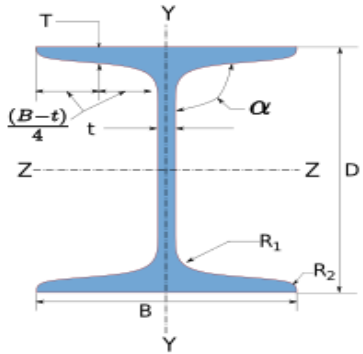
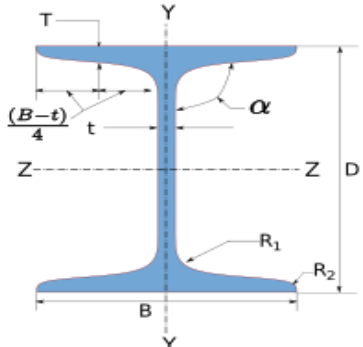




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Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
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1 Input Parameters

Main Module		Moment Connection		
Module		Beam-Column End Plate		
Connectivity		Column Flange-Beam Web		
End Plate Type		Flushed - Reversible Moment		
Bending Moment (kNm)		220.0		
Shear Force (kN)		95.0		
Axial Force (kN)		32.0		
Column Section - Mechanical Properties				
	Column Section		PBP 400 X 140.2	
	Material		E 300 (Fe 440)	
	Ultimate Strength, Fu (MPa)		440	
	Yield Strength, Fy (MPa)		300	
	Mass, m (kg/m)	140.2	Iz (cm4)	40200.0
	Area, A (cm2)	178.0	Iy(cm4)	16000.0
	D (mm)	352.0	rz (cm)	15.0
	B (mm)	392.0	ry (cm)	9.5
	t (mm)	16.0	Zz (cm3)	2280.0
	T (mm)	16	Zy (cm3)	820.0
	Flange Slope	90	Zpz (cm3)	2540.0
	R1 (mm)	15.0	Zpy (cm3)	1250.0
	R2 (mm)	0.0		
Beam Section - Mechanical Properties				
	Beam Section		WB 500	
	Material		E 300 (Fe 440)	
	Ultimate Strength, Fu (MPa)		440	
	Yield Strength, Fy (MPa)		300	
	Mass, m (kg/m)	95.12	Iz (cm4)	52200.0
	Area, A (cm2)	121.0	Iy(cm4)	2980.0
	D (mm)	500.0	rz (cm)	20.7
	B (mm)	250.0	ry (cm)	4.96
	t (mm)	9.9	Zz (cm3)	2090.0
	T (mm)	14.7	Zy (cm3)	239.0
	Flange Slope	96	Zpz (cm3)	2350.0



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	R_1 (mm)	15.0	Z_{py} (cm ³)	406.0
	R_2 (mm)	7.5		
Plate Details - Input and Design Preference				
Thickness (mm)			[8, 10, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 75, 80, 90, 100, 110, 120]	
Material			E 300 (Fe 440)	
Ultimate Strength, F_u (MPa)			440	
Yield Strength, F_y (MPa)			290	
Bolt Details - Input and Design Preference				
Diameter (mm)			[24, 30]	
Property Class			[10.9, 12.9]	
Type			Bearing Bolt	
Bolt Tension			Non pre-tensioned	
Hole Type			Standard	
Slip Factor, (μ_f)			0.3	
Weld Details - Input and Design Preference				
Type of Weld Fabrication			Shop Weld	
Material Grade Overwrite, f_u (MPa)			510.0	
Beam Flange to End Plate			Groove Weld	
Beam Web to End Plate			Fillet Weld	
Stiffener			Fillet Weld	
Continuity Plate			Fillet Weld	
Detailing - Design Preference				
Edge Preparation Method			Rolled, machine-flame cut, sawn and planed	
Gap Between Members (mm)			0.0	
Are the Members Exposed to Corrosive Influences?			False	



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2 Design Checks

Design Status	Pass
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2.1 Beam to Column - Compatibility Check

Check	Required	Provided	Remarks
Beam Section Compatibility	$B_{req} = B_b + 25$ $= 250.0 + 25$ $= 275.0$	$B_{available} = B_c$ $= 392.0$	Compatible

2.2 Member Capacity - Supported Section

Check	Required	Provided	Remarks
Shear Capacity (kN)		$V_{dy} = \frac{A_v f_y}{\sqrt{3} \gamma_{mo}}$ $= \frac{0.6 \times 470.6 \times 9.9 \times 300}{\sqrt{3} \times 1.1 \times 1000}$ $= 440.16$ <p>[Ref. IS 800 : 2007, Cl.10.4.3]</p>	Restricted to low shear
Plastic Moment Capacity (kNm)		$M_{dz-z} = \frac{\beta_b Z_{pz} f_y}{\gamma_{mo}}$ $= \frac{1.0 \times 2350000.0 \times 300}{1.1 \times 10^6}$ $= 640.91$ <p>[Ref. IS 800 : 2007, Cl. 8.2.1.2]</p>	$V < 0.6 V_{dy}$

2.3 Member Capacity - Supporting Section

Check	Required	Provided	Remarks
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Check	Required	Provided	Remarks
Plastic Moment Capacity (kNm)		$M_{dz-z} = \frac{\beta_b Z_{pz} f_y}{\gamma_{mo}}$ $= \frac{0.9 \times 2540000.0 \times 300}{1.1 \times 10^6}$ $= 621.82$ <p><i>Note : The capacity of the section is not based on the beam – column or column design. The actual capacity might vary.</i></p> <p>[Ref. IS 800 : 2007, Cl. 8.2.1.2]</p>	Semi-compact
Plastic Moment Capacity (kNm)		$M_{dy-y} = \frac{\beta_b Z_{py} f_y}{\gamma_{mo}}$ $= \frac{0.66 \times 1250000.0 \times 300}{1.1 \times 10^6}$ $= 223.64$ <p><i>Note : The capacity of the section is not based on the beam – column or column design. The actual capacity might vary.</i></p> <p>[Ref. IS 800 : 2007, Cl. 8.2.1.2]</p>	Semi-compact

