		Created with Osdag®	
Company Name		Project Title	Beam to Beam Cover Plate
Group/Team Name		Subtitle	
Designer		Job Number	
Date	21 /01 /2025	Client	

1 Input Parameters

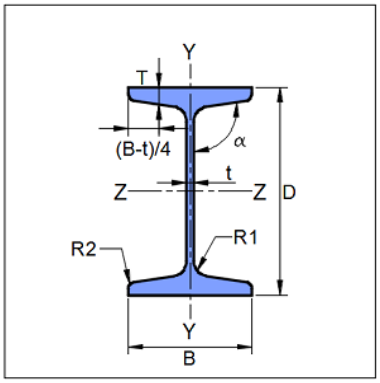
Module			Beam-to-Beam Cover Plate Bolted Connection	
Main Module			Moment Connection	
Bending Moment (kNm) *			34.0	
Shear Force (kN) *			34.0	
Axial Force (kN)			34.0	
Beam Section - Mechanical Properties				
	Beam Section		JB 175	
	Material *		E 165 (Fe 290)	
	Ultimate Strength, F_u (MPa)		290	
	Yield Strength, F_y (MPa)		165	
	Mass, m (kg/m)	8.07	I_z (cm^4)	480.0
	Area, A (cm^2)	1020.0	I_y(cm^4)	9.65
	D (mm)	175.0	r_z (cm)	6.83
	B (mm)	50.0	r_y (cm)	0.97
	t (mm)	3.2	Z_z (cm^3)	54.9
	T (mm)	4.8	Z_y (cm^3)	3.86
	Flange Slope	91.5	Z_{pz} (cm^3)	64.2
	R_1 (mm)	5.0	Z_{py} (cm^3)	6.32
	R_2 (mm)	1.5		
Bolt Details - Input and Design Preference				
Diameter (mm) *			[8, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 45, 48, 52, 56, 60, 64]	
Property Class *			[np.float64(3.6), np.float64(4.6), np.float64(4.8), np.float64(5.6), np.float64(5.8), np.float64(6.8), np.float64(8.8), np.float64(9.8), np.float64(10.9), np.float64(12.9)]	
Type *			Bearing Bolt	
Hole Type			Standard	
Slip Factor, (μ_f)			0.3	
Edge Preparation Method			Sheared or hand flame cut	
Gap Between Beams (mm)			3.0	
Are the Members Exposed to Corrosive Influences?			False	

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Plate Details - Input and Design Preference	
Preference *	Outside
Ultimate Strength, F_u (MPa)	290
Yield Strength, F_y (MPa)	165
Material *	E 165 (Fe 290)
Thickness (mm) *	[8, 10, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 45, 50, 56, 63, 75, 80, 90, 100, 110, 120]

2 Design Checks

Design Status	Fail

2.1 Member Capacity

Check	Required	Provided	Remarks
Section Classification		**Plastic** [Ref: Table 2, Cl.3.7.2 and 3.7.4, IS 800:2007]	
Axial Capacity Member (kN)	$P_x = 34.0$	$T_{dg} = \frac{A_g f_y}{\gamma_{m0}}$ $= \frac{1020.0 \times 165}{1.1 \times 10^3}$ $= 153.0$ [Ref. IS 800:2007, Cl.6.2]	
Shear Capacity Member (kN)		$V_{d_y} = \frac{A_v f_y}{\sqrt{3}\gamma_{m0}}$ $= \frac{165.4 \times 3.2 \times 165}{\sqrt{3} \times 1.1 \times 1000}$ $= 45.84$ [Ref. IS 800:2007, Cl.10.4.3]	
Allowable Shear Capacity (kN)	$V_y = 34.0$	$V_d = 0.6\ V_{dy}$ $= 0.6 \times 45.84$ $= 27.5$ [Limited to low shear]	**Fail**
Plastic Moment Capacity (kNm)		$M_{d_z} = \frac{\beta_b Z_p f y}{\gamma_{m0}}$ $= \frac{1 \times 64200.0 \times 165}{1.1 \times 10^6}$ $= 9.63$ [Ref. IS 800:2007, Cl.8.2.1.2]	

Check	Required	Provided	Remarks
Moment Deformation Criteria (kNm)		$M_{dc} = \frac{1.5 Z_e f y}{\gamma_{m0} \times 10^6}$ $= \frac{1.5 \times 54900.0 \times 165}{1.1 \times 10^6}$ $= 12.35$ [Ref. IS 800:2007, Cl.8.2.1.2]	
Moment Capacity Member (kNm)	$M_z = 34.0$	$M_{dz} = \min(M_{dz},\ M_{dc})$ $= \min(9.63, 12.35)$ $= 9.63$ [Ref. IS 800:2007, Cl.8.2]	

