Design Calculation Sheet for me

Designer: er

Location: ion

City: ty

Country: ry

Date: 2020-06-20 10:06:55

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
7	(20,0,6)	(20,4,6)	4	0.04	0.04

Design Limit state:

Combo: D+L

Md: 0.04 t.m

Vd: 0.04 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: 0 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 15.58 < 81.98 => Compact Web

c/tf= 3.06 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 59.39 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

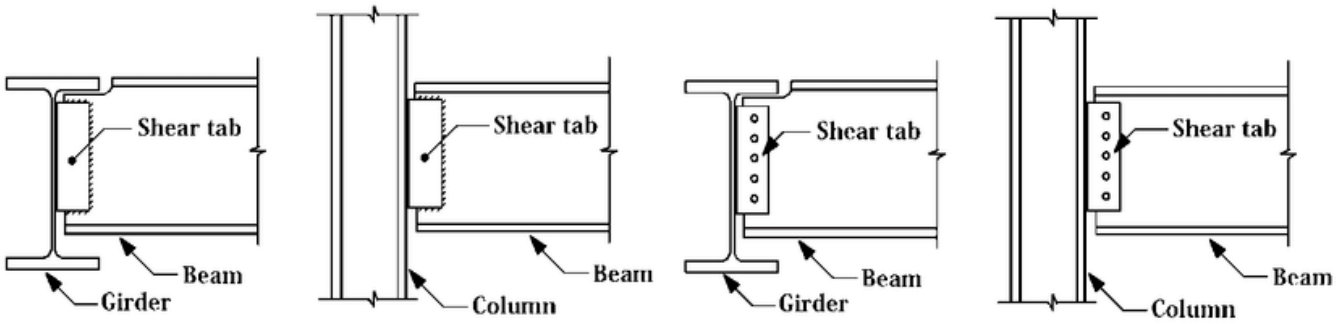
fact= 0.22 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.01 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 0.04 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 t/cm^2 & q = 0 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0 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 t/cm^2 & qmt = 0 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0 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)
8	(20,4,6)	(20,8,6)	4	1.54	1.54
1	(0,0,6)	(0,4,6)	4	1.54	1.54

Design Limit state:

Combo: D+L

Md: 1.54 t.m

Vd: 1.54 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -0.5 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 26.08 < 81.98 => Compact Web

c/tf= 4.21 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 105.86 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

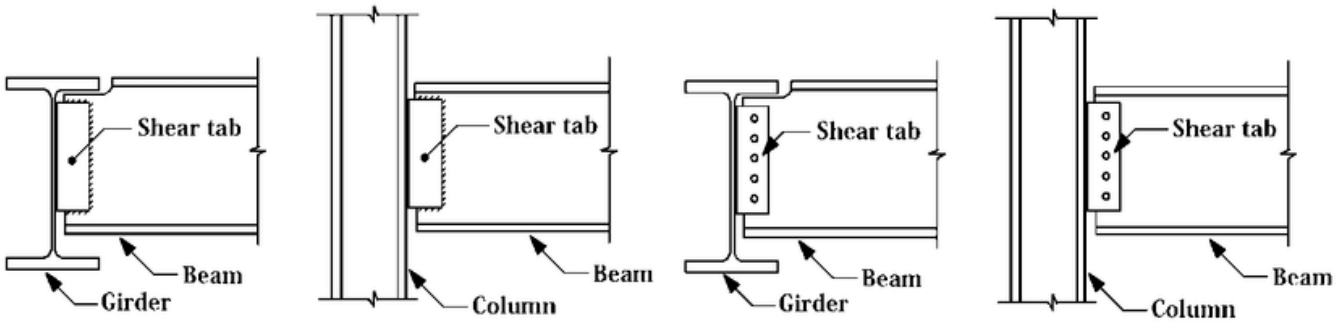
fact= 1.42 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.91 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.54 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 = 0.11 t/cm^2 & q = 0.07 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.16 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 = 0.07 t/cm^2 & qmt = 0.11 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.13 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.13 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)
14	(10,3,6)	(14,3,6)	4	3.04	3.04
12	(6,2,6)	(10,2,6)	4	3.04	3.04
11	(8,7,6)	(12,7,6)	4	3.04	3.04
10	(8,5,6)	(12,5,6)	4	3.04	3.04
6	(18,4,6)	(18,8,6)	4	3.04	3.04
5	(16,4,6)	(16,8,6)	4	3.04	3.04
4	(14,4,6)	(14,8,6)	4	3.04	3.04
3	(4,0,6)	(4,4,6)	4	3.04	3.04
2	(2,0,6)	(2,4,6)	4	3.04	3.04
13	(10,1,6)	(14,1,6)	4	3.18	3.18

