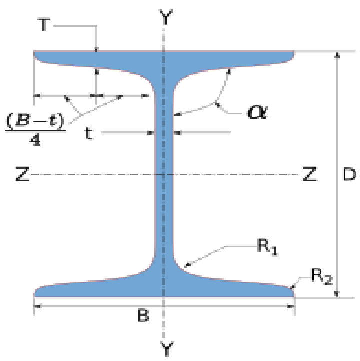
Company Name		Project Title	
Group/Team Name		Subtitle	
Designer		Job Number	
Date	05 /06 /2020	Client	

1 Input Parameters

<table>
<tr><td colspan="3">Module</td><td colspan="2">Column Coverplate Connection</td></tr>
<tr><td colspan="3">MainModule</td><td colspan="2">Moment Connection</td></tr>
<tr><td colspan="3">Moment(kNm)*</td><td colspan="2">5.0</td></tr>
<tr><td colspan="3">Shear (kN)*</td><td colspan="2">100.0</td></tr>
<tr><td colspan="3">Axial (kN) *</td><td colspan="2">100.0</td></tr>
<tr><td colspan="5">Section</td></tr>
<tr><td rowspan="11">
</td><td colspan="2">Column Section *</td><td colspan="2">UC 254 x 254 x 107</td></tr>
<tr><td colspan="2">Material *</td><td colspan="2">E 250 (Fe 410 W)A</td></tr>
<tr><td colspan="2">Ultimate strength, fu (MPa)</td><td colspan="2">410</td></tr>
<tr><td colspan="2">Yield Strength , fy (MPa)</td><td colspan="2">240</td></tr>
<tr><td>Mass</td><td>107.1</td><td>R1(mm)</td><td>12.7</td></tr>
<tr><td>Area(mm2) - A</td><td>13640.0</td><td>R2(mm)</td><td>0.0</td></tr>
<tr><td>D(mm)</td><td>266.7</td><td>Iz(mm4)</td><td>175100000.0</td></tr>
<tr><td>B(mm)</td><td>258.8</td><td>Iy(mm4)</td><td>59270000.0</td></tr>
<tr><td>t(mm)</td><td>12.8</td><td>rz(mm)</td><td>113.0</td></tr>
<tr><td>T(mm)</td><td>20.5</td><td>ry(mm)</td><td>65.9</td></tr>
<tr><td>FlangeSlope</td><td>90</td><td>Zz(mm3)</td><td>1313000.0</td></tr>
<tr><td colspan="5">Bolt Details</td></tr>
<tr><td colspan="3">Preferences</td><td colspan="2">Outside + Inside</td></tr>
<tr><td colspan="3">Diameter (mm)*</td><td colspan="2">[12.0]</td></tr>
<tr><td colspan="3">Grade *</td><td colspan="2">[3.6]</td></tr>
<tr><td colspan="3">Type *</td><td colspan="2">Bearing Bolt</td></tr>
<tr><td colspan="3">Bolt hole type</td><td colspan="2">Standard</td></tr>
<tr><td colspan="3">Slip factor (µ_f)</td><td colspan="2">0.3</td></tr>
<tr><td colspan="3">Type of edges</td><td colspan="2">a - Sheared or hand flame cut</td></tr>
<tr><td colspan="3">Gap between beam and
support (mm)</td><td colspan="2">10.0</td></tr>
<tr><td colspan="3">Are the members exposed to
corrosive influences</td><td colspan="2">False</td></tr>
</table>

2 Design Checks

2.1 Member Capacity

Check	Required	Provided	Remarks
Axial Capacity Member (kN)		$A_c = \frac{A * f_y}{\gamma_{m0} * 10^3}$ $= \frac{13640.0 * 240}{1.1 * 10^3}$ $= 2976.0$	
Shear Capacity Member (kN)		$S_c = \frac{A_v * f_y}{\sqrt{3} * \gamma_{mo} * 10^3}$ $= \frac{225.7 * 12.8 * 240}{\sqrt{3} * 1.1 * 10^3}$ $= 363.91$	
Plastic Moment Capacity (kNm)		$Pmc = \frac{\beta_b * Z_p * fy}{\gamma_{mo} * 10^6}$ $= \frac{1 * 163009.57 * 240}{1.1 * 10^6}$ $= 35.57$	
Moment Deformation Criteria (kNm)		$Mdc = \frac{1.5 * Z_e * fy}{1.1 * 10^6}$ $= \frac{1.5 * 1313000.0 * 240}{1.1 * 10^6}$ $= 429.71$	
Moment Capacity Member (kNm)		$M_c = min(Pmc, Mdc)$ $= min(35.57, 429.71)$ $= 35.57$	

