

## Design Calculation Sheet for trial

Designer:

Location:

City:

Country:

Date: 2020-06-22 04:22:53

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## Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
45	(23.7,10,6)	(23.7,15,6)	5	1.18	0.94
44	(23.7,5,6)	(23.7,10,6)	5	1.18	0.94
43	(23.7,0,6)	(23.7,5,6)	5	1.18	0.94
2	(0,5,6)	(0,10,6)	5	1.34	1.07
3	(0,10,6)	(0,15,6)	5	1.34	1.07
1	(0,0,6)	(0,5,6)	5	1.34	1.07

### Design Limit state:

Combo: 1.4\*Dead + 1.6\*Live

Md: 1.34 t.m

Vd: 1.07 ton

### Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.13 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 26.08 < 81.98 \Rightarrow$  Compact Web

$c/tf = 4.21 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 105.86 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

$f_{act} = 1.23 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.13 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0.58 \text{ cm} < d_{all} = 1.67 \text{ cm}$



### Group Connection Design (Simple Shear Plate Connection)

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 1.07$  ton

$R_{least} = 2.85$  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<sup>2</sup> &  $q = 0.05$  t/cm<sup>2</sup>  $\Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.11$  t/cm<sup>2</sup>  $< 1.1 * 0.2F_u = 0.79$  t/cm<sup>2</sup>  $\Rightarrow$  OK

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

$q = 0.05$  t/cm<sup>2</sup> &  $q_{mt} = 0.08$  t/cm<sup>2</sup>  $\Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.09$  t/cm<sup>2</sup>  $< 0.2F_u = 0.72$  t/cm<sup>2</sup>  $\Rightarrow$  OK

#### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.09$  t/cm<sup>2</sup>  $< 0.72 * F_y = 1.73$  t/cm<sup>2</sup>  $\Rightarrow$  OK

Plate Layout  $\Rightarrow L = 189$  mm &  $t_p = 10$  mm &  $S_w = 6$  mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
39	(21.1,10,6)	(21.1,15,6)	5	2.25	1.8
37	(21.1,0,6)	(21.1,5,6)	5	2.25	1.8
36	(19.8,10,6)	(19.8,15,6)	5	2.25	1.8
35	(19.8,5,6)	(19.8,10,6)	5	2.25	1.8
34	(19.8,0,6)	(19.8,5,6)	5	2.25	1.8
38	(21.1,5,6)	(21.1,10,6)	5	2.25	1.8
40	(22.4,0,6)	(22.4,5,6)	5	2.25	1.8
42	(22.4,10,6)	(22.4,15,6)	5	2.25	1.8
41	(22.4,5,6)	(22.4,10,6)	5	2.25	1.8

6	(1.5,10,6)	(1.5,15,6)	5	2.58	2.07
9	(3,10,6)	(3,15,6)	5	2.58	2.07
8	(3,5,6)	(3,10,6)	5	2.58	2.07
7	(3,0,6)	(3,5,6)	5	2.58	2.07
5	(1.5,5,6)	(1.5,10,6)	5	2.58	2.07
4	(1.5,0,6)	(1.5,5,6)	5	2.58	2.07
31	(18.5,0,6)	(18.5,5,6)	5	2.83	2.26
32	(18.5,5,6)	(18.5,10,6)	5	2.83	2.26
33	(18.5,10,6)	(18.5,15,6)	5	2.83	2.26
10	(4.5,0,6)	(4.5,5,6)	5	3	2.4
11	(4.5,5,6)	(4.5,10,6)	5	3	2.4
12	(4.5,10,6)	(4.5,15,6)	5	3	2.4

### Design Limit state:

Combo: 1.4\*Dead + 1.6\*Live

Md: 3 t.m

Vd: 2.4 ton

### Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.26 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 31.06 < 81.98 \Rightarrow$  Compact Web

$c/tf = 4.66 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 142.01 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

