Design Calculation Sheet for ITIFinal02

Designer: abc

Location: mansoura

City: giza

Country: giza

Date: 2020-06-20 10:05:46

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
9	(20,4,6)	(20,8,6)	4	0.04	0.04
8	(20,0,6)	(20,4,6)	4	0.04	0.04
5	(14,0,6)	(14,4,6)	4	0.04	0.04
4	(6,0,6)	(6,4,6)	4	0.04	0.04
1	(0,0,6)	(0,4,6)	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

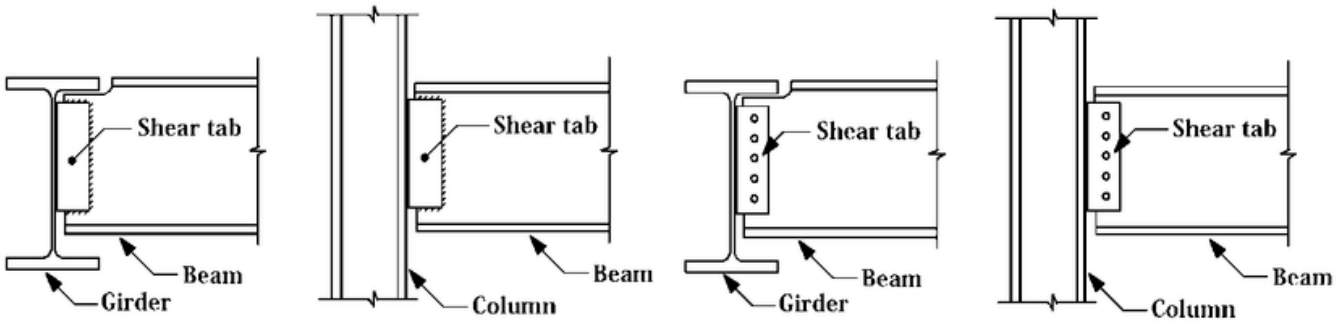
fact= 0.22 t/cm^2 < Fb= 1.54 t/cm^2

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)
15	(8,3,6)	(12,3,6)	4	2.04	2.04
14	(8,1,6)	(12,1,6)	4	2.04	2.04
13	(10,7,6)	(14,7,6)	4	2.04	2.04
12	(10,5,6)	(14,5,6)	4	2.04	2.04
11	(6,6,6)	(10,6,6)	4	2.04	2.04
7	(18,4,6)	(18,8,6)	4	2.04	2.04
6	(16,4,6)	(16,8,6)	4	2.04	2.04
3	(4,0,6)	(4,4,6)	4	2.04	2.04
2	(2,0,6)	(2,4,6)	4	2.04	2.04

Design Limit state:

Combo: D+L

Md: 2.04 t.m

Vd: 2.04 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -1 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

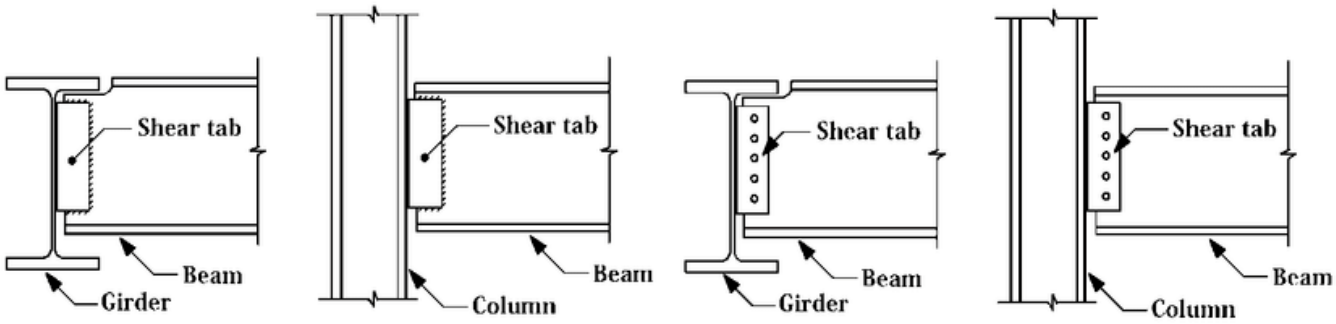
fact= 1.4 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.21 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.2 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.04 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 = 0.14 t/cm^2 & q = 0.09 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.22 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 = 0.14 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.17 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.17 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)
10	(0,6,6)	(6,6,6)	6	4.66	3.11