2.4 Load Consideration

Check	Required	Provided	Remarks
Shear Force (kN)	$V_y = 95.0$	$V_{ymin} = \min(0.15 \times V_{dy}, 40.0)$ $= \min(0.15 \times 440.16, 40.0)$ $= \min(66.02, 40.0)$ $= 40.0$ $V_u = \max(V_y, V_{ymin})$ $= \max(95.0, 40.0)$ $= 95.0$ <p>[Ref. IS 800 : 2007, Cl. 10.7]</p>	OK



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Check	Required	Provided	Remarks
Axial Force (kN)		$P_x = 32.0$	OK
Bending Moment (major axis) (kNm)	$M_z = 220.0$	$M_{zmin} = 0.5 * M_{dz-z}$ $= 0.5 \times 640.91$ $= 320.45$ $M_u = \max(M_z, M_{zmin})$ $\text{but, } \leq M_{dz-z} \text{ of the column section}$ $= \max(220.0, 320.45)$ ≤ 621.82 $= 320.45$ $[Ref. IS 800 : 2007, Cl. 8.2.1.2]$	OK
Effective Bending Moment (major axis) (kNm)		$M_{ue} = M_u + P_x \times \left(\frac{D}{2} - \frac{T}{2} \right) \times 10^{-3}$ $= 320.45 +$ $32.0 \times \left(\frac{500.0}{2} - \frac{14.7}{2} \right) \times 10^{-3}$ $= 328.21$	OK

2.5 Bolt Optimization

Check	Required	Provided	Remarks
Diameter (mm)	Bolt Diameter Optimization	$d = 24$	Pass
Property Class	Bolt Property Class Optimization	10.9	Pass
Hole Diameter (mm)		$d_0 = 26.0$	OK
No. of Bolt Columns		$n_c = 2$	Pass
No. of Bolt Rows		$n_r = 4$	Pass
Total No. of Bolts		$n = n_r \times n_c = 8$	Pass



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2.6 Detailing

Check	Required	Provided	Remarks
Min. Pitch Distance (mm)	$p_{min} = 2.5 d$ $= 2.5 \times 24.0$ $= 60.0$ [Ref IS 800 : 2007, Cl. 10.2.2]	80	Pass
Max. Pitch Distance (mm)	$p_{max} = \min(32 t, 300 \text{ mm})$ $= \min(32 \times 25.0, 300 \text{ mm})$ $= \min(800.0, 300 \text{ mm})$ $= 300$ Where, $t = \min(25.0, 25.0)$ [Ref. IS 800 : 2007, Cl. 10.2.3]	80	Pass
Min. End Distance (mm)	$e_{min} = 1.5 d_0$ $= 1.5 \times 26.0$ $= 39.0$ [Ref. IS 800 : 2007, Cl. 10.2.4.2]	40	Pass
Max. End Distance (mm)	$e_{max} = 12 t \varepsilon; \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 25.0 \times \sqrt{\frac{250}{290}} = 278.54$ $e_2 = 12 \times 25.0 \times \sqrt{\frac{250}{290}} = 278.54$ $e_{max} = \min(e_1, e_2) = 278.54$ [Ref. IS 800 : 2007, Cl. 10.2.4.3]	40	Pass
Min. Edge Distance (mm)	$e'_{min} = 1.5 d_0$ $= 1.5 \times 26.0$ $= 39.0$ [Ref. IS 800 : 2007, Cl. 10.2.4.2]	40	Pass



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Check	Required	Provided	Remarks
Max. Edge Distance (mm)	$e'_{max} = 12 t \varepsilon; \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 25.0 \times \sqrt{\frac{250}{290}} = 278.54$ $e_2 = 12 \times 25.0 \times \sqrt{\frac{250}{290}} = 278.54$ $e'_{max} = \min(e_1, e_2) = 278.54$ [Ref. IS 800 : 2007, Cl. 10.2.4.3]	40	Pass
Cross-centre Gauge Distance (mm)		112	Pass

2.7 Critical Bolt Design

Check	Required	Provided	Remarks
Shear Capacity (kN)		$V_{dsb} = \frac{f_{ub} n_n A_{nb}}{\sqrt{3} \gamma_{mb}}$ $= \frac{1040.0 \times 1 \times 353}{1000 \times \sqrt{3} \times 1.25}$ $= 169.57$ [Ref. IS 800 : 2007, Cl. 10.3.3]	OK
Kb		$k_b = \min\left(\frac{e}{3d_0}, \frac{p}{3d_0} - 0.25, \frac{f_{ub}}{f_u}, 1.0\right)$ $= \min\left(\frac{40}{3 \times 26.0}, \frac{80}{3 \times 26.0} - 0.25, \frac{1040.0}{440}, 1.0\right)$ $= \min(0.51, 0.78, 2.36, 1.0)$ $= 0.51$ [Ref. IS 800 : 2007, Cl. 10.3.4]	OK



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Check	Required	Provided	Remarks
Bearing Capacity (kN)		$V_{d_{pb}} = \frac{2.5 k_b d t f_u}{\gamma_{mb}}$ $= \frac{2.5 \times 0.51 \times 24.0 \times 25.0 \times 440}{1000 \times 1.25}$ $= 269.28$ <p>[Ref. IS 800 : 2007, Cl. 10.3.4]</p>	OK
Bolt Capacity (kN)		$V_{db} = \min (V_{dsb}, V_{d_{pb}})$ $= \min (169.57, 269.28)$ $= 169.57$ <p>[Ref. IS 800 : 2007, Cl. 10.3.2]</p>	
Large Grip Length Reduction Factor		$l_g = \sum (t_p + t_{member})$ $= \sum (25.0 + 16)$ $= 41.0 \text{ mm}$ $5d = 5 \times 24.0 = 120.0$ $8d = 8 \times 24.0 = 192.0$ <p>Since, $l_g < 5d$</p> $\beta_{lg} = 1.0$ <p>[Ref. IS 800 : 2007, Cl. 10.3.3.2]</p>	Pass
Bolt Capacity (post reduction factor) (kN)		$V_{db} = V_{db} \beta_{lg}$ $= 169.57 \times 1.0$ $= 169.57$ <p>[Ref. IS 800 : 2007, Cl. 10.3.3.2]</p>	OK
Shear Demand (kN)	$V_{sb} = \frac{V_u}{n}$ $= \frac{95.0}{8}$ $= 11.88$	Vdb = 169.57	Pass



