

FORKLIFT TRAINING

CHAPTER ONE

OBJECTIVES OF FORKLIFT TRAINING COURSE:

The objective of this course is to give the operator an understanding of the OSHA Regulations regarding Industrial Trucks and provide the training OSHA requires.

This course will:

1. Cover OSHA regulations on the training of operators and relating to safe industrial truck operations
2. Teach operators how to safely operate a forklift through classroom and hands-on training
3. Teach you about the components, weight, stability and speed characteristics of forklifts,
4. Teach you how to safely handle forklift fuels and batteries
5. Teach you how to perform the required daily maintenance and safety inspections on your forklift.

OSHA:

The Williams-Steiger Occupational Safety and Health Act, or OSHA, is legislation passed by the U.S. Congress in 1970.

The purpose is to help ensure a safe work place for workers.

OSHA has set standards for safe working conditions covering many businesses such as mining, manufacturing and hundreds of others along with the equipment used in the operations. In this course we will present Subpart N, Section 1910.178 on Powered Industrial Trucks-

GENERAL REQUIREMENTS OF OSHA 1910.178:

"This section contains safety requirements relating to fire protection, design, maintenance, and use of fork trucks, tractors, platform forklifts, motorized hand trucks and other specialized industrial trucks powered by electric motors or internal combustion engines."

This course has been designed to provide general training in the safe use, operation, and maintenance of a Forklift in compliance with OSHA 1910.178, as well as hands on training simulating work place situations of an operating Engineer.

TRAINING REQUIREMENT OF OSHA 1910-178:

OSHA requires AOnly trained and authorized operators shall be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks."

This means that employers must provide training to all operators in order to comply with OSHA. Through out the course OSHA regulations will be included with the information presented to you, along with explanation of procedures to help you learn how to operate the truck in compliance with OSHA directives.

OVERVIEW OF COURSE:

We will referring to the use of sit-down rider forklifts with

- * OSHA designations G (gas), D (diesel), LP (Liquified petroleum gas and E (Electric for use in

non-hazardous locations.

- * Counterbalanced design where the weight of the truck and the counter balance weight offsets the capacity loads.
- * Capacities in the range of 2,000 to 10,000 pounds.

It is recommended that this course be offered on a yearly basis after initial certification. This will allow all operators to keep up with changes and serve as a refresher effective in increasing their knowledge of truck types and operating techniques, increase operator efficiency and productivity and increase awareness of safety issues. The course includes written exams as well as exercises in completing a daily inspection and a driving test evaluation. Certification cards will be issued upon successful completion of this course as evidenced through testing and evaluation.

WHY FORMAL TRAINING?

To help increase operator efficiency and reduce the number of accidents.

A study reported by the National Institute for Occupational Health and Safety indicated that trained operators reduced the rates of error by 70%

This course will help you to understand the exact nature of your job, the equipment used and what is expected of you as a forklift operator. You will also understand procedures that protect personnel, equipment and facilities.

BENEFITS OF FORMAL TRAINING:

1. **Safety is Improved for You and Others:**
You understand proper operating procedures for the truck and maintenance such as changing/charging batteries.
2. **Your morale is improved:**
You have a better sense of worth in the job you will perform the responsibilities that go along with the job.
3. **Accidents/Injuries are decreased:**
You know how to perform a daily inspection which REDUCES down time, INCREASES Production, REDUCES costs and IMPROVES safety.
4. **Equipment is better cared for:**
You have an understanding of the equipment value and how to use it more efficiently.
5. **Your training and progress is documented:**
The value of what you learned is recognized and seen as you apply it to the job.
6. **You fulfill OSHA requirements:**
While certification or a license may not be required, all employers must follow OSHA standards in providing their operators with training. Your training helps the employer meet the OSHA requirement.

INTRODUCTION TO FORKLIFTS

The information presented here on forklifts will enable operators to;

1. Identify and define truck components and their functions.
2. Know the characteristics of forklifts such as weight capacity, stability and rear-wheel steering.

3. Learn rules for safe operation where speed is concerned.
4. Understand data plate and decal information requirements
5. Recognize safety equipment used on forklifts.

TRUCK COMPONENTS:

This text describes each of the major components of a typical sit-down, rider truck and their functions. (See Picture A)

Counterweight: Mounted to the rear of the truck and is designed to offset the weight of loads lifted at the front of the truck. Without this loads would tip the truck forward.

Overhead Guard: A safety device designed to protect the operator from falling objects. Overhead guards are required in any area where objects are lifted or stored overhead.

Operator Restraint System: Consists of a seat latch, seatbelt and lateral restraints-on the seat. combined as a system to help reduce chance of injury if trucks overturn.

Steering Axle and Wheels: Controls the direction of movement of the truck when you turn the steering wheel. Trucks may have a single wheel or two wheels depending on the type and style but all steer from the rear.

Drive Axle and Wheels: Uses power transferred from the engine through the transmission to drive the truck in forward and reverse. Additional traction is a result of having the mast mounted over the drive axle and wheels.

Tires: Play an important role in the type of Jobs for which a forklift is used. Cushion tires are semi-solid tires only for use in areas with hard flat surfaces. Pneumatic tires are pressurized tires used in improved areas ie: blacktop.

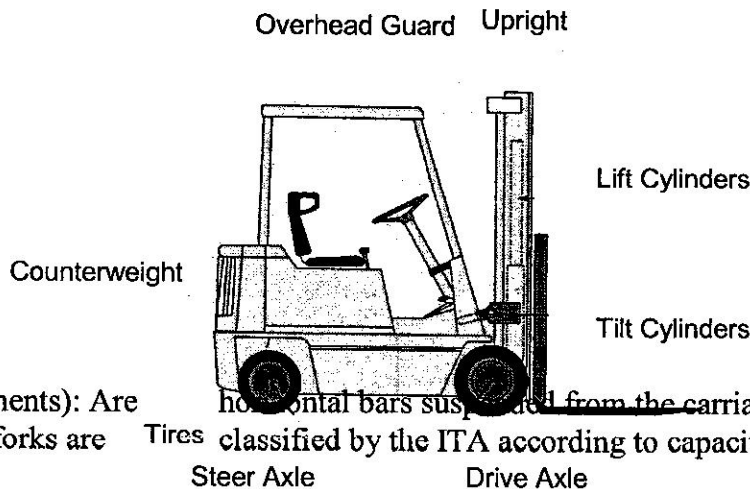
Upright: (or Mast) Is a series of Anested@ I or J beam steel rails which use hydraulic power to extend and lift loads. Each set of beams, connected by tie bars represents a stage of lift. Uprights are designed to extend from 2 to 4 stages.

Lift Cylinders: Hydraulically-powered devices that provide the lifting thrust to the upright. Most uprights use a center mounted primary cylinder and two side-mounted secondary cylinders to provide multiple stages of lift.

Tilt Cylinders: Two tilt cylinders connect the stationary rails of the upright to the truck frame. Tilt cylinders are double-acting cylinders that provide backward and forward angle to the upright.

Carriage: Are support devices for forks or other attachments. The Industrial Truck Association (ITA) recognizes different classes of carriages according to capacities. The carriage provides the connection between the load engaging device and the lifting device, the upright. The carriage is mounted using chains, rollers, and stops that allow it to move.

PICTURE A

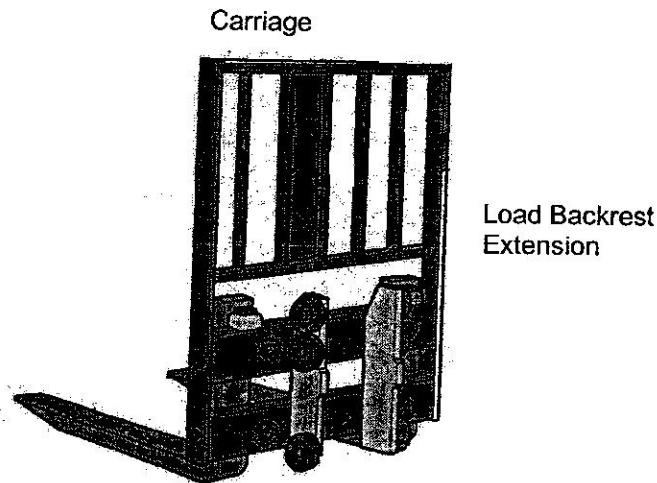


Forks (Lifting Attachments): Are horizontal bars suspended from the carriage that engage and support loads. Like carriages, forks are classified by the ITA according to capacities. Some trucks are equipped

with attachments like roll clamps, which use hydraulic power to engage and support special non-palletized loads.

Load Backrest Extension: Is a device attached to the carriage which provides support to loads. The load back rest stabilizes loads stacked above the carriage.

PICTURE B



OPERATING CONTROLS:

This text gives a general description of operator compartment controls. Different trucks use a variety of types of these controls.

Key Switch: In an Internal Combustion (IC) truck provides the control to start and fire the engine. In an electric truck the key switch completes an electrical circuit so that current can be delivered from the battery to the pump and drive motor(s).

Gauges: Several gauges are used according to the type of truck. One gauge trucks have in common is the Hour-Meter which is a timing device registering the hours of use. Electric trucks may also have a gauge registering the charge of the battery. IC trucks may be equipped with oil pressure fuel and or temperature gauges.

Lift and Tilt Levers: Control the main hydraulic valves which direct hydraulic fluid to the lift and tilt cylinders.

Directional Lever: Controls the forward or reverse direction of either IC or electric trucks.

Service and Inching Brakes: The Service Brake functions to stop the truck like normal brakes in a car. The inching brake allows slow, precise "Inching" movement for maneuvering loads.

Parking Brake: Is designed to hold the truck in the stopped position. It is not intended to brake a moving truck.

Accelerator Pedal: In IC trucks the accelerator pedal controls the amount of fuel delivered to the carburetor. In electric trucks, the accelerator pedal controls the amount of current delivered from the battery to the drive

motors. Both types control the speed and power of the truck.

Horn: As in some cars the horn is mounted in the center of the steering wheel and is used as a warning device.

Auxiliary/Attachment Controls: Auxiliary or attachment controls typically work like lift and tilt levers by controlling hydraulic power to side shifter, clamping or other specialized devices.

CHARACTERISTICS OF FORKLIFTS:

The information presented here on forklifts will enable operators to:

1. Calculate the total weight of a truck.
2. Understand the tip factor and load centers as they relate to truck capacity and stability
3. Understand the stability triangle as it relates to truck stability
4. Learn the characteristics of rear wheel steering used on forklifts.

WEIGHT OF A FORKLIFT:

The weight is misleading as it can be assumed that because a truck has a capacity of 4,000 pounds the truck must also weigh 4,000 pounds. In reality the truck can weigh up to three times as much as its listed capacity. Some trucks have a basic capacity of 4,000 pounds, with an operator and without a load they weigh about 8,000 pounds.

AS A GENERAL RULE, a truck will weigh **TWICE** its capacity. This 2:1 ration is generally effective in estimating the weight of a truck.

If the total weight of the truck, operator and capacity load is added together the weight will equal about 12,000 pounds. Therefore you have about 6 tons of actual weight, including the capacity load of the truck.

******* Knowing the weight of a truck with a capacity load **IS VITAL** when you must operate in rail cars, tractor trailers, elevators, or any location with wooden floors. A good idea is to have the truck weighed on a truck scale and paint the weight on the truck. You can then determine total weights when the weight of a capacity load is added to the truck weight.

Electric truck data plates provide the approximate weight of the truck with a battery installed. The weight of the battery is important to the operation of the truck since the battery acts as a counterbalance to the load. This is the reason that a minimum and maximum battery weight is included on the data plate. If a new battery is purchased for a forklift, its weight must be at least the weight that the manufacturer specifies on the data plate.

THE TIP FACTOR:

A forklift works on the principle of loads balanced over a fulcrum. A simple example of a fulcrum is a see-saw, or teeter-totter. A point in the exact middle will balance the weights at the ends. The fulcrum of the loaded truck is a vertical line through the center of the drive axle hub.

Too much load weight to a point in front of the fulcrum line introduces the possibility of forward tipping and decreases steering control. To counter forward tipping truck weight is increased by the addition of the counter-weight.

Load Centers:

Counterweights are effective in preventing forward tipping only when a load is correctly placed on the forks. The load center rating of a truck defines the maximum distance from the back of the forks to the center of gravity of a capacity load ; for instance, the load center of a truck may be 24 inches (CHECK THE DATA PLATE FOR THIS(INFORMATION)). If the center of gravity of a load is more than 24 inches from the back of the forks, truck capacity is reduced. The following figure shows the possible effect of a load placed beyond the correct load center.

RULE OF THUMB TO REMEMBER:

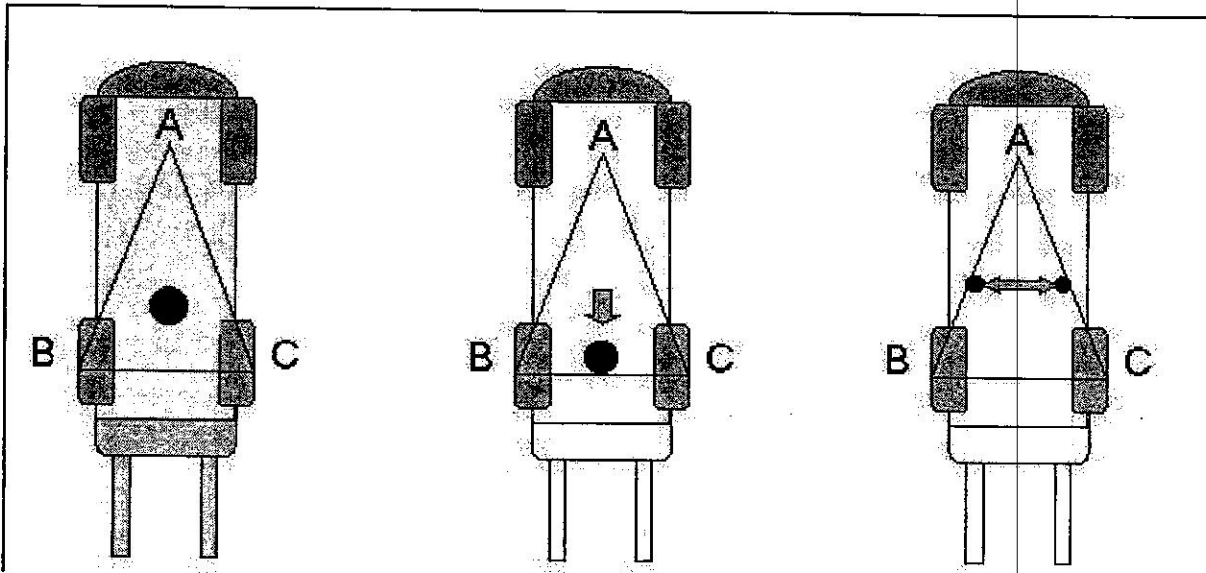
For every inch beyond the load center that a load is placed approximately 100 lbs of capacity is lost.

Two techniques to remember that will help you work safely:

- 1) When lifting, drive the forks as far under the load as possible, usually until the load contacts the load backrest extension. This keeps capacity weights as close as possible to the load center of the truck.
- 2) When traveling with a load the forks should be lifted no higher than 6 to 8 inches off the floor. The mast should be tilted back so that the load rests against the backrest extension. This keeps the load center closer to the drive wheels (the fulcrum) reducing the possibility that the truck can tip forward as you travel and stop.

THE STABILITY TRIANGLE:

One of the most important things to remember about the design of a forklift is that it is supported at three points. This is true even if it has four wheels. The steer axle of most four-wheel forklifts is attached to the truck by means of a pivot pin in the center of the axle. This three point support forms a triangle when the points are connected.



The Stability Triangle is a concept based on this three point support and has been determined by engineered tests in such away that it can predict when load weights and motion contribute to truck instability.

DIAGRAM A: Stability Triangle

In the above diagram the spot represents the Center of Gravity (CG) of an unloaded motionless truck. The CG shifts according to the loads added or operations performed -traveling and stacking. If the CG moves outside the triangle, the truck will overturn.

In traveling with a safe, recommended load, the CG is maintained at a point equidistant between lines A - B, B - C, and C - A. This provides safe side-to-side and front-to-back stability.

DIAGRAM B: Adding a Load and Breaking

When a load is added the CG shifts toward the base triangle, line B-C. The heavier the load the greater the tendency to tip forward as the CG nears line B-C. This is also the case with breaking.

DIAGRAM C: Uneven ground and Turning

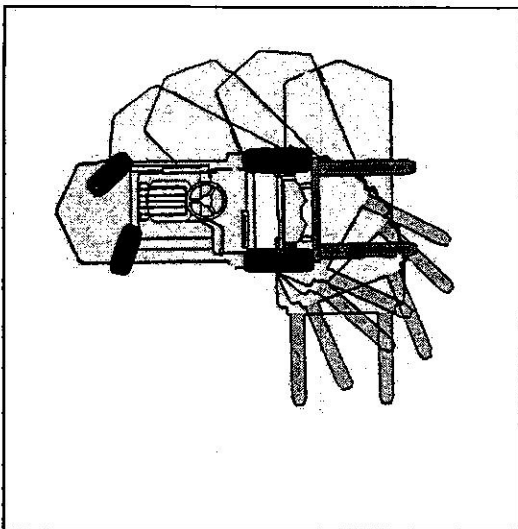
What happens when the truck operates with one side of the truck lower than the other, on uneven ground, for example? The CG shifts toward line A-B or C-A and sideways tipping becomes likely. The same is true when turning. Any turn will shift the CG toward line A-B or C-A and introduce a possibility of a lateral overturn. The higher speed in turns the more likely the truck will overturn.

We can also think of the Stability Triangle as three-sided pyramid. When the forks are lifted, the closer the CG moves toward the top of the pyramid and the narrower the range of side-to-side and front-to-back stability becomes. Turning with a raised load, for example is EXTREMELY DANGEROUS.

ANY CHANGE TO THE TRUCK'S WEIGHT, LOAD CAPACITY OR CERTAIN COMPONENTS ALTERS THE STABILITY TRIANGLE. Narrow tires and rims for example will change the truck's operating stability.

REAR WHEEL STEERING:

Forklifts are highly maneuverable. The rear-wheel steering of forklifts enable them to make very tight turns. The following illustration shows how rear wheel steering turns the forklift.

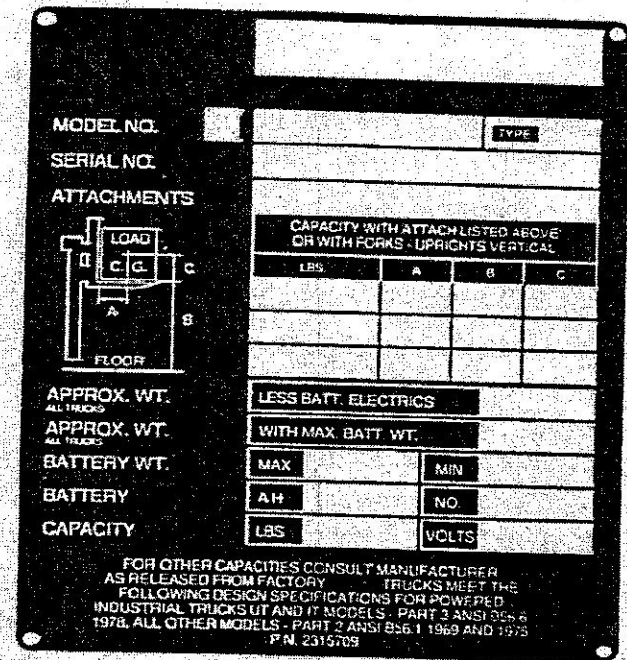


While rear wheel steering increases maneuverability it can also increase the possibility of accidents. Turning a sharp corner at even moderate speeds affects the Stability Triangle and the truck may tip. If you do not concentrate on each turn that you make, the rear end of the truck can swing wide and hit someone or something to the side that is out of your line of forward sight.

***As you approach a turn, make sure to judge the area for clearance. In the illustration for example you would be required to judge your clearance in the area indicated by the arrows

.SPEED OF FORKLIFTS:

The operating speed of a forklift is listed on the SPECKSHEET in miles per hour (mph) with 8.7 mph being average truck speed. A truck traveling at 8.78 miles per hour is traveling at approximately 13 feet-per-second (fps) A car traveling at 55 mph covers 80.6 fps.



Even though the speed of a forklift is relatively low, it cannot stop instantly. And because of the possibility of dropping the load or tipping the CG forward it is not possible to stop a forklift as fast as a car. And of course when speeds increase, the stopping distance also increases.

Reaction Times and Avoiding Accidents:

Why is track speed important? It becomes important when you realize that the time it takes you to react and stop the truck may help you to avoid an accident.

To clarify this: Think of an electric truck and its operating noise level. Two electric trucks approaching a blind intersection would be totally unaware of each others presence until the last second.

Look at the figure on the following page.. It illustrates such a situation. WE will use the figure to discuss reaction times and three procedures you should follow to avoid an accident.

The letter within the body of the trucks represent the operators and their line of sight. Neither operator has any indication that an accident is about to occur. The total time it takes to stop the truck depends on:

Detection +
 Identification +
 Decision +
 Response +
Brake System Response
 = STOPPING TIME.

When all these factors are considered, it is easy to see that the trucks can travel many feet before stopping, increasing the chance of an accident.

Excessive speeds, coupled with inattention or lapses of judgement, are the most common causes of truck accidents. It is easy to see how slow 'Reaction Time' becomes and how far the truck would travel before stopping - if an operator is not paying attention.

Accidents in this or many other similar situations can be avoided if operators:

- 1) Keep speeds in check
- 2) Sound horns at cross aisles and intersections
- 3) Stay alert

OSHA Section (n)(4) requires that operators "...Slow down and sound the horn at cross aisles and other locations where vision is obstructed." While sounding your horn warns others of our presence, it does not give you the right of way. Remember this and use the three procedures given above to protect yourself and others against accidents and injury.

DATA PLATES AND DECALS:

The capacity plate on a forklift gives information about the machines weight and capacity. Example:

The data plate lists:

- * The model number
- * The serial number
- * Any type of attachment other than standard upright.

The illustration and chart on the plate provide:

- * Load capacity, listed under ALBS@
- * Horizontal load center, given in inches under 'A'
- * Maximum lift height, in inches, listed under "B"
- * Vertical load center in inches, listed under "C"

The data plate also lists the approximate weight of the truck. On electric trucks approximate weight is truck weightless battery weight. The second APPROX.WT@ entry is the weight of an electric truck with the maximum battery weight.

The other entries concern electrics only and list:

- * Maximum and Minimum battery weights.
- * Amp-hour capacity the battery must provide for truck operation listed under "AH"
- * Voltage required by the truck, listed under "VOLTS"

Always make certain that the data plate is on the truck.

This is **CRITICALLY IMPORTANT INFORMATION AND IS REQUIRED BY OSHA**. Some examples:

- * You must always know the load capacity, battery weight, and load center of any truck you operate.
- * You must always know the weight of your truck and load before entering elevators, railcars or trailers.
- * Mechanics must know the type and model truck to get the correct parts.
- * Any battery used must be the correct weight for safety and the correct voltage to prevent damage to the truck and/or loads.

NOTE: If identification plates are missing, defaced or inaccurate you can get replacements through the equipment dealer.

