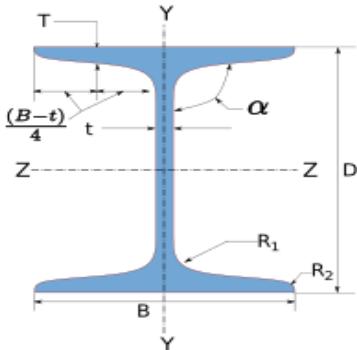




Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Beam-Beam End Plate Splice
Designer	Engineer #1	Job Number	1.2.1.2.1.2.2
Date	17 /12 /2020	Client	S R Satish Kumar, Professor, IIT Madras

1 Input Parameters

Main Module		Moment Connection		
Module		Beam-Beam End Plate Splice		
Connectivity		Coplanar Tension-Compression Flange		
End Plate Type		Extended One Way - Irreversible Moment		
Bending Moment (kNm)		110.0		
Shear Force (kN)		55.0		
Axial Force (kN)		15.0		
Beam Section - Mechanical Properties				
	Beam Section		LB 400	
	Material		E 250 (Fe 410 W)A	
	Ultimate Strength, Fu (MPa)		410	
	Yield Strength, Fy (MPa)		250	
	Mass, m (kg/m)	56.82	Iz (cm4)	19300.0
	Area, A (cm2)	7240.0	Iy (cm4)	716.0
	D (mm)	400.0	rz (cm)	16.3
	B (mm)	165.0	ry (cm)	3.14
	t (mm)	8.0	Zz (cm3)	965.0
	T (mm)	12.5	Zy (cm3)	86.8
	Flange Slope	98	Zpz (cm3)	1090.0
	R1 (mm)	16.0	Zpy (cm3)	151.0
	R2 (mm)	8.0		
Plate Details - Input and Design Preference				
Thickness (mm)		[12]		
Material		E 250 (Fe 410 W)A		
Ultimate Strength, Fu (MPa)		410		
Yield Strength, Fy (MPa)		250		
Bolt Details - Input and Design Preference				
Diameter (mm)		[20]		
Property Class		[5.8]		
Type		Bearing Bolt		
Bolt Tension		Non pre-tensioned		
Hole Type		Standard		



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Slip Factor, (μ_f)	0.3
Weld Details - Input and Design Preference	
Type of Weld Fabrication	Shop Weld
Material Grade Overwrite, f_u (MPa)	410.0
Beam Flange to End Plate	Groove Weld
Beam Web to End Plate	Fillet Weld
Stiffener	Fillet Weld
Detailing - Design Preference	
Edge Preparation Method	Rolled, machine-flame cut, sawn and planed
Gap Between Beams (mm)	0.0
Are the Members Exposed to Corrosive Influences?	False



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2 Design Checks

Design Status	Fail
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2.1 Member Capacity

Check	Required	Provided	Remarks
Shear Capacity (kN)		$V_{dy} = \frac{A_v f_y}{\sqrt{3} \gamma_{mo}}$ $= \frac{0.6 \times 375.0 \times 8.0 \times 250}{\sqrt{3} \times 1.1 \times 1000}$ $= 236.19$ <p>[Ref. IS 800 : 2007, Cl.10.4.3]</p>	Restricted to low shear
Plastic Moment Capacity (kNm)		$M_{dz-z} = \frac{\beta_b Z_{pz} f_y}{\gamma_{mo}}$ $= \frac{1 \times 1090000.0 \times 250}{1.1 \times 10^6}$ $= 247.73$ <p>[Ref. IS 800 : 2007, Cl. 8.2.1.2]</p>	$V < 0.6 V_{dy}$

2.2 Load Consideration

Check	Required	Provided	Remarks
Shear Force (kN)	$V_y = 55.0$	$V_{ymin} = \min(0.15 \times V_{dy}, 40.0)$ $= \min(0.15 \times 236.19, 40.0)$ $= \min(35.43, 40.0)$ $= 35.43$ $V_u = \max(V_y, V_{ymin})$ $= \max(55.0, 35.43)$ $= 55.0$ <p>[Ref. IS 800 : 2007, Cl. 10.7]</p>	OK
Axial Force (kN)		$P_x = 15.0$	OK



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Check	Required	Provided	Remarks
Bending Moment (kNm)	$M_z = 110.0$	$M_{zmin} = 0.5 * M_{dz-z}$ $= 0.5 \times 247.73$ $= 123.86$ $M_u = \max(M_z, M_{zmin})$ $= \max(110.0, 123.86)$ $= 123.86$ <i>[Ref. IS 800 : 2007, Cl. 8.2.1.2]</i>	OK
Effective Bending Moment (kNm)		$M_{ue} = M_u + P_x \times \left(\frac{D}{2} - \frac{T}{2} \right) \times 10^{-3}$ $= 123.86 +$ $15.0 \times \left(\frac{400.0}{2} - \frac{12.5}{2} \right) \times 10^{-3}$ $= 126.77$	OK

3 Design Log

2020-12-17 23:50:48 - Osdag - WARNING - The Load(s) defined is/are less than the minimum recommended value [Ref. IS 800:2007, Cl.10.7].

2020-12-17 23:50:48 - Osdag - WARNING - [Minimum Factored Load] The external factored bending moment (110.0 kNm) is less than 0.5 times the plastic moment capacity of the beam (247.73 kNm)

2020-12-17 23:50:48 - 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)

2020-12-17 23:50:48 - 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

2020-12-17 23:50:48 - Osdag - INFO - Designing the connection for a factored moment of 123.86 kNm



2020-12-17 23:50:48 - Osdag - WARNING - [End Plate] The end plate of 12.0 mm is thinner than the thickest part of the elements being connected

2020-12-17 23:50:48 - Osdag - INFO - Selecting a plate of higher thickness which is at least 12.5 mm thick

2020-12-17 23:50:48 - Osdag - ERROR - [End Plate] The list of plate thicknesses passed into the solver is insufficient to perform end plate design

2020-12-17 23:50:48 - Osdag - WARNING - The end plate should at least be thicker than the maximum thickness of the connecting element(s)

2020-12-17 23:50:48 - Osdag - INFO - Provide a plate/list of plates with a minimum thickness of 12.5 mm

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2020-12-17 23:50:48 - Osdag - INFO - [Bolt Design] Bolt diameter and grade combination ready to perform bolt design

2020-12-17 23:50:48 - Osdag - INFO - The solver has selected 1 combinations of bolt diameter and grade to perform optimum bolt design in an iterative manner

2020-12-17 23:50:48 - Osdag - INFO - Checking the design with the following bolt diameter-grade combination [(20.0, 5.8)]

2020-12-17 23:50:48 - Osdag - INFO - [Optimisation] Performing the design by optimising the plate thickness, using the thin plate and large (suitable) bolt diameter approach

2020-12-17 23:50:48 - Osdag - INFO - If you wish to optimise the bolt diameter-grade combination, pass a higher value of plate thickness using the Input Dock