



Created with



Company Name	IIT B	Project Title	Connection Designs
Group/Team Name	Osdag	Subtitle	Moment End Plate
Designer	Engineer 2	Job Number	1.2.2.1.3.1.2
Date	12 /06 /2019	Client	V Kalyanaraman

Design Conclusion**Beam to Column End Plate Moment Connection****Fail****Connection Properties****Connection**

Connection Type	Moment Connection
Connection Title	Extended End Plate
End plate type	Flush end plate

Connection Category

Connectivity	Column flange-Beam web
Beam to end plate Connection	Welded
Column flange to end plate Connection	Bolted

Loading Details

Bending Moment (kNm)	25.0
Shear Force (kN)	35.0
Axial Force (kN)	12.0

Components

Beam Section	WPB 300x300x96.8
Grade of Steel	Fe 410.0
Column Section	UC 305 x 305 x 137
Grade of Steel	Fe 410.0
Plate Section	330.0 X 300.0 X 24.0
Thickness (t) (mm)	24.0
Width (mm)	300.0
Depth (mm)	330.0
Clearance holes for fasteners	Standard

Weld

Type	Fillet Weld
Weld at Flange (mm)	10
Weld at Web (mm)	6

Bolts

Type	Bearing Bolt
Property Class	10.9
Diameter (d) (mm)	20
Hole diameter (d_o) (mm)	22.0

Number of Bolts (n)	12
End Distance (e)(mm)	40
Edge Distance (e') (mm)	105
Cross-centre gauge (g') (mm)	90.0
Pitch Distance (p) (mm)	
Pitch-1,2	50.0
Pitch-2,3	50.0
Pitch-3,4	-20.0
Pitch-4,5	50.0
Pitch-5,6	50.0



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Design Preferences

Bolt

Hole Type	Standard
Hole Clearance (mm)	2.0
Ultimate Strength (f_u) (MPa)	1000.0
Slip factor	N/A
Beta (β)(non pre-tensioned)	2

Weld

Type of Weld	Shop weld
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Detailing

Type of Edges	Sheared or hand flame cut
Minimum Edge-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			
Bolt shear capacity (kN)	Factored shear force / Number of bolts = $35.0 / 12 = 2.917$	$V_{dsb} = (1000 \times 1 \times 0.6126 \times 20 \times 20) / (\sqrt{3} \times 1.25) = 113.161$ [cl. 10.3.3]	Pass
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times k_b \times d \times t \times f_u) = 266.293$ [cl. 10.3.4]	
Bolt capacity (kN)	min(Shear Capacity, Bearing Capacity) = min (113.161, 266.293)	113.161	
Tension capacity of bolt (kN)	\geq Tension in bolt due to external moment + external axial load + prying force $= 211.278 + 1.0 + 68.051 = 280.329$	Tension capacity = $(0.9 \times 1000 \times 245) / (1.25 \times 1000) = 176.4$ [cl. 10.4.5]	Fail
Combined shear and tension capacity of bolt	≤ 1.0	$(V_{sb}/V_{db})^2 + (T_b/T_{db})^2 = (2.917/113.161)^2 + (280.329/176.4)^2 = 2.526$ [cl. 10.3.6]	Fail
No. of bolts	$\geq 4, \leq 12$	12.0	
Pitch distance (mm)	$\geq 2.5 \times d = 50, \leq \min(32 \times t, 300) = 300$ [cl. 10.2.2 & cl. 10.2.3]	50	Pass
End distance (mm)	$\geq 1.7 d_o = 37.4, \leq 12 \times t \times \epsilon = 260.4$ [cl. 10.2.4]	40	Pass
Edge distance (mm)	$\geq 1.7 d_o = 37.4, \leq 12 \times t \times \epsilon = 260.4$ [cl. 10.2.4]	40	Pass
Distance to the centre line of bolt from face of beam flange (mm)	$33\text{mm} \leq l_v \leq 47\text{mm}$	45	Pass
Plate Checks			
Plate thickness (mm)	$\geq \sqrt{(M \times (1.1/f_y) \times (4/b_e))} = \geq \sqrt{(211.278 \times (1.1/250.0) \times (4/150.0))} = 23.91$	24.0	Pass
Plate height (mm)		330.0	

Plate width (mm)	\geq width of beam flange , ≥ 300.0	300.0	Pass
Weld Checks			
Flange			
Effective weld length on top flange (mm)		280.0	
Effective weld length on bottom flange (mm)		122.3	
Weld throat thickness at flange (mm)	$< 15.0, > 6.0$	10.0	Pass
Critical stress in weld at flange (N/mm ²)	$\geq ((M/Z_{\text{weld,flange}}) + (P/A_{\text{weld}})) = 177.945$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	Pass
Web			
Effective weld length at web (each side) (mm)		252.6	
Weld throat thickness at web (mm)	$< 10.0, > 6.0$	6.0	Pass
Critical stress in weld at web (N/mm ²)	$\geq \sqrt{((M/Z_{\text{weld,web}} + P/A_{\text{weld}})^2) + (V/A_{\text{weld,web}})^2} = 157.961$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	Pass
Stiffener Checks			
Horizontal Continuity Plate in Tension			
Length (mm)		277.1	
Width (mm)		147.7	
Thickness (mm)	≥ 15.713	16.0	
Weld (mm)		8.0	
Horizontal Continuity Plate in Compression			
Length (mm)		277.1	
Width (mm)		147.7	
Thickness (mm)	≥ 15.713	16.0	
Weld (mm)		8.0	
End Plate Stiffeners			
Length (mm)		225.0	
Height (mm)		135.0	
Thickness (mm)		10.0	
Noch at top side of plate (mm)		50.0	
Noch at bottom side of plate		10.0	

(mm)			
Fillet weld size (mm)		8.0	



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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	
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