Design Calculation Sheet for ITIFinal02

Designer: dfd

Location: dfdf

City: dfdf

Country: fdf

Date: 2020-06-20 08:31:31

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
20	(18,4,6)	(18,8,6)	4	0.07	0.07
19	(18,0,6)	(18,4,6)	4	0.07	0.07
2	(0,4,6)	(0,8,6)	4	0.07	0.07
1	(0,0,6)	(0,4,6)	4	0.07	0.07

Design Limit state:

Combo: D+L

Md: 0.07 t.m

Vd: 0.07 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

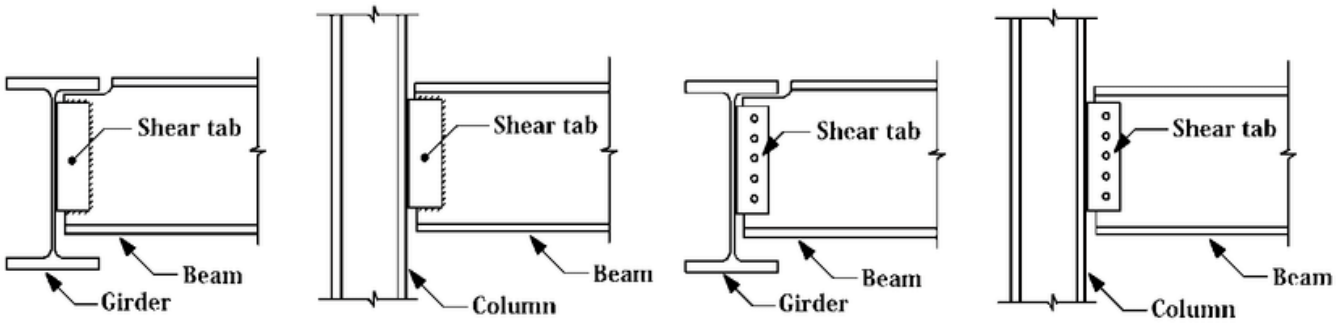
fact= 0.36 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.02 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= 0.07 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 = 0.01 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)
16	(14,4,6)	(14,8,6)	4	2.07	2.07
15	(14,0,6)	(14,4,6)	4	2.07	2.07
14	(12,4,6)	(12,8,6)	4	2.07	2.07
13	(12,0,6)	(12,4,6)	4	2.07	2.07
12	(10,4,6)	(10,8,6)	4	2.07	2.07
11	(10,0,6)	(10,4,6)	4	2.07	2.07
17	(16,0,6)	(16,4,6)	4	2.07	2.07
9	(8,0,6)	(8,4,6)	4	2.07	2.07
8	(6,4,6)	(6,8,6)	4	2.07	2.07

7	(6,0,6)	(6,4,6)	4	2.07	2.07
6	(4,4,6)	(4,8,6)	4	2.07	2.07
5	(4,0,6)	(4,4,6)	4	2.07	2.07
4	(2,4,6)	(2,8,6)	4	2.07	2.07
3	(2,0,6)	(2,4,6)	4	2.07	2.07
18	(16,4,6)	(16,8,6)	4	2.07	2.07
10	(8,4,6)	(8,8,6)	4	2.07	2.07

Design Limit state:

Combo: D+L

Md: 2.07 t.m

Vd: 2.07 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

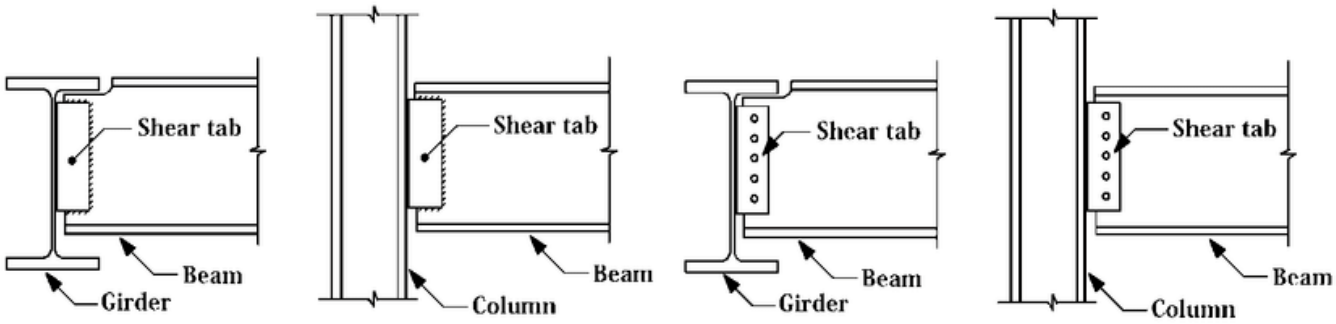
fact= 1.42 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.2 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.07 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 = 0.15 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) = 0.17 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)
9	(12,8,6)	(18,8,6)	6	4.25	2.14
8	(6,8,6)	(12,8,6)	6	4.25	2.14
7	(0,8,6)	(6,8,6)	6	4.25	2.14
3	(12,0,6)	(18,0,6)	6	4.25	2.14
2	(6,0,6)	(12,0,6)	6	4.25	2.14
1	(0,0,6)	(6,0,6)	6	4.25	2.14

