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Mechanical handling

A wide range of machinery and equipment, such as elevators, hoists, trucks and conveyors is used in mechanical handling operations. The selection of a mechanical handling system will depend on a range of factors, such as the size, weight, shape, distance and frequency of movement of loads, together with ancillary factors, such as space and height restrictions, storage arrangements and the nature of the material to be handled.



Fixed handling equipment

This term is generally taken to include conveyors, elevators, fixed cranes and lifts, used for the transfer of products, raw materials and other items.

Conveyors

These may take the form of belt conveyors, roller conveyors, chain conveyors, screw conveyors and slat conveyors. Hazards vary for different types of conveyor, but the

principal hazards with conveyors can be outlined below:

- a) traps or 'nips' between moving parts, e.g. between a moving belt and rollers;
- b) traps between moving and fixed parts, e.g. between the screw of a screw conveyor (auger) and the edge of a feed opening;
- c) hazards associated with sharp worn edges, e.g. on worn conveyor chains;
- d) traps and nips created by drive mechanisms, e.g. V-belts and pulleys; and
- e) traps created at transfer points between two conveyors, e.g. between a belt conveyor and a roller conveyor.



Conveyors should be appropriately guarded, including the installation of fixed guards at trapping points or, in certain cases, interlocking guards.

In addition:

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- a) arrangements should be made for lubrication with the guards in position, where practicable;
- b) to minimize the risk of conveyed items jamming or falling off the conveyor, the radius of all bends should be maximized;
- c) all fixed support members, including guide rails, should be free from sharp edges;
- d) where conveyors rise one metre above floor or walkway level, suitable rails or side members should be provided to a sufficient height to contain the top item of the load being conveyed; and
- e) emergency stop buttons located at operator positions, or a continuous stop wire, provided on long conveyors.

Elevators

Fixed elevators may operate vertically or at an angle, usually between floors of a building. They may take the form of:

- a) bucket elevators for transferring loose materials, such as grain;
- and
- b) bar elevators, on which items are placed or hung, e.g. sacked or boxed items.

The elevator is generally contained inside a fixed shaft, hoistway or enclosure and may be continuous in operation, often being linked with horizontal conveyors at each end.

When conveying loose materials, such as grain or flour, the potential for dust explosions is significant. Thus, in flour and agricultural mills, the installation of explosion reliefs at elevator heads is a basic safety requirement.

Hoistways and floor openings should also be fire-proofed to provide a notional period of fire resistance of 30 minutes.

Fixed guards, e.g. tunnel guards, must be installed at trapping points, e.g. at the entrance to an elevator, where a trap is created between the elevator and the hoistway or enclosure.

Fixed cranes

These are a common installation in loading bays, wharves, docks and rail sidings. They may incorporate a fixed angle jib or variable angle jib and rotate through a full circle. Crane failures result in crane collapse are commonly associated with:

- a) overloading of the crane;
- b) failure to lift vertically;
- c) the use of a fixed crane to drag a load sideways; and
- d) the ‘snatching’ of loads, as opposed to operating a slow and steady lifting action.

With variable angle jib cranes, operators must be trained to recognize the reduction in





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the SWL as the jib moves towards the horizontal position.

Lifts

The principal hazards associated with lifts for the carriage of both people and/or goods are:

- a) total failure of the lift, resulting in the car dropping vertically to the base of the shaft;
- b) inadequate mechanical and electrical maintenance causing faults in operation, including the risk of people being trapped inside a car;
- c) the risk of people falling down liftways due to the gates being open when the car is at another point in the liftway;
- d) overloading; and
- e) people coming into contact with moving parts of a lift or lift mechanism, e.g. maintenance personnel.

Mobile handling equipment

Within this heading can be included mobile cranes, overhead traveling cranes, various forms of lift truck and pedestrian-operated stacking trucks.

Mobile cranes

This form of crane, mounted, in many cases, on a purpose-built road vehicle, may incorporate a variety of features, such as a fixed or variable angle jib telescopic or articulated boom, and rotation through a full circle. Much will depend on the tasks

undertaken, from vehicle recovery to the lifting of loads into position in construction operations.

The principal hazards, as with any crane, are that of overloading and the use of incorrect lifting techniques. The procedures relating to jib angles in relation to loads lifted are similar as those for fixed cranes. With a mobile crane, it is vital that any lift takes place on solid ground using, where fitted, the vehicle's outriggers fully extended to spread the load. The use of mobile cranes on sloping, soft or uneven ground, where the centre of gravity of the load combined with that of the crane has fallen outside the wheel base of the vehicle, inevitably results in a mobile crane failing and, in many cases, overturning.



