1.0 MATERIAL HANDLING EQUIPMENT:

Material handling equipments have a very important role in our Factory. These materials handling equipments are used in all areas of construction, fabrication, maintenance, production, transportation of raw materials as well as finished products. Accordingly, here are various designs, varieties of kinds of lifting the loads as well as for transporting the loads. If these equipments are not used properly during their usage at site, accidents will occur. In our Industry 20% of the accidents are attributed to material handling. The results of the accidents that have occurred due to material handling are of serve in nature. The material handling equipments that are being used are chain pulleys blocks, cranes both EOT and mobile, conveyors, trolleys, hoists, winches, etc. Hence it is very much essential to know more about these equipments for its safe usage. Apart from these material handling equipments, we are using ropes (manila and hessian), wire ropes, chains etc, for lifting the material in all departments of our organization. Here are some of the guidelines for such equipments.

1.1 CHAIN PULLEY BLOCKS:

For safe use of chain pulley blocks, the following precautions should be taken while using.

1.1.1 DOs

Whenever a chain pulley block is suspended from an overhead crane for accurate positioning of load, the SWL of the block should be reduced by 15% to allow for higher dynamic loading.

1.1.1.1 The hand and load chains should hang freely without any knot or twist.

1.1.1.2 The load should always be applied through seat of the hook.

1.1.1.3 Always a ring or shackle connecting the upper ends of sling legs can be put on The hook as this ensures vertical loading of the hook.

1.1.1.4 If dropped accidentally, get examined the block by a competent person or responsible Person before use.

1.1.1.5 While lifting the load where there is a possibility of movement of persons, guard the Area to restrict the movement.

1.1.1.6 Avoid swing of the load.

1.1.2 **DON'T's**

1.1.2.1 Do not attempt to raise the load with tip of the hook. Side loading will disturb and damage the hook

1.1.2.2 Do not overcrowd the hook with multi-slings.

1.1.2.3 Do not drop, throw or drag the blocks on the floor surface.

1.1.2.4 Do not stand below a suspended load or walk beneath the suspended load.

1.1.2.5 Do not leave the load suspended for a long time.

1.1.2.6 Do not use a load chain as sling wrapping the chain around the load and back hook,. By doing this, safe working load of a sling used in this manner is always less than that of the safe working load of the chain pulley block itself.

1.1.2.7 Do not drag the load with chain pulley block as the chain pulley block is designed to lift vertical loads.

1.1.3 **GENERAL**

When chain pulley block is not in use; it should be returned to storage.

The storage area should be clean, neat, dry and well-ventilated.

The block should be cleaned and dried before storage.

Powerful solvents and direct heat should not be used while cleaning or drying.

Exposed surfaces are liable to corrosion, apply anti-corrosion coatings.

Non-portable chain pulley block used in outdoor applications should be covered with
Protection covers.

Suspending the chain pulley blocks with its load chain and hand chain is a good method of Storing.

The chain pulley block should be well maintained.

Lubrication to be made frequently and should be carried out as per manufacturers' recommendations.

Particular attention should be paid to the lubrication of bearing surfaces.

1.2 Forklifts:

Forklifts are normally being used for raising and lowering the load an also for shifting the loaded material from one place to other for a short distance. The forklift is our asset and it carries valuable cargo. If proper precaution is not taken while operating the forklifts, it may not only lead to breakdown to the equipment, but also damage to the cargo and sometimes damage to life also. For guidance of the operator of the forklift to avoid the damages to the forklifts and the mishaps, some of the DOs and DONTs are giving hereunder:

1.2.1 DOs – General:

1.2.1.1 Always inspect the tyre for any physical damages such as cuts and excessive wears of the treads.

1.2.1.2 Ensure that the recommended air pressure is maintained in tires

1.2.1.3 Keep your battery and battery connections in good condition.

1.2.1.4 Keep the brakes in good condition.

1.2.1.5 Keep the hydraulic system and steering mechanism in good condition for lifting and Tilting operations.

1.2.1.6 Keep the lights of your Forklift in good condition, including dash board indicator lamps.

1.2.1.7 **Know the safe working load of the machine.**

1.2.2 **DOs – Operational Driving:**

1.2.2.1 **Drive the truck at a moderate speed at which you can stop the vehicle at the time you Require almost immediately within a safe distance ahead.**

1.2.2.2 **Drive slowly in corners.**

1.2.2.3 **Always keep the Forks of the Forklift 40 Cms above the ground so as to be not too low and not too high.**

1.2.2.4 **While turning, watch out for enough space at the rear end and for the ground Conditions.**

1.2.2.5 **While crossing railway tracks, drive diagonally, holding the steering wheel firmly in Position.**

1.2.2.6 **While crossing bridge plates, see that the plates are secured and they can bear the load of your vehicle.**

1.2.2.7 **Keep a clear view of the path ahead.**

1.2.2.8 **Keep the loaded Forks as low as possible while driving, for better vision.**

