Design Calculation Sheet for WEE

Designer:

Location:

City:

Country:

Date: 2020-06-22 03:05:11

Table of Contents

Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
22	(20,4,6)	(20,8,6)	4	1.12	1.12
21	(20,0,6)	(20,4,6)	4	1.12	1.12
2	(0,4,6)	(0,8,6)	4	1.12	1.12
1	(0,0,6)	(0,4,6)	4	1.12	1.12

Design Limit state:

Combo: 1.4*D + 1*L

Md: 1.12 t.m

Vd: 1.12 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -0.2 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

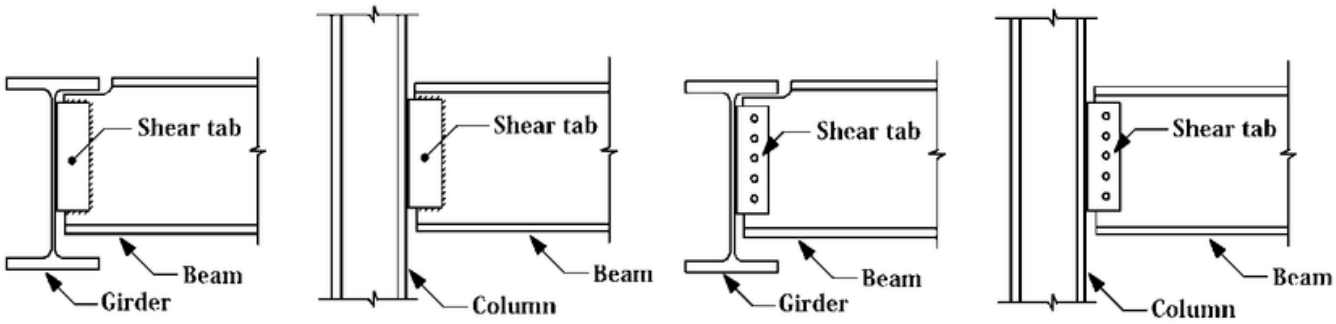
fact= 1.45 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.59 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.12 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 = 0.08 t/cm^2 & q = 0.05 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.12 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 = 0.05 t/cm^2 & qmt = 0.08 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.09 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.09 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)
18	(16,4,6)	(16,8,6)	4	2.18	2.18
17	(16,0,6)	(16,4,6)	4	2.18	2.18
20	(18,4,6)	(18,8,6)	4	2.18	2.18
3	(2,0,6)	(2,4,6)	4	2.18	2.18
4	(2,4,6)	(2,8,6)	4	2.18	2.18
5	(4,0,6)	(4,4,6)	4	2.18	2.18
6	(4,4,6)	(4,8,6)	4	2.18	2.18
7	(6,0,6)	(6,4,6)	4	2.18	2.18
8	(6,4,6)	(6,8,6)	4	2.18	2.18

9	(8,0,6)	(8,4,6)	4	2.18	2.18
10	(8,4,6)	(8,8,6)	4	2.18	2.18
19	(18,0,6)	(18,4,6)	4	2.18	2.18
12	(10,4,6)	(10,8,6)	4	2.18	2.18
13	(12,0,6)	(12,4,6)	4	2.18	2.18
14	(12,4,6)	(12,8,6)	4	2.18	2.18
15	(14,0,6)	(14,4,6)	4	2.18	2.18
16	(14,4,6)	(14,8,6)	4	2.18	2.18
11	(10,0,6)	(10,4,6)	4	2.18	2.18

Design Limit state:

