

Company Name	LERA	Project Title	Design Prob 3 Practice
Group/Team Name		Subtitle	
Designer	Karthik Bandi	Job Number	P786
Date	06 /06 /2016	Method	Limit State Design (No Earthquake Load)

Design Conclusion	
Cleat Angle	Pass
Cleat Angle	
Connection Properties	
Connection	
Connection Title	Double Angle Web Cleat
Connection Type	Shear Connection
Connection Category	
Connectivity	Beam-Beam
Beam Connection	Bolted
Column Connection	Bolted
Loading (Factored Load)	
Shear Force (kN)	100.0
Components	
Column Section	ISMB 450
Material	Fe 410
Beam Section	ISMB 300
Material	Fe 410
Hole	STD
Cleat Section	ISA 90X90X8
Thickness (mm)	8
Cleat Leg Size B (mm)	90
Cleat Leg Size A (mm)	90
Hole	STD
Bolts on Beam	
Type	Black Bolt
Grade	4.8
Diameter (mm)	16
Bolt Numbers	4

Columns (Vertical Lines)	1
Bolts Per Column	4
Gauge (mm)	0
Pitch (mm)	46
End Distance (mm)	30
Edge Distance (mm)	30
Bolts on Column	
Type	Black Bolt
Grade	4.8
Diameter (mm)	16
Bolt Numbers	6
Columns (Vertical Lines)	1
Bolts Per Column	3
Gauge (mm)	0
Pitch (mm)	70
End Distance (mm)	30
Edge Distance (mm)	30
Assembly	
Column-Beam Clearance (mm)	20

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Design Check: Secondary Beam Connectivity			
Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((2 \times 400 \times 0.6126 \times 16 \times 16) / (\sqrt{3} \times 1.25 \times 1000)) = 58.012$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 7.7 \times 400) / (1.25 \times 1000) = 48.393$ [cl. 10.3.4]	
Bearing capacity of beam web (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 7.7 \times 410) / (1.25 \times 1000) = 49.603$ [cl. 10.3.4]	
Bearing capacity of cleat (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 8 \times 410) / (1.25 \times 1000) = 51.535$ [cl. 10.3.4]	
Bearing capacity (kN)		Min (48.393, 49.603, 51.535) = 48.393	
Bolt capacity (kN)		Min (58.012, 48.393) = 48.393	
Critical bolt shear (kN)	≤ 48.393	22.982	Pass
No. of bolts		4	
No. of column(s)	≤ 2	1	
No. of bolts per column		4	
Bolt pitch	$\geq 2.5 \times 16 = 40, \leq \text{Min}(32 \times 7.7, 300) = 247$	46	Pass

(mm)	[cl. 10.2.2]		
Bolt gauge (mm)	$\geq 2.5 \cdot 16 = 40, \leq \text{Min}(32 \cdot 7.7, 300) = 247$ [cl. 10.2.2]	0	
End distance (mm)	$\geq 1.7 \cdot 18.0 = 30.6, \leq 12 \cdot 7.7 = 92.4$ [cl. 10.2.4]	30	Pass
Edge distance (mm)	$\geq 1.7 \cdot 18.0 = 30.6, \leq 12 \cdot 7.7 = 92.4$ [cl. 10.2.4]	30	Pass
Block shear capacity (kN)	≥ 100.0	$V_{db} = 200.437$ [cl. 6.4.1]	Pass
Cleat height (mm)	$\geq 0.6 \cdot 300.0 = 180.0, \leq 300.0 - 13.1 - 14.0 - 17.4 - 15.0 - 5 = 235.5$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	200	Pass
Cleat moment capacity (kNm)	$(2 \cdot 58.012 \cdot 46^2) / (46 \cdot 1000) = 3.0$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 96.0$ [cl. 8.2.1.2]	Pass

