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# 1 Input Parameters

Modu	ıle				Fin Plate
MainMo	odule		Shear Connection		
Connectivity			Beam-Beam		
Shear(k	Shear(kN)*				50.0
	,	Sı	pporting Sec	tion	
	Supporting Section				NPB 300x150x36.5
	Material *				E 250 (Fe 410 W)A
т ү	Ultimate stren	ngth, fu (MPa)			410
	Yield Streng	th , fy (MPa)			250
$\alpha$	Mass	36.52	Iz(cm4)	71735000.0	
ZZ D	Area(cm2) - A	4650.0	Iy(cm4)	5183900.0	
	D(mm)	297.0	rz(cm)	124.2	
-R <sub>1</sub>	B(mm)	150.0	ry(cm)	33.4	
R <sub>2</sub>	t(mm)	6.1	Zz(cm3)	483060.0	
Y	T(mm)	9.2	Zy(cm3)	69120.0	
	FlangeSlope	90	Zpz(cm3)	541790.0	
	R1(mm)	1.5	Zpy(cm3)	69120.0	
	R2(mm)	0.0			
		S	upported Sect	tion	
		ed Section			MB 250
	Mate	erial *			E 250 (Fe 410 W)A
тт	Ultimate strength, fu (MPa)				410
		th , fy (MPa)			250
$(B-t)$ $\alpha$	Mass	37.2	Iz(cm4)	51190000.0	
4	Area(cm2) -	4740.0	Iy(cm4)	3210000.0	

т	(	
(B-t) t Z	$\preceq_{\alpha}$	
Z	z	D
	$R_1$ $R_2$	
- В	-	
,	Y	

Supported Section		MB 250			
Material *			E 250 (Fe 410 W)A		
Ultimate strength, fu (MPa)			410		
Yield Streng	th , fy (MPa)		250		
Mass	37.2	Iz(cm4)	51190000.0		
Area(cm2) -	4740.0	Iy(cm4)	3210000.0		
A					
D(mm)	250.0	rz(cm)	104.0		
B(mm)	125.0	ry(cm)	26.0		
t(mm)	6.9	Zz(cm3)	409600.0		
T(mm)	12.5	Zy(cm3)	51000.0		
FlangeSlope	98	Zpz(cm3)	464500.0		
R1(mm)	13.0	Zpy(cm3)	51000.0		
R2(mm)	6.5				

` '	
	Bolt Details
Diameter (mm)*	[12.0, 16.0, 20.0, 24.0, 30.0, 36.0]
Grade *	[3.6, 4.6, 4.8, 5.6, 5.8, 6.8, 8.8, 9.8, 10.9, 12]
Type *	Bearing Bolt
Bolt hole type	Standard
Slip factor (µ_f)	0.3
Type of edges	a - Sheared or hand flame cut

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Gap between beam and support (mm)	10.0		
Are the members exposed to corrosive influences	False		
	Plate Details		
Thickness(mm)*	[3.0, 4.0, 5.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0, 24.0]		
Material *	E 165 (Fe 290)		
Ultimate strength, fu (MPa)	290		
Yield Strength , fy (MPa)	165		
	Weld Details		
Weld Type	Fillet		
Type of weld fabrication	Shop Weld		
Material grade overwrite (MPa) Fu	410.0		

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## 2 Design Checks

### 2.1 Bolt Design Checks

Check	Required	Provided	Remarks
Diameter (mm)*		20.0	
Grade *		3.6	
Shear Capacity (kN)		$V_{dsb} = \frac{f_u b \ n_n \ A_{nb}}{\sqrt{3} \ \gamma_{mb}}$ $= \frac{300.0 * 1 * 245}{\sqrt{3} \ * 1.25}$ $= 33.95$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5 \ k_b \ d \ t \ f_u}{\gamma_{mb}}$ $= \frac{2.5 \ * 0.51 * 20.0 * 8.0 * 290}{1.25}$ $= 47.33$	
Capacity (kN)		$V_{db} = min (V_{dsb}, V_{dpb})$ = $min (33.95, 47.33)$ = $33.95$	
No of Bolts	$R_{u} = \sqrt{V_{u}^{2} + A_{u}^{2}}$ $n_{trial} = R_{u}/V_{bolt}$ $R_{u} = \frac{\sqrt{50.0^{2} + 50.0^{2}}}{33.95}$ $= 3$	3	
No of Columns		1	
No of Rows		3	
Min. Pitch (mm)	$p/g_{min} = 2.5 d$ $= 2.5 * 20.0 = 50.0$	0.0	N/A
Max. Pitch (mm)	$p/g_{max} = \min(32 \ t, \ 300 \ mm)$ $= \min(32 * 6.9, \ 300 \ mm)$ $= 300$	0.0	N/A
Min. Gauge (mm)	$p/g_{min} = 2.5 d$ $= 2.5 * 20.0 = 50.0$	50	Pass
Max. Gauge (mm)	$p/g_{max} = \min(32 \ t, \ 300 \ mm)$ = $\min(32 * 6.9, \ 300 \ mm)$ = 300	50	Pass
Min. End Distance (mm)	$e/e'_{min} = [1.5 \text{ or } 1.7] * d_0$ = 1.7 * 22.0 = 37.4	40	Pass
Max. End Distance (mm)	$e/e'_{max} = 12 \ t \ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e'_{max} = 12 \ *8.0 * \sqrt{\frac{250}{165}}$ $= 118.08$	40	Pass

