



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

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)	145
------------------	-----

Components

Column Section	WB 450
-----------------------	--------

Material	Fe 410
----------	--------

Beam Section	MB 400
---------------------	--------

Material	Fe 410
----------	--------

Hole	STD
------	-----

Cleat Section	100 100 x 10
----------------------	--------------

Thickness (mm)	10
----------------	----

Cleat Leg Size B (mm)	100
-----------------------	-----

Cleat Leg Size A (mm)	100
-----------------------	-----

Hole	STD
------	-----

Bolts on Beam

Type	Bearing Bolt
------	--------------

Grade	4.6
-------	-----

Diameter (mm)	24
---------------	----

Bolt Numbers	3
--------------	---

Columns (Vertical Lines)	1
--------------------------	---

Bolts Per Column	3
------------------	---

Gauge (mm)	0
------------	---

Pitch (mm)	60
------------	----

End Distance (mm)	44
-------------------	----

Edge Distance (mm)	60
Bolts on Column	
Type	Bearing Bolt
Grade	4.6
Diameter (mm)	24
Bolt Numbers	6
Columns (Vertical Lines)	1
Bolts Per Column	3
Gauge (mm)	0
Pitch (mm)	60
End Distance (mm)	44
Edge Distance (mm)	60.0
Assembly	
Column-Beam Clearance (mm)	10.0



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

Design Preferences

Bolt

Hole Type	Standard
Material Grade (MPa) (overwrite)	800.0
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?	No

Design

Design Method	Limit State Design
---------------	--------------------



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

Design Check: Secondary Beam Connectivity

Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((2 \cdot 400 \cdot 0.6126 \cdot 24 \cdot 24) / (\sqrt{3} \cdot 1.25 \cdot 1000)) = 130.435$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \cdot 0.519 \cdot 24 \cdot 8.9 \cdot 400) / (1.25 \cdot 1000) = 88.687$ [cl. 10.3.4]	
Bearing capacity of beam web (kN)		$V_{dwb} = (2.5 \cdot 0.519 \cdot 24 \cdot 8.9 \cdot 410) / (1.25 \cdot 1000) = 90.904$ [cl. 10.3.4]	
Bearing capacity of cleat (kN)		$V_{dpc} = (2.5 \cdot 0.519 \cdot 24 \cdot 10 \cdot 410) / (1.25 \cdot 1000) = 102.139$ [cl. 10.3.4]	
Bearing capacity (kN)		Min (88.687, 90.904, 102.139) = 88.687	
Bolt capacity (kN)		Min (130.435, 88.687) = 88.687	
Critical bolt shear (kN)	≤ 88.687	41.578	Pass
No. of bolts		3	
No. of column(s)	≤ 2	1	
No. of bolts per column		3	
Bolt pitch (mm)	$\geq 2.5 \cdot 24 = 60, \leq \text{Min}(32 \cdot 8.9, 300) = 285$ [cl. 10.2.2]	60	Pass
Bolt gauge (mm)	$\geq 2.5 \cdot 24 = 60, \leq \text{Min}(32 \cdot 8.9, 300) = 285$ [cl. 10.2.2]	0	
End distance (mm)	$\geq 1.7 \cdot 26.0 = 44, \leq 12 \cdot 8.9 = 106.8$ [cl. 10.2.4]	44	Pass
Edge distance	$\geq 1.7 \cdot 26.0 = 44, \leq 12 \cdot 8.9 = 106.8$	60	Pass

(mm)	[cl. 10.2.4]		
Block shear capacity (kN)	≥ 145	$V_{db} = 149.247$ [cl. 6.4.1]	Pass
Cleat height (mm)	$\geq 0.6 \cdot 400.0 = 240.0, \leq 400.0 - 16.0 - 14.0 - 15.4 - 15.0 - 5 = 334.6$ [cl. 10.2.4, Insdag Detailing Manual, 2002]	240.0	Pass
Cleat moment capacity (kNm)	$(2 \cdot 130.435 \cdot 60^2) / (60 \cdot 1000) = 4.06$	$M_d = (1.2 \cdot 250 \cdot Z) / (1000 \cdot 1.1) = 172.8$ [cl. 8.2.1.2]	Pass



Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

Design Check: Primary Beam Connectivity

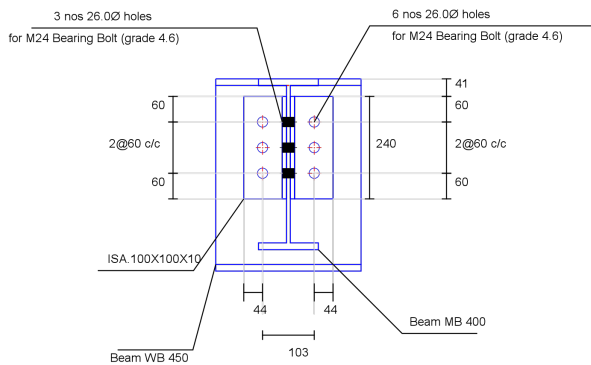
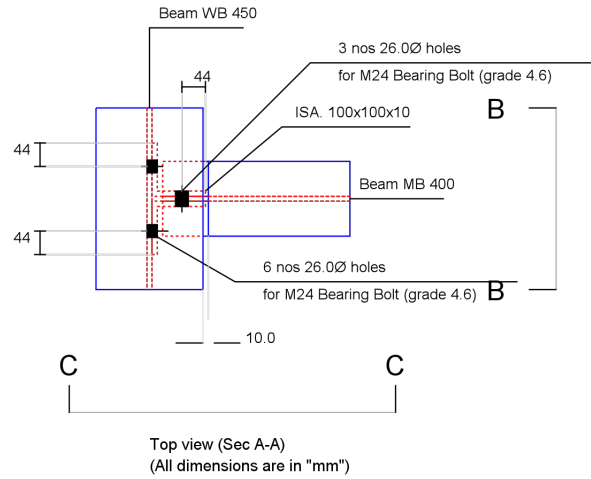
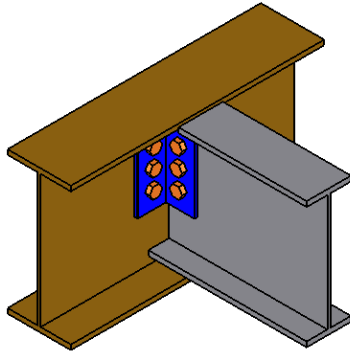
Check	Required	Provided	Remark
Bolt shear capacity (kN)		$V_{dsb} = ((400 \cdot 0.6126 \cdot 24 \cdot 24) / (\sqrt{3} \cdot 1.25 \cdot 1000)) = 65.218$ [cl. 10.3.3]	
Bolt bearing capacity (kN)		$V_{dpb} = (2.5 \cdot 0.519 \cdot 24 \cdot 9.2 \cdot 400) / (1.25 \cdot 1000) = 91.676$ [cl. 10.3.4]	
Bearing capacity of beam web (kN)		$V_{dpb} = (2.5 \cdot 0.519 \cdot 24 \cdot 9.2 \cdot 410) / (1.25 \cdot 1000) = 93.968$ [cl. 10.3.4]	
Bearing capacity of cleat (kN)		$V_{dpb} = (2.5 \cdot 0.519 \cdot 24 \cdot 10 \cdot 410) / (1.25 \cdot 1000) = 102.139$ [cl. 10.3.4]	
Bearing capacity (kN)		Min (91.676, 93.968, 91.676) = 91.676	
Bolt capacity (kN)		Min (65.218, 91.676) = 65.218	
Critical bolt shear (kN)	≤ 65.218	43.794	Pass
No. of bolts		6	
No. of column(s) per angle	≤ 2	1	
No. of bolts per column per angle		3	
Bolt pitch (mm)	$\geq 2.5 \cdot 24 = 60, \leq \text{Min}(32 \cdot 9.2, 300) = 295$ [cl. 10.2.2]	60	Pass
Bolt gauge (mm)	$\geq 2.5 \cdot 24 = 60, \leq \text{Min}(32 \cdot 9.2, 300) = 295$ [cl. 10.2.2]	0	
End distance (mm)	$\geq 1.7 \cdot 26.0 = 44, \leq 12 \cdot 9.2 = 110.4$ [cl. 10.2.4]	44	Pass
	$\geq 1.7 \cdot 26.0 = 44, \leq 12 \cdot 9.2 =$		

Edge distance (mm)	110.4 [cl. 10.2.4]	60.0	Pass
Block shear capacity (kN)	≥145	$V_{db} = 149.247$ [cl. 6.4.1]	Pass
Cleat height (mm)	≥ 0.6*400.0=240.0, ≤ 400.0-16.0-14.0-15.4-15.0- 5=334.6 [cl. 10.2.4, Insdag Detailing Manual, 2002]	240.0	Pass
Cleat moment capacity (kNm)	$(2*65.218*60^2)/(60*1000) = 4.383$	$M_d = (1.2*250*Z)/(1000*1.1) = 172.8$ [cl. 8.2.1.2]	Pass

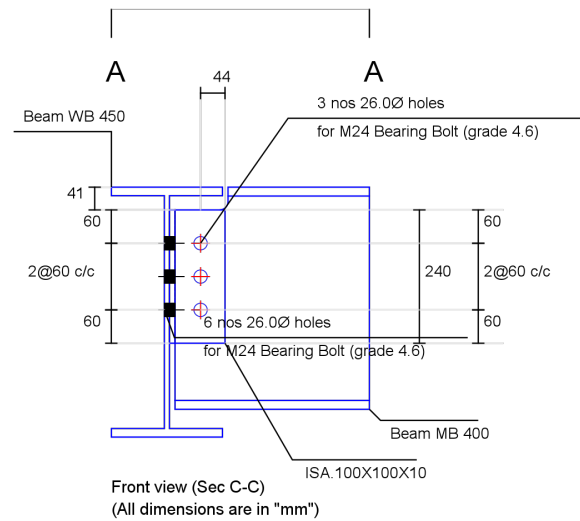


Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

Views



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





Company Name	IIT Bombay	Project Title	Connection Design Examples
Group/Team Name	Osdag	Subtitle	Cleat Angle Shear Connection
Designer	Engineer #1	Job Number	1.1.3.3.1
Date	20 /06 /2018	Client	Manas M. Ghosh, INSDAG, Kolkata

Additional Comments	
----------------------------	--