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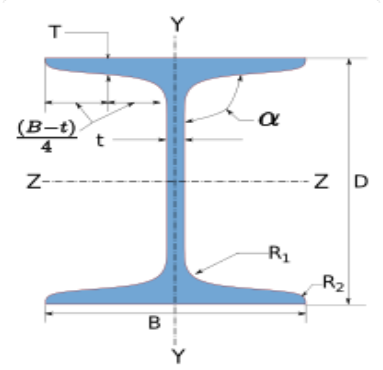
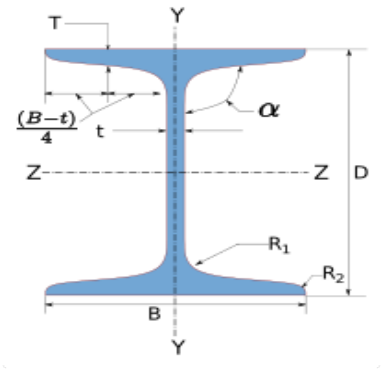
1 Input Parameters

Module		Fin Plate	
MainModule		Shear Connection	
Connectivity		Beam-Beam	
Shear(kN)*		200.0	
Supporting Section			
	Supporting Section	NPB 550x210x122.5	
	Material *	E 250 (Fe 410 W)A	
	Ultimate strength, fu (MPa)	410	
	Yield Strength , fy (MPa)	230	
	Mass 122.52	Iz(cm4)	791573000.0
	Area(cm2) - A 15610.0	Iy(cm4)	32197399.999999996
	D(mm) 556.0	rz(cm)	225.2
	B(mm) 212.0	ry(cm)	45.4
	t(mm) 12.7	Zz(cm3)	2847390.0
	T(mm) 20.2	Zy(cm3)	303750.0
	FlangeSlope 90	Zpz(cm3)	3263380.0
	R1(mm) 2.4	Zpy(cm3)	303750.0
	R2(mm) 0.0		
Supported Section			
	Supported Section	MB 300	
	Material *	E 250 (Fe 410 W)A	
	Ultimate strength, fu (MPa)	410	
	Yield Strength , fy (MPa)	230	
	Mass 46.0	Iz(cm4)	89700000.0
	Area(cm2) - A 5860.0	Iy(cm4)	4660000.0
	D(mm) 300.0	rz(cm)	124.0
	B(mm) 140.0	ry(cm)	28.2
	t(mm) 7.7	Zz(cm3)	598000.0
	T(mm) 13.1	Zy(cm3)	67000.0
	FlangeSlope 98	Zpz(cm3)	679600.0
	R1(mm) 14.0	Zpy(cm3)	67000.0
	R2(mm) 7.0		
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
Weld Details	
Weld Type	Fillet
Type of weld fabrication	Shop Weld
Material grade overwrite (MPa) Fu	410.0

2 Design Checks

2.1 Bolt Design Checks

Check	Required	Provided	Remarks
Shear Capacity (kN)		$V_{dsb} = \frac{f_u b\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}}$ $= \frac{410 * 1 * 245}{\sqrt{3}\ *\ 1.25}$ $= 64.1$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}}$ $= \frac{2.5\ * 0.51 * 20.0 * 7.7 * 410}{1.25}$ $= 64.1$	
Capacity (KN)		$V_{db} = min\ (V_{dsb}, V_{dpb})$ $= min\ (64.1, 64.1)$ $= 64.1$	
No of Bolts	$R_u = \sqrt{V_u^2 + A_u^2}$ $n_{trial} = R_u / V_{bolt}$ $R_u = \frac{\sqrt{200.0^2 + 20.0^2}}{64.1}$ $= 4$	6	
No of Columns		2	
No of Rows		3	
Min. Pitch (mm)	$p/g_{min} = 2.5\ d$ $=2.5 * 20.0 \quad = 50.0$	50	Pass
Max. Pitch (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 7.7,\ 300\ mm)$ $= 300$	50	Pass
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $=2.5 * 20.0 \quad = 50.0$	80	Pass
Max. Gauge (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 7.7,\ 300\ mm)$ $= 300$	80	Pass
Min. End Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 22.0 = 37.4$	40	Pass

