Machine Design –II

Material handling system

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Material handling Overview

- Objectives of material handling system
- Factors for selecting material handing equipment
- Classification of material handling system
- Trucks (fork lift)
- Cranes
- Pulley system
- Wire ropes
- Rope drum

Objective of material handling system

- Accuracy in travel
- Precision in position
- On time
- Without damage / no harm to load
- With Minimum man power / reduce man power
- Low initial & operating cost
- Safety during transfer
- Easy maintenance after installation

Factors for selecting material handling system

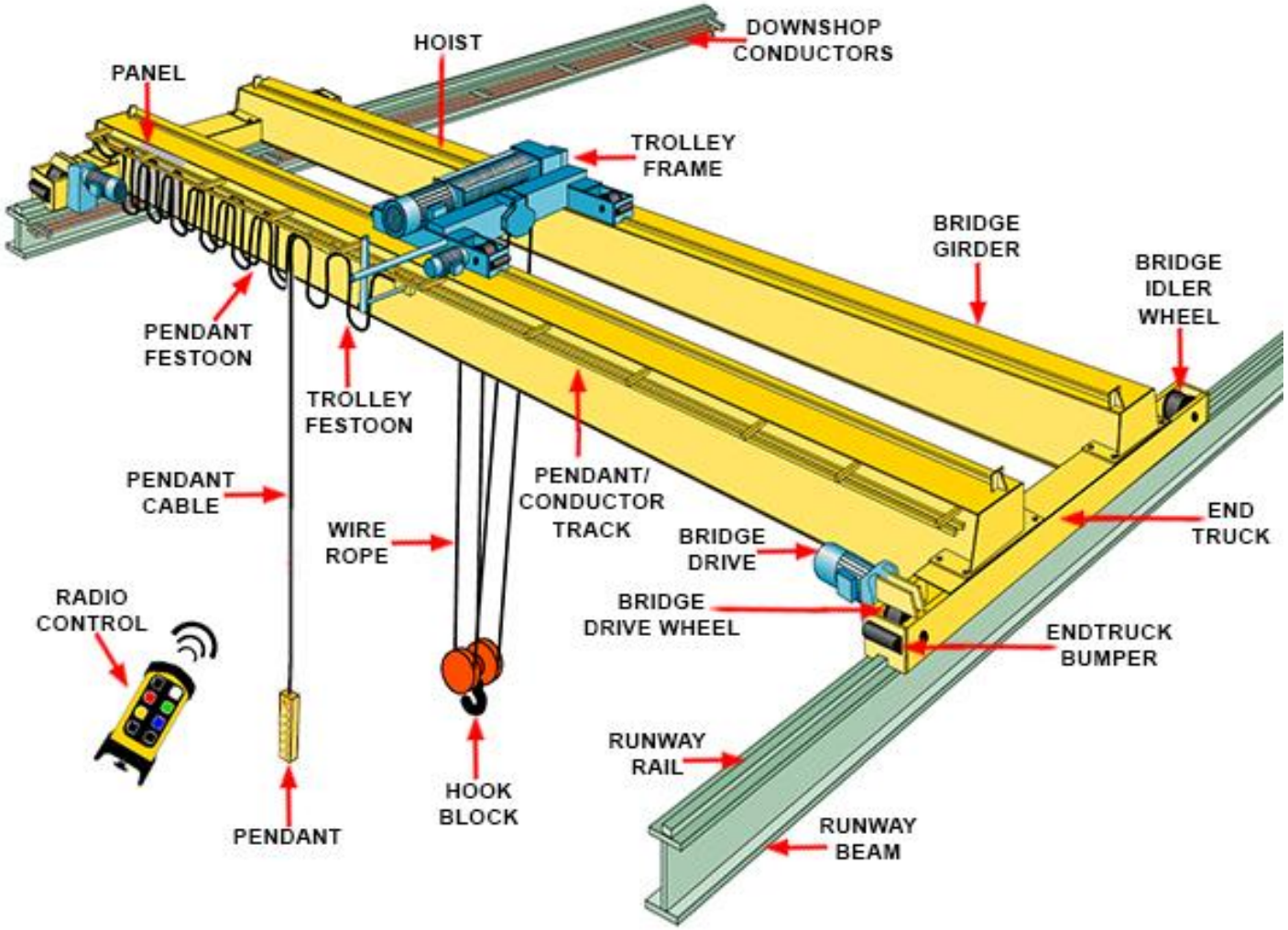
- Direction of load travel
- Length of load travel
- Type of load
- bulk load , unit load
- Moving capacity
- Stacking condition
- Initial & operational cost
- Size shape or area available
- Safety requirements

