

# Design Calculation Sheet for AUTRA01

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## Secondary Beams

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
24	(20,10,3)	(20,15,3)	5	0.07	0.06

### Design Limit state:

Combo: 1\*Dead + 1\*Live

Md: 0.07 t.m

Vd: 0.06 ton

### Service Limit State

Combo: LIVE

Span: 5 m

Load: 0 t/m'

### Design Checks

#### 1-Check Local Buckling

$d_w/t_w = 15.58 < 81.98 \Rightarrow$  Compact Web

$c/t_f = 3.06 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 59.39 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

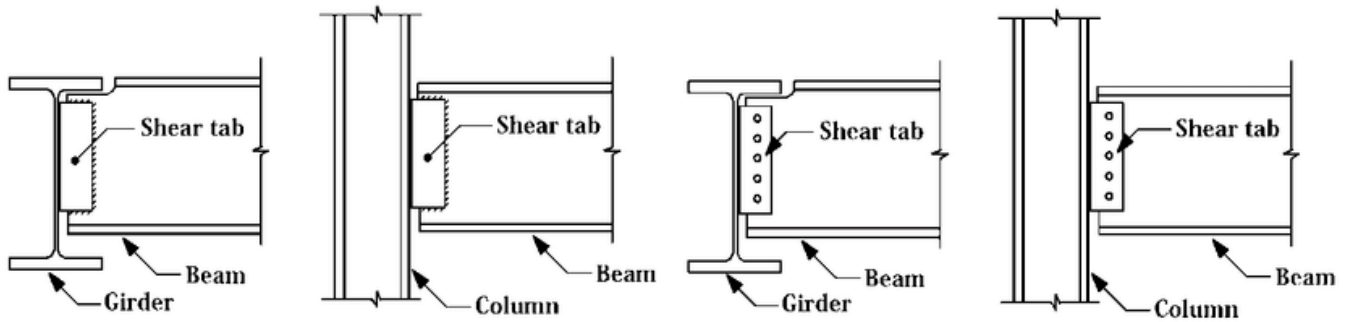
$f_{act} = 0.35 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.02 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0 \text{ cm} < d_{all} = 1.67 \text{ cm}$



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

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 0.06$  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)

$f = 0 \text{ t/cm}^2$  &  $q = 0 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.01 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2$   
 $\Rightarrow$  OK

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

$q = 0 \text{ t/cm}^2$  &  $q_{mt} = 0 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow$   
 OK

#### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow$  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)
1	(0,0,3)	(0,5,3)	5	1.16	0.93
23	(20,5,3)	(20,10,3)	5	1.16	0.93
2	(0,10,3)	(0,15,3)	5	1.16	0.93
20	(14,10,3)	(14,15,3)	5	1.16	0.93

#### Design Limit state:

Combo: 1\*Dead + 1\*Live

$M_d = 1.16$  t.m

$V_d = 0.93$  ton

## Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.2 t/m'

## Design Checks

### 1-Check Local Buckling

$d_w/t_w = 23.92 < 81.98 \Rightarrow$  Compact Web

$c/t_f = 3.95 < 10.91 \Rightarrow$  Compact Flange

### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 94.24 \text{ m} \Rightarrow$  Supported (No LTB)

### 3-Check Bending Stress

Section: IPE270

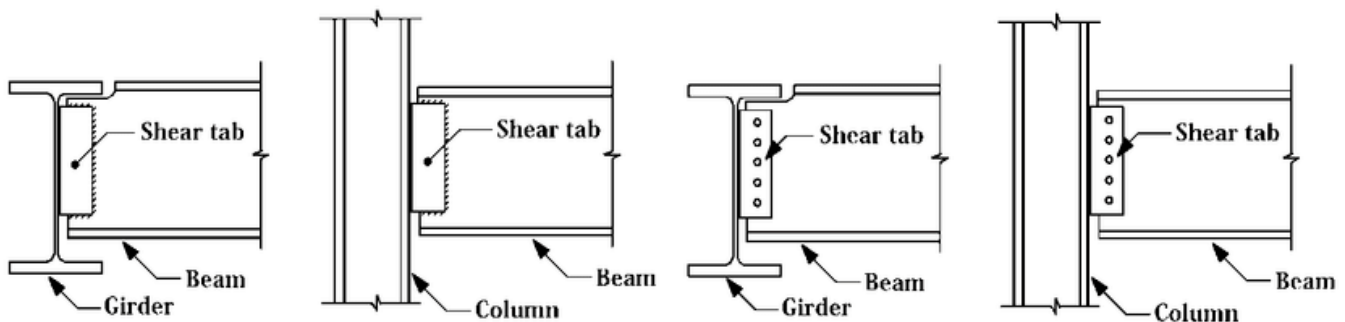
$f_{act} = 1.51 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