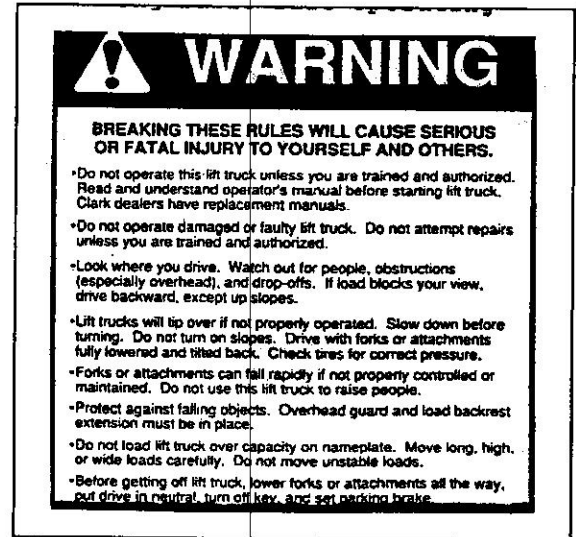
TRUCK MODIFICATIONS AND ATTACHMENTS:

OSHA section (a)(4) states: "Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturer's prior written approval. Capacity, operation and maintenance instruction plates, tags, or decals shall be changed accordingly.@

Modifications of uprights, overhead guards, load backrest extensions, counterweights, LPG systems, axles, tires, tilt cylinders and batteries affect safety and capacity. Any new attachment added to the truck will also affect safety and capacity. A change to any of this equipment or addition of an attachment must therefore be approved by the manufacturer.

Once you have written approval for modification or attachment installation, make sure the capacity plates reflect the capacity change. Contact your dealer to get replacement plates. Your dealer can tell you whether operation and maintenance instruction tags and decals also must be changed.

WARNING DECALS:



Decals covering warning and safe operation information must be on the machine - THIS IS AN OSHA REQUIREMENT. Check with your dealer to make sure that all required operator instruction decals are on your machines. The following is an example of a decal describing basic safe operating principles:

SAFETY EQUIPMENT:

1) Overhead Guards and Load Backrest Extensions:

OSHA requires that all high lift, rider type trucks be equipped with overhead guards and load backrest extension where needed. Overhead guards are not required if operation conditions are such that the guard cannot be used or if there is no danger from falling objects.

The overhead guard is a "Falling-objects" protection device. Its protective capacity is measured in "Foot pounds" and all have restricted capacity. "An overhead guard is intended to offer protection from the impact of packages, boxes, bagged material etc. representative of the job application but not to withstand the impact of a falling capacity load OSHA (m)(9)

*** The overhead guard should serve as a reminder to keep all parts of your body within the protected operators compartment. never ride with arms, legs, feet or head outside the compartment. In addition if the load being handled presents a hazard from falling objects, a load backrest extension must be used. The load backrest extension provides load support and also helps prevent material from falling back into the operator's compartment.

These safety devices must meet the American National Standard Institute ANSI B56.1 design and test standards.

2) Operator Restraints: (SEAT BELTS and other restraints)

Many sit down rider trucks are equipped with operator restraints in other words a seat belt. Some also include shoulder-level side restraints along with the seat belt. if your sit-down rider trucks do not have seat belts, you should contact your local dealer to have them installed.

3) Pedestrian Warning Devices:

Your employer must assess the need for pedestrian warning devices, determined by the special conditions of your operation. This assessment is a critical part of the total safety program. No single combination of pedestrian warning equipment can provide the means to the safest environment in all applications. High noise levels, low lighting, aisles crowded with people and machines may all be a part of the work environment than can't be changed. However there are many pedestrian warning devices available that may fit into the overall plant safety program.

4) Operator's Manual:

KNOW YOUR MACHINE! Manufacturers provide operator manuals for their equipment which provide information about the design and operation of the specific machine and includes safety information

concerning truck operation.

The manuals are usually complete and specific as to the pre-operating inspection procedures as well as instructions for operating the machine and handling materials. The manual must be kept where the operator can easily find and read it.

(Basket)
(Clocker) (Uret -)

CHAPTER TWO

GASOLINE AND DIESEL FORKLIFTS:

ALL INTERNAL COMBUSTION ENGINES PRODUCE COLORLESS, ODORLESS, POISONOUS GAS AS THEY RUN. IF YOU FEEL SICK, OR DEVELOP A HEADACHE, IT COULD BE DUE TO IMPROPER VENTILATION IN THE TRUCK OPERATION AREA. STOP WORK AND NOTIFY YOUR SUPERVISOR.

Gasoline and diesel are both fuels made from petroleum or crude oil. They are produced when hydrogen and carbon components are taken out of the crude oil and are mixed indifferent combinations.

The basis difference between these two fuels is the way they are ignited in an engine. Gasoline powered engines use an electric spark, produced by a coil, distributor and spark

plug to ignite the gasoline. Diesel engines simply compress air in a cylinder, making the air temperature very hot, then injects the diesel fuel. The hot highly compressed mixture explodes driving the piston and rod in the cylinder, the same as gasoline engines.

Basic Characteristics of Gasoline:

- * Extremely flammable. All sources of ignition should be strictly avoided when working around gasoline. Smoking, flames or sparks can cause an explosion.
- * Colorless raw gasoline looks like water, dye adds color.
- * Has a distinctive gasoline odor which is produced by the refining process. Learn to recognize the odor to detect any fuel leakages.

Basic Characteristics of Diesel:

- * Flammable. Like gasoline all sources of ignition should be avoided when working around diesel. Any open spark, flame or hot surface will ignite the fuel oil.
- * Colorless.
- * Has only a slight odor. This makes them potentially more dangerous than gasoline because fumes may be present and you cannot recognize them.

Gasoline and Diesel Refueling:

While truck refueling is similar to refueling a car there a number of differences in the vehicles and procedures. One difference is that the forklift may have a special fuel filler cap. These caps have a venting device and screen which resembles a strainer.

The strainer serves an important purpose. It acts as a fire retardant device and keeps fire out of the fuel tank. The device is doubled wire mesh screen which slows the refueling process. **CHECK WHEN REFUELING TO MAKE SURE THE STRAINER IS IN PLACE.**

Caps should be checked at each refueling to make sure they are in good shape and operate properly.

Correct Refueling Procedure:

1. Refuel only in designated areas having adequate ventilation.
2. Smoking and open flames are prohibited.

3. Shut off truck engine, lower forks to the floor, put truck in neutral, and set parking brake.
4. Do not overfill the tank.
5. Clean up any spills.
6. Use only clean properly marked fuel cans.

OSHA (p)(4) states: "No truck shall be operated with a leak in the fuel system until the leak has been corrected." If you notice any leaks or excessive fuel consumption which could indicate a leak, take the truck out of service and notify your supervisor or mechanic.

Note: Additional reference material can be located in the National Fire Protection Association (NFPA) 30-1981 Flammable and Combustible Liquids Code.

LIQUIFIED PETROLEUM GAS (LPG) FORKLIFTS

Liquefied petroleum gas is used as an alternative fuel source and can be derived from petroleum or natural gas. A well tuned engine and properly adjusted LPG system will run cleaner than gasoline systems. However, LPG still produces a poisonous gas that you may not see or smell and so it must be operated in areas with good ventilation.

The quality of fuel is vital to long service life for trucks and for low frequency of fuel system failures. The best grade of fuel available for forklifts is HD-5 propane.

Characteristics of LPG:

- * Heavier than air. LPG seeks low lying areas so a cigarette thrown on the floor can ignite a pocket of LPG which you may not have smelled.
- * Extremely flammable. All sources of ignition should be strictly avoided when working around gasoline. Smoking, flames or sparks can cause an explosion.
- * Acts like a liquid: can soak into your clothes & ignite.
- * Has a low fuel temperature. In its liquid state it has a temperature 44 degrees below zero. If it comes in contact with your skin it will cause frostbite
- * Odorless in its natural state. Chemicals are added to give it a distinctive odor which you should learn to recognize to detect any fuel leakage.

LPG SAFETY:

OSHA (f)(2) states: "The storage and handling of liquefied petroleum gas fuel shall be in accordance with NFPA Storage and Handling of Liquefied Petroleum Gases (NFPA #58-1969)

LEAKS: Whenever you detect a fuel leak:

1. Shut off the service valve (See instructions below.)
2. Take the truck out of service
3. Report the problem to your supervisor or maintenance.

General Guidelines:

- 1) A specific area should be designated for use and handling of LPG Tanks.
- 2) Tanks should always be stored in their upright position with all gauges and valves at the top whether empty or filled.
- 3) When trucks are parked overnight or for extended periods, the service valve of the tank must be closed.
- 4) Never park a truck near a source of heat.

REFUELING:

Only trained and authorized personnel are permitted to fill LPG tanks. The refueling station is to be operated only by personnel trained in its use. These persons **MUST** understand filling station equipment, be trained in station use, know container types and the proper refilling procedures.

LPG TANKS:

Tanks are replaceable storage chambers for LPG Fuel and are made of steel or aluminum. Aluminum tanks are lighter than steel tanks making handling and installation easier, they also maintain fuel quality and reduce fuel system failure better than steel tanks. Tanks should be transported using a two-wheel dolly or in another safe manner. Dragging or rolling creates the potential for accidents.

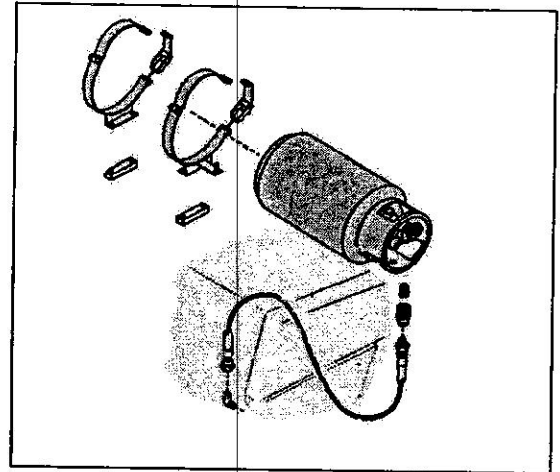
Basic Operational Characteristics of LPG Tanks:

- * Tanks are manufactured to regulated specifications in capacities of 20, 33-1/2, or 43-1/2 lbs of liquid fuel. Working pressures range between 25 and 240 PSI (pounds per square inch) depending on ambient temperatures. One end of the tank is equipped with a service (shut-off) valve, fuel gauge, safety relief valve and maximum withdrawal valve, surrounded by a protective collar.
- * The **SERVICE VALVE** is operated manually to control the flow of fuel from the tank. The valve opens counter clockwise, closes clockwise. It has seals around the stem and seat.
- * The **FUEL GAUGE** is a float level type that indicates the percentage of fuel remaining in the tank.
- * The **SAFETY RELIEVE VALVE** opens automatically when pressure in tanks rise above 275 PSI and closes when excess pressure is reduced. The relief valve must be positioned within the vapor section of a tank in order to relieve pressure.
- * The **10-PERCENT MAXIMUM WITHDRAWAL VALVE** which is a constant flow valve is threaded into the base of the service valve. If fuel flow exceeds normal engine demands by 10% this valve closes. Any sudden surge, such as due to hose breakage or sudden opening of the service valve, closes the 10% Maximum withdrawal valve and shuts off the fuel flow.
- * Other Components include a **WITHDRAWAL TUBE** and **FUEL LEVEL FLOAT**. These internal components withdraw fuel and indicate fuel levels respectively.

Connecting the tank to the truck should be done with the **SERVICE** valve turned off. There are several types of connectors used. Familiarize yourself with the types used in your operations for safe tank handling.

LPG TANK INSTALLATION:

Tanks are designed for either vertical or horizontal installation. The type of tank will be printed on the face of the fuel gauge. Combination tanks are available which show both installation methods on the face of the fuel gauge. With Horizontal Mounting position is important for the withdrawal tube. The tank collar has two small holes that line up with a vertical pin on the truck's tank bracket. Turning the tank a few degrees from this position creates excessive fuel consumption. If the pin is broken or missing do not mount the tank. Park the truck and report the problem to your supervisor.



HORIZONTAL TYPE LPG TANK INSTALLATION PROCEDURES:

- 1) No smoking is allowed.
- 2) Shut off truck engine by closing the tank's service valve and wait for the engine to run out of fuel. Set the controls to neutral, lower forks, set parking brake, and turn ignition off.
- 3) With the service valve closed, unscrew the line connection and move the hose out of the way. CAREFULLY remove the tank from the mounting bracket.
- 4) Select a replacement tank. Check its condition for leaks, dents, or unusual conditions. If these are present, tag the tank with the proper information for repair. If the tank is OK, check that service valve is completely closed before mounting it on the truck.
- 5) DO NOT ROLL OR DRAG THE TANK. This is flammable fuel in a pressurized state. Use 2-wheelers or other suitable equipment.
- 6) CAREFULLY position tank in mounting bracket. Line up pin on the mounting bracket with the hole in the tank collar. This position is important for the pressure relief valve angle and for all fuel to be consumed.
- 7) Check rubber seals in the tank and fuel line connection. if any of the seals are broken or damage, do not connect the tank to the truck. Notify your supervisor.
- 8) Rescrew the fuel-line connection until tight. If properly tightened there will 1/8th clearance between the 2 fittings.
- 9) Slowly turn on the service valve ONE FULL TURN ONLY. Opening the valve quickly may shut off the fuel supply to the engine.(The maximum-withdrawal valve may react.) If this happens shutoff the service valve completely and slowly reopen it with one turn only.
 - * The service valve should be opened no more than one full turn to provide fuel supply to the engine and still be able to shut off quickly.
 - * If you hear or smell leaks do not try to start the truck. Take the truck out of service and report the problem to your supervisor.
- 10) If no leaks are detected, start the truck and check for normal operation.

BATTERY POWER AND FORKLIFTS:

With the increasing cost of fuel, the demand for electric trucks has increased. Electric trucks also run cleaner and do not release gases such as hydrocarbons, nitric oxide or carbon monoxide which pollute the environment. Solid state speed controls resulted in the ability to vary speed controls and reduce battery drain, greatly reducing battery shift lifetime, which also increased the use of electric forklifts.

As electric forklifts need to be recharged the need for training came about as companies often require operators to fill and charge truck batteries at the end of the shift.

Battery Handling Safety Factors:

OPEN FLAMES AND CIGARETTES ARE NOT ALLOWED IN ANY BATTERY CHARGING STATION.

- * **Battery Weight:** Most batteries average 2,000 pounds which is why a mechanical lifting device plus a battery lifting sling is required to change the battery.
- * **Acid:** All wet cell batteries contain extremely corrosive sulfuric acid. Care must be taken to avoid contact with the acid. Gauntlet type gloves and eye protection **MUST** be worn at all times when filling battery cells. Immediate medical attention is required in the case of acid burns.
- * **Explosive Fumes:** All batteries produce hydrogen gas when being discharged or charged. Ventilation must be adequate to disperse gas produced by battery charging.
- * **Electrical:** Metal tools, wrist watches and rings must be kept from uncovered batteries to prevent electrical short circuiting. Shorts cause severe burns on unprotected skin.

Battery Voltages and Sizes:

A lead acid battery is a portable power source for supplying direct current (DC) electricity to an electric vehicle. It consists of six or more cells connected in series and assembled into a metal or fiberglass tray. This type of battery comes in a wide variety of shapes, voltages and amp-hour capacities.

Batteries are rated according to how many amperes (a unit of electrical current) per hour they can deliver. This measure is called the Amp Hour Capacity (AHC). A new standard now uses Kilowatts-per-hour (KWH).

Generally the higher the amperage of

KWH Output, the larger the battery. Batteries are composed of two or more cells. Each cell fully charged equals 2.1 volts.

Counting the number of cells and multiplying by 2 will give you the approximate total battery voltage. For example, Automotive batteries have six cells. The number of cells multiplied by 2 means the battery delivers 12 volts. Electric forklifts can be found in many voltages. Most common are 12, 14, 36 and 48 volts.

Size is another factor that must be considered. Batteries that do not fill the battery compartment of a truck are not necessarily undersized. The important point is that they meet the minimum battery weight required for the truck as a counter balance. The minimum battery weight is stated on the data plate.

OSHA (g)(5) states: "Reinstalled batteries shall be properly positioned and secured in the truck." This prevents shifting and ensures proper weight placement. With undersized batteries, excess space in the battery compartment should be blocked with wood or similar materials. Undersized batteries must be

positioned and secured as far toward the rear of the truck as possible.

Adding Water:

NEVER ADD ACID TO THE BATTERY. ONLY PERSONNEL TRAINED IN BATTERY SERVICE SHOULD BE ALLOWED TO HANDLE AND ADD ACID TO A BATTERY.

Some water loss is normal in all batteries due to gassing and evaporation. The loss should be replaced with distilled water which is free of impurities that can be harmful to the battery.

Overfilling is the most common error made with water is added to batteries. This causes several problems. When overfilled, the electrolyte expands and will spill on top of the battery during the charging cycle. Although water in a spilled electrolyte evaporates a concentrated solution of acid remains on the battery. If damp, this causes the positive post of the battery to form a connection and the cells continually discharge even if the battery is at rest. This shortens battery life. To learn more, check the manufacturer's product literature shipped with the battery which contains maintenance and service tips to ensure long battery life.

Charging:

Only trained and authorized personnel are permitted to handle the charging procedures. Check your company's policy. If it is your duty to charge battery for your truck, make sure you receive complete instructions for the equipment and procedures to use.

- * According to OSHA (g)(1) a special service area should be set aside for handling and charging batteries.
- * OSHA (g)(10) states: Smoking shall be prohibited in the charging area.
- * OSHA (g) contains other directives for battery charging Procedures. Similar recommendations are contained in National Fire Protection Association (NFPA) Standard 505, Powered Industrial Trucks.

To obtain maximum service life from a battery, it should be charged only when needed. Charging a battery before recommended discharge levels are met will shorten the life of the battery. Discharge levels are stated in product literature for all batteries.

The minimum average life of a battery is about 1500 to 1800 cycles, depending on maintenance, proper filling, and charging procedures. One discharge period and one charging period is one cycle. A cycle charge is normally based on the duty cycle. If a battery is used for eight hours, it will typically require eight hours to return to full charge. Evidence indicates that charging a battery at any time other than when a full charge is needed is detrimental and will decrease the service life of the battery.

BASIC PRECAUTIONS TO TAKE WHEN CHARGING BATTERIES:

- 1) Vent caps must be left on during charging. These caps vent gasses and eliminate electrolyte splash produced during charging. Vent caps should be checked frequently to make sure they are working correctly.
- 2) If the battery is charged while still in the truck the battery compartment must be left open during charging. This prevents hydrogen gas and heat build up both which are normally produced as the battery receives a charge.
- 3) The charger should be turned off as it is connected to the battery, then turned on to begin the charging cycle.

- 4) Color coded connectors help prevent misconnection between the charger and truck connector instead of the battery connector.
- 5) Charges should be properly set to avoid over or under charging, both are harmful to batteries.

HANDLING EMERGENCIES:

Your company probably has basic fire prevention practices established that all employees should be familiar with. Following are some general rules to follow in emergency situations.

THE THREE AR@ RULE:

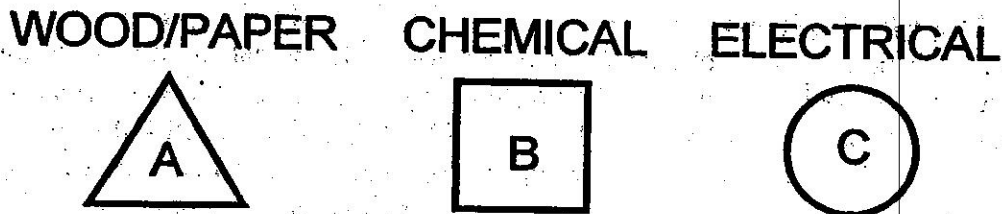
- 1) **REGAIN** control: avoid panic at all costs.
- 2) **RESPOND**: follow company policy dealing with fires.
- 3) **REACT**: quick efficient responses may save lives & property.

HANDLING FIRES:

- A) Know where all fire extinguishers are located in the work area.
- B) Memorize the locations since you will be moving through different areas during your shift.

Fire extinguishers are rated according to the type of fire they are designed to fight. There are three symbols and designations for fire extinguishers:

A multipurpose extinguisher is rated ABC and is capable of fighting all three types of fires.



General Rules:

- * Aim the extinguisher at the base of the flames and use a side to side sweeping motion.
- * If an LPG powered truck is on fire **SHUT OFF THE LP TANK. NEVER REMOVE AN LP TANK DURING A FIRE!**
- * On Electrical Truck, **DISCONNECT** the battery at the connector plug or the quick-disconnect plug if so equipped.

Reviewing basics like these and procedures of your company in addition to knowing fire extinguisher locations will help you keep potential problems from reaching critical stages.

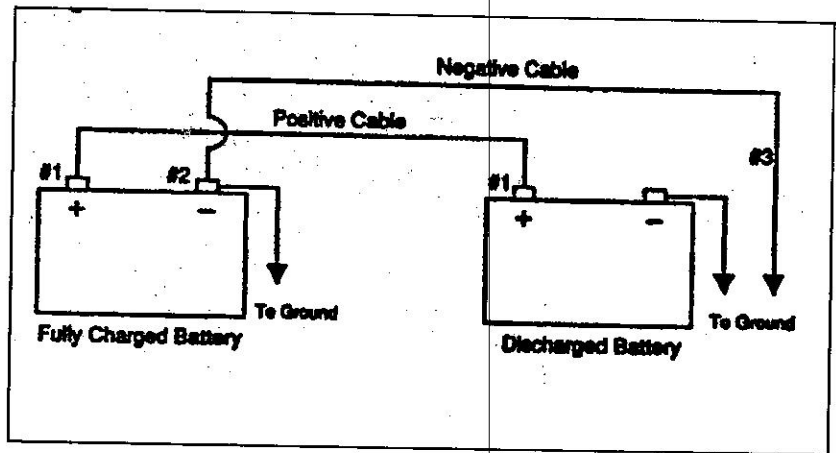
JUMP STARTING:

Jump starting internal combustion (IC) trucks is common practice **BUT** every year personal injury occurs due to **IMPROPER** connecting procedures. You should realize that you may encounter situations where jump starting is necessary.

Connection Illustration:

USE THIS EXACT SEQUENCE!!!:

- 1) Connect jumper cable to positive post of each battery.
- 2) Connect one end of the free jumper cable to the negative post of the charged battery.
- 3) Connect the other end of the free jumper cable to an engine ground on the disabled truck.



MAKE SURE CABLES ARE KEPT AWAY FROM ANY ENGINE PARTS - PANS -BELTS THAT WILL MOVE WHEN THE ENGINE IS STARTED.

The objective is to keep sparks away from the battery. Sparks will ignite any hydrogen gas that may be venting from the battery. USING THIS PROCEDURE, when you make the final cable connection to an engine ground on the disabled truck the spark caused will not be near the battery where it will cause an explosion.

* To disconnect the cables, reverse the sequence listed above.

CHAPTER THREE

FUNDAMENTALS OF FORKLIFT OPERATION:

This training on Forklift operations is based on how to SAFELY conduct material handling operations. We will cover the basic procedures for operation of any model or style of truck. The forklift used in this training is to give you a general idea of itl these procedures. IT S UP TO YOU TO READ THE SPECIFIC OPERATING MANUAL FOR ANY TRUCK YOU OPERATE. Each operators manual list general safety rules as well as specific instructions for it's model or type of truck. If a truck does not have an operators manual it can be ordered from the manufacturer.

OPERATOR'S DAILY INSPECTION:

OSHA section (q)(7) states that "industrial trucks ... be examined before being placed in service and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. @ OSHA further states "Where industrial trucks are used on a round the clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected;

Daily Inspections are a cost effective way to reduce maintenance and service costs, help ehsure consistent truck and operator safety, and build records of truck performance and or problems.

