



Created with



Company Name	IIT B	Project Title	Connection Designs
Group/Team Name	Osdag	Subtitle	Moment End Plate
Designer	Engineer 3	Job Number	1.2.2.1.3.2.1
Date	12 /06 /2019	Client	Pradyumna M

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	Flush end plate
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)	15.0
Shear Force (kN)	20.0
Axial Force (kN)	15.0
Components	
Beam Section	NPB 160x80x15.8
Grade of Steel	Fe 410.0
Column Section	UC 305 x 305 x 97
Grade of Steel	Fe 410.0
Plate Section	170.0 X 160.0 X 20.0
Thickness (t) (mm)	20.0
Width (mm)	160.0
Depth (mm)	170.0
Clearance holes for fasteners	Standard
Weld	
Type	Groove Weld (CJP)
Weld at Flange (mm)	16
Weld at Web (mm)	10
Bolts	
Type	Bearing Bolt
Property Class	8.8
Diameter (d) (mm)	16
Hole diameter (d_o) (mm)	18.0

Number of Bolts (n)	4
End Distance (e)(mm)	35
Edge Distance (e') (mm)	35
Cross-centre gauge (g') (mm)	90.0
Pitch Distance (p) (mm)	
Pitch-1,2	55.2



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Design Preferences

Bolt

Hole Type	Standard
Hole Clearance (mm)	2.0
Ultimate Strength (f_u) (MPa)	800.0
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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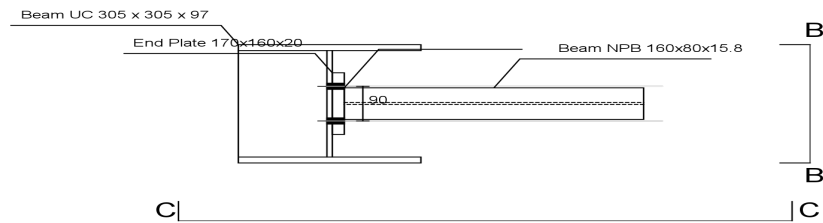
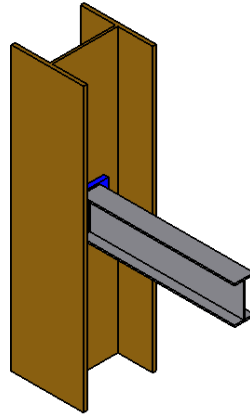
Design Check			
Check	Required	Provided	Remark
Bolt Checks			
Bolt shear capacity (kN)	Factored shear force / Number of bolts = 20.0 / 4 = 5.0	$V_{dsb} = (800 \times 1 \times 0.6126 \times 16 \times 16) / (\sqrt{3} \times 1.25) = 58.012$ [cl. 10.3.3]	Pass
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times k_b \times d \times t \times f_u) = 134.758$ [cl. 10.3.4]	
Bolt capacity (kN)	min(Shear Capacity, Bearing Capacity) = min (58.012, 134.758)	58.012	
Tension capacity of bolt (kN)	\geq Tension in bolt due to external moment + external axial load + prying force $= 72.185 + 3.75 + 13.301 = 89.235$	Tension capacity = $(0.9 \times 800 \times 157) / (1.25 \times 1000) = 90.432$ [cl. 10.4.5]	Pass
Combined shear and tension capacity of bolt	≤ 1.0	$(V_{sb}/V_{db})^2 + (T_b/T_{db})^2 = (5.0/58.012)^2 + (89.235/90.432)^2 = 0.981$ [cl. 10.3.6]	Pass
No. of bolts	$\geq 4, \leq 12$	4.0	
Pitch distance (mm)	$\geq 2.5 \times d = 40, \leq \min(32 \times t, 300) = 300$ [cl. 10.2.2 & cl. 10.2.3]	40	Pass
End distance (mm)	$\geq 1.7 d_o = 30.6, \leq 12 \times t \times \epsilon = 118.8$ [cl. 10.2.4]	35	Pass
Edge distance (mm)	$\geq 1.7 d_o = 30.6, \leq 12 \times t \times \epsilon = 118.8$ [cl. 10.2.4]	35	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)	$\geq \sqrt{(M \times (1.1/f_y) \times (4/b_e))} = \geq \sqrt{(72.185 \times (1.1/250.0) \times (4/41.0))} = 17.638$	20.0	Pass
Plate height (mm)		170.0	
Plate width (mm)	\geq width of beam flange , ≥ 82.0	160.0	Pass