### 4-Check Shear Stress

$q_{act} = 0.14 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

### 5-Check Deflection

$\delta_{act} = 1.43 \text{ cm} < \delta_{all} = 1.67 \text{ cm}$



## Group Connection Design (Simple Shear Plate Connection)

### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 0.93 \text{ ton}$

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

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

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

$f = 0.07 \text{ t/cm}^2$  &  $q = 0.04 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.1 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.04 \text{ t/cm}^2$  &  $q_{mt} = 0.07 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.08 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.08 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

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)
11	(8,10,3)	(8,15,3)	5	2.26	1.81
3	(2,0,3)	(2,5,3)	5	2.26	1.81
4	(2,10,3)	(2,15,3)	5	2.26	1.81
5	(4,0,3)	(4,5,3)	5	2.26	1.81
6	(4,10,3)	(4,15,3)	5	2.26	1.81
7	(6,0,3)	(6,5,3)	5	2.26	1.81
8	(6,10,3)	(6,15,3)	5	2.26	1.81
9	(8,0,3)	(8,5,3)	5	2.26	1.81
10	(8,5,3)	(8,10,3)	5	2.26	1.81
13	(10,5,3)	(10,10,3)	5	2.26	1.81
12	(10,0,3)	(10,5,3)	5	2.26	1.81
14	(10,10,3)	(10,15,3)	5	2.26	1.81
15	(12,0,3)	(12,5,3)	5	2.26	1.81
16	(12,5,3)	(12,10,3)	5	2.26	1.81
17	(12,10,3)	(12,15,3)	5	2.26	1.81
18	(14,0,3)	(14,5,3)	5	2.26	1.81
19	(14,5,3)	(14,10,3)	5	2.26	1.81
21	(16,5,3)	(16,10,3)	5	2.26	1.81
22	(18,5,3)	(18,10,3)	5	2.26	1.81

### Design Limit state:

Combo: 1\*Dead + 1\*Live

Md: 2.26 t.m

Vd: 1.81 ton

### Service Limit State

Combo: LIVE

Span: 5 m

Load: -0.4 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 29.65 < 81.98 \Rightarrow$  Compact Web

$c/tf = 4.56 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 129.1 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

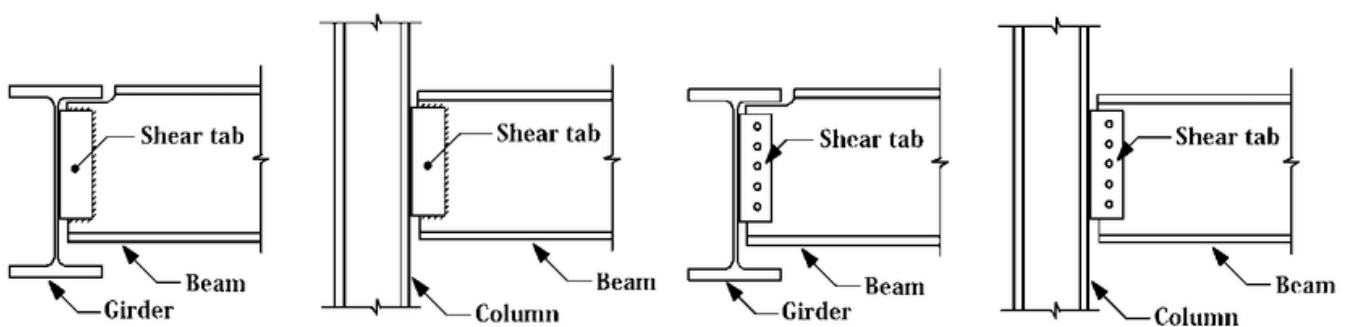
$f_{act} = 1.16 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.16 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0.8 \text{ cm} < d_{all} = 1.67 \text{ cm}$



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

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

Vd= 1.81 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)

$f = 0.13 \text{ t/cm}^2$  &  $q = 0.08 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.19 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.08 \text{ t/cm}^2$  &  $q_{mt} = 0.13 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.15 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

