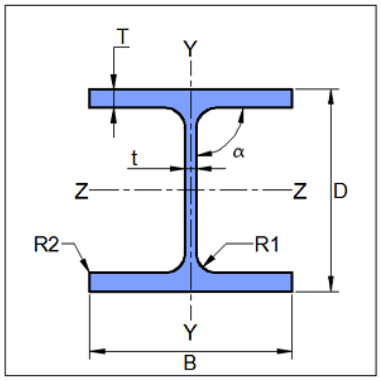
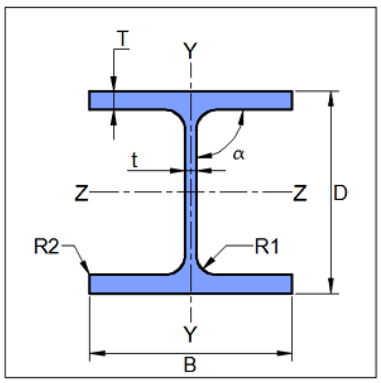
Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Cleat Angle
Designer	Engineer #1	Job Number	1.1.3.2.1
Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

1 Input Parameters

Main Module		Shear Connection	
Module		Cleat Angle	
Connectivity		Column Web-Beam Web	
Shear Force (kN)		170.0	
Supporting Section - Mechanical Properties			
			
Supporting Section		PBP 300 X 95	
Material		E 250 (Fe 410 W)A	
Ultimate Strength, Fu (MPa)		410	
Yield Strength, Fy (MPa)		250	
Mass, m (kg/m)	95.0	I_z (cm^4)	20000.0
Area, A (cm^2)	121.0	I_y(cm^4)	6540.0
D (mm)	304.0	r_z (cm)	12.8
B (mm)	309.0	r_y (cm)	7.36
t (mm)	13.3	Z_z (cm^3)	1320.0
T (mm)	13.3	Z_y (cm^3)	423.0
Flange Slope	90	Z_{pz} (cm^3)	1470.0
R_1 (mm)	15.0	Z_{py} (cm^3)	649.0
R_2 (mm)	0.0		
Supported Section - Mechanical Properties			
			
Supported Section		WPB 250 X 250 X 85.04	
Material		E 250 (Fe 410 W)A	
Ultimate Strength, Fu (MPa)		410	
Yield Strength, Fy (MPa)		250	
Mass, m (kg/m)	85.04	I_z (cm^4)	12100.0
Area, A (cm^2)	108.0	I_y(cm^4)	3910.0
D (mm)	253.0	r_z (cm)	10.5
B (mm)	255.0	r_y (cm)	6.0
t (mm)	14.0	Z_z (cm^3)	961.0
T (mm)	14.1	Z_y (cm^3)	306.0
Flange Slope	90	Z_{pz} (cm^3)	1080.0
R_1 (mm)	24.0	Z_{py} (cm^3)	475.0
R_2 (mm)	0.0		
Bolt Details - Input and Design Preference			

Diameter (mm)	[16, 20, 24]
Property Class	[6.8, 8.8, 9.8]
Type	Bearing Bolt
Hole Type	Standard
Slip Factor, (mu_f)	0.3
Detailing - Design Preference	
Edge Preparation Method	Rolled, machine-flame cut, sawn and planed
Gap Between Members (mm)	10.0
Are the Members Exposed to Corrosive Influences?	False

