



Created with



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Seated Angle shear connection
Designer	Engineer #1	Job Number	1.1.4.2.2
Date	19 /06 /2017	Client	Yogesh D Pisal, Aker Powergas Ltd, Pune

Design Conclusion	
Seated Angle	Pass
Seated Angle	
Connection Properties	
Connection	
Connection Title	Seated Angle
Connection Type	Shear Connection
Connection Category	
Connectivity	Column web-Beam flange
Beam Connection	Bolted
Column Connection	Bolted
Loading (Factored Load)	
Shear Force (kN)	80.0
Components	
Column Section	HB 200
Material	Fe 410
Hole	Over-sized
Beam Section	WPB 140x140x24.7
Material	Fe 410
Hole	Over-sized
Seated Angle Section	150 150 X 15
Material	Fe 410
Hole	Over-sized
Top Angle Section	90 90 x 10
Material	Fe 410
Hole	Over-sized
Bolts	
Type	Bearing Bolt
Grade	5.8
Diameter (mm)	12
Bolts - Required	5
Bolts - Provided	6
Rows	2
Columns	3
Gauge (mm)	45
Pitch (mm)	31.0

End Distance (mm)	70
Edge Distance (mm)	25
Assembly	
Column-Beam Clearance (mm)	5



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Design Preferences

Bolt

Hole Type	Over-sized Hole
Material Grade Fu (MPa) (overwrite)	520

Detailing

Type of Edge	Rolled, machine-flame cut, sawn and planed
Minimum Edge Distance check multiplier	1.5 * bolt_hole_diameter
Are members exposed to corrosive influences?	No
Gap between Beam and Column (mm)	5

Design

Design Method	Limit State Design
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Design Check			
Check	Required	Provided	Remark
Bolt Checks			
Bolt shear capacity (kN)	$V_{dsb} = \text{bolt_fu} * (\pi * 0.78/4) * \text{bolt_diameter}^2 / (\sqrt{3}) / \gamma_{mb}$ [cl. 10.3.3]	$V_{dsb} = 500 * (0.6126) * 12^2 / (\sqrt{3}) / 1.25 / 1000$ $= 19.5$	
Bolt bearing capacity (kN)	V_{dpb} [Cl. 10.3.4]	$V_{dpb} = 2.5 * 0.417 * 12 * 5.5 * 410 / 1.25 / 1000$ $= 36.9 \text{ kN}$	
Bolt capacity (kN)	min (bolt_shear_capacity, bolt_bearing_capacity)	min (19.5, 36.9) = 19.5	
No. of bolts	$80.0 / 19.5 = 5.0$	6	Pass
No. of columns		3	
No. of row(s)	≤ 2	2	
Bolt pitch (mm)	$\geq 2.5 * 12 = 30,$ $\leq \min(32 * 9.0, 300) = 288.0$ [cl. 10.2.2]	31.0	Pass
Bolt gauge (mm)	$\geq 2.5 * 12 = 30,$ $\leq \min(32 * 9.0, 300) = 288.0$ [cl. 10.2.2]	45	Pass
End distance (mm)	$\geq 1.5 * 15 = 23$	70	Pass
Edge distance (mm)	$\geq 1.5 * 15 = 23$ [cl. 10.2.4.2] $\leq 12 * 9.0 \sqrt{250/250} = 108.0$ [Cl 10.2.4.3]	25	Pass
Seated Angle 150 150 X 15			
Length (mm)	$= \min(140.0, 200.0 - 2 * 9.0 - 2 * 9.0 - 18.0)$	140	
Outstanding leg length (mm)	[Cl. 8.7.4] $= (80.0 * 1000 * 1.1 / (250 * 5.5)) + 5$	150	Pass
Shear capacity of outstanding	$V_{dp} \geq V$ $V_{dp} \geq 80.0 \text{ kN}$	$= (140 * 15.0) * 250 / (\sqrt{3} * 1.1)$	Pass

leg (kN)	[Cl. 8.4.1]	= 333.4	
Moment capacity of outstanding leg (kN-mm)	As $V \leq 0.6 V_d$, [Cl 8.2.1.2] is applicable $M_d \geq \text{Moment at root of angle}$ $M_d \geq 590.0$	$M_d = \min(\beta_b Z_e f_y / \gamma_{m0}, 1.5 Z_e f_y / \gamma_{m0})$ = $\min(1.0 * 140 * (15.0^2 / 6) * 250 / 1.1, 1.5 * 140 * (15.0^2 / 6) * 250 / 1.1)$ = 1193.2	Pass
Top Angle			
Section	Recommended size (based on stability only): 35 35 X 4	User selected size: 90 90 x 10	
End distance (mm)	$\geq 1.5 * \text{bolt_hole_diameter}$ [cl. 10.2.4.2] $\geq 1.5 * 15 = 23$	on leg connected to Beam: 35 on leg connected to Column: 35	Pass