Design Limit state:

Combo: D+L

Md: 4.66 t.m

Vd: 3.11 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -1 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

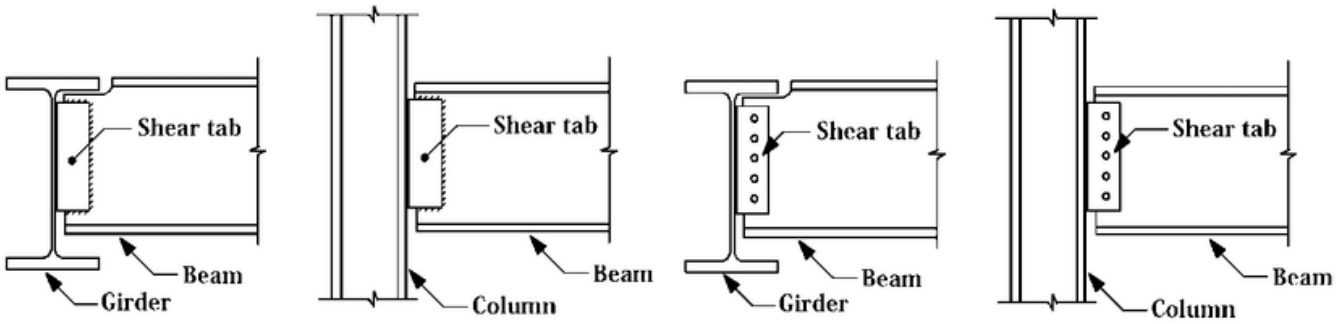
fact= 1.09 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.39 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.11 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 = 0.22 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

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
13	(0,8,6)	(6,8,6)	6	0.16	0.11
9	(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

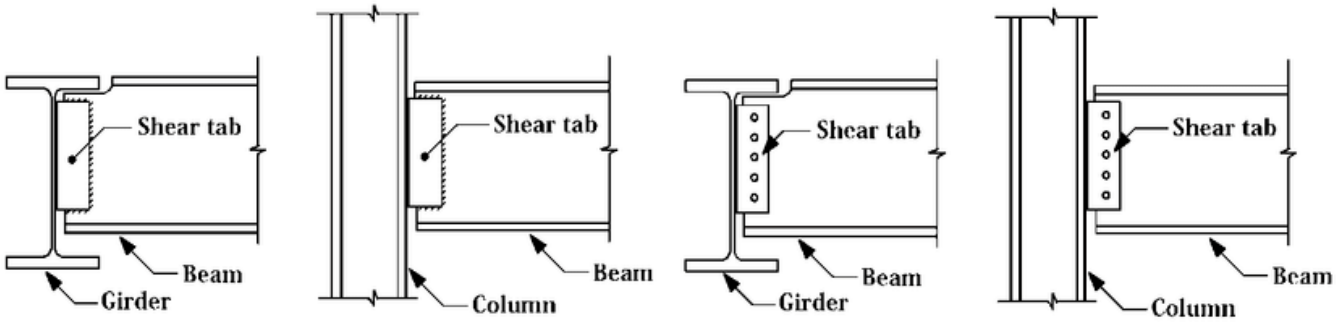
fact= 0.81 t/cm^2 < Fb= 1.54 t/cm^2

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	(14,4,6)	(14,8,6)	4	2.09	2.09
2	(8,0,6)	(8,4,6)	4	2.09	2.09
1	(12,0,6)	(12,4,6)	4	2.09	2.09

Design Limit state:

Combo: D+L

Md: 2.09 t.m

Vd: 2.09 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -1 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 29.65 < 81.98 => Compact Web

c/tf= 4.56 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 129.1 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE270