2.2 Load Consideration

Check	Required	Provided	Remarks
Interaction Ratio		I.R. axial $= P_x/T_{dg}$ $= 34.0/153.0$ $= 0.2222$ I.R. moment $= M_z/M_{dz}$ $= 34.0/9.63$ $= 3.5306$ I.R. sum $=$ I.R. axial + I.R. moment $= 0.2222 + 3.5306$ $= 3.7528$	

Check	Required	Provided	Remarks
Minimum Required Load	if I.R. axial < 0.3 and I.R. moment < 0.5 $P_{x\min} = 0.3T_{dg}$ $M_{z\min} = 0.5M_{dz}$ elif sum I.R. $<= 1.0$ and I.R. moment < 0.5 if $(0.5 - \text{I.R. moment}) < (1 - \text{sum I.R.})$ $M_{z\min} = 0.5 \times M_{dz}$ else $M_{z\min} = M_z + ((1 - \text{sum I.R.}) \times M_{dz})$ $P_{x\min} = P_x$ elif sum I.R. $<= 1.0$ and I.R. axial < 0.3 if $(0.3 - \text{I.R. axial}) < (1 - \text{sum I.R.})$ $P_{x\min} = 0.3T_{dg}$ else $P_{x\min} = P_x + ((1 - \text{sum I.R.}) \times T_{dg})$ $M_{z\min} = M_z$ else $P_{x\min} = P_x$ $M_{z\min} = M_z$ Note: AL is the user input for load	$M_{z\min} = 34.0$ $P_{x\min} = 34.0$ [Ref. IS 800:2007, Cl.10.7]	
Applied Axial Force (kN)	$P_x = 34.0$	$P_u = \max(P_x,\ P_{x\min})$ $= \max(34.0, 34.0)$ $= 34.0$	

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Check	Required	Provided	Remarks
Applied Shear Force (kN)	$V_y = 34.0$	$V_{y_{\min}} = \min(0.15V_{d_y},\ 40.0)$ $= \min(0.15 \times 45.84,\ 40.0)$ $= 6.88$ $V_u = \max(V_y,\ V_{y_{\min}})$ $= \max(34.0, 6.88)$ $= 34.0$ [Ref. IS 800:2007, Cl.10.7]	
Applied Moment (kNm)	$M_z = 34.0$	$M_u = \max(M_z,\ M_{z\min})$ $= \max(34.0,\ 34.0)$ $= 34.0$ [Ref. IS 800:2007, Cl.8.2.1.2]	
Force Carried by Web		$A_w =$ Axial force in web $= \frac{(D-2T)tAu}{A}$ $= \frac{(175.0 - 2 \times 4.8) \times 3.2 \times 34.0}{1020.0}$ $= 17.64$ kN $M_w =$ Moment in web $= \frac{Z_w Mu}{Z}$ $= \frac{21885.73 \times 34.0}{64200.0}$ $= 11.59$ kNm	

Check	Required	Provided	Remarks
Force Carried by Flange		A_f = Axial force in flange $= \frac{AuBT}{A}$ $= \frac{34.0 \times 50.0 \times 4.8}{1020.0}$ $= 8.0$ kN M_f = Moment in flange $= Mu - M_w$ $= 34.0 - 11.59$ $= 22.41$ kNm F_f = flange force $= \frac{M_f \times 10^3}{D - T} + A_f$ $= \frac{22.41 \times 10^3}{175.0 - 4.8} + 8.0$ $= 139.67$ kN	

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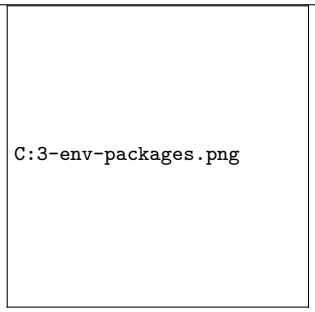
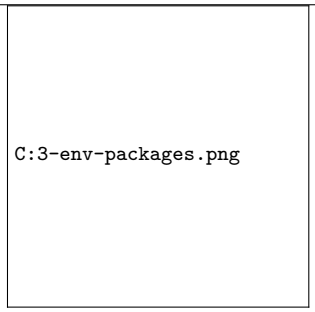
3 3D Views



(a) 3D View



(b) Top View

(c) Side View

(d) Front View

4 Design Log

2025-01-21 13:47:45 - Osdag - WARNING - : The value of factored shear load exceeds by 0.6 times the shear capacity of the member, 27.5 kN.

2025-01-21 13:47:45 - Osdag - ERROR - : Design of members in high shear is not recommended by Osdag. Design is unsafe.

2025-01-21 13:47:45 - Osdag - INFO - :==========End Of design==========