Design Limit state:

Combo: D+L

Md: 4.25 t.m

Vd: 2.14 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.67 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

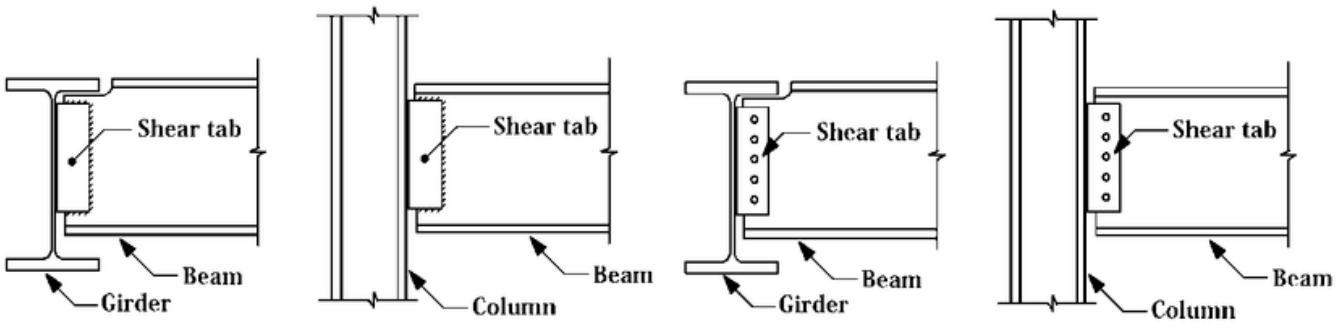
fact= 1.31 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 1.38 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.14 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 = 0.1 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.23 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 = 0.15 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.18 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	(12,4,6)	(18,4,6)	6	8.39	4.21
5	(6,4,6)	(12,4,6)	6	8.39	4.21
4	(0,4,6)	(6,4,6)	6	8.39	4.21

Design Limit state:

Combo: D+L

Md: 8.39 t.m

Vd: 4.21 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -1.33 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

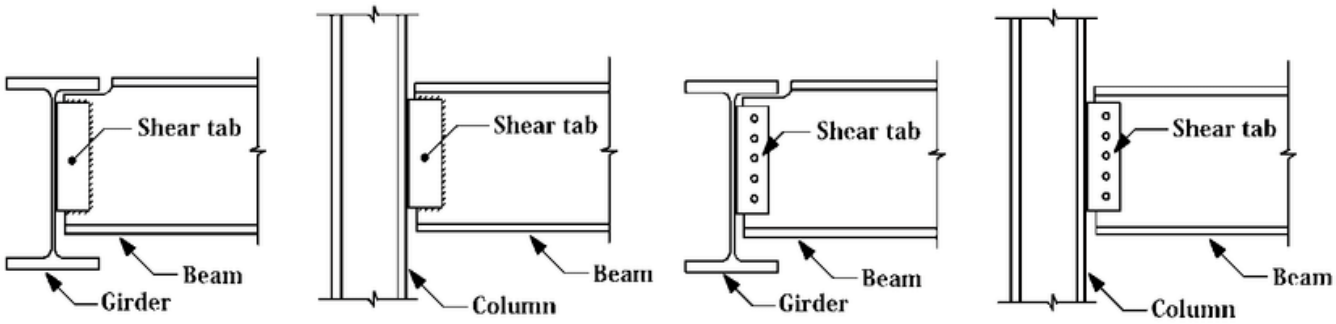
fact= 1.51 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.2 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 1.28 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 4.21 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 = 0.24 t/cm^2 & q = 0.17 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 = 0.17 t/cm^2 & qmt = 0.24 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.29 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.29 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 210 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	-12.82

7	(12,4,0)	(12,4,6)	6	-12.82
2	(6,0,0)	(6,0,6)	6	-6.6
3	(12,0,0)	(12,0,6)	6	-6.6
10	(6,8,0)	(6,8,6)	6	-6.6
11	(12,8,0)	(12,8,6)	6	-6.6
5	(0,4,0)	(0,4,6)	6	-4.61
8	(18,4,0)	(18,4,6)	6	-4.61
1	(0,0,0)	(0,0,6)	6	-2.46
4	(18,0,0)	(18,0,6)	6	-2.46
9	(0,8,0)	(0,8,6)	6	-2.46
12	(18,8,0)	(18,8,6)	6	-2.46

Design Limit state:

Combo: D+L

Nd: -12.82 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= 0.24 t/cm^2 < Fc= 0.23 t/cm^2