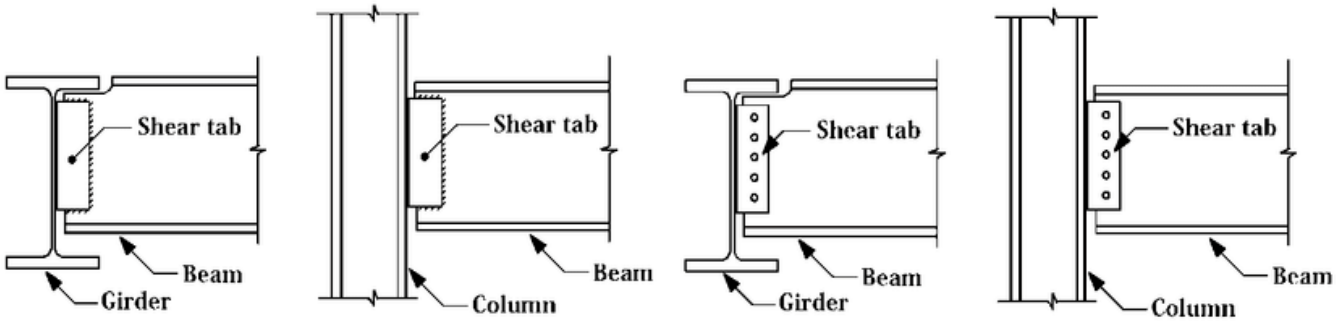
fact= 1.08 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.82 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.09 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 = 0.15 t/cm^2 & q = 0.09 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.22 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 = 0.15 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.17 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.18 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)
6	(0,4,6)	(0,8,6)	4	3.15	1.6
4	(10,4,6)	(10,8,6)	4	4.13	3.11
15	(14,8,6)	(20,8,6)	6	4.25	2.15
12	(14,4,6)	(20,4,6)	6	4.25	2.15
10	(0,4,6)	(6,4,6)	6	4.25	2.15
7	(0,0,6)	(6,0,6)	6	4.25	2.15
8	(6,0,6)	(14,0,6)	8	4.47	2.23

Design Limit state:

Combo: D+L

Md: 4.47 t.m

Vd: 2.23 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.5 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

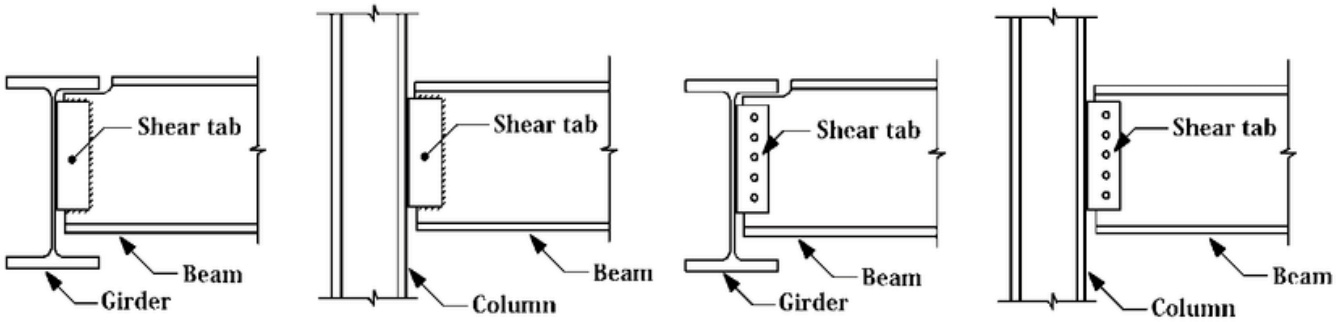
fact= 1.04 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.13 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 2.19 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.23 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 = 0.16 t/cm^2 & q = 0.1 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.24 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 = 0.1 t/cm^2 & qmt = 0.16 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.19 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.19 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	(6,4,6)	(6,8,6)	4	5.2	2.62
14	(6,8,6)	(14,8,6)	8	6.51	1.7

Design Limit state:

Combo: D+L

Md: 6.51 t.m

Vd: 1.7 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.38 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

