Design Calculation Sheet for sdss

Designer:

Location:

City:

Country:

Date: 2020-06-21 08:41:00

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
45	(23.7,10,3)	(23.7,15,3)	5	0.87	0.7
44	(23.7,5,3)	(23.7,10,3)	5	0.87	0.7
43	(23.7,0,3)	(23.7,5,3)	5	0.87	0.7
2	(0,5,3)	(0,10,3)	5	0.99	0.79
3	(0,10,3)	(0,15,3)	5	0.99	0.79
1	(0,0,3)	(0,5,3)	5	0.99	0.79

Design Limit state:

Combo: D+L

Md: 0.99 t.m

Vd: 0.79 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.16 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

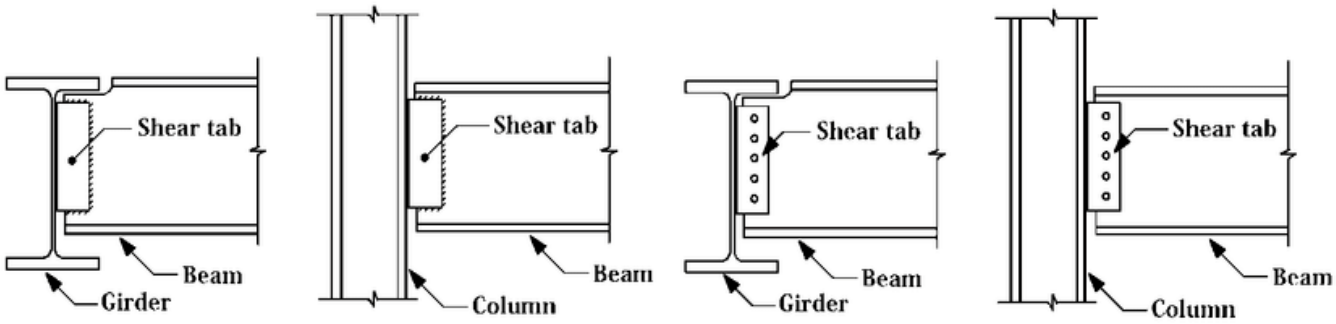
fact= 1.28 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.12 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.16 cm < dall= 1.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 0.79 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 => feq = (f^2 + 3q^2)^0.5 = 0.08 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 & qmt = 0.06 t/cm^2 => qres = (q^2 + qmt^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)
39	(21.1,10,3)	(21.1,15,3)	5	1.64	1.31
37	(21.1,0,3)	(21.1,5,3)	5	1.64	1.31
36	(19.8,10,3)	(19.8,15,3)	5	1.64	1.31
35	(19.8,5,3)	(19.8,10,3)	5	1.64	1.31
34	(19.8,0,3)	(19.8,5,3)	5	1.64	1.31
38	(21.1,5,3)	(21.1,10,3)	5	1.64	1.31
40	(22.4,0,3)	(22.4,5,3)	5	1.64	1.31
42	(22.4,10,3)	(22.4,15,3)	5	1.64	1.31
41	(22.4,5,3)	(22.4,10,3)	5	1.64	1.31

6	(1.5,10,3)	(1.5,15,3)	5	1.87	1.5
9	(3,10,3)	(3,15,3)	5	1.87	1.5
8	(3,5,3)	(3,10,3)	5	1.87	1.5
7	(3,0,3)	(3,5,3)	5	1.87	1.5
5	(1.5,5,3)	(1.5,10,3)	5	1.87	1.5
4	(1.5,0,3)	(1.5,5,3)	5	1.87	1.5
31	(18.5,0,3)	(18.5,5,3)	5	2.05	1.64
32	(18.5,5,3)	(18.5,10,3)	5	2.05	1.64
33	(18.5,10,3)	(18.5,15,3)	5	2.05	1.64
10	(4.5,0,3)	(4.5,5,3)	5	2.16	1.73
11	(4.5,5,3)	(4.5,10,3)	5	2.16	1.73
12	(4.5,10,3)	(4.5,15,3)	5	2.16	1.73

Design Limit state:

Combo: D+L

Md: 2.16 t.m

Vd: 1.73 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.32 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