Inspection Forms:

Daily inspections forms record the operating and safety conditions of your truck. A truck and operator are the most important asset for a company. The inspection form is a link between you, your supervisor and the maintenance department. With your input, the overall productivity, efficiency and safety of a truck can be improved. The form below is a sample inspection form. Dealers and manufacturers offer these forms which can be customized:

OPERATORS DAILY CHECKLIST:	TRUCK NUMBER:
----------------------------	---------------

DATE: _____ OPERATOR: _____	
TRUCK TYPE _____	GAS/LPG/DIESEL _____ ELECTRIC _____
HOUR METER READING: _____	SHIFT START: _____ END: _____
TOTAL HOURS OF SHIFT: _____	SUPERVISOR=S OK: _____
Check the following: X = OK, N = NEEDS ATTENTION	
<u>Visual Checks</u> <input type="checkbox"/> Tire Condition <input type="checkbox"/> Head & Tail Lights <input type="checkbox"/> Warning Lights <input type="checkbox"/> Hour Meter <input type="checkbox"/> Other gauges/instruments <input type="checkbox"/> Damage or Leaks <input type="checkbox"/> Engine Oil Level <input type="checkbox"/> Radiator Water Level <input type="checkbox"/> Fuel Level <input type="checkbox"/> Battery Plug Connection BE SURE IT IS TIGHT <input type="checkbox"/> Battery Discharge Indicator KEY/NEEDLE SHOULD INDICATE GREEN AREA.	<u>Operational Checks</u> <input type="checkbox"/> Horn <input type="checkbox"/> Steering <input type="checkbox"/> Service Brakes <input type="checkbox"/> Parking Brakes <input type="checkbox"/> Hydraulic Controls <input type="checkbox"/> Seat Belt <input type="checkbox"/> Battery Load Test WATCH BATTERY INDICATOR WHILE HOLDING TILT LEVER ON FULL TILT. IF NEEDLE FALLS TO RED AREA, BATTERY DOES NOT HAVE SUFFICIENT CHARGE TO OPERATE TRUCK PROPERLY
REMARKS: _____	

DAILY START-UP INSPECTIONS:

1) Overhead Guard and Load Backrest Extension:

- * Inspect and record condition.
- * Check for loose or missing parts or fasteners. Damage to these can weaken the guard or backrest.

2) Operator Restraints:

- * Check for proper condition or. cuts and tears.

3) Warning Decals:

- * Make sure they are in place and readable.

4) Warning Devices:

- * Test all audible and visual warning devices, be sure they are working at all times.

5) Forks and Fork Retention:

- * Inspect forks for cracks, heel or tip wear & tip alignment.
- * If forks are worn beyond limits, they MUST be replaced.*Forks should not be straightened or welded.
- * Stop devices are mounted on the top ends of the forks. These along with the backrest extension stop the forks from sliding off the end. If fork stops are removed, worn, or broken they MUST be repaired or replaced.

6) Tires:

(Very important as there is no suspension system on forklifts.)

- * Must be inspected for cuts, breaks and signs of wear.
- * Remove material that may have become embedded in solid tires
- * On pneumatic trucks check tire pressure from a position FACING THE TREAD OF THE TIRE, not the side, and use long handled gauges to keep the body away from the side of the tire.
- * Low tire pressure can affect the trucks stability, BUT DON=T JUST ADD AIR. If tires need additional pressure, check with the mechanic, the tire may require removal and repair.

7) Truck Fluids:

- * Engine Oil Level: Maintain between 'Add' and 'Full' marks. Check before starting the engine for the shift. Allow oil to drain in the crankcase for the most accurate measure. One quart raises the level from the "Add' to the "Full" Mark.
- * Gasoline/Diesel Engines: fuel level must be checked with the key in "On" position.
- * LPG Trucks: leave key in "Off" position and check the fuel level on the tank gauge.
- * Check for obvious damage or leaks in the hydraulic system, engine and transmission oils, fuel, engine coolant, power steering and batteries.

8) Brakes:

- * Service Brakes and Inching Brakes:
Pedal should feel firm when pressed. There should be no noticeable drift (falling) on the pedal with pressure applied for ten seconds. If significant increase in pressure on the pedal is required to stop the truck, notify your supervisor.
- * Parking Brake:
Check by moving the lever from full forward to full back position. Maximum force should be required just before the full back (brake on) position. Brake should hold the truck with a capacity load on 15% grade (1.5 feet of vertical rise over 10 feet) or the maximum grade the truck will encounter in operations. If these checks are not satisfactory report the condition to your supervisor.

9) Hydraulics:

- * Check functions with the engine running.
- * All movements of uprights and carriage should be smooth with no binding up or down.
- * Check full forward and back tilt for smooth operation.
- * Raise carriage to its maximum height. If carriage will not reach full upper limit this indicates low hydraulic fluid level.
- * Report any unusual, jerky, or sluggish operating conditions to your supervisor.

10) Batteries:

- * Check battery for any leaks or buildup of deposits. Have the battery serviced immediately because these conditions mean that sulfuric acid is escaping from the battery cells. The acid will damage the battery and the truck.
- * Check connections from the battery to the truck. On battery powered trucks, make sure the battery plug connections are clean, free of corrosion and snap into place firmly. On ignition batteries make sure the connector cables are in good shape and are; attached to the battery posts snugly. Connectors and posts should be free of corrosion and or acid buildup.

SAFE TRUCK OPERATION

OSHA 1910.178 (1) requires: "@Only trained and authorized operators shall be permitted to operate a powered industrial truck.@

You must read the operator's manual and other specific information related to the operation of any specific truck you are assigned to operated. Check with your supervisor for this information.

**STUNT DRIVING AND HORSEPLAY:
ARE ABSOLUTELY NOT PERMITTED!**

OSHA 1910.178 (n)(9) states.- "Stunt driving and horseplay shall not be permitted." Think of the risks you place yourself, your family and your co-workers in before you even think of doing this, You could lose your job, YOUR LIFE or the a co-workers life.

OPERATOR INSTRUCTIONS:

- * You MUST read and understand the Operators Manual for each truck you operate. The information in the manual and the warning decals provide specific information about the truck. Also check with your supervisor for any additional information.

FAULTY EQUIPMENT AND MAINTENANCE:

OSHA section (p)(1) states: "If at any time a powered industrial truck is found to be in need of repair, defective or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition."

- * If your truck is not functioning properly, stop the truck immediately and report it to your supervisor.
- * Never attempt to repair the truck yourself.
- * Only Qualified mechanics should be allowed to repair trucks. They have been trained and have the special tools and equipment for forklift repairs. They can also get technical assistance from the manufacturer.
- * Battery powered equipment has special maintenance requirements. Maintenance technicians have specialized training and equipment. Dealers can provide battery specialists to assist in repairs..

OPERATING AROUND OTHER PERSONNEL:

Awareness of people who must work around you is the best way to provide safe working conditions for your co-workers and yourself.

GENERAL Rules for Operating a truck around other personnel:

- 1) Watch where you are going and always face the direction of travel. Pedestrians use the same roadway that you do, so sound your horn at intersections and blind spots.
- 2) Watch for other people in the work area as they might not be watching for you, even if you have warning lights or alarms.
 - * If you think they do not see you, do not move until you make eye-to-eye contact.
 - * Make people stand back, even when you are stopped and warn them about tail swing on the truck.
- 3) If your view is blocked because of the load, travel backwards. If you must move forward make sure that people are out of the way and move the forklift slowly.
 - * Use a spotter to help you. If you can't see the spotter or a clear path of travel, don't move the truck.
- 4) Never attempt to move a load that required someone to steady or position the load. The risk of accident or injury is too great.
 - * If you can't handle the load with the truck alone, re-stack the parcels, interlocking them squarely on the pallet or use a wrap or strap to secure the load to the pallet.

SPECIFIC Procedures for operating a truck around other personnel:

- 1) Never drive up to someone in front of a bench, wall, shelves or any other fixed objects.
 - * This is EXTREMELY dangerous, your brakes could fail or the person unaware of your presence

could step into the direct path of your truck. NEVER POINT YOUR TRUCK AT ANYONE. Too many things could go wrong leading to serious injury.

- 2) Never allow anyone to stand or walk under the raised upright whether loaded or empty. OSHA (m)(2)
- 3) Never allow anyone to stand on the forks or climb on the upright assembly.
- 4) Never allow anyone to reach or step in the areas of the mast, carriage, forks or load.
- 5) Never allow anyone to ride on the truck. OSHA (m)(3)

CARBON MONOXIDE AND FUMES:

Do not operate an internal combustion engine in a closed area such as a cold storage locker. Carbon monoxide is a colorless, odorless, poisonous gas which can overcome you without warning. As mentioned earlier when we discussed fuels, all IC trucks using gasoline, diesel or LPG produce carbon monoxide.

LEAVING OR PARKING YOUR TRUCK:

OSHA has rules which must be observed when you leave a truck unattended. OSHA considers a truck unattended if the operator is 25 feet away or out of sight of the truck. If you must leave the truck or park it for longer periods follow these procedures:

- 1) Bring the truck to a complete stop before getting off.
- 2) Turn the engine off. When parking LPG trucks, shut off the service valve and let the engine run out of fuel.
- 3) Lower the forks or attachment completely. Be sure that the forks are flat on the floor.
- 4) Place the directional level in neutral.
- 5) Apply the parking brake. If your parking brake does not work, report it and take the machine out of service.
- 6) Never park on any type of grade, park on level surfaces.
- 7) Never park the truck where it blocks emergency or fire fighting equipment, emergency travel routes or any traffic.
- 8) Never leave a truck parked on a dock ramp, dock leveler or in a trailer.
- 9) If there is any question about a truck moving chock the wheels.
- 10) Turn off the power supply. If possible, remove the keys to prevent use by unauthorized or unqualified personnel.

PERSONNEL ELEVATORS:

Forklifts are designed for a specific use, such as moving pallets of material, lumber etc. not as personnel elevators. It is strongly advised against using trucks as elevators. If you MUST use a forklift as a personnel elevator OSHA has procedures you MUST follow. See OSHA (m)(12).

- 1) Use a safety platform that is properly mounted and securely fastened to the vertical face of the forks and carriage. ALL APPLICABLE ANSI AND OSHA SAFETY STANDARDS MUST BE FOLLOWED.
- 2) Be sure that no part of the platform interferes with the operation of the carriage or upright assembly.
- 3) Be certain that there are no mechanical problems which might cause the upright to bind.

- 4) Raise and lower the platform to test its operation before you let anyone on it. When the work platform is raised and lowered watch for slack chains or any stationary object which could cause the forks, rails or platform to hang up or drop.
- 5) Stay with the truck during the time the platform is raised.
- 6) Keep the upright in a vertical position.
- 7) Do not allow anyone to climb on the upright or walk under the raised platform.
- 8) Never allow anyone to ride on the platform while the truck is being moved.

FORKLIFT TIP OVER:

If not operated properly, FORKLIFTS CAN TIP OVER! Many of the points listed below will be repeated in other sections but are now given as a reminder of things you must watch for that can cause a truck to tip over:

- 1) Slow down before turning. Go into and out of turns slowly, using slow rotating of the steering wheel.
- 2) Drive with the forks or attachments lowered and tilted back only enough to stabilize the load. Raising a load high moves the center of gravity and lowers the capacity.
- 3) CHECK CAPACITIES, DON'T OVERLOAD THE TRUCK!
- 4) Don't move unstable loads.
- 5) Move long, high or wide loads slowly and carefully.
- 6) Don't forget your truck has rear steering. A turn into a soft shoulder off a dock can tip the truck over. Watch the steer end of the truck and keep steer tires on the road.
- 7) If you have some long runs where you operate the truck empty, close to its top speed, SLOW DOWN BEFORE TURNING. Forklifts are rear-end heavy because of the counterweight used to offset loads. An empty truck can turn over just like a loaded one.
- 8) If you turn too sharply with the forks raised the truck can tip over. Even at slow speeds and with no load. SLOW DOWN.
- 9) Most trucks are equipped with seat belts, check company policy for wearing seat belts while operating the truck.

IF YOUR TRUCK TIPS OVER:

- 1) DO NOT ATTEMPT TO LEAP FROM THE TRUCK! Statistics show that the risk of serious injury from being pinned by the truck is greater than if you remain in the seat.
- 2) Grip the wheel firmly with both hands.
- 3) Brace your feet firmly against the floorboard.

LOAD HANDLING:

Along with traveling, load handling introduces the greatest possibilities for accidents. OSHA list directives for safe load handling in section (o), which are numbered this section. Under each we will explain procedures to be applied when handling loads.

- 1) Only stable or safely arranged loads within the rated capacity of the truck should be handled:
 - * DON'T pick up loads that are off balance. Make all loads stable by interlocking the objects or strapping the load to prevent items from falling off the pallet.
 - * DON'T pick and move loads that are too heavy. If in doubt check with your supervisor.

2) When picking up loads follow these two rules:

- * Spread the adjustable forks on the truck to fit the load. Normally wider the better
- * Center loads evenly on the forks. Check the fork length. Forks must be at least 2/3 the length of the load

When space restricts you from centering the load onto forks squarely, in boxcars or trailers, move the load only as far as necessary to clear the restricted space the re-position the load squarely on the forks.

- 3) When handling long or high loads, watch your clearance. These loads can reduce stability and capacity:
- * A turn with a wide load puts extra force on side-to-side stability. Remember with a long load, if the load center extends beyond the prescribed limit for the truck, capacity is reduced. Always keep forward tipping and the stability triangle in mind when moving any load.
- 4) When picking up a load, place the forks under the load as far as possible and carefully tilt the mast backward just enough to stabilize the load.
- * Engage loads squarely until the load rests against the vertical portion of the forks or load backrest.
 - * Keep the load low to the ground; only raise the forks 6 or 8 inches.
 - * Review the procedure under (2) for loads that cannot be squarely centered on the forks.
- 5) Check overhead clearance. Keep your truck at least 10 feet from any overhead electrical wires. Watch for overhead obstructions, like pipes, beams and low doors.
- 6) USE EXTRA CAUTION WHEN STACKING LOADS:
- a. Bring the truck in square to the rack or bin.
 - b. Brake the truck to a stop.
 - c. Elevate the load to the height necessary.
 - d. Inch the truck in and tilt the load forward to place the load.
 - e. Lower the forks just enough to take the pressure off the pallet.
 - f. Back the truck up till the forks are clear.
 - g. Lower the forks before beginning to travel.
 - h. Use the same procedures in reverse when picking up a load from a stack.
- * When right angle stacking or moving with a raised load to clear low objects **MOVE VERY SLOWLY - AVOID SHARP TURNS.**

TRAVELING:

OSHA presents two general rules to apply to travel under ALL conditions which should be consistently practiced to reduce the possibility for accidents:

- #1: Section (n)(8): "Under all travel conditions the truck shall be operated at a speed that will permit to be brought to a stop in a safe manner.
- #2: Section (n)(15): "While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate."

TRAFFIC REGULATIONS:

- 1) OSHA Section (n)(1) states: "All traffic regulations shall be observed, including authorized plant speed limits."

- * STOP at STOP signs, yield to other vehicles where necessary, and give pedestrians the right of way. Traffic regulations apply in all areas; in buildings and outside; wherever the truck is operated. **MEMORIZE ALL TRAFFIC REGULATIONS. (SPEED LIMITS ETC.)**
 - * Check with your supervisor for the comprehensive safety plan and layout for the entire facility.
 - * Familiarize yourself with all areas you will be operating the truck.
 - * Stay in marked traveling routes and out of pedestrian walkways if possible.
- 2) When working around other trucks, use safe courteous, defensive driving practices:
 - * Keep your truck under control at all times.
 - * Maintain at-least three truck lengths between yourself and any truck ahead. Truck lengths include the truck, forks, and loads.
 - * Yield the right of way to ambulances, fire trucks or any other vehicles in an emergency situation.
 - 3) Do not attempt to pass any vehicle traveling in the same direction at any intersection, blind spot, or other potentially dangerous location.
 - 4) Be especially cautious at intersections. OSHA states: "The driver shall be required to SLOW DOWN and SOUND THE HORN at cross aisles and other locations where vision is obstructed."

TRAVELING SURFACES:

Look at the surfaces on which you will operate your truck. Become familiar with plant floors, dock surfaces, yards. Consider conditions that may change such as is the dock clear one day, wet one day, and slippery from ice another? Know the possible hazards and what to do to reduce accident risks.

- 1) OSHA (n)(10) states: "The driver shall be required to slowdown for wet and slippery floors."
 - * Inspect conditions before you begin the day's operations. If there are spots of water or oil in your path have them cleaned up if possible. if such conditions exist USE EXTRA CAUTION TO OPERATE THE TRUCK.
- 2) Check your tires daily. (Daily Inspection Procedure)
 - * Keep the tires clean and remove any objects stuck in the tread. Check pneumatic tires for correct pressures. Wipe off any oil or grease.
- 3) OSHA (N)(14) states: "Running over loose objects on the roadway surface shall be avoided."
 - * Watch for AND REMOVE any objects that could puncture a tire or cause the truck to tip if run over. Take the objects to a safe disposal area.
- 4) Avoid potholes; keep the truck on solid improved surfaces.
 - * Operate trucks at a SAFE SPEED to avoid possible lateral overturn in case you must swerve avoid a pothole.
- 5) Keep in mind special problems of dock areas due to weather exposure.
 - * Keep docks clean and clear, if possible keep them dry.
 - * Check dockboards/ramps before using. See that they are as dry as possible.
- 6) In the yard around the facility you may be required to cross railroad tracks.
 - * Cross railroad tracks **DIAGONALLY** when possible. Head on crossings increase possibilities of forward tipping and/or product damage.

- * Use EXTREMELY LOW SPEEDS crossing tracks whether the truck is loaded or empty.
- * OSHA states: "Parking closer than 8 feet from the center of the tracks is prohibited."

VISIBILITY:

OSHA section (n) Traveling part (6) states: "The driver shall be required to look in the direction of and keep a clear view of the path of travel." Although forklifts are designed to lift and carry loads in front of the machine, the mast and load can restrict your visibility.

When you must carry loads that restrict visibility, turn and operate the truck in reverse.

When you are moving in and out of railcars, traveling upgrades or picking up/depositing loads, visibility may be almost completely restricted. Visibility may also be restricted by building structures, storage systems or materials.

When you must move in a direction in which visibility is blocked, you must have a spotter to help.

ELEVATORS:

- 1) Never enter an elevator until you are sure that:
 - a: The capacity of the elevator is great enough to handle the combined weight of your truck and its load. **IF YOU ARE NOT SURE:** check the elevator's capacity and compare it to the weight of the truck and load.
 - b: The condition of the elevator floor is good enough to support the weight of your truck and its load. Check the flooring for missing, cracked, warped or boards in poor condition. Your company should have service records on file for elevator inspections.
- 2) Once the elevator has been leveled, approach the opening, **SLOWLY** and enter squarely.
- 3) When you are on the elevator:
 - a. Lower the forks.
 - b. Place the controls in neutral.
 - c. Shut off the truck engine.
 - d. Set the parking brake.

GRADES, RAMPS AND INCLINES:

- 1) Travel up and down grades **SLOWLY**.
- 2) Travel straight up and straight down. Never turn on ramps, slopes or inclines, wait until you are back on level ground.
- 3) **WITH A LOAD;** travel up or down with the load pointing upgrade.
- 4) **WITHOUT A LOAD:** travel up or down with the forks pointing downgrade.
- 5) The load should be tilted back and raised **ONLY** as high as necessary to clear the surface.

DOCK OPERATIONS:

Dock operations present situations that required **ADDED CAUTION**. Restricted space, driving with a load in reverse; running over bridge plates or dockboards and driving into and out of railcars or tractor trailers combine to complicate operations.

LOADING DOCK OPERATION PROCEDURES:

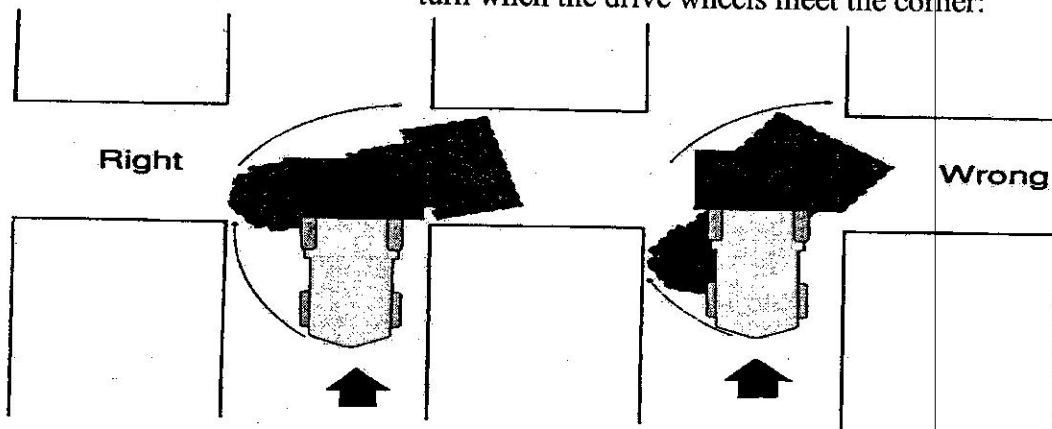
- 1) OSHA (m)(7): "Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railcars while loading or unloading."

- * Before entering a tractor trailer, make sure that the wheels are chocked.
 - * Before entering a railcar, make certain that the brake is set or that wheel stops are in place.
- Movement of your truck in a railcar or trailer may set it rolling. A dockplate or ramp can become disconnected and you may fall out of the railcar or trailer. **NEVER TAKE IT FOR GRANTED THAT THE TRAILER OR RAILCAR IS BRAKED OR CHECKED. TAKE THE TIME TO CHECK FOR YOURSELF.**

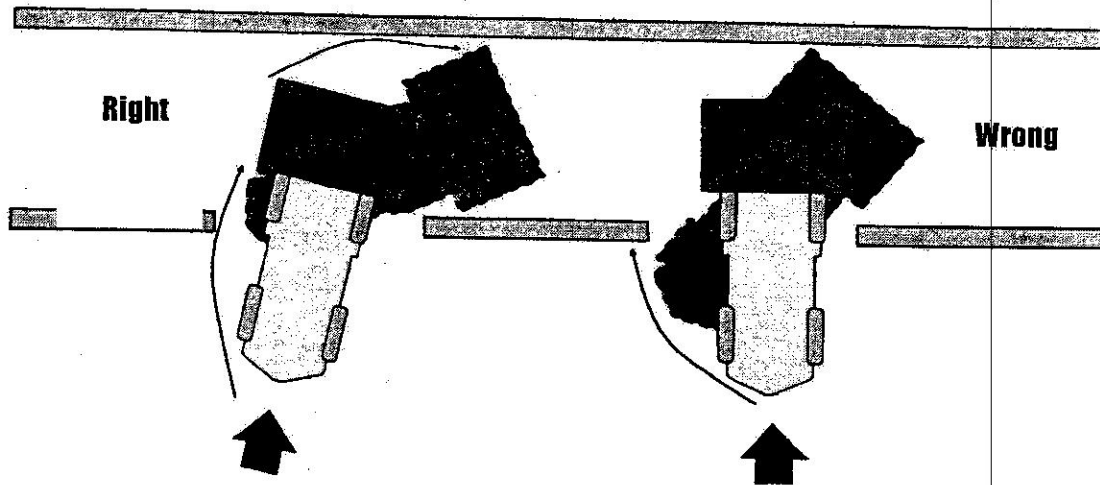
- 2) Fixed jacks may be necessary to support a semi trailer during loading or unloading when the trailer is not coupled to a tractor.
 - * Check to make sure the trailer jacks are fully lowered and securely in place. Ideally the jacks should be lowered to make the trailer level.
- 3) Check the flooring of trucks, trailers and railcars for breaks and weakness before you drive onto them.
 - * Make sure the flooring will support the combined weight of your truck and the loads you will be handling.
- 4) You must watch the trailer to dock interface. Levelers, dockboards and ramps must be available and properly maintained.
 - * Make sure dockboards are securely in place when mounted between the dock and railcar or trailer.
 - * Travel slowly on the dockboards or bridge plates. High speed travel or sudden acceleration can jar them loose.
- 5) OSHA (m)(6) states: "A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car."
 - * Move very carefully to avoid getting wheels too close to the edge of the dock, watch out for tail swing.
 - * When you must maneuver around a dock where loads or conditions restrict visibility use a spotter to help you.
- 6) Use lights to improve visibility while working in trailers.

