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Company Name	**IIT B**	**Project Title**	**Moment Connection Design Examples**
Group/Team Name	**Osdag**	**Subtitle**	**End Plate Moment Connection**
Designer	**Engineer 2**	**Job Number**	**1.2.1.2.3.2**
Date	**13 /06 /2019**	**Client**	**Pradyumna M**

Design Conclusion	
Beam to Beam Extended Flush End Plate Splice Connection	**Fail**
Connection Properties	
Connection	
Connection Title	Beam to Beam Extended Flush End Plate Splice
Connection Type	Moment Connection
Connection Category	
Connectivity	Beam - Beam
Beam to End Plate Connection	Welded
End Plate to End Plate Connection	Bolted
End plate type	Extended both way
Loading (Factored Loads)	
Bending Moment (kNm)	50.0
Shear Force (kN)	25.0
Axial Force (kN)	0.0
Components	
Beam Section	MB 300
Grade of Steel	Fe 410.0
Plate Section	332.0 X 180.0 X 20.0
Thickness (mm)	20.0
Width (mm)	180.0
Height (mm)	332.0
Clearance Holes for Fasteners	Over-sized
Grade of Steel	Fe 410.0
Weld	

Type	Fillet Weld
Size of Weld at Flange (mm)	6
Size of Weld at Web (mm)	5
Bolts	
Type	Friction Grip Bolt
Property Class	8.8
Diameter (d) (mm)	20
Hole Diameter (d_o) (mm)	24
Number of Bolts (n)	4
End Distance (e) (mm)	41
Edge Distance (e') (mm)	45
Gauge Distance (g) (mm)	50
Cross-centre gauge (g') (mm)	90.0
Pitch Distance (p) (mm)	
Pitch	173.8

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Design Preferences	
Bolt	
Hole Type	Over-sized
Hole Clearance (mm)	4.0
Ultimate Strength (f_u) (MPa)	800.0
Slip factor	0.3
Beta (β)(non pre-tensioned)	2
Weld	
Type of Weld	Shop weld
Detailing	
Type of Edges	Sheared or hand flame cut
Minimum Edge and End Distance	1.7 times the hole diameter
Are members exposed to corrosive influences?	No
Design	
Design Method	Limit State Design

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Design Check			
Check	**Required**	**Provided**	**Remark**
Bolt Checks			
Tension capacity of critical bolt (kN)	Tension in bolt due to external factored moment & external factored axial load + Prying force = 100.165+62.668 = 162.833 [cl. 10.4.7]	Tension capacity = (0.9*800*245) / (1.25*1000) = 141.12 [cl. 10.4.5]	**Fail**
Bolt slip resistance (kN)	Factored shear force / Number of bolts = 25.0 / 4 = 6.25	V_{dsf} = (0.3*1*0.85*137.2) / 1.25 = 27.989 [cl. 10.4.3]	**Pass**
Bolt bearing capacity (kN)	N/A	N/A	
Bolt value (kN)		Bolt Shear Capacity =27.989	
Combined shear and tension capacity of bolt	≤ 1.0	(V_{sf}/V_{df})^2 + (T_f/T_{df})^2 = (6.25/27.989)^2 + (162.833/141.12)^2 = 1.381 [cl. 10.4.6]	**Fail**
No. of bolts		4.0	
No. of column(s)		2	
No. of row(s)		2	
Bolt gauge (mm)	≥ 2.5 * d = 50.0, ≤ min(32 * t, 300) = 300.0 [cl. 10.2.2 & cl. 10.2.3]	50	**Pass**
Bolt pitch (mm)	≥ 2.5 * d = 50.0, ≤ min(32 * t, 300) = 300.0 [cl. 10.2.2 & cl. 10.2.3]	50	**Pass**

End distance (mm)	≥ 1.7 d_o = 40.8,≤ 12*t*ε = 240.0 [cl. 10.2.4]	41	**Pass**
Edge distance (mm)	≥ 1.7 d_o = 40.8,≤ 12*t*ε = 240.0 [cl. 10.2.4]	41	**Pass**
Plate Checks			
Plate thickness (mm)	((4*1.10*2439.576*1000)/(250.0*70.0)) ^ 0.5 = 21.842 [Design of Steel Structures - N. Subramanian, 2014]	20.0	**Fail**
Plate height (mm)	Based on detailing requirements	332.0	
Plate width (mm)		180.0	
Plate moment capacity (kNm)	Moment demand (M_d) = ((21.842^2*250.0*70.0)/(4.4)) * 10^ -3 = 2439.576 [Design of Steel Structures - N. Subramanian, 2014]	Moment capacity (M_c) = ((20.0^2*250.0*70.0)/(4.4)) * 10^ -3 = 2475.0 [Design of Steel Structures - N. Subramanian, 2014]	**Pass**
Weld Checks			
Flange			
Weld size at flange (mm)	≥ (0.783* 10^3)/132.56=5.907 [Design of Steel Structures - N. Subramanian, 2014]	6.0	**Pass**
Effective weld length on flange (each side) (mm)		240.3	
Critical stress in weld at flange (N/mm^2)	≤ 410.0 / (√3 * 1.25) = 189.371 [cl. 10.5.7]	(170.537* 10^3)/(3 * 480.6) = 65.833	**Pass**
Web			
Weld size at web (mm)	≤ minimum(7.7,21.842)	5.0	**Pass**
Effective weld length on flange (each side) (mm)		235.8	

Critical stress in weld at web (N/mm ^ 2)	≤ 410.0/(√3 * 1.25) = 189.371 [cl. 10.5.7 and cl. 10.5.10]	√((0.0)^2 + (3 * 9.835^2)) =176.833	**Pass**
Stiffener Checks			
Height (mm)		86.15	
Thickness (mm)		8.0	
WeldSize (mm)		8.0	
MomentCapacity (KN-m)	≥ 10.016	18.518	**Pass**

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Fabrication Drawings
The fabrication drawings are not been generated due to the failure of the connection.

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Additional Comments	