = & 26.94 \ [\text{MPa}] \ \text{Ta} \\ \text{G}_z = & 46.69 \ [\text{MPa}] \ \text{Ta} \\ \text{max} & (\sigma_g, \tau  /  (0.58),  \sigma_z )  /  (f_{yp}) \\ \end{array}$	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\rm M0} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the contact surface be ending moment acting on a stiffener process of the neutral axis (from the plate of the inertial of a stiffener primal stress on the contact surface between the stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface between the stress in a stiffener quivalent stress on the contact surface between the stress in a stiffener quivalent stress on the contact surface between the stress of the stress of the contact surface between the stress of the stress o	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\begin{array}{lll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ed} \\ \text{max} \left(\sigma_g, \tau / (0.58), \sigma_z\right) / \left(f_{yp}\right) \\ \text{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 \text{ [kN*m] Be} \\ \text{Q}_1 = & 46.07 \text{ [kN] Sh} \\ \text{Z}_s = & 39 \text{ [mm] Lo} \\ \text{I}_s = & 1630.18 \text{ [cm}^4\text{] Mo} \\ \sigma_d = & 1.54 \text{ [MPa] No} \\ \sigma_g = & 16.59 \text{ [MPa] No} \\ \tau = & 26.94 \text{ [MPa] Ta} \\ \sigma_z = & 46.69 \text{ [MPa] Ed} \\ \text{max} \left(\sigma_g, \tau / (0.58), \sigma_z\right) / \left(f_{yp}\right) \\ \hline \\ \text{WELDS BETWEEN} \\ \end{array}$	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \ (6.1)  0.73 < 1.00$ the web (along the extension of the contact price acting on a stiffener process of the neutral axis (from the plate coment of inertia of a stiffener primal stress on the contact surface between the stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface between the stress on the stress on the contact surface between the stress on the stress of the str	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)]
$\begin{array}{llll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ed} \\ \text{max } (\sigma_g, \tau / (0.58), \sigma_z) / (fyp) \\ \textbf{Stiffener perpendicular to} \\ M_1 = & 1.73 \text{ [kN*m] Be} \\ Q_1 = & 46.07 \text{ [kN] Sh} \\ Z_S = & 39 \text{ [mm] Lo} \\ I_S = & 1630.18 \text{ [cm}^4\text{] Mo} \\ \sigma_d = & 1.54 \text{ [MPa] No} \\ \sigma_g = & 16.59 \text{ [MPa] No} \\ \tau = & 26.94 \text{ [MPa] Ta} \\ \sigma_z = & 46.69 \text{ [MPa] Ed} \\ \text{max } (\sigma_g, \tau / (0.58), \sigma_z) / (fyp) \\ \hline \\ \textbf{WELDS BETWEEN} \\ \sigma_{\perp} = & 25.64 \text{ [MPa]} \end{array}$	permal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \ (6.1)  0.73 < 1.00$ the web (along the extension of the contact surface acting on a stiffener near force acting on a stiffener ocation of the neutral axis (from the plate coment of inertia of a stiffener formal stress on the contact surface between the stress in a stiffener quivalent stress on the contact surface between the stress in a stiffener quivalent stress on the contact surface between the stress in a stiffener quivalent stress on the contact surface between the stress on the cont	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20)