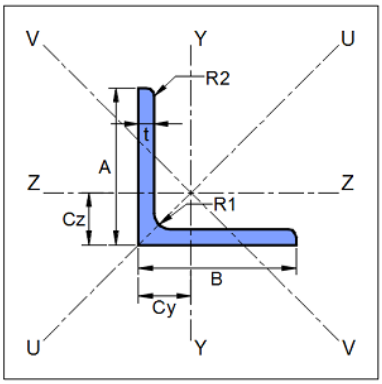
1.1 List of Input Section

Cleat Angle List	'50 x 50 x 3', '50 x 50 x 4', '50 x 50 x 5', '50 x 50 x 6', '55 x 55 x 4', '55 x 55 x 5', '55 x 55 x 6', '55 x 55 x 8', '60 x 60 x 4', '60 x 60 x 5', '60 x 60 x 6', '60 x 60 x 8', '65 x 65 x 4', '65 x 65 x 5', '65 x 65 x 6', '65 x 65 x 8', '70 x 70 x 5', '70 x 70 x 6', '70 x 70 x 8', '70 x 70 x 10', '75 x 75 x 5', '75 x 75 x 6', '75 x 75 x 8', '75 x 75 x 10', '80 x 80 x 6', '80 x 80 x 8', '80 x 80 x 10', '80 x 80 x 12', '90 x 90 x 6', '90 x 90 x 8', '90 x 90 x 10', '90 x 90 x 12', '100 x 100 x 6', '100 x 100 x 8', '100 x 100 x 10', '100 x 100 x 12', '110 x 110 x 8', '110 x 110 x 10', '110 x 110 x 12', '110 x 110 x 16', '130 x 130 x 8', '130 x130 x 10', '130 x130 x 12', '130 x130 x 16', '150 x 150 x 10', '150 x 150 x 12', '150 x 150 x 16', '150 x 150 x 20', '200 x 200 x 12', '200 x 200 x 16', '200 x 200 x 20', '200 x 200 x 25', '50 x 50 x 7', '50 x 50 x 8', '55 x 55 x 10', '60 x 60 x 10', '65 x 65 x 10', '70 x 70 x 7', '100 x 100 x 7', '100 x 100 x 15', '120 x 120 x 8', '120 x 120 x 10', '120 x 120 x 12', '120 x 120 x 15', '130 x 130 x 9', '150 x 150 x 15', '150 x 150 x 18', '180 x 180 x 15', '180 x 180 x 18', '180 x 180 x 20', '200 x 200 x 24'

2 Design Checks

Design Status	Pass

2.1 Selected Member Data



Section Size		75 x 75 x 8	
Material		E 250 (Fe 410 W)A	
Ultimate Strength, Fu (MPa)		410	
Yield Strength, Fy (MPa)		250	
Mass, m (kg/m)	9.0	I_u (cm^4)	95.7
Area, A (cm^2)	11.4	I_v(cm^4)	24.9
A (mm)	75.0	r_z (cm)	2.29
B (mm)	75.0	r_y (cm)	2.29
t (mm)	8.0	r_u (cm)	2.89
R_1 (mm)	7.0	r_v (cm)	1.47
R_2 (mm)	0.0	Z_z (cm^3)	11.3
C_y (mm)	21.6	Z_y (cm^3)	11.3
C_z (mm)	21.6	Z_{pz} (cm^3)	20.3
I_z (cm^4)	60.3	Z_{py} (cm^3)	11.3
I_y(cm^4)	60.3		

2.2 Initial Section Check

Check	Required	Provided	Remarks
Shear Yielding Capacity (kN)	170.0	$V_{dy} = \frac{A_v\ f_y}{\sqrt{3}\ \gamma_{mo}}$ $= \frac{253.0 \times 14.0 \times 250}{\sqrt{3} \times 1.1 \times 1000}$ $= 464.77$ [$Ref. IS$ 800 : 2007, $Cl.$10.4.3]	Pass
Allowable Shear Capacity (kN)	170.0	$V_d = 0.6\ V_{dy}$ $= 0.6 \times 464.77$ $= 278.86$ [*Limited to low shear*]	Pass

2.3 Load Consideration

Check	Required	Provided	Remarks
Applied Shear Force (kN)	170.0	$V_{y_{min}} = min(0.15 \times V_{dy}, 40.0)$ $= min(0.15 \times 464.77, 40.0)$ $= 40$ $V_u = max(V_y,\ V_{y_{min}})$ $= max(170.0, 40)$ $= 170.0$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.7]$	

2.4 Bolt Design - Connected to Beam

Check	Required	Provided	Remarks
Diameter (mm)		16	
Property Class		8.8	
Cleat Angle		75 x 75 x 8	
No. of Bolt Columns		1	
No. of Bolt Rows		3	
Min. Pitch Distance (mm)	$p_{min} = 2.5\ d$ $= 2.5 \times 16$ $= 40.0$ $[Ref\ IS\ 800 : 2007,\ Cl.\ 10.2.2]$	55	**Pass**
Max. Pitch Distance (mm)	$p_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 \times 8.0,\ 300\ mm)$ $= \min(256.0,\ 300\ mm)$ $= 256.0$ $Where,\ t = min(8.0, 14.0)$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.2.3]$	55	**Pass**