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Check	Required	Provided	Remarks
Lever Arm (mm)	$r = [437.95, 47.35, 357.95, 127.35]$ <i>Note : r_1 is the first row inside tension/top flange r_2 is the first row inside compression/bottom flange Further row(s) are added in a symmetrical manner with odd row placed near the tension/top flange and even row placed near the compression/bottom flange respectively</i> <i>Note : The lever arm is computed by considering the NA at the centre of the bottom flange. Rows with identical lever arm values mean they are considered acting as bolt group near the tension or compression flange.</i>		Pass
Tension Due to Moment (kN)	$T_1 = \frac{M_{ue}}{n_c \times \left(r_1 + \sum_{i=2}^{n_r} \frac{r_i^2}{r_1} \right)}$ $= \frac{328.21 \times 10^3}{2 \times \left(437.95 + \sum_{i=2}^4 \frac{r_i^2}{437.95} \right)}$ $= 212.39$ <i>Note : T_1 is the tension in the critical bolt The critical bolt is the bolt nearest to the tension flange</i>		OK



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Check	Required	Provided	Remarks
Prying Force (kN)	$Q = \frac{l_v}{2 \times l_e} \left[T_e - \frac{\beta \times \eta \times f_o \times b_e \times t^4}{27 \times l_e \times l_v^2} \right]$ $l_v = e - \frac{R_1}{2}$ $= 40 - \frac{15.0}{2} = 32.5 \text{ mm}$ $f_o = 0.7 \times f_{ub}$ $= 0.7 \times 1040.0$ $= 728.0 \text{ N/mm}^2$ $l_e = \min \left(e, 1.1 t \sqrt{\frac{\beta f_o}{f_y}} \right)$ $= \min \left(40, 1.1 \times 25 \times \sqrt{\frac{2 \times 728.0}{290}} \right)$ $= \min(40, 61.62) = 40 \text{ mm}$ $\beta = 2 \text{ (non pre-tensioned bolt)}$ $\eta = 1.5$ $b_e = \frac{B}{n_c}$ $= \frac{250.0}{2} = 125.0 \text{ mm}$ $Q = \frac{32.5}{2 \times 40} \times \left[212.39 - \left(\frac{2 \times 1.5 \times 728.0 \times 125.0 \times 25^4}{27 \times 40 \times 32.5^2} \right) \times 10^{-3} \right]$ $Q = 48.31$ <p>[Ref. IS 800 : 2007, Cl. 10.4.7]</p>		OK



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Check	Required	Provided	Remarks
Tension Demand (kN)	$T_b = T_1 + Q$ $= 212.39 + 48.31$ $= 260.7$	$T_{db} = 0.90 f_{ub} A_n / \gamma_{mb}$ $< f_{yb} A_{sb} (\gamma_{mb} / \gamma_{m0})$ $= \min \left(0.90 \times 1040.0 \times 353 / 1.25, \right.$ $\quad \left. 940.0 \times 452.0 \times (1.25/1.1) \right)$ $= \min(264.33, 482.82)$ $= 264.33$ [Ref. IS 800 : 2007, Cl. 10.3.5]	Pass
Combined Capacity, (I.R)	≤ 1	$\left(\frac{V_{sb}}{V_{db}} \right)^2 + \left(\frac{T_b}{T_{db}} \right)^2 \leq 1.0$ $\left(\frac{11.88}{169.57} \right)^2 + \left(\frac{260.7}{264.33} \right)^2 = 0.98$ [Ref. IS 800 : 2007, Cl. 10.3.6]	Pass

2.8 Compression Flange Check

Check	Required	Provided	Remarks
Tension in Bolt Rows (kN)		$T = [212.39, 22.96, 173.59, 61.76]$	OK
Reaction at Compression Flange (kN)	$R_c = n_c \sum_{n_r=1}^{n_r} T_{n_r}$ $= 2 \times \sum_{n_r=1}^4 T_{n_r}$ $= 2 \times 470.7$ $= 941.4$	$F_c = A_g f_y / \gamma_{m0}$ $= \frac{B \times T \times f_y}{\gamma_{m0}}$ $= \frac{250.0 \times 14.7 \times 300}{1.1 \times 1000}$ $= 1002.27$	Pass



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2.9 End Plate Checks

Check	Required	Provided	Remarks
Height (mm)		$H_p = D + 25$ $= 500.0 + 25$ $= 525.0$	Pass
Width (mm)		$B_p = B + 25$ $= 250.0 + 25$ $= 275.0$	Pass
Moment at Critical Section (kNm)		$M_{cr} = T_1 l_v - Q l_e$ $= (212.39 \times 32.5 - 48.31 \times 40) \times 10^{-3}$ $= 4.97$ <i>Note : The critical section is at the toe of the weld or the edge of the flange from bolt center – line</i>	OK
Plate Thickness (mm)	$t_p = \sqrt{\frac{4M_{cr}}{b_e(f_y/\gamma_{m0})}}$ $= \sqrt{\frac{4 \times 4.97 \times 10^6}{125 \times (290/1.1)}}$ $= 24.56$	25	Pass
Moment Capacity (kNm)	4.97	$M_p = \left(\frac{b_e t_p^2}{4}\right) \times \frac{f_y}{\gamma_{m0}}$ $= \frac{125 \times 25^2}{4} \times \frac{290}{1.1} \times 10^{-6}$ $= 5.15$	Pass

2.10 Longitudinal Stiffener Design

Check	Required	Provided	Remarks
Width (mm)		$W_{st} = B_p - \frac{t}{2}$ $= 275.0 - \frac{9.9}{2}$ $= 132.55$	132.55
Length (mm)		$L_{st} = 2 * W_{st}$ $= 2 * 132.55$ $= 265.1$	Pass
Thickness (mm)	$t = 9.9$	$t_{st} = 10$	Pass