Combo: 1.4*D + 1*L

Md: 2.18 t.m

Vd: 2.18 ton

Service Limit State

Combo: LIVE

Span: 4 m

Load: -0.4 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

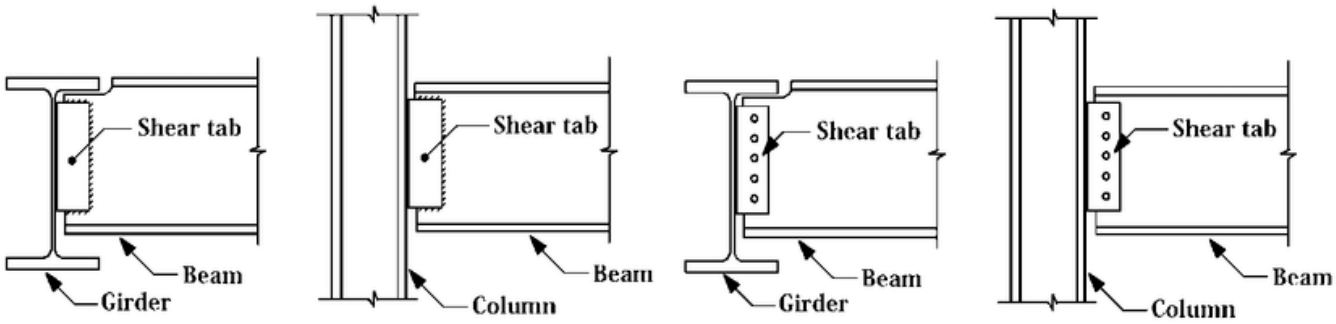
fact= 1.13 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.33 cm < dall= 1.33 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.18 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 = 0.15 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

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
9	(14,8,6)	(20,8,6)	6	4.59	2.33
7	(0,8,6)	(6,8,6)	6	4.59	2.33
3	(14,0,6)	(20,0,6)	6	4.59	2.33
1	(0,0,6)	(6,0,6)	6	4.59	2.33

Design Limit state:

Combo: 1.4*D + 1*L

Md: 4.59 t.m

Vd: 2.33 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.27 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

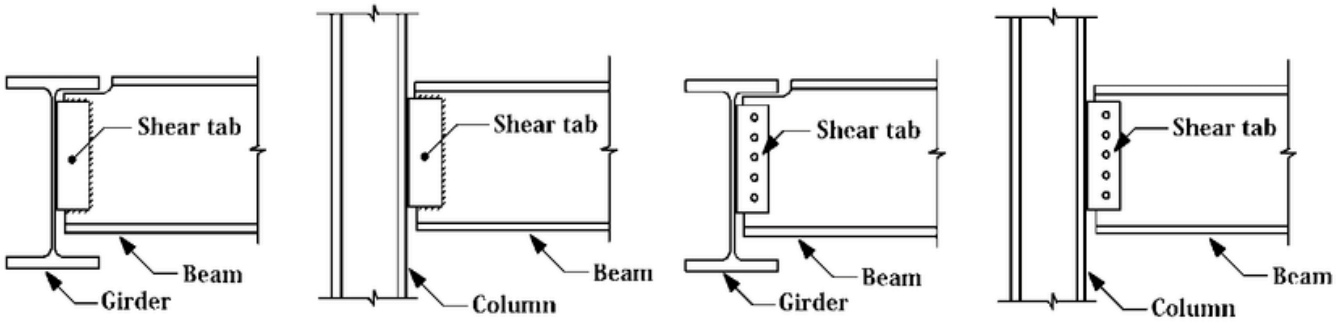
fact= 1.42 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.16 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.55 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 2.33 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 = 0.11 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.25 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 = 0.11 t/cm^2 & qmt = 0.16 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.2 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.2 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	(14,4,6)	(20,4,6)	6	8.96	4.52
4	(0,4,6)	(6,4,6)	6	8.96	4.52
8	(6,8,6)	(14,8,6)	8	9.14	3.48
2	(6,0,6)	(14,0,6)	8	9.14	3.48

Design Limit state:

Combo: 1.4*D + 1*L

Md: 9.14 t.m

Vd: 3.48 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.3 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