$\begin{array}{llll} \tau = & 99.19 \ [\text{MPa}] \ \text{Ta} \\ \sigma_z = & 171.81 \ [\text{MPa}] \ \text{Eo} \\ \text{max} & (\sigma_g, \tau  /  (0.58), \sigma_z )  /  (f_{yp}) \\ \text{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 \ [\text{kN*m}] \ \text{Be} \\ \text{Q}_1 = & 46.07 \ [\text{kN}] \ \text{Sh} \\ \text{Z}_s = & 39 \ [\text{mm}] \ \text{Lo} \\ \text{I}_s = & 1630.18 \ [\text{cm}^4] \ \text{Mo} \\ \text{G}_d = & 1.54 \ [\text{MPa}] \ \text{No} \\ \text{G}_g = & 16.59 \ [\text{MPa}] \ \text{No} \\ \tau = & 26.94 \ [\text{MPa}] \ \text{Ta} \\ \text{G}_z = & 46.69 \ [\text{MPa}] \ \text{Ta} \\ \text{G}_z = & 46.69 \ [\text{MPa}] \ \text{Eo} \\ \text{max} & (\sigma_g, \tau  /  (0.58), \sigma_z )  /  (f_{yp}) \\ \hline \\ \text{WELDS BETWEEN} \\ \\ \sigma_{\perp} = & 25.64 \ [\text{MPa}] \\ \tau_{\perp} = & 25.64 \ [\text{MPa}] \end{array}$	primal stress in upper fibers angent stress in a stiffener equivalent stress on the contact surface be $I/\gamma_{MO} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the conding moment acting on a stiffener operation of the neutral axis (from the plate operation of the neutral axis (from	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20) [4.5.3.(7)]
$\begin{array}{lllll} \tau = & 99.19 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 171.81 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \textbf{Stiffener perpendicular to} \\ \text{M}_1 = & 1.73 & [\text{kN*m}] & \text{Be} \\ \text{Q}_1 = & 46.07 & [\text{kN}] & \text{Sh} \\ \text{Z}_s = & 39 & [\text{mm}] & \text{Lo} \\ \text{I}_s = & 1630.18 & [\text{cm}^4] & \text{Mo} \\ \text{G}_d = & 1.54 & [\text{MPa}] & \text{No} \\ \text{G}_g = & 16.59 & [\text{MPa}] & \text{No} \\ \text{T} = & 26.94 & [\text{MPa}] & \text{Ta} \\ \text{G}_z = & 46.69 & [\text{MPa}] & \text{Ta} \\ \text{G}_z = & 46.69 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \hline \\ \textbf{WELDS BETWEEN} \\ \text{G}_\perp = & 25.64 & [\text{MPa}] \\ \text{T}_\perp = & 25.64 & [\text{MPa}] \\ \text{TyII} = & 0.00 & [\text{MPa}] \\ \end{array}$	primal stress in upper fibers angent stress in a stiffener equivalent stress on the contact surface be $I/\gamma_{MO} \le 1.0 \ (6.1) \ 0.73 < 1.00$ The web (along the extension of the contact surface be ending moment acting on a stiffener extension of the neutral axis (from the plate coment of inertia of a stiffener extension of the neutral axis (from the plate extension of the contact surface between the plate extension of the contact surface between the neutral axis (from the plate extension of the contact surface between the plate extension of the contact surfa	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20) [4.5.3.(7)] [4.5.3.(7)]
$\begin{array}{lllll} \tau = & 99.19 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 171.81 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \textbf{Stiffener perpendicular to} \\ M_1 = & 1.73 & [\text{kN*m}] & \text{Be} \\ Q_1 = & 46.07 & [\text{kN}] & \text{Sh} \\ Z_S = & 39 & [\text{mm}] & \text{Lo} \\ I_S = & 1630.18 & [\text{cm}^4] & \text{Mo} \\ \sigma_d = & 1.54 & [\text{MPa}] & \text{No} \\ \sigma_g = & 16.59 & [\text{MPa}] & \text{No} \\ \tau = & 26.94 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 46.69 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 46.69 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \hline \\ \textbf{WELDS BETWEEN} \\ \sigma_{\perp} = & 25.64 & [\text{MPa}] \\ \tau_{\perp} = & 25.64 & [\text{MPa}] \\ \tau_{yII} = & 0.00 & [\text{MPa}] \\ \tau_{zII} = & -4.27 & [\text{MPa}] \\ \end{array}$	permal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \text{ (6.1)}  0.73 < 1.00$ the web (along the extension of the contact surface be ending moment acting on a stiffener near