3.4 ERECTION EQUIPMENTS

A universal piece of erection equipment, it is the crane. Mounted on wheels or tractor threads, it is extremely mobile, both on the job and in moving from job to job. Practically all buildings are erected with this efficient raising device. Erection involves positioning, aligning and securing the components on prepared foundations to form a complete frame.

Safe erection of structural construction depends upon proper and timely planning. Operation of lifting a weight from one location and moving it to another location which is at a reasonable distance and then dumping it. The following are the different types of erection equipment. Cranes are classified into the following classes such as:

1. Derrick cranes

- 2. Mobile cranes
- 3. Hydraulic cranes
- 4. Overhead cranes
- 5. Traveller cranes
- 6. Tower cranes

DERRICK CRANES: Derrick cranes consists of a mast, a boom, bull wheel on which it rotates, supporting membrane. These cranes are used for construction projects, plant erections, loading and unloading of cargos, ship buildings etc., Boom can revolve through 360-degree, bull wheel attach mast and rotate and it can be operated by diesel engine or by electric motor. It can also work upto 40 tones.

MOBILE CRANES: Either crawler mounted or wheel mounted, crawler mounted has an ability to operate unmade ground. It can be used in tough terrain. Economically used where ground conditions are poor and operate in a limited area. Wheel mounted crane has high mobility which can travel up to 70 to 75 Kmph and it is designed for long distance travel.

HYDRAULIC CRANES: hydraulic cranes are operated hydraulically powered including extension and its powers are generated by rotary oil pumps. It can change its boom length easily and quickly changes the angle.

OVERHEAD CRANES: it is used for handling loads over long rectangular area. It can be supported on tram wheel and can move on gantry rails. These are widely used in erection. It consists of two main parts: Bridge and Crab; Crab consists of hoisting gear mounted on a frame. Frame mounted on another set of wheels and capable of moving across the main girder.

TRAVELLER CRANES: traveller cranes are also called as goliath cranes. Its crab is moving on girders supported on legs, legs move on tracks laid on floor and its useful as dock site cranes.

TOWER CRANES: tower cranes are mounted on steel tower. It can be used in various construction projects. It is constructed for work and then dismantled. Ladders are provided inside the whole height, saddle moves horizontally and controlled from the hook block.

Methods for erecting girders above heavy traffic include the launching method and the whole erection method. The launching method requires a back yard (to assemble girders) and the whole erection method requires a crane capable of lifting a weight over the girders to be erected. Erections are mainly used in constructions such as: erection of cables of suspension bridges, overhanging erections for cable slayed bridges, efficient concrete placing for RCD dams etc.,

<u>2)</u> <u>CRANES</u>

A crane is a type of machine, generally equipped with a hoist rope, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. It is mainly used for lifting heavy objects and transporting them to other places.

There are two main categories of cranes: static cranes and mobile cranes.

A static crane is a permanent/semi-permanent structure fixed to the ground or building those lifts and moves loads along a fixed path. A mobile crane is mounted on treads or wheels and can be moved from job site to job site.

There are different types of cranes used in construction projects. Crane is a machine capable of lifting, lowering and moving of heavy materials with the use of pulleys and cables. Cranes are valuable assets for the construction industry because they made things easy for any type of construction. These are helpful for construction of high-rise buildings as well as in areas inaccessible.

Types of Cranes Used in Construction

- 1. Vehicle Mounted Crane
- 2. Tower Crane
- 3. Rough Terrain Crane
- 4. Crawler Crane
- 5. All Terrain Crane
- 6. Railroad Crane

7. Telescopic Handler Crane

- 8. Harbour Cranes
- 9. Floating Crane

10.Aerial Crane

11. Telescopic Crane

12.Level Luffing Cranes

1. Vehicle Mounted Crane: Cranes are required only during the construction as temporary structures. So, these are mounted to vehicles for easy movement. Mostly cranes are truck mounted except some heavy cranes. The wheels of vehicle mounted cranes are made with rubber. These wheeled vehicles can move faster than trucked but are not accessible to uneven areas. Outriggers are provided to the base of vehicle to provide stability to the crane while working.

2. Tower Crane: Tower cranes are widely used for construction of tall buildings as they can work up to 265 feet as well as lower to 230 feet. These have lifting capacity approximately equal to 20 tons and are fixed to the ground during construction period. These cranes are fixed using strong concrete base and anchored by large bolts which can be removed easily after construction.

3. Rough Terrain Crane: Rough terrain crane is special type of vehicle mounted crane. This crane is used for off-road construction work or rough terrain places where a normal vehicle mounted crane is not suitable. Specially designed rubber tires are used for this crane and outriggers are provided at the base of the vehicle to provide stability while working.

4. Crawler Crane: This is a movable crane but the movement of vehicle is done

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by tracks due to which they do not require outriggers for stability. Their lifting capacity is very high (40 tons to 3500 tons). Because of tracked system it can move to any site even in soft soils. It is capable of traveling with load and is used for heavy load transport in the construction site.

5. All Terrain Crane

It is also mobile crane which can move at same speed in the paved road as well as in rough terrains. It has a greater number of wheels than normal vehicle and they balance the vehicle without overturning in rough terrains. So, we can use this crane instead of both truck mounted crane and rough terrain crane for dual purpose.