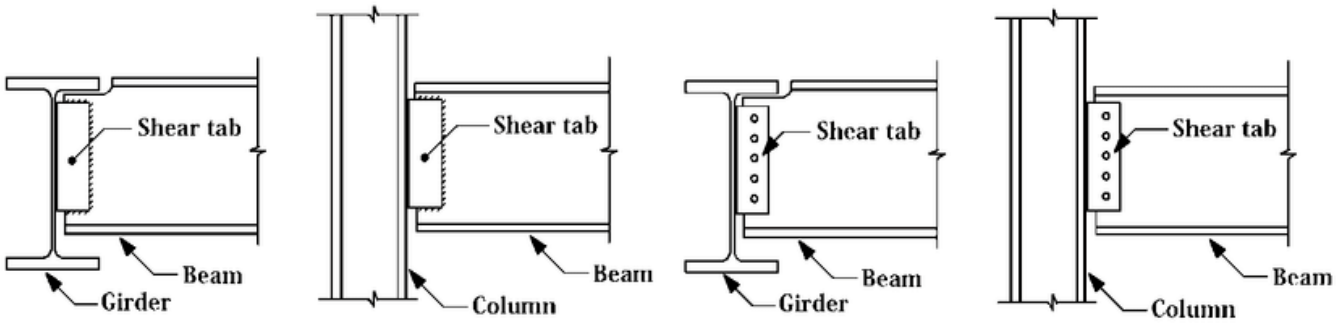
fact= 1.28 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.65 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 3.48 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 = 0.16 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) = 0.2 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)
5	(6,4,6)	(14,4,6)	8	17.87	6.75

Design Limit state:

Combo: 1.4*D + 1*L

Md: 17.87 t.m

Vd: 6.75 ton

Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.6 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

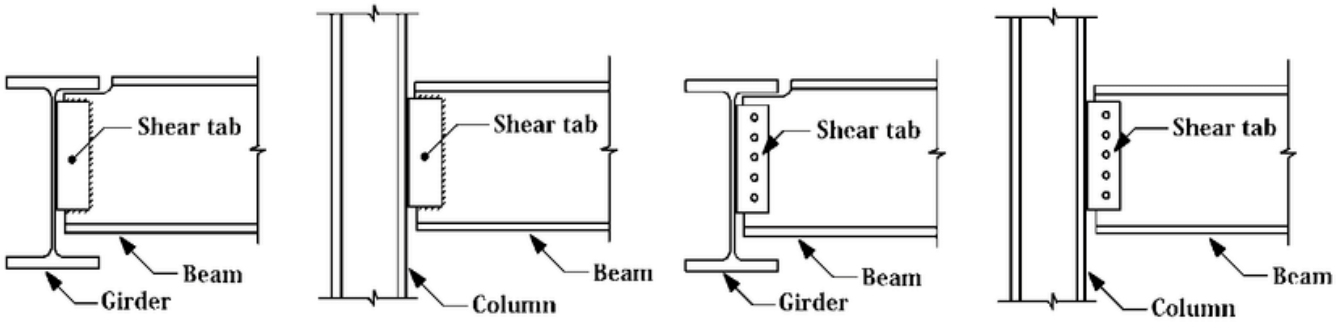
fact= 1.19 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.16 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.45 cm < dall= 2.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 6.75 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 = 0.17 t/cm^2 & q = 0.18 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.36 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 = 0.17 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) = 0.2 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	-15.99
7	(14,4,0)	(14,4,6)	6	-15.99
2	(6,0,0)	(6,0,6)	6	-8.35
10	(6,8,0)	(6,8,6)	6	-8.35
3	(14,0,0)	(14,0,6)	6	-8.35
11	(14,8,0)	(14,8,6)	6	-8.35
8	(20,4,0)	(20,4,6)	6	-7.12
5	(0,4,0)	(0,4,6)	6	-7.12
1	(0,0,0)	(0,0,6)	6	-3.81
4	(20,0,0)	(20,0,6)	6	-3.81
9	(0,8,0)	(0,8,6)	6	-3.81
12	(20,8,0)	(20,8,6)	6	-3.81

Design Limit state:

Combo: 1.4*D + 1*L

Nd: -15.99 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= 0.3 t/cm^2 < Fc= 0.23 t/cm^2