FORKLIFTS OPERATIONS AND CONFINED AREAS:

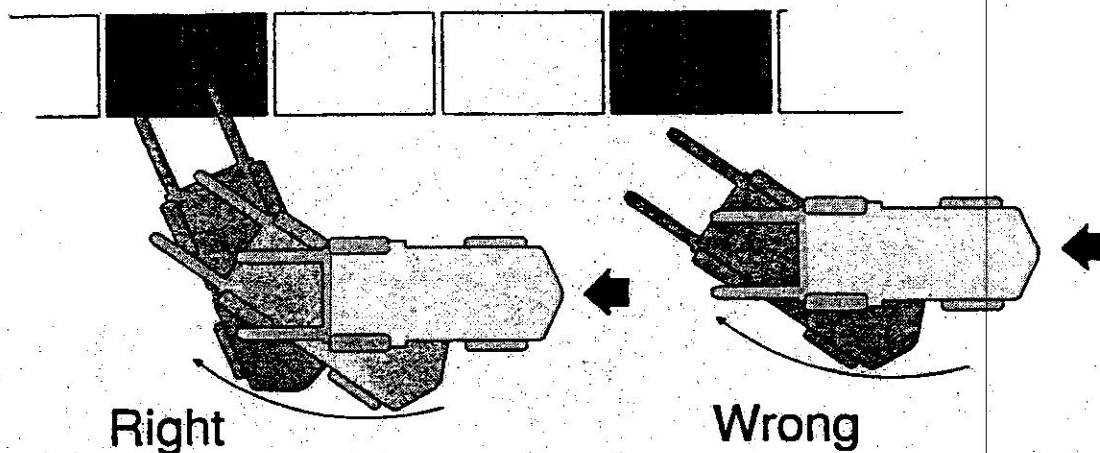
- 1) **TURNING SHARP CORNERS:** Negotiate turns by keeping close to the inside corner and start to turn when the drive wheels meet the corner:



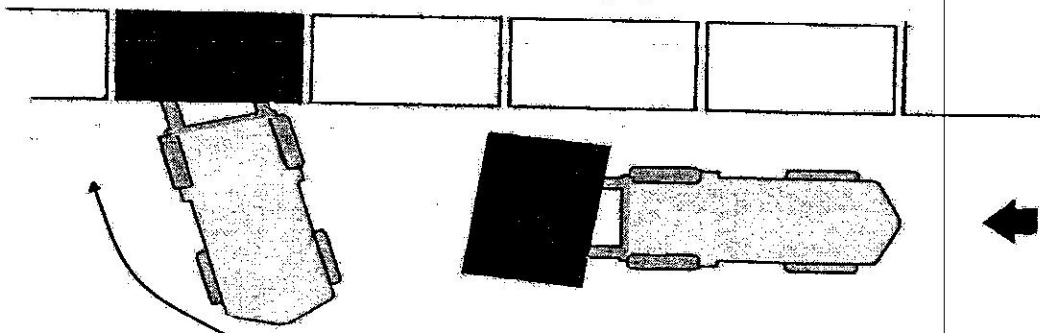
- 2) **ENTERING RAILWAY CARS:** Enter boxcar door at an angle for counterweight swing. Do not pull straight in with the truck at a right angle to the boxcar side:



- 3) **TURNING ACROSS NARROW AISLES:** Approach turn as far away from stock pile or obstacle as possible and begin turn early **BEFORE** you reach the middle of the aisle:



- 4) **ANGLE LOADS IN NARROW QUARTERS:** In exceptionally narrow aisles, save time maneuvering by carrying the load carefully at an angle. As soon as possible, re-position the load evenly on the forks for proper balance:



SUMMARY OF SAFE FORKLIFT OPERATIONS

OPERATION:

- * Only trained and authorized personnel should operate the truck.
- * Know all safety devices, functions and operations of the truck.
- * Mount and dismount carefully.
- * Refuel or recharge only in designated areas.
 - a. No smoking is allowed.
 - b. Fully lower the forks.
 - c. Place the truck in neutral.
 - d. Set the brake.
 - e. Turn off the key switch.
- * Wear protective clothing or safety gear as required.
- * Do not modify the truck or attachments.

LIFTING:

- * Do not operate the truck in stacking areas without the overhead guard in place.
- * Never exceed the rated capacity of the truck. Check the data plate for capacity information.
- * Never allow anyone to stand or pass under a raised mast.
- * Position loads evenly on the forks. Lift loads carefully and smoothly.
- * Lift loads with the mast vertical or tilted slightly back, never with the mast tilted forward.
- * Tilt elevated loads forward only when directly over drop spot and keep the load as low as possible.

TRAVEL:

- * Always observe all traffic rules, warning signs, floor load limits and overhead clearances. Travel only in designated routes.
- * Travel only at speeds which allow for safe stops.
- * Sound warning device and slow down at all cross aisle, exits, elevators, sharp corners, ramps, blind corners and when ever approaching pedestrians.
- * SLOW DOWN for turns, ramps, dips, uneven or slippery surfaces, and in congested areas. Avoid debris and holes.
- * Carry loads close to the floor with the mast tilted back. Operate the unit and attachments only from the operators position.
- * Be extra careful when handling long, wide or high loads. Watch end swing of long or wide loads. Check rear end swing when turning.
- * Exercise EXTREME caution if you MUST turn on an incline.
- * Look in the direction of travel.
- * When carrying bulky loads, travel in reverse for better visibility.
- * Travel with loads facing uphill when running up or down ramps, grades or inclines.

PARKING:

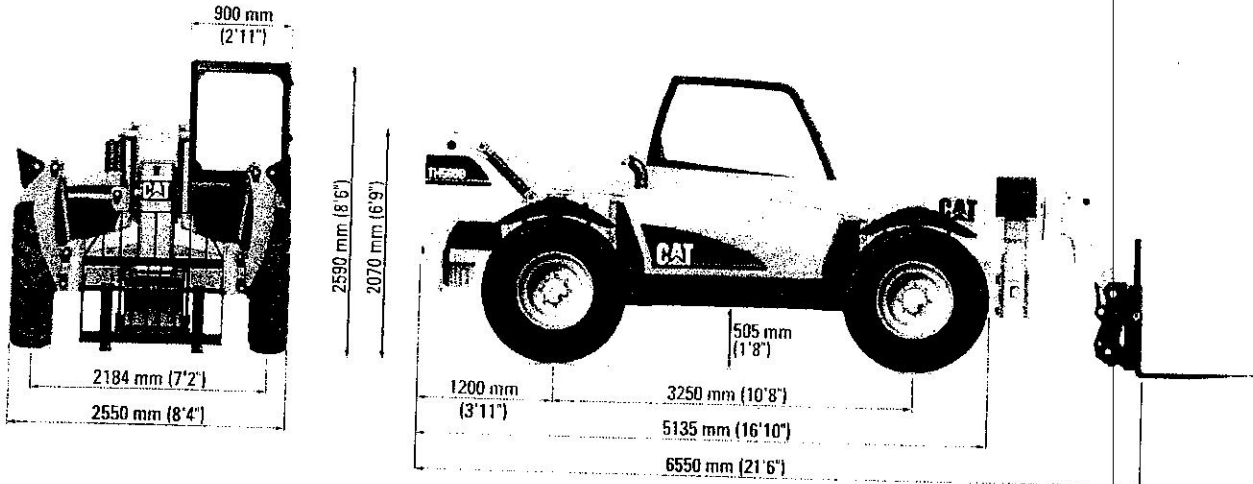
- * Park the truck only in authorized areas.
- * Park with: Forks fully lowered; Controls in neutral; Parking brake set; Key switch off and key removed; and Wheels chocked if on an incline.

MAINTENANCE:

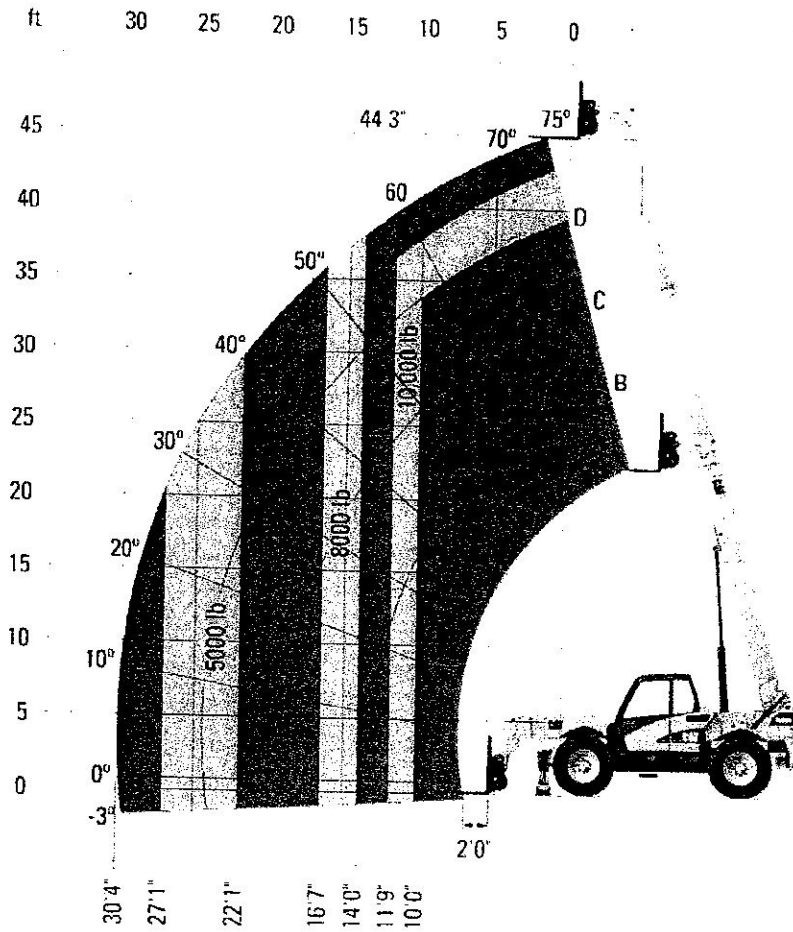
- * Complete all daily maintenance (fuel, water, hydraulics, transmission, battery, tires, controls) and visual checks before operation.
- * Read and understand all warning and caution information for the truck.
- * Do not operate any truck which is in need of repair, defective or in any way unsafe. Notify service personnel. Do not attempt any repair.

Dimensions

All dimensions are approximate.

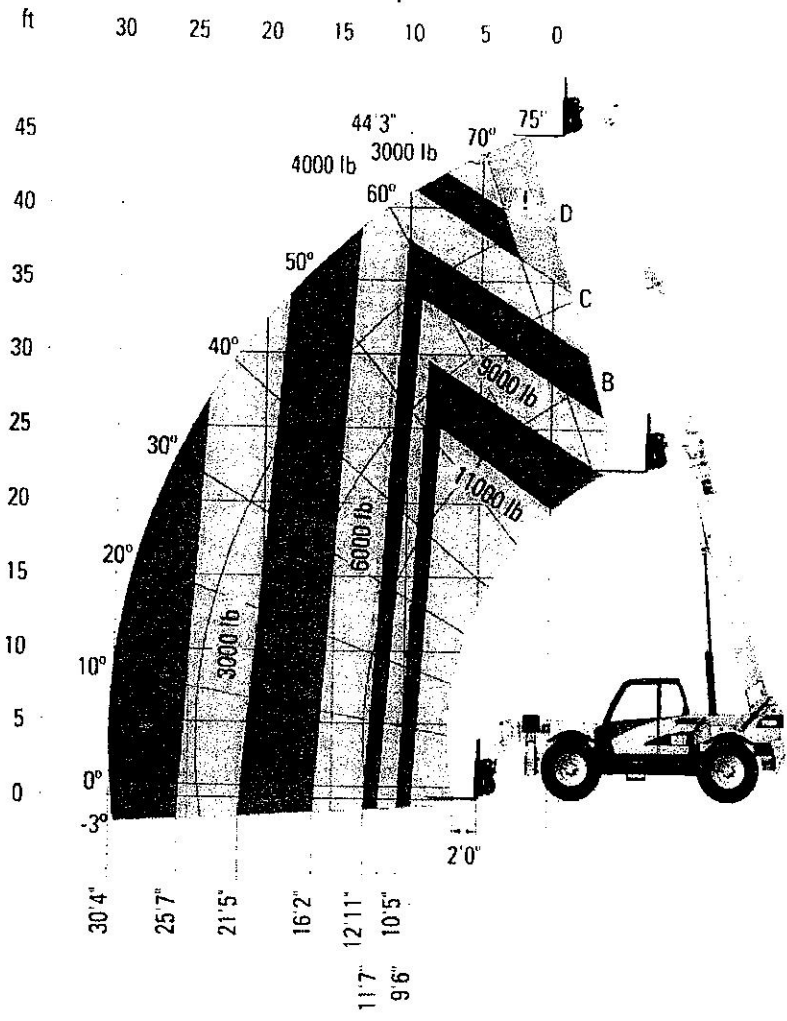


Load Charts and Dimensions

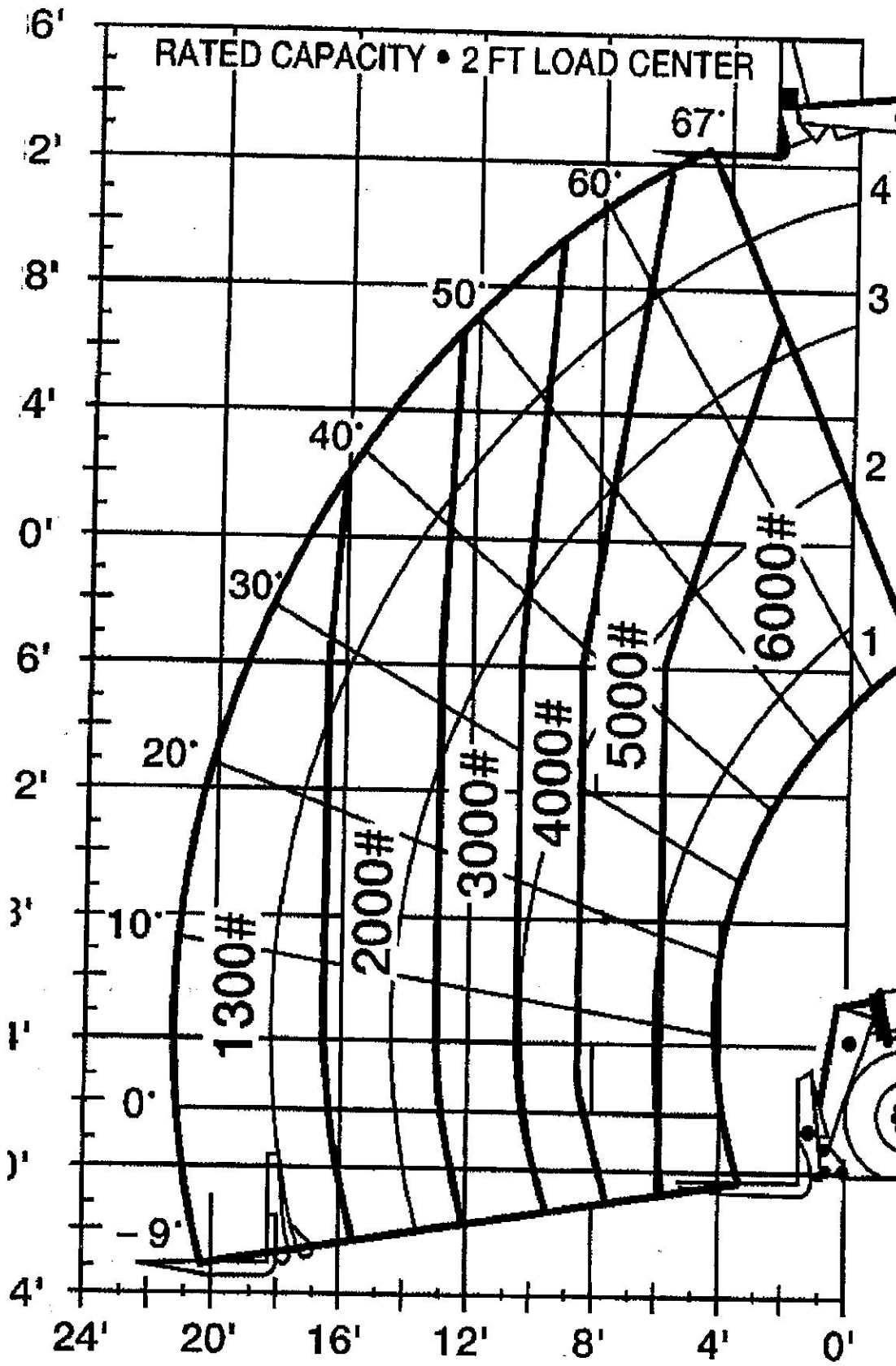


Handwritten note: R/O

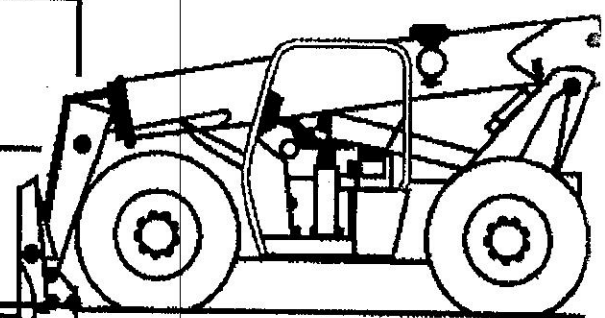
Load Charts and Dimensions (continued)



**MODEL
522D-3S
524D-3S**



**DEDUCT 300 LBS
FROM ALL CAPACITIES
WHEN MACHINE IS
EQUIPPED WITH WINCH**



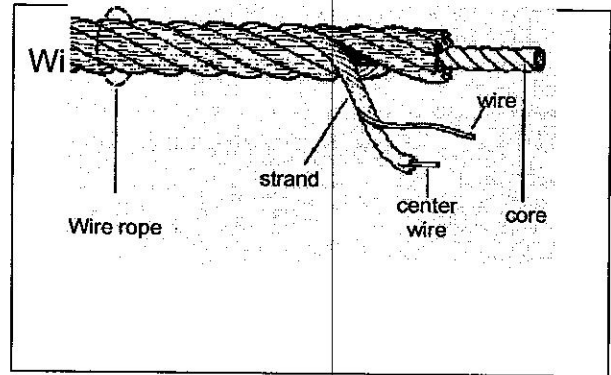
- SEE WITH:**
- 9108-5033 48" CARRIAGE
 - 9045-5051 48" CARRIAGE
 - 9045-5052 66" CARRIAGE

Specify, Select, and Inspect Rigging Equipment

Wire Rope Slings

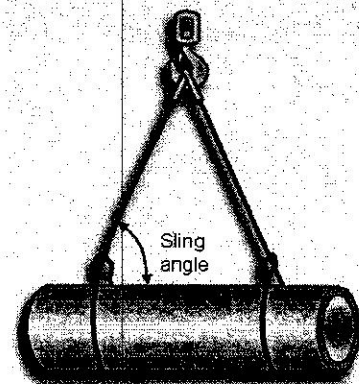
Pre-Use Inspection Checklist

- Inspect daily before use and frequently during use
- Slings must be removed from service when any of the below listed substandard conditions exist.
- Shock loading is prohibited
- Ten (10) randomly distributed broken wires in one (1) rope lay, or five (5) broken wires in one (1) strand in one (1) rope lay
- More than one broken wire at an end connection
- Reduction in rope diameter (1/3 or more of the original wire diameter)
- Severe localized wear, abrasion, or scraping
- Kinking, crushing, under-stranding, bird-caging, core protrusion, and any other damage resulting in distortion of the rope structure
- Evidence of heat damage
- End attachments that are cracked, deformed, or worn
- Hooks or latches deformed or damaged
- Corrosion of the rope or end attachments
- Each wire rope sling shall be marked to show:
 - Name or trademark of manufacturer
 - Rated load capacity for the types of hitches, and the angle upon which it is based
 - Diameter or size
 - BNL color-coded inspection tag or tape
 - 2008: Green • 2011: Orange
 - 2009: Red • 2012: Green
 - 2010: Blue • 2013: Red



Visual Insp

Rope Dia. (Inches)	1 Leg		Vertical	2 Leg Bridle		
	Vertical	Choker	Vertical Basket	60°	45°	30°
7/16	3800	2800	7800	6800	5400	3800
9/16	6400	4800	12800	11000	9000	6400
3/4	11200	8200	22000	19400	15800	11200
1	19600	14400	40000	34000	28000	19600
1 1/4	30000	22000	60000	52000	42000	30000



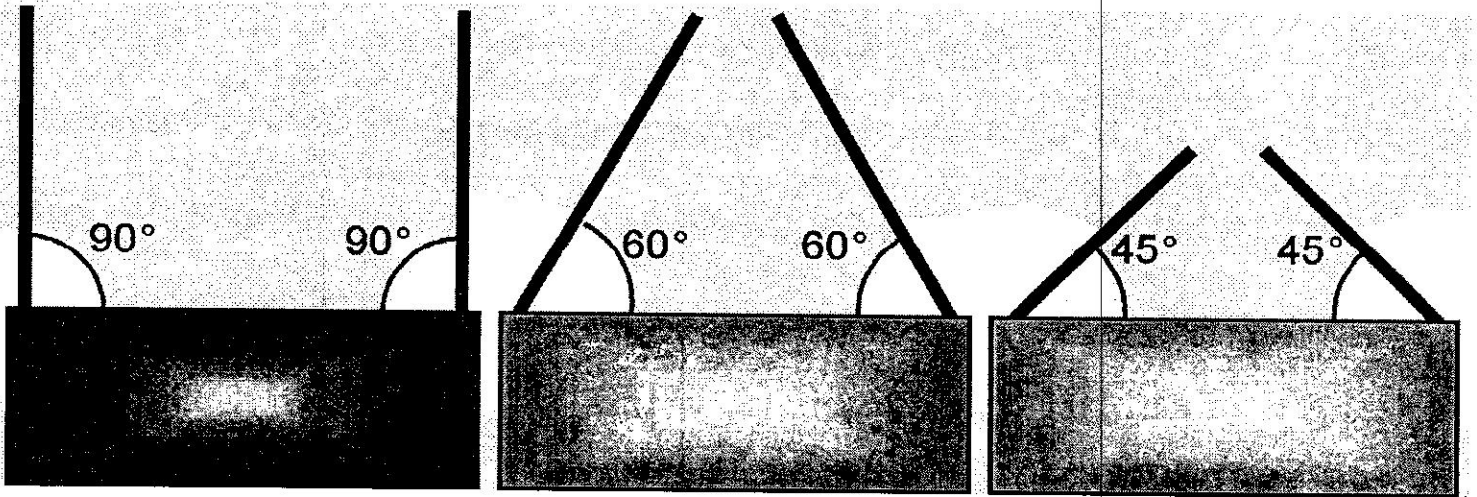
Sling Angle Factor

The Sling Angle Factor is a multiplier used to determine the required sling size when angle formed between sling and load is less than 90°.