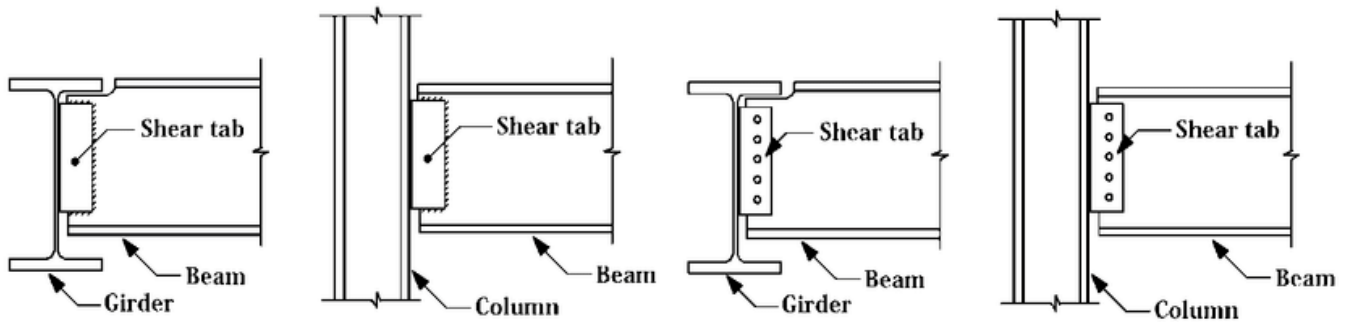
$f_{act} = 1.19 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$$q_{act} = 0.18 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$$

#### 5-Check Deflection

$$d_{act} = 0.36 \text{ cm} < d_{all} = 1.67 \text{ cm}$$



### Group Connection Design (Simple Shear Plate Connection)

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$$V_d = 2.4 \text{ ton}$$

$$R_{least} = 2.85 \text{ ton}$$

$$N = 3 \text{ with Pitch} = 63 \text{ mm \& Full Layout: (31;63 63 31.5)}$$

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

$$f = 0.17 \text{ t/cm}^2 \text{ \& } q = 0.11 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.25 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$$

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

$$q = 0.11 \text{ t/cm}^2 \text{ \& } q_{mt} = 0.17 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.2 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$$

#### 4-Check Thickness of Plate

$$f = (6 * V_d * e) / (t_p * L^2) = 0.2 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$$

$$\text{Plate Layout} \Rightarrow L = 189 \text{ mm \& } t_p = 10 \text{ mm \& } S_w = 6 \text{ mm}$$

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
15	(6.5,10,6)	(6.5,15,6)	5	3.41	2.73
13	(6.5,0,6)	(6.5,5,6)	5	3.41	2.73
14	(6.5,5,6)	(6.5,10,6)	5	3.41	2.73
20	(10.5,5,6)	(10.5,10,6)	5	3.41	2.73
16	(8.5,0,6)	(8.5,5,6)	5	3.41	2.73
17	(8.5,5,6)	(8.5,10,6)	5	3.41	2.73

18	(8.5,10,6)	(8.5,15,6)	5	3.41	2.73
19	(10.5,0,6)	(10.5,5,6)	5	3.41	2.73
21	(10.5,10,6)	(10.5,15,6)	5	3.41	2.73
22	(12.5,0,6)	(12.5,5,6)	5	3.41	2.73
24	(12.5,10,6)	(12.5,15,6)	5	3.41	2.73
25	(14.5,0,6)	(14.5,5,6)	5	3.41	2.73
26	(14.5,5,6)	(14.5,10,6)	5	3.41	2.73
27	(14.5,10,6)	(14.5,15,6)	5	3.41	2.73
28	(16.5,0,6)	(16.5,5,6)	5	3.41	2.73
29	(16.5,5,6)	(16.5,10,6)	5	3.41	2.73
30	(16.5,10,6)	(16.5,15,6)	5	3.41	2.73
23	(12.5,5,6)	(12.5,10,6)	5	3.41	2.73

### Design Limit state:

Combo: 1.4\*Dead + 1.6\*Live

Md: 3.41 t.m

Vd: 2.73 ton

### Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.4 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 31.06 < 81.98 \Rightarrow$  Compact Web

$c/tf = 4.66 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 142.01 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

