<u>Design Calculation Sheet for Path</u>

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Location:

City:

Country: lwelw

Date: 2020-06-26 06:44:05

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Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
6	(6,0,3)	(6,5,3)	5	1.11	0.89
3	(0,0,3)	(0,5,3)	5	1.11	0.89

Design Limit state:

Combo: 1*Dead + 1*Live

Md: 1.11 t.m

Vd: 0.89 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.2 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 23.92 < 81.98 => Compact Web

c/tf= 3.95 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 94.24 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

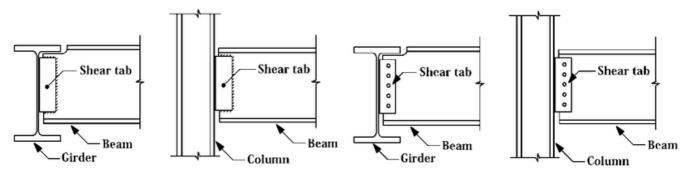fact= 1.44 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.14 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.43 cm < dall= 1.67 cm

Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 0.89 ton

Rleast= 2.85 ton

N= 3 with Pitch= 63 mm & Full Layout: (31;63 63 31.5)

2-Stresses Induced in Fillet Weld Lines at Plane(1-1)

$f = 0.06$ t/cm^2 & $q = 0.04$ t/cm^2 => $f_{eq} = (f^2 + 3q^2)^{0.5} = 0.09$ t/cm^2 < 1.1 * 0.2Fu = 0.79 t/cm^2 => OK

3-Stresses Induced in Fillet Weld Lines at Plane(2-2)

$q = 0.04$ t/cm^2 & $q_{mt} = 0.06$ t/cm^2 => $q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.07$ t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

$f = (6*Vd*e)/(tp*L^2) = 0.07$ t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 189 mm & tp = 10 mm & Sw = 6 mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
5	(4,0,3)	(4,5,3)	5	2.21	1.76
4	(2,0,3)	(2,5,3)	5	2.21	1.76

Design Limit state:

Combo: 1*Dead + 1*Live

Md: 2.21 t.m

Vd: 1.76 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.4 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 27.93 < 81.98 => Compact Web

c/tf= 4.36 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 117.48 m => Supported (No LTB)
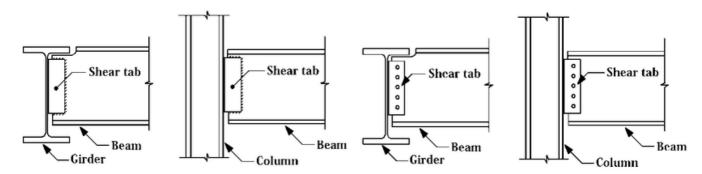
3-Check Bending Stress

Section: IPE270

fact= 1.51 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.19 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.17 cm < dall= 1.67 cm

Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.76 ton

Rleast= 2.85 ton

N= 3 with Pitch= 63 mm & Full Layout: (31;63 63 31.5)

2-Stresses Induced in Fillet Weld Lines at Plane(1-1)

f = 0.12 t/cm^2 & q = 0.08 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.19 t/cm^2 < 1.1 * 0.2Fu = 0.79 t/cm^2 => OK

3-Stresses Induced in Fillet Weld Lines at Plane(2-2)

q = 0.08 t/cm^2 & qmt = 0.12 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.15 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.15 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 189 mm & tp = 10 mm & Sw = 6 mm

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
2	(0,5,3)	(6,5,3)	6	3.56	1.78
1	(0,0,3)	(6,0,3)	6	3.56	1.78

Design Limit state:

Combo: 1*Dead + 1*Live

Md: 3.56 t.m

Vd: 1.78 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.33 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 31.06 < 81.98 => Compact Web

c/tf= 4.66 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 142.01 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

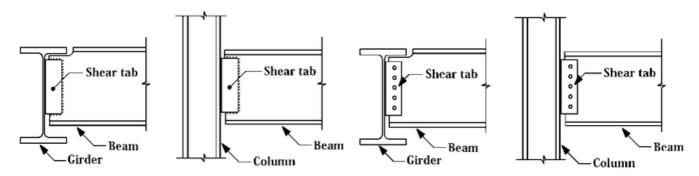fact= 1.41 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.14 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.97 cm < dall= 2 cm

Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.78 ton

Rleast= 2.85 ton

N= 3 with Pitch= 63 mm & Full Layout: (31;63 63 31.5)

2-Stresses Induced in Fillet Weld Lines at Plane(1-1)

$f = 0.12$ t/cm^2 & $q = 0.08$ t/cm^2 => $feq = (f^2 + 3q^2)^{0.5} = 0.19$ t/cm^2 < 1.1 * 0.2Fu = 0.79 t/cm^2 => OK

3-Stresses Induced in Fillet Weld Lines at Plane(2-2)

$q = 0.08$ t/cm^2 & $qmt = 0.12$ t/cm^2 => $qres = (q^2 + qmt^2)^{0.5} = 0.15$ t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

$f = (6*Vd*e)/(tp*L^2) = 0.15$ t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 189 mm & tp = 10 mm & Sw = 6 mm

Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
7	(0,0,0)	(0,0,3)	3	-2.69
8	(6,0,0)	(6,0,3)	3	-2.69
9	(0,5,0)	(0,5,3)	3	-2.69
10	(6,5,0)	(6,5,3)	3	-2.69

Design Limit state:

Combo: 1*Dead + 1*Live

Nd: -2.69 ton

1-Check Local Buckling

dw/tw= 26.08 < 37.44 => Compact Web

c/tf= 4.21 < 10.91 => Compact Flange

2-Check Normal Stress

Section: IPE160

lambda = 163.04 > 100

fc= 0.13 t/cm^2 < Fc= 0.28 t/cm^2