2.2 Load Consideration

Check	Required	Provided	Remarks
Applied Axial Load (kN)	$Ac_{min} = 0.3 * A_c$ $= 0.3 * 2976.0$ $= 892.8$ $Ac_{max} = Ac$ $= 2976.0$	$A_u = 892.8$	Pass
Applied Shear Load (kN)	$Vc_{min} = 0.6 * S_c$ $= 0.6 * 363.91$ $= 218.35$ $Vc_{max} = Sc$ $= 363.91$	$V_u = 218.35$	Pass
Applied Moment Load (kNm)	$Mc_{min} = 0.5 * M_c$ $= 0.5 * 35.57$ $= 17.78$ $Mc_{max} = Mc$ $= 35.57$	$M_u = 17.78$	Pass
Forces Carried by Web		$A_w = Axial\ force\ in\ web$ $= \frac{(D - 2 * T) * t * Au}{A}$ $= \frac{(266.7 - 2 * 20.5) * 12.8 * 892.8}{13640.0}$ $= 189.1\ kN$ $M_w = Moment\ in\ web$ $= \frac{Z_w * Mu}{Z}$ $= \frac{163009.57 * 17.78}{1484000.0}$ $= 1.95\ kNm$	

Company Name		Project Title	
Group/Team Name		Subtitle	
Designer		Job Number	
Date	05 /06 /2020	Client	

Check	Required	Provided	Remarks
Forces Carried by Flange		$A_f = Axial\ force\ in\ flange$ $= \frac{Au * B * T}{A}$ $= \frac{892.8 * 258.8 * 20.5}{13640.0}$ $= 347.26\ kN$ $M_f = Moment\ in\ flange$ $= Mu - M_w$ $= 17.78 - 1.95$ $= 15.83\ kNm$ $F_f = flange\ force$ $= \frac{M_f * 10^3}{D - T} + A_f$ $= \frac{15.83 * 10^3}{266.7 - 20.5} + 347.26$ $= 411.56\ kN$	

2.3 Initial Member Check

Check	Required	Provided	Remarks
Tension Yielding Capacity (kN)	$F_f = 411.56$	$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 258.8 * 20.5 * 240}{1.1}$ $= 1205.77$	Pass
Web Tension Yielding Capacity (kN)	$A_w = 189.1$	$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 225.7 * 12.8 * 240}{1.1}$ $= 657$	Pass

2.4 Initial flange plate height check

Check	Required	Provided	Remarks
Flange_Plate.Height	Bfp >= 50	$B_{fp} = 258.8$	Pass
Flange_Plate.InnerHeight	Bifp >= 50	$B_{fp} = \frac{B - t - (2 * R1)}{2}$ $= \frac{258.8 - 12.8 - (2 * 12.7)}{2}$ $= 110.3$	Pass

2.5 Flange plate thickness

Check	Required	Provided	Remarks
Thickness (mm)*	$T = 10.25$	$t_{fp} = 12.0$	Pass
Plate Area check (mm2)	$pt.area >=$ $connected\ member\ area * 1.05$ $= 5570.67$	$B_{fp} = B$ $= 258.8$ $B_{ifp} = \frac{B - t - (2 * R1)}{2}$ $= \frac{258.8 - 12.8 - (2 * 12.7)}{2}$ $= 110.3$ $pt.area = (258.8 + (2 * 110.3)) * 12.0$ $= 5752.8$	Pass

2.6 Initial web plate height check

Check	Required	Provided	Remarks
Web_Plate.Height	$= 0.6 * D$ $= 0.6 * 266.7$ $= 160.02$	$C = max((R1, t_{ifp}) + 10)$ $= max((12.7, 12.0) + 10)$ $= 22.7$ $W_{wp} = D - (2 * T) - (2 * C)$ $= 266.7 - (2 * 20.5) - (2 * 22.7)$ $= 180.3$	Pass

