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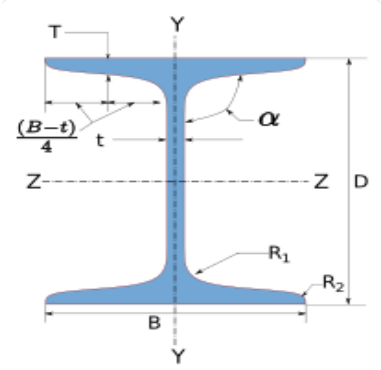
1 Input Parameters

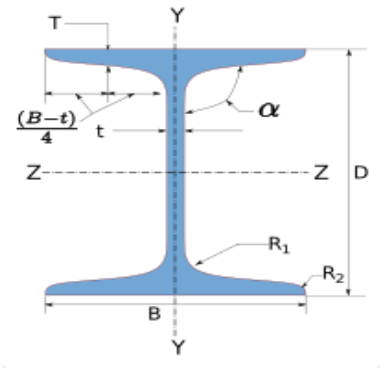
Module	Fin Plate
MainModule	Shear Connection
Connectivity	Column flange-Beam web
Shear(kN)*	50.0

Supporting Section



Supporting Section		PBP 360X152	
Material *		E 250 (Fe 410 W)A	
Ultimate strength, fu (MPa)		410	
Yield Strength , fy (MPa)		250	
Mass	152.02	Iz(cm4)	439716000.0
Area(cm2) - A	19370.0	Iy(cm4)	158755000.0
D(mm)	356.4	rz(cm)	150.7
B(mm)	376.0	ry(cm)	90.5
t(mm)	17.8	Zz(cm3)	2467540.0
T(mm)	17.9	Zy(cm3)	844440.0
FlangeSlope	90	Zpz(cm3)	2766750.0
R1(mm)	1.52	Zpy(cm3)	844440.0
R2(mm)	0.0		

Supported Section



Supported Section		MB 200	
Material *		E 250 (Fe 410 W)A	
Ultimate strength, fu (MPa)		410	
Yield Strength , fy (MPa)		250	
Mass	24.1	Iz(cm4)	21100000.0
Area(cm2) - A	3070.0	Iy(cm4)	1310000.0
D(mm)	200.0	rz(cm)	82.8
B(mm)	100.0	ry(cm)	20.7
t(mm)	5.7	Zz(cm3)	211000.0
T(mm)	10.0	Zy(cm3)	26000.0
FlangeSlope	98	Zpz(cm3)	239800.0
R1(mm)	11.0	Zpy(cm3)	26000.0
R2(mm)	5.5		

Bolt Details

Diameter (mm)*	[12.0, 16.0, 20.0]
Grade *	[3.6, 4.6, 4.8, 5.6, 5.8, 6.8, 8.8, 9.8, 10.9, 12.9]
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]
Material *	E 250 (Fe 410 W)A
Ultimate strength, fu (MPa)	410
Yield Strength , fy (MPa)	250
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)*		16.0	
Grade *		4.8	
Shear Capacity (kN)		$V_{dsb} = \frac{f_u b\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}}$ $= \frac{400.0 * 1 * 157}{\sqrt{3}\ *\ 1.25}$ $= 29.01$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}}$ $= \frac{2.5\ * 0.49 * 16.0 * 5.7 * 410}{1.25}$ $= 36.64$	
Capacity (kN)		$V_{db} = min\ (V_{dsb}, V_{dpb})$ $= min\ (29.01, 36.64)$ $= 29.01$	
No of Bolts	$R_u = \sqrt{V_u^2 + A_u^2}$ $n_{trial} = R_u / V_{bolt}$ $R_u = \frac{\sqrt{50.0^2 + 50.0^2}}{29.01}$ $= 3$	4	
No of Columns		2	
No of Rows		2	
Min. Pitch (mm)	$p/g_{min} = 2.5\ d$ $=2.5 * 16.0 \quad = 40.0$	40	Pass
Max. Pitch (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 5.7,\ 300\ mm)$ $= 300$	40	Pass
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $=2.5 * 16.0 \quad = 40.0$	80	Pass
Max. Gauge (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 5.7,\ 300\ mm)$ $= 300$	80	Pass
Min. End Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 18.0 = 30.6$	35	Pass
Max. End Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12\ * 6.0 * \sqrt{\frac{250}{250}}$ $= 72.0$	35	Pass