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Check	Required	Provided	Remarks
Max. End Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12\ * 8.0 * \sqrt{\frac{250}{230}}$ $= 99.84$	40	Pass
Min. Edge Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 22.0 = 37.4$	40	Pass
Max. Edge Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12\ * 8.0 * \sqrt{\frac{250}{230}}$ $= 99.84$	40	Pass
Capacity (KN)	63886.5	64096.67	Pass

2.2 Plate Design Checks

Check	Required	Provided	Remarks
Min. Plate Height (mm)	$0.6 * d_b = 0.6 * 300.0 = 180.0$	240	Pass
Max. Plate Height (mm)	$d_b - t_{bf} + r_{b1} - notch_h$ $= 300.0 - 13.1 + 14.0 - 45$ $= 250.0$	240	Pass
Min. Plate Length (mm)	$2 * e_{min} + (n\ c - 1) * p_{min})$ $= 2 * 37.4 + (2 - 1) * 50.0$ $= 134.8$	140.0	Pass
Min.Plate Thickness (mm)	$t_w = 7.7$	8.0	Pass
Shear yielding Capacity (V_dy) (kN)		$V_{dg} = \frac{A_v * f_y}{\sqrt{3} * \gamma_{mo}}$ $= \frac{240 * 8.0 * 230}{\sqrt{3} * 1.1}$ $= 139.07$	
Shear Rupture Capacity (V_dn) (kN)		$V_{dn} = \frac{0.75 * A_{vn} * f_u}{\sqrt{3} * \gamma_{mo}}$ $= 1 * (240 - (3 * 22.0)) * 8.0 * 410$ $= 428.04$	
Block Shear Capacity in Shear (V_db) (kN)		337.42	
Shear Capacity (V_d) (kN)	200.0	$V_d = Min(V_{dy}, V_{dn}, V_{db})$ $= Min(139.07, 428.04, 337.42)$ $= 139.07$	Fail

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Check	Required	Provided	Remarks
Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}} = \frac{140.0 * 8.0 * 230}{\sqrt{3} * 1.1} = 234.18$	
Tension Rupture Capacity(kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}} = \frac{0.9 * (140.0 - 3 * 22.0) * 8.0 * 410}{1.25} = 226.71$	
Block Shear Capacity in Tension (T_db) (kN)		337.42	
Tension Capacity (kN)	20.0	$T_d = Min(T_{dg}, T_{dn}, T_{db}) = Min(234.18, 226.71, 337.42) = 226.71$	Pass
Moment Capacity (kNm)	15.0	19.27	Pass
Interaction Ratio	≤ 1	$\frac{15.0}{19.27} + \frac{20.0}{226.71} = 0.87$	Pass

2.3 Weld Checks

Check	Required	Provided	Remarks
Min Weld Size (mm)	$Thickness\ of\ Thicker\ part = Max(12.7, 12.7) = 12.7$ $IS800:2007\ cl.10.5.2.3\ Table21,$ $t_{w_{min}} = 5$	8	Pass
Max Weld Size (mm)	$Thickness\ of\ Thinner\ part = Min(12.7, 12.7) = 8.0$ $t_{w_{max}} = 8.0$	8	Fail
Weld Strength (kN/mm)	$R_w = \sqrt{(T_{wh} + A_{wh})^2 + (T_{wv} + V_{wv})^2}$ $T_{wh} = \frac{M * y_{max}}{Ipw} = \frac{15000000.0 * 112.0}{1873237.33}$ $T_{wv} = \frac{M * x_{max}}{Ipw} = \frac{15000000.0 * 0.0}{1873237.33}$ $V_{wv} = \frac{V}{l_w} = \frac{200000.0}{448}$ $A_{wh} = \frac{A}{l_w} = \frac{20000.0}{448}$ $R_w = \sqrt{(896.84 + 44.64)^2 + (0.0 + 446.43)^2} = 1041.97$	$f_w = \frac{t_t * f_u}{\sqrt{3} * \gamma_{mw}} = \frac{5.6 * 410}{\sqrt{3}} * 1.25 = 1060.48$	Pass