Company Name	IIT Bombay	Project Title	Sample Connection Design
Group/Team Name	Osdag	Subtitle	Cleat Angle
Designer	Engineer #1	Job Number	1.1.3.2.1
Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Min. Gauge Distance (mm)	$g_{min} = 2.5\ d$ $= 2.5 \times 16$ $= 40.0$ [$Ref\ IS\ 800:2007,\ Cl.\ 10.2.2$]	N/A	
Max. Gauge Distance (mm)	$g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 \times 8.0,\ 300\ mm)$ $= \min(256.0,\ 300\ mm)$ $= 256.0$ $Where,\ t = min(8.0, 14.0)$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.2.3$]	N/A	
Min. End Distance (mm)	$e_{min} = 1.5\ d_0$ $= 1.5 \times 18.0$ $= 27.0$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.2$]	30	**Pass**
Max. End Distance (mm)	$e_{max} = 12\ t\ \varepsilon;\ \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 8.0 \times \sqrt{\frac{250}{250}} = 96.0$ $e_2 = 12 \times 14.0 \times \sqrt{\frac{250}{250}} = 168.0$ $e_{max} = min(e_1, e_2) = 96.0$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.3$]	30	**Pass**
Min. Edge Distance (mm)	$e'_{min} = 1.5\ d_0$ $= 1.5 \times 18.0$ $= 27.0$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.2$]	30	**Pass**

Company Name	IIT Bombay	Project Title	Sample Connection Design
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Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Max. Edge Distance (mm)	$e'_{max} = 12\ t\ \varepsilon;\ \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 8.0 \times \sqrt{\frac{250}{250}} = 96.0$ $e_2 = 12 \times 14.0 \times \sqrt{\frac{250}{250}} = 168.0$ $e'_{max} = min(e_1, e_2) = 96.0$ [*Ref. IS* 800 : 2007, *Cl.* 10.2.4.3]	30	**Pass**
Moment Demand (kNm)		$M_d = (V_u \times ecc + M_w)$ $ecc = eccentricity$ $M_w = external\ moment\ acting\ on\ web$ $= \frac{(170.0 \times 10^3 \times 45.0 + 0.0 \times 10^6)}{10^6}$ $= 7650.0$	
Bolt Force Parameter(s) (mm)	$l_n = length\ available$ $l_n = p\ (n_r - 1)$ $= 55 \times (3 - 1)$ $= 110$ $y_{max} = l_n/2$ $= 110/2$ $= 55.0$ $x_{max} = g(n_c - 1)/2$ $= 0.0 \times (1 - 1)/2$ $= 0.0$		

Check	Required	Provided	Remarks
Bolt.Force (kN)	$vbv = V_u/(n_r \times n_c)$ $= \frac{170.0}{(3 \times 1)}$ $= 56.67$ $tmh = \frac{M_d \times y_{max}}{\Sigma r_i^2}$ $= \frac{7650.0 \times 55.0}{6.05}$ $= 69.55$ $tmv = \frac{M_d \times x_{max}}{\Sigma r_i^2}$ $= \frac{7650.0 \times 0.0}{6.05}$ $= 0.0$ $abh = \frac{A_u}{(n_r \times n_c)}$ $= \frac{0.0}{(3 \times 1)}$ $= 0.0$ $vres = \sqrt{(vbv + tmv)^2 + (tmh + abh)^2}$ $= \sqrt{(56.67 + 0.0)^2 + (69.55 + 0.0)^2}$ $= 89.71$		
Shear Capacity (kN)		$V_{dsb} = \frac{f_{ub}\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}}$ $= \frac{800.0 \times 2 \times 157}{1000 \times \sqrt{3}\ \times\ 1.25}$ $= 116.02$ [$Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.3$]	