## 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.15 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

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Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
25	(0,7.5,3)	(6,7.5,3)	6	4.1	2.73

## Design Limit state:

Combo: 1\*Dead + 1\*Live

Md: 4.1 t.m

Vd: 2.73 ton

## Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.5 t/m'

## Design Checks

### 1-Check Local Buckling

$d_w/t_w = 32.39 < 81.98 \Rightarrow \text{Compact Web}$

$c/t_f = 4.81 < 10.91 \Rightarrow \text{Compact Flange}$

### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 154.92 \text{ m} \Rightarrow \text{Supported (No LTB)}$

### 3-Check Bending Stress

Section: IPE270

$f_{act} = 1.27 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

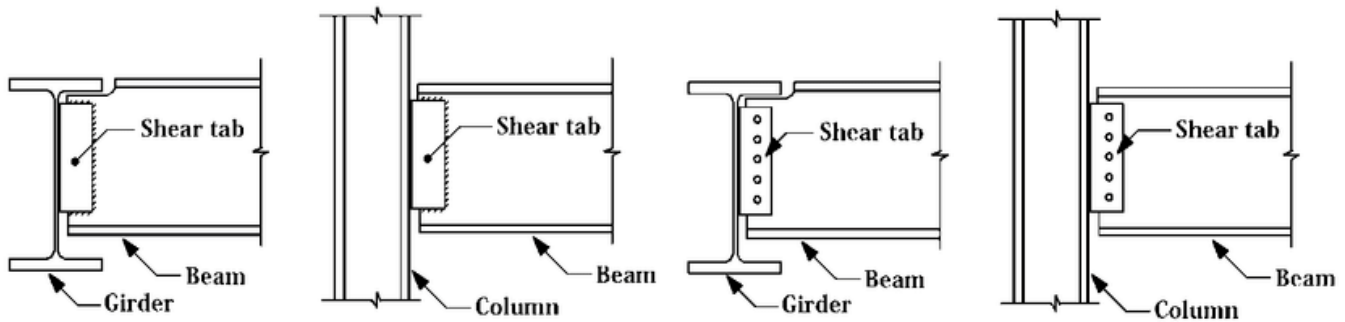
### 4-Check Shear Stress



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

#### 5-Check Deflection

$$d_{act} = 1.03 \text{ cm} < d_{all} = 2 \text{ cm}$$



### 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)
38	(14,15,3)	(20,15,3)	6	0.16	0.11

#### Design Limit state:

Combo: 1\*Dead + 1\*Live

$$M_d = 0.16 \text{ t.m}$$

Vd: 0.11 ton

### Service Limit State

Combo: LIVE

Span: 6 m

Load: 0 t/m'

### Design Checks

#### 1-Check Local Buckling

$d_w/t_w = 15.58 < 81.98 \Rightarrow$  Compact Web

$c/t_f = 3.06 < 10.91 \Rightarrow$  Compact Flange

#### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 59.39 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE270

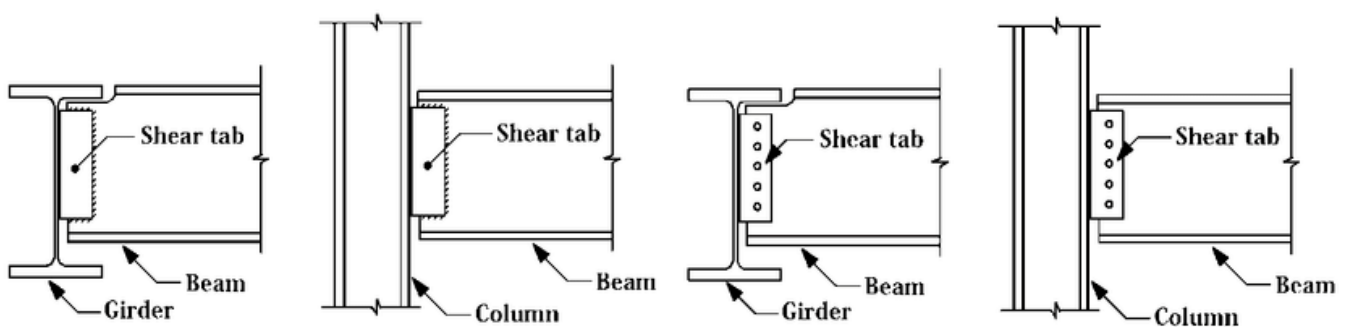
$f_{act} = 0.81 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

