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Company Name	**mukund**	**Project Title**	**Connection**
Group/Team Name	**shiyekar**	**Subtitle**	**Cleat Angle**
Designer	**Mukund**	**Job Number**	**003**
Date	**05 /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	5
Columns (Vertical Lines)	1
Bolts Per Column	5
Gauge (mm)	0
Pitch (mm)	40
End Distance (mm)	30
Edge Distance (mm)	30
Bolts on Column	
Type	Black Bolt
Grade	4.8
Diameter (mm)	16
Bolt Numbers	8

Columns (Vertical Lines)	1
Bolts Per Column	4
Gauge (mm)	0
Pitch (mm)	40
End Distance (mm)	50
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*400*0.6126*16*16)/(√3*1.25*1000) = 58.012 [cl. 10.3.3]	
Bolt bearing capacity (kN)		V_{dpb} = (2.5*0.491*16*7.7*400)/(1.25*1000) = 48.393 [cl. 10.3.4]	
Bearing capacity of beam web (kN)		V_{dpb} = (2.5*0.491*16*7.7*410)/(1.25*1000) = 49.603 [cl. 10.3.4]	
Bearing capacity of cleat (kN)		V_{dpb} = (2.5*0.491*16*8*410)/(1.25*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	18.028	**Pass**
No. of bolts		5	
No.of column(s)	≤ 2	1	
No. of bolts per column		5	
Bolt pitch (mm)	≥ 2.5* 16 = 40, ≤ Min(32*7.7, 300) = 247 [cl. 10.2.2]	40	**Pass**
Bolt gauge (mm)	≥ ;2.5*16 = 40, ≤ Min(32*7.7, 300) = 247 [cl. 10.2.2]	0	
End distance (mm)	≥ 1.7*18.0 = 30.6, ≤ 12*7.7 = 92.4 [cl. 10.2.4]	30	**Pass**
Edge distance (mm)	≥ 1.7*18.0 = 30.6, ≤ 12*7.7 = 92.4 [cl. 10.2.4]	30	**Pass**
Block shear capacity (kN)	≥ 100.0	V_{db} = 203.164 [cl. 6.4.1]	**Pass**
Cleat height (mm)	≥ 0.6*300.0=180.0, ≤ 300.0-13.1-14.0-17.4-15.0- 5=235.5 [cl. 10.2.4, Insdag Detailing Manual, 2002]	220	**Pass**
Cleat moment capacity (kNm)	$(2*58.012*40^2)/(40*1000)$ = 3.0	M_d = (1.2*250*Z)/(1000*1.1) = 116.16 [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*0.6126*16*16)/(√3*1.25*1000) = 29.006 [cl. 10.3.3]	
Bolt bearing capacity (kN)		V_{dpb} = (2.5*0.491*16*8.0*400)/(1.25*1000) = 50.278 [cl. 10.3.4]	
Bearing capacity of beam web (kN)		V_{dpb} = (2.5*0.491*16*9.4*410)/(1.25*1000) = 60.554 [cl. 10.3.4]	
Bearing capacity of cleat (kN)		V_{dpb} = (2.5*0.491*16*8*410)/(1.25*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	27.01	**Pass**
No. of bolts		8	
No.of column(s) per angle	≤ 2	1	
No. of bolts per column per angle		4	
Bolt pitch (mm)	≥ 2.5* 16 = 40, ≤ Min(32*8.0, 300) = 256 [cl. 10.2.2]	40	**Pass**
Bolt gauge (mm)	≥ 2.5*16 = 40, ≤ Min(32*8.0, 300) = 256 [cl. 10.2.2]	0	
End distance (mm)	≥ 1.7*18.0 = 30.6, ≤ 12*8.0 = 96.0 [cl. 10.2.4]	50	**Pass**
Edge distance (mm)	≥1.7*18.0 = 30.6, ≤12*8.0 = 96.0 [cl. 10.2.4]	30	**Pass**
Block shear capacity (kN)	≥100.0	V_{db} = 200.437 [cl. 6.4.1]	**Pass**
Cleat height (mm)	≥ 0.6*300.0=180.0, ≤ 300.0-13.1-14.0-17.4-15.0- 5=235.5 [cl. 10.2.4, Insdag Detailing Manual, 2002]	220	**Pass**