Design Limit state:

Combo: D+L

Md: 3.18 t.m

Vd: 3.18 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -1 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

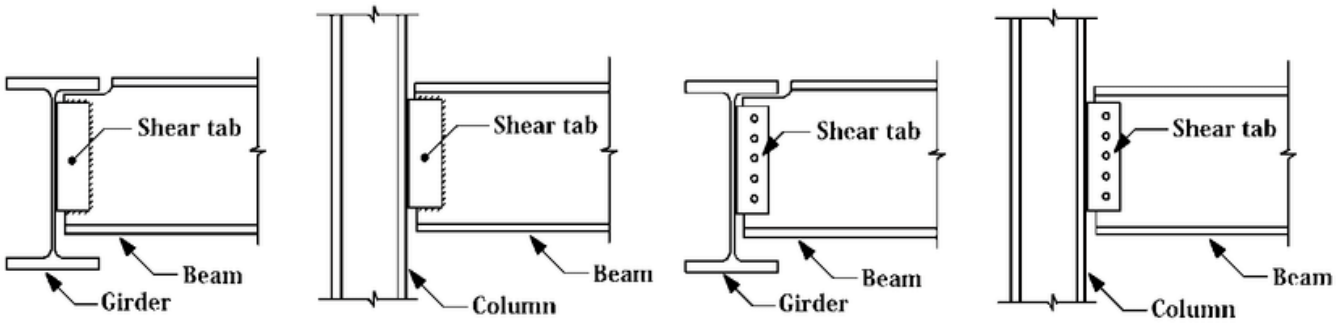
fact= 1.26 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.25 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.57 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.18 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 = 0.22 t/cm^2 & q = 0.14 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.34 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 = 0.14 t/cm^2 & qmt = 0.22 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.27 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.27 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)

9	(0,6,6)	(6,6,6)	6	6.91	4.61

Design Limit state:

Combo: D+L

Md: 6.91 t.m

Vd: 4.61 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -1 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 36.23 < 81.98 => Compact Web

c/tf= 5.68 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 193.65 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE300

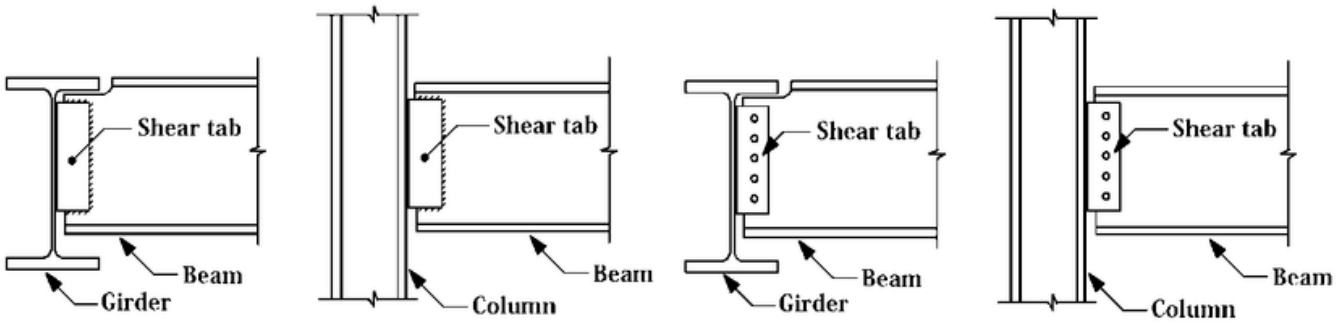
fact= 1.24 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.22 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.96 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 4.61 ton