force acting on a stiffener ocation of the neutral axis (from the plate oment of inertia of a stiffener ormal stress on the contact surface between the stress in a stiffener quivalent stress in a stiffener equivalent stress on the contact surface between the stress in a stiffener or the stress on the contact surface between the str	etween stiffener and plate verified  plumn flanges)  base)  een stiffener and plate etween stiffener and plate verified	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73) (0.73) EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20) [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)]
$\begin{array}{llll} \tau = & 99.19 \ [\text{MPa}] \ Ta \\ \sigma_z = & 171.81 \ [\text{MPa}] \ Eo \\ max \left(\sigma_g, \tau / (0.58), \sigma_z\right) / \left(f_{yp} / (0.58), \sigma_z\right) $	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the contact surface be ending moment acting on a stiffener procession of the neutral axis (from the plate coment of inertia of a stiffener primal stress on the contact surface between the stress in a stiffener quivalent stress in a stiffener quivalent stress on the contact surface between the stress on the contact	etween stiffener and plate verified plumn flanges) base) een stiffener and plate etween stiffener and plate verified  BASE PLATE	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73)  EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20)  [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)]
$\begin{array}{llll} \tau = & 99.19 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 171.81 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \textbf{Stiffener perpendicular to} \\ M_1 = & 1.73 & [\text{kN*m}] & \text{Be} \\ Q_1 = & 46.07 & [\text{kN}] & \text{Sh} \\ Z_S = & 39 & [\text{mm}] & \text{Lo} \\ I_S = & 1630.18 & [\text{cm}^4] & \text{Mo} \\ \sigma_d = & 1.54 & [\text{MPa}] & \text{No} \\ \sigma_g = & 16.59 & [\text{MPa}] & \text{No} \\ \tau = & 26.94 & [\text{MPa}] & \text{Ta} \\ \sigma_z = & 46.69 & [\text{MPa}] & \text{Ed} \\ \text{max} & (\sigma_g, \tau / (0.58), \sigma_z) / (f_{yp}) \\ \hline \\ \textbf{WELDS BETWEEN} \\ \sigma_{\perp} = & 25.64 & [\text{MPa}] \\ \tau_{\perp} = & 25.64 & [\text{MPa}] \\ \tau_{yII} = & 0.00 & [\text{MPa}] \\ \tau_{zII} = & -4.27 & [\text{MPa}] \\ \beta_W = & 0.85 \\ \sigma_{\perp} / (0.9^* f_u/\gamma_{M2})) \leq 1.0 & (4.1) \\ \end{array}$	permal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the contact surface be ending moment acting on a stiffener near force acting on a stiffener ocation of the neutral axis (from the plate formal stress on the contact surface between the stress in a stiffener quivalent stress in a stiffener quivalent stress on the contact surface between the stress in a stiffener quivalent stress in a stiffener quival	etween stiffener and plate verified plumn flanges) base) een stiffener and plate etween stiffener and plate verified  BASE PLATE	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73)  EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20)  [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)] (0.10)