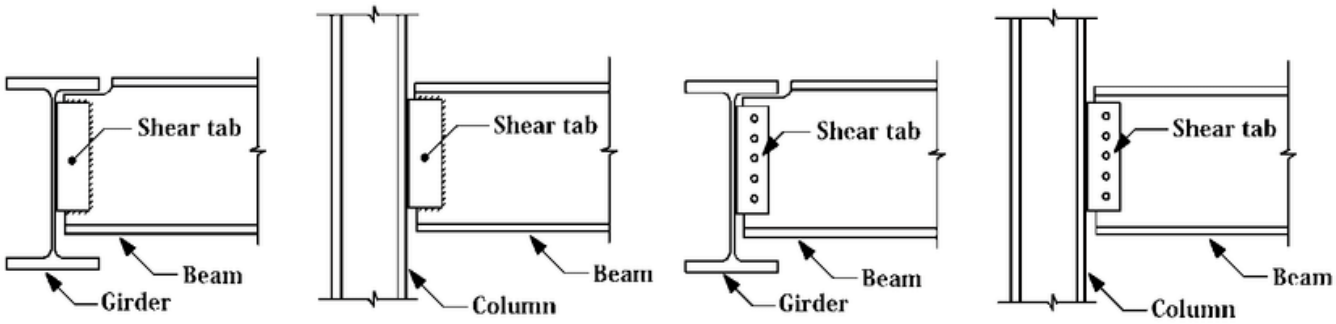
fact= 1.12 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.65 cm < dall= 1.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.73 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) = 0.15 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	(6.5,10,3)	(6.5,15,3)	5	2.46	1.97
13	(6.5,0,3)	(6.5,5,3)	5	2.46	1.97
14	(6.5,5,3)	(6.5,10,3)	5	2.46	1.97
20	(10.5,5,3)	(10.5,10,3)	5	2.46	1.97
16	(8.5,0,3)	(8.5,5,3)	5	2.46	1.97
17	(8.5,5,3)	(8.5,10,3)	5	2.46	1.97

18	(8.5,10,3)	(8.5,15,3)	5	2.46	1.97
19	(10.5,0,3)	(10.5,5,3)	5	2.46	1.97
21	(10.5,10,3)	(10.5,15,3)	5	2.46	1.97
22	(12.5,0,3)	(12.5,5,3)	5	2.46	1.97
24	(12.5,10,3)	(12.5,15,3)	5	2.46	1.97
25	(14.5,0,3)	(14.5,5,3)	5	2.46	1.97
26	(14.5,5,3)	(14.5,10,3)	5	2.46	1.97
27	(14.5,10,3)	(14.5,15,3)	5	2.46	1.97
28	(16.5,0,3)	(16.5,5,3)	5	2.46	1.97
29	(16.5,5,3)	(16.5,10,3)	5	2.46	1.97
30	(16.5,10,3)	(16.5,15,3)	5	2.46	1.97
23	(12.5,5,3)	(12.5,10,3)	5	2.46	1.97

Design Limit state:

Combo: D+L

Md: 2.46 t.m

Vd: 1.97 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.5 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

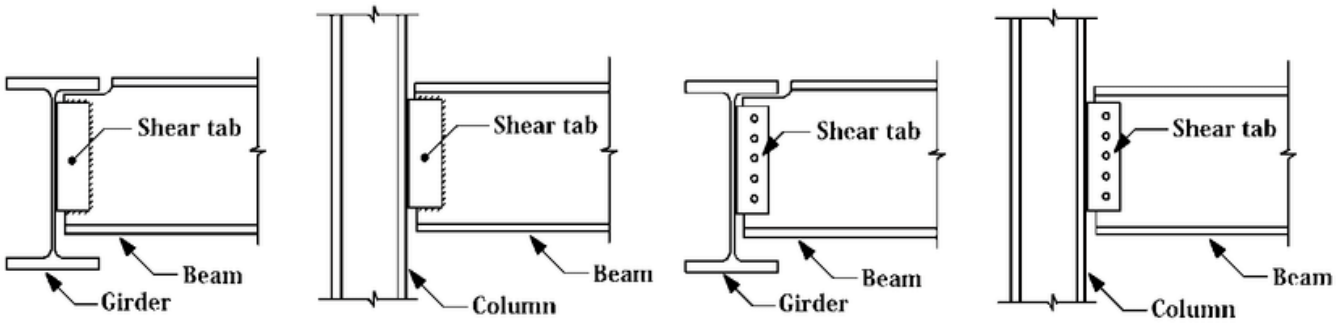
fact= 1.27 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1 cm < dall= 1.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.97 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 = 0.21 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 = 0.16 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

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
13	(0,15,3)	(4.5,15,3)	4.5	2.34	1.58
1	(0,0,3)	(4.5,0,3)	4.5	2.34	1.58

Design Limit state:

Combo: D+L

Md: 2.34 t.m

Vd: 1.58 ton

Service Limit State

Combo: LIVE

Span: 4.5 m

Load: -0.42 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

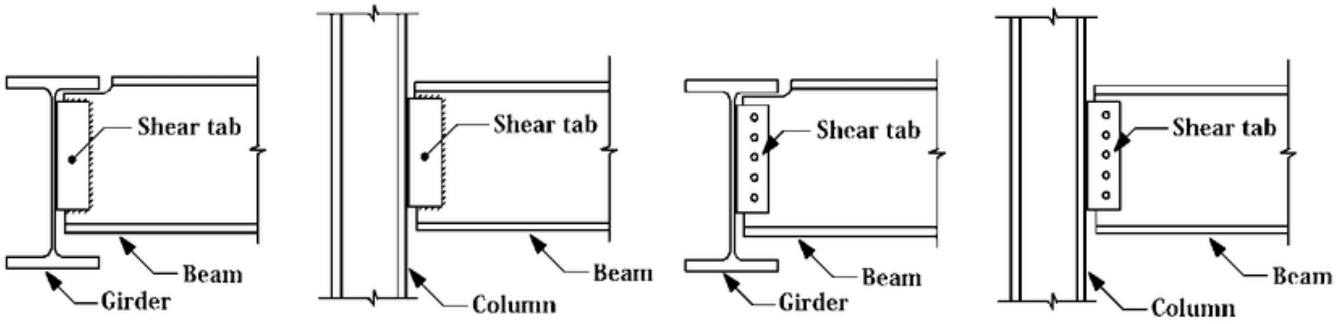
fact= 1.2 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.55 cm < dall= 1.5 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.58 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 = 0.17 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)
16	(18.5,15,3)	(23.7,15,3)	5.2	3.53	2.06
4	(18.5,0,3)	(23.7,0,3)	5.2	3.53	2.06
14	(4.5,15,3)	(10.5,15,3)	6	4.09	2.07
2	(4.5,0,3)	(10.5,0,3)	6	4.09	2.07
9	(0,10,3)	(4.5,10,3)	4.5	4.58	3.07
5	(0,5,3)	(4.5,5,3)	4.5	4.58	3.07

Design Limit state:

Combo: D+L

Md: 4.58 t.m

Vd: 3.07 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.42 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

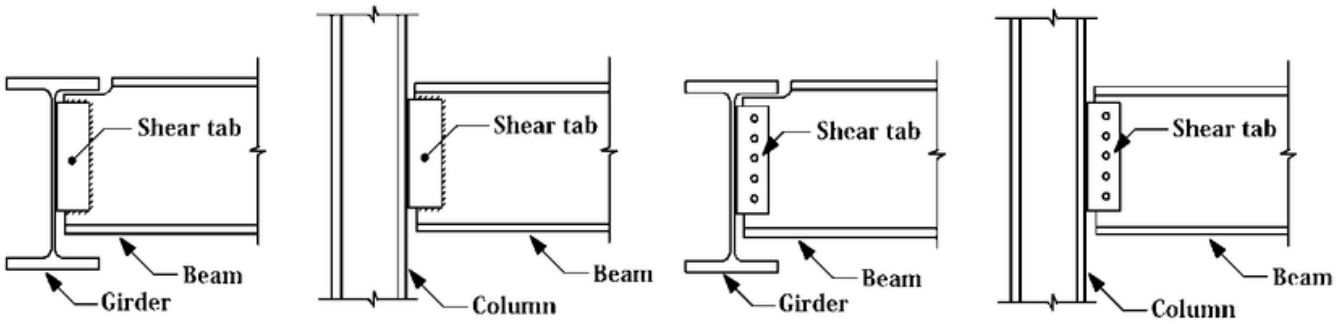
fact= 1.41 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.86 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.07 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 = 0.32 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)

12	(18.5,10,3)	(23.7,10,3)	5.2	6.93	4.02
8	(18.5,5,3)	(23.7,5,3)	5.2	6.93	4.02
10	(4.5,10,3)	(10.5,10,3)	6	8.02	4.04
6	(4.5,5,3)	(10.5,5,3)	6	8.02	4.04
15	(10.5,15,3)	(18.5,15,3)	8	8.15	3.09
3	(10.5,0,3)	(18.5,0,3)	8	8.15	3.09

Design Limit state:

Combo: D+L

Md: 8.15 t.m

Vd: 3.09 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.47 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