Rleast= 3.07 ton

N= 3 with Pitch= 70 mm & Full Layout: (35;70 70 35)

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

f = 0.26 t/cm^2 & q = 0.18 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.41 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 = 0.18 t/cm^2 & qmt = 0.26 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.32 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.31 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 210 mm & tp = 10 mm & Sw = 6 mm

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
10	(14,0,6)	(20,0,6)	6	0.16	0.11

Design Limit state:

Combo: D+L

Md: 0.16 t.m

Vd: 0.11 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: 0 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 15.58 < 81.98 => Compact Web

c/tf= 3.06 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 59.39 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

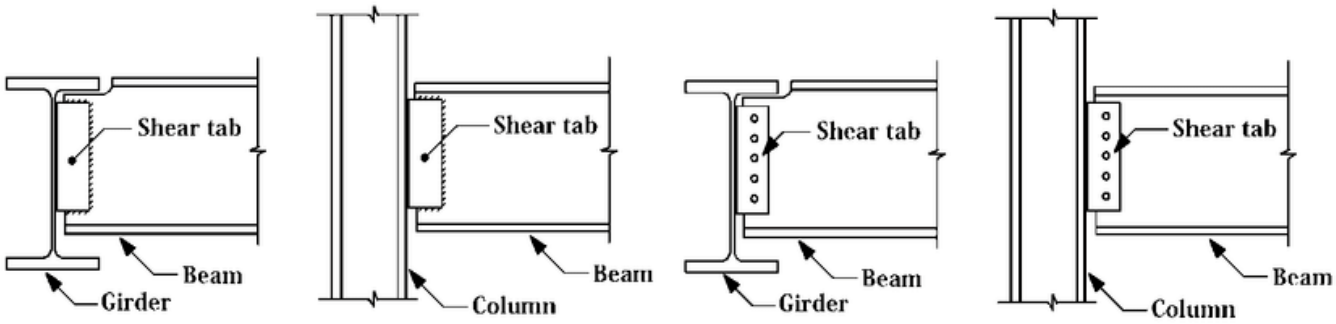
fact= 0.81 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.04 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 0.11 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 = 0.01 t/cm^2 & q = 0 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.01 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 t/cm^2 & qmt = 0.01 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.01 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.01 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)
3	(6,0,6)	(6,4,6)	4	3.09	1.57
1	(14,0,6)	(14,4,6)	4	3.18	3.19
14	(0,8,6)	(6,8,6)	6	3.54	2.36
5	(8,4,6)	(8,8,6)	4	4.59	4.59
4	(12,4,6)	(12,8,6)	4	4.59	4.59

Design Limit state:

Combo: D+L

Md: 4.59 t.m

Vd: 4.59 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.5 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 32.39 < 81.98 => Compact Web

c/tf= 4.81 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 154.92 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

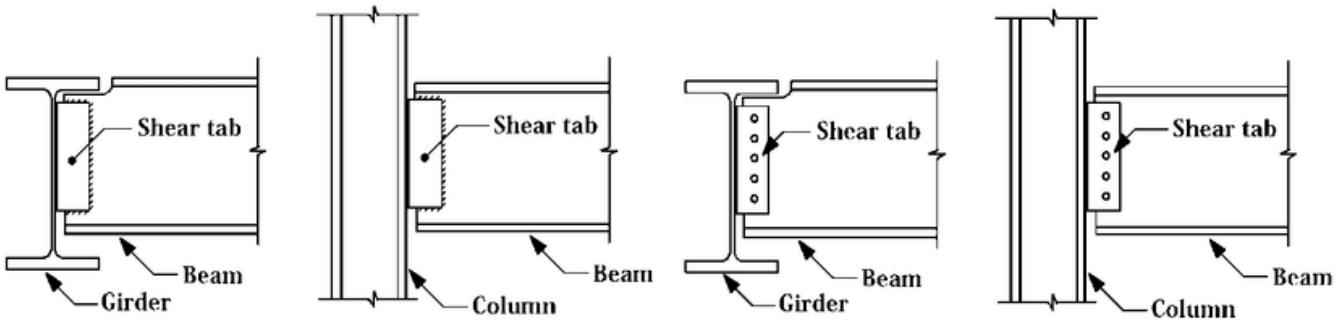
fact= 1.42 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.31 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.03 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 4.59 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 = 0.32 t/cm^2 & q = 0.21 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.48 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 = 0.21 t/cm^2 & qmt = 0.32 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.38 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.39 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)
7	(0,4,6)	(0,8,6)	4	4.65	2.35
6	(6,4,6)	(6,8,6)	4	6.15	3.85
2	(10,0,6)	(10,4,6)	4	6.2	4.71
16	(14,8,6)	(20,8,6)	6	6.25	3.15
13	(14,4,6)	(20,4,6)	6	6.25	3.15
8	(0,0,6)	(6,0,6)	6	6.25	3.15

