Design Calculation Sheet for bhg

Designer: bghch

Location: bv b

City: htyt

Country: gvhg

Date: 2020-06-20 07:20:42

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Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
30	(18,10,3)	(18,15,3)	5	4.76	3.81
29	(18,5,3)	(18,10,3)	5	4.76	3.81
2	(0,5,3)	(0,10,3)	5	4.76	3.81
3	(0,10,3)	(0,15,3)	5	4.76	3.81
1	(0,0,3)	(0,5,3)	5	4.76	3.81
28	(18,0,3)	(18,5,3)	5	4.76	3.81

Design Limit state:

Combo: D+L

Md: 4.76 t.m

Vd: 3.81 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -1 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

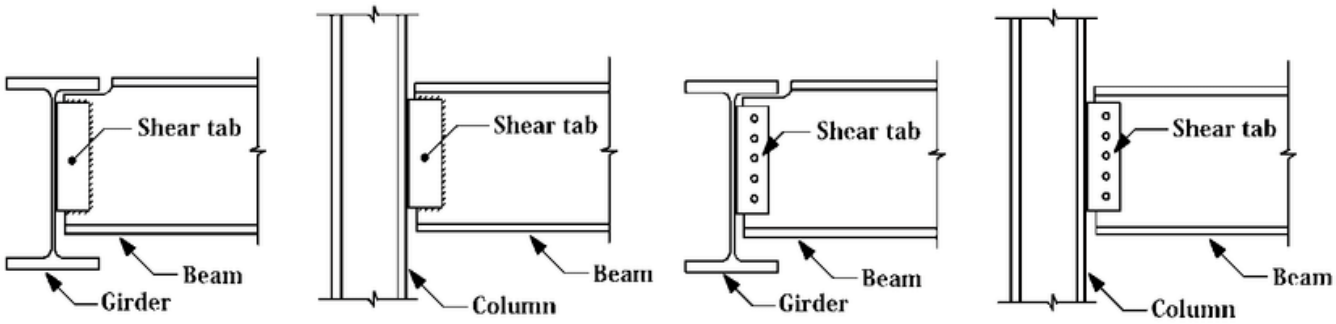
fact= 1.47 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.26 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= 3.81 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 = 0.27 t/cm^2 & q = 0.17 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.4 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 = 0.27 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) = 0.32 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)
25	(16,0,3)	(16,5,3)	5	9.44	7.56
12	(6,10,3)	(6,15,3)	5	9.44	7.56
27	(16,10,3)	(16,15,3)	5	9.44	7.56
4	(2,0,3)	(2,5,3)	5	9.44	7.56
5	(2,5,3)	(2,10,3)	5	9.44	7.56
6	(2,10,3)	(2,15,3)	5	9.44	7.56
7	(4,0,3)	(4,5,3)	5	9.44	7.56
8	(4,5,3)	(4,10,3)	5	9.44	7.56
9	(4,10,3)	(4,15,3)	5	9.44	7.56

10	(6,0,3)	(6,5,3)	5	9.44	7.56
11	(6,5,3)	(6,10,3)	5	9.44	7.56
13	(8,0,3)	(8,5,3)	5	9.44	7.56
24	(14,10,3)	(14,15,3)	5	9.44	7.56
14	(8,5,3)	(8,10,3)	5	9.44	7.56
26	(16,5,3)	(16,10,3)	5	9.44	7.56
16	(10,0,3)	(10,5,3)	5	9.44	7.56
17	(10,5,3)	(10,10,3)	5	9.44	7.56
18	(10,10,3)	(10,15,3)	5	9.44	7.56
19	(12,0,3)	(12,5,3)	5	9.44	7.56
20	(12,5,3)	(12,10,3)	5	9.44	7.56
21	(12,10,3)	(12,15,3)	5	9.44	7.56
22	(14,0,3)	(14,5,3)	5	9.44	7.56
23	(14,5,3)	(14,10,3)	5	9.44	7.56
15	(8,10,3)	(8,15,3)	5	9.44	7.56

Design Limit state:

Combo: D+L

Md: 9.44 t.m

Vd: 7.56 ton

Service Limit State

Combo: LIVE

Span: 5 m

Load: -2 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

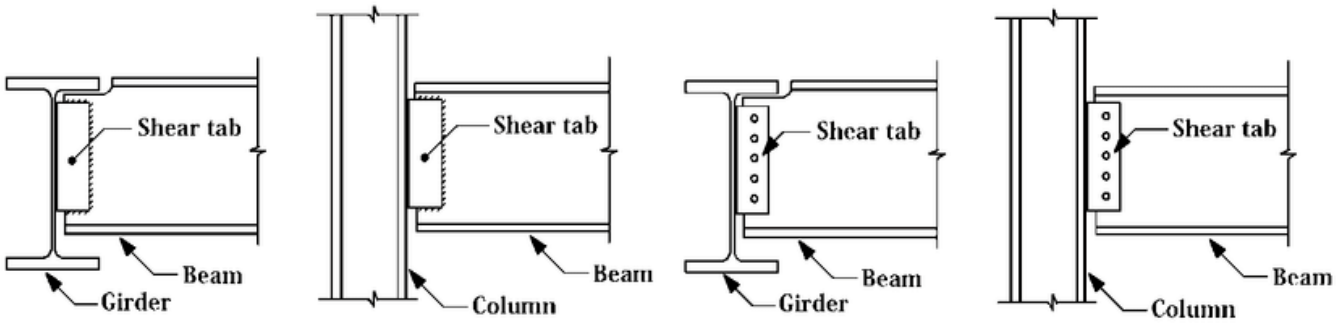
fact= 1.32 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.31 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.66 cm < dall= 1.67 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 7.56 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 = 0.35 t/cm^2 & q = 0.28 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.6 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 = 0.28 t/cm^2 & qmt = 0.35 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.45 t/cm^2 < 0.2Fu = 0.72 t/cm^2 => OK

4-Check Thickness of Plate

f = (6*Vd*e)/(tp*L^2) = 0.43 t/cm^2 < 0.72*Fy = 1.73 t/cm^2 => OK

Plate Layout => L = 231 mm & tp = 10 mm & Sw = 6 mm

Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
12	(12,15,3)	(18,15,3)	6	15.27	7.66

11	(6,15,3)	(12,15,3)	6	15.27	7.66
10	(0,15,3)	(6,15,3)	6	15.27	7.66
3	(12,0,3)	(18,0,3)	6	15.27	7.66
2	(6,0,3)	(12,0,3)	6	15.27	7.66
1	(0,0,3)	(6,0,3)	6	15.27	7.66

Design Limit state:

Combo: D+L

Md: 15.27 t.m

Vd: 7.66 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -1.67 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

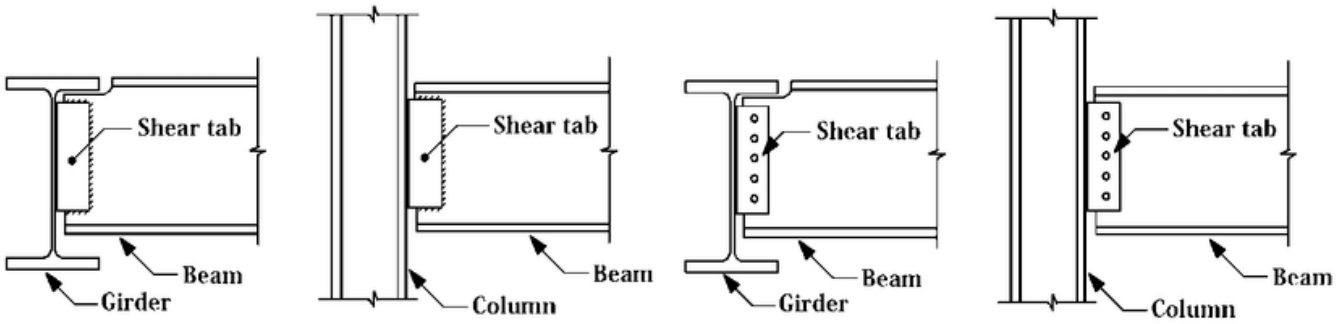
fact= 1.32 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

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

5-Check Deflection

dact= 0.58 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 7.66 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 = 0.24 t/cm^2 & q = 0.23 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.47 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 = 0.23 t/cm^2 & qmt = 0.24 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.34 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 = 280 mm & tp = 10 mm & Sw = 6 mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
9	(12,10,3)	(18,10,3)	6	30.39	15.22
8	(6,10,3)	(12,10,3)	6	30.39	15.22
7	(0,10,3)	(6,10,3)	6	30.39	15.22
6	(12,5,3)	(18,5,3)	6	30.39	15.22
5	(6,5,3)	(12,5,3)	6	30.39	15.22
4	(0,5,3)	(6,5,3)	6	30.39	15.22