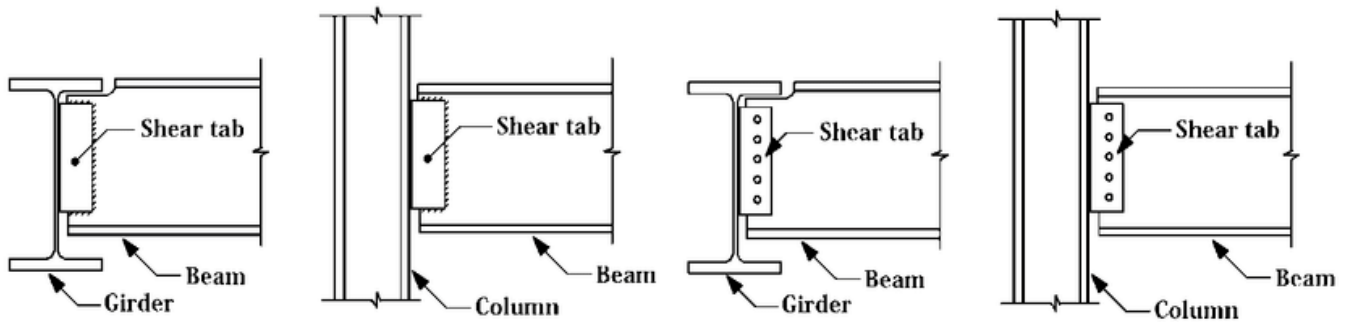
$f_{act} = 1.35 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$$q_{act} = 0.21 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$$

#### 5-Check Deflection

$$\delta_{act} = 0.56 \text{ cm} < \delta_{all} = 1.67 \text{ cm}$$



### Group Connection Design (Simple Shear Plate Connection)

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$$V_d = 2.73 \text{ ton}$$

$$R_{least} = 2.85 \text{ ton}$$

$$N = 3 \text{ with Pitch} = 63 \text{ mm \& Full Layout: (31;63 63 31.5)}$$

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

$$f = 0.19 \text{ t/cm}^2 \text{ \& } q = 0.12 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.29 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$$

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

$$q = 0.12 \text{ t/cm}^2 \text{ \& } q_{mt} = 0.19 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.23 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$$

#### 4-Check Thickness of Plate

$$f = (6 * V_d * e) / (t_p * L^2) = 0.23 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$$

$$\text{Plate Layout} \Rightarrow L = 189 \text{ mm \& } t_p = 10 \text{ mm \& } S_w = 6 \text{ mm}$$

## Main Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
13	(0,15,6)	(4.5,15,6)	4.5	3.23	2.18
1	(0,0,6)	(4.5,0,6)	4.5	3.23	2.18

#### Design Limit state:

$$\text{Combo: } 1.4 * \text{Dead} + 1.6 * \text{Live}$$



Md: 3.23 t.m

Vd: 2.18 ton

### Service Limit State

Combo: LIVE

Span: 4.5 m

Load: -0.33 t/m'

### Design Checks

#### 1-Check Local Buckling

$d_w/t_w = 31.06 < 81.98 \Rightarrow$  Compact Web

$c/t_f = 4.66 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 142.01 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

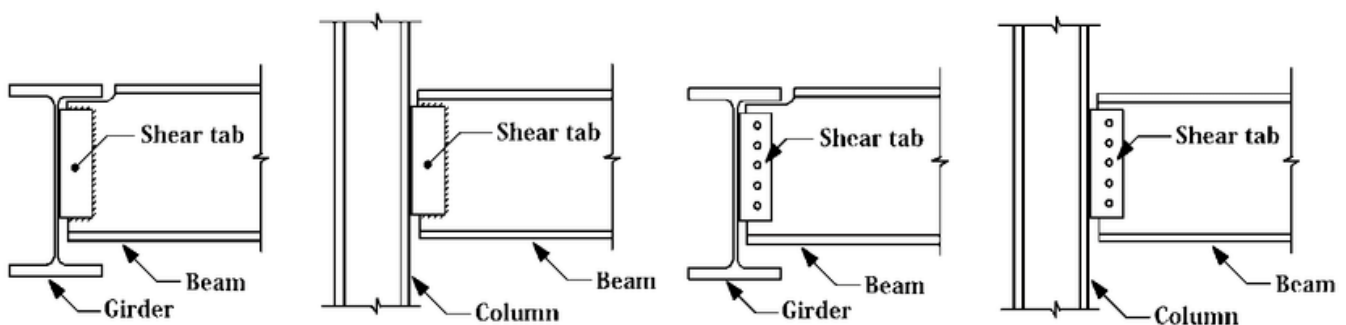
$f_{act} = 1.28 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.17 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0.31 \text{ cm} < d_{all} = 1.5 \text{ cm}$