Cleat moment capacity (kNm)	$(2*29.006*40^2)/(40*1000) = 3.192$	$M_d = (1.2*250*Z)/(1000*1.1) =$ 116.16 [cl. 8.2.1.2]	**Pass**

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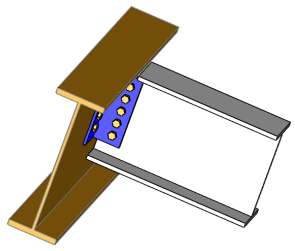
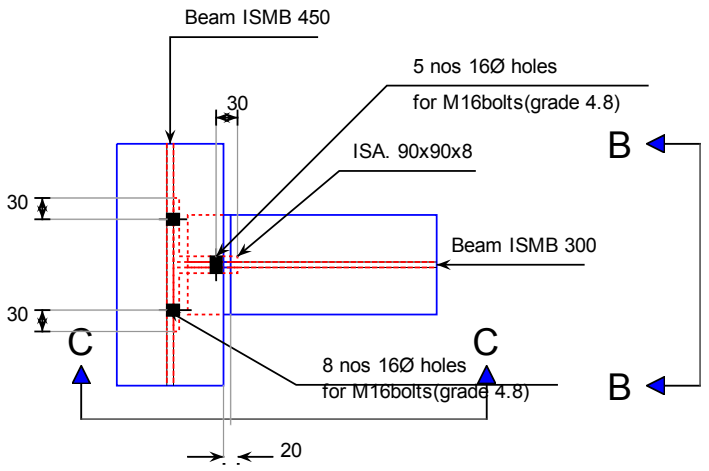
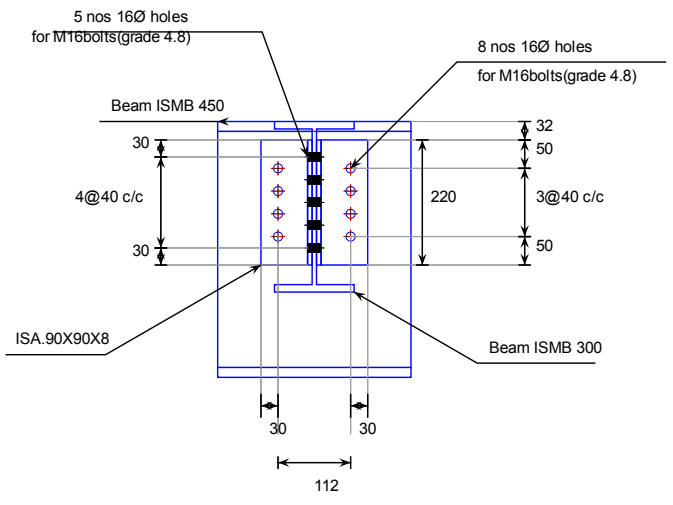
Views

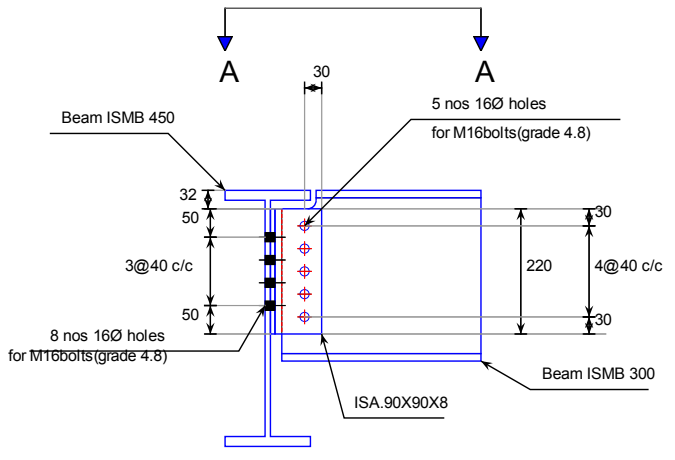




Top view (Sec A-A) (All distances are in "mm")



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	