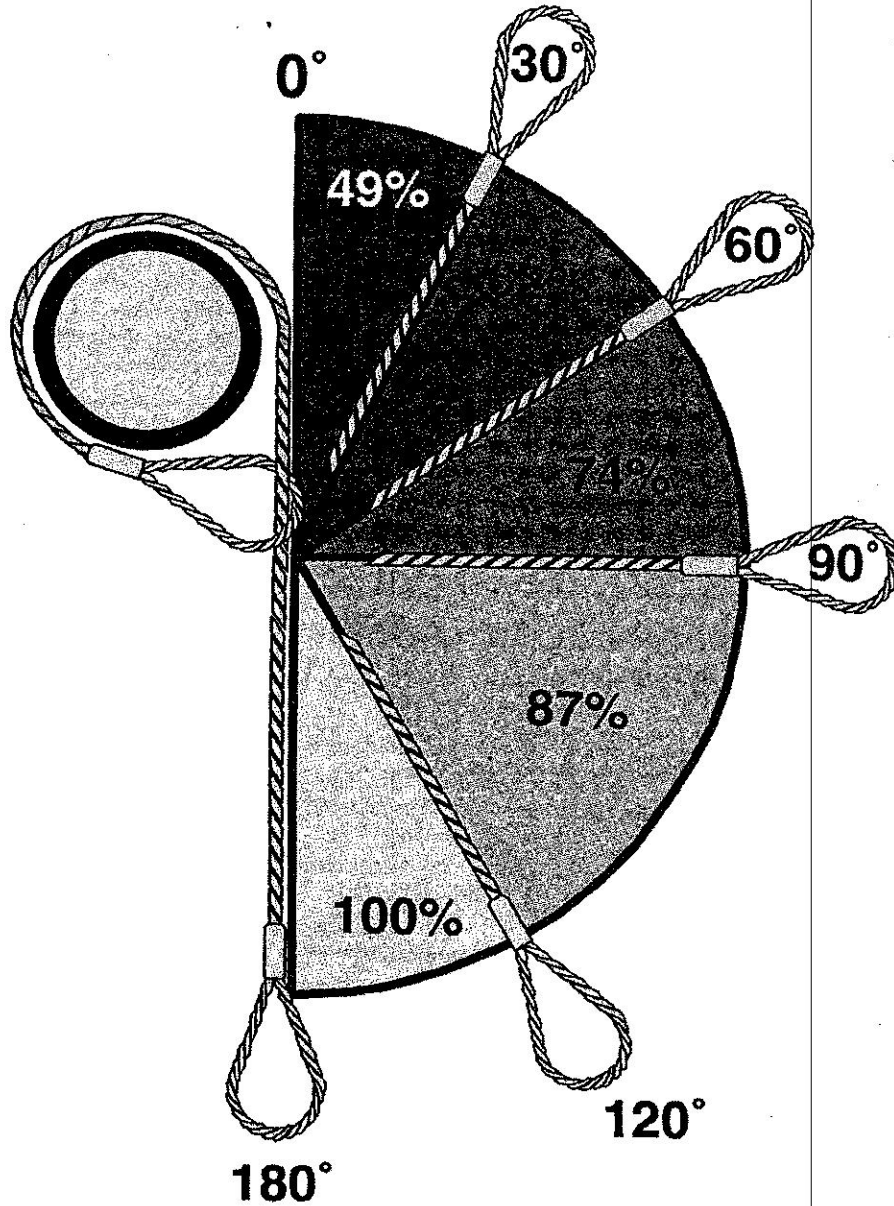
Need to estimate angle to nearest 5°

Avoid rigging loads where angle is less than 45°

Sling angle	Load angle factor
90°	1.000
85°	1.004
80°	1.015
75°	1.035
70°	1.064
65°	1.103
60°	1.155
55°	1.221
50°	1.305
45°	1.414
40°	1.555
35°	1.742
30°	2.000
25°	2.366
20°	2.924
15°	3.864
10°	5.759
5°	11.47



Angle of choke



Choker hitch Rated capacity adjustment	
Angle of choke in degrees	Rated capacity
Over 120	100%
90 - 120	87%
60 - 89	74%
30 - 59	62%
0 - 29	49%

*Values are for I.W.R.C. and fibre core wire rope, the percentage listed is the percentage of sling rated capacity in a choker hitch.

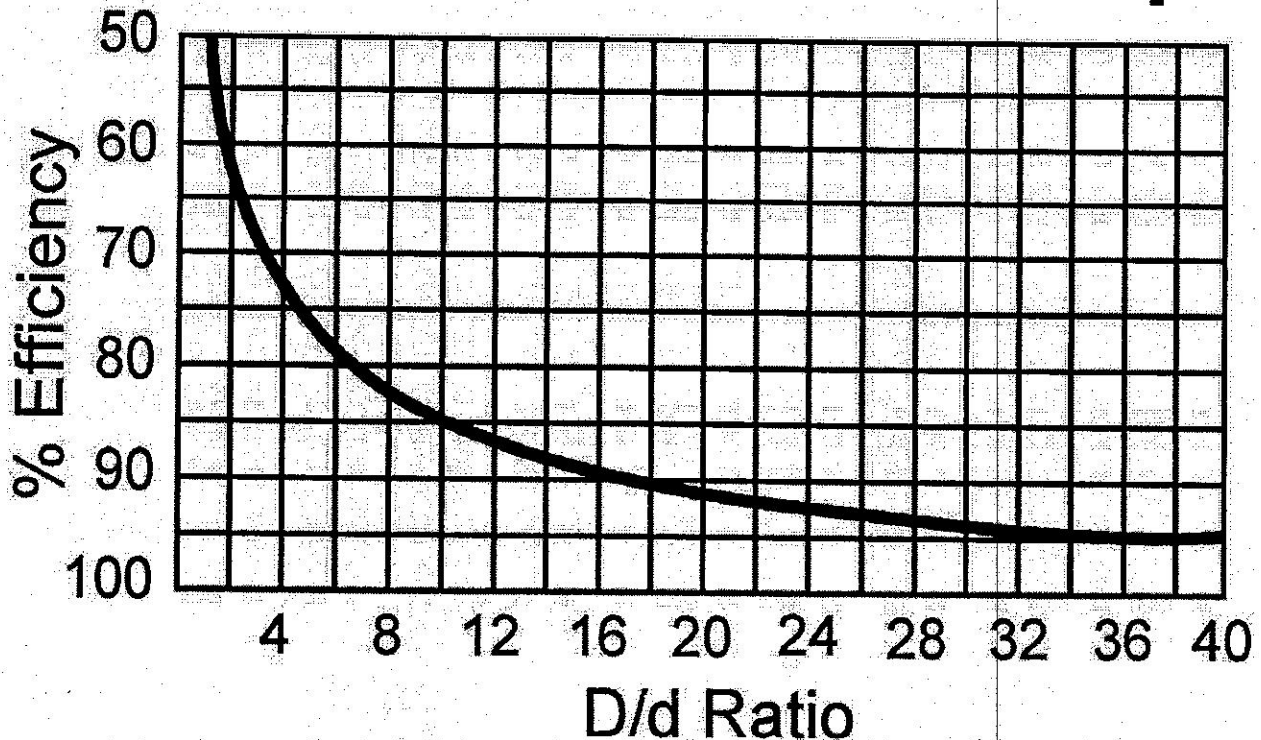
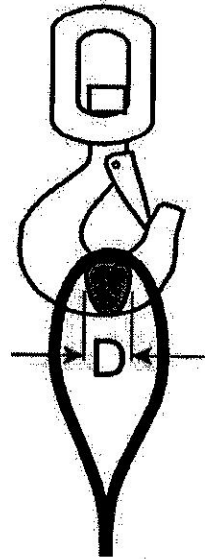
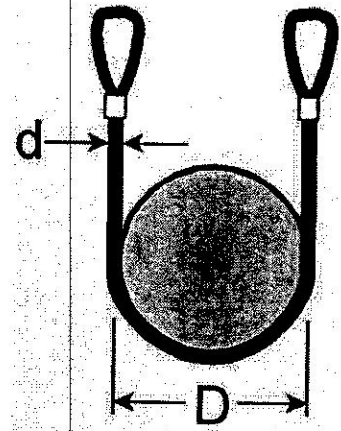
D/d Ratio

When a wire rope sling is used in a basket hitch, the diameter of the load where the sling contacts the load can reduce sling capacity. The method used to determine the loss of strength or efficiency is referred to as the *D/d Ratio*.

The "D" refers to the diameter of the object being lifted, while the "d" refers to the diameter of the wire rope sling, as shown in the figure at the upper right. For example, when a 1-inch wire rope sling is used to lift an object that measures 25 inches in diameter, the D/d Ratio is 25-to-1 (written 25/1).

Alternatively, the "D" can refer to the cross-sectional diameter of the eye, hook, or other object being used to hoist the load, as shown in the figure at right.

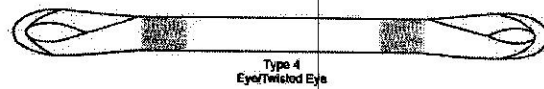
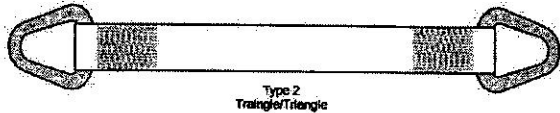
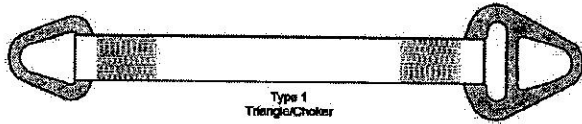
In both cases, the effective strength of the sling results. The table below shows the D/d Ratio and corresponding efficiency percentage.



Synthetic Slings

Synthetic Web Slings – 1 Ply Rated Capacities in Pounds

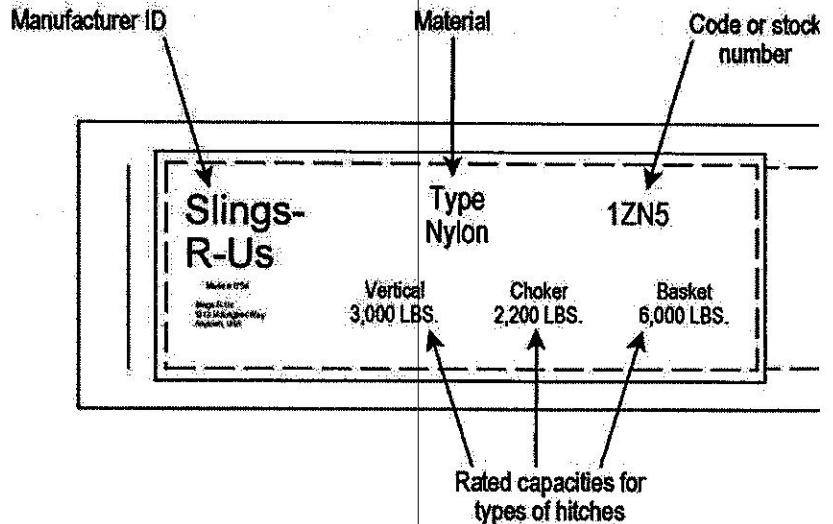
Sling Width (Inches)	1 Leg		Vertical Basket	2-Leg Bridle		
	Vertical	Choker		60°	45°	30°
1	1000	750	2000	1700	1400	1000
2	2000	1500	4000	3500	2800	2000
3	3000	2200	6000	5200	4200	3000
4	4000	3000	8000	6900	5700	4000
5	5000	3700	10000	8700	7100	5000
6	6000	4500	12000	10400	8500	6000



Synthetic Web Sling Pre-Use Inspection Checklist

Inspect slings daily before use and frequently during use. Slings must be removed from service when any of the following substandard conditions exist.

- Knots, snags, holes, tears, or cuts
- Extensive abrasive wear
- Melting or charring of any part of the sling surface
- Visible red yarns or threads indicate excessive wear
- Broken or worn stitches
- Chemical damage including acid or caustic burns, brittle or stiff areas, and discoloration of any kind
- Corrosive discoloration, or other damage to fittings
- Missing, illegible, or incomplete sling identification
- Synthetic web slings must have tags marked with the information shown at right as well as a BNL color-coded inspection tag



Synthetic Web Slings
 Endless and Eye-and Eye
 Rated Capacities in Pounds

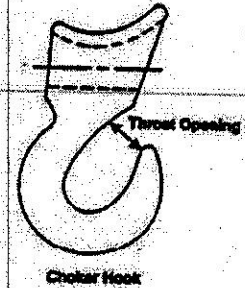
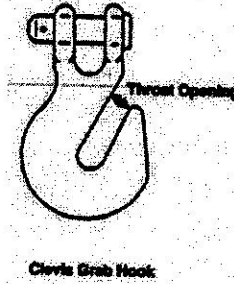
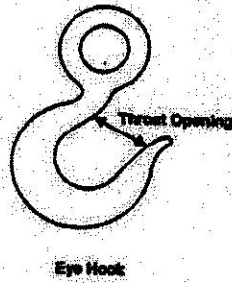
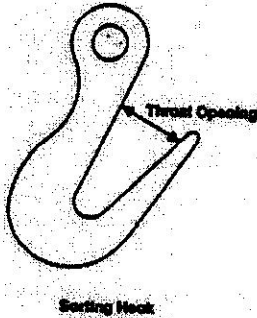
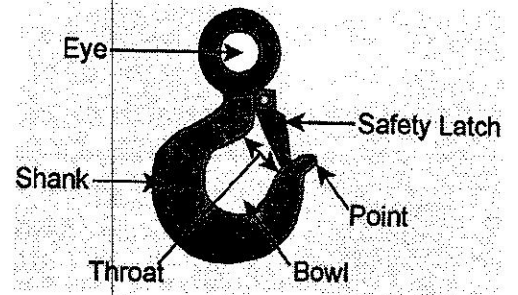
Sling Width (Inches)	1 Leg		Vertical Basket	2-Leg Bridle		
	Vertical	Choker		60°	45°	30°
1	2600	2100	5200	4500	3700	2600
2	5300	4200	10600	9200	7500	5300
3	6400	6700	16800	14500	11900	8400
4	10600	8500	21200	18400	15000	10600
5	13200	10600	26400	22900	18700	13200
6	16800	13400	33600	29100	23800	16800
7	21200	17000	42400	36700	30000	21200
8	25000	20000	50000	43300	35400	25000
9	31000	24800	62000	53700	43800	31000
10	40000	32000	80000	69300	56600	40000
11	53000	42800	106000	91800	74900	53000
12	66000	52800	132000	114300	93300	66000
13	90000	72000	180000	155900	127300	90000

Endless and Eye-and Eye Synthetic Web Sling Pre-Use Inspection Checklist

Inspect slings daily before use and frequently during use. Slings must be removed from service when any of the following substandard conditions exist.

- Chemical damage including acid or caustic burns, brittle or stiff areas, and discoloration of any kind
- Melting, charring or weld spatter on any part of the fittings
- Holes, tears, cuts, snags, broken or worn stitching, or any abrasion in the sling cover that exposes the core yarns
- Knots in the sling
- Extensive abrasive wear
- Stretching, cracking, pitting, distortion, or any other damage to the fittings
- Other visible damage that could affect sling strength
- Sling identification missing, illegible, or incomplete (required: manufacturer ID, code or stock number, rated capacity for hitches, core and cover material)

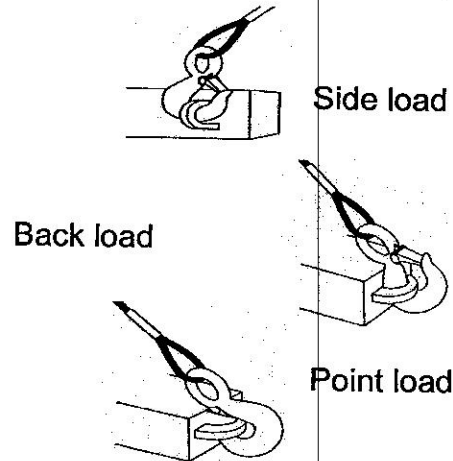
Hooks



**Eye Hook Rated Capacity Table
(Forged Alloy Steel)**

Throat Opening	Safe Working Limit (SWL, in pounds)
5/8	600
11/16	800
1	1500
1-1/16	2000
1-1/4	4000
1-3/8	4500
1-13/32	5000
1-1/2	5500
1-17/32	6000

Incorrect Hook Connections

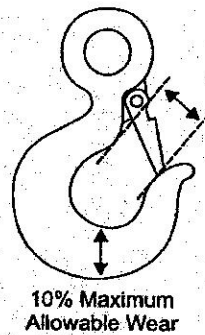


Hook Pre-Use Inspection Checklist

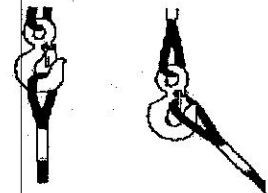
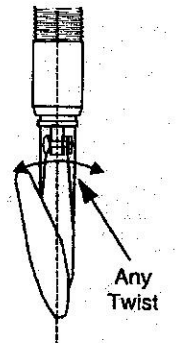
Inspect hooks daily before use and frequently during use. Remove from service when any of the following conditions exist:

- Missing or illegible manufacturer identification
- Cracks, nicks, or gouges
- Damage from heat
- Unauthorized repairs
- Improper operation and locking of self-locking hooks
- Any twist from plane of unbent hook
- Distortion or wear – any increase in throat opening of 5% not to exceed 1/4 inch, or wear exceeding 10% of original dimension

For added safety, hooks must be equipped with a latch or the throat opening closed-off/secured with a mouse. The latch or mouse is **not** intended to support the load.



5% not to exceed 1/4 in.

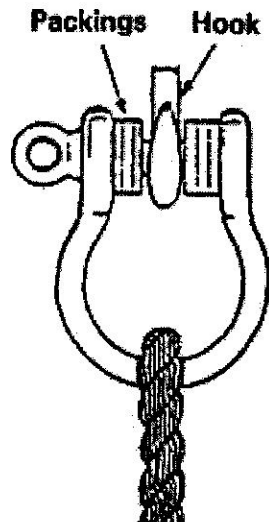
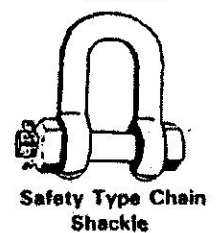
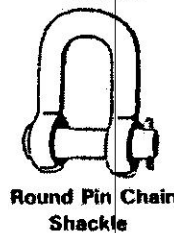
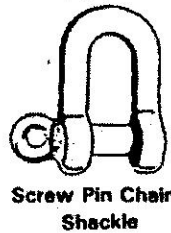
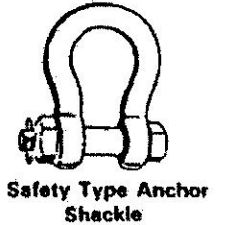
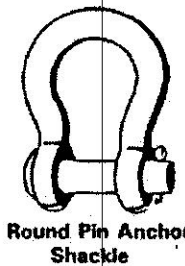
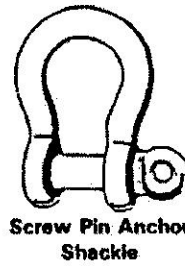


Shackles

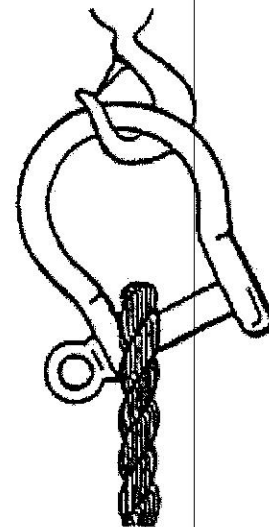
**Shackle Capacity Table
(Forged with Alloy Pins)**

Nominal Shackle Size	Rated Capacity (Pounds)
3/16	660
1/4	1000
5/16	1500
3/8	2000
7/16	3000
1/2	4000
5/8	6500
3/4	9500
7/8	13000
1	17000
1 1/8	19000
1 1/4	24000
1 3/8	27000
1 1/2	34000
2 1/2	110000

- If different from capacities listed above, use rated capacity marked on the shackle.
- If capacity marking is absent, shackle should be removed from service.



Good Practice
Pack the Pin with Washers to Centralize the Shackle



Poor Practice
Never Allow Shackle to be Pulled at an Angle, the Legs will Open Up

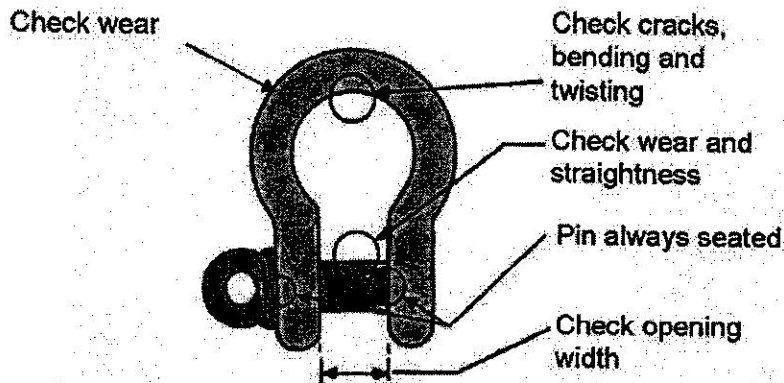
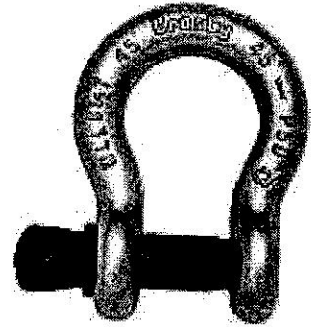
Shackle Pre-Use Inspection Checklist

Inspect shackles daily before use and frequently during use.

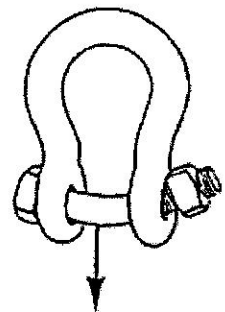
- Each shackle body shall have forged, cast, or die stamped markings by the manufacturer showing: name or trademark of the manufacturer, rated load/capacity (WLL or SWL), and size. This information shall not be missing and must be legible.

Remove from service when any of the following conditions exist:

- Indications of heat damage including weld spatter or arc strikes
- Excessive pitting or corrosion
- 10% reduction of the original or catalog dimension at any point around the body or pin
- Body spread including: bent, twisted, distorted, stretched, elongated, cracked, or broken load-bearing components
- Excessive nicks or gouges
- Incomplete pin engagement, shoulder of pin is not flush with shackle body
- Excessive thread damage
- Evidence of unauthorized welding



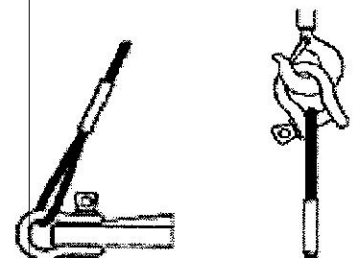
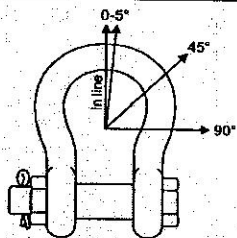
Never Replace a Shackle Pin with a Bolt



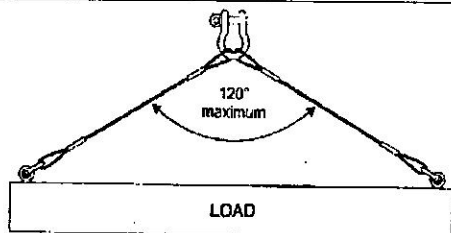
The Load will Bend the Bolt

Side Loading Reduction Factors Screw Pin and Bolt Type Shackles

Angle of Side Load from Vertical In-Line of Shackle	Percent Rated Load Reduction
0° - 5°	0%
5° - 45°	30%
46° - 90°	50%
Over 90°	Avoid



Incorrect Applications



The rated capacity of shackles only applies when they are symmetrically loaded and the included angle between two sling legs is a maximum of 120°. Shackle capacity must be reduced when the angle is greater than 120°.

Eye Bolts

Forged Eye bolts – Shoulder Type
Rated Capacity Table in Pounds

Nominal Eye Bolt Size (Inches)	90°	60°	30°
1/4	400	75	NR
5/16	680	210	NR
3/8	1000	400	220
7/16	1380	530	330
1/2	1840	850	520
9/16	2370	1160	700
5/8	2940	1410	890
3/4	4340	2230	1310
7/8	6000	2960	1910
1	7880	3850	2630
1 1/8	9920	4790	3840
1 1/4	12600	6200	4125
1 1/2	18260	9010	6040
1 3/4	24700	12100	8250
2	32500	15970	10910

Eye Bolt Pre-Use Inspection Checklist

All eye bolts must be forged, cast, or die stamped with the name or trademark of the manufacturer, size or capacity, and grade (alloy eye bolts only). This information shall not be missing and must be legible.

Inspect eye bolts daily before use and frequently during use.

Remove from service if any of the following conditions exist:

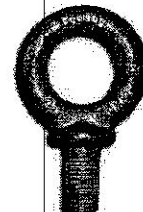
- Nicks, gouges, bent or distorted eye, or shank
- Obvious wear (10% reduction of original/catalog dimension at any point)
- Worn, corroded and/or distorted threads
- Indications of heat damage including weld spatter or arc strikes
- Any alteration or repair to eye bolts, such as grinding, machining, welding, notching, stamping, etc. is not permissible.