1.2.2.9 **Keep the mast tilted backwards while traveling with load.**

1.2.2.10 **If the load is too bulky and blocks the vision, drive the forklift in reverse after looking Out for people walking on the road and for obstructions on the road.**

1.2.2.11 **While driving on ramps, keep the load up tilted so as to avoid the load slipping.**

1.2.3 **DONT's**

1.2.3.1 Do not start and stop with jerks.

1.2.3.2 Do not allow anybody to sit on the forklift except the driving man.

1.2.3.3 Do not use the forklift for pushing other vehicle.

1.2.3.4 Do not raise or lower the load while the truck is in motion.

1.2.3.5 Do not keep the mast with loaded forks in front of vehicle in motion.

1.2.3.6 Do not park the forklift keeping the forks in a raised position.

1.2.3.7 Do not operate in such a way which causes the forklift instabilities.

1.3. Chains, Wire Ropes and Fibre Ropes

1.3.1 Introduction:

Chains, Wire ropes and fibre ropes are widely used in our plant for lifting objcts and handling materials. Wire ropes are also used in winches and to lift the objects from ground floor to various heights of preheaters and other departments. All these material handling equipments, chains, etc, are susceptible to damages because of exposure to weather conditions, rough handling, improper method of storage and overloading. In this chapter, the procedures of handling the chains, wire ropes and fire ropes are given.

1.3.2 Fibre ropes & Rope slings:

Fibre rope slings have the advantage of extreme flexibility and they can be easily spliced. Among the natural fibre ropes, Manila and Sisal ropes are preferred and have better resistance to wear weather and damp. Man-made fibres are heavy-duty polythene polypropylene and nylon. On account of their superior properties they have distinct advantage over ropes made of natural fibres for lifting purposes.

1.3.2.1 Simple equation for calculating approx. breaking loads of fibre ropes.

Let D = Dia of rope in mm
Let B/L = Breaking load of rope in metric tones.

Manila ropes	H D Polyethylene Ropes	Polyproplene ropes	Polyster ropes	Nylon ropes
$B/L = 2D^2$	$B/L = 25\ D^2$	$B/L = 3D^2$	$B/L = 4D^2$	$B/L = 5D^2$
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300	300	300	300	300

1.3.3 Maintenance and Inspection of Wire Ropes and Slings:

1.3.4 Wire ropes shall be lubricated with lubricants free from acids and alkalis at regular intervals to prevent rust and excessive wear.

1.3.5 In order to prevent kinking, twisting, or untwisting on wire rope, the rope shall –

a) When received in coils, be uncoiled by rolling the coils like hoops on level surfaces which are free from quit and be straightened out before being put on the sheaves; and

b) When received on reels, be unwound by rolling the reels along the ground, or by pulling the ends from reels mounted horizontally on spindles or vertically on turntables with sufficient tension on the reels to prevent accumulation of slack.

1.3.6 Fastenings of wire ropes shall be carefully examined at regular intervals and clips or clamps to be brightened if they show signs of loosening.

1.3.6.1 At the first sign of dangerous condition at sockets or other fastenings of wire ropes a section of the rope from 1 to 3 mtrs above the fastening shall be cut off and the rope refastened.

1.3.6.2 Wire ropes shall be stored in cool places which are free from moisture, excessive heat, and acid fumes.

1.3.6.3 Wire ropes shall be taken out from service whenever their strength is affected by broken wires, wear or corrosion according to the following specifications:

1.	6 by 7 wire rope	:	12% on a length of 50 cms.
2.	6 by 19 wire rope	:	20% on a length of 50 cms.
3.	6 by 37 wire rope	:	25% on a length of 50 cms.
4.	6 by 61 wire rope	:	25% on a length of 50 cms.

5. Special cables:

i) "Seal Cables" : 12%
ii) Cables with strands of triangular section : 15% on a length
iii) "Noplex" cables: 20% on a length of one mtr.

1.3.6 STORAGE:

1.3.6.1 Wire rope should be stored in a manner which avoids damage or deteroriation.

1.3.6.2 Never store ropes in an atmosphere containing acid or acid fumes.

1.3.6.3 Rope shall be stored only in a dry place where air circulated freely about it.

1.3.6.4 Hung up small ropes and lay larger ropes on gratings to facilitate air getting underneath and around them.

1.3.6.5 Ropes shall be kept in well lubricated condition to reduce internal friction and prevent corrosion.

1.3.6.6 **INSPECTION:**

1. Rope shall be inspected every 30 days.

2. ***Procedures for inspection :***

a) Check for broken fibers and abrasions on the outside.

b) Inspect fiber by untwisting the tope in several places. If the inner yarns are bright, clear and unspotted, the strength of the rope has been preserved to large degree.

c) **Unwind a piece of yarn 8 inches long and ½" diameter from the rope. Try to break this with your hands. If the yarn breaks with little effort, the rope is unsafe.**

d) **As a general rule, rope that has lost its pliability or stretch, or in which the fibres have lost their luster and appear dry and brittle, should be discarded**