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Check	Required	Provided	Remarks
Min. Edge Distance (mm)	$e/e`_{min} = [1.5 \ or \ 1.7] * d_0$ $= 1.7 * 18.0 = 30.6$	35	Pass
Max. Edge Distance (mm)	$e/e`_{max} = 12 \ t \ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12 \ * 6.0 * \sqrt{\frac{250}{250}}$ $= 72.0$	35	Pass
Capacity (kN)	35.38	36.64	Pass

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2.2 Plate Design Checks

Check	Required	Provided	Remarks
Min. Plate Height (mm)	$0.6 * d_b = 0.6 * 200.0 = 120.0$	150	Pass
Max. Plate Height (mm)	$d_b - 2(t_{bf} + r_{b1} + gap)$ $= 200.0 - 2 * (10.0 + 11.0 + 10)$ $= 158.0$	150	Pass
Min. Plate Length (mm)	$2 * e_{min} + (n\ c - 1) * p_{min})$ $= 2 * 30.6 + (2 - 1) * 40.0$ $= 111.2$	120.0	Pass
Min.Plate Thickness (mm)	$t_w = 5.7$	6.0	Pass
Shear yielding Capacity (V_dy) (kN)		$V_{dg} = \frac{A_v * f_y}{\sqrt{3} * \gamma_{mo}}$ $= \frac{150 * 6.0 * 250}{\sqrt{3} * 1.1}$ $= 118.09$	
Shear Rupture Capacity (V_dn) (kN)		$V_{dn} = \frac{0.75 * A_{vn} * f_u}{\sqrt{3} * \gamma_{mo}}$ $= 1 * (150 - (2 * 18.0)) * 6.0 * 410$ $= 210.33$	
Block Shear Capacity in Shear (V_db) (kN)		175.56	
Shear Capacity (V_d) (kN)	50.0	$V_d = Min(V_{dy}, V_{dn}, V_{db})$ $= Min(118.09, 210.33, 175.56)$ $= 118.09$	Pass
Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t_p * f_y}{\gamma_{mo}}$ $= \frac{150 * 6.0 * 250}{1.1}$ $= 204.55$	
Tension Rupture Capacity (kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ $= \frac{0.9 * (150 - 2 * 18.0) * 6.0 * 410}{1.25}$ $= 201.92$	
Block Shear Capacity in Tension (T_db) (kN)		233.02	
Tension Capacity (kN)	50.0	$T_d = Min(T_{dg}, T_{dn}, T_{db})$ $= Min(204.55, 201.92, 233.02)$ $= 201.92$	Pass
Moment Capacity (kN-m)	3.25	7.67	Pass
Interaction Ratio	≤ 1	$\frac{3.25}{7.67} + \frac{50.0}{201.92} = 0.67$	Pass

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2.3 Weld Checks

Check	Required	Provided	Remarks
Min Weld Size (mm)	$Thickness\ of\ Thicker\ part$ $= max(17.9, 6.0)$ $= 17.9$ $IS800:2007\ cl.10.5.2.3\ Table21,$ $t_{w_{min}} = 5$	6	Pass
Max Weld Size (mm)	$Thickness\ of\ Thinner\ part$ $= Min(17.9, 6.0) = 6.0$ $t_{w_{max}} = 6.0$	6	Pass
Weld Strength (kN/mm)	$R_w = \sqrt{(T_{wh} + A_{wh})^2 + (T_{wv} + V_{wv})^2}$ $T_{wh} = \frac{M * y_{max}}{Ipw} = \frac{3250000.0 * 70.0}{457333.33}$ $T_{wv} = \frac{M * x_{max}}{Ipw} = \frac{3250000.0 * 0.0}{457333.33}$ $V_{wv} = \frac{V}{l_w} = \frac{50000.0}{280}$ $A_{wh} = \frac{A}{l_w} = \frac{50000.0}{280}$ $R_w = \sqrt{(497.45 + 178.57)^2 + (0.0 + 178.57)^2}$ $= 699.21$	$f_w = \frac{t_t * f_u}{\sqrt{3} * \gamma_{mw}}$ $= \frac{4.2 * 410}{\sqrt{3} * 1.25}$ $= 795.36$	Pass