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Check	Required	Provided	Remarks
Weld Size (mm)	6	tw = 6	Pass

2.11 Weld Design - Beam Web to End Plate Connection

Check	Required	Provided	Remarks
Weld Strength (N/mm ²)	$f_{uw} = \min(f_w, f_u)$ $= \min(510.0, 440)$ <i>[Ref. IS 800 : 2007, Cl. 10.5.7.1.1]</i>	$f_{uw} = 440$	Pass
Total Weld Length (mm)		$L_w = 2 \times [D - (2 \times T) - (2 \times R1) - 20]$ $= 2 \times [500.0 - (2 \times 14.7) - (2 \times 15.0) - 20]$ $= 831.3$ <i>Note : Weld is provided on both sides of the web</i>	OK
Weld Size (mm)	$t_w = \frac{V_u}{f_{uw} k L_w} \times \sqrt{3} \gamma_{mw}$ $= \frac{95.0 \times 10^3}{440 \times 0.7 \times 831.3} \times \sqrt{3} \times 1.25$ $= 0.8$ <i>[Ref. IS 800 : 2007, Cl. 10.5.7]</i>	6	Pass



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Check	Required	Provided	Remarks
Min. Weld Size (mm)	<p>1) t_{wmin} – based on thickness of the thicker part</p> $t_{thicker} = \max(25.0, 9.9)$ $= 25.0$ $t_{wmin} = 6$ <p>2) t_{wmin} – based on thickness of the thinner part</p> $t_{thinner} = \min(25.0, 9.9)$ $= 9.9$ $t_{wmin} \leq \min(6, 9.9)$ <p>[Ref IS 800 : 2007, Table 21 , Cl10.5.2.3]</p>	$t_w = \max(t_w, t_{wmin})$ $= \max(0.8, 6)$ $= 6$	Pass
Max. Weld Size (mm)	<p>t_{wmax} based on thickness of the thinner part</p> $t_{thinner} = \min(25.0, 9.9)$ $= 9.9$ $t_{wmax} = 9.9$ <p>[Ref. IS 800 : 2007, Cl. 10.5.3.1]</p>	$t_w \leq t_{wmax}$ $6 \leq 9.9$	Pass
Normal Stress (N/mm ²)		$f_a = \frac{H}{0.7 \times t_w \times L_w}$ $= \frac{32.0 \times 10^3}{0.7 \times 6 \times 831.3}$ $= 9.17$ <p>[Ref. IS 800 : 2007, Cl. 10.5.9]</p>	



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Check	Required	Provided	Remarks
Shear Stress (N/mm ²)		$q = \frac{V}{0.7 \times t_w \times L_w}$ $= \frac{95.0 \times 10^3}{0.7 \times 6 \times 831.3}$ $= 27.21$ <p>[Ref. IS 800 : 2007, Cl. 10.5.9]</p>	
Equivalent Stress (N/mm ²)	$f_e = \sqrt{f_a^2 + 3q^2}$ $= \sqrt{9.17^2 + (3 \times 27.21^2)}$ $= 47.23$ <p>[Ref. IS 800 : 2007, Cl. 10.5.10.1.1]</p>	$f_w = \frac{f_u}{\sqrt{3} \gamma_{mw}}$ $= \frac{440}{\sqrt{3} \times 1.25}$ $= 203.23$ <p>[Ref. IS 800 : 2007, Cl. 10.5.7.1.1]</p>	Pass

2.12 Continuity Plate Check - Compression/Tension Flange

Check	Required	Provided	Remarks
Local Web Yielding Capacity (kN)		$P_{cw1} = \frac{f_{wc} (5k + T_b)}{\gamma_{m0}}$ $k = T_c + R_{1c}$ $= 16 + 15.0$ $= 31.0$ $f_{wc} = f_{yc} \times t_c$ $= 300.0 \times 16.0$ $= 4800.0$ $P_{cw1} = \frac{4800.0 \times ((5 \times 31.0) + 14.7)}{1.1 \times 1000}$ $= 740.51$ <p>Note : subscript c denotes column section, and, subscript b denotes beam section</p>	OK



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Check	Required	Provided	Remarks
Web Compression Buckling Capacity (kN)		$P_{cw2} = 10710 \left(\frac{t_c^3}{h_c} \right) \sqrt{\frac{f_{yc}}{\gamma_{m0}}}$ $h_c = D_c - (2 \times k)$ $= 352.0 - (2 \times 31.0)$ $= 290.0$ $P_{cw2} = 10710 \times \frac{16.0^3}{290.0} \times \sqrt{\frac{300.0}{1.1}} \times 10^{-3}$ $= 2498.13$	OK
Web Crippling Capacity (kN)		$P_{cw3} = \left(\frac{300t_c^2}{\gamma_{m1}} \right) \left[1 + 3 \left(T_b/D_c \right) \left(t_c/T_c \right)^{1.5} \right] \sqrt{f_{yc} \left(T_c/t_c \right)}$ $= \left(\frac{300 \times 16.0^2}{1.25} \right) \times \left[1 + 3 \times \left(14.7/352.0 \right) \times \left(16.0/16 \right)^{1.5} \right] \times$ $\sqrt{300.0 \times \left(16/16.0 \right)} \times 10^{-3}$ $= 1197.5$	OK
Compression Strength (kN)		$P_{cw} = \min(P_{cw1}, P_{cw2}, P_{cw3})$ $= \min(740.51, 2498.13, 1197.5)$ $= 740.51$	OK
Continuity Plate Required?	$R_c = 941.4$	$P_{cw} = 740.51$	Yes

2.13 Continuity Plate Design - Compression/Tension Flange

Check	Required	Provided	Remarks
Area Required (mm ²)	$A_{cp} = \frac{R_c - P_{cw}}{f_{y_{cp}} \gamma_{m0}}$ $= \frac{(941.4 - 740.51) \times 10^3}{290 \times 1.1}$ $= 629.75$		OK
Notch Size (mm)		$n = 24$	OK