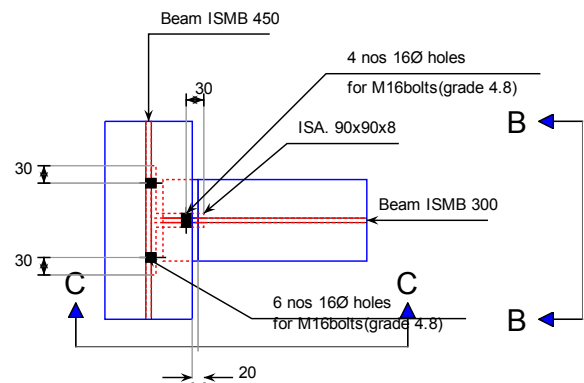
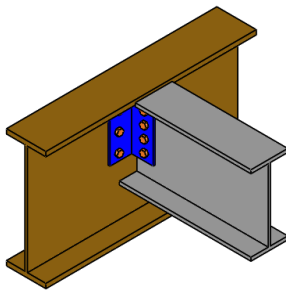
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Design Check: Primary Beam Connectivity			
Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((400 \times 0.6126 \times 16 \times 16) / (\sqrt{3} \times 1.25 \times 1000)) = 29.006$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 8.0 \times 400) / (1.25 \times 1000) = 50.278$ [cl. 10.3.4]	
Bearing capacity of beam web (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 9.4 \times 410) / (1.25 \times 1000) = 60.554$ [cl. 10.3.4]	
Bearing capacity of cleat (kN)		$V_{dpb} = (2.5 \times 0.491 \times 16 \times 8 \times 410) / (1.25 \times 1000) = 51.535$ [cl. 10.3.4]	
Bearing capacity (kN)		Min (50.278, 60.554, 51.535) = 51.535	
Bolt capacity (kN)		Min (29.006, 51.535) = 29.006	
Critical bolt shear (kN)	≤ 29.006	28.245	Pass
No. of bolts		6	
No. of column(s) per angle	≤ 2	1	
No. of bolts per column per angle		3	
Bolt pitch	$\geq 2.5 \times 16 = 40, \leq \text{Min}(32 \times 8.0, 300) = 256$	70	Pass

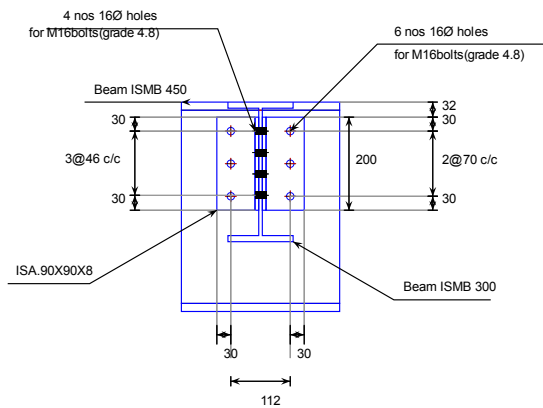
(mm)	[cl. 10.2.2]		
Bolt gauge (mm)	$\geq 2.5 \cdot 16 = 40, \leq \text{Min}(32 \cdot 8.0, 300) = 256$ [cl. 10.2.2]	0	
End distance (mm)	$\geq 1.7 \cdot 18.0 = 30.6, \leq 12 \cdot 8.0 = 96.0$ [cl. 10.2.4]	30	Pass
Edge distance (mm)	$\geq 1.7 \cdot 18.0 = 30.6, \leq 12 \cdot 8.0 = 96.0$ [cl. 10.2.4]	30	Pass
Block shear capacity (kN)	≥ 100.0	$V_{db} = 224.979$ [cl. 6.4.1]	Pass
Cleat height (mm)	$\geq 0.6 \cdot 300.0 = 180.0, \leq 300.0 - 13.1 - 14.0 - 17.4 - 15.0 - 5 = 235.5$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	200	Pass
Cleat moment capacity (kNm)	$(2 \cdot 29.006 \cdot 70^2) / (70 \cdot 1000) = 3.192$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 96.0$ [cl. 8.2.1.2]	Pass

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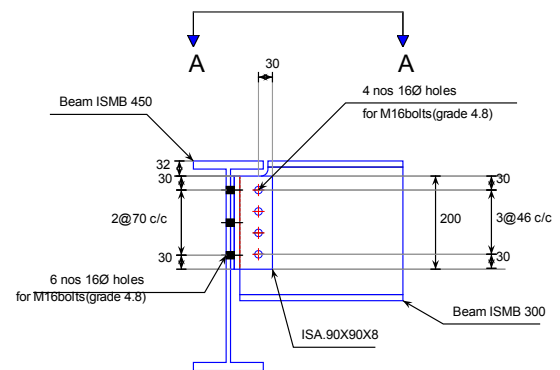
Views



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



Side View (Sec B-B) (All distances are in "mm")



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



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Additional Comments	
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