### 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)

$f = 0.15 \text{ t/cm}^2$  &  $q = 0.1 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.23 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.1 \text{ t/cm}^2$  &  $q_{mt} = 0.15 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.18 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

#### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.18 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

Plate Layout  $\Rightarrow L = 189 \text{ mm}$  &  $t_p = 10 \text{ mm}$  &  $S_w = 6 \text{ mm}$

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
16	(18.5,15,6)	(23.7,15,6)	5.2	4.85	2.83
4	(18.5,0,6)	(23.7,0,6)	5.2	4.85	2.83
14	(4.5,15,6)	(10.5,15,6)	6	5.68	2.88
2	(4.5,0,6)	(10.5,0,6)	6	5.68	2.88
9	(0,10,6)	(4.5,10,6)	4.5	6.33	4.25
5	(0,5,6)	(4.5,5,6)	4.5	6.33	4.25

#### Design Limit state:

Combo:  $1.4 * \text{Dead} + 1.6 * \text{Live}$

Md: 6.33 t.m

Vd: 4.25 ton

#### Service Limit State

Combo: LIVE

Span: 6 m

Load:  $-0.33 \text{ t/m'}$

#### Design Checks

##### 1-Check Local Buckling

$d_w/t_w = 34.73 < 81.98 \Rightarrow \text{Compact Web}$

$c/t_f = 5.3 < 10.91 \Rightarrow \text{Compact Flange}$

##### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 174.28 \text{ m} \Rightarrow$  Supported (No LTB)

### 3-Check Bending Stress

Section: IPE270

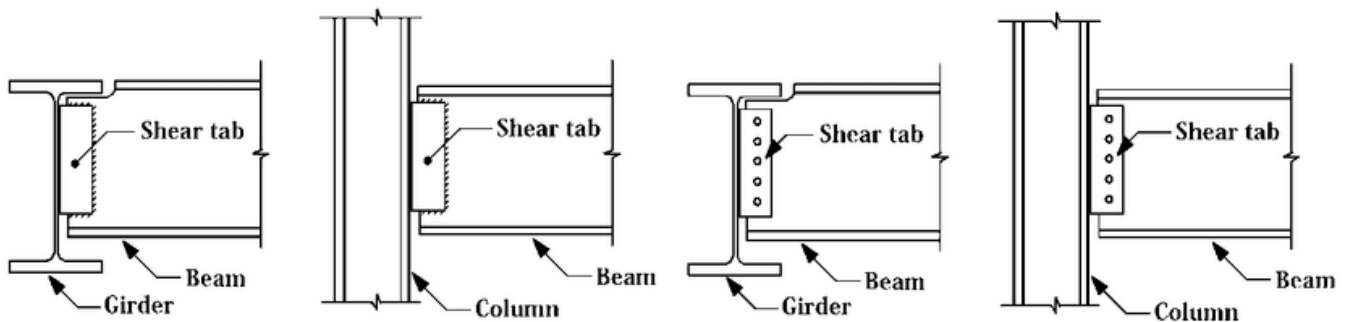
$f_{act} = 1.47 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

### 4-Check Shear Stress

$q_{act} = 0.24 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

### 5-Check Deflection

$\delta_{act} = 0.46 \text{ cm} < \delta_{all} = 2 \text{ cm}$



## Group Connection Design (Simple Shear Plate Connection)

### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 4.25 \text{ ton}$

$R_{least} = 2.85 \text{ ton}$

$N = 3$  with Pitch = 63 mm & Full Layout: (31;63 63 31.5)

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

$f = 0.3 \text{ t/cm}^2$  &  $q = 0.19 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.45 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.19 \text{ t/cm}^2$  &  $q_{mt} = 0.3 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.35 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.36 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

