



Created with



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	End Plate shear connection
Designer	Engineer #1	Job Number	1.1.2.1.1
Date	19 /06 /2017	Client	Pratip Bhattacharya, Tata Consulting Engineers Ltd, Kolkata

Design Conclusion	
End Plate	Pass
End Plate	
Connection Properties	
Connection	
Connection Title	Flexible End Plate
Connection Type	Shear Connection
Connection Category	
Connectivity	Column flange-Beam web
Beam Connection	Welded
Column Connection	Bolted
Loading (Factored Load)	
Shear Force (kN)	140
Components	
Column Section	SC 250
Material	Fe 410
Beam Section	MB 350
Material	Fe 410
Hole	STD
Plate Section	210X174X10
Thickness (mm)	10
Width (mm)	174
Depth (mm)	210
Hole	STD
Weld	
Type	Double Fillet
Size (mm)	10
Bolts	
Type	Bearing Bolt
Grade	4.6
Diameter (mm)	20
Bolt Numbers	4

Columns (Vertical Lines)	1
Bolts Per Column	2
Gauge (mm)	0
Pitch (mm)	50
End Distance (mm)	80
Edge Distance (mm)	37
Assembly	
Column-Beam Clearance (mm)	10



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Design Preferences

Bolt

Hole Type	Standard
Hole Clearance (mm)	2.0
Material Grade (MPa) (overwrite)	400.0
Slip factor	N/A

Weld

Type of Weld	Shop weld
Material Grade (MPa) (overwrite)	410.0

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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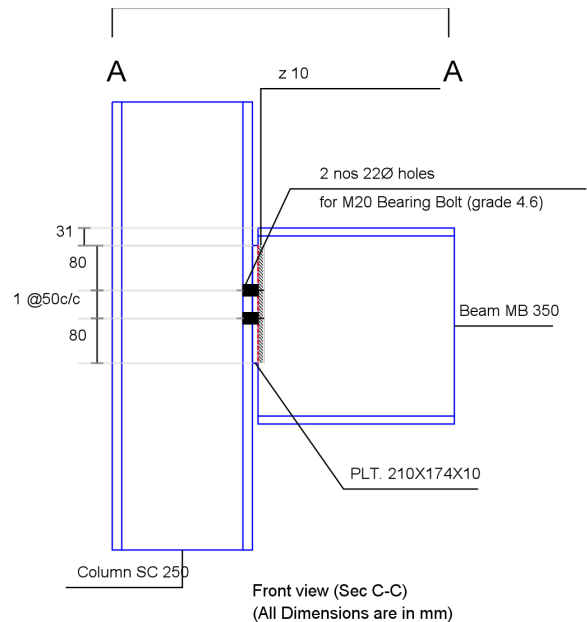
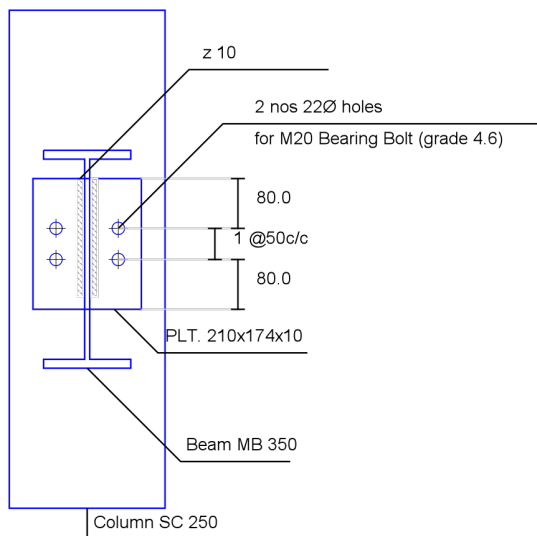
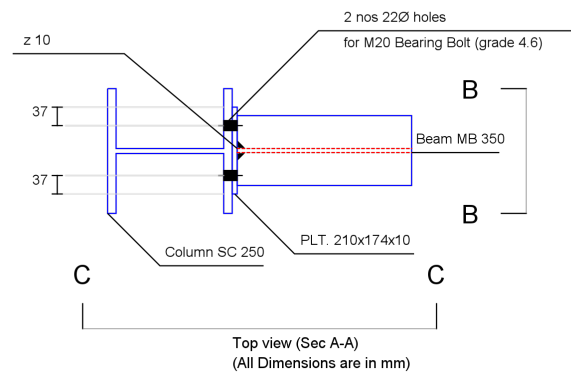
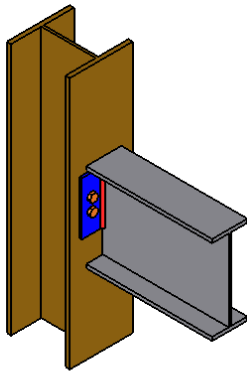
Design Check			
Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((400.0 \times 0.6126 \times 20 \times 20) / (\sqrt{3} \times 1.25 \times 1000)) = 45.264$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times 0.508 \times 20 \times 10.0 \times 410) / (1.25 \times 1000) = 83.312$ [cl. 10.3.4]	
Bolt capacity (kN)		Min (45.264, 83.312) = 45.264	
Critical bolt shear (kN)	≤ 45.264	35.0	Pass
No. of bolts		4	
No. of column(s) per side of end plate	≤ 2	1	
No. of bolts per column per side of end plate		2	
Bolt pitch (mm)	$\geq 2.5 \times 20 = 50, \leq \text{Min}(32 \times 8.1, 300) = 260$ [cl. 10.2.2]	50	Pass
Bolt gauge (mm)	$\geq 2.5 \times 20 = 50, \leq \text{Min}(32 \times 8.1, 300) = 260$ [cl. 10.2.2]	0	
End distance (mm)	$\geq 1.7 \times 22.0 = 37, \leq 12 \times 8.1 = 97.2$ [cl. 10.2.4]	80	Pass
Edge distance (mm)	$\geq 1.7 \times 22.0 = 37, \leq 12 \times 8.1 = 97.2$ [cl. 10.2.4]	37	Pass
Block shear capacity (kN)	≥ 140	$V_{db} = 149$ [cl. 6.4.1]	Pass
Plate thickness (mm)	≥ 6	10	Pass
Plate height (mm)	$\geq 0.6 \times 350.0 = 210.0, \leq 350.0 - 14.2 - 14.0 - 14.2 - 14.0 - 10 = 283.6$	210	Pass

	[cl. 10.2.4, Insdag Detailing Manual, 2002]		
Plate Width (mm)	$\geq 174, \leq 250.0$	174	Pass
Effective weld length on each side(mm)		$210 - 2 \cdot 10 = 190$	
Weld strength (kN/mm)	0.368	$f_v = (0.7 \cdot 10 \cdot 410) / (\sqrt{3} \cdot 1.25 \cdot 1000)$ $= 1.326$ [cl. 10.5.7]	Pass



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Additional Comments	
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