$q_{act} = 0.04 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

#### 5-Check Deflection

$d_{act} = 0 \text{ cm} < d_{all} = 2 \text{ cm}$



### 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)

$f = 0.01 \text{ t/cm}^2$  &  $q = 0 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.01 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0 \text{ t/cm}^2$  &  $q_{mt} = 0.01 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.01 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

## 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.01 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

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)
27	(0,5,3)	(0,10,3)	5	3.49	1.42
36	(0,15,3)	(6,15,3)	6	3.77	1.91
35	(14,10,3)	(20,10,3)	6	3.77	1.91
32	(14,5,3)	(20,5,3)	6	3.77	1.91
28	(0,0,3)	(6,0,3)	6	3.77	1.91
26	(6,5,3)	(6,10,3)	5	4.58	2.3

## Design Limit state:

Combo: 1\*Dead + 1\*Live

Md: 4.58 t.m

Vd: 2.3 ton

## Service Limit State

Combo: LIVE

Span: 6 m

Load: -0.33 t/m'

## Design Checks

### 1-Check Local Buckling

$d_w/t_w = 32.39 < 81.98 \Rightarrow \text{Compact Web}$

$c/t_f = 4.81 < 10.91 \Rightarrow \text{Compact Flange}$

### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 154.92 \text{ m} \Rightarrow \text{Supported (No LTB)}$

### 3-Check Bending Stress

Section: IPE270

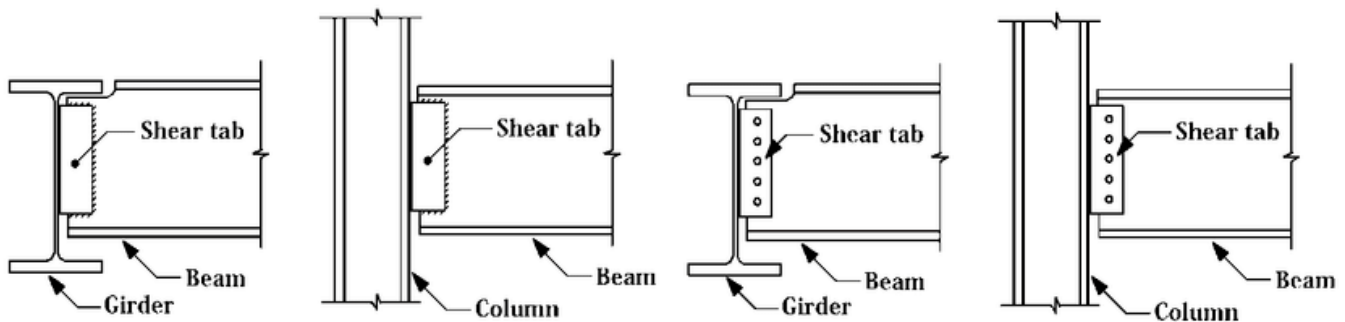
$$f_{act} = 1.41 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$$

### 4-Check Shear Stress

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

### 5-Check Deflection

$$\delta_{act} = 0.69 \text{ cm} < \delta_{all} = 2 \text{ cm}$$



## Group Connection Design (Simple Shear Plate Connection)

### 1-Bolts Design

Bolts: M20 of Grade 8.8

$$V_d = 2.3 \text{ ton}$$

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

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

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

$$f = 0.16 \text{ t/cm}^2 \& q = 0.1 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.24 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$$

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

$$q = 0.1 \text{ t/cm}^2 \& q_{mt} = 0.16 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.19 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$$

### 4-Check Thickness of Plate

$$f = (6 * V_d * e) / (t_p * L^2) = 0.19 \text{ t/cm}^2 < 0.72 * F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$$

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

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
33	(0,10,3)	(6,10,3)	6	5.75	3.23
30	(0,5,3)	(6,5,3)	6	5.75	3.23

37	(6,15,3)	(14,15,3)	8	7.51	2.85
29	(6,0,3)	(14,0,3)	8	7.51	2.85

### Design Limit state:

Combo: 1\*Dead + 1\*Live

Md: 7.51 t.m

Vd: 2.85 ton

### Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.38 t/m'

### Design Checks

#### 1-Check Local Buckling

$dw/tw = 36.23 < 81.98 \Rightarrow$  Compact Web

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

#### 2-Check Lateral Torsional Buckling

$Lu_{act} = 0 \text{ m} < Lu_{max} = 193.65 \text{ m} \Rightarrow$  Supported (No LTB)