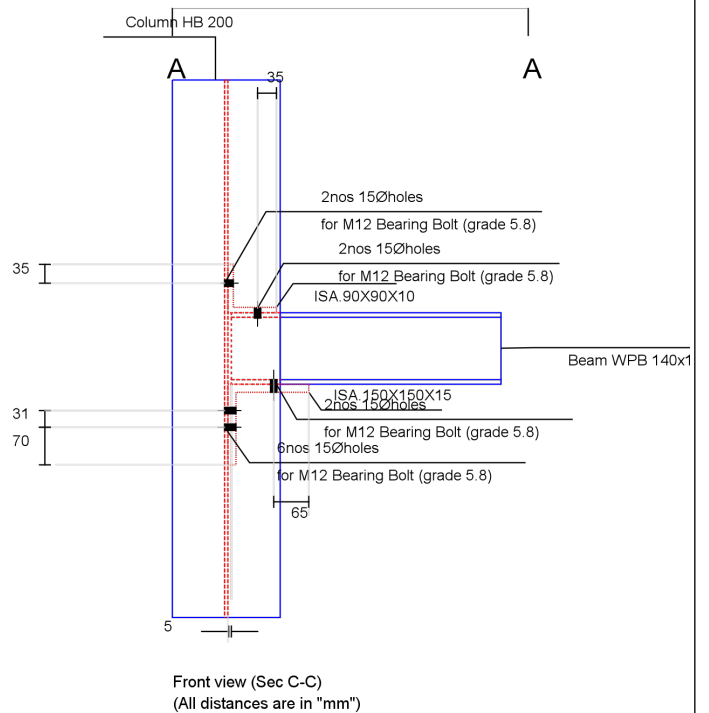
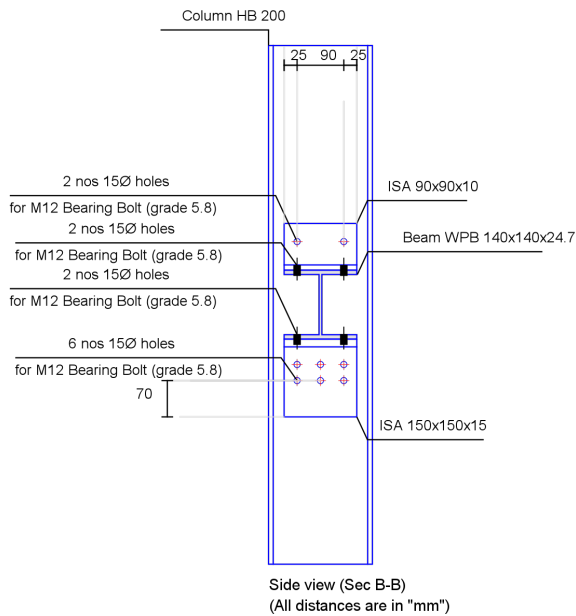
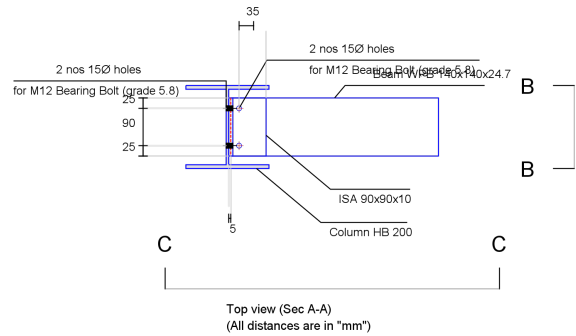
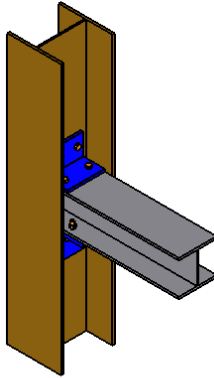


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Additional Comments	
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