Company Name	IIT Bombay	Project Title	Sample Connection Design
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Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Length (mm)		$l_{cp1} = \text{Outer length}$ $l_{cp1} = D_c - 2 \times T_c$ $= 352.0 - (2 \times 16)$ $= 320.0$ $l_{cp2} = \text{Inner length}$ $l_{cp2} = D_c - 2(T_c + n)$ $= 352.0 - [2 \times (16 + 24)]$ $= 272.0$	OK
Width (mm)		$w_{cp} = \frac{B_c - T_c - 2n}{2}$ $= \frac{392.0 - 16.0 - 2 \times 24}{2}$ $= 164.0$	OK



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Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Thickness (mm)	$t_{cp1} = \text{Minimum area criteria}$ $t_{cp1} = \frac{A_{cp}/2}{w_{cp}}$ $= \frac{629.75/2}{164.0}$ $= 1.92$ $t_{cp2} = \text{Limiting } b/t \text{ ratio criteria}$ $t_{cp2} = \frac{l_{cp1}}{29.3 \epsilon_{cp}}$ $\epsilon_{cp} = \sqrt{\frac{250}{f_{y_{cp}}}}$ $= \sqrt{\frac{250}{290}}$ $= 0.93$ $= \frac{320.0}{29.3 \times 0.93}$ $= 11.76$ $t_{cp3} = \text{Minimum thickness criteria}$ $t_{cp3} = T_b$ $= 14.7$ $t_{cp} = \max(t_{cp1}, t_{cp2}, t_{cp3})$ $= \max(1.92, 11.76, 14.7)$ $= 14.7$	16	Pass



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2.14 Weld Design - Continuity Plate

Check	Required	Provided	Remarks
Weld Strength (N/mm ²)	$f_{uw} = \min(f_w, f_{u_{cp}})$ $= \min(510.0, 440)$ [Ref. IS 800 : 2007, Cl. 10.5.7.1.1]	$f_{uw} = 440$	Pass
Total (effective) Weld Length (mm)		$L_{w_{cp}} = 256.0$ <i>Note : Provide weld on one side of the continuity plate</i>	OK
Weld Size (mm)	$t_{w_{cp}} = \frac{V_{cp}/2}{f_{uw} k L_{w_{cp}}} \times \sqrt{3} \gamma_{mw}$ $= \frac{R_c - P_{cw}}{2 \times f_{uw} k L_{w_{cp}}} \times \sqrt{3} \gamma_{mw}$ $= \frac{(941.4 - 740.51) \times 10^3}{2 \times 440 \times 0.7 \times 256.0} \times \sqrt{3} \times 1.25$ $= 2.76$ [Ref. IS 800 : 2007, Cl. 10.5.7]	5	Pass
Min. Weld Size (mm)	1) $t_{w_{min}}$ – based on thickness of the thicker part $t_{thicker} = \max(16, 16.0)$ $= 16$ $t_{w_{min}} = 5$ 2) $t_{w_{min}}$ – based on thickness of the thinner part $t_{thinner} = \min(16, 16.0)$ $= 16$ $t_{w_{min}} \leq \min(5, 16)$ [Ref IS 800 : 2007, Table 21 , Cl.10.5.2.3]	$t_w = \max(t_w, t_{w_{min}})$ $= \max(2.76, 5)$ $= 5$	Pass



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Check	Required	Provided	Remarks
Max. Weld Size (mm)	t_{wmax} based on thickness of the thinner part $t_{thinner} = \min(16, 16.0)$ $= 16$ $t_{wmax} = 16$ [Ref. IS 800 : 2007, Cl. 10.5.3.1]	$t_w \leq t_{wmax}$ $5 \leq 16$	Pass

2.15 Column Web Shear Check

Check	Required	Provided	Remarks
Web Stiffener Plate Required ?	$t_{wc} = \frac{1.9M_{ue}}{D_c D_b f_{yc}}$ $= \frac{1.9 \times 328.21}{352.0 \times 500.0 \times 300.0}$ $= 11.81$	$t_c = 16.0$	No



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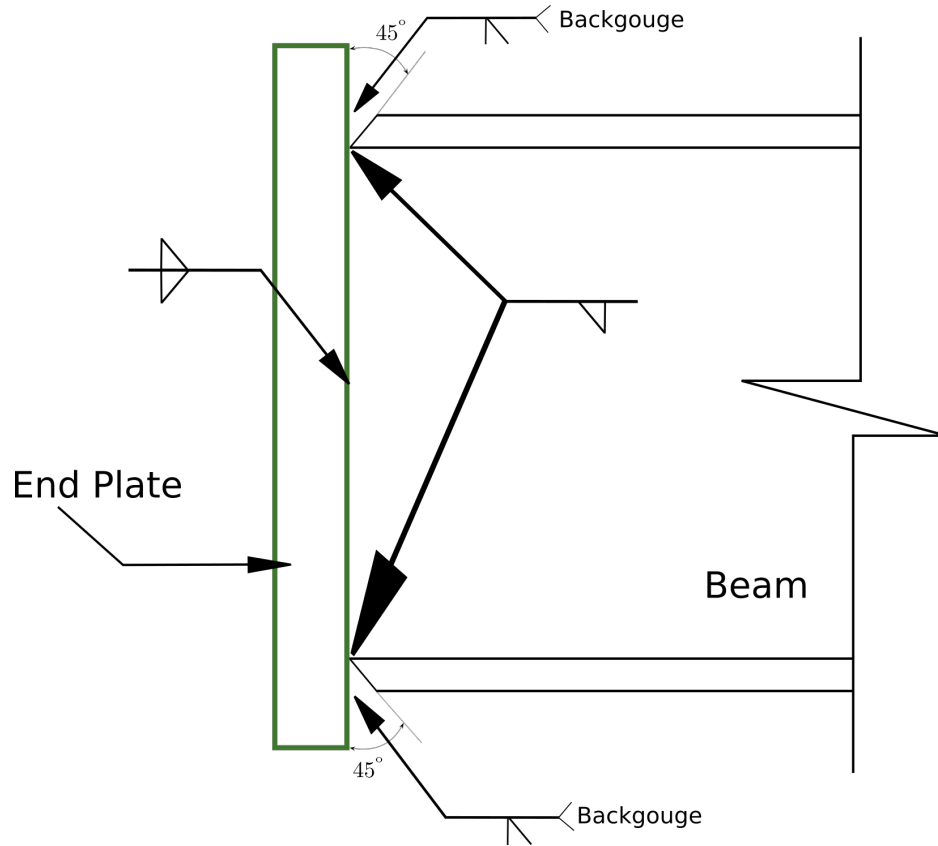