Weld Checks			
Gap between beam and plate	Refernce: IS 9595:1996, Annex B	3.0	
Flange			
Weld Size at Flange (mm)	min(beam flange thickness, end plate thickness) = min(7.4 , 20.0)	7.4	
Web			
Weld Size at Web (mm)	min(beam web thickness, plate thickness) = min(5.0 , 20.0)	5.0	
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)		215.0	
Height (mm)		120.0	
Thickness (mm)		10.0	
Noch at top side of plate (mm)		50.0	
Noch at bottom side of plate (mm)		5.0	
Fillet weld size (mm)		8.0	



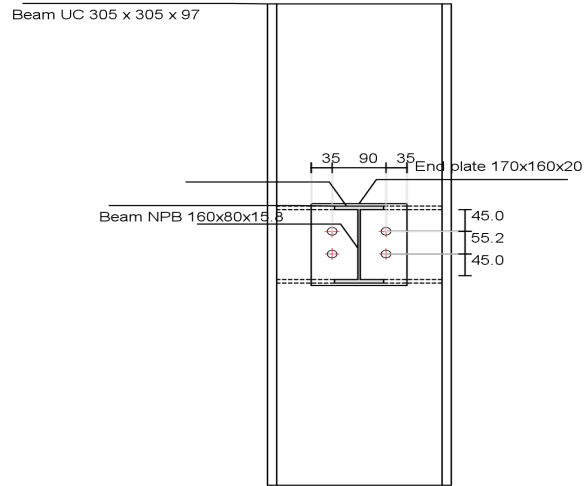
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Fabrication Drawings

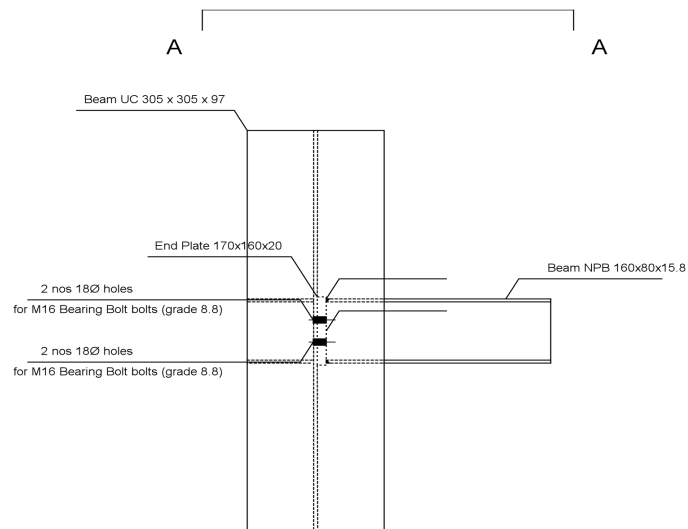


Top view (Sec A-A)
(All dimensions are in "mm")