Design Limit state:

Combo: D+L

Md: 6.25 t.m

Vd: 3.15 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.67 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 34.73 < 81.98 => Compact Web

c/tf= 5.3 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 174.28 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

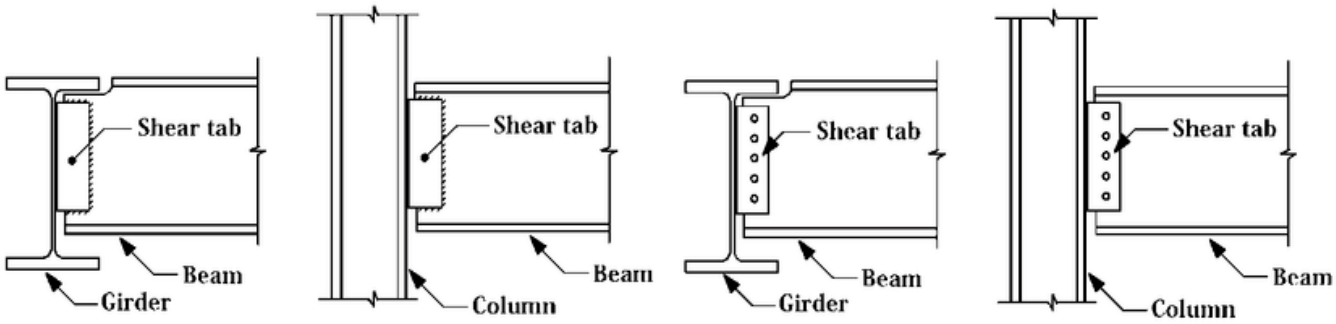
fact= 1.46 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.18 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.93 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.15 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 = 0.22 t/cm^2 & q = 0.14 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.33 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 = 0.14 t/cm^2 & qmt = 0.22 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.26 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.26 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)
15	(6,8,6)	(14,8,6)	8	9.47	4.73
11	(0,4,6)	(6,4,6)	6	9.63	5.4
9	(6,0,6)	(14,0,6)	8	9.72	2.5

Design Limit state:

Combo: D+L

Md: 9.72 t.m

Vd: 2.5 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.75 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 37.87 < 81.98 => Compact Web

c/tf= 5.64 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 206.56 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE330

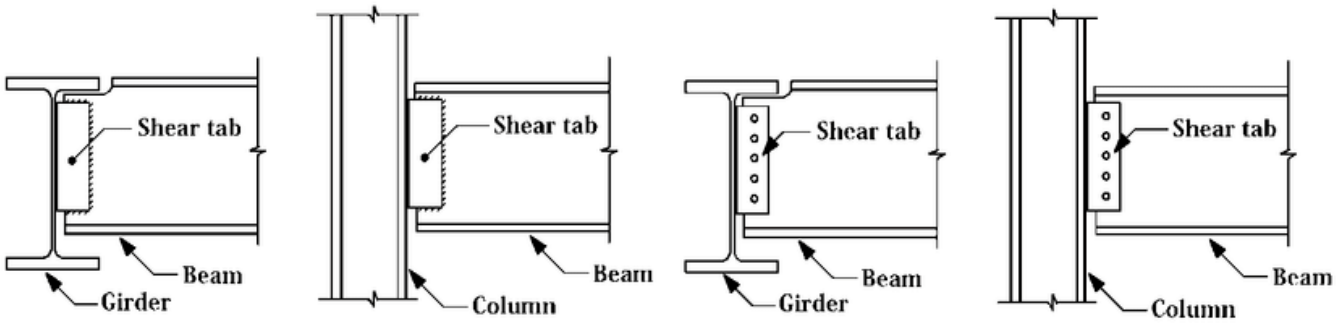
fact= 1.36 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.1 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.62 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.5 ton

