



Material handling

# Introduction

“Material handling embraces the basic operations in connection with the movement of bulk, packaged and individual products in a semi-solid or solid state by means of gravity manually or power-actuated equipment and within the limits of individual producing, fabricating, processing or service establishment”

*–Haynes*

# Objectives of material handling

- ◆ Minimise cost of material handling.
- ◆ Minimise delays and interruptions by making available the materials at the point of use at right quantity and at right time.
- ◆ Increase the productive capacity of the production facilities by effective utilisation of capacity and enhancing productivity.
- ◆ Safety in material handling through improvement in working condition.
- ◆ Maximum utilisation of material handling equipment.
- ◆ Prevention of damages to materials.
- ◆ Lower investment in process inventory.

# Principles of material handling

# Planning principle



# Systems principle



# Space utilisation principle



# Unit load principle



# Gravity principle



# Simplification principle



# Mechanisation principle



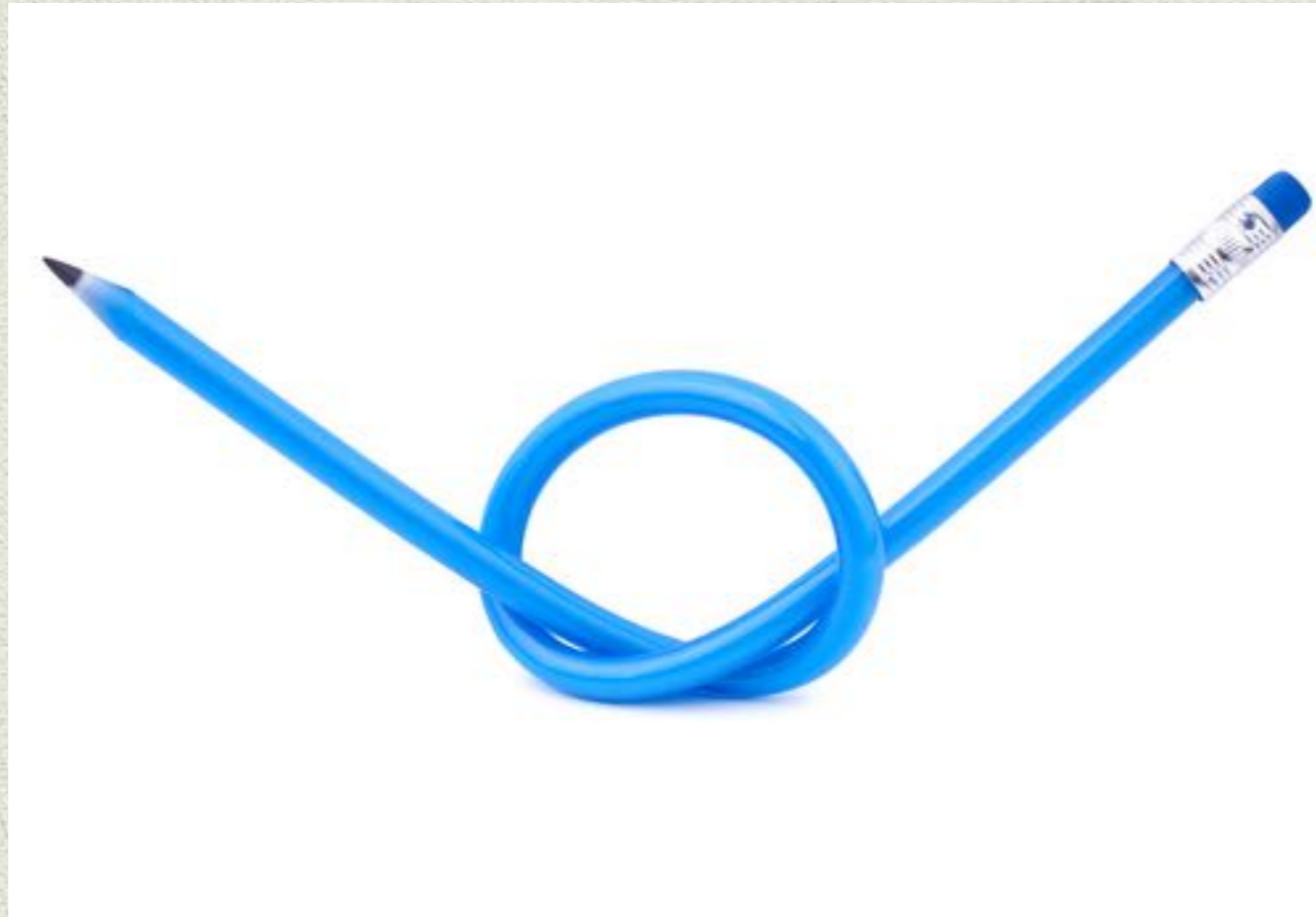
# Material flow principle



# Standardization principle



# Flexibility principle



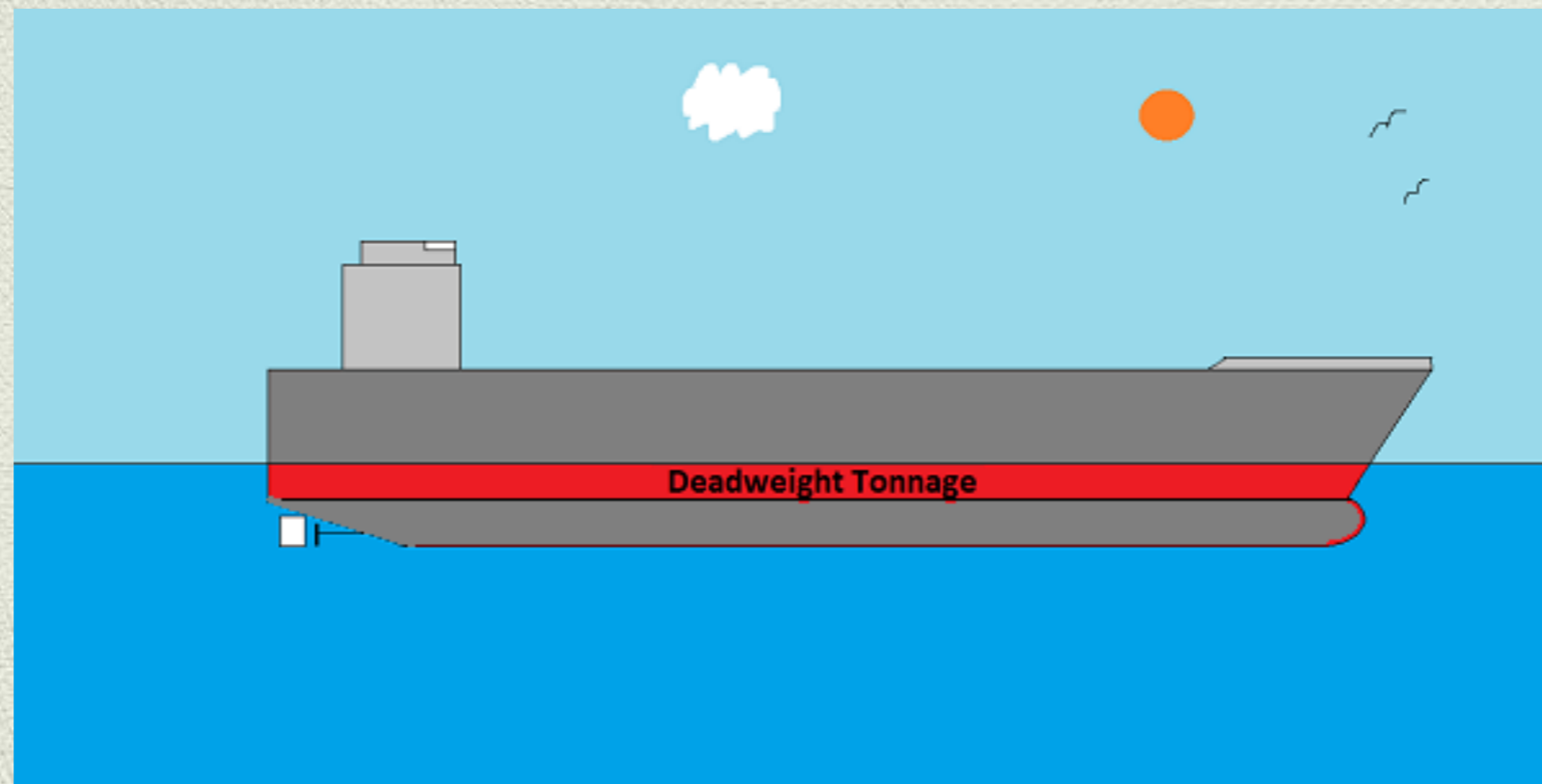