2.7 Web plate thickness

Check	Required	Provided	Remarks
Thickness (mm)*	$t = 6.4$	$t_{wp} = 10.0$	Pass
Plate Area check (mm2)	$pt.area >=$ $connected\ member\ area * 1.05$ $= 3033.41$	$pt.area = t_{wp} * 2 * W_{wp}$ $= 10.0 * 2 * 180.3$ $= 3606.0$	Pass

2.8 Web Spacing Checks

Check	Required	Provided	Remarks
Min.Diameter (mm)		$d = 12.0$	
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $= 2.5 * 12.0 \quad = 30.0$	$g = 30\ (Col\ Limit\ (c_l) = 2)$	
Min. Edge Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25	
Spacing Check	$depth = 2 * e + (c_l - 1) * g$ $= 2 * 25 + (2.0 - 1) * 30$ $= 80.0$	180.3	Pass

Company Name		Project Title	
Group/Team Name		Subtitle	
Designer		Job Number	
Date	05 /06 /2020	Client	

2.9 Flange Spacing Checks

Check	Required	Provided	Remarks
Min.Diameter (mm)		$d = 12.0$	
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $=2.5 * 12.0 \quad = 30.0$	$g = 0.0\ (Col\ Limit\ (c_l) = 1)$	
Min. Edge Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25	
Spacing Check	$depth = 2 * e + (c_l - 1) * g$ $= 2 * 25 + (1.0 - 1) * 30$ $= 50.0$	110.3	Pass

2.10 Flange Bolt Checks

Check	Required	Provided	Remarks
Diameter (mm)	Bolt Quantity Optimisation	$d = 12.0$	
Grade	Bolt Grade Optimisation	3.6	
Bolt Ultimate Strength (N/mm2)		$f_{ub} = 330.0$	
Bolt Yield Strength (N/mm2)		$f_{yb} = 190.0$	
Nominal Stress Area (mm2)		$A_{nb} = 84.3\ (Ref\ IS\ 1367-3\ (2002))$	
Hole Diameter (mm)		$d_0 = 13.0$	
Shear Capacity (kN)		$V_{dsb} = \frac{f_{ub}\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}} = \frac{330.0*2*84.3}{\sqrt{3}\ *\ 1.25} = 25.7$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}} = \frac{2.5\ *0.52*12.0*20.5*410}{1.25} = 104.89$	
Bolt Capacity (kN)		$V_{db} = min\ (V_{dsb}, V_{dpb}) = min\ (25.7, 104.89) = 25.7$	
No of Bolts	$R_u = \sqrt{V_u^2 + A_u^2}$ $n_{trial} = R_u/V_{bolt}$ $R_u = \frac{2*\sqrt{0.0^2+411.56^2}}{25.7} = 34$	36	
No of Columns		$n_c = 6$	
No of Rows		$n_r = 6$	
Min. Pitch (mm)	$p/g_{min} = 2.5\ d$ $=2.5*12.0 = 30.0$	30	Pass
Max. Pitch (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm) = \min(32*\ 12.0,\ 300\ mm) = 300$ $t = min(12.0, 12.0)$	30	Pass
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $=2.5*12.0 = 30.0$	30	Pass

Check	Required	Provided	Remarks
Max. Gauge (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 12.0,\ 300\ mm)$ $= 300$ $t = min(12.0, 12.0)$	30	Pass
Min. End Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25	Pass
Max. End Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12\ * 12.0 * \sqrt{\frac{250}{250}}$ $= 144.0$	25	Pass
Min. Edge Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25.15	Pass
Max. Edge Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$ $\varepsilon = \sqrt{\frac{250}{f_y}}$ $e/e`_{max} = 12\ * 12.0 * \sqrt{\frac{250}{250}}$ $= 144.0$	25.15	Pass
Bolt Capacity post Long Joint (kN)	$if\ l \geq 15 * d\ then\ V_{rd} = \beta_{ij} * V_{db}$ $if\ l < 15 * d\ then\ V_{rd} = V_{db}$ $where,$ $l = ((nc\ or\ nr) - 1) * (p\ or\ g)$ $\beta_{ij} = 1.075 - l/(200 * d)$ $but\ 0.75 \leq \beta_{ij} \leq 1.0$	$l\ = ((nc\ or\ nr) - 1) * (p\ or\ g)$ $lc = 2 * ((\frac{6}{2} - 1) * 30 + 25) + 10.0$ $= 180.0$ $lr = 2 * ((\frac{6}{2} - 1) * 30 + 25.15$ $+ 12.7) + 12.8 = 208.5$ $l\ = 208.5$ $15 * d = 15 * 12.0 = 180.0$ $since,\ l \geq 15 * d$ $then\ V_{rd} = \beta_{ij} * V_{db}$ $\beta_{ij} = 1.075 - 208.5/(200 * 12.0)$ $= 0.99$ $V_{rd} = 0.99 * 25.7 = 25.7$	
Capacity (kN)	22.86	25.7	Pass

