Design Calculation Sheet for itiiti

Designer: abc

Location: bvb

City: vbvv

Country: bvb

Date: 2020-06-23 12:00:00

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
1	(0,4,6)	(0,8,6)	4	0.04	0.04
4	(14,0,6)	(14,4,6)	4	0.04	0.04
12	(20,8,6)	(20,12,6)	4	0.04	0.04
11	(20,4,6)	(20,8,6)	4	0.04	0.04
10	(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

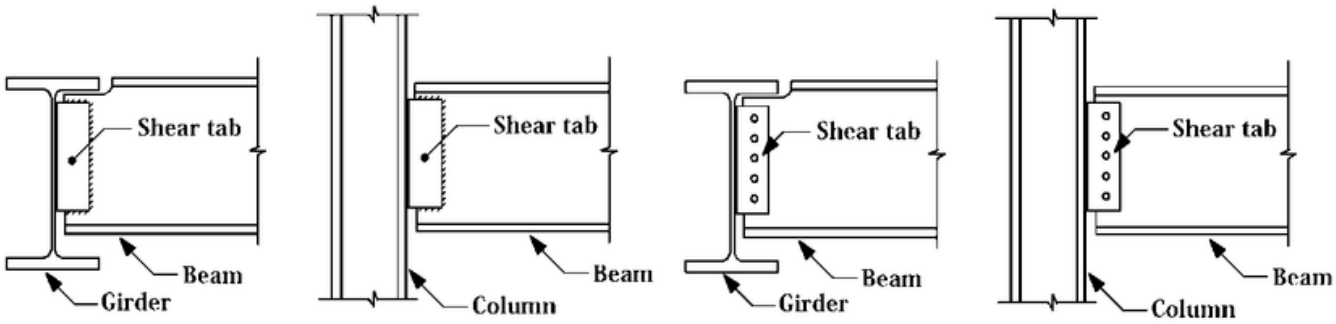
fact= 0.22 t/cm^2 < Fb= 1.54 t/cm^2

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)
7	(16,8,6)	(16,12,6)	4	3.04	3.04
2	(2,4,6)	(2,8,6)	4	3.04	3.04
3	(4,4,6)	(4,8,6)	4	3.04	3.04
5	(14,8,6)	(14,12,6)	4	3.04	3.04
6	(16,0,6)	(16,4,6)	4	3.04	3.04
17	(6,6,6)	(10,6,6)	4	3.04	3.04
8	(18,0,6)	(18,4,6)	4	3.04	3.04
16	(10,7,6)	(14,7,6)	4	3.04	3.04
14	(8,10,6)	(12,10,6)	4	3.04	3.04

15	(10,5,6)	(14,5,6)	4	3.04	3.04
9	(18,8,6)	(18,12,6)	4	3.04	3.04

Design Limit state:

Combo: D+L

Md: 3.04 t.m

Vd: 3.04 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

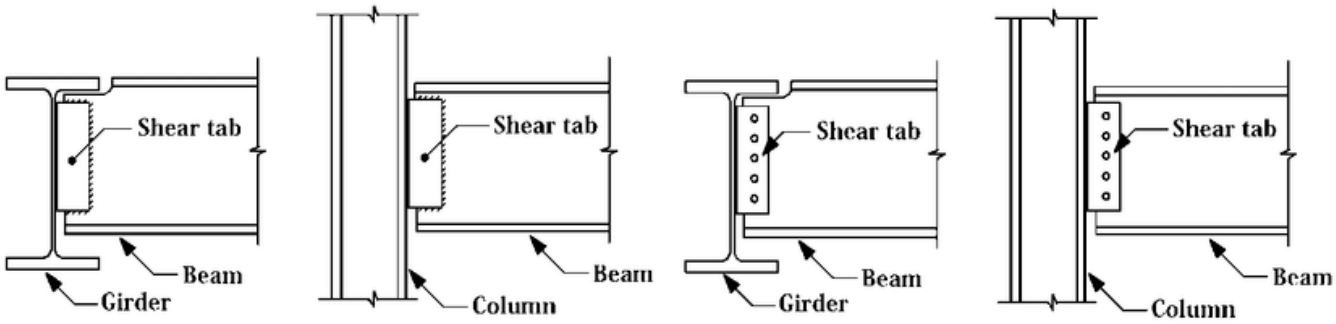
fact= 1.21 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.23 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= 3.04 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 = 0.21 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 = 0.21 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.25 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)
13	(0,10,6)	(6,10,6)	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

