



Created with



<b>Company Name</b>	<b>IIT B</b>	<b>Project Title</b>	<b>Connection Designs</b>
<b>Group/Team Name</b>	<b>Osdag</b>	<b>Subtitle</b>	<b>Moment End Plate</b>
<b>Designer</b>	<b>Engineer 3</b>	<b>Job Number</b>	<b>1.2.2.1.2.1.2</b>
<b>Date</b>	<b>12 /06 /2019</b>	<b>Client</b>	<b>Pradyumna M</b>

**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	Extended one way

**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)	120.0

**Components**

<b>Beam Section</b>	WPB 300x300x96.8
Grade of Steel	Fe 410.0
<b>Column Section</b>	UC 305 x 305 x 137
Grade of Steel	Fe 410.0
<b>Plate Section</b>	410.0 X 300.0 X 26.0
Thickness (t) (mm)	26.0
Width (mm)	300.0
Depth (mm)	410.0
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)	24
Hole diameter ( $d_o$ ) (mm)	26.0

Number of Bolts (n)	10
End Distance (e)(mm)	45
Edge Distance ( $e'$ ) (mm)	100
Cross-centre gauge ( $g'$ ) (mm)	100.0
Pitch Distance (p) (mm)	
Pitch-1,2	115.0
Pitch-2,3	60.0
Pitch-3,4	60.0
Pitch-4,5	50.0



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<b>Design Preferences</b>	
<b>Bolt</b>	
Hole Type	Standard
Hole Clearance (mm)	2.0
Ultimate Strength ( $f_u$ ) (MPa)	1000.0
Slip factor	N/A
Beta ( $\beta$ )(non pre-tensioned)	2
<b>Weld</b>	
Type of Weld	Shop weld
<b>Detailing</b>	
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
<b>Design</b>	
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 = $35.0 / 10 = 3.5$	$V_{dsb} = (1000 \times 1 \times 0.6126 \times 24 \times 24) / (\sqrt{3} \times 1.25) = 163.044$ [cl. 10.3.3]	Pass
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times k_b \times d \times t \times f_u) = 341.194$ [cl. 10.3.4]	
Bolt capacity (kN)	min(Shear Capacity, Bearing Capacity) = min (163.044, 341.194)	163.044	
Tension capacity of bolt (kN)	$\geq$ Tension in bolt due to external moment + external axial load + prying force $= 156.486 + 12.0 + 74.931 = 243.417$	Tension capacity = $(0.9 \times 1000 \times 353) / (1.25 \times 1000) = 254.16$ [cl. 10.4.5]	Pass
Combined shear and tension capacity of bolt	$\leq 1.0$	$(V_{sb}/V_{db})^2 + (T_b/T_{db})^2 = (3.5/163.044)^2 + (243.417/254.16)^2 = 0.918$ [cl. 10.3.6]	Pass
No. of bolts	$\geq 4, \leq 12$	10.0	
Pitch distance (mm)	$\geq 2.5 \times d = 60, \leq \min(32 \times t, 300) = 300$ [cl. 10.2.2 & cl. 10.2.3]	60	Pass
End distance (mm)	$\geq 1.7 d_o = 44.2, \leq 12 \times t \times \epsilon = 260.4$ [cl. 10.2.4]	45	Pass
Edge distance (mm)	$\geq 1.7 d_o = 44.2, \leq 12 \times t \times \epsilon = 260.4$ [cl. 10.2.4]	45	Pass
Distance to the centre line of bolt from face of beam flange (mm)	$25\text{mm} \leq l_v \leq 63.5\text{mm}$	50	Pass
Plate Checks			
Plate thickness (mm)	$\geq \sqrt{(M \times (1.1/f_y) \times (4/b_e))} = \geq \sqrt{(156.486 \times (1.1/250.0) \times (4/150.0))} = 25.955$	26.0	Pass
Plate height (mm)		410.0	

Plate width (mm)	$\geq$ width of beam flange , $\geq 300.0$	300.0	Pass
<b>Weld Checks</b>			
<b>Flange</b>			
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 <sup>2</sup> )	$\geq ((M/Z_{\text{weld,flange}}) + (P/A_{\text{weld}})) = 189.354$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	Pass
<b>Web</b>			
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 <sup>2</sup> )	$\geq \sqrt{((M/Z_{\text{weld,web}} + P/A_{\text{weld}})^2) + (V/A_{\text{weld,web}})^2} = 169.311$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	Pass
<b>Stiffener Checks</b>			
<b>Horizontal Continuity Plate in Tension</b>			
Length (mm)		277.1	
Width (mm)		147.7	
Thickness (mm)	$\geq 15.713$	16.0	
Weld (mm)		8.0	
<b>Horizontal Continuity Plate in Compression</b>			
Length (mm)		277.1	
Width (mm)		147.7	
Thickness (mm)	$\geq 15.713$	16.0	
Weld (mm)		8.0	
<b>End Plate Stiffeners</b>			
Length (mm)		245.0	
Height (mm)		155.0	
Thickness (mm)		10.0	
Noch at top side of plate (mm)		50.0	
Noch at bottom			

<b>side of plate (mm)</b>		10.0	
<b>Fillet weld size (mm)</b>		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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