# Equipment selection principle



# Safety principle



# Dead weight principle



# Motion principle



# Idle time principle



# Maintenance principle





# Capacity principle



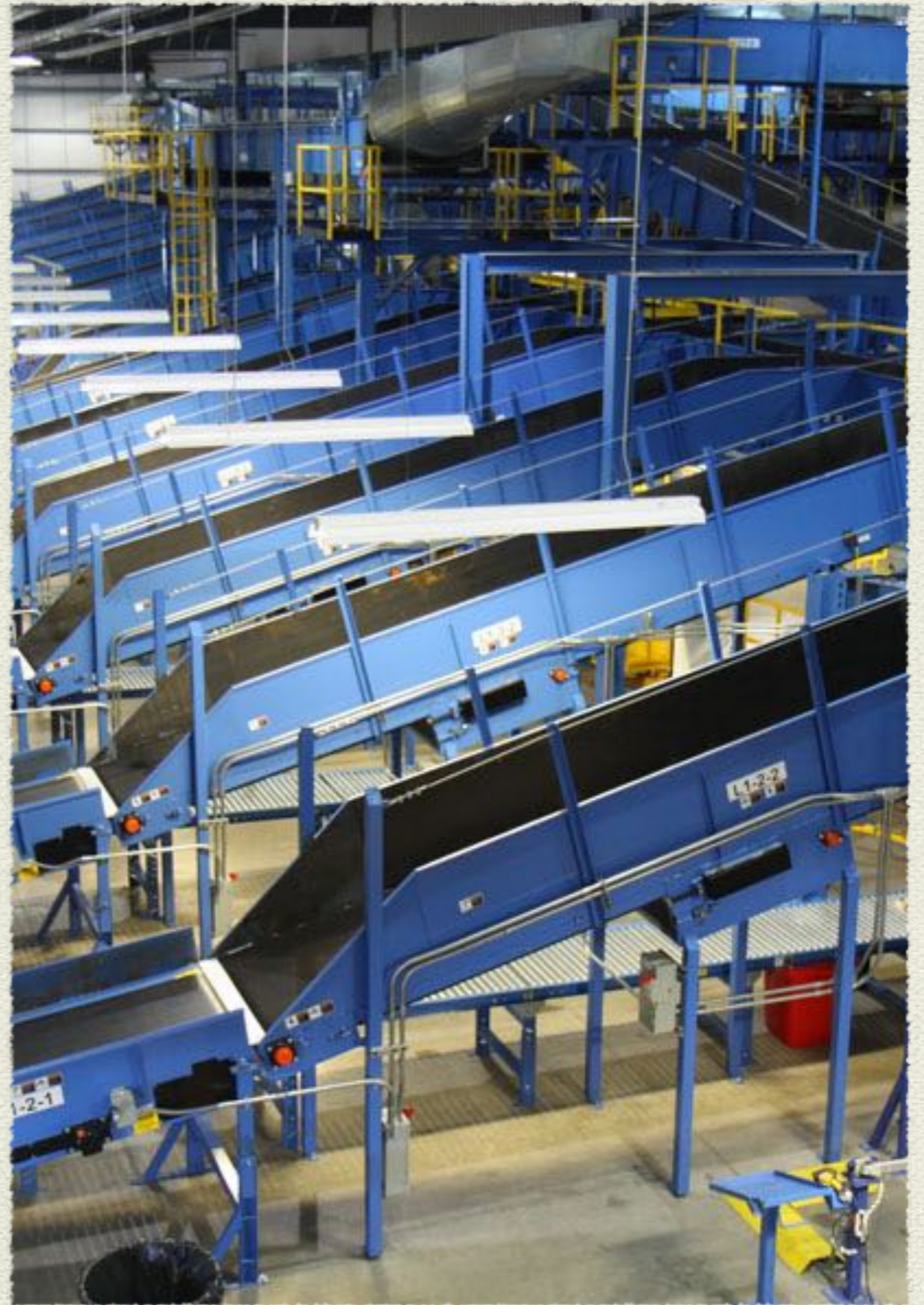
# Control principle



# Performance principle



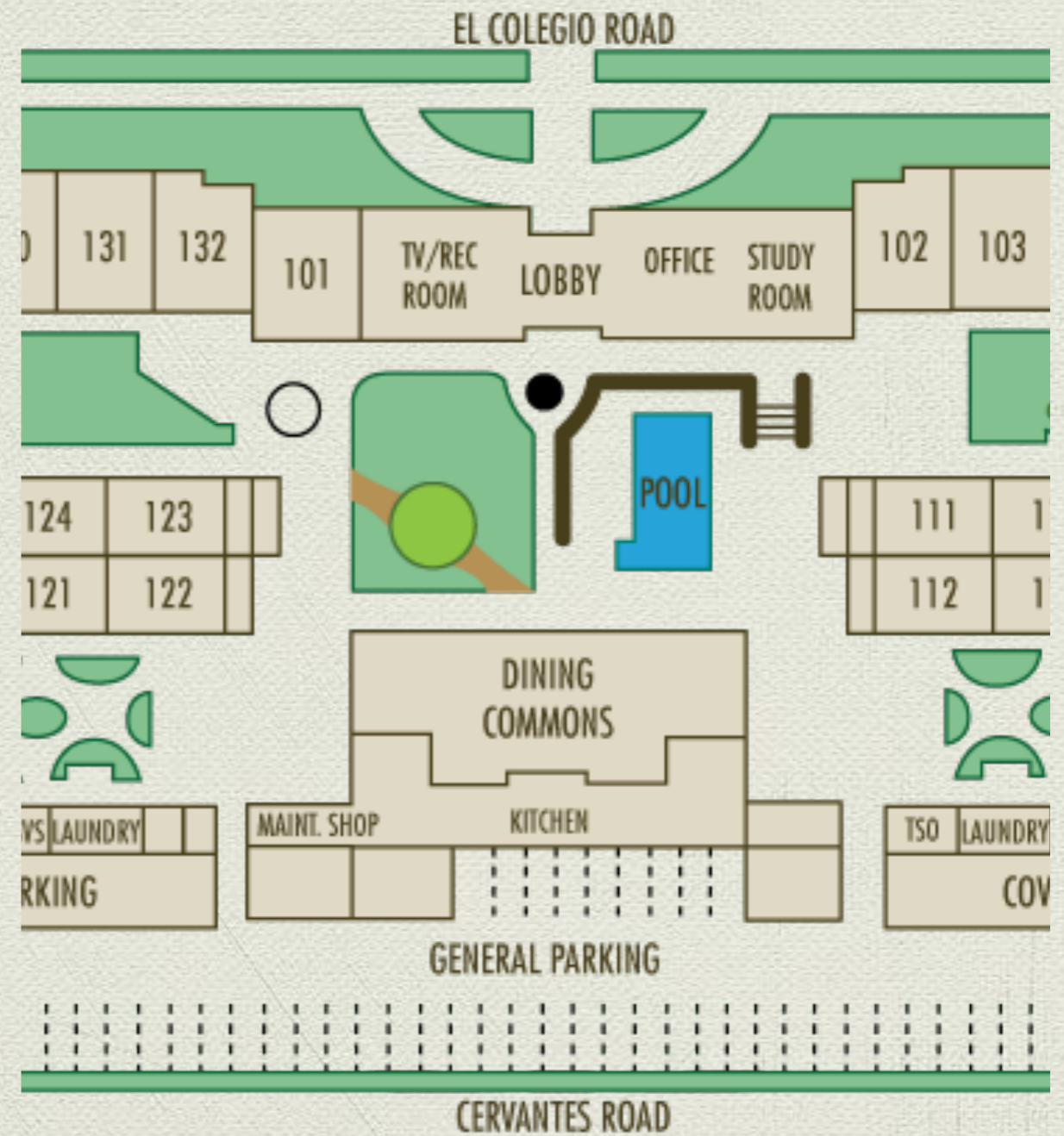
# Selection of material handling equipments



