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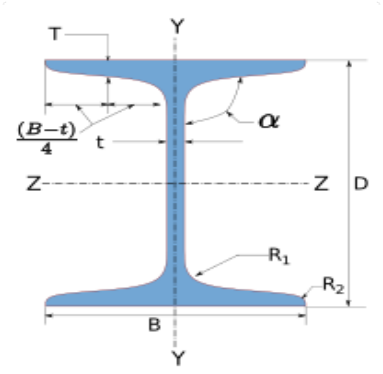
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

# 1 Input Parameters

| Module | Beam Coverplate Connection |
|---|---|
| MainModule | Moment Connection |
| Moment(kNm)* | 1.0 |
| Shear (kN)* | 1.0 |
| Axial (kN) * | 2.0 |

**Section**




| | | | |
|---|---|---|---|
| Beam Section * | | JB 150 | |
| Preferences | | Outside | |
| Material * | | E 250 (Fe 410 W)A | |
| Ultimate strength, fu (MPa) | | 410 | |
| Yield Strength , fy (MPa) | 250 | R1(mm) | 5.0 |
| Mass | 7.1 | R2(mm) | 1.5 |
| Area(mm2) - A | 901.0 | Iz(mm4) | 3220000.0 |
| D(mm) | 150.0 | Iy(mm4) | 92000.0 |
| B(mm) | 50.0 | rz(mm) | 59.8 |
| t(mm) | 3.0 | ry(mm) | 10.1 |
| T(mm) | 4.6 | Zz(mm3) | 42900.0 |
| FlangeSlope | 91.5 | Zy(mm3) | 3700.0 |

**Bolt Details**

| | |
|---|---|
| Diameter (mm)* | [12.0, 16.0, 20.0, 24.0, 30.0, 36.0] |
| Grade * | [3.6, 4.6, 4.8, 5.6, 5.8, 6.8, 8.8, 9.8, 10.9, 12.9] |
| Type * | Bearing Bolt |
| Bolt hole type | Standard |
| Slip factor (μ_f) | 0.3 |
| Type of edges | a - Sheared or hand flame cut |
| Gap between beam and <br>support (mm) | 10.0 |
| Are the members exposed to <br>corrosive influences | False |

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| Group/Team Name | LoremIpsum | Subtitle | |
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| Date | 26 /05 /2020 | Client | LoremIpsum |

# 2 Design Checks

## 2.1 Member Capacity

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Axial Capacity Member Ac (kN) | | $A_c = \frac{A * f_y}{\gamma_{m0} * 10^3}$ $= \frac{901.0 * 250}{1.1 * 10^3}$ $= 204.77$ | |
| Shear Capacity Member Sc (kN) | | $S_c = \frac{A_v * f_y}{\sqrt{3} * \gamma_{mo} * 10^3}$ $= \frac{140.8 * 3.0 * 250}{\sqrt{3} * 1.1 * 10^3}$ $= 55.43$ | |
| Plastic Moment Capacity Pmc (kNm) | | $Pmc = \frac{\beta_b * Z_p * fy}{\gamma_{mo} * 10^6}$ $= \frac{1 * 14868.48 * 250}{1.1 * 10^6}$ $= 3.38$ | |
| Moment Deformation Criteria Mdc (kNm) | | $Mdc = \frac{1.5 * Z_e * fy}{1.1 * 10^6}$ $= \frac{1.5 * 42900.0 * 250}{1.1 * 10^6}$ $= 14.62$ | |
| Moment Capacity Member Mc (kNm) | | $M_c = min(Pmc, Mdc)$ $= min(3.38, 14.62)$ $= 3.38$ | |

| Company Name | LoremIpsum | Project Title | Fossee |
|---|---|---|---|
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.2 Load Consideration