6. Railroad Crane

Railroad cranes are used for construction of railway line, repairing and maintaining of railroad. These have flanged wheels at its bottom which can be moved in rail track only.

7. Telescopic Handler Crane

Telescopic cranes are used to handle pallet of bricks, to install steel trusses at the top etc. and has forklift type part at the end of boom. They also have outriggers at its base. The crane part is rotatable to 360°.

8. Harbour Cranes

Harbour cranes are provided in port areas for loading and unloading of ships.

9. Floating Crane

Floating cranes are required for bridge construction, port construction. They are also used to load and unload the ships. They have capacity up to 9000 tons. So

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these are also useful to lift sunk ships from water.

10. Aerial Crane

These are also called as sky cranes. It looks like helicopter and are used when the target is difficult to reach by land. Cables are used to lift the material.

11. Telescopic Crane

Telescopic crane has a large boom in which number of tubes are fitted one inside the other. These tubes extend outwards by hydraulic mechanism. It is used to build signal towers, rescue operations, lifting boats from water etc.

12. Level Luffing Cranes

Level luffing crane has a hinged jib which move up and down enabling the crane arm to move inwards and outwards. It is used in shipyards to place containers or to unload ships.

3) MOBILE CRANES

A mobile crane is a cable-controlled crane mounted on crawlers or rubber-tired carriers or a hydraulic-powered crane with a telescoping boom mounted on truck-type carriers or as self-propelled models.

Mobile cranes are typically used for construction, infrastructure, roofing, HVAC, and industrial moving. Mobile cranes generally operate a boom from the end of which a hook is suspended by wire rope and sheaves.

The wire ropes are operated by whatever prime movers the designers have available, operating through a variety of transmissions. Mobile crane manufacturers are designing cranes that can address the complexity of urban development sites. Different types of mobile serves varied purposes. **Given below are different types of mobile cranes used in construction.**

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- Truck-mounted mobile crane.
- Side lifter mobile crane.
- All-terrain mobile crane.
- Rough terrain mobile crane.
- Telescopic handler mobile crane.
- Crawler mobile cranes.
- Stiff boom mobile crane.
- Folding boom mobile crane.

Truck-mounted mobile crane: Truck-mounted cranes are widely used in a variety of construction projects. In this type of mobile cranes, industrial sensors must be able to survive the heavy shock, vibration, weather, and temperature conditions when installed on truck-mounted cranes.

Modern machines predominantly have telescopic booms, although they are also available with lattice booms. They are designed to travel on public highways and are often based on, or mounted on commercially available truck chassis. They are powered by a diesel engine and employ hydraulic systems to drive the boom and lifting gear.

The powerful, long telescopic booms can reach great working heights quickly and easily. Flexibility is the highest priority for the equipment – the right crane for every job can be configured quickly using functional lattice extensions, folding jobs, fixed and luffing lattice jobs.

Side lifter mobile crane: Modern Side lifter mobile crane is designed with versatility in mind and is available with a lifting capacity of 25, 36, or 40 tonnes. It is the lightest Side loader in its class, with a tare weight starting at 8,0 tonnes with 20'-40' capacity, 3 axles and 36 tonnes SWL. The support legs are extending and tilting, making their positioning very versatile. An excellent quality when you have a wide range of different operations.

All-terrain mobile crane: An all-terrain crane is considered the luxury version of a mobile hydraulic crane. All-terrain cranes are essentially a hybrid between a mobile truck crane and a rough terrain crane.

Modern models have capacity ranges from 40 to 1,000 tons and reach heights of up to 500 feet offering both power and precision. It is *b*uilt to handle tough job site conditions, while at the same time providing comfort and ease for operators. This allows them to work more effectively for longer days with less fatigue. Even though all-terrain cranes are compact, they still offer exceptional visibility from the cab to help operators have a full view of the work area. Allterrain cranes are some of the largest, most mobile cranes available today.

Rough terrain mobile crane: Rough terrain mobile crane is compact and highly manoeuvrable with robust construction and high torque multiplicity, which make them performance-worthy for rough terrains and applications. They are more compact than most other types of off-road cranes, which means that they can get into tighter spaces. Most rough terrain cranes have 4-wheel drive to better navigate off-road. Modern models have the highest possible level of standard safety features available on a rough terrain crane.

Telescopic handler mobile crane: In industry, the most common attachment for a telehandler is pallet forks and the most common application is to move loads to

and from places unreachable for a conventional forklift. For example, telehandlers can remove palletized cargo from within a trailer and place loads on rooftops and other high places.

Crawler mobile cranes: Crawler mobile cranes are ideal for traveling on public roads and for off-road use due to their all-terrain chassis. They feature safety, economy and comfort. With a range of around 25 LTM cranes, from a small two-axle to the large 9-axle model, there are right crane models to suit every requirement. Modern crawler cranes are used on soft ground for erection and maintenance work. Crawler cranes are similar to Hydraulic Excavators in traction and swing the load through 360 degrees.

Stiff boom mobile crane: Stiff boom mobile crane work by using a hydraulic winch which is raised or lowered by the boom to lift materials. To move materials from one location to the next, the crane operator can rotate the boom of the crane, extend it, and raise or lower it to achieve the right lifting height. Since *stiff boom cranes* can only lift materials straight up and down, it is the ideal choice for gently placing loads on the worksite, no matter the lifting radius, as well as to suspend heavy loads in the air for long periods with little to no drift.