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Overhead travelling cranes

This type of crane, which runs along a fixed traverse, is commonly used in foundries and in engineering fabrication shops. The crane may have a fixed operating position or rotate through a full circle.

Derailment is the principal hazard with such cranes, which may be caused by:

- a) overloading;
- b) 'snatching' and dragging of loads;
- c) obstructions on the traverse; and
- d) the absence of adequate stop devices at each end of the traverse.

In the case of rail-mounted cranes, the crane should be fitted with an effective braking system or controlled through the use of sprags, scotches or chocks.

Lift trucks

There are numerous variations of this type of mobile handling equipment, including pedestrian operated stacking trucks, reach trucks, counterbalance fork trucks, narrow aisle trucks and order pickers. Whilst their design features may vary, they all fundamentally operate on the same principles and for the same purposes, namely that of transferring commodities both vertically and horizontally, and for the placing in, and removal from, storage of loads.

Unsafe driving of lift trucks is the principal cause of fatal and major injury accidents, together with damage to premises, plant, products and the truck itself. To ensure safe operation of trucks, the following points must be considered:

In the case of the **lift truck itself**, the following points must be stressed:

- only trained and authorized personnel should operate such equipment;
- drivers should not leave trucks unattended unless the forks are lowered, the truck immobilized and the starter key removed;
- the maximum rated load capacity, as stated on the manufacturer's identification plate should never be exceeded;
- on no account should passengers be carried, unless in a properly constructed cage or platform;
- when used on a public highway, they must comply with the Road Traffic Acts in terms of the provision of adequate brakes, lights and steering;
- the keys must be kept in a secure place when the truck is not in use;
- the truck must be adequately maintained and subject to a regular servicing programme; and
- lifting chains should be inspected on an annual basis at least.





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The design and layout of **operating areas** should incorporate the following:

- floors and roadways should be of adequate load-bearing capacity, well-maintained, smooth-surfaced and level;
- ramps should be installed at changes of road or floor level;
- gradients should not exceed 10%;
- bridge plates should incorporate an adequate safety margin to support loaded equipment;
- aisles should be of adequate width and overhead clearance to facilitate turning and safe movement;
- lighting should be adequate with a minimum overall illuminance level of 100 Lux; extra lighting on the truck may be necessary for external work; (see Lighting at work)
- clear direction signs, marked barriers, electrically-operated warning devices and convex mirrors should be used to prevent pedestrian contact with lift trucks;
- where pedestrians and trucks use the same route between parts of a building, separate pedestrian access doors should be available and the pedestrian route protected by steel barriers;
- in truck battery charging areas, permanent natural ventilation should be sufficient to

prevent concentrations of hydrogen gas developing; and

- refuelling of petrol driven trucks should be located in the open air.

In the case of **truck operators**:

- a highly level of supervision should be maintained;
- drivers should be physically and mentally fit;
- they should be trained by trained trainers and subject to a formal test prior to formal authorization as truck operators;
- they should be provided with appropriate personal protection including, as appropriate, safety footwear, safety helmet and protective clothing to suit weather and/or temperature conditions.



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The use of lift trucks with working platforms

Lift trucks are commonly used, in conjunction with a purpose-designed working platform fitted to the forks of the truck, for high level work, such as inspection and maintenance, fault-finding, redecoration and repair work.

The following precautions are necessary to ensure safe working:

- the manufacturer's view of the suitability of the truck for use with a working platform should be obtained;
- the vertical movement of the platform should be under the control of the person using the platform;
- the weight of the platform and total superimposed load should be less than 50% of the truck's rated capacity;
- the platform should be firmly fixed to the forks and should incorporate a 1m high safety rail with either an intermediate rail and toe board or steel mesh infill below the safety rail;
- a locking device should be fitted to ensure the mast remains vertical;
- where controls are located on the working platform, they should be of the 'dead man's handle' type;

- the parking brake should be applied before elevating the platform and a notice to this effect displayed on the truck;
- no person should remain on the platform during movement of the truck;
- the truck should only be used for this purpose on level and wellmaintained floors; and
- all trapping points on the truck should be adequately fenced or screened.

Motor vehicles

A wide range of commercial vehicles operate in and around workplaces.

Many of the requirements for lift trucks outlined above apply in the case of motor vehicles, in particular the need to regulate speed with visibility and comply with designated speed limits. In particular:

- loads should be secure;
- reversing and manoeuvring activities should be undertaken with the aid of traffic marshals where there is serious congestion;
- vehicles should be maintained, with particular attention to brakes, lights and steering; and
- drivers should adhere to designated traffic routes, including oneway systems, and park only in identified parking areas.