Tapped receiving holes must be cleaned and inspected for thread wear and deterioration.

Types of Eye Bolts



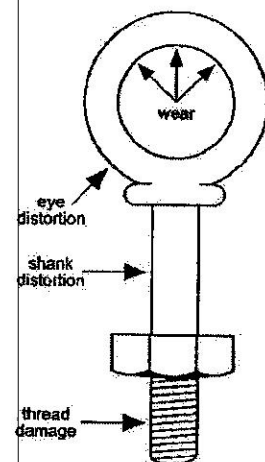
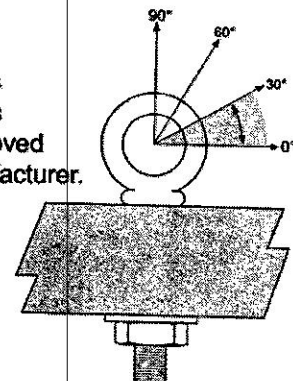
Straight



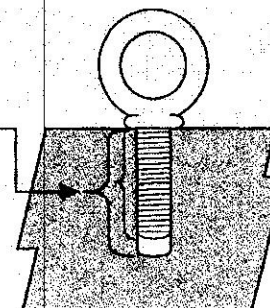
Shoulder

Angle Loading Factors

It is recommended that shoulder-type eye bolts not be loaded at angles below 30° unless approved by the eye bolt's manufacturer.



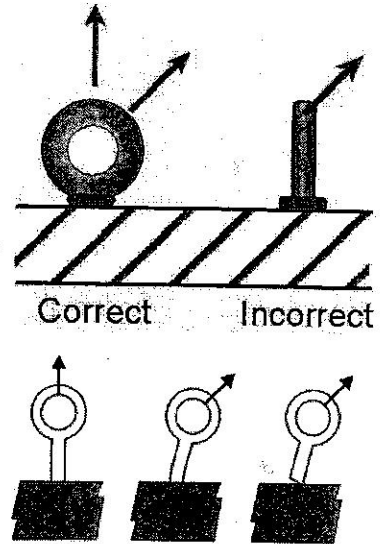
When using machinery type eye bolts, the minimum tap depth is basic shank length plus one-half the nominal eye bolt diameter.

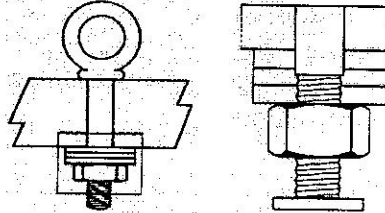
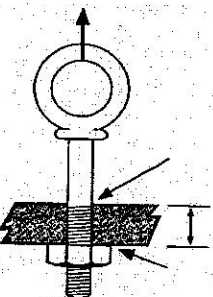
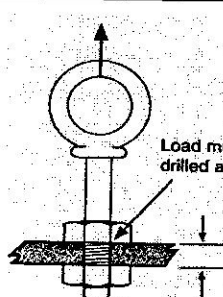
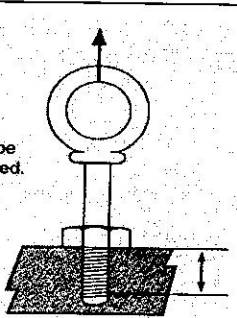


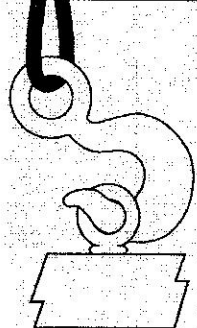
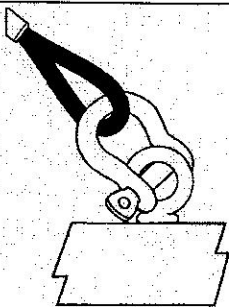
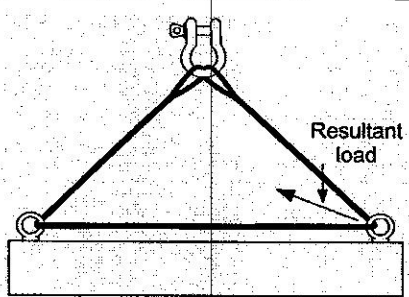
Eye Bolt Installation and Applications

- Shoulder eye bolts must always be positioned to take the load in the plane of the eye. An eye bolt that is "turned to the side" will have less capacity and may experience damage and failure when a load is lifted.
- Shoulder eye bolts should not be loaded at angles below 30° unless approved by the manufacturer.
- Non-shoulder eye bolts are only designed for vertical loads. When loaded at angles, a non-shoulder eye bolt will bend or break.
- Eye bolts must be tightened securely, torqued to spec if required by the manufacturer.

For angular lifts, the shoulder must be flush, making full contact with the load. Otherwise, only vertical lifts are allowed.



 <p>If the nut cannot be tightened securely against the load, washers can be used to take up excess space between the load and nut.</p> <p>To ensure that the nut tightens securely, spacers must extend beyond the threaded portion of the eye bolt.</p>	 <p>Only one nut is required when there is more than one eye bolt diameter of threads engaging the load.</p>	 <p>Two hex nuts must be used when one eye bolt diameter of threads or less engages the load.</p> <p>Load must not be drilled and tapped.</p>	 <p>Only one hex nut is required when at least twice the eye bolt diameter of the threaded portion engages the load.</p>
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 <p>Do not use the point of a hook in an eye bolt.</p>	 <p>Use a shackle instead to attach the sling to the eye bolt.</p>	 <p>Do not lift or pull loads with slings reeved from one eye bolt to another. This will change the angle of loading on the eye bolts and create added tension.</p> <p>Resultant load</p>
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Hoist Rings

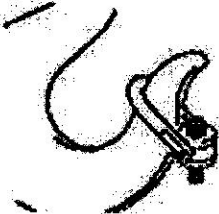
UNC Threads – Hoist Rings
Rated Capacity Table in Pounds

Bolt Diameter (inches)	Bolt Length (inches)	Ring Diameter (inches)	Torque (ft-lbs)	Working Load Limits (pounds)
5/16	1.50	0.38	7	800
3/8	1.50	0.38	12	1000
1/2	2.00	0.75	28	2500
1/2	2.50	0.75	28	2500
5/8	2.00	0.75	60	4000
5/8	2.75	0.75	60	4000
3/4	2.25	0.75	100	5000
3/4	2.75	0.75	100	5000
3/4	2.75	1.00	100	7000
3/4	3.50	1.00	100	7000
3/4	2.25	0.75	100	5000
7/8	2.75	1.00	160	8000
7/8	3.50	1.00	160	8000
1	4.00	1.00	230	10000
1 1/4	4.50	1.25	470	15000
1 1/2	6.50	1.75	800	24000
2	6.50	1.75	1100	30000

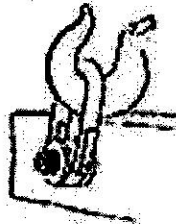
- Tightening torque values shown are based upon threads being clean, dry and free of lubrication.
- Long bolts are designed for use with soft metal (i.e., aluminum) work pieces. While long bolts may be used with ferrous metal (i.e., steel and iron) work pieces, short bolts are designed for ferrous metal work pieces only.

Incorrect Applications

Incorrect

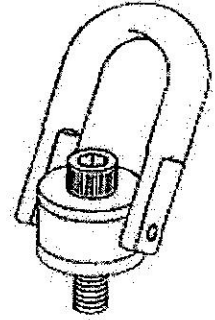


Incorrect

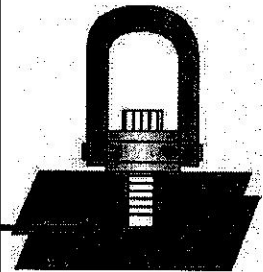


Installation

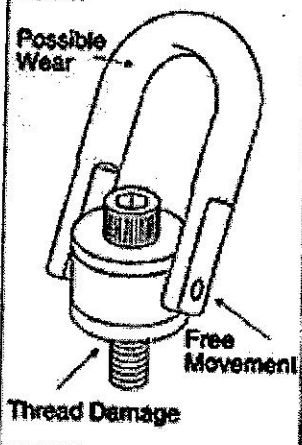
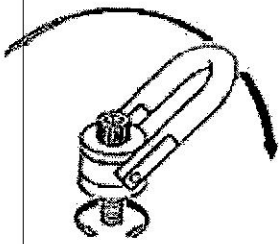
The following instructions must be followed when installing hoist rings, including any instructions provided by the manufacturer:



- Retention nuts, when used, must have full thread engagement. For the rated capacity to apply, SAE 8 standard hex or equivalent must be used.
- Spacers must not be used between the bushing flange and the mounting surface.
- Contact must be flush and in full contact with the hoisting ring, bushing mating, surface.
- Drilled and tapped hole must be 90° to the load surface.
- Using a torque wrench, install hoist ring to the torque value recommended and provided by the manufacturer.
- Drilled holes must be correct diameter. Depth must be threaded shank length plus one-half the threaded shank diameter.

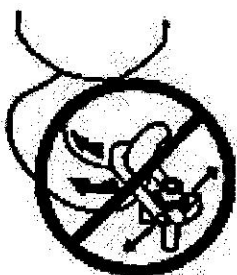
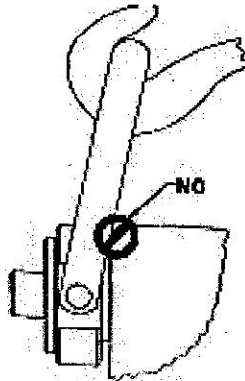



Hoist Rings Pre-Use Inspection Checklist

<p>Inspect daily before use and frequently during use. Remove from service if any of the following conditions exist:</p>	<p>External Inspection Points</p> 	<p>RIGHT</p> <p>180° Pivot</p>  <p>360° Rotation</p>
<ul style="list-style-type: none"> • Missing or illegible manufacturer's name or trademark, capacity and torque values 	<ul style="list-style-type: none"> • Bail must move freely (it should pivot 180° and swivel 360°) 	
<ul style="list-style-type: none"> • Bail is bent, twisted, or elongated 		
<ul style="list-style-type: none"> • Threads on the shank and receiving holes are unclean, damaged, or do not fit properly 		
<ul style="list-style-type: none"> • Corrosion, wear, or damage 		
<ul style="list-style-type: none"> • Tapped receiving holes must be cleaned and inspected for tread wear and deterioration 		
<ul style="list-style-type: none"> • Any evidence of alteration or repair to hoist rings, such as grinding, machining, welding, notching, stamping, etc. 		
<ul style="list-style-type: none"> • Indications of heat damage including weld spatter or arc strikes 		

Application

Unlike eye bolts, the rated capacity of hoist rings is not reduced when loaded at angles. It is important to remember that when hoist rings are loaded at angles (see illustration below) additional tension is created. This tension plus the actual load weight must not exceed the rated capacity of the hoist rings.

 <p>Never use a hook or other lifting device which will pry or tend to open the "U" shaped bar on Center-Full Hoist Rings!</p>	 <p>After installation, check the Hoist Ring to be sure it swivels and pivots freely in all directions. The side of the ring must not contact anything!</p>	 <p>Depending upon the sling angle, the applied load may be more than the weight being lifted. Two point lifting of a 2000 pound weight, with a sling angle of 30°, will result in an applied load of 2000 pounds to each hoist ring!</p>
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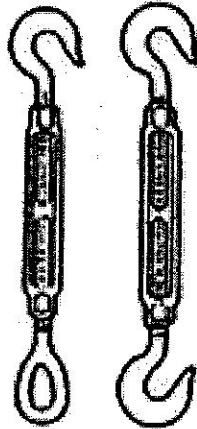
Turnbuckles

Turnbuckle Capacity Table

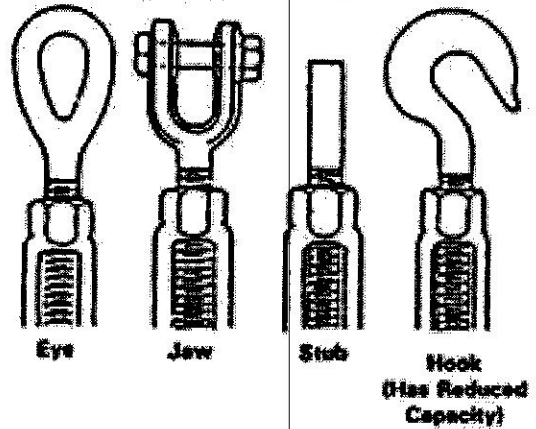
Alloy Steel or Equivalent

Hook-style Turnbuckles

Size (Inches)	Rated Capacity (Pounds)
1/4	400
5/16	700
3/8	1000
1/2	1500
5/8	2250
3/4	3000
7/8	4000
1	5000
1 1/4	6500
1 1/2	7500

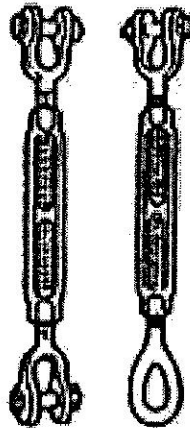


End Fitting Types



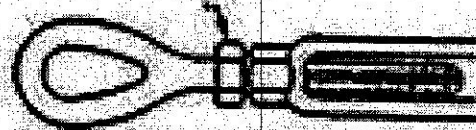
Jaw-style and Eye-style Turnbuckles

Size (Inches)	Rated Capacity (Pounds)
1/4	500
5/16	800
3/8	1200
1/2	2200
5/8	3500
3/4	5200
7/8	7200
1	10000
1 1/4	15200
1 1/2	21400
1 3/4	28000
2	37000
2 1/2	50000
2 3/4	75000

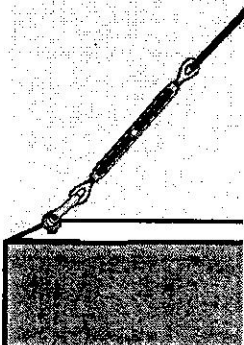


Securing Turnbuckle End Fittings
End Fittings must be secured to prevent rotation

Do not use jam nuts



Instead, use a lock wire

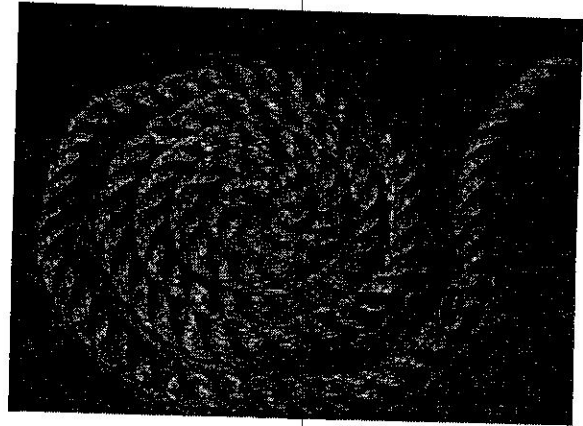


Applications

- Turnbuckles can be used to level and distribute the load among the sling.
- When used in hoisting and rigging applications, turnbuckles should be made from alloy steel or the equivalent, and not welded.
- Turnbuckles must be used in a straight or in-line pull only.

Using Rope in Rigging Applications

- Allowable uses:
 - Hand hoisting of objects to elevated positions
 - Tag lines
 - Other acceptable uses
- Requires
 - Knowledge of knots
 - Knowledge of rope strength



Fiber or Synthetic Rope Strength

- Rule of Thumb used to calculate safe working load in pounds
 1. Change rope diameter into 8ths of an inch
 2. Square the numerator of the fraction
 3. Multiply the result by N
 - a. N = 20 for manila
 - b. N = 60 for nylon and polyester

Example: 3/4 inch manila rope

- Convert to 8ths: $3/4 = 6/8$
- Square the numerator: $6^2 = 36$
- Multiply the result by N: $36 \times 20 = 720 \text{ lbs}$
- Calculated safe working load applies to straight length of new rope
 - Additional reductions are required for knots, age, and condition

Knots, Bends, and Hitches

- Knots, bends, and hitches reduce the working strength of a rope.
 - Knot 50%
 - Bend 50%
 - Hitch 75%

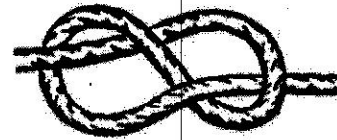
Rope Condition

- Manila rope is affected by age.
 - Safe working load decreases 1% per year.
- All rope is to be removed from service if any of the following conditions are present:
 - Abnormal wear
 - Powder or grit between strands
 - Broken or cut fibers
 - Variations in size or roundness
 - Discoloration or rotting

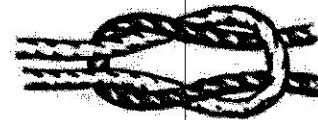


Useful Knots

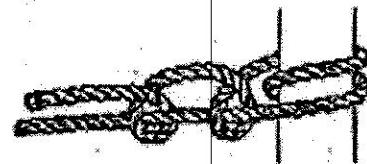
- Figure-Eight Knot
 - at end to prevent from passing through object



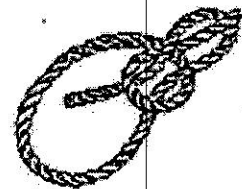
- Reef or Square Knot
 - join two ropes of same size



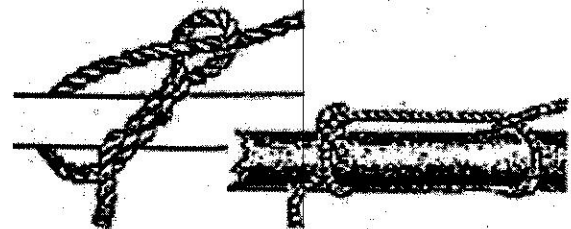
- Round turn and two half hitches
 - secure tag line to object



- Bowline
 - most widely used knot
 - will not slip, jam, or fail



- Timber Hitch
 - used for hoisting planks or pipe
 - holds without slipping or jamming



(a) The following companies may be exempt from the licensing and permitting requirements of 520 CMR 6.02 and 6.03, provided that certain provisions are met:

- (1) Utility Companies: Utility companies which have self-propelled truck mounted cranes, derricks and similar Hoisting Machinery which is used for the maintenance and construction of the utility company's own equipment.
- (2) Companies Operating Solely on Company Property: A company which operates Hoisting Machinery specifically limited to industrial lift trucks, Fork Lifts, overhead cranes and other Hoisting Machinery specifically authorized by the Department and used exclusively on Company Property.
- (3) Companies Operating Solely on Utility Property: Any company which has equipment such as cranes, derricks and similar Hoisting Machinery used solely on Utility Company Property.

Subcontractors working for exempt companies are excluded from the provisions for exemption.

(b) For any of the exemptions in this section to apply, the following requirements must be met:

- (1) The company must have at least 1 supervisory employee on site at all times of operation who holds a License for the equipment being used, issued by the Department under M.G.L. c. 146, Section 53 and is designated as the responsible person in charge of Hoisting Machinery during that period of operation;
- (2) The company must have an In-Service Training program for employees approved by the Department which may be audited by the Department. The In-Service Training program must meet all of the requirements of 520 CMR 6.07;
- (3) Company Licenses must be issued to each trained and certified employee and shall contain a picture of the Licensee, a list of the specific Hoisting Machinery the Licensee has been qualified to operate and the printed name and legible signature of the supervisor who holds a Department License to operate that type of equipment.

6.07: In-Service Training Program for Exempt Companies

This section shall apply to In-Service Training programs for Company Licenses for exempt companies as defined in 520 CMR 6.06. All approvals previously issued by the Department for an In-Service Training program will be rescinded 120 days from the date this section goes into effect. All companies must reapply for approval and then must reapply biennially.

- (1) Approval by Department: All individuals or organizations seeking approval to operate an In-Service Training program shall submit, for the Department's approval:
 - a. A completed application on a form furnished by the Department;

- b. Identification of Department-approved curriculum or a copy of company curriculum and training materials, all of which shall incorporate a classroom and a practical component;
- c. a list including the names and Massachusetts Hoisting Machinery License numbers of all Instructors, a legible photocopy of Instructors' Massachusetts Hoisting Machinery License, and legible photocopies of the Company Licenses;
- d. A list of the type of equipment, including model and make, to be used in the company's In-Service Training program.

(2) The Department shall issue a certificate of approval for In-Service Training programs. Approval shall be contingent upon having a Massachusetts Hoisting License holder in the applicant company's employ.

(3) All In-Service Training Programs must be supervised by a Massachusetts Hoisting Licensee of equal or greater grade of Massachusetts License, who will verify by their printed name and legible signature on the Company License that all those issued Company Licenses have fully participated in the program for which they have been issued a permit.

a. Method of Verification. Each program must provide a means to ensure Company License authenticity. Such means shall include, but not be limited to:

- 1. Embossment of Company License
- 2. Computer data transfer of program participants
- 3. Signature verification
- 4. Numbered Company Licenses
- 5. Date of issuance
- 6. Date of expiration.

(4) In-Service Training Program: In-Service Training programs approved by the Department shall offer a program that, at a minimum, complies with the following requirements for each associated class of Hoisting Machinery licensure:

a. Class 1 (Hoisting) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 1A, 1B, or 1C License shall be four (4) classroom hours and two (2) classroom hours for the renewal of a 1D License.
- ii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 1A, 1B, 1C, or

1D License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. 520 CMR 14.00;
4. OSHA Standards 29 CFR 1926;
5. OSHA Standards 29 CFR 1910;
6. ANSI B30;
7. MGL c. 82, §40;
8. MGL c. 82A;
9. MGL c. 164, §76D.

b. Class 2 (Excavation) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 2A, 2B, 2C, and 2D License shall be four (4) classroom hours.
- ii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 2A, 2B, 2C, or 2D License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. 520 CMR 14.00;
4. OSHA Standards 29 CFR 1926
5. MGL c. 82, §40;
6. MGL c. 82A;
7. MGL c. 164, §76D;
8. 220 CMR 99.00 (Dig Safe).

c. Class 3 (Tower and Electric) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 3A License shall be four (4) classroom hours.
- ii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 3A License shall include but may not be limited to:

1. MGL c. 146;
 2. 520 CMR 6.00;
 3. OSHA Standard 29 CFR 1926;
 4. OSHA Standard 29 CFR 1910;
 5. ANSI B30.
- d. Class 4 (Specialty) Licenses:
- i. The minimum number of continuing education hours required for renewal of a 4A License shall be four (4) classroom hours.
 - ii. The minimum number of continuing education hours required for renewal of a 4B, 4C, 4D, 4E, 4F, or 4G License shall be two (2) hours.
 - iii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 4A, 4B, 4C, 4D, 4E, 4F, or 4G License shall include but may not be limited to:
 1. MGL c. 146;
 2. 520 CMR 6.00;
 3. 520 CMR 14.00
 4. OSHA Standards 29 CFR 1926;
 5. OSHA Standards 29 CFR 1910;
 6. ANSI B30;
 7. MGL c. 82, §40
 8. MGL c. 82A;
 9. MGL c. 164, §76D;
 10. 220 CMR 99.00 (Dig Safe).

(5) Requirements for Company Licenses

(1) Facilities shall issue a Company License to those who satisfactorily complete an In-Service Training program and pass an examination. Company Licenses shall contain the following information:

- a. Name of company Licensee;
- b. Address of company Licensee;

- c. Name and address of the institution or organization providing the In-Service Training program;
- d. The printed name and legible signature of a Massachusetts Hoisting Licensee verifying participant has completed the In-Service Training program;
- e. The License number of the Licensee endorsing the Company License.
- f. A photograph of the company Licensee.

(6) Exempt Companies that are approved to conduct In-Service Training programs shall keep uniform records of company Licensees and have those records readily accessible to Inspectors of the Department upon request for a period of 3 years. They shall be responsible for the security and retention of all uniform Company Licenses and the proper issuance thereof. Instructors shall verify by signature that participants in In-Service Training programs have satisfactorily completed the necessary training.

