Cranes Loads

Middle span Crane loads :

	10	320	2.5					0.8	4.0	5.0			17.0	24.0	
	12.5	320	2.5					1.0	4.2	5.2			20.0	25.0	
32/5	16	320	2.5	1.4	1.9	16	0.5	1.1	4.3	5.3	1.0	14	24.0	27.0	2
	20	330	2.6					1.3	4.4	5.5			28.5	28.5	
	25	330	2.6					1.4	4.6	5.8			35.0	30.5	
→	32	330	2.6					1.6	5.1	6.4			43.0	33.0	

crane own weight : (38 / 32) * 33 = 40 t

Max wheel load = 40 t

Minimum Wheel load = 40t * $W_{crane\ ow}$ / W_{total} = 40 * 43 / (43 + 32 + 14) = **19 t**

Max Lateral shock = 0.1 * 40t = **4 t**

Min Lateral shock = 0.1 * 19 = **1.9 t**

Left span crane loads :

	10	250	1.8					0.8	3.1	4.1			7.5	6.8	
	12.5	250	1.8					1.0	3.7	4.7			10.0	7.7	
10	16	270	1.8	1.0	0.8	16	0.3	1.1	3.9	4.9	2.8		12.9	8.7	2
	20	270	1.9					1.3	4.1	5.2			17.0	9.8	
→	25	280	1.9					1.4	4.6	5.6			21.7	11.5	
	32	280	1.9					1.5	5.1	6.1			27.5	12.7	

Max wheel load : 11.5 t

Minimum Wheel load = 11.5t * $W_{crane\ ow}$ / W_{total} = 11.5*21.7/(21.7+2.8 + 10) = **7.2t**

Max Lateral shock = 0.1 * 11.5t = **1.15 t**

Min Lateral shock = 0.72 t

Corrugated Sheets

roof Corrugated sheets :

Middle span Live load = 60 – 200/3 * tan(α) = 60 – 200/3 * 0.06 = 56 kg / m^2

- use corrugated sheet of allowable live load = 100 kg / m^2 , span **2 m**
  use **continuous** corrugated sheet of thickness **0.55 mm**
- Ow Dead Load = 5.25 kg/m^2
- **Total load Gravity** = 5.25 + 56 = **61.25** kg/m^2
- **Wind Load** (wind side) = q * c * K * a / cos(angle) = 50kg/m^2 * -0.8 * 1.15 / cos($\tan^{-1}$(1200/20000)) = -**46 kg/m^2**
- **Wind Load** (wind opposite side) = q * c * K * a / cos(angle) = 50kg/m^2 * -0.5 * 1.15 / cos($\tan^{-1}$(1200/20000)) = -**29 kg/m^2**

side spans live load = 60 – 200/3 * tan(α) = 60 – 200/3 * 0.1 = 53 kg / m^2

- use corrugated sheet of allowable live load = 100 kg / m^2 , span **2.5 m**
- use **continuous** corrugated sheet of thickness **0.7 mm**
- ow = 6.66 kg/m^2
- **Total load =** 6.66 + 53 = **60** kg/m^2
- **Wind Load** = q * c * K * a / cos(angle) = 50kg/m^2 * -0.8 * 1.15 / cos($\tan^{-1}$(1200/12500)) = -**46 kg/m^2**
- **Wind Load** (wind side) = q * c * K * a / cos(angle) = 50kg/m^2 * -0.5 * 1.15 / cos($\tan^{-1}$(1200/20000)) = -**29 kg/m^2**

side Corrugated sheets :

level > 10 m , Span = 2 m

- wind load (wind direction) **=** C_e * K * q = 0.8 * 1.15 * 50 = 50 kg / m^2 ,
- Wind load (opposite wind direction) = **=** C_e * K * q = -0.5 * 1.15 * 50 = -**32 kg / m^2** ,
- Ow = 4.75 kg/m^2 (vertical load)
- Use **continuous** corrugated sheets for all side of thickness **0.5 mm**

level < 10 m , Span = 2.5 m

- Use corregated sheet of allowable load = 50 kg / m^2
- **wind load** (wind direction) **=** C_e * K * q = 0.8 * 1.0 * 50 = 40kg/m^2
- **wind load** (wind opposite dir.) **=** C_e * K * q = -0.5 * 1.0 * 50 = -25kg/m^2
- Ow = 4.75 kg/m^2 (vertical load)
- Use **continuous** corrugated sheets for all side of thickness **0.5 mm**

Corrugated Sheets Summery :

- Use continuous in **middle span** roof corrugated sheets of **0.7 mm**
- Use continuous in **side spans** roof corrugated sheets of **0.55 mm**
- Use continuous in **side corrugated** sheets of **0.50 mm**

Mezanin

Flooring = 200 kg/m^2

Storage Floor Live Load = 500 Kg/m^2

Management Floors Live Load = 400 Kg/m^2

Walls distributed load = 200 kg/m^2

Deck span = 2.50 m

Use Metal Deck thickness = 1.2 mm

For **Storage Floor** Use concrete thickness = 8 cm

- concrete load = 2500 kg/m^3 * 0.08 = 200 kg/m^2

- total dead load = 600 kg/m^2
- total live load = 500 kg/m^2
- total working load = 1100 kg/m^2
- Total ultimate load for storage floor = 1.4 * (200 + 200 + 200) + 1.6 * 500 = 1640 kg/m^2
- Allowable load for storage floor = **1758 kg/m^2**