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Check	Required	Provided	Remarks
Min. Edge Distance (mm)	$e/e^{\circ}_{min} = [1.5 \text{ or } 1.7] * d_0$	40	Pass
IIIII Zage Zistance (IIIII)	= 1.7 * 22.0 = 37.4		1 6655
Max. Edge Distance (mm)	$e/e'_{max} = 12 t \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e'_{max} = 12 * 8.0 * \sqrt{\frac{250}{165}}$ $= 118.08$	40	Pass
Capacity (kN)	44.88	47.33	Pass

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#### 2.2 Plate Design Checks

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Check	Required	Provided	Remarks
$\begin{array}{llllllllllllllllllllllllllllllllllll$	Min. Plate Height (mm)	$0.6 * d_b = 0.6 * 250.0 = 150.0$	180	Pass
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Max. Plate Height (mm)	= 250.0 - 12.5 + 13.0 - 20	180	Pass
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		, , , , , , , , , , , , , , , , , , , ,		_
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Min. Plate Length (mm)	` '	90.0	Pass
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	16 Di			D.
$ \begin{array}{c} \text{Shear yielding Capacity} \\ (\text{V\_dy})  (\text{kN}) \\ \end{array} = \frac{180*8.0*165}{\sqrt{3}*1.1} \\ = 124.71 \\ \\ V_{dn} = \frac{0.75*A_{vn}*f_{u}}{\sqrt{3}*\gamma_{mo}} \\ = 1*\left(180-\left(3*22.0\right)\right)*8.0*290 \\ = 198.36 \\ \end{array} $ Shear Rupture Capacity in Shear Capacity in Shear (V_db) (kN) $ \begin{array}{c} \text{Dlock Shear Capacity in Shear Capacity (V_d)} \\ \text{Shear Capacity (V_d)} \\ \text{(kN)} \\ \end{array} = \frac{129.97}{124.71} \\ \end{array} $ Pass $ \begin{array}{c} V_d = Min(V_{dy}, V_{dn}, V_{db}) \\ = Min(124.71, 198.36, 129.97) \\ = 124.71 \\ \end{array} $ Pass $ \begin{array}{c} \text{Tension Yielding Capacity} \\ \text{(kN)} \\ \end{array} = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{198.0*8.0*165}{\gamma_{mo}} \\ = 198.0*8.0*165$		$t_w = 6.9$		Pass
$ \begin{array}{c} \text{Shear yielding Capacity} \\ (\text{V\_dy})  (\text{kN}) \\ \end{array} = \frac{180*8.0*165}{\sqrt{3}*1.1} \\ = 124.71 \\ \\ V_{dn} = \frac{0.75*A_{vn}*f_{u}}{\sqrt{3}*\gamma_{mo}} \\ = 1*\left(180-\left(3*22.0\right)\right)*8.0*290 \\ = 198.36 \\ \end{array} $ Shear Rupture Capacity in Shear Capacity in Shear (V_db) (kN) $ \begin{array}{c} \text{Dlock Shear Capacity in Shear Capacity (V_d)} \\ \text{Shear Capacity (V_d)} \\ \text{(kN)} \\ \end{array} = \frac{129.97}{124.71} \\ \end{array} $ Pass $ \begin{array}{c} V_d = Min(V_{dy}, V_{dn}, V_{db}) \\ = Min(124.71, 198.36, 129.97) \\ = 124.71 \\ \end{array} $ Pass $ \begin{array}{c} \text{Tension Yielding Capacity} \\ \text{(kN)} \\ \end{array} = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{180*8.0*165}{\gamma_{mo}} \\ = \frac{198.0*8.0*165}{\gamma_{mo}} \\ = 198.0*8.0*165$			$V_{dq} = \frac{A_v * f_y}{\sqrt{2}}$	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			$\sqrt{3}*\gamma_{mo}$	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	· · · · · ·		$=\frac{180*8.0*103}{\sqrt{2} \cdot 1.1}$	