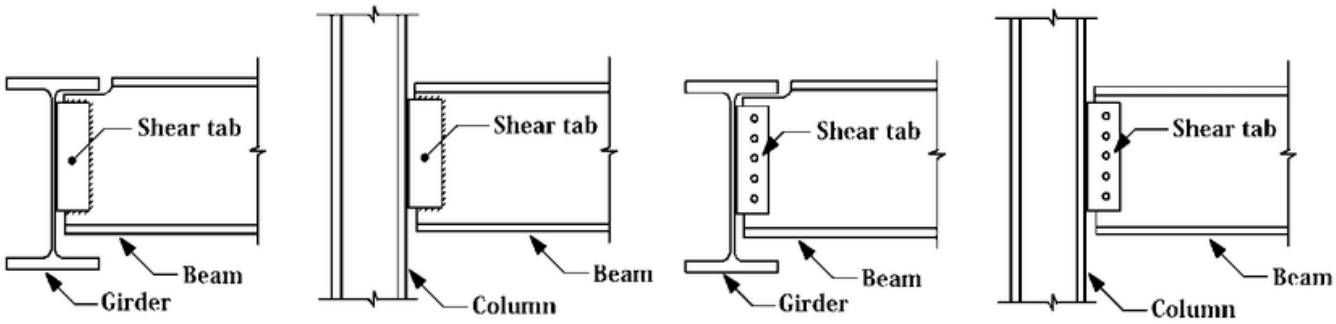
fact= 1.24 t/cm^2 < Fb= 1.54 t/cm^2

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)
15	(0,12,6)	(6,12,6)	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

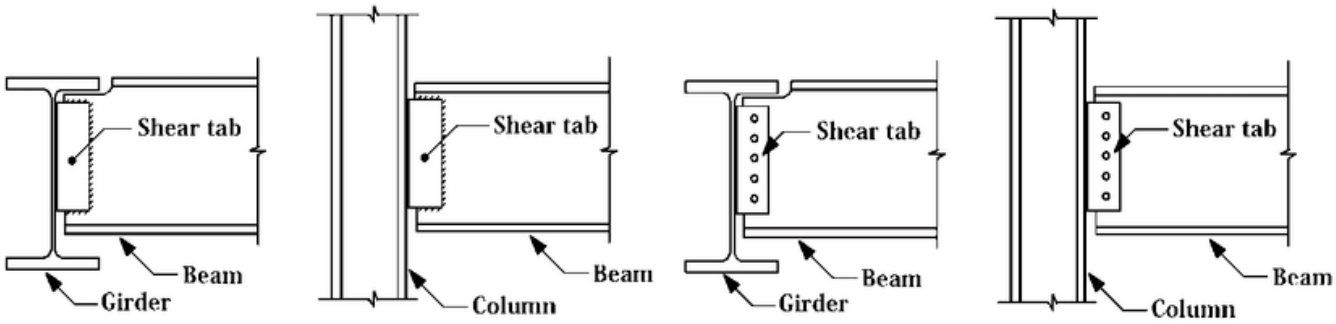
fact= 0.81 t/cm^2 < Fb= 1.54 t/cm^2

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)
1	(6,4,6)	(6,8,6)	4	3.09	1.57
2	(14,4,6)	(14,8,6)	4	3.09	3.09
4	(12,8,6)	(12,12,6)	4	3.09	1.57
5	(8,8,6)	(8,12,6)	4	3.09	1.57
16	(6,12,6)	(14,12,6)	8	3.42	1.71

Design Limit state:

Combo: D+L

Md: 3.42 t.m

Vd: 1.71 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.25 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

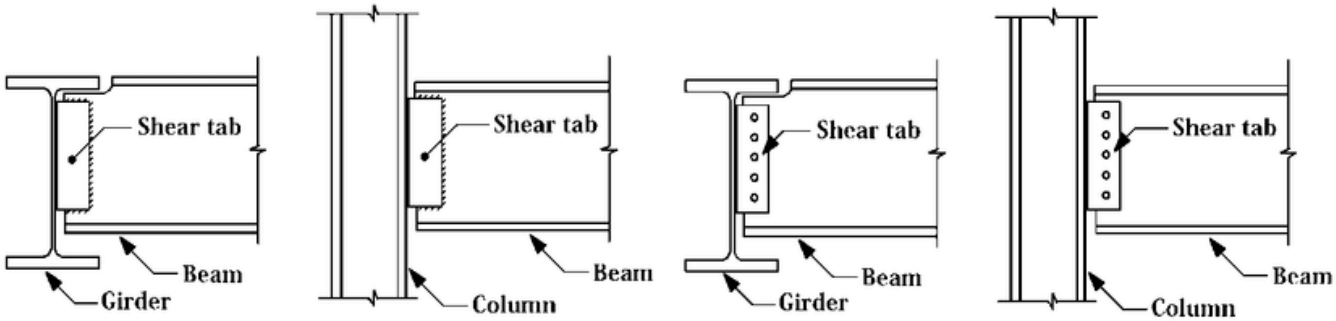
fact= 1.36 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 2.29 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.71 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)
7	(0,8,6)	(0,12,6)	4	4.65	2.35
6	(6,8,6)	(6,12,6)	4	4.65	2.35
3	(10,4,6)	(10,8,6)	4	6.13	4.61
17	(14,12,6)	(20,12,6)	6	6.25	3.15
8	(14,0,6)	(20,0,6)	6	6.25	3.15
11	(14,4,6)	(20,4,6)	6	6.25	3.15
12	(0,8,6)	(6,8,6)	6	6.25	3.15
14	(14,8,6)	(20,8,6)	6	6.25	3.15
9	(0,4,6)	(6,4,6)	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