Classification of material handling equipment

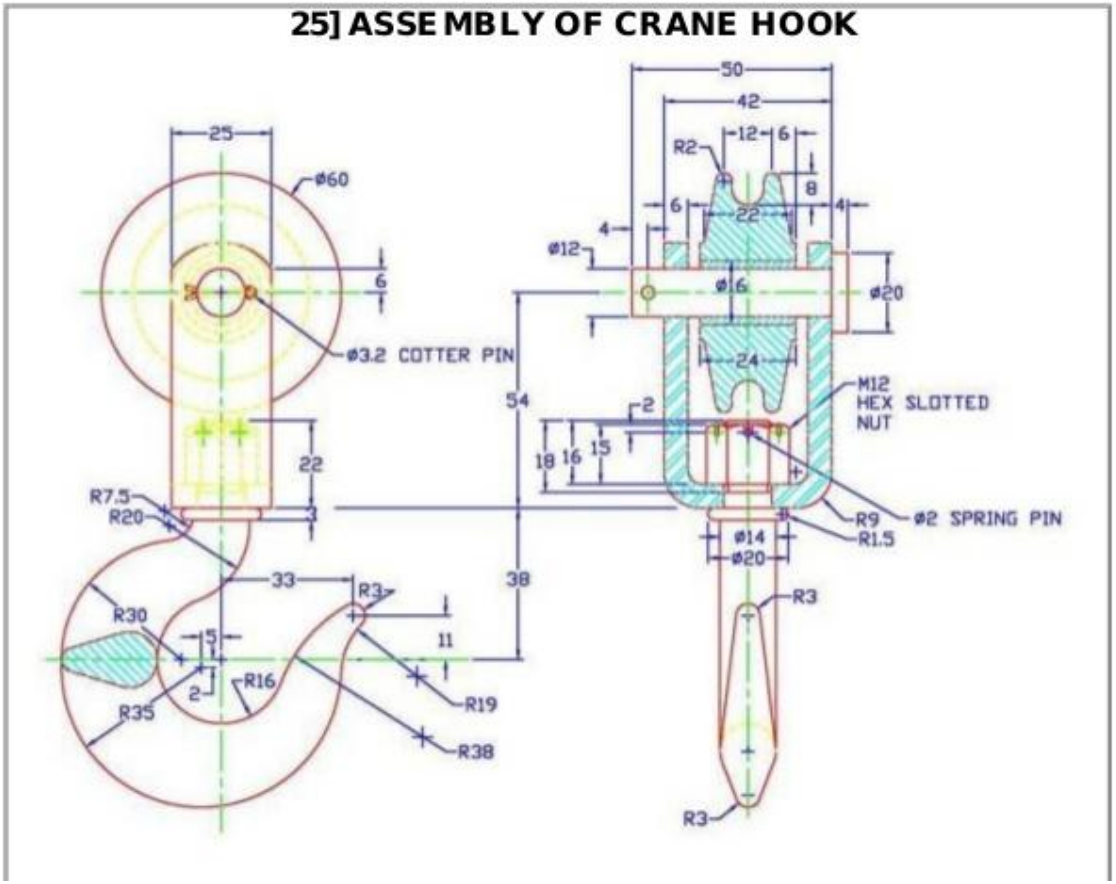
- Hoisting equipment:
- Hoisting Machines – fork lifts , pulleys , jacks
- Cranes – EOT , gantry , Tower ,
- Elevators
- Conveyors
- Flat belt
- Chain conveyors
  Apron conveyors

- Surface and over head
- Trucks .