Company Name	IIT Bombay	Project Title	Sample Connection Design
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Designer	Engineer #1	Job Number	1.1.3.2.1
Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Kb		$k_b = min\left(\frac{e}{3d_0},\ \frac{p}{3d_0} - 0.25,\ \frac{f_{ub}}{f_u},1.0\right)$ $= min\left(\frac{30}{3 \times 18.0},\ \frac{55}{3 \times 18.0} - 0.25,\ \frac{800.0}{410},\ 1.0\right)$ $= min(0.56, 0.77, 1.95, 1.0)$ $= 0.56$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.4]$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}}$ $= \frac{2.5 \times 0.56 \times 16 \times 14.0 \times 410}{1000 \times 1.25}$ $= 102.86$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.4]$	
Capacity (kN)		$V_{db} = min\ (V_{dsb}, V_{dpb})$ $= min\ (116.02, 102.86)$ $= 102.86$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.2]$	
Long Joint Reduction Factor		$l_j = (n_r - 1) \times p$ $= (3 - 1) \times 55 = 110$ $l = 110$ $15 \times d = 15 \times 16 = 240$ $since,\ l_j < 15 \times d\ then\ \beta_{lj} = 1.0$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.3.1]$	
Large Grip Length Reduction Factor		$l_g = \Sigma\ (t_p + t_{member})$ $= 30.0$ $5d = 80$ $8d = 128$ $since,\ l_g < 5d\ ;\ \beta_{lg} = 1.0$ $[Ref.\ IS\ 800 : 2007,\ Cl.\ 10.3.3.2]$	**Pass**

Check	Required	Provided	Remarks
Bolt Capacity (post reduction factor) (kN)		$V_{rd} = \beta_{lj}\beta_{lg}V_{db}$ $= 1.0 \times 1.0 \times 102.86$ $= 102.86$	
Capacity (kN)	89.71	102.86	**Pass**

2.5 Bolt Design - Connected to Column

Check	Required	Provided	Remarks
Diameter (mm)		16	
Property Class		8.8	
Cleat Angle		75 x 75 x 8	
No. of Bolt Columns		1	
No. of Bolt Rows		3	
Min. Pitch Distance (mm)	$p_{min} = 2.5\ d$ $= 2.5 \times 16$ $= 40.0$ [$Ref\ IS\ 800:2007,\ Cl.\ 10.2.2$]	55	**Pass**
Max. Pitch Distance (mm)	$p_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 \times 8.0,\ 300\ mm)$ $= \min(256.0,\ 300\ mm)$ $= 256.0$ $Where,\ t = min(8.0, 13.3)$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.2.3$]	55	**Pass**
Min. Gauge Distance (mm)	$g_{min} = 2.5\ d$ $= 2.5 \times 16$ $= 40.0$ [$Ref\ IS\ 800:2007,\ Cl.\ 10.2.2$]	N/A	

Check	Required	Provided	Remarks
Max. Gauge Distance (mm)	$g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 \times 8.0,\ 300\ mm)$ $= \min(256.0,\ 300\ mm)$ $= 256.0$ $Where,\ t = min(8.0, 13.3)$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.2.3]$	N/A	
Min. End Distance (mm)	$e_{min} = 1.5\ d_0$ $= 1.5 \times 18.0$ $= 27.0$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.2]$	30	**Pass**
Max. End Distance (mm)	$e_{max} = 12\ t\ \varepsilon;\ \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 8.0 \times \sqrt{\frac{250}{250}} = 96.0$ $e_2 = 12 \times 13.3 \times \sqrt{\frac{250}{250}} = 159.6$ $e_{max} = min(e_1, e_2) = 96.0$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.3]$	30	**Pass**
Min. Edge Distance (mm)	$e'_{min} = 1.5\ d_0$ $= 1.5 \times 18.0$ $= 27.0$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.2.4.2]$	30	**Pass**