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Applied Axial Load Au (kN) | $Ac_{min} = 0.3 * A_c$<br>$= 0.3 * 204.77$<br>$= 61.43$<br>$Ac_{max} = Ac$<br>$= 204.77$ | $A_u = 61.43$ | Pass |
| Applied Shear Load Vu (kN) | $Vc_{min} = 0.6 * S_c$<br>$= 0.6 * 55.43$<br>$= 33.26$<br>$Vc_{max} = Sc$<br>$= 55.43$ | $V_u = 33.26$ | Pass |
| Applied Moment Load Mu (kNm) | $Mc_{min} = 0.5 * M_c$<br>$= 0.5 * 3.38$<br>$= 1.69$<br>$Mc_{max} = Mc$<br>$= 3.38$ | $M_u = 1.69$ | Pass |
| Forces Carried by Web | | $A_w = Axial\ force\ in\ web$<br>$= \frac{(D - 2 * T) * t * Au}{A}$<br>$= \frac{(150.0 - 2 * 4.6) * 3.0 * 61.43}{901.0}$<br>$= 28.8\ kN$<br>$M_w = Moment\ in\ web$<br>$= \frac{Z_w * Mu}{Z}$<br>$= \frac{14868.48 * 1.69}{47600.0}$<br>$= 0.53\ kNm$ | |
| Forces Carried by Flange | | $A_f = Axial\ force\ in\ flange$<br>$= \frac{Au * B * T}{A}$<br>$= \frac{61.43 * 50.0 * 4.6}{901.0}$<br>$= 15.68\ kN$<br>$M_f = Moment\ in\ flange$<br>$= Mu - M_w$<br>$= 1.69 - 0.53$<br>$= 1.16\ kNm$<br>$F_f = flange\ force$<br>$= \frac{M_f * 10^3}{D - T} + A_f$<br>$= \frac{1.16 * 10^3}{150.0 - 4.6} + 15.68$<br>$= 23.67\ kN$ | |

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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.3 Initial Member Check

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Flange Tension Yielding Capacity (kN) | $F_f = 23.67$ | $T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 50.0 * 4.6 * 250}{1.1}$ $= 52.27$ | Pass |
| Web Tension Yielding Capacity (kN) | $A_w = 28.8$ | $T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 140.8 * 3.0 * 250}{1.1}$ $= 96$ | Pass |

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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.4 Initial flange plate height check

| Check | Required | Provided | Remarks |
|---|---|---|---|
| flange_plate.Height | Outer.b >= 50 | $Outer.b = 50.0$ | Pass |

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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.5 Flange plate thickness

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Thickness (mm)* | $T = 4.6$ | $t_f = 6.0$ | Pass |
| Plate Area check (mm2) | $pt.area >=$ $connected\ member\ area * 1.05$ $= 241.5$ | $outer.b = B$ $= 50.0$ $pt.area = 6.0 * 50.0$ $= 300.0$ | Pass |

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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.6 Web plate thickness

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Thickness (mm)* | $t = 1.5$ | $t_w = 6.0$ | Pass |
| Plate Area check (mm2) | $pt.area >= connected\ member\ area * 1.05 = 342.72$ | $web\ b = D - (2 * T) - (2 * r_1) = 150.0 - (2 * 4.6) - (2 * 5.0) = 108.8$<br>$pt.area = 6.0 * 2 * 108.8 = 1305.6$ | Pass |

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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.7 Web Spacing Checks

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Min.Diameter (mm) | | $d = 12.0$ | |
| Min. Gauge (mm) | $p/g_{min} = 2.5\ d$<br>$=2.5 * 12.0 \quad = 30.0$ | $g = 30$ ($Row\ Limit$ $(r_l) = 2$) | |
| Min. Edge Distance (mm) | $e/e'_{min} = [1.5\ or\ 1.7] * d_0$<br>$= 1.7 * 13.0 = 22.1$ | 25 | |
| Spacing Check | $depth = 2 * e + (r_l - 1) * g$<br>$= 2 * 25 + (2.0 - 1) * 30$<br>$= 80.0$ | 108.8 | Pass |

| | | | |
|---|---|---|---|
| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
| Designer | LoremIpsum | Job Number | 123 |
| Date | 26 /05 /2020 | Client | LoremIpsum |

## 2.8 Flange Spacing Checks

| Check | Required | Provided | Remarks |
|---|---|---|---|
| Min.Diameter (mm) | | $d = 12.0$ | |
| Min. Gauge (mm) | $p/g_{min} = 2.5\ d$<br>$=2.5 * 12.0 \quad = 30.0$ | $g = 0.0$ ($Row\ Limit$ $(r_l) = 1$) | |
| Min. Edge Distance (mm) | $e/e'_{min} = [1.5\ or\ 1.7] * d_0$<br>$= 1.7 * 13.0 = 22.1$ | 25 | |
| Spacing Check | $depth = 2 * e + (r_l - 1) * g$<br>$= 2 * 25 + (1.0 - 1) * 30$<br>$= 50.0$ | 18.5 | Fail |

| | | | |
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| Company Name | LoremIpsum | Project Title | Fossee |
| Group/Team Name | LoremIpsum | Subtitle | |
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| Date | 26 /05 /2020 | Client | LoremIpsum |

## 3 3D View


Figure 1: 3D View