#### 3-Check Bending Stress

Section: IPE300

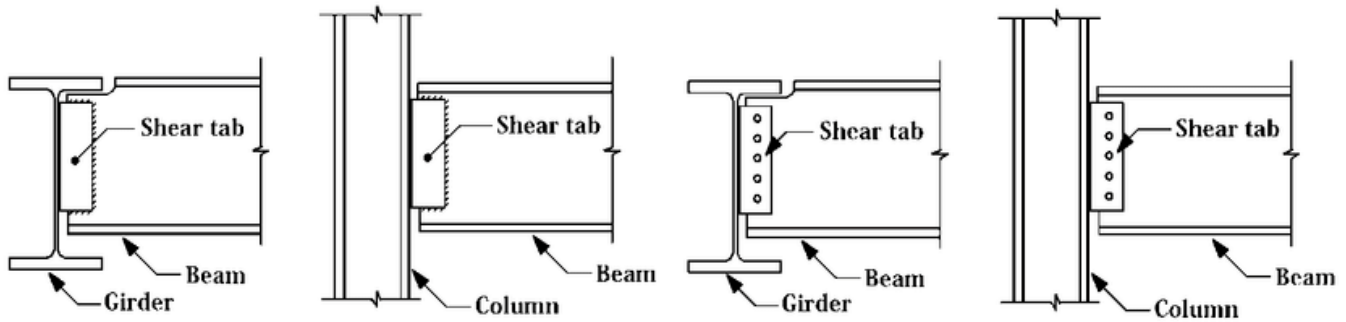
$f_{act} = 1.35 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

#### 4-Check Shear Stress

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

#### 5-Check Deflection

$d_{act} = 1.14 \text{ cm} < d_{all} = 2.67 \text{ cm}$



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

#### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 2.85$  ton

$R_{least} = 3.07$  ton

$N = 3$  with Pitch = 70 mm & Full Layout: (35;70 70 35)

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

$f = 0.16$  t/cm<sup>2</sup> &  $q = 0.11$  t/cm<sup>2</sup>  $\Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.26$  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)

$q = 0.11$  t/cm<sup>2</sup> &  $q_{mt} = 0.16$  t/cm<sup>2</sup>  $\Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.2$  t/cm<sup>2</sup> <  $0.2F_u = 0.72$  t/cm<sup>2</sup>  $\Rightarrow$  OK

#### 4-Check Thickness of Plate

$f = (6 * V_d * e) / (t_p * L^2) = 0.19$  t/cm<sup>2</sup> <  $0.72 * F_y = 1.73$  t/cm<sup>2</sup>  $\Rightarrow$  OK

Plate Layout  $\Rightarrow L = 210$  mm &  $t_p = 10$  mm &  $S_w = 6$  mm

Beam ID	Start Point	End Point	Span (m)	Mmax (t.m)	Vmax (ton)
34	(6,10,3)	(14,10,3)	8	14.74	5.56
31	(6,5,3)	(14,5,3)	8	14.74	5.56

#### Design Limit state:

Combo: 1\*Dead + 1\*Live

$M_d = 14.74$  t.m

$V_d = 5.56$  ton

#### Service Limit State

Combo: LIVE

Span: 8 m

Load: -0.75 t/m'

## Design Checks

### 1-Check Local Buckling

$d_w/t_w = 40.24 < 81.98 \Rightarrow$  Compact Web

$c/t_f = 5.35 < 10.91 \Rightarrow$  Compact Flange

### 2-Check Lateral Torsional Buckling

$L_{uact} = 0 \text{ m} < L_{umax} = 232.38 \text{ m} \Rightarrow$  Supported (No LTB)