2.11 Web Bolt Checks

Check	Required	Provided	Remarks
Shear Capacity (kN)		$V_{dsb} = \frac{f_{ub}\ n_n\ A_{nb}}{\sqrt{3}\ \gamma_{mb}}$ $= \frac{330.0 * 2 * 84.3}{\sqrt{3}\ *\ 1.25}$ $= 25.7$	
Bearing Capacity (kN)		$V_{dpb} = \frac{2.5\ k_b\ d\ t\ f_u}{\gamma_{mb}}$ $= \frac{2.5\ * 0.52 * 12.0 * 12.8 * 410}{1.25}$ $= 65.5$	
Bolt Capacity (kN)		$V_{db} = min\ (V_{dsb}, V_{dpb})$ $= min\ (25.7, 65.5)$ $= 25.7$	
No of Bolts	$R_u = \sqrt{V_u^2 + A_u^2}$ $n_{trial} = R_u / V_{bolt}$ $R_u = \frac{2 * \sqrt{218.35^2 + 189.1^2}}{25.7}$ $= 24$	150	
No of Rows		$n_r = 30$	
No of Columns		$n_c = 5$	
Min. Pitch (mm)	$p/g_{min} = 2.5\ d$ $= 2.5 * 12.0 \quad = 30.0$	30	Pass
Max. Pitch (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 10.0,\ 300\ mm)$ $= 300$ $t = min(10.0, 10.0)$	30	Pass
Min. Gauge (mm)	$p/g_{min} = 2.5\ d$ $= 2.5 * 12.0 \quad = 30.0$	30	Pass
Max. Gauge (mm)	$p/g_{max} = \min(32\ t,\ 300\ mm)$ $= \min(32 *\ 10.0,\ 300\ mm)$ $= 300$ $t = min(10.0, 10.0)$	30	Pass
Min. End Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25	Pass

Check	Required	Provided	Remarks
Max. End Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$   $\varepsilon = \sqrt{\frac{250}{f_y}}$   $e/e`_{max} = 12\ * 10.0 * \sqrt{\frac{250}{250}}$ $= 120.0$	25	Pass
Min. Edge Distance (mm)	$e/e`_{min} = [1.5\ or\ 1.7] * d_0$ $= 1.7 * 13.0 = 22.1$	25	Pass
Max. Edge Distance (mm)	$e/e`_{max} = 12\ t\ \varepsilon$   $\varepsilon = \sqrt{\frac{250}{f_y}}$   $e/e`_{max} = 12\ * 10.0 * \sqrt{\frac{250}{250}}$ $= 120.0$	25	Pass
Parameters required for bolt force (mm)		$l_n = length\ available$ $l_n = g * (n_c - 1)$ $= 30 * (5 - 1)$ $= 120$ $y_{max} = l_n/2$ $= 120/2$ $= 60.0$ $x_{max} = p * (\frac{n_r}{2} - 1)/2$ $= 30 * (\frac{30}{2} - 1)/2$ $= 210.0$	
Moment Demand (kNm		$M_d = (V_u * ecc + M_w)$ $= \frac{(218.35 * 10^3 * 435.0 + 1.95 * 10^6)}{10^6}$ $= 96.94$	