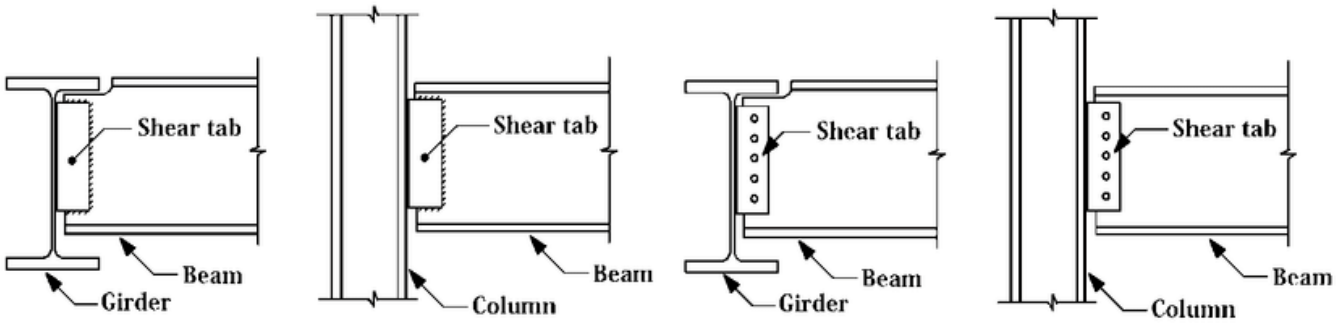
fact= 1.46 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.42 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.09 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 = 0.18 t/cm^2 & q = 0.12 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.28 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 = 0.12 t/cm^2 & qmt = 0.18 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.21 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 = 210 mm & tp = 10 mm & Sw = 6 mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
11	(10.5,10,3)	(18.5,10,3)	8	16.01	6.04
7	(10.5,5,3)	(18.5,5,3)	8	16.01	6.04

Design Limit state:

Combo: D+L

Md: 16.01 t.m

Vd: 6.04 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.94 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 40.24 < 81.98 => Compact Web

c/tf= 5.35 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 232.38 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE400

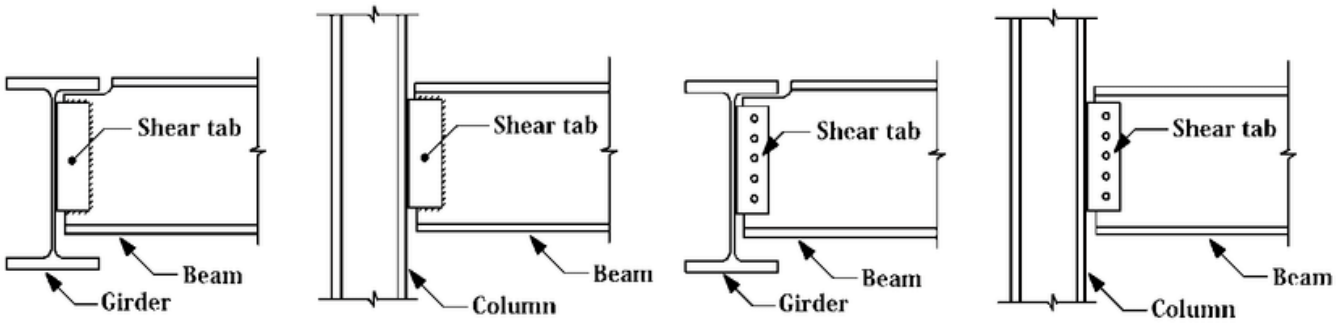
fact= 1.38 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.03 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 6.04 ton

Rleast= 3.72 ton

N= 3 with Pitch= 93 mm & Full Layout: (46;93 93 47.5)

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

f = 0.19 t/cm^2 & q = 0.18 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.37 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 = 0.19 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) = 0.23 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 280 mm & tp = 10 mm & Sw = 6 mm

Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
8	(10.5,5,0)	(10.5,5,3)	3	-14.14
13	(10.5,10,0)	(10.5,10,3)	3	-14.14
9	(18.5,5,0)	(18.5,5,3)	3	-13.46
14	(18.5,10,0)	(18.5,10,3)	3	-13.46
7	(4.5,5,0)	(4.5,5,3)	3	-10.7
12	(4.5,10,0)	(4.5,10,3)	3	-10.7
3	(10.5,0,0)	(10.5,0,3)	3	-7.26
18	(10.5,15,0)	(10.5,15,3)	3	-7.26
4	(18.5,0,0)	(18.5,0,3)	3	-6.91
19	(18.5,15,0)	(18.5,15,3)	3	-6.91
10	(23.7,5,0)	(23.7,5,3)	3	-5.55
15	(23.7,10,0)	(23.7,10,3)	3	-5.55
2	(4.5,0,0)	(4.5,0,3)	3	-5.51
17	(4.5,15,0)	(4.5,15,3)	3	-5.51
6	(0,5,0)	(0,5,3)	3	-4.79
11	(0,10,0)	(0,10,3)	3	-4.79
20	(23.7,15,0)	(23.7,15,3)	3	-2.88
5	(23.7,0,0)	(23.7,0,3)	3	-2.88
16	(0,15,0)	(0,15,3)	3	-2.5
1	(0,0,0)	(0,0,3)	3	-2.5

Design Limit state:

Combo: D+L

Nd: -14.14 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 = 89.55 < 100

fc= 0.26 t/cm^2 < Fc= 0.88 t/cm^2