$V_{dn} = \frac{0.75 * A_{vn} * f_u}{\sqrt{3} * \gamma_{mo}}$ = 1 * (180 - (3 * 22.0)) * 8.0 * 290 = 198.36 Block Shear Capacity in Shear (V_db) (kN) $V_d = Min(V_{dy}, V_{dn}, V_{db})$ = $Min(124.71, 198.36, 129.97)$ Pass = 124.71 $T_{dg} = \frac{l * t_p * f_y}{\gamma_{mo}}$ = $\frac{180 * 8.0 * 165}{1.1}$ = 216.0 $T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ = $\frac{0.9 * (180 - 3 * 22.0) * 8.0 * 290}{1.25}$ = 263.92 $\frac{l * 6.17}{l = 166.17}$ Block Shear Capacity (kN) = $\frac{T_d = Min(T_{dg}, T_{dn}, T_{db})}{l = Min(126.0, 263.92, 166.17)}$ Pass = 166.17	( v _uy) (ki v)		- 124 71	
Shear Rupture Capacity (V_dn) (kN) $ = 1*(180 - (3*22.0))*8.0*290 $ $= 198.36$ Block Shear Capacity in Shear (V_db) (kN) $ = 129.97 $ Shear Capacity (V_d)			$0.75 * A_{vn} * f_u$	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			$V_{dn} = \frac{1}{\sqrt{3} * \gamma_{mo}}$	
Block Shear Capacity in Shear (V_db) (kN)			= 1 * (180 - (3 * 22.0)) * 8.0 * 290	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	( Vdii) (kiv)		= 198.36	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- ,		129.97	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			$V_d = Min(V_{dy}, V_{dn}, V_{db})$	
Tension Yielding Capacity (kN)	1 ( _ /	50.0	= Min(124.71, 198.36, 129.97)	Pass
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(kN)		= 124.71	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			$T_{dq} = \frac{l * t_p * f_y}{}$	
$ = 216.0 $ $ T_{dn} = \frac{0.9*A_n*f_u}{\gamma_{m1}} $ $ = \frac{0.9*(180-3*22.0)*8.0*290}{1.25} $ $ = 263.92 $ Block Shear Capacity in Tension (T_db) (kN) $ T_d = Min(T_{dg}, T_{dn}, T_{db}) $ $ = Min(216.0, 263.92, 166.17) $ Pass $ = 166.17 $ Moment Capacity (kN-m) 2.5  9.72  Pass	Tongion Violding Capacity		$\gamma_{mo}$ $180 * 8.0 * 165$	
$ = 216.0 \\ T_{dn} = \frac{0.9*A_n*f_u}{\gamma_{m1}} \\ = \frac{0.9*(180-3*22.0)*8.0*290}{1.25} \\ = 263.92 \\ \text{Block Shear Capacity in Tension (T_db) (kN)} $ $ T_d = Min(T_{dg}, T_{dn}, T_{db}) \\ = Min(216.0, 263.92, 166.17) \\ = Min(216.0, 263.92, 166.17) \\ = Min(216.0, 263.92, 166.17) \\ = 166.17 \\ \text{Moment Capacity (kN-m)} $ Pass	9 1		$=\frac{100 * 0.0 * 100}{1.1}$	
Tension Rupture Capacity (kN) $ = \frac{0.9*(180-3*22.0)*8.0*290}{1.25} $ $= 263.92$ Block Shear Capacity in Tension (T_db) (kN) $ = \frac{166.17}{T_d = Min(T_{dg}, T_{dn}, T_{db})} $ Tension Capacity (kN) $ = \frac{Min(216.0, 263.92, 166.17)}{1.25} $ Pass $ = 166.17 $ Moment Capacity (kN-m) 2.5 $ = \frac{9.72}{1.25} $			= 216.0	
Tension Rupture Capacity (kN) $ = \frac{0.9*(180-3*22.0)*8.0*290}{1.25} $ $= 263.92$ Block Shear Capacity in Tension (T_db) (kN) $ = \frac{166.17}{T_d = Min(T_{dg}, T_{dn}, T_{db})} $ Tension Capacity (kN) $ = \frac{Min(216.0, 263.92, 166.17)}{1.25} $ Pass $ = 166.17 $ Moment Capacity (kN-m) 2.5 $ = \frac{9.72}{1.25} $			$T_{dn} = \frac{0.9 * A_n * f_u}{}$	
Tension Capacity (kN)   Solution   Tours of the content of the	T D C		$\gamma_{m1}$	
	1 1		$= \frac{0.9 * (180 - 3 * 22.0) * 8.0 * 290}{1.25}$	0
Block Shear Capacity in Tension (T_db) (kN)	(KIV)			
Tension (T_db) (kN)	Block Shear Capacity in			
Tension Capacity (kN) 50.0 $ = Min(216.0, 263.92, 166.17) $ Pass $ = 166.17 $ Moment Capacity (kN-m) 2.5 $ 9.72 $ Pass				
= 166.17  Moment Capacity (kN-m) 2.5 9.72 Pass			$T_d = Min(T_{dg}, T_{dn}, T_{db})$	
Moment Capacity (kN-m) 2.5 9.72 Pass	Tension Capacity (kN)	50.0	= Min(216.0, 263.92, 166.17)	Pass
Interaction Ratio $\leq 1$ $\frac{2.5}{0.79} + \frac{50.0}{100.17} = 0.56$ Pass	Moment Capacity (kN-m)	2.5		Pass
	Interaction Ratio	$  \leq 1$	$\frac{2.5}{9.72} + \frac{50.0}{166.17} = 0.56$	Pass