Company Name		Project Title	
Group/Team Name		Subtitle	
Designer		Job Number	
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Check	Required	Provided	Remarks
Bolt.Force		$vbv = V_u/((n_r/2)*n_c)$ $= \frac{218.35}{(5*(30/2))}$ $= 2.91$ $tmh = \frac{M_d * y_{max}}{\Sigma r_i^2}$ $= \frac{96.94*60.0}{1395.0}$ $= 4.17$ $tmv = \frac{M_d * x_{max}}{\Sigma r_i^2}$ $= \frac{96.94*210.0}{1395.0}$ $= 14.59$ $abh = \frac{A_u}{((n_r/2)*n_c)}$ $= \frac{189.1}{(5*(30/2))}$ $= 2.52$ $vres = \sqrt{(vbv+tmv)^2+(tmh+abh)^2}$ $= \sqrt{(2.91+14.59)^2+(4.17+2.52)^2}$ $= 18.74$	
Bolt Capacity post Long Joint (kN)	$if\ l \geq 15*d\ then\ V_{rd} = \beta_{ij}*V_{db}$ $if\ l < 15*d\ then\ V_{rd} = V_{db}$ $where,$ $l = ((nc\ or\ nr)-1)*(p\ or\ g)$ $\beta_{ij} = 1.075 - l/(200*d)$ $but\ 0.75 \leq \beta_{ij} \leq 1.0$	$l = ((nc\ or\ nr)-1)*(p\ or\ g)$ $lc = 2*((\frac{30}{2}-1)*30+25)+10.0$ $= 900.0$ $lr = (5-1)*30 = 120$ $l = 900.0$ $15*d = 15*12.0 = 180.0$ $since,\ l \geq 15*d$ $then\ V_{rd} = \beta_{ij}*V_{db}$ $\beta_{ij} = 1.075 - 900.0/(200*12.0)$ $= 0.75$ $V_{rd} = 0.75*25.7 = 19.27$	
Capacity (kN)	18.74	19.27	Pass

2.12 Inner and Outer flange plate Checks

Check	Required	Provided	Remarks
Min. Plate Height (mm)	$min\ flange\ plate\ ht = beam\ width$ $= 258.8$	258.8	Pass
Min. Plate Length (mm)	$2[2 * e_{min} + (\frac{n_r}{2} - 1) * p_{min})]$ $+ \frac{gap}{2}]$ $= 2 * [(2 * 22.1 + (\frac{6}{2} - 1) * 30.0$ $= + \frac{10.0}{2}]$ $= 218.4$	230.0	Pass
Min. Inner Plate Height (mm)	$= \frac{B - t - (2 * R1)}{2}$ $= \frac{258.8 - 12.8 - 2 * 12.7}{2}$ $= 110$	110	Pass
Max. Inner Plate Height (mm)	$= \frac{B - t - (2 * R1)}{2}$ $= \frac{258.8 - 12.8 - 2 * 12.7}{2}$ $= 110$	110	Pass
Min. Inner Plate Length (mm)	$2[2 * e_{min} + (\frac{n_r}{2} - 1) * p_{min})]$ $+ \frac{gap}{2}]$ $= 2 * [(2 * 22.1 + (\frac{6}{2} - 1) * 30.0$ $= + \frac{10.0}{2}]$ $= 218.4$	230.0	Pass
Min.Plate Thickness (mm)	$T/2 = 10.25$	$t_{ifp} = 12.0$	Pass

2.13 Web Plate Rechecks

Check	Required	Provided	Remarks
Min. Plate Height (mm)	$= 0.6 * D$ $= 0.6 * 266.7$ $= 160.02$	170	Pass
Min. Plate Length (mm)	$2[2 * e_{min} + (\frac{n_r}{2} - 1) * p_{min})]$ $+ \frac{gap}{2}]$ $= 2 * [(2 * 22.1 + (\frac{30}{2} - 1) * 30.0$ $= + \frac{10.0}{2}]$ $= 938.4$	950.0	Pass
Min.Plate Thickness (mm)	$t/2 = 6.4$	$t_{wp} = 10.0$	Pass