(7) Falsification of Documents. The falsification of attendance records or fraudulent issuance of Company Licenses by any Massachusetts Hoisting Licensee shall be grounds for initiating formal proceedings under M.G.L. c. 146 section 59 and c. 30A and may also be grounds for the immediate revocation or suspension of the approval to issue Company Licenses.

(8) Approval for any In-Service Training program shall be valid for 2 years from the date of issuance.

6.08: Operating Procedures for Hoisting Machinery

(1) All Hoisting Machinery shall be operated in accordance with the manufacturer's specifications. In the event the manufacturer does not exist, a Massachusetts registered professional engineer shall review and approve, in writing, the actions and reasons for said specifications. The manufacturer or the professional engineer shall demonstrate to the Department upon request, from standards or from the maintenance manual, that the specifications will not compromise the integrity of the Hoisting Machinery and public safety. Prior to operation, the operator shall perform the following:

- (a) Maintenance. Maintenance, repair and refueling shall be done when the machine is inoperable and secure.
- (b) Required Inspections. Visual inspection shall be made daily of wire ropes, bearings, gears, friction clutches, brakes, chain drives and other parts subject to wear on all Hoisting Machinery to ensure against development of unsafe conditions. A daily log sheet in accordance with 29 CFR 1926 and 29 CFR 1910 inspectional methods shall be available to the Department during the useful life of the machine.
- (c) Additional Requirements.

- (1) A written and signed record of all inspections shall be kept with the Hoisting Machinery and made available at the site for examination by the Department that conforms with the requirements of 29 CFR 1926.1412.
- (2) Prior to starting any Hoisting Machinery, the operator must make a complete walk -around of the equipment to verify people are clear of the equipment, and that it is in a safe condition.
- (3) The operator shall not engage in any practice that will divert their attention while engaged in operating the Hoisting Machinery.
- (4) At no time shall the operator of Hoisting Machinery operate or be required to operate the Hoisting Machinery beyond its rated capacity without the manufacturer's written approval which shall include a new chart showing the new limitations. Other than assembly/disassembly, the use of the load moment indicator override key or the entering of false crane set-up criteria to increase rated capacity is strictly forbidden.
- (5) The operator shall operate Hoisting Machinery only when fully attentive. The operator shall not operate the equipment erratically and/or under the influence of alcohol or drugs. When an operator is physically or mentally unfit, the operator shall not operate Hoisting Machinery.
- (6) Prior to operating Hoisting Machinery with a rotating superstructure, safety procedures such as but not limited to: the erection of barricades, warning lines or other procedures shall be used to prevent entry into the swinging superstructure's radius.
- (7) All controls shall be tested by the operator prior to operating the Hoisting Machinery. If any controls are found to be functioning improperly, repairs shall be made in accordance with manufacturer's requirements prior to the operation of the Hoisting Machinery.
- (8) Operators shall respond only to signals given by a Signal Person except in emergency situations.
- (9) If a warning signal is furnished by the operator, it shall be sounded each time before traveling, and intermittently during travel particularly when approaching people.
- (10) The operator shall be responsible for those operations under

their direct control. When there is any doubt as to the safety of any action, the operator shall have the authority to stop and refuse to handle loads until safety has been assured.

- (11) The operator is responsible for securing any unattended Hoisting Machinery in accordance with applicable manufacturer's specifications.
- (12) If power fails during operation of any Hoisting Machinery, the operator shall secure the machine prior to leaving the equipment. When practical, suspended loads shall be landed under brake control.
- (13) At no time shall persons work under a boom or a load suspended thereon except in the case of tower cranes.
- (14) All manufacturer's load charts and operation manuals shall be kept in the Hoisting Machinery.
- (15) All applicable power line clearances shall be maintained.
- (16) Hoisting Machinery equipped with outriggers/stabilizers shall be used, with adequate blocking, according to manufacturer's specifications or surface conditions.
- (17) Dig Safe. Prior to any excavation, Dig Safe and other utilities not covered by Dig Safe must be notified. The operator must have a Dig Safe permit number, start date, and time.

6.09: Special Requirements for Cranes, Derricks, Pile Drivers, Excavating Machines, Fork Lifts, and Hoists

The operator shall not operate the Hoisting Machinery unless the following requirements are met:

Special Requirements for Cranes

- (1) Loading. Material moving, handling or Hoisting Machinery shall be loaded in accordance with the manufacturer's specifications. Manufacturers' load-rating plates or applicable load charts shall be kept in the cab of the crane in clear view of the operator. Rating plates or load charts for boom cranes shall clearly indicate the safe load for maximum and minimum positions of the boom and for at least two intermediate positions. The procedures applicable to the operation of the equipment, including instructions, recommended operating speeds, special hazard warnings, and Operator's Manual, must be readily available in the cab at

all times for use by the operator. Where rated capacities are available in the cab only in electronic form: In the event of a failure which makes the rated capacities inaccessible, the operator must immediately cease operations or follow safe shut-down procedures until the rated capacities (in electronic or other form) are available.

- (2) **Boom Stops.** Devices to prevent the boom from falling over backward shall be provided on cranes. Cable boom stops by themselves shall not be considered as adequate for this purpose.
- (3) **Speed Controls and Stops.** Hoisting Machinery operating on rails, tracks or trolleys shall be equipped with speed controls and shall have positive stops or limiting devices to prevent overrunning safe limits.
- (4) **Equipment Modifications.** Any Modification made to Hoisting Machinery shall maintain at least the same factor of safety as the original designed equipment. A record of the differences between the unmodified machinery and the modified machinery shall be maintained by the owner of the machinery and furnished to the Department upon request. All Modifications shall be done with the manufacturer's written approval. If the manufacturer's written approval cannot be obtained, the owner shall have a professional engineer create and certify a procedure which shall be added to the permanent record of the equipment.
- (5) **Protection of Operator.** The operator of material handling and moving equipment when exposed to overhead hazards or the elements shall be protected with a cab or equivalent covering affording adequate protection but which shall not cut off his vision of the load movements. All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.
- (6) **Required Presence.** Operators of material moving, handling or Hoisting Machinery shall remain at the controls while the load is suspended, except in cases where loss of power occurs in which case operators shall act pursuant to 520 CMR 6.08(1)(c)(12). The operator of the machine shall not leave the machine while the master clutch is engaged.
- (7) **Erection or Dismantling.** Crane erection or dismantling shall be performed in accordance with the manufacturer's specifications and 29 CFR 1926, under the supervision of his representative or other persons experienced in erection and/or dismantling of this type of equipment. The attachments used with cranes shall not exceed the capacity, rating or scope recommended by the manufacturer.

- (8) **Factor of Safety.** All parts of the crane and supports shall be designed, constructed and maintained to withstand all stresses resulting from intended use with a safety factor of not less than 2.0.
- (9) **Capacity Schedule/Load Charts.** Each crane model shall contain a schedule of load capacities in the operator's station at all times.
- (10) **Tower Crane Foundations.** Tower crane foundations must be designed by the manufacturer or a registered professional engineer.
- (11) **Wind Speed.** Wind speed must not exceed manufacturer's recommendations for continued work operations.
- (12) **Tower Crane Safety Devices.** All required safety devices for tower cranes must be installed and properly functioning.
- (13) **Tower Crane operational Aids.** All required operational aids for tower cranes must be installed and functioning properly or approved temporary alternative measures in place.

Special Requirements for Derricks

Required Inspection. Guys, cable clamps and other rigging shall be visually checked by the operator at the beginning of each work day and before making any lifts that are near the capacity of the rig or as otherwise required by the manufacturer.

Frequent checking by a duly licensed person of lead cables and mast foot blocks shall be performed to ensure that cables are not crossed or fouled. Lead line blocks shall be checked frequently to ensure that they are properly secured. Leads shall be so arranged as to minimize tripping hazards.

Special Requirements for Pile Drivers

- (1) **Inspection.** All pile driving equipment shall be inspected daily before the start of work by a licensed operator of the equipment and all unsafe conditions and defective parts shall be corrected before beginning operations.
- (2) **Driver Not in Use.** When the pile driver is not in use, the hammer shall be chocked or blocked in the leads or lowered to the ground.
- (3) **Temporary Interruption.** The operator of every pile driver shall remain at his post when the driving is interrupted until the hammer has been chocked or blocked in the leads, or has been lowered and is resting on a driven pile or on the ground.

- (4) Jib Attachment. Pile drivers shall not be used with a jib attached.
- (5) Stop Blocks. Stop blocks shall be provided for the leads to prevent the hammer from being raised against the head block.

Special Requirements for Fork Lifts

Only a duly licensed operator or Apprentice Licensee under the direct supervision of a duly licensed operator shall operate a Fork Lift. No Fork Lift shall be loaded beyond its capacity rating.

- (1) Brakes. Every power operated Fork Lift shall be equipped with adequate wheel brakes.
- (2) Operation. No Fork Lift shall be operated at unsafe speeds. No person except a duly licensed operator or Apprentice Licensee under the direct supervision of a duly licensed operator shall be permitted on a Fork Lift while it is in operation.

Special Requirements for Excavating Machines, including backhoes and frontend loaders

- (1) Dig Safe. Prior to any excavation, Dig Safe and other utilities not covered by Dig Safe must be notified. The operator must have a Dig Safe permit number, start date, and time.
- (2) Protection of Operator. Where the operator of an excavating machine may be exposed to the elements or overhead hazards, a suitable equipped cab for protection against such conditions shall be provided.
- (3) Operation. Excavating machines shall be operated by a Licensee, Temporary Permit Holder, or an Apprentice Licensee under the direct supervision of a duly licensed operator. SAE hand signals shall be used with excavating machinery. No person except the operating crew or Apprentice Licensee operating under the direct supervision of a duly licensed operator shall be permitted on an excavating machine while it is in operation. No person other than the pitman and excavating crew shall be permitted to stand within the full working radius of an excavator or backhoe while the shovel or backhoe is in operation. Excavating machinery shall not be allowed to straddle an open trench.

Special Requirements for Crane or Derrick Suspended Personnel Platforms

The hoisting, lowering, swinging, or traveling while anyone is on the load or hook is prohibited except when the use of a conventional means of access to any

elevated worksite would be impossible or more hazardous. Operations must comply with the provisions of 29 CFR 1926.550(g)(3), (4), (5), (6), (7), and (8).

Crane and Derrick Operations. Where conventional means (e.g., scaffolds, ladders) of access would not be considered safe, personnel hoisting operations, which comply with the terms of this regulation, would be authorized.

Cranes and derricks used to hoist personnel must be placed on a firm foundation and the crane or derrick must be uniformly level within 1 percent of level grade.

The crane operator must always be at the controls when the crane engine is running and the personnel platform is occupied. The crane operator also must have full control over the movement of the personnel platform. Any movement of the personnel platform must be performed slowly and cautiously without any sudden jerking of the crane, derrick, or the platform. Wire rope used for personnel lifting must have a minimum safety factor of seven. Rotation resistant rope must have a minimum safety factor of ten.

When the occupied personnel platform is in a stationary position, all brakes and locking devices on the crane or derrick must be set.

The combined weight of the loaded personnel platform and its rigging must not exceed 50 percent of the rated capacity of the crane or derrick for the radius and configuration of the crane or derrick.

Instruments and Components. Cranes and derricks with variable angle booms must have a boom angle indicator that is visible to the operator. Cranes with telescoping booms must be equipped with a device to clearly indicate the boom's extended length, or an accurate determination of the load radius to be used during the lift must be made prior to hoisting personnel. Cranes and derricks also must be equipped with (1) an anti-two-blocking device that prevents contact between the load block and overhaul ball and the boom tip, or (2) a two-block damage-prevention feature that deactivates the hoisting action before damage occurs.

Personnel Platforms. Platforms used for lifting personnel must be designed with a minimum safety factor of five and designed by a professional engineer or a qualified person competent in structural design. The suspension system must be designed to minimize tipping due to personnel movement on the platform.

Each personnel platform must be provided with a standard guardrail system that is enclosed from the toeboard to the mid-rail to keep tools, materials, and equipment from falling on employees below. The platform also must have an inside grab rail, adequate headroom for employees, and a plate or other permanent marking that clearly indicates the platform's weight and rated load capacity or maximum intended load. When personnel are exposed to falling objects, overhead protection on the platform and the use of hard hats are required.

An access gate, if provided, must not swing outward during hoisting and must have a restraining device to prevent accidental opening.

All rough edges on the platform must be ground smooth to prevent injuries to employees.

All welding on the personnel platform and its components must be performed by a Qualified Welder who is familiar with weld grades, types, and materials specified in the platform design.

Loading. The personnel platform must not be loaded in excess of its rated load capacity or its minimum intended load. Only personnel instructed in the requirements of the regulation and the task to be performed—along with their tools, equipment, and materials needed for the job—are allowed on the platform. Materials and tools must be secured and evenly distributed to balance the load while the platform is in motion.

Rigging. When a wire rope bridle is used to connect the platform to the load line, the bridle legs must be connected to a master link or shackle so that the load is evenly positioned among the bridle legs. Bridles and associated rigging for attaching the personnel platform to the hoist line must not be used for any other purpose.

Attachment assemblies such as hooks must be closed and locked to eliminate the hook throat opening; an alloy anchor-type shackle with a bolt, nut, and retaining pin may be used as an alternative. "Mousing" (wrapping wire around a hook to cover the hook opening) is not permitted.

Inspecting and Testing. A trial lift of the unoccupied personnel platform must be made before any employees are allowed to be hoisted. During the trial lift, the personnel platform must be loaded at least to its anticipated lift weight. The lift must start at ground level or at the location where employees will enter the platform and proceed to each location where the personnel platform is to be hoisted and positioned. The trial lift must be performed immediately prior to placing personnel on the platform.

The crane or derrick operator must check all systems, controls, and safety devices to ensure the following:

- (1) They are functioning properly.
- (2) There are no interferences.
- (3) All boom or hoisting configurations necessary to reach work locations will allow the operator to remain within the 50-percent load limit of the hoist's rated capacity.

If a crane or derrick is moved to a new location or returned to a previously used one, the trial lift must be repeated before hoisting personnel.

After the trial lift, the personnel platform must be hoisted a few inches and inspected to ensure that it remains secured and is properly balanced.

Before employees are hoisted, a check must be made to ensure the following:

- (1) Hoist ropes are free of kinks.
- (2) Multiple part lines are not twisted around each other.
- (3) The primary attachment is centered over the platform.
- (4) There is no slack in the wire rope.
- (5) All ropes are properly seated on drums and in sheaves.

Immediately after the trial lift, a thorough visual inspection of the crane or derrick, the personnel platform, and the crane or derrick base support or ground must be conducted by a Competent Person to determine if the lift test exposed any defects or produced any adverse effects on any component or structure. Any defects found during inspections must be corrected before hoisting personnel.

When initially brought to the job site and after any repair or modification, and prior to hoisting personnel, the platform and rigging must be proof tested to 125 percent of the platform's rated capacity. This is achieved by holding the loaded platform-with the load evenly distributed-in a suspended position for 5 minutes. A Competent Person must inspect the platform and rigging for defects. If any problems are detected, they must be corrected and another proof test must be conducted. Personnel hoisting must not be conducted until the proof testing requirements are satisfied.

Pre-Lift Meeting. The employer must hold a meeting with all employees involved in personnel hoisting operations (crane or derrick operator, signal person(s), employees to be lifted, and the person responsible for the hoisting operation) to review the provisions of 29 CFR 1926.550(g)(3), (4), (5), (6), (7), (8), 520 CMR 6.09, and the procedures to be followed before any lift operations are performed.

This meeting must be held before the trial lift at each new work site and must be repeated for any employees newly assigned to the operation.

Safe Work Practices. Employees must follow these safe work practices:

- (1) Use tag lines unless their use creates an unsafe condition.
- (2) Keep all body parts inside the platform during raising, lowering, and positioning.
- (3) Make sure a platform is secured to the structure where work is to be performed before entering or exiting it, unless such securing would create an unsafe condition.

- (4) Wear a body belt or body harness system with a lanyard. The lanyard must be attached to the lower load block or overhaul ball or to a structural member within the personnel platform. If the hoisting operation is performed over water, the requirements 29 CFR 1926.106—Working over or near water—must apply.
- (5) Stay in view of, or in direct communication with, the operator or signal person.

Crane and derrick operators must follow these safe work practices:

- (1) Never leave crane or derrick controls when the engine is running or when the platform is occupied.
- (2) Stop all hoisting operations if there are indications of any dangerous weather conditions or other impending danger.
- (3) Do not make any lifts on another load line of a crane or derrick that is being used to hoist personnel.

Movement of Cranes. Personnel hoisting is prohibited while the crane is traveling except when the employer demonstrates that this is the least hazardous way to accomplish the task or when portal, tower, or locomotive cranes are used.

When cranes are moving while hoisting personnel, the following rules apply:

- (1) Travel must be restricted to a fixed track or runway.
- (2) Travel also must be limited to the radius of the boom during the lift.
- (3) The boom must be parallel to the direction of travel.
- (4) There must be a complete trial run before employees occupy the platform.
- (5) If the crane has rubber tires, the condition and air pressure of the tires must be checked and the chart capacity for lifts must be applied to remain under the 50-percent limit of the hoist's rated capacity. Outriggers may be partially retracted as necessary for travel.

6.10: Classification of Licenses; Qualifications

(1) CLASS 1 - HOISTING

(a) 1A Prerequisites:

1. The applicant shall meet the prerequisites as listed in 520 CMR 6.02.
2. The applicant shall display knowledge of the crane operator ASME hand signals.
3. The applicant must be able to read and comprehend load charts and manufacturer's specifications.

(b) 1A Operators may operate:

1. All friction clutch machines and all derricks (including guy derricks, stiff legs, Chicago booms, gin poles);

2. Lattice boom machinery and may also require a 3A License in accordance with 6.10 (3);

3. All wire rope machines;

4. All equipment listed in classes 1B,1C, and 1D;

(c) 1B Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02. The applicant shall display knowledge of the crane operator hand signals. The applicant must be able to read and comprehend load charts and manufacturers specifications.

(d) 1B Operators may operate:

1. All equipment having telescoping boom and wire rope;

2. All equipment listed in class 1C and class 1D;

(e) 1C Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.

2. The applicant must be able to read and comprehend load charts and manufacturer's specifications.

(f) 1C Operators may operate:

1. Equipment with hydraulic telescoping booms and any other hydraulic equipment designed for the purpose of hoisting, excluding those with wire rope hoist lines; all equipment listed in class 1D.

(g) 1D Prerequisites: The applicant must meet the prerequisites as listed in 520 CMR 6.02.

(h) 1D Operators may operate:

1. General industrial warehouse Fork Lift equipment primarily used in indoor facilities.

(2) CLASS 2 – EXCAVATING

(a) 2A Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.

2. Knowledge of hand signals for controlling crawler/excavator operations

(b) 2A Operators may operate:

1. All crawler and rubber tired excavators and backhoes;

2. Equipment listed in classes 2B, 2C and 2D.;

(c) 2B Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.

2B Operators may operate:

1. Combination loader/backhoe machines;
2. Equipment listed in Class 2C and class 2D;

(d) 2C Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.

2C Operators may operate:

1. Front end loaders;
2. Equipment listed in Class 2D

(e) 2D Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.

2D Operators may operate:

1. Compact Hoisting Machinery with a gross vehicle weight not exceeding 10,000 pounds, excluding Class 1, Class 3, and Class 4 Hoisting Machinery as listed in 520 CMR 6.10.

(3) CLASS 3 – TOWER/ELECTRIC AND AIR.

(a) 3A Operators Prerequisites:

1. The applicant must meet the prerequisites as listed in 520 CMR 6.02.
2. The applicant must be able to read and comprehend load charts and manufacturer's specifications.

(b) 3A Operators may operate:

1. Tower – Derricks and Self-erecting Tower Cranes
2. Persons holding a 1A3A may also operate a tower/derrick crane.

(4) CLASS 4 - SPECIALTY. Operators may operate the equipment listed in 4(a)-(g) below:

- (a) 4A: 4B- 4G
- (b) 4B: Drill Rigs
- (c) 4C: Pipeline Side booms
- (d) 4D: Concrete Pumps
- (e) 4E: Catch Basin Cleaner
- (f) 4F: Sign Hanging Equipment
- (g) 4G: Specialty Lawn Mower

6.11: Operation of Hoisting Machinery; Accident Reporting

(1) Operators of Hoisting Machinery shall cease operating if ordered by the Department to do so. Conditions which shall warrant immediate cessation of operation may include but not limited to:

- (a) Serious Injury; or
- (b) Any condition that is necessary for the preservation of the public health or safety as determined by the Inspector.

(2) Operators of Hoisting Machinery shall immediately surrender their Hoisting License or Temporary Permit if ordered by the Department to do so pursuant to M.G.L. 146 §53.

(3) Any person found operating Hoisting Machinery without a License, Temporary Permit, Apprentice License or proper classification of Hoisting License according to 520 CMR 6.00 *et seq.* shall immediately cease operating. Said person shall make his identity known to the Department with a valid government-issued form of photographic identification.

(4) Notification/Investigation.

(a) Notification. Any Incident which results in Serious Injury, Property Damage, or any condition that is necessary for the preservation of the public health or safety at a site where Hoisting Machinery is operational must be reported by the Licensee operating the Hoisting Machinery or owner or owner's representative to the Department through the Department Incident Hotline at (508) 820-1444 within one (1) hour from the time that the Incident occurred or was discovered. The Hoisting Machinery shall not be moved or dismantled from the site of the Incident until the Department has investigated the Incident and approval is granted by an Inspector. The only exception to this requirement is for preservation of life and property, the removal of injured persons or bodies or to permit the flow of emergency vehicles. The Hoisting Machinery and area surrounding the Hoisting Machinery shall not be disturbed, cleaned, or altered in any way that will impede the investigation. The Department shall investigate the Incident pursuant to M.G.L. c. 146, §§53, 54A and 55.

(b) Investigation. In the event that an Incident occurs in accordance to the provisions of 6.11(4)(a), the Hoisting Machinery shall be immediately shut down and secured by the operator until an Inspector has completed an investigation. No person shall move or alter the Incident scene or the Hoisting Machinery, except to remove the victim(s), until the Inspector has completed the investigation and determined that the Hoisting Machinery is safe. Incidents shall be reported within one (1) hour to the Department through the Department Incident Hotline at (508) 820-1444 and a written report shall be submitted to the Department within 48 hours. The Hoisting Machinery, operator, and owner of the Hoisting Machinery shall be accessible to the Department.

6.12: Suspension, Revocation, and Appeals of Licensing, Certification, and Temporary Permitting

- (1) Where the Commissioner, Chief, or any Inspector determines that circumstances indicate the denial or immediate suspension or revocation of a License or Temporary Permit or Company certificate of approval to operate Hoisting Machinery is necessary for the preservation of the public health or safety, they may deny, revoke or suspend depending on the severity of the offense. Any License covered under 520 CMR 6.00 may be revoked or suspended for the following reasons:
 - (a) False or misleading information on application for examination or License renewal.
 - (b) Operating Hoisting Machinery under the influence of alcohol or drugs.
 - (c) Failure to pay excise tax or other taxes.
 - (d) Failure to report Accidents as required by the Department of Public Safety.
 - (e) Failure to report a Serious Injury as required by the Department of Public Safety.
 - (f) Operating in an unsafe manner.
 - (g) Failure to comply with any provision of this regulation;
 - (h) Failure to comply with 520 CMR 14.00.
 - (i) Failure to comply with M.G.L. c. 146, §§53-56.
 - (j) The fraudulent or otherwise improper issuance of Temporary Permits.
 - (k) The fraudulent or otherwise improper issuance of any Company License.
- (2) A Licensee aggrieved by the action taken by the Commissioner, Chief or an Inspector, pursuant to Chapter 146, § 53 in suspending or revoking their License or Temporary Permit to operate Hoisting Machinery may, within one week, appeal from such decision to the Chief who shall appoint three Inspectors of the Department, or himself and two Inspectors, to act together as a board of appeal. The decision of a majority of the members of the board of appeal shall be final and may be appealed in accordance with M.G.L. c. 30A. All hearings will be held in accordance with M.G.L. c. 30A and 801 CMR 1.02.