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3 3D View

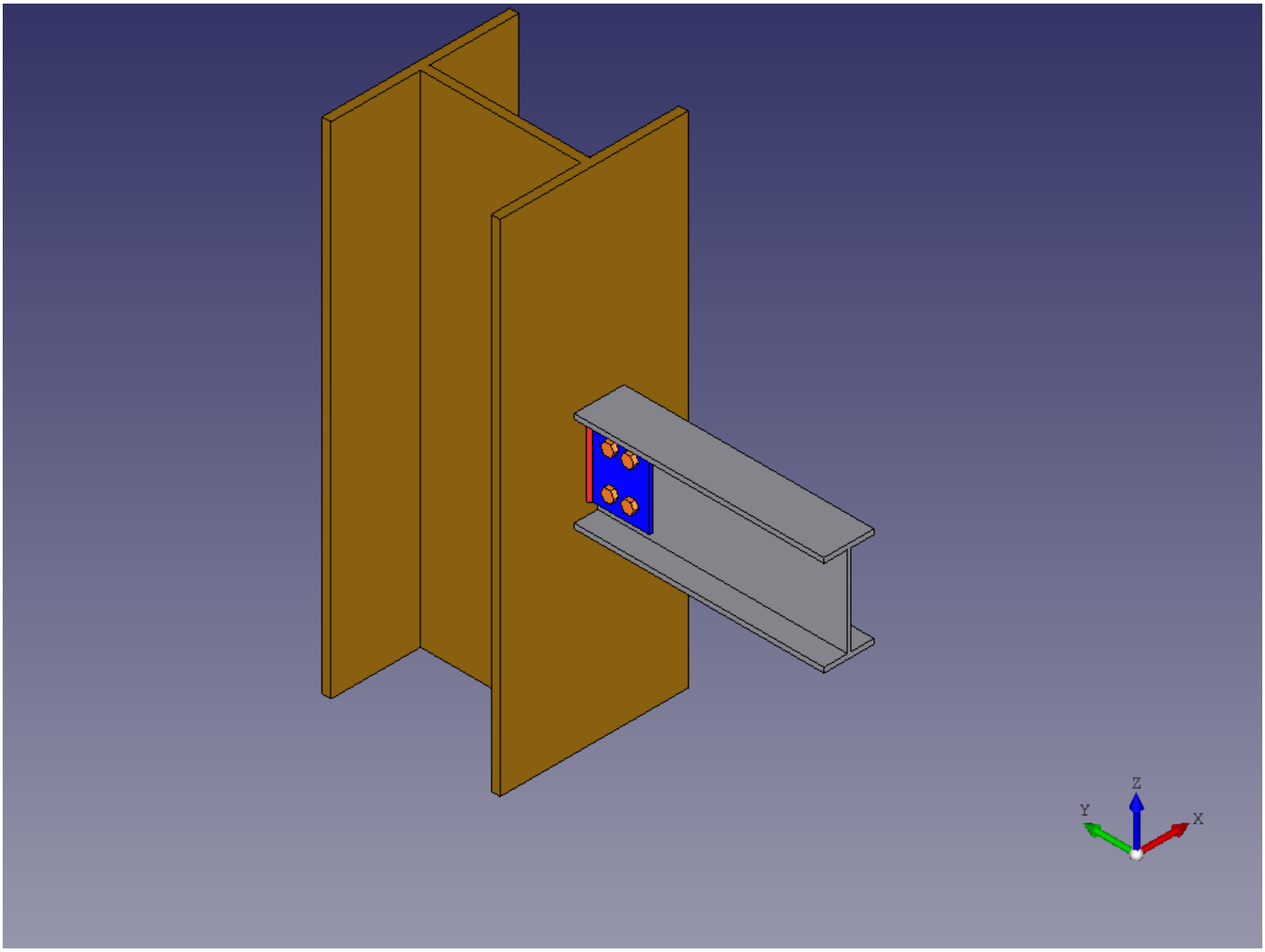

Figure 1: 3D View