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#### 2.3 Weld Checks

Check	Required	Provided	Remarks
Min Weld Size (mm)		3	Pass
Max Weld Size (mm)	Thickness of Thinner part $= Min(6.1, 8.0) = 6.1$ $t_{w_{max}} = 6.1$	3	Pass
Weld Strength (kN/mm)	$R_{w} = \sqrt{(T_{wh} + A_{wh})^{2} + (T_{wv} + V_{wv})^{2}}$ $T_{wh} = \frac{M * y_{max}}{Ipw} = \frac{2500000.0 * 87.0}{878004.0}$ $T_{wv} = \frac{M * x_{max}}{Ipw} = \frac{2500000.0 * 0.0}{878004.0}$ $V_{wv} = \frac{V}{l_{w}} = \frac{50000.0}{348}$ $A_{wh} = \frac{A}{l_{w}} = \frac{50000.0}{348}$ $R_{w} = \sqrt{(247.72 + 143.68)^{2} + (0.0 + 143.68)^{2}}$ $= 416.94$	$f_w = \frac{t_t * f_u}{\sqrt{3} * \gamma_{mw}}$ $= \frac{3 * 290}{\sqrt{3} * 1.25}$ $= 568.11$	Pass

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### 3 3D View

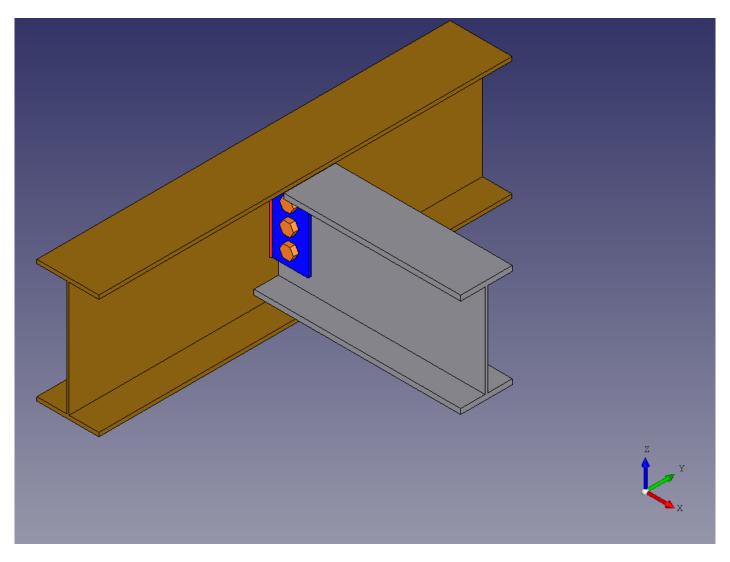


Figure 1: 3D View