2.14 Member Checks

Check	Required	Provided	Remarks
Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 258.8 * 20.5 * 240}{1.1}$ $= 1205.77$	
Tension Rupture Capacity (kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ $= \frac{1 * 0.9 * (258.8 - 6 * 13.0) * 20.5 * 410}{1.25}$ $= 1094.13$	
Block Shear Capacity (kN)		$T_{db1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $T_{db2} = \frac{0.9 * A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $T_{db} = min(T_{db1}, T_{db2}) = 1094.52$	
Flange Tension Capacity (kN)	$F_f = 411.56$	$T_d = min(T_{dg}, T_{dn}, T_{db})$ $= min(1205.77, 1094.13, 1094.52)$ $= 1094.13$	Pass
Web Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 225.7 * 12.8 * 240}{1.1}$ $= 656.58$	
Web Tension Rupture Capacity (kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ $= \frac{1 * 0.9 * (225.7 - 5 * 13.0) * 12.8 * 410}{1.25}$ $= 607.21$	
Block Shear Capacity (kN)		$T_{db1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $T_{db2} = \frac{0.9 * A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $T_{db} = min(T_{db1}, T_{db2}) = 1846.22$	
Web Tension Capacity (kN)	$A_w = 189.1$	$T_d = min(T_{dg}, T_{dn}, T_{db})$ $= min(656.58, 607.21, 1846.22)$ $= 607.21$	Pass

2.15 Flange Plate Capacity Checks in axial-Outside/Inside

Check	Required	Provided	Remarks
Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{1 * 478.8 * 12.0 * 250}{1.1}$ $= 1305.82$	
Tension Rupture Capacity (kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ $= \frac{1 * 0.9 * (478.8 - 6 * 13.0) * 12.0 * 410}{1.25}$ $= 1419.79$	
Block Shear Capacity (kN)		$T_{db1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $T_{db2} = \frac{0.9 * A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $T_{db} = min(T_{db1}, T_{db2}) = 1416.71$	
Plate Tension Capacity (kN)	$F_f = 411.56$	$T_d = min(T_{dg}, T_{dn}, T_{db})$ $= min(1305.82, 1419.79, 1416.71)$ $= 1305.82$	Pass

2.16 Web Plate Capacity Checks in Axial

Check	Required	Provided	Remarks
Tension Yielding Capacity (kN)		$T_{dg} = \frac{l * t * f_y}{\gamma_{mo}}$ $= \frac{2 * 170 * 10.0 * 250}{1.1}$ $= 772.73$	
Tension Rupture Capacity (kN)		$T_{dn} = \frac{0.9 * A_n * f_u}{\gamma_{m1}}$ $= \frac{2 * 0.9 * (170 - 5 * 13.0) * 10.0 * 410}{1.25}$ $= 619.92$	
Block Shear Capacity (kN)		$T_{db1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $T_{db2} = \frac{0.9 * A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $T_{db} = min(T_{db1}, T_{db2}) = 2884.72$	
Web Plate Tension Capacity (kN)	$A_w = 189.1$	$T_d = min(T_{dg}, T_{dn}, T_{db})$ $= min(772.73, 619.92, 2884.72)$ $= 619.92$	Pass

2.17 Web Plate Capacity Checks in Shear

Check	Required	Provided	Remarks
Shear Yielding Capacity (kN)		$V_{dy} = \frac{A_v * f_y}{\sqrt{3} * \gamma_{mo}}$ $= \frac{2 * 170 * 10.0 * 250}{\sqrt{3} * 1.1}$ $= 446.13$	
Shear Rupture Capacity (kN)		$V_{dn} = \frac{0.9 * A_{vn} * f_u}{\sqrt{3} * \gamma_{m1}}$ $= \frac{2 * 0.9 * (170 - (5 * 13.0)) * 10.0 * 410}{\sqrt{3} * 1.25}$ $= 357.91$	
Block Shear Capacity (kN)		$V_{db1} = \frac{A_{vg} f_y}{\sqrt{3}\gamma_{m0}} + \frac{0.9 A_{tn} f_u}{\gamma_{m1}}$ $V_{db2} = \frac{0.9 * A_{vn} f_u}{\sqrt{3}\gamma_{m1}} + \frac{A_{tg} f_y}{\gamma_{m0}}$ $V_{db} = min(V_{db1}, V_{db2}) = 2317.58$	
Web Plate Shear Capacity (kN)	$V_u = 218.35$	$V_d = min(V_{dy}, V_{dn}, V_{db})$ $= min(446.13, 357.91, 2317.58)$ $= 357.91$	Pass