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Designer	Engineer #1	Job Number	1.1.3.2.1
Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Max. Edge Distance (mm)	$e'_{max} = 12\ t\ \varepsilon;\ \varepsilon = \sqrt{\frac{250}{f_y}}$ $e_1 = 12 \times 8.0 \times \sqrt{\frac{250}{250}} = 96.0$ $e_2 = 12 \times 13.3 \times \sqrt{\frac{250}{250}} = 159.6$ $e'_{max} = min(e_1, e_2) = 96.0$ [*Ref. IS* 800 : 2007, *Cl.* 10.2.4.3]	30	**Pass**
Moment Demand (kNm)		$M_d = (V_u \times ecc + M_w)$ $ecc = eccentricity$ $M_w = external\ moment\ acting\ on\ web$ $= \frac{(85.0 \times 10^3 \times 45.0 + 0.0 \times 10^6)}{10^6}$ $= 3825.0$	
Bolt Force Parameter(s) (mm)	$l_n = length\ available$ $l_n = p\ (n_r - 1)$ $= 55 \times (3 - 1)$ $= 110$ $y_{max} = l_n/2$ $= 110/2$ $= 55.0$ $x_{max} = g(n_c - 1)/2$ $= 0.0 \times (1 - 1)/2$ $= 0.0$		

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Designer	Engineer #1	Job Number	1.1.3.2.1
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Check	Required	Provided	Remarks
Bolt.Force (kN)	$vbv = V_u/(n_r \times n_c)$ $= \frac{170.0}{(3 \times 1)}$ $= 28.33$ $tmh = \frac{M_d \times y_{max}}{\Sigma r_i^2}$ $= \frac{3825.0 \times 55.0}{6.05}$ $= 34.77$ $tmv = \frac{M_d \times x_{max}}{\Sigma r_i^2}$ $= \frac{3825.0 \times 0.0}{6.05}$ $= 0.0$ $abh = \frac{A_u}{(n_r \times n_c)}$ $= \frac{0.0}{(3 \times 1)}$ $= 0.0$ $vres = \sqrt{(vbv + tmv)^2 + (tmh + abh)^2}$ $= \sqrt{(28.33 + 0.0)^2 + (34.77 + 0.0)^2}$ $= 44.85$		
Shear Capacity (kN)		$V_{dsb} = \frac{f_{ub}\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}}$ $= \frac{800.0 \times 1 \times 157}{1000 \times \sqrt{3}\ \times\ 1.25}$ $= 58.01$ [$Ref.\ IS\ 800:2007,\ Cl.\ 10.3.3$]	

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Designer	Engineer #1	Job Number	1.1.3.2.1
Date	17 /12 /2020	Client	Somnath Mukherjee, MN Dastur, Kolkata

Check	Required	Provided	Remarks
Kb		$k_b = min\left(\frac{e}{3d_0},\ \frac{p}{3d_0} - 0.25,\ \frac{f_{ub}}{f_u},1.0\right)$ $= min\left(\frac{30}{3 \times 18.0},\ \frac{55}{3 \times 18.0} - 0.25,\ \frac{800.0}{410},\ 1.0\right)$ $= min(0.56, 0.77, 1.95, 1.0)$ $= 0.56$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.3.4]$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}}$ $= \frac{2.5 \times 0.56 \times 16 \times 14.0 \times 410}{1000 \times 1.25}$ $= 58.78$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.3.4]$	
Capacity (kN)		$V_{db} = min\ (V_{dsb}, V_{dpb})$ $= min\ (58.01, 58.78)$ $= 58.01$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.3.2]$	
Long Joint Reduction Factor		$l_j = (n_r - 1) \times p$ $= (3 - 1) \times 55 = 110$ $l = 110$ $15 \times d = 15 \times 16 = 240$ $since,\ l_j < 15 \times d\ then\ \beta_{lj} = 1.0$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.3.3.1]$	
Large Grip Length Reduction Factor		$l_g = \Sigma\ (t_p + t_{member})$ $= 21.3$ $5d = 80$ $8d = 128$ $since,\ l_g < 5d\ ;\ \beta_{lg} = 1.0$ $[Ref.\ IS\ 800:2007,\ Cl.\ 10.3.3.2]$	**Pass**

Check	Required	Provided	Remarks
Bolt Capacity (post reduction factor) (kN)		$V_{rd} = \beta_{lj}\beta_{lg}V_{db}$ $= 1.0 \times 1.0 \times 58.01$ $= 58.01$	
Capacity (kN)	44.85	58.01	**Pass**