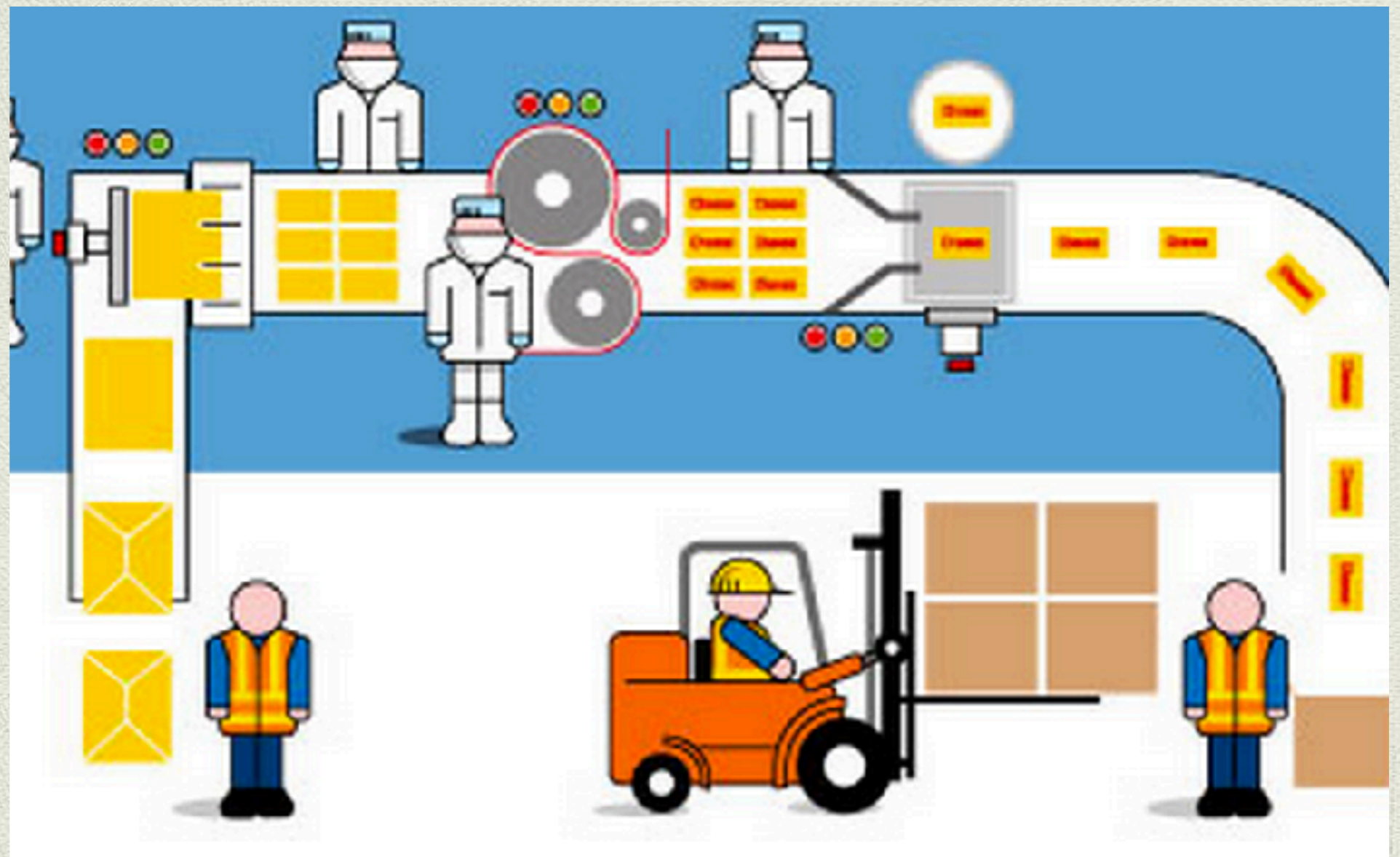
◆ Properties of the material



Layout and characteristics of the building



Production  
flow



◆ Cost considerations



◆ Nature of operations



◆ Engineering factors



◆ Equipment reliability



# Evaluation of material handling system

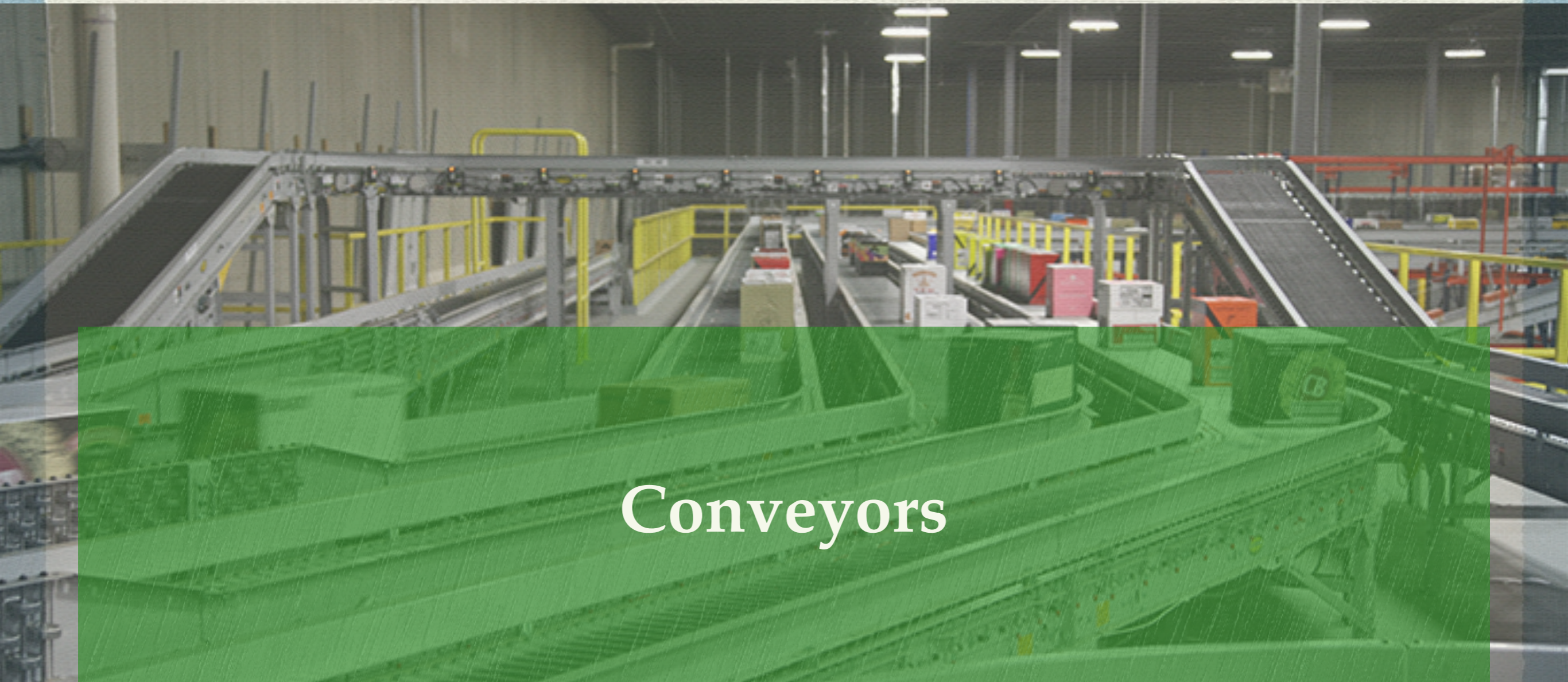


Equipment utilization ratio

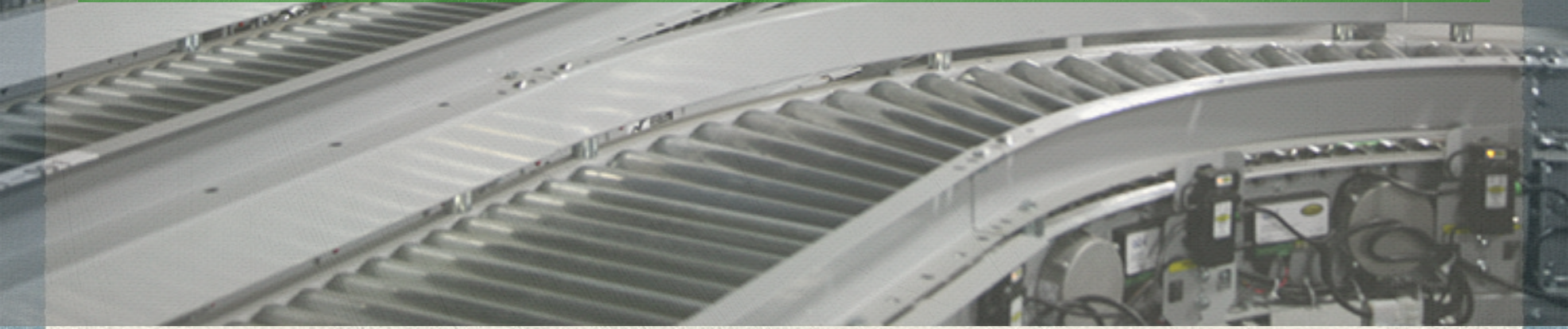
$$\text{MHL} = \frac{\text{Personnel assigned to materials handling}}{\text{Total operating work force}}$$

$$\text{DLHL} = \frac{\text{Materials handling time lost of labour}}{\text{Total direct labour time}}$$

# Material handling equipments



# Conveyors



A red industrial truck is shown from a low-angle perspective, carrying a blue pallet of goods. The pallet is stacked with various items, including what appear to be metal components or machinery. The truck is positioned in a warehouse or industrial setting, with a blue wall and a white ceiling visible in the background. The truck's front grille and headlights are prominent, and its large tires are visible. The overall scene is brightly lit, suggesting an indoor industrial environment.

# Industrial trucks

  
HOOSIER CRANE  
SERVICE COMPANY  
(800) 509-6131  
**10 Ton**  
Rated Capacity  
Serial #: 7537  
Made in the USA