Plate Layout  $\Rightarrow L = 189 \text{ mm}$  &  $t_p = 10 \text{ mm}$  &  $S_w = 6 \text{ mm}$

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
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12	(18.5,10,6)	(23.7,10,6)	5.2	9.54	5.53
8	(18.5,5,6)	(23.7,5,6)	5.2	9.54	5.53
10	(4.5,10,6)	(10.5,10,6)	6	11.14	5.61
6	(4.5,5,6)	(10.5,5,6)	6	11.14	5.61
15	(10.5,15,6)	(18.5,15,6)	8	11.32	4.29
3	(10.5,0,6)	(18.5,0,6)	8	11.32	4.29

### Design Limit state:

Combo: 1.4\*Dead + 1.6\*Live

Md: 11.32 t.m

Vd: 4.29 ton

### Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.38 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 38.65 < 81.98 \Rightarrow$  Compact Web

$c/tf = 5.38 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 219.47 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE360

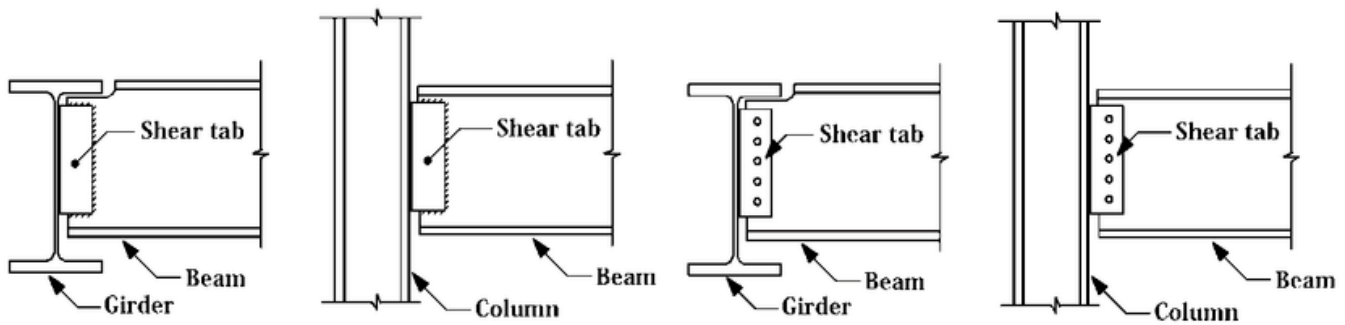
$f_{act} = 1.25 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.15 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0.59 \text{ cm} < d_{all} = 2.67 \text{ cm}$



### Group Connection Design (Simple Shear Plate Connection)

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 4.29$  ton

$R_{least} = 3.46$  ton

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

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

$f = 0.17 \text{ t/cm}^2$  &  $q = 0.14 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.3 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.14 \text{ t/cm}^2$  &  $q_{mt} = 0.17 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.22 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

#### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.2 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

Plate Layout  $\Rightarrow L = 252 \text{ mm}$  &  $t_p = 10 \text{ mm}$  &  $S_w = 6 \text{ mm}$

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
11	(10.5,10,6)	(18.5,10,6)	8	22.23	8.39
7	(10.5,5,6)	(18.5,5,6)	8	22.23	8.39

#### Design Limit state:

Combo:  $1.4 * \text{Dead} + 1.6 * \text{Live}$

$M_d = 22.23 \text{ t.m}$

$V_d = 8.39$  ton

#### Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.75 t/m'

## Design Checks

### 1-Check Local Buckling

$dw/tw = 41.66 < 81.98 \Rightarrow$  Compact Web

$c/tf = 5.19 < 10.91 \Rightarrow$  Compact Flange

### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 245.29 \text{ m} \Rightarrow$  Supported (No LTB)

