

## 5.5 MATERIAL HANDLING AND ERECTION EQUIPMENTS

Horizontal transportation

Vertical transportation

Upward only

Downward only

Upward and downward

Derricks are commonly used to lift equipment of materials in industrial or building construction. A derrick consists of a vertical mast and an inclined boom sprouting from the foot of the mast. The mast is held in position by guys or stiff legs connected to a base while a topping lift links the top of the mast and the top of the inclined boom. A hook in the road line hanging from the top of the inclined boom is used to lift loads. Guy derricks may easily be moved from one floor to the next in a building under construction while stiff leg derricks may be mounted on tracks for movement within a work area. Tower cranes are used to lift loads to great heights and to facilitate the erection of steel building frames. Horizon boom type tower cranes are most common in high rise building construction. Inclined boom type tower cranes are also used for erecting steel structures. Forklift trucks are useful for horizontal and limited vertical transportation of materials. Hoists are used in two-way vertical transportation of materials and passengers, whereas rubble chutes are used in downward transportation of construction and demolition debris. Cranes are the most versatile material handling equipment that can be chosen or designed for any kind of movement.

### (a) Forklift Trucks

Forklift trucks are used for horizontal and limited vertical transportation of packaged materials positioned on pallets or banded together such as brick packs.

They are generally suitable for construction sites where the building height does not exceed three stories. Although designed to negotiate rough terrain sites, forklift trucks have a higher productivity on firm and level soils.

Three types of forklift trucks with various height, reach and lifting capacities are in common use namely,

- Straight mast
- Overhead truck
- Telescopic boom

### **(b) Hoists**

Hoists are equipment used for transporting materials and passengers vertically. Common types of hoists are as follows:

#### **(i) Material Hoists**

These are designed for the vertical transportation of materials and under no circumstances should they be used to transport passengers. Most material hoists are mobile, can be dismantled, folded onto the chassis and moved to another position or site under their own power or towed by a haulage vehicle. When in use material hoists need to be stabilized and / or tied to the structure and enclosed with a protective screen.

#### **(ii) Passenger Hoists**

These are designed to carry passengers although most are capable of transporting a combined load of materials and passengers within the lifting capacity of the hoist. A wide selection of hoists is available ranging from a single cage with rope suspension to twin cages with rack and pinion operation mounted on two sides of a static tower.

### **(c) Cranes**

Cranes are machines designed to move materials vertically (raise by rope pulley operation) or horizontally. The range of cranes available is very wide, from gear wheel to a complex tower crane. Therefore, choice must be based on:

- The loads to be lifted

- Height of lifting
- Horizontal distance to be covered
- Time period of lifting operations
- Utilization factors and
- Degree of mobility required

However, it may be possible to place most cranes into one following groups

### **(i) Mobile Cranes**

These are low-pivot cranes capable of horizontal motion, either by itself or mounting on crawler or truck. They are classified based on the type of mobility as:

- Self-propelled cranes with wheeled chassis
- Truck mounted hydraulic cranes
- Truck mounted lattice jib cranes
- Crawler mounted cranes

### **(ii) Static Cranes**

These are either operating from affixed position on ground or is capable of longitudinal motion on rails. Depending on the height of pivot and operational ability, static cranes are of three types:

- Gantry Cranes which are not pivoted, and are cranes with pulley, rope and hook are hung from a portal frame
- Most Cranes which are similar to tower cranes are low pivot cranes
- Tower Cranes are high pivot cranes

### **Rubble Chutes**

These are used in demolition, repair, maintenance and refurbishment. The concept involves connecting of several perforated dustbins vertically downwards for expedient and safe conveyance of materials. In customized

forms the tapered cylinders are produced from reinforced rubber with chain linkage for continuity. Overall unit lengths are generally 1.1 m, providing an effective length of 1 m. Hoppers and side entry units are made for special applications.

## **Dumpers**

These are used for the horizontal transportation of materials on and off construction sites generally by means of an integral tipping skip. A wide range of dumpers is available depending on their carrying capacities, discharge control (gravity or hydraulic discharge) and tipping facilities (front tipping, side tipping). Special dumpers fitted with flat platforms, rigs to carry materials, skips and rigs for concrete, skips for crane hosting are also available. Highway dumpers are of a similar but larger design and can be used to carry materials such as excavated soil along the roads.