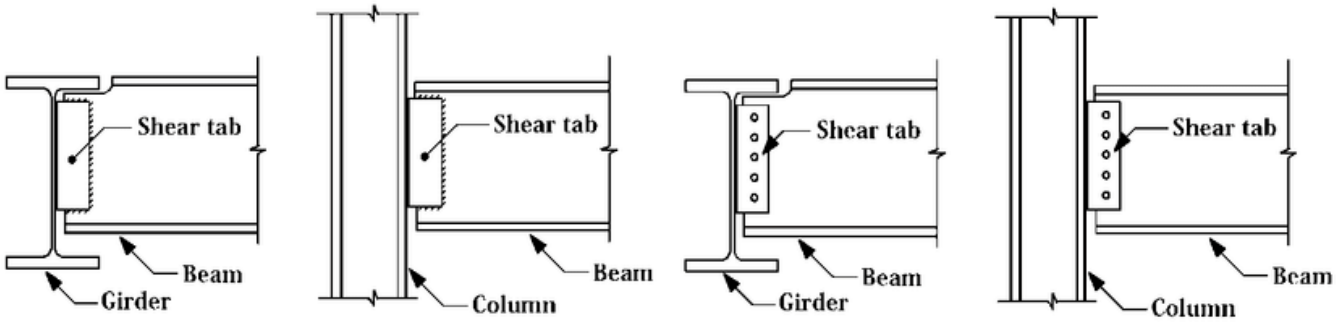
fact= 1.46 t/cm^2 < Fb= 1.54 t/cm^2

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)
10	(6,4,6)	(14,4,6)	8	9.51	2.45
13	(6,8,6)	(14,8,6)	8	12.65	4.02

Design Limit state:

Combo: D+L

Md: 12.65 t.m

Vd: 4.02 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.38 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 38.65 < 81.98 => Compact Web

c/tf= 5.38 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 219.47 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE360

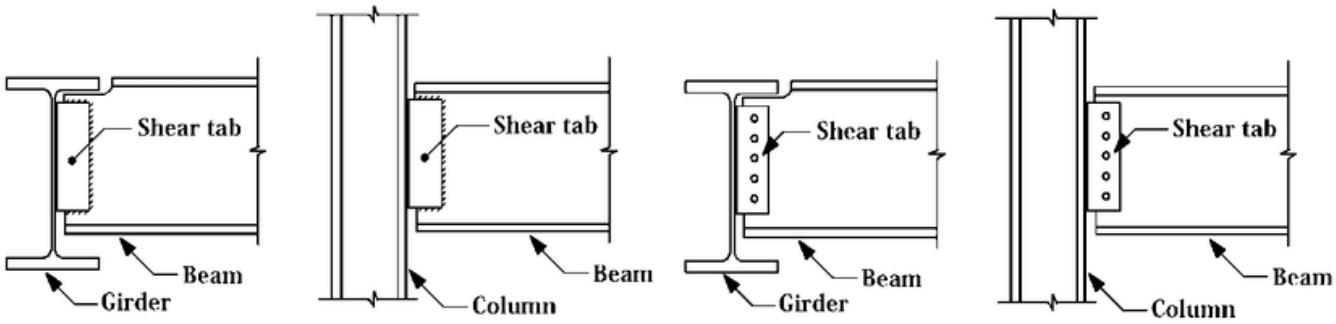
fact= 1.4 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.59 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 4.02 ton

Rleast= 3.46 ton

N= 3 with Pitch= 84 mm & Full Layout: (42;84 84 42)

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

f = 0.16 t/cm^2 & q = 0.13 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 = 0.13 t/cm^2 & qmt = 0.16 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) = 0.19 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 252 mm & tp = 10 mm & Sw = 6 mm

Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
9	(14,8,0)	(14,8,6)	6	-13.56
8	(6,8,0)	(6,8,6)	6	-11.34
5	(14,4,0)	(14,4,6)	6	-8.99
13	(14,12,0)	(14,12,6)	6	-8.16
4	(6,4,0)	(6,4,6)	6	-7.42
7	(0,8,0)	(0,8,6)	6	-5.8
12	(6,12,0)	(6,12,6)	6	-4.42
6	(20,4,0)	(20,4,6)	6	-3.5

10	(20,8,0)	(20,8,6)	6	-3.5
2	(20,0,0)	(20,0,6)	6	-3.45
14	(20,12,0)	(20,12,6)	6	-3.45
1	(14,0,0)	(14,0,6)	6	-3.45
3	(0,4,0)	(0,4,6)	6	-3.45
11	(0,12,0)	(0,12,6)	6	-2.71

Design Limit state:

Combo: D+L

Nd: -13.56 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= 0.25 t/cm^2 < Fc= 0.23 t/cm^2