Figure 1: Typical Weld Details - Beam to End Plate Connection

3 2D Drawings (Typical)



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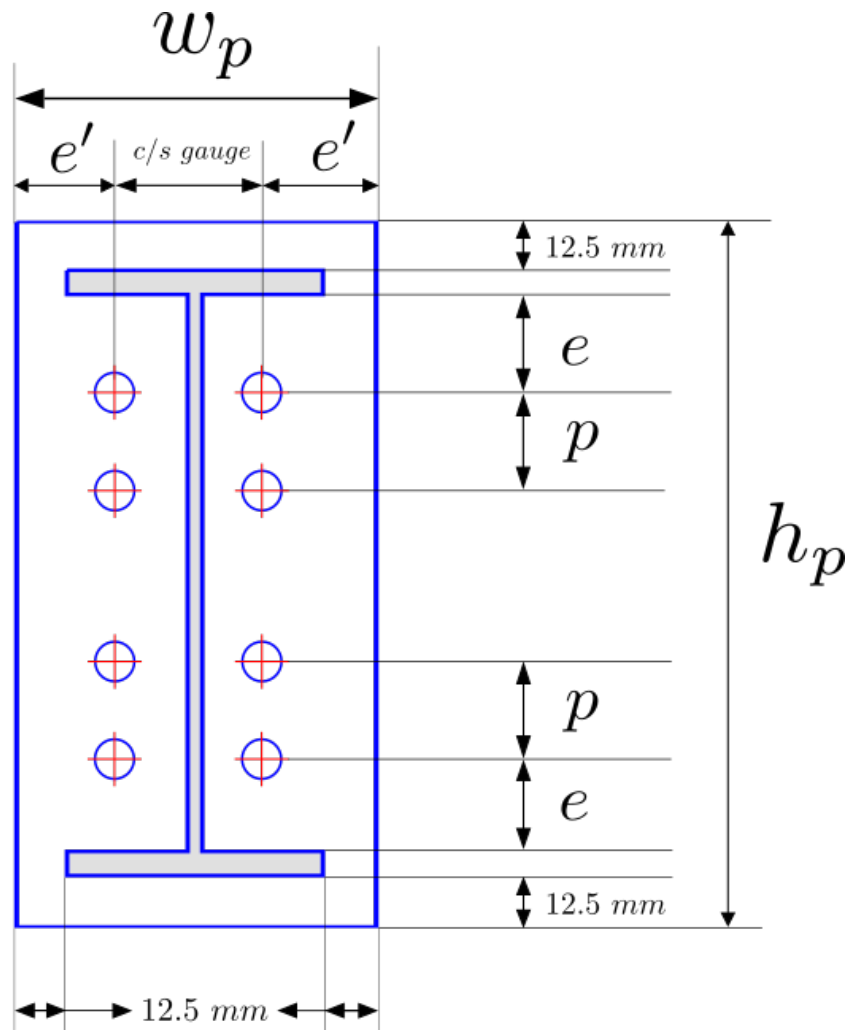


Figure 2: Typical Detailing



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Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

