



Created with



Company Name	IIT B	Project Title	Connection Designs
Group/Team Name	Osdag	Subtitle	Moment End Plate
Designer	Engineer 4	Job Number	1.2.2.1.2.2.2
Date	12 /06 /2019	Client	Manas M Ghosh

Design Conclusion	
Beam to Column End Plate Moment Connection	Pass
Connection Properties	
Connection	
Connection Type	Moment Connection
Connection Title	Extended End Plate
End plate type	Extended one way
Connection Category	
Connectivity	Column web-Beam web
Beam to end plate Connection	Welded
Column web to end plate Connection	Bolted
Loading Details	
Bending Moment (kNm)	12.0
Shear Force (kN)	150.0
Axial Force (kN)	50.0
Components	
Beam Section	WPB 240x240x60.3
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 240.0 X 26.0
Thickness (t) (mm)	26.0
Width (mm)	240.0
Depth (mm)	330.0
Clearance holes for fasteners	Standard
Weld	
Type	Fillet Weld
Weld at Flange (mm)	8
Weld at Web (mm)	6
Bolts	
Type	Friction Grip Bolt
Property Class	10.9
Diameter (d) (mm)	20
Hole diameter (d_o) (mm)	22.0

Number of Bolts (n)	8
End Distance (e)(mm)	40
Edge Distance (e') (mm)	70
Cross-centre gauge (g') (mm)	100.0
Pitch Distance (p) (mm)	
Pitch-1,2	112.0
Pitch-2,3	50.0
Pitch-3,4	56.0