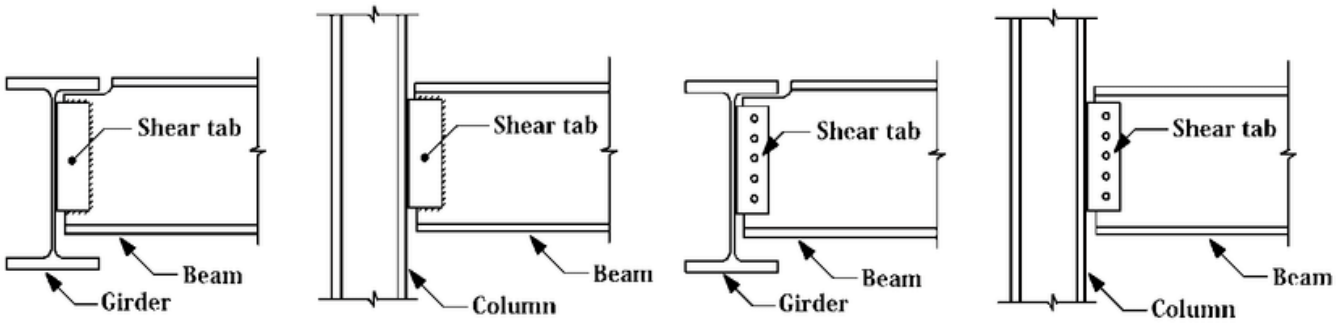
fact= 1.52 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.64 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.7 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 = 0.18 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 = 0.14 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 = 189 mm & tp = 10 mm & Sw = 6 mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
11	(6,4,6)	(14,4,6)	8	10.69	3.79

Design Limit state:

Combo: D+L

Md: 10.69 t.m

Vd: 3.79 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.88 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

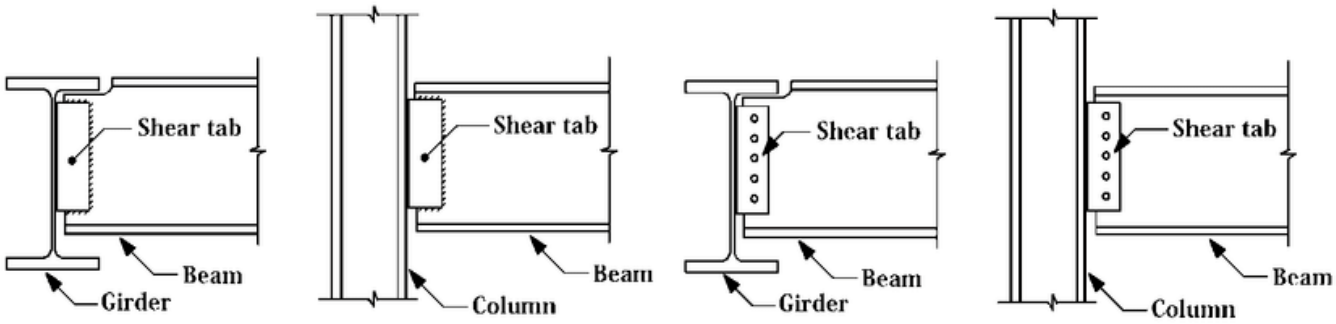
fact= 1.5 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.15 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.89 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.79 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 = 0.18 t/cm^2 & q = 0.14 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.3 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 = 0.18 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.23 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 = 231 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	-8.86
7	(14,4,0)	(14,4,6)	6	-8.33
11	(14,8,0)	(14,8,6)	6	-6.2
2	(6,0,0)	(6,0,6)	6	-4.69
10	(6,8,0)	(6,8,6)	6	-4.68
5	(0,4,0)	(0,4,6)	6	-4.05
1	(0,0,0)	(0,0,6)	6	-3.45
3	(14,0,0)	(14,0,6)	6	-2.64
8	(20,4,0)	(20,4,6)	6	-2.5
12	(20,8,0)	(20,8,6)	6	-2.45
9	(0,8,0)	(0,8,6)	6	-1.96
4	(20,0,0)	(20,0,6)	6	-0.41

Design Limit state:

Combo: D+L

Nd: -8.86 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= 0.16 t/cm^2 < Fc= 0.23 t/cm^2
