



Company Name	El Mystico & Janet	Project Title	Twenty-five story blocks
Group/Team Name	Design by Hypnosis	Subtitle	Something completely different
Designer	El Mystico	Job Number	1.1.3.2.2
Date	19 /06 /2017	Client	Mr. Clement Onan

<b>Design Conclusion</b>	
Cleat Angle	Fail
<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	Column web-Beam web
Beam Connection	Bolted
Column Connection	Bolted
<b>Loading (Factored Load)</b>	
Shear Force (kN)	80
<b>Components</b>	
Column Section	SC 140
Material	Fe 410
Beam Section	MB 200
Material	Fe 410
Hole	STD
Cleat Section	110 110 X 16
Thickness (mm)	16
Cleat Leg Size B (mm)	110
Cleat Leg Size A (mm)	110
Hole	STD
<b>Bolts on Beam</b>	
Type	Bearing Bolt
Grade	6.8
Diameter (mm)	12
Bolt Numbers	10
Columns (Vertical Lines)	2
Bolts Per Column	5
Gauge (mm)	30
Pitch (mm)	30
End Distance (mm)	22

Edge Distance (mm)	22
<b>Bolts on Column</b>	
Type	Bearing Bolt
Grade	6.8
Diameter (mm)	12
Bolt Numbers	16
Columns (Vertical Lines)	2
Bolts Per Column	4
Gauge (mm)	30
Pitch (mm)	30
End Distance (mm)	22
Edge Distance (mm)	37
<b>Assembly</b>	
Column-Beam Clearance (mm)	10.0



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### Design Preferences

#### Bolt

Hole Type	Standard
Material Grade (MPa) (overwrite)	600.0
Slip factor	N/A

#### Detailing

Type of Edges	Sheared or hand flame cut
Minimum Edge-End Distance	1.7 times the hole diameter
Gap between beam & support (mm)	10.0
Are members exposed to corrosive influences?	Yes

#### Design

Design Method	Limit State Design
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Design Check: Beam Connectivity			
Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((2*600*0.6126*12*12)/(\sqrt{3}*1.25*1000)) = 46.835$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5*0.519*12*5.7*600)/(1.25*1000) = 42.6$ [cl. 10.3.4]	
Bearing capacity of beam web (kN)		$V_{dpb} = (2.5*0.519*12*5.7*410)/(1.25*1000) = 29.11$ [cl. 10.3.4]	
Bearing capacity of cleat (kN)		$V_{dpb} = (2.5*0.519*12*16*410)/(1.25*1000) = 81.711$ [cl. 10.3.4]	
Bearing capacity (kN)		Min (42.6, 29.11, 81.711) = 29.11	
Bolt capacity (kN)		Min (46.835, 29.11) = 29.11	
Critical bolt shear (kN)	$\leq 29.11$	10.811	Pass
No. of bolts		10	
No. of column(s)	$\leq 2$	2	
No. of bolts per column		5	
Bolt pitch (mm)	$\geq 2.5*12 = 30, \leq \text{Min}(32*5.7, 300) = 183$ [cl. 10.2.2]	30	Pass
Bolt gauge (mm)	$\geq 2.5*12 = 30, \leq \text{Min}(32*5.7, 300) = 183$ [cl. 10.2.2]	30	Pass
End distance (mm)	$\geq 1.7*13.0 = 22, \leq 12*5.7 = 68.4$ [cl. 10.2.4]	22	Pass
Edge distance	$\geq 1.7*13.0 = 22, \leq 12*5.7 = 68.4$	22	Pass

(mm)	[cl. 10.2.4]		
<b>Block shear capacity (kN)</b>	$\geq 80$	$V_{db} = 324.077$ [cl. 6.4.1]	<b>Pass</b>
<b>Cleat height (mm)</b>	$\geq 0.6 \cdot 200.0 = 120.0, \leq 200.0 - 10.0 - 11.0 - 10.0 - 11.0 - 10 = 148.0$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	164	<b>Fail</b>
<b>Cleat moment capacity (kNm)</b>	$(2 \cdot 46.835 \cdot 30^2) / (30 \cdot 1000) = 2.92$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 129.101$ [cl. 8.2.1.2]	<b>Pass</b>



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<b>Design Check: Column Connectivity</b>			
<b>Check</b>	<b>Required</b>	<b>Provided</b>	<b>Remark</b>
<b>Bolt shear capacity (kN)</b>		$V_{dsb} = ((600 \times 0.6126 \times 12 \times 12) / (\sqrt{3} \times 1.25 \times 1000))$ $= 23.418$ [cl. 10.3.3]	
<b>Bolt bearing capacity (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 7.0 \times 600) / (1.25 \times 1000)$ $= 52.315$ [cl. 10.3.4]	
<b>Bearing capacity of column flange (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 7.0 \times 410) / (1.25 \times 1000)$ $= 35.749$ [cl. 10.3.4]	
<b>Bearing capacity of cleat (kN)</b>		$V_{dpb} = (2.5 \times 0.519 \times 12 \times 16 \times 410) / (1.25 \times 1000) = 81.711$ [cl. 10.3.4]	
<b>Bearing capacity (kN)</b>		Min (52.315, 35.749, 35.749) = 35.749	
<b>Bolt capacity (kN)</b>		Min (23.418, 35.749) = 23.418	
<b>Critical bolt shear (kN)</b>	$\leq 23.418$	15.643	<b>Pass</b>
<b>No. of bolts</b>		16	
<b>No. of column(s) per angle</b>	$\leq 2$	2	
<b>No. of bolts per column per angle</b>		4	
<b>Bolt pitch (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 7.0, 300) = 224$ [cl. 10.2.2]	30	<b>Pass</b>
<b>Bolt gauge (mm)</b>	$\geq 2.5 \times 12 = 30, \leq \text{Min}(32 \times 7.0, 300) = 224$ [cl. 10.2.2]	30	<b>Pass</b>
<b>End distance (mm)</b>	$\geq 1.7 \times 13.0 = 22, \leq 12 \times 7.0 = 84.0$ [cl. 10.2.4]	22	<b>Pass</b>
<b>Edge distance</b>	$\geq 1.7 \times 13.0 = 22, \leq 12 \times 7.0 = 84.0$	37	<b>Pass</b>

(mm)	[cl. 10.2.4]		
<b>Block shear capacity (kN)</b>	$\geq 80$	$V_{db} = 324.077$ [cl. 6.4.1]	<b>Pass</b>
<b>Cleat height (mm)</b>	$\geq 0.6 \cdot 200.0 = 120.0, \leq 200.02 \cdot (10.0 + 11.0 + 5) = 148.0$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	164	<b>Fail</b>
<b>Cleat moment capacity (kNm)</b>	$(2 \cdot 23.418 \cdot 30^2) / (30 \cdot 1000) = 3.034$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 129.101$ [cl. 8.2.1.2]	<b>Pass</b>



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**Views**



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<b>Additional Comments</b>	
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