2.6 Cleat Angle Check

Check	Required	Provided	Remarks
Min. Cleat Angle Height	$0.6\times(d_b - 2 \times t_f - 2 \times r_r)$ $= 0.6 \times (253.0 - 2 \times 14.1 - 2 \times 24.0)$ $= 106.08$ $[Ref.\ INSDAG - Chpt.5,\ Sect.5.2.3]$	170	**Pass**
Max. Cleat Angle Height	$d_b - 2(t_{bf} + r_{b1} + gap)$ $= 304.0 - 2 \times (13.3 + 15.0 + 10)$ $= 176.8$	170	**Pass**
Min. Leg Length (mm) on supported leg	$max(gap, t_{cleat} + r_{r-angle}) + 2e`_{min} + (n_c - 1)g_{min}$ $= max(10.0,\ 8.0 + 7.0) + 2 \times 27.0 + (1 - 1) \times 40.0$ $= 69.0$	75.0	**Pass**
Min. Leg Length (mm) on supporting leg	$t_{cleat} + r_{r-angle} + 2e`_{min} + (n_c - 1)g_{min}$ $= 8.0 + 7.0 + 2 \times 27.0 + (1 - 1) \times 40.0$ $= 69.0$	75.0	**Pass**
Min. Cleat Angle Thickness (mm)	$t_w = 0.5 * 14.0 = 7.0$	8.0	**Pass**
Shear Yielding Capacity (kN)		$V_{dy} = \frac{A_v\ f_y}{\sqrt{3}\ \gamma_{mo}}$ $= \frac{2 \times 170 \times 8.0 \times 250}{\sqrt{3} \times 1.1 \times 1000}$ $= 356.91$ $[Ref. IS\ 800 : 2007, Cl.10.4.3]$	

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Check	Required	Provided	Remarks
Block Shear Capacity in Shear (kN)		$V_{dbl1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $V_{dbl2} = \frac{0.9 A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $V_{db} = min(V_{db1}, V_{db2}) = 368.15$ $[Ref.\ IS\ 800:2007,\ Cl.\ 6.4]$	
Shear Capacity (kN)	170.0	$V_d = min(V_{dy}, V_{db})$ $= min(356.91, 368.15)$ $= 356.91$ $[Ref.\ IS\ 800:2007,\ Cl.\ 6.1]$	**Pass**
Moment Capacity (kNm)	7.65	$M_{dzz} = \frac{\beta_b \times Z_p \times fy}{\gamma_{mo} \times 10^6}$ $= \frac{1.0 \times 115600.0 \times 250}{1.1 \times 10^6}$ $= 26.27$ $[Ref.\ IS\ 800:2007,\ Cl.\ 8.2.1.2]$	**Pass**

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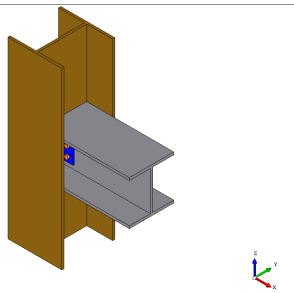
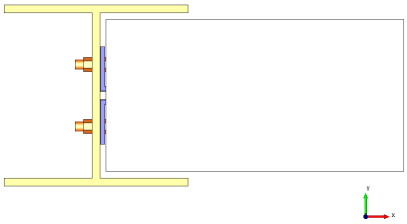
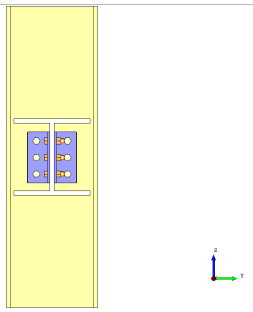
3 3D Views



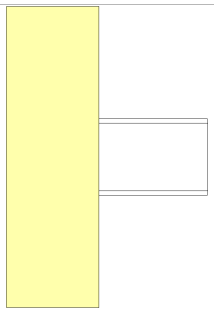
(a) 3D View



(b) Top View



(c) Side View



(d) Front View

4 Design Log