### 3-Check Bending Stress

Section: IPE450

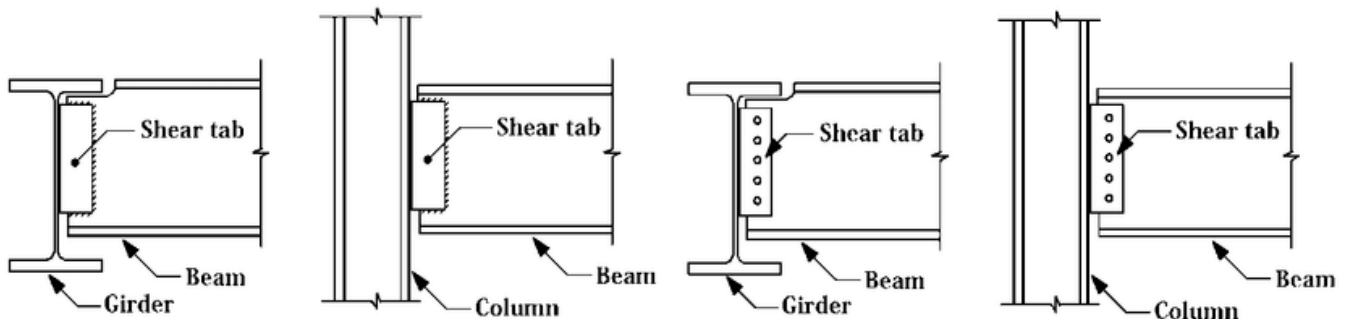
$f_{act} = 1.48 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

### 4-Check Shear Stress

$q_{act} = 0.2 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

### 5-Check Deflection

$\delta_{act} = 0.56 \text{ cm} < \delta_{all} = 2.67 \text{ cm}$



## Group Connection Design (Simple Shear Plate Connection)

### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 8.39 \text{ ton}$

$R_{least} = 4.06 \text{ ton}$

$N = 3$  with Pitch = 105 mm & Full Layout: (52;105 105 52.5)

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

$f = 0.21 \text{ t/cm}^2$  &  $q = 0.23 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.45 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.23 \text{ t/cm}^2$  &  $q_{mt} = 0.21 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.31 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

### 4-Check Thickness of Plate

$f = (6 \cdot V_d \cdot e) / (t_p \cdot L^2) = 0.25 \text{ t/cm}^2 < 0.72 \cdot F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

Plate Layout  $\Rightarrow L = 315 \text{ mm}$  &  $t_p = 10 \text{ mm}$  &  $S_w = 6 \text{ mm}$

## Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
8	(10.5,5,0)	(10.5,5,6)	6	-19.81
13	(10.5,10,0)	(10.5,10,6)	6	-19.81
9	(18.5,5,0)	(18.5,5,6)	6	-18.8
14	(18.5,10,0)	(18.5,10,6)	6	-18.8
7	(4.5,5,0)	(4.5,5,6)	6	-15.01
12	(4.5,10,0)	(4.5,10,6)	6	-15.01
3	(10.5,0,0)	(10.5,0,6)	6	-10.26
18	(10.5,15,0)	(10.5,15,6)	6	-10.26
4	(18.5,0,0)	(18.5,0,6)	6	-9.74
19	(18.5,15,0)	(18.5,15,6)	6	-9.74
2	(4.5,0,0)	(4.5,0,6)	6	-7.81
17	(4.5,15,0)	(4.5,15,6)	6	-7.81
10	(23.7,5,0)	(23.7,5,6)	6	-7.77
15	(23.7,10,0)	(23.7,10,6)	6	-7.77
6	(0,5,0)	(0,5,6)	6	-6.74
11	(0,10,0)	(0,10,6)	6	-6.74
20	(23.7,15,0)	(23.7,15,6)	6	-4.13
5	(23.7,0,0)	(23.7,0,6)	6	-4.13
16	(0,15,0)	(0,15,6)	6	-3.6
1	(0,0,0)	(0,0,6)	6	-3.6

### Design Limit state:

Combo:  $1.4 \cdot \text{Dead} + 1.6 \cdot \text{Live}$

Nd: -19.81 ton

**1-Check Local Buckling**

$dw/tw = 36.23 < 37.44 \Rightarrow$  Compact Web

$c/tf = 5.68 < 10.91 \Rightarrow$  Compact Flange

**2-Check Normal Stress**

Section: IPE300

$\lambda = 179.1 > 100$

$f_c = 0.37 \text{ t/cm}^2 < F_c = 0.23 \text{ t/cm}^2$

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