For **management Floor** Use concrete thickness = 7 cm

- concrete load = 2500 kg/m^3 * 0.08 = 200 kg/m^2
- total dead load = 575 kg / m^2
- total live load = 400 kg/m^2
- total working load = 975 kg/m^2
- Total ultimate load for mang. floor = 1.4 * (200 + 175 + 200) + 1.6 * 400 = 1445 kg/m^2
- Allowable load for management floor = **1542 kg/m^2**

<u>Mezanin Summery :</u>

Use Metal Deck of **1.2 mm**

For Management Floors , Concrete Thickness = **7 cm**

For storage Floor , Concrete Thickness = **8 cm**

Thickness	0.8 mm.				1.0 mm.				1.2 mm.				1.6 mm.			
Concrete thickness / Span	5 cm.	6 cm.	7 cm.	8 cm.	5 cm.	6 cm.	7 cm.	8 cm.	5 cm.	6 cm.	7 cm.	8 cm.	5 cm.	6 cm.	7 cm.	8 cm.
2.0 m	1500	1760	2070	2360	1630	1900	2210	2520	1850	2130	2440	2770	1940	2230	2540	2890
2.4	1000	1180	1400	1630	1100	1280	1500	1730	1290	1480	1700	1930	1350	1550	1770	2000
2.8	610	750	880	1050	720	860	990	1160	920	1060	1210	1380	990	1140	1300	1470

Purlins Design

Purlins Middle span :

- **Live** load = 56 kg/m^2 * 2m = **112 kg/m**
- Ow = 25 kg/m
- **Dead** load = 5.25 kg/m^2 * 2m + 25kg/m = **30.5** kg/m
- Dead Load Reactions = 30.5kg/m * 6m / 2 = 91.5 kg = 0.092t
- Live load Reactions = 112kg/m * 6m / 2 = 336 kg = 0.34t
- Total load Reactions = 427.5 kg = 0.43 t
- Wind Load (wind direction) =

Purlins Side Spans :

- **Live** Load = 53 kg/m^2 * 2.5m = **132.5 kg/m**
- Ow = 25 kg/m
- **Dead** Load = 25kg/m + 6.66kg/m^2 * 2.5m = **41.65 kg/m**
- **Dead** load **Reactions** = 41.65kg/m * 6m / 2 = 125 kg = 0.125 t @ 2.5m span
- **Live** load **Reactions** = 132.5kg/m * 6m / 2 = 397.5 kg = 0.4t @ 2.5m span
- Total load = 0.525t

Beams load

Mezanin storage floor main beams (using metal deck allowable load) :

- Dead load = 1.6t/m * 6m = 9.6 t , secondary beams from one side , @2.5m spacing
- Live load = 1.25t/m * 6m = 7.5 t , secondary beams from one side , @2.5m spacing

Mezanin management floor main beams (using metal deck allowable load) :

- Dead load = 1.55t/m * 6m = 9.3 t, secondary beams from one side , @2.5m spacing
- Live load = 1t/m * 6m = 6 t , secondary beams from one side , @2.5m spacing

Mezanin Storage Floor Secondary Beams :

- Dead load = 0.6t/m^2 * 2.5m = 1.5 t/m
- Total Live load = 0.5t/m^2 * 2.5m = 1.25 t/m
- ow = 100 kg / m
- Total Dead load = 0.1t/m + 1.5t/m = 1.6 t/m

Mezanin Management Floor Secondary Beams :

- Dead load = 0.58t/m^2 * 2.5m = 1.45 t/m
- Ow = 0.1 t/m
- Total Dead load = 1.55 t/m
- Live load = 0.4t/m^2 * 2.5m = 1 t/m

Frame girder load :

- Purlins concentrated **Dead** loads from each sides= 2 * 0.125t = **0.25t** ,9purlins@2.5m
- Purlins concentrated **Live** loads from each sides = 2 * 0.4t = **0.8t** ,9purlins@2.5m
- Utilities **Dead** loads = **0.1 t /m**

Truss loads :

- Purlins concentrated **Dead** loads at nodes from each sides = 2* 0.092t = **0.185t** ,purlins@2.5m at each node
- Purlins concentrated **Live** loads at nodes from each sides = 2* 0.34t = **0.68t** ,purlins@2.5m at each node
- Utilities **Dead** Load = 100 kg / node = **0.1t** /node

Side Purlins Beams < 10.00 m level:

- Wind Lateral Load = 40kg/m^2 * 2.5m = 100kg/m = 0.1 t/m
- Vertical load = corrugated sheet ow + purlin ow = 4.75 kg/m^2 * 2.5m + 25kg/m = 36.9kg/m
- Lateral Reaction = 0.1t/m * 6m / 2 = 0.3t
- Vertical Reaction = 36.9kg/m * 6m / 2 = 0.11t

Side Purlins Beams > 10.00 m level:

- Wind Lateral Load = 46kg/m^2 * 2 m = 92kg/m = 0.092 t/m
- Vertical load = corrugated sheet ow + purlin ow = 4.75 kg/m^2 * 2 m + 25kg/m = 35kg/m
- Lateral Reaction = 0.092t/m * 6m / 2 = 0.28t
- Vertical Reaction = 35kg/m * 6m / 2 = 0.11t