### 3-Check Bending Stress

Section: IPE400

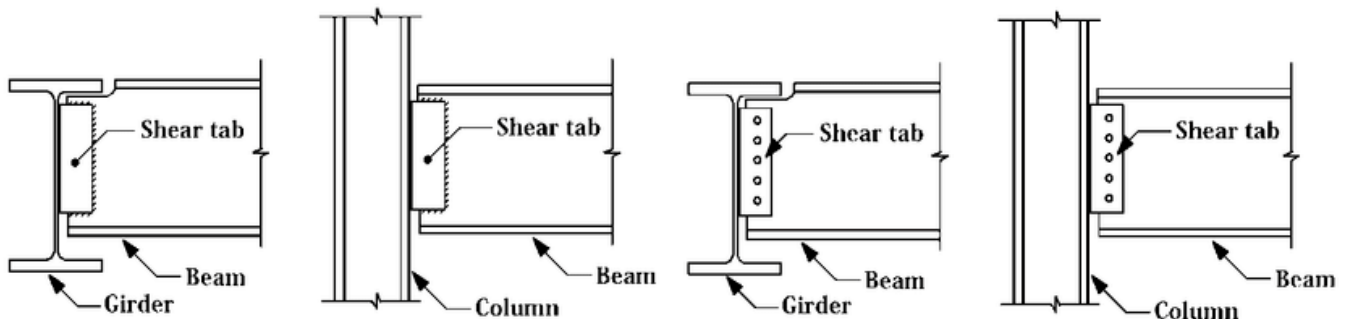
$f_{act} = 1.27 \text{ t/cm}^2 < F_b = 1.54 \text{ t/cm}^2$

### 4-Check Shear Stress

$q_{act} = 0.16 \text{ t/cm}^2 < q_{all} = 0.84 \text{ t/cm}^2$

### 5-Check Deflection

$\delta_{act} = 0.82 \text{ cm} < \delta_{all} = 2.67 \text{ cm}$



## Group Connection Design (Simple Shear Plate Connection)

### 1-Bolts Design

Bolts: M20 of Grade 8.8

$V_d = 5.56 \text{ ton}$

$R_{least} = 3.72 \text{ ton}$

$N = 3$  with Pitch = 93 mm & Full Layout: (46;93 93 47.5)

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

$f = 0.18 \text{ t/cm}^2$  &  $q = 0.17 \text{ t/cm}^2 \Rightarrow f_{eq} = (f^2 + 3q^2)^{0.5} = 0.34 \text{ t/cm}^2 < 1.1 * 0.2F_u = 0.79 \text{ t/cm}^2 \Rightarrow \text{OK}$

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

$q = 0.17 \text{ t/cm}^2$  &  $q_{mt} = 0.18 \text{ t/cm}^2 \Rightarrow q_{res} = (q^2 + q_{mt}^2)^{0.5} = 0.24 \text{ t/cm}^2 < 0.2F_u = 0.72 \text{ t/cm}^2 \Rightarrow \text{OK}$

### 4-Check Thickness of Plate

$f = (6 \cdot V_d \cdot e) / (t_p \cdot L^2) = 0.21 \text{ t/cm}^2 < 0.72 \cdot F_y = 1.73 \text{ t/cm}^2 \Rightarrow \text{OK}$

Plate Layout  $\Rightarrow L = 280 \text{ mm}$  &  $t_p = 10 \text{ mm}$  &  $S_w = 6 \text{ mm}$

## Columns

Column ID	Start Point	End Point	Height (m)	Nmax (ton)
43	(6,5,0)	(6,5,3)	3	-13.02
47	(6,10,0)	(6,10,3)	3	-13.02
44	(14,5,0)	(14,5,3)	3	-11.22
48	(14,10,0)	(14,10,3)	3	-10.34
40	(6,0,0)	(6,0,3)	3	-6.7
51	(6,15,0)	(6,15,3)	3	-6.7
42	(0,5,0)	(0,5,3)	3	-5.71
46	(0,10,0)	(0,10,3)	3	-5.71
41	(14,0,0)	(14,0,3)	3	-4.79
52	(14,15,0)	(14,15,3)	3	-4.02
49	(20,10,0)	(20,10,3)	3	-3.03
39	(0,0,0)	(0,0,3)	3	-2.97
45	(20,5,0)	(20,5,3)	3	-2.97
50	(0,15,0)	(0,15,3)	3	-2.97
53	(20,15,0)	(20,15,3)	3	-0.29

### Design Limit state:

Combo: 1\*Dead + 1\*Live

Nd: -13.02 ton

### 1-Check Local Buckling

$d_w/t_w = 36.23 < 37.44 \Rightarrow \text{Compact Web}$

$c/t_f = 5.68 < 10.91 \Rightarrow \text{Compact Flange}$

### 2-Check Normal Stress



Section: IPE300

$\lambda = 89.55 < 100$

$f_c = 0.24 \text{ t/cm}^2 < F_c = 0.88 \text{ t/cm}^2$

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