Fabrication Drawings

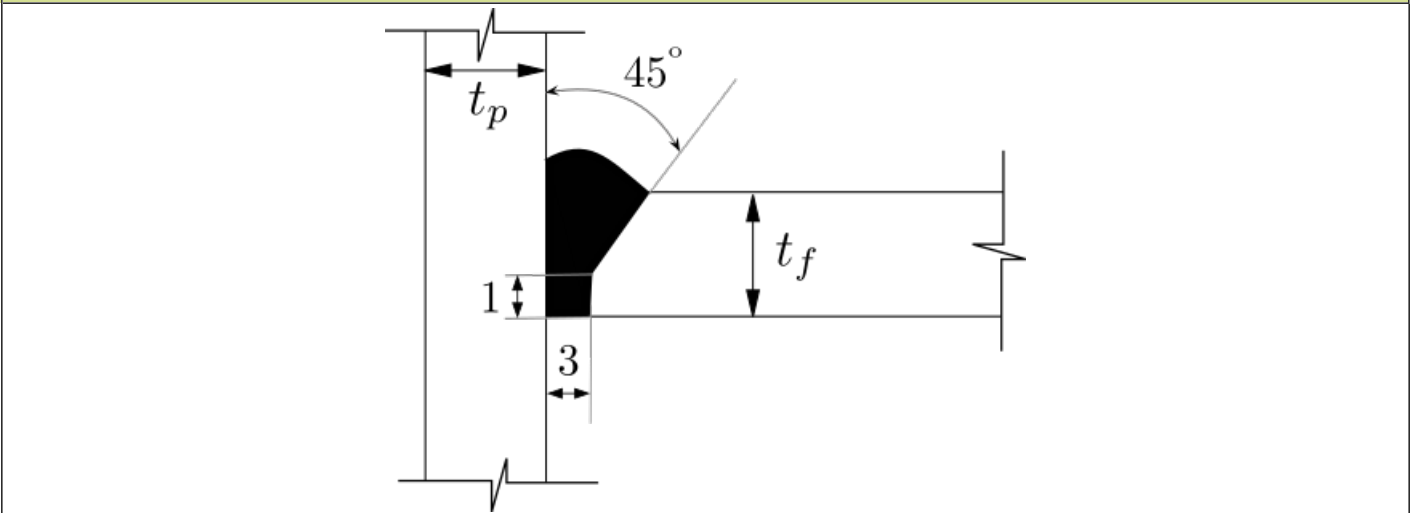


Side view (Sec B-B)
(All dimensions are in "mm")

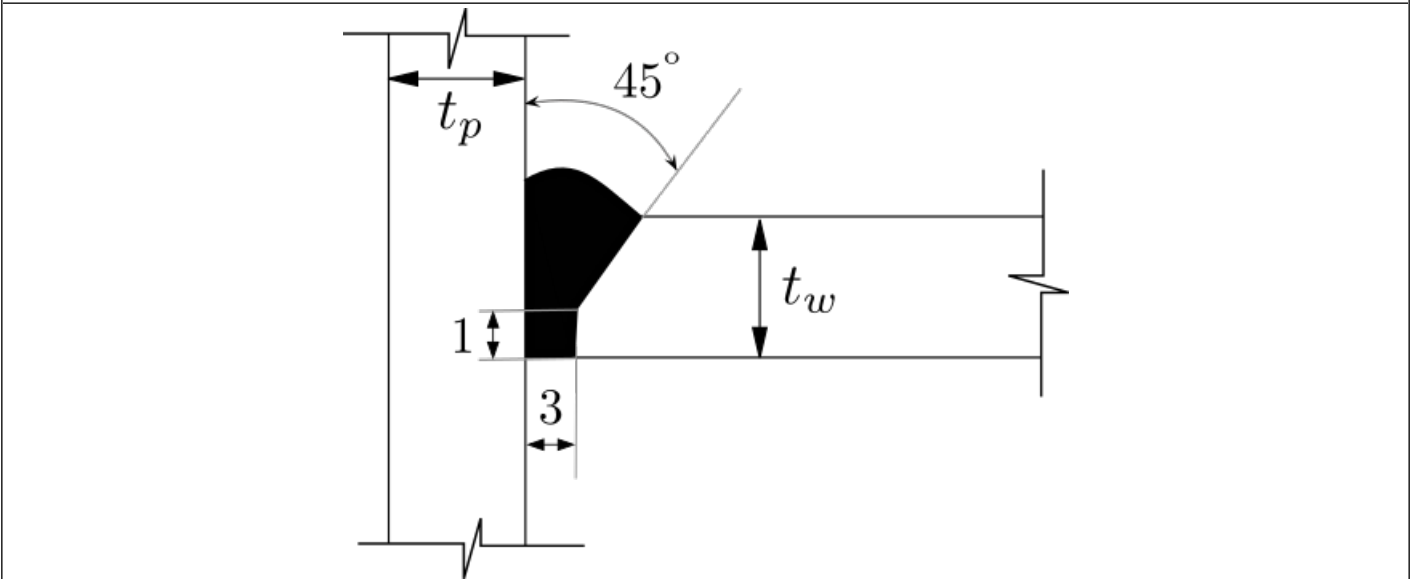


Front view (Sec C-C)
(All dimensions are in "mm")

Weld Detailing



Note :- As flange thickness, t_f (7.4mm) \leq 12mm, single bevel butt welding is provided [Reference: IS 9595: 1996] (All dimensions are in mm)



Note :- As flange thickness, t_w (5.0mm) \leq 12mm, single bevel butt welding is provided [Reference: IS 9595: 1996] (All dimensions are in mm)



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Additional Comments	
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