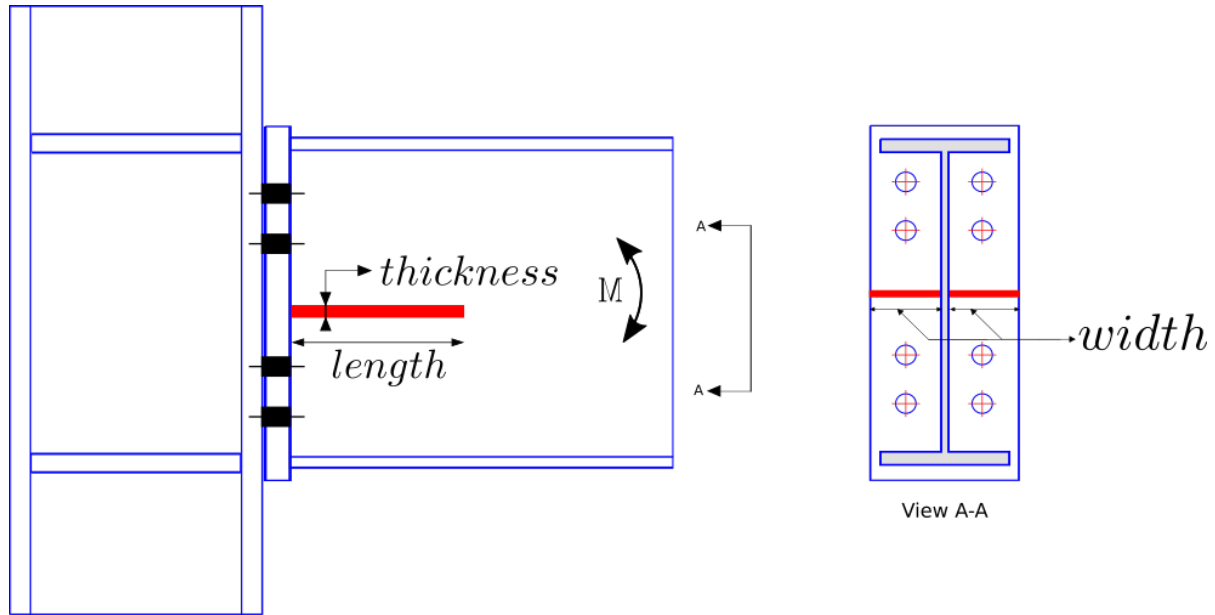
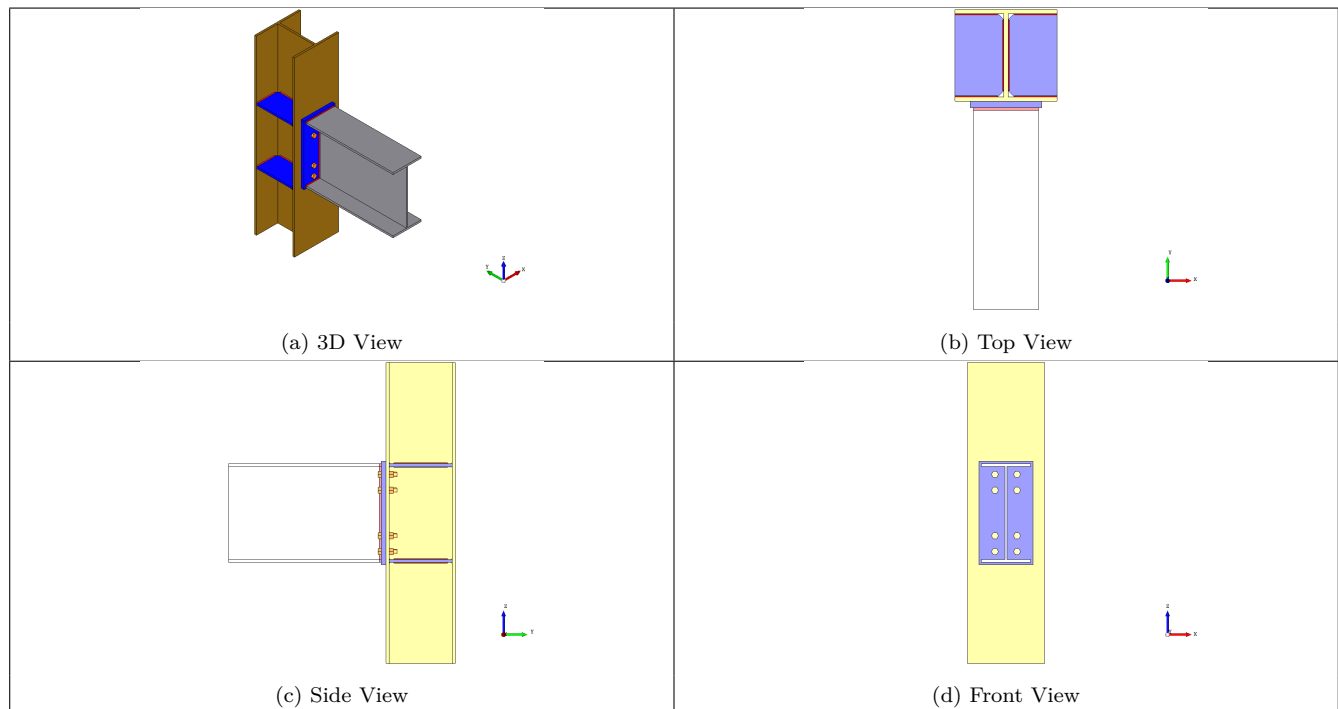




Figure 3: Typical Stiffener Details

4 3D Views



			
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Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
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5 Design Log

2020-12-18 00:10:35 - Osdag - WARNING - The Load(s) defined is/are less than the minimum recommended value [Ref. IS 800:2007, Cl.10.7].

2020-12-18 00:10:35 - Osdag - WARNING - [Minimum Factored Load] The external factored bending moment (220.0 kNm) is less than 0.5 times the plastic moment capacity of the beam (640.91 kNm)

2020-12-18 00:10:35 - Osdag - INFO - The minimum factored bending moment should be at least 0.5 times the plastic moment capacity of the beam to qualify the connection as rigid connection (Annex. F-4.3.1, IS 800:2007)

2020-12-18 00:10:35 - Osdag - INFO - The value of load(s) is/are set at minimum recommended value as per Cl.10.7 and Annex. F, IS 800:2007

2020-12-18 00:10:35 - Osdag - INFO - Designing the connection for a factored moment of 320.45 kNm

2020-12-18 00:10:35 - Osdag - WARNING - [End Plate] The end plate of 8.0 mm is thinner than the thickest of the elements being connected

2020-12-18 00:10:35 - Osdag - INFO - Selecting a plate of higher thickness which is at least 16 mm thick

2020-12-18 00:10:35 - Osdag - WARNING - [End Plate] The end plate of 10.0 mm is thinner than the thickest of the elements being connected

2020-12-18 00:10:35 - Osdag - INFO - Selecting a plate of higher thickness which is at least 16 mm thick

2020-12-18 00:10:35 - Osdag - WARNING - [End Plate] The end plate of 12.0 mm is thinner than the thickest of the elements being connected

2020-12-18 00:10:35 - Osdag - INFO - Selecting a plate of higher thickness which is at least 16 mm thick

2020-12-18 00:10:35 - Osdag - WARNING - [End Plate] The end plate of 14.0 mm is thinner than the thickest of the elements being connected

2020-12-18 00:10:35 - Osdag - INFO - Selecting a plate of higher thickness which is at least 16 mm thick

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] Bolt diameter and grade combination ready to perform bolt design

2020-12-18 00:10:35 - Osdag - INFO - The solver has selected 4.0 combinations of bolt diameter and grade to perform optimum bolt design in an iterative manner

2020-12-18 00:10:35 - Osdag - INFO - Checking the design with the following bolt diameter-grade combination [(24.0, 10.9), (24.0, 12.9), (30.0, 10.9), (30.0, 12.9)]

2020-12-18 00:10:35 - Osdag - WARNING - [Column Web] The web of the column is not susceptible to shear bucking due to the reaction transferred by the beam to the column

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of the web i.e. 11.81 mm is satisfied

2020-12-18 00:10:35 - Osdag - INFO - Additional stiffening of the column web is not required

