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<b>Company Name</b>	ngd	<b>Project Title</b>	problem3
<b>Group/Team Name</b>	mit	<b>Subtitle</b>	
<b>Designer</b>	ngd	<b>Job Number</b>	
<b>Date</b>	06 /06 /2016	<b>Method</b>	Limit State Design (No Earthquake Load)

<b>Design Conclusion</b>	
<b>Cleat Angle</b>	Pass
<b>Cleat Angle</b>	
<b>Connection Properties</b>	
<b>Connection</b>	
Connection Title	Double Angle Web Cleat
Connection Type	Shear Connection
<b>Connection Category</b>	
Connectivity	Beam-Beam
Beam Connection	Bolted
Column Connection	Bolted
<b>Loading (Factored Load)</b>	
Shear Force (kN)	160.0
<b>Components</b>	
<b>Column Section</b>	ISMB 450
Material	Fe 410
<b>Beam Section</b>	ISMB 300
Material	Fe 410
Hole	STD
<b>Cleat Section</b>	ISA 100X100X8
Thickness (mm)	8
Cleat Leg Size B (mm)	100
Cleat Leg Size A (mm)	100
Hole	STD
<b>Bolts on Beam</b>	
Type	Black Bolt
Grade	4.8
Diameter (mm)	12
Bolt Numbers	12
Columns (Vertical Lines)	2
Bolts Per Column	6
Gauge (mm)	30
Pitch (mm)	30
End Distance (mm)	22

Edge Distance (mm)	22
<b>Bolts on Column</b>	
Type	Black Bolt
Grade	4.8
Diameter (mm)	12
Bolt Numbers	24
Columns (Vertical Lines)	2
Bolts Per Column	6
Gauge (mm)	30
Pitch (mm)	30
End Distance (mm)	22
Edge Distance (mm)	22
<b>Assembly</b>	
Column-Beam Clearance (mm)	20

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Design Check: Secondary Beam Connectivity			
Check	Required	Provided	Remark
<b>Bolt shear capacity (kN)</b>		$V_{dsb} = ((2 \times 400 \times 0.6126 \times 12 \times 12) / (\sqrt{3} \times 1.25 \times 1000)) = 31.223$ [cl. 10.3.3]	
<b>Bolt bearing capacity (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 7.7 \times 400) / (1.25 \times 1000) = 38.364$ [cl. 10.3.4]	
<b>Bearing capacity of beam web (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 7.7 \times 410) / (1.25 \times 1000) = 39.324$ [cl. 10.3.4]	
<b>Bearing capacity of cleat (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 8 \times 410) / (1.25 \times 1000) = 40.856$ [cl. 10.3.4]	
<b>Bearing capacity (kN)</b>		Min (38.364, 39.324, 40.856) = 38.364	
<b>Bolt capacity (kN)</b>		Min (31.223, 38.364) = 31.223	
<b>Critical bolt shear (kN)</b>	$\leq 31.223$	14.176	Pass
<b>No. of bolts</b>		12	
<b>No. of column(s)</b>	$\leq 2$	2	
<b>No. of bolts per column</b>		6	
<b>Bolt pitch (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 7.7, 300) = 247$ [cl. 10.2.2]	30	Pass
<b>Bolt gauge (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 7.7, 300) = 247$ [cl. 10.2.2]	30	
<b>End distance (mm)</b>	$\geq 1.7 \times 13.0 = 22.1, \leq 12 \times 7.7 = 92.4$ [cl. 10.2.4]	22	Pass
<b>Edge distance</b>	$\geq 1.7 \times 13.0 = 22.1, \leq 12 \times 7.7 = 92.4$	22	Pass

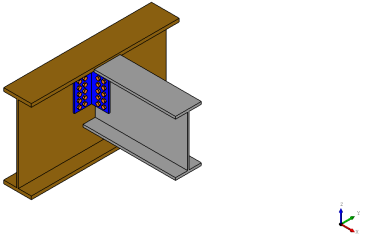
(mm)	[cl. 10.2.4]		
<b>Block shear capacity (kN)</b>	$\geq 160.0$	$V_{db} = 231.574$ [cl. 6.4.1]	<b>Pass</b>
<b>Cleat height (mm)</b>	$\geq 0.6 \cdot 300.0 = 180.0, \leq 300.0 - 13.1 - 14.0 - 17.4 - 15.0 - 5 = 235.5$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	194	<b>Pass</b>
<b>Cleat moment capacity (kNm)</b>	$(2 \cdot 31.223 \cdot 30^2) / (30 \cdot 1000) = 5.04$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 90.326$ [cl. 8.2.1.2]	<b>Pass</b>


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Design Check: Primary Beam Connectivity			
Check	Required	Provided	Remark
<b>Bolt shear capacity (kN)</b>		$V_{dsb} = ((400 \times 0.6126 \times 12 \times 12) / (\sqrt{3} \times 1.25 \times 1000)) = 15.611$ [cl. 10.3.3]	
<b>Bolt bearing capacity (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 8.0 \times 400) / (1.25 \times 1000) = 39.859$ [cl. 10.3.4]	
<b>Bearing capacity of beam web (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 9.4 \times 410) / (1.25 \times 1000) = 48.005$ [cl. 10.3.4]	
<b>Bearing capacity of cleat (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 8 \times 410) / (1.25 \times 1000) = 40.856$ [cl. 10.3.4]	
<b>Bearing capacity (kN)</b>		Min (39.859, 48.005, 40.856) = 40.856	
<b>Bolt capacity (kN)</b>		Min (15.611, 40.856) = 15.611	
<b>Critical bolt shear (kN)</b>	$\leq 15.611$	14.791	Pass
<b>No. of bolts</b>		24	
<b>No. of column(s) per angle</b>	$\leq 2$	2	
<b>No. of bolts per column per angle</b>		6	
<b>Bolt pitch (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 8.0, 300) = 256$ [cl. 10.2.2]	30	Pass
<b>Bolt gauge (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 8.0, 300) = 256$ [cl. 10.2.2]	30	
<b>End distance (mm)</b>	$\geq 1.7 \times 13.0 = 22.1, \leq 12 \times 8.0 = 96.0$ [cl. 10.2.4]	22	Pass
	$\geq 1.7 \times 13.0 = 22.1, \leq 12 \times 8.0 =$		-

<b>Edge distance (mm)</b>	96.0 [cl. 10.2.4]	22	<b>Pass</b>
<b>Block shear capacity (kN)</b>	$\geq 160.0$	$V_{db} = 231.574$ [cl. 6.4.1]	<b>Pass</b>
<b>Cleat height (mm)</b>	$\geq 0.6 \cdot 300.0 = 180.0, \leq 300.0 - 13.1 - 14.0 - 17.4 - 15.0 - 5 = 235.5$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	194	<b>Pass</b>
<b>Cleat moment capacity (kNm)</b>	$(2 \cdot 15.611 \cdot 30^2) / (30 \cdot 1000) = 5.348$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 90.326$ [cl. 8.2.1.2]	<b>Pass</b>

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<b>Additional Comments</b>			