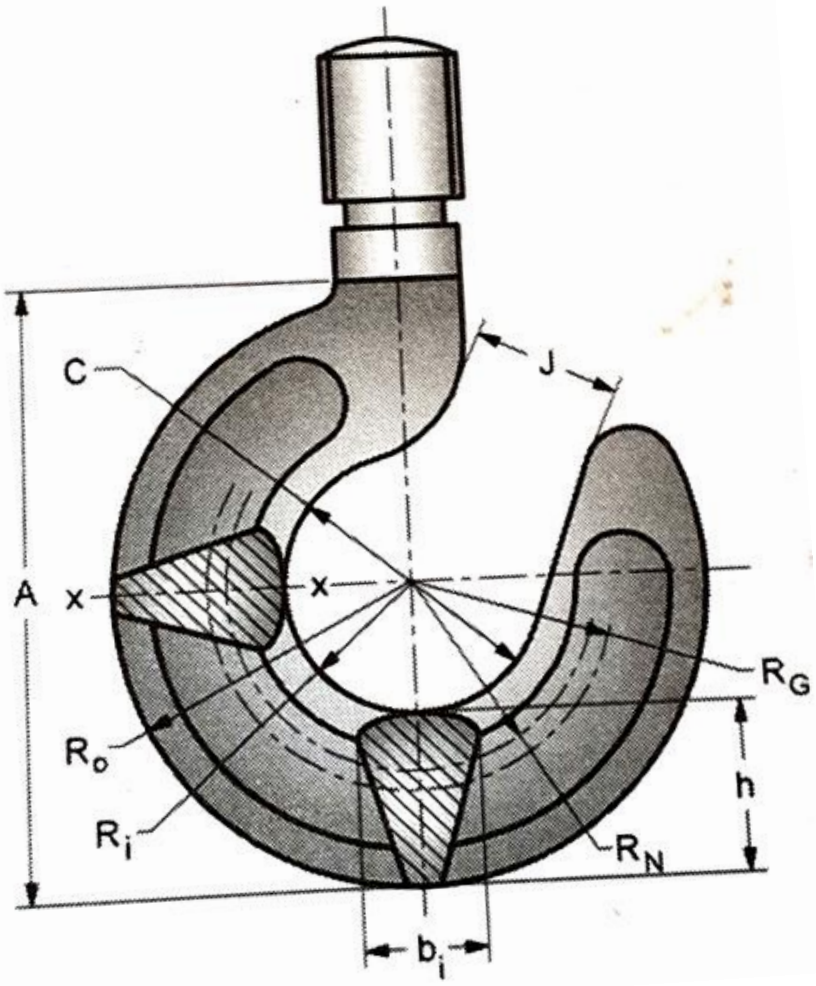
Components of EOT cranes



Crane hook assembly



Design of crane hook Triangle cross section



C = bed diameter
J = Throat = 0.75 C
B_i = width of cross section =0.5 H
H = Depth of cross section =0.9 C
A= Cross section area = ½ Bi x H
R_N = Radius of neutral axis
R_G = Radius of Centroid axis
R_0 = Extrados radius =0.5 C + H
R_i = intrados radius =0.5 C

M= P x R_N
Hi = $R_N - R_i$
Ho = $R_0 - R_N$

$$R_G = R_i + \frac{h}{2} \qquad R_n = \frac{h}{\log_e\left(\frac{R_o}{R_i}\right)}$$

Design of crane hook Triangle cross section

Design a crane hook for maximum load capacity of 10 ton . Material for hook is forged steel which is having permissible stress 120 N/ mm² . Define cross section dimensions for crane .

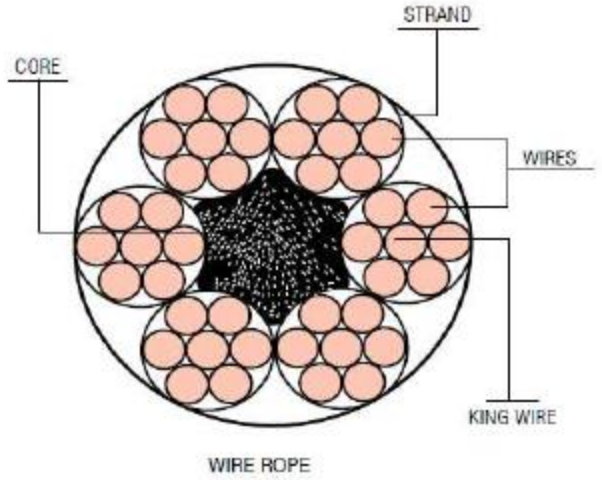
Design data for crane

$$\sigma_b = \frac{M}{A.e}\left(\frac{y}{R_n - y}\right)$$

$$R_n = \frac{h}{\log_e\left(\frac{R_o}{R_i}\right)}$$

$$R = R_i + \frac{h}{2}$$

Ropes in crane



WIRE ROPE

Ropes in crane

Cold drawn steel wires twisted into stands (7, 9 ,19,37) according to application .

Types of rays are chosen according to application

Regular ray ,

lang ray .

Failure of ropes is due to excessive tension over fatigue load .