$\begin{array}{llll} \tau = & 99.19 \text{ [MPa] Ta} \\ \sigma_z = & 171.81 \text{ [MPa] Ed} \\ \text{max } (\sigma_g, \tau / (0.58), \sigma_z) / (fyp) \\ \textbf{Stiffener perpendicular to} \\ M_1 = & 1.73 \text{ [kN*m] Be} \\ Q_1 = & 46.07 \text{ [kN] Sh} \\ Z_S = & 39 \text{ [mm] Lo} \\ I_S = & 1630.18 \text{ [cm}^4\text{] Mo} \\ \sigma_d = & 1.54 \text{ [MPa] No} \\ \sigma_g = & 16.59 \text{ [MPa] No} \\ \tau = & 26.94 \text{ [MPa] Ta} \\ \sigma_z = & 46.69 \text{ [MPa] Ed} \\ \text{max } (\sigma_g, \tau / (0.58), \sigma_z) / (fyp) \\ \hline \\ \textbf{WELDS BETWEEN} \\ \sigma_{\perp} = & 25.64 \text{ [MPa]} \\ \tau_{\perp} = & 25.64 \text{ [MPa]} \\ \tau_{2II} = & -4.27 \text{ [MPa]} \\ \sigma_{\perp} / (0.9^* f_u / \gamma_{M2})) \leq 1.0 \text{ (4.1)} \\ \sqrt{(\sigma_{\perp}^2 + 3.0 \text{ (tyll}^2 + \tau_{\perp}^2)) / (f_u / t_0^2)} / (f_u / t_0^2) \\ \end{array}$	primal stress in upper fibers angent stress in a stiffener quivalent stress on the contact surface be $\gamma_{\text{YMO}} \le 1.0 \ (6.1) \ 0.73 < 1.00$ the web (along the extension of the contact surface be ending moment acting on a stiffener procession of the neutral axis (from the plate coment of inertia of a stiffener primal stress on the contact surface between the stress in a stiffener quivalent stress in a stiffener quivalent stress on the contact surface between the stress on the contact	etween stiffener and plate verified plumn flanges) base) een stiffener and plate etween stiffener and plate verified  BASE PLATE	EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.73)  EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] EN 1993-1-1:[6.2.1.(5)] (0.20)  [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)] [4.5.3.(7)]

# **VERTICAL WELDS OF STIFFENERS**

Stiffene	r parallel to	the web	(along the extension of the column	web)	
σ⊥ =	83.82	[MPa]	Normal stress in a weld		[4.5.3.(7)]
$\tau_{\perp}$ =	83.82	[MPa]	Perpendicular tangent stress		[4.5.3.(7)]
τιι =	61.99	[MPa]	Parallel tangent stress		[4.5.3.(7)]
$\sigma_z =$	199.08	[MPa]	Total equivalent stress		[4.5.3.(7)]
$\beta_W =$	0.85		Resistance-dependent coefficient		[4.5.3.(7)]
max (σ⊥,	, τιι * √3, σz)	/ $(f_u/(\beta_W^*)$	$\gamma_{M2})) \le 1.0 (4.1)  0.58 < 1.00$	verified	(0.58)
Stiffene	r perpendio	cular to t	he web (along the extension of the co	olumn flanges)	
σ⊥ =	15.67	[MPa]	Normal stress in a weld		[4.5.3.(7)]
$\tau_{\perp} =$	15.67	[MPa]	Perpendicular tangent stress		[4.5.3.(7)]
τιι =	16.84	[MPa]	Parallel tangent stress		[4.5.3.(7)]
$\sigma_z =$	42.81	[MPa]	Total equivalent stress		[4.5.3.(7)]
βw =	0.85		Resistance-dependent coefficient		[4.5.3.(7)]
max (σ⊥,	, τιι * √3, σz)	/ $(f_u/(\beta w^*)$	$\gamma_{M2})) \le 1.0 (4.1)  0.12 < 1.00$	verified	(0.12)

# TRANSVERSAL WELDS OF STIFFENERS

$\sigma_{\perp}$ =	83.75	[MPa]	Normal stress in a weld		[4.5.3.(7)]
$\tau_{\perp}$ =	83.75	[MPa]	Perpendicular tangent stress		[4.5.3.(7)]
τιι =	80.85	[MPa]	Parallel tangent stress		[4.5.3.(7)]
$\sigma_z =$	218.33	[MPa]	Total equivalent stress		[4.5.3.(7)]
$\beta w =$	0.85		Resistance-dependent coefficient		[4.5.3.(7)]
max (σ⊥	, τιι * √3, σz)	/ <b>(f</b> <sub>u</sub> / <b>(</b> βw*	$\gamma_{M2})) \le 1.0 (4.1)  0.64 < 1.00$	verified	(0.64)
Stiffene	r perpendic	cular to t	he web (along the extension of the	column flanges)	
$\sigma_{\perp}$ =	29.09	[MPa]	Normal stress in a weld		[4.5.3.(7)]
$\tau_{\perp}$ =	29.09	[MPa]	Perpendicular tangent stress		[4.5.3.(7)]
τιι =	17.18	[MPa]	Parallel tangent stress		[4.5.3.(7)]
$\sigma_z =$	65.35	[MPa]	Total equivalent stress		[4.5.3.(7)]
$\beta_W =$	0.85		Resistance-dependent coefficient		[4.5.3.(7)]
max (σ⊥	, τιι * √3, σz)	/ (f <sub>u</sub> /(βw*	$\gamma_{M2})) \le 1.0 (4.1)  0.19 < 1.00$	verified	(0.19)

Connection conforms to the code Ra	0.83
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