Design Limit state:

Combo: D+L

Md: 30.39 t.m

Vd: 15.22 ton

Service Limit State

Combo: LIVE

Span: 6 m

Load: -3.33 t/m'

Design Checks

1-Check Local Buckling

dw/tw= 43.36 < 81.98 => Compact Web

c/tf= 4.79 < 10.91 => Compact Flange

2-Check Lateral Torsional Buckling

Luact= 0 m < Lumax= 271.11 m => Supported (No LTB)

3-Check Bending Stress

Section: IPE550

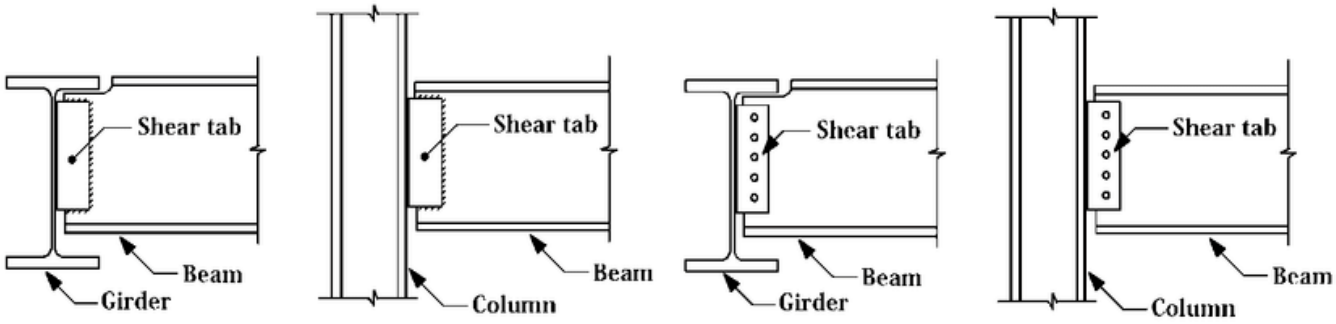
fact= 1.25 t/cm^2 < Fb= 1.54 t/cm^2

4-Check Shear Stress

qact= 0.25 t/cm^2 < qall= 0.84 t/cm^2

5-Check Deflection

dact= 0.4 cm < dall= 2 cm



Group Connection Design (Simple Shear Plate Connection)

1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 15.22 ton

Rleast= 4.8 ton

N= 4 with Pitch= 96 mm & Full Layout: (48;96 96 96 49)

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

f = 0.26 t/cm^2 & q = 0.33 t/cm^2 => feq = (f^2 + 3q^2)^0.5 = 0.63 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 = 0.33 t/cm^2 & qmt = 0.26 t/cm^2 => qres = (q^2 + qmt^2)^0.5 = 0.42 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 = 385 mm & tp = 10 mm & Sw = 6 mm

Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
6	(6,5,0)	(6,5,3)	3	-45.68
7	(12,5,0)	(12,5,3)	3	-45.68
10	(6,10,0)	(6,10,3)	3	-45.68
11	(12,10,0)	(12,10,3)	3	-45.68
2	(6,0,0)	(6,0,3)	3	-23.01
3	(12,0,0)	(12,0,3)	3	-23.01
14	(6,15,0)	(6,15,3)	3	-23.01
15	(12,15,0)	(12,15,3)	3	-23.01
5	(0,5,0)	(0,5,3)	3	-22.96
8	(18,5,0)	(18,5,3)	3	-22.96
9	(0,10,0)	(0,10,3)	3	-22.96
12	(18,10,0)	(18,10,3)	3	-22.96
1	(0,0,0)	(0,0,3)	3	-11.6
13	(0,15,0)	(0,15,3)	3	-11.6
4	(18,0,0)	(18,0,3)	3	-11.6
16	(18,15,0)	(18,15,3)	3	-11.6

Design Limit state:

Combo: D+L

Nd: -45.68 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= 0.85 t/cm^2 < Fc= 0.88 t/cm^2