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3 3D View

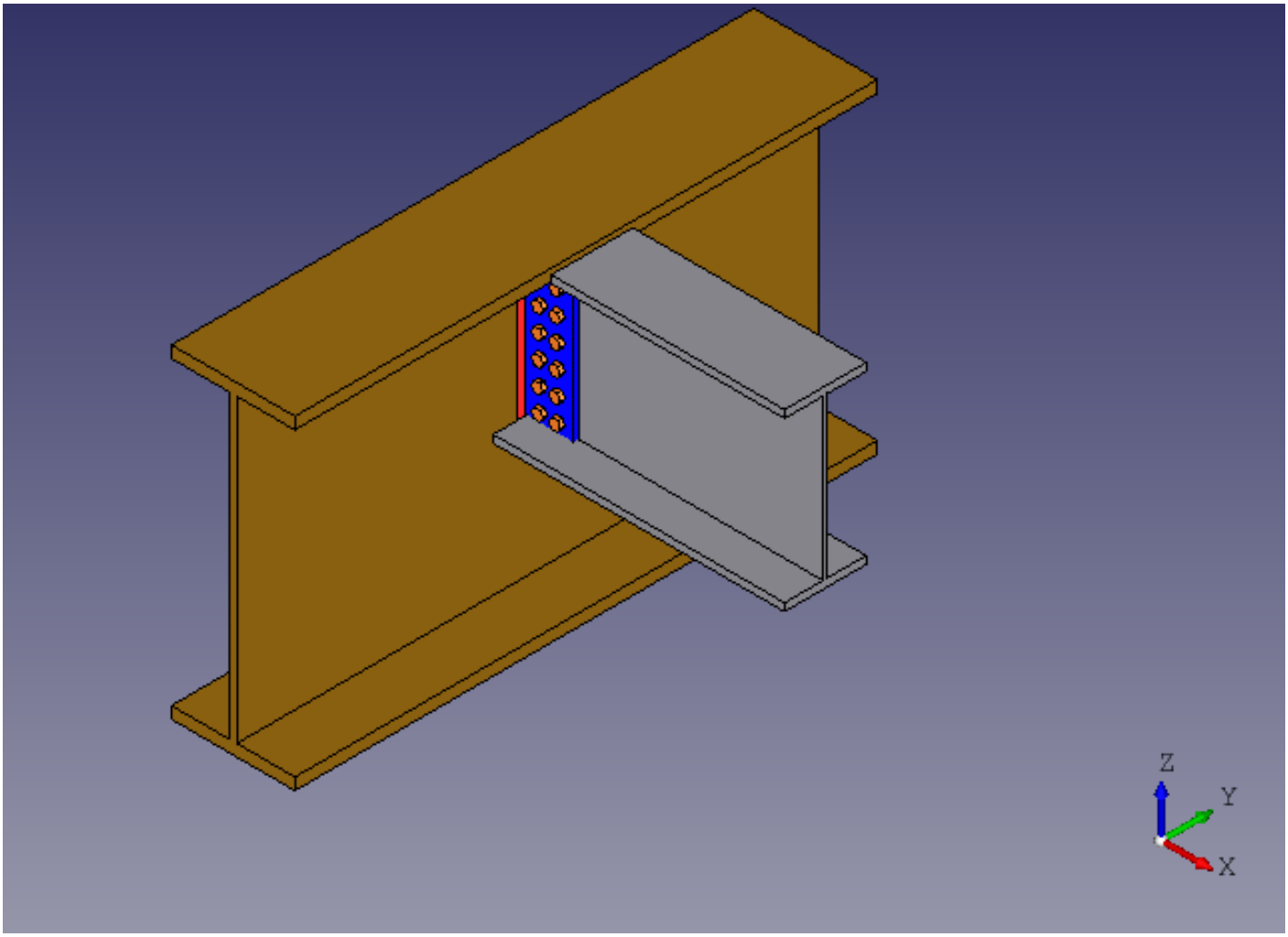

Figure 1: 3D View