2020-12-18 00:10:35 - Osdag - INFO - [Optimisation] Performing the design by optimising the plate thickness, using the thin plate and large (suitable) bolt diameter approach



2020-12-18 00:10:35 - Osdag - INFO - If you wish to optimise the bolt diameter-grade combination, pass a higher value of plate thickness using the Input Dock

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment

			
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capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 27.15 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 518.8321925872062 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 3.872

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 20.88 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 294.6184096812406 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.247

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 27.23 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the tension check



2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 513.3721925872062 kN and exceeds the bolt tension capacity (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 2.76

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

		Created with 	
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2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 20.98 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 291.1984096812406 kN and the bolt tension capacity is (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.887

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 31.03 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 577.9725156462692 kN and exceeds the bolt tension capacity (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.905

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab



2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 24.0 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 337.682746158003 kN

			
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and the bolt tension capacity is (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.649

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 31.06 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 562.1325156462692 kN and exceeds the bolt tension capacity (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.313

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 16.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 24.04 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 328.372746158003 kN and the bolt tension capacity is (492.78 kN)



2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.447

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the

			
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flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 27.46 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 510.64219258720624 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 3.752

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 21.28 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 288.4684096812406 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.196

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 27.61 mm



2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 508.88219258720625 kN and exceeds the bolt tension capacity (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the combined shear + tension check

		Created with  Osdag®	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 2.708

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 21.47 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 286.6984096812406 kN and the bolt tension capacity is (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.859

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 31.19 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 553.6525156462692 kN and exceeds the bolt tension capacity (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.747

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling



2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 24.2 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

			
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 322.82274615800304 kN and the bolt tension capacity is (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.593

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 31.24 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 539.5725156462693 kN and exceeds the bolt tension capacity (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.209

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 18.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 24.26 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness



2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 314.542746158003 kN and the bolt tension capacity is (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.41

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

		Created with  Osdag®	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 28.39 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 505.2921925872063 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 3.674

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 22.24 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 283.1184096812406 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.152

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check



2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 28.62 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 502.6021925872062 kN and exceeds the bolt tension capacity (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

		Created with 	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 2.642

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 22.53 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 280.41840968124063 kN and the bolt tension capacity is (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.821

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 31.91 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 531.2625156462693 kN and exceeds the bolt tension capacity (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.607

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN



2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

			
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 24.86 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 309.122746158003 kN and the bolt tension capacity is (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.543

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 32.03 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 527.8725156462692 kN and exceeds the bolt tension capacity (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.155

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 20.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 25.01 mm



2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 306.682746158003 kN and the bolt tension capacity is (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.389

		Created with  Osdag®	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 29.0 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 498.07219258720625 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 3.57

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 23.01 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 275.8984096812406 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.094

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.



2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 29.33 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 494.13219258720625 kN

		Created with 	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

kN and exceeds the bolt tension capacity (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 2.554

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 941.4 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 23.42 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 271.9584096812406 kN and the bolt tension capacity is (310.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 24.0 mm diameter and 12.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.773

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 32.24 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 525.6525156462692 kN and exceeds the bolt tension capacity (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.574

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter



2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

		Created with  Osdag®	
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 25.28 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 304.46274615800303 kN and the bolt tension capacity is (420.08 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 10.9 grade passes the combined shear + tension check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.527

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 854.36 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 32.42 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 523.7225156462692 kN and exceeds the bolt tension capacity (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 1.136

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Flange Strength] The reaction at the compression flange of the beam 1004.64 kN exceeds the flange capacity 1002.27 kN

2020-12-18 00:10:35 - Osdag - ERROR - Reaction on the flange exceeds the flange capacity by 2.37 kN

2020-12-18 00:10:35 - Osdag - WARNING - The beam flange can have local buckling

2020-12-18 00:10:35 - Osdag - INFO - Select a different beam with more flange area or provide stiffening at the flange to increase the beam flange thickness. Re-design connection using the effective flange thickness after stiffening

2020-12-18 00:10:35 - Osdag - INFO - Custom beams can be defined through the Osdag Design Preferences tab

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 22.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 25.51 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the tension check

2020-12-18 00:10:35 - Osdag - INFO - Total tension demand on bolt (due to direct tension + prying action) is 302.532746158003 kN and the bolt tension capacity is (492.78 kN)

2020-12-18 00:10:35 - Osdag - INFO - [Bolt Design] The bolt of 30.0 mm diameter and 12.9 grade passes the combined shear + tension



Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Column End Plate
Designer	Engineer #1	Job Number	1.2.2.1.1.1.1
Date	18 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

check

2020-12-18 00:10:35 - Osdag - INFO - The Interaction Ratio (IR) of the critical bolt is 0.379

2020-12-18 00:10:35 - Osdag - INFO - The provided beam can accommodate a single column of bolt on either side of the web [Ref. based on detailing requirement]

2020-12-18 00:10:35 - Osdag - INFO - Performing the design with a single column of bolt on each side

2020-12-18 00:10:35 - Osdag - INFO - [Flange Strength] The reaction at the compression flange of the beam 820.84 kN is less than the flange capacity 1002.27 kN. The flange strength requirement is satisfied.

2020-12-18 00:10:35 - Osdag - ERROR - [End Plate] The selected trial end plate of 25.0 mm is insufficient and fails in the moment capacity check

2020-12-18 00:10:35 - Osdag - INFO - The minimum required thickness of end plate is 30.25 mm

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a plate of available higher thickness

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the tension check

2020-12-18 00:10:35 - Osdag - ERROR - Total tension demand on bolt (due to direct tension + prying action) is 482.87219258720626 kN and exceeds the bolt tension capacity (264.33 kN)

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter

2020-12-18 00:10:35 - Osdag - ERROR - [Bolt Design] The bolt of 24.0 mm diameter and 10.9 grade fails the combined shear + tension check

2020-12-18 00:10:35 - Osdag - ERROR - The Interaction Ratio (IR) of the critical bolt is 3.357

2020-12-18 00:10:35 - Osdag - INFO - Re-designing the connection with a bolt of higher grade and/or diameter