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Design Preferences

Bolt

Hole Type	Standard
Hole Clearance (mm)	2.0
Ultimate Strength (f_u) (MPa)	1000.0
Slip factor	0.3
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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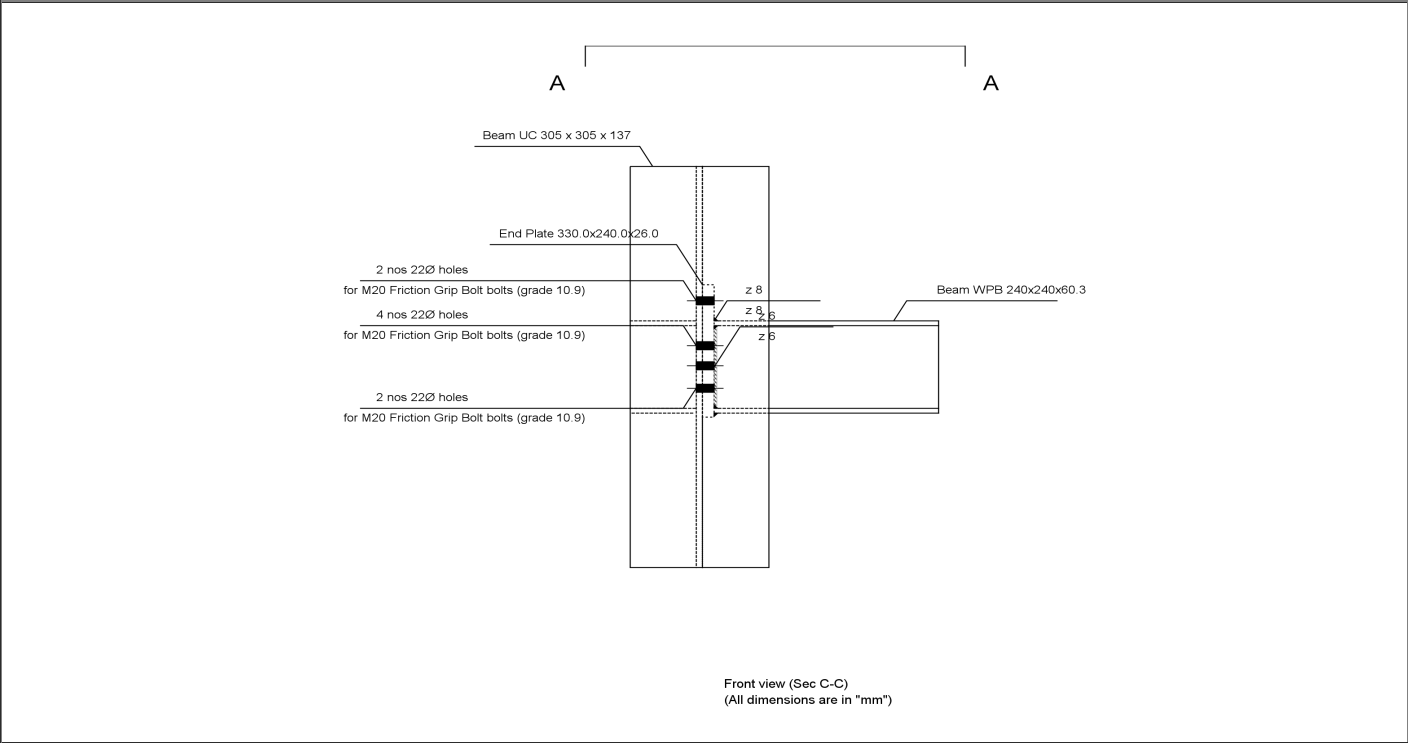
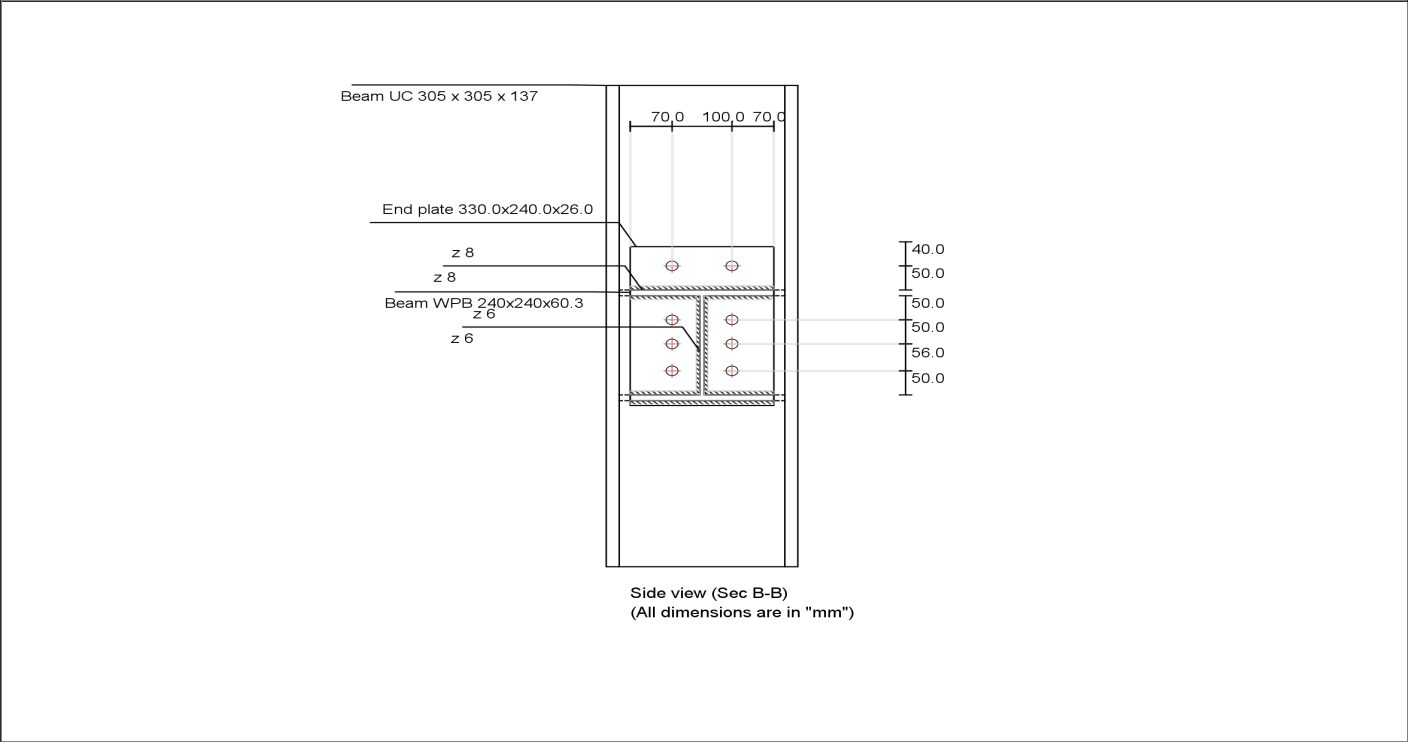
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Design Check			
Check	Required	Provided	Remark
Bolt Checks			
Bolt slip resistance (kN)	Factored shear force / Number of bolts = 150.0 / 8 = 18.75	$V_{dsf} = (0.3 \times 1 \times 1.0 \times 171.5) / 1.25 = 46.773$ [cl. 10.4.3]	Pass
Bolt bearing capacity (kN)	N/A	N/A	
Bolt capacity (kN)		Bolt slip resistance = 46.773	
Tension capacity of bolt (kN)	\geq Tension in bolt due to external moment + external axial load + prying force = 110.758 + 6.25 + 43.228 = 160.236	Tension capacity = $(0.9 \times 1000 \times 245) / (1.25 \times 1000) = 176.4$ [cl. 10.4.5]	Pass
Combined shear and tension capacity of bolt	≤ 1.0	$(V_{sf}/V_{df})^2 + (T_f/T_{df})^2 = (18.75/46.773)^2 + (160.236/176.4)^2 = 0.986$ [cl. 10.4.6]	Pass
No. of bolts	$\geq 4, \leq 12$	8.0	
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)	$\geq 1.7 d_o = 37.4, \leq 12 \times t \times \epsilon = 165.6$ [cl. 10.2.4]	40	Pass
Edge distance (mm)	$\geq 1.7 d_o = 37.4, \leq 12 \times t \times \epsilon = 165.6$ [cl. 10.2.4]	40	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)	$\geq \sqrt{(M \times (1.1/f_y) \times (4/b_e))} = \sqrt{(110.758 \times (1.1/250.0) \times (4/120.0))} = 23.799$	26.0	Pass
Plate height (mm)		330.0	
Plate width (mm)	\geq width of beam flange, ≥ 240.0	240.0	Pass
Weld Checks			
Flange			

Effective weld length on top flange (mm)		224.0	
Effective weld length on bottom flange (mm)		98.15	
Weld throat thickness at flange (mm)	< 12.0, > 6.0	8.0	Pass
Critical stress in weld at flange (N/mm ²)	$\geq ((M/Z_{\text{weld,flange}}) + (P/A_{\text{weld}})) = 180.658$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	Pass
Web			
Effective weld length at web (each side) (mm)		189.8	
Weld throat thickness at web (mm)	< 7.5, > 6.0	6.0	Pass
Critical stress in weld at web (N/mm ²)	$\geq \sqrt{((M/Z_{\text{weld,web}} + P/A_{\text{weld}})^2) + (V/A_{\text{weld,web}})^2} = 185.165$	$(f_u / \sqrt{3} * \sigma_{mb}) = 189.371$	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)		230.0	
Height (mm)		140.0	
Thickness (mm)		10.0	
Noch at top side of plate (mm)		50.0	
Noch at bottom side of plate (mm)		10.0	
Fillet weld size (mm)		8.0	



Fabrication Drawings





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Additional Comments	
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