SPACEMASTER

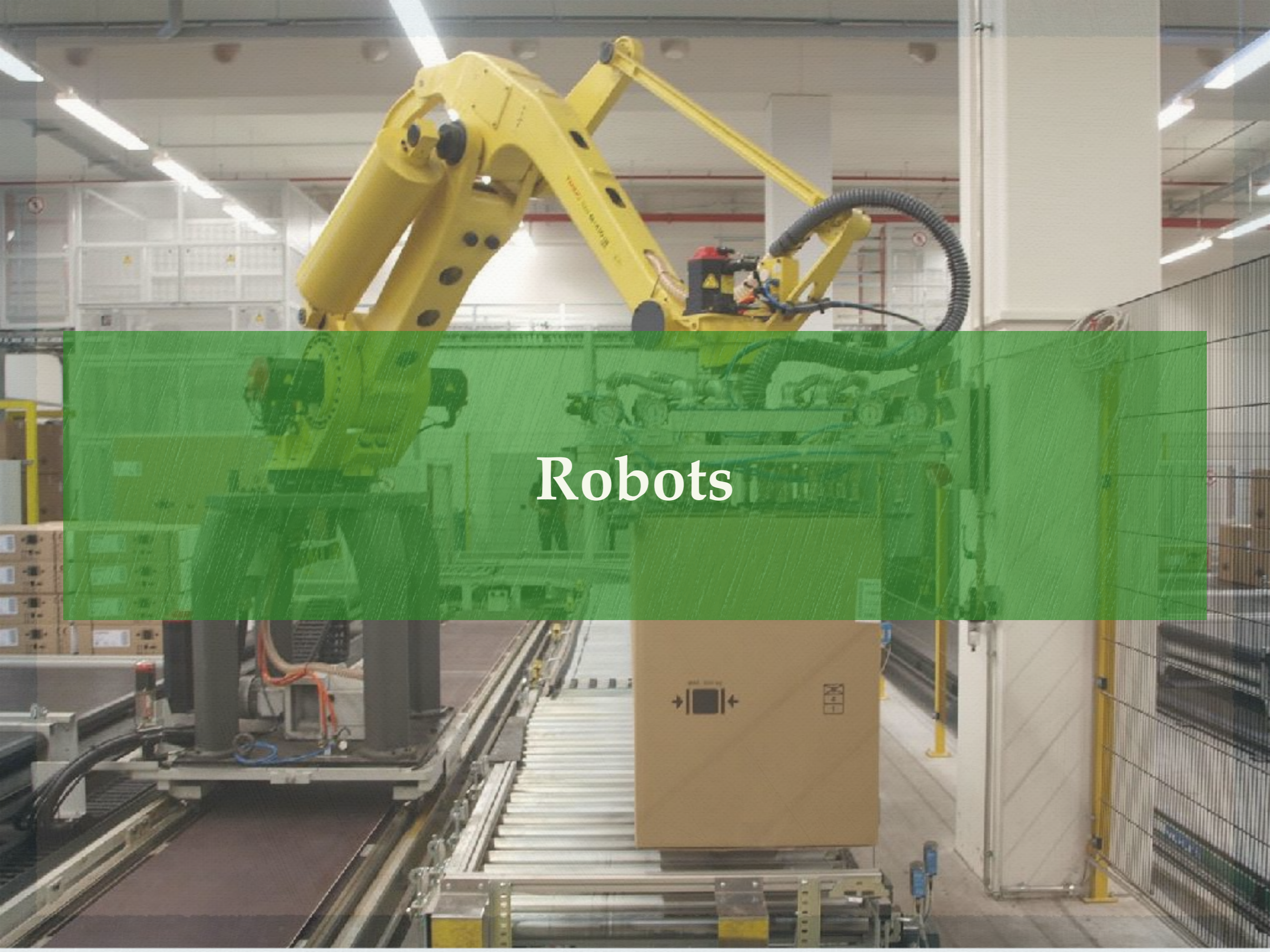
SX

# Cranes and hoists



A photograph of a red shipping container, viewed from a low angle. The container is closed, showing the locking mechanism on the left side. A green semi-transparent rectangular overlay is positioned in the center of the image, containing the word "Containers" in white, bold, sans-serif font. The background is a plain, light-colored surface.

# Containers



# Robots

# Material handling equipments







# Guidelines for effective utilization of material handling equipments

- ◆ Eliminate handling wherever possible
- ◆ Sequence the operations in logical manner
- ◆ Use gravity
- ◆ Standardize handling equipments
- ◆ Install a regular preventive maintenance programme for material handling
- ◆ Versatility and adaptability
- ◆ Weight of unit load must be maximum
- ◆ Consider work study aspects
- ◆ Non-productive operations in handling should be minimum

# Guidelines for effective utilization of material handling equipments

- ◆ Close location
- ◆ Application of OR techniques
- ◆ Safety aspect
- ◆ Avoid wasteful movements
- ◆ Ensure proper coordination through judicious selection of equipments and training of workmen

# Relationship between plant layout and material handling