Rleast= 3.24 ton

N= 3 with Pitch= 77 mm & Full Layout: (38;77 77 38.5)

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

f = 0.12 t/cm^2 & q = 0.09 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.2 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 = 0.09 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) = 0.14 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 231 mm & tp = 10 mm & Sw = 6 mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
12	(6,4,6)	(14,4,6)	8	18.76	7.06

Design Limit state:

Combo: D+L

Md: 18.76 t.m

Vd: 7.06 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -1.12 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 41.66 < 81.98 => Compact Web

c/tf= 5.19 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 245.29 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE450

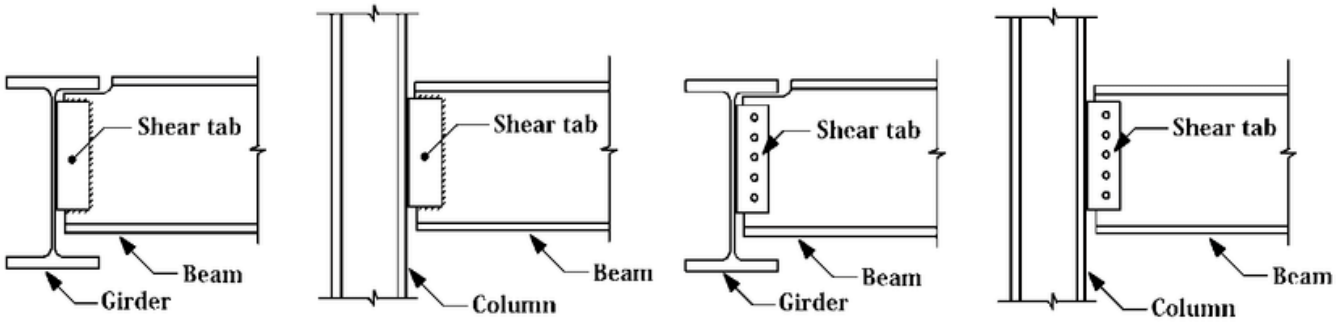
fact= 1.25 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.17 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.85 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 7.06 ton

Rleast= 4.06 ton

N= 3 with Pitch= 105 mm & Full Layout: (52;105 105 52.5)

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

f = 0.18 t/cm^2 & q = 0.19 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.38 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 = 0.19 t/cm^2 & qmt = 0.18 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.26 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.21 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 315 mm & tp = 10 mm & Sw = 6 mm

Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
6	(6,4,0)	(6,4,6)	6	-18.13
7	(14,4,0)	(14,4,6)	6	-16.63
10	(6,8,0)	(6,8,6)	6	-11.19
11	(14,8,0)	(14,8,6)	6	-11.19
5	(0,4,0)	(0,4,6)	6	-9.55
2	(6,0,0)	(6,0,6)	6	-7.48

3	(14,0,0)	(14,0,6)	6	-6.06
8	(20,4,0)	(20,4,6)	6	-5
9	(0,8,0)	(0,8,6)	6	-4.96
12	(20,8,0)	(20,8,6)	6	-4.95
1	(0,0,0)	(0,0,6)	6	-4.95
4	(20,0,0)	(20,0,6)	6	-0.41

Design Limit state:

Combo: D+L

Nd: -18.13 ton

1-Check Local Buckling

dw/tw= 36.23 < 37.44 => Compact Web

c/tf= 5.68 < 10.91 => Compact Flange

2-Check Normal Stress

Section: IPE300

lambda = 179.1 > 100

fc= 0.34 t/cm^2 < Fc= 0.23 t/cm^2