6.13: Variance Procedure

Variance.

- (a) Any person who believes that full compliance with 520 CMR 6.00 is overly burdensome may apply to the Department for a variance from 520 CMR 6.00.

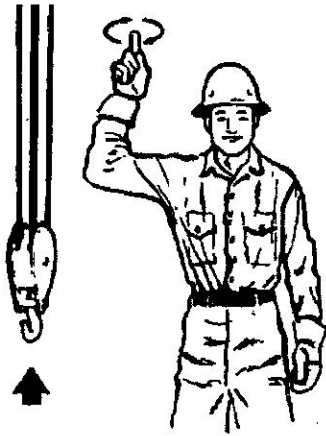
The burden is on the applicant to demonstrate in writing to the Department that the granting of the variance would not compromise public safety or otherwise undermine the purpose of 520 CMR 6.00. Applications for a variance shall be made on a form provided by the Department for this purpose and shall contain such information as is required by the Department, and shall be signed by the applicant.

- (b) Upon receipt of an application for a variance, the Commissioner, or his designee may:
 - 1. Grant the application with whatever conditions are deemed appropriate;
 - or
 - 2. Deny the application without a hearing;

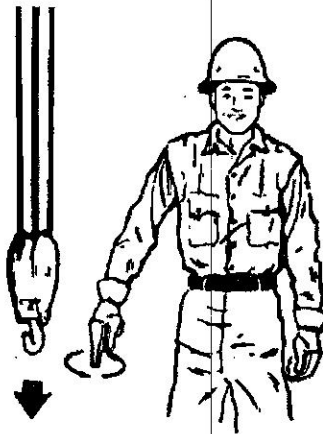
- (c) Any person aggrieved by this decision may file a request for an adjudicatory hearing with the Department within 30 days of receipt of the decision. All adjudicatory hearings shall be held in accordance with the provisions of M.G.L. c. 30A and 801 CMR 1.02. Any person aggrieved by a decision made after an adjudicatory hearing may appeal to the Superior Court in accordance with M.G.L. c. 30A, § 14.

REGULATORY AUTHORITY
520 CMR 6.00: M.G.L. c. 146, 53 through 54A.
Appendix A
CRANE HAND SIGNALS

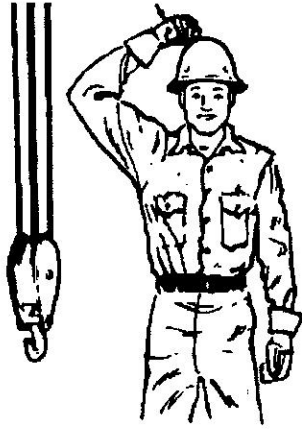
1. ANSI/ASME B30.5-2011 Mobile and Locomotive Cranes



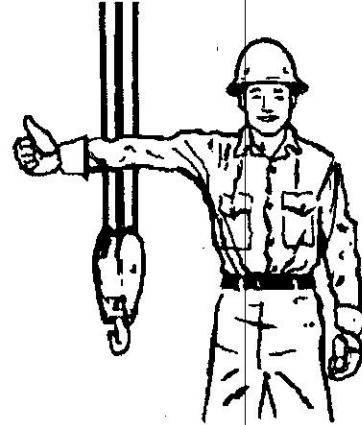
Hoist
With forearm vertical, forefinger pointing up, move hand in small horizontal circle.



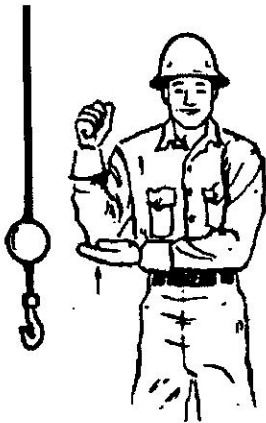
Lower
With arm extended downward, forefinger pointing down, move hand in small horizontal circle.



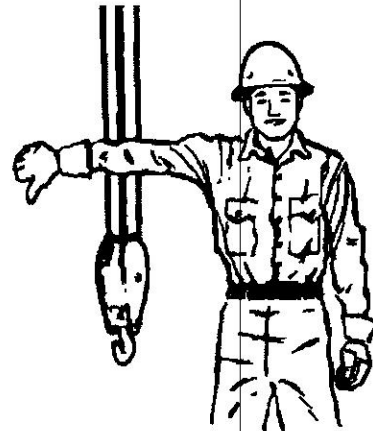
Use Main Hoist
Tap fist on head; then use regular signals.



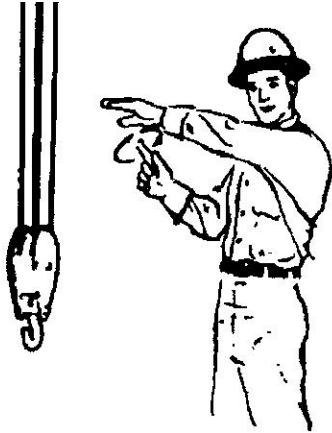
Raise Boom
Arm extended, fingers closed, thumb pointing upward.



Use Whipline (Auxiliary Hoist)
Tap elbow with one hand; then use regular signals.

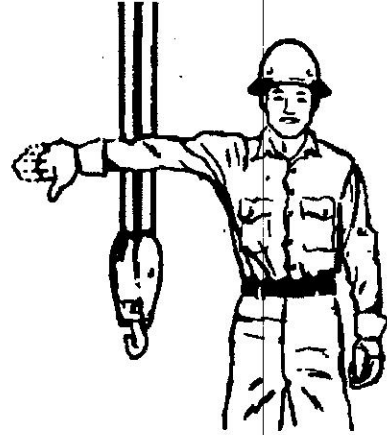


Lower Boom
Arm extended, fingers closed, thumb pointing downward.



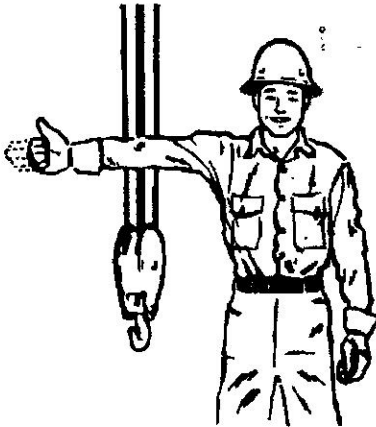
Move Slowly

Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)



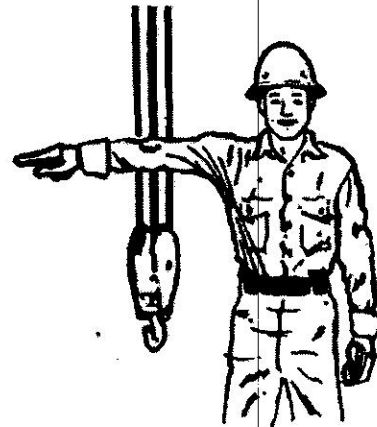
Lower the Boom and Raise the Load

With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.



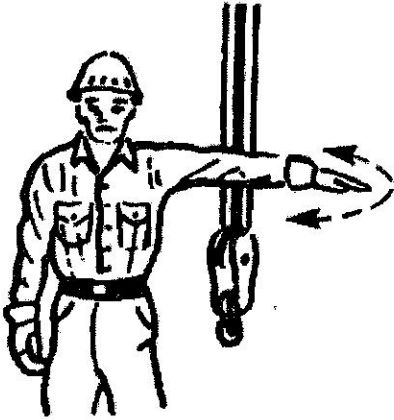
Raise the Boom and Lower the Load

With arm extended, thumb pointing up, flex fingers in and out as long as the load movement is desired.

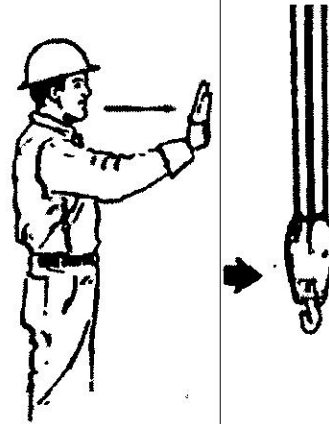


Swing

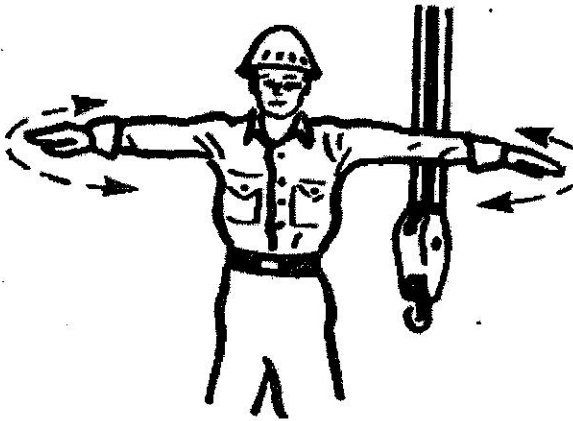
Arm extended, point with finger in direction of swing of boom.



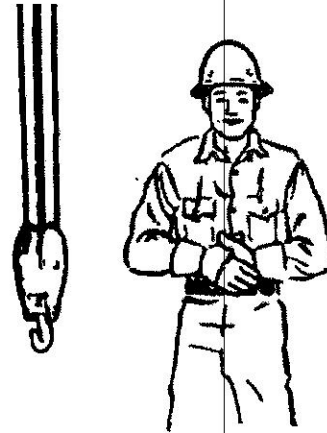
Stop
Arm extended, palm down, move arm back and forth horizontally.



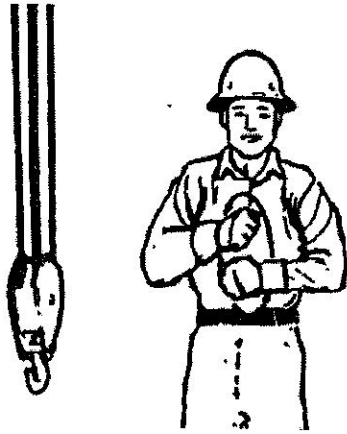
Travel
Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.



Emergency Stop
Both arms extended, palms down, move arms back and forth horizontally.

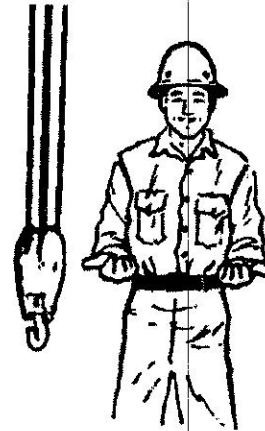


Dog Everything
Clasp hands in front of body.



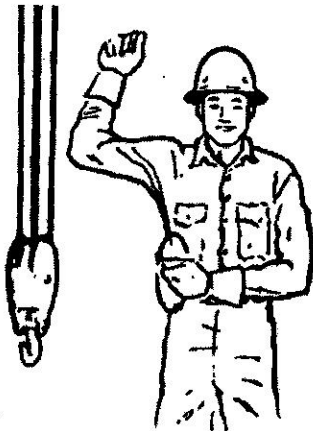
Travel (Both Tracks)

Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward. (For land cranes only.)



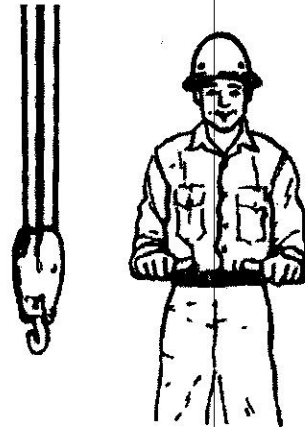
Extend Boom (Telescoping Booms)

Both fists in front of body with thumbs pointing outward.



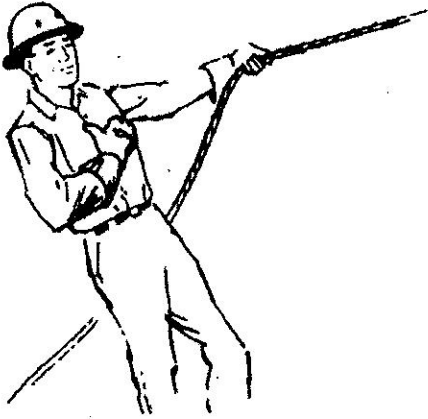
Travel (One Track)

Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only.)

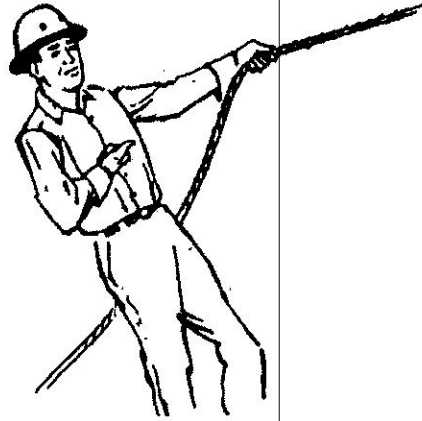


Retract Boom (Telescoping Booms)

Both fists in front of body with thumbs pointing toward each other.

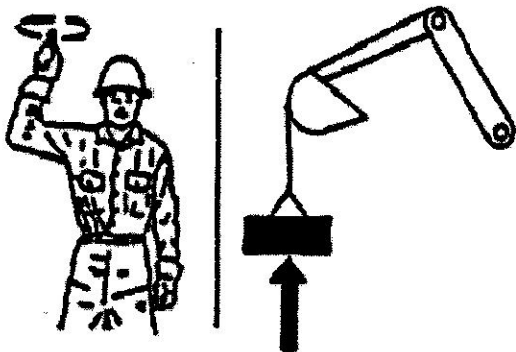


Extend Boom (Telescoping Boom)
One Hand Signal. One fist in front of chest with thumb tapping chest.



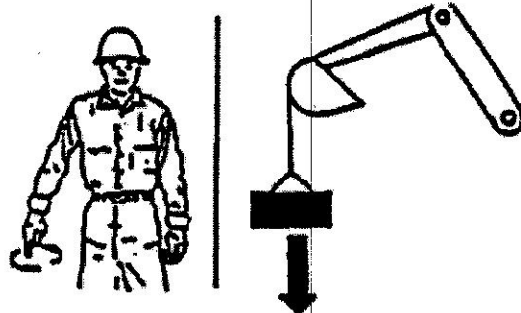
Retract Boom (Telescoping Boom)
One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

Appendix B
 EXCAVATOR AND BACKHOE HAND SIGNALS
 (2) SAE Excavator and Backhoe Hand Signals



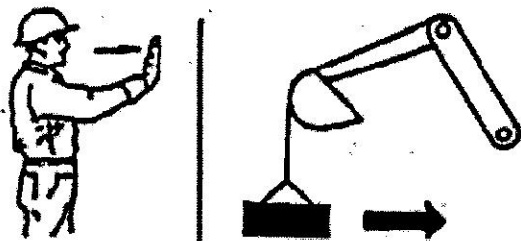
Raise Load Vertically

With either forearm vertical, forefinger pointing up, move hand in small horizontal circle.



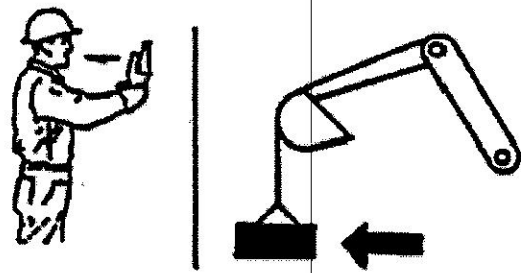
Lower Load Vertically

With either arm extended downward, forefinger pointing down, move hand in small horizontal circle.



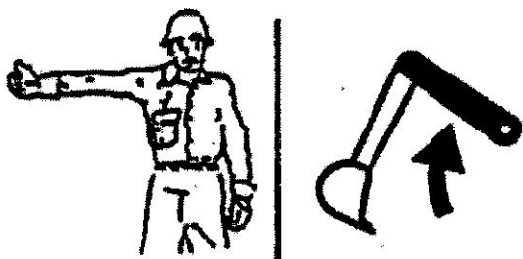
Move Load In Horizontally

With either arm extended, hand raised and open toward direction of movement, move hand in direction of required movement.



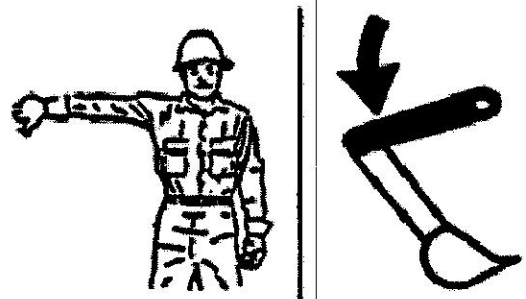
Move Load Out Horizontally

With either arm extended, hand raised and open toward direction of movement, move hand in direction of required movement.



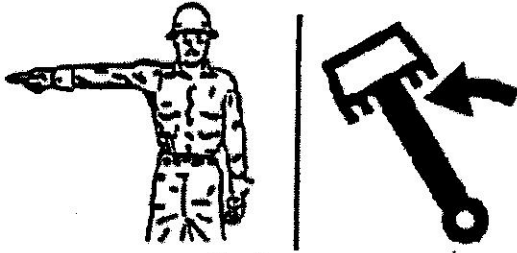
Raise Boom

With either arm extended horizontally, fingers closed, point thumb upward.



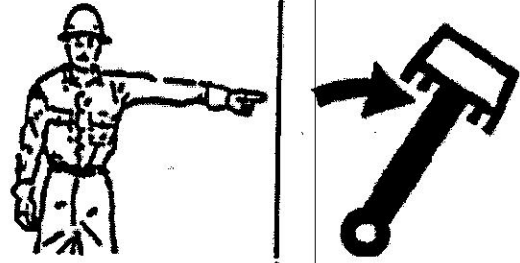
Lower Boom

With either arm extended horizontally, fingers closed, point thumb downward.



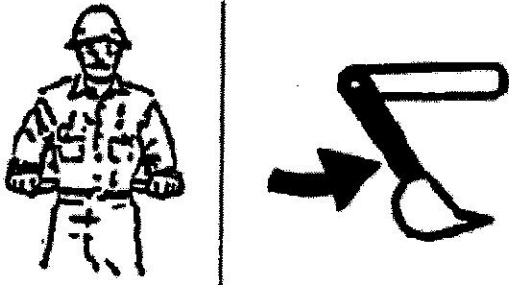
Swing

With either arm extended horizontally, point with forefinger to direction of swing rotation.



Swing

With either arm extended horizontally, point with forefinger to direction of swing rotation.



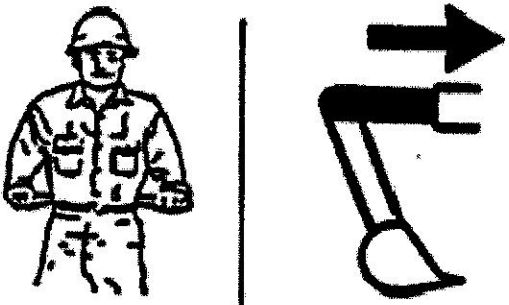
Arm/Dipperstick Inward

With both hands clenched, point thumbs inward.



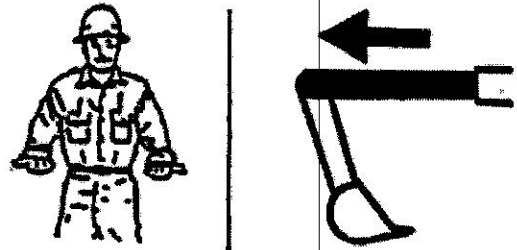
Arm/Dipperstick Outward

With both hands clenched, point thumbs outward.



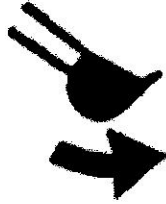
Retract Telescopic Boom

With both hands clenched, point thumbs inward.



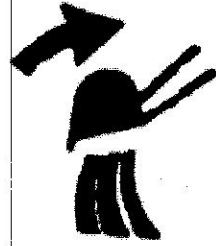
Extend Telescopic Boom

With both hands clenched, point thumbs outward.



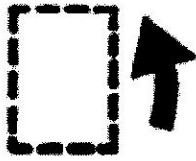
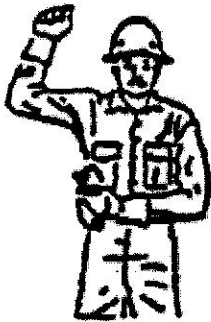
Close Bucket

Hold one hand closed and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at closed hand.



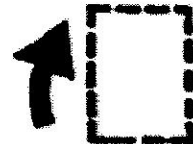
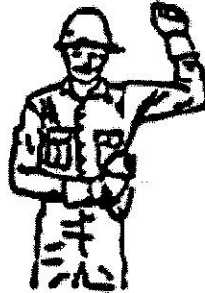
Open Bucket

Hold one hand open and stationary. Rotate other hand in small vertical circle with forefinger pointing horizontally at open hand.



Turn

Raise forearm with closed fist indicating inside of turn. Move other fist in vertical circle indicating direction of track or wheel rotation.



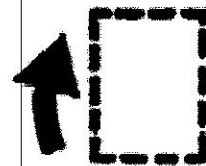
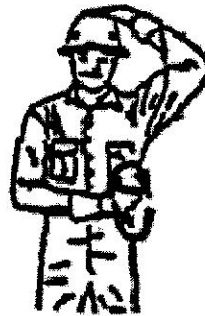
Turn

Raise forearm with closed fist indicating inside of turn. Move other fist in vertical circle indicating direction of track or wheel rotation.



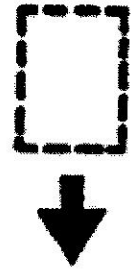
Counter Rotate

Place hand on head indicating side or reverse track or wheel rotation. Move other hand in vertical circle indicating forward rotation of other track or wheel.



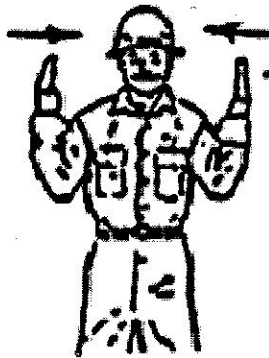
Counter Rotate

Place hand on head indicating side or reverse track or wheel rotation. Move other hand in vertical circle indicating forward rotation of other track or wheel.

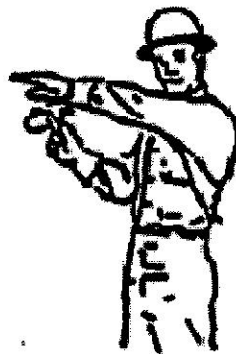


Travel

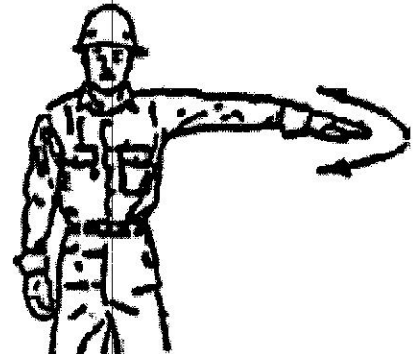
Move fists in vertical circle about each other in direction of track or wheel rotation.



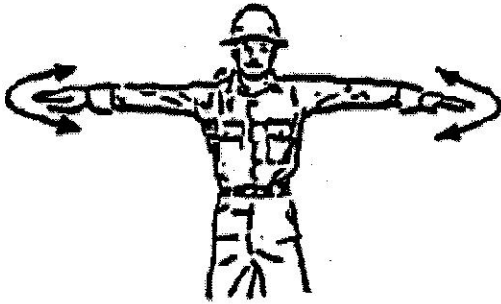
This Far to Go
With hands raised and open inward, move hands laterally, indicating distance to go.



Move Slowly
Place one hand motionless in front of hand giving motion signal. (Raise load slowly is shown)

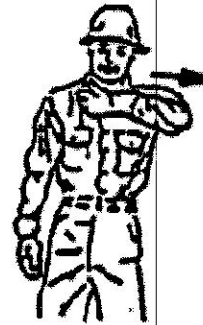


Stop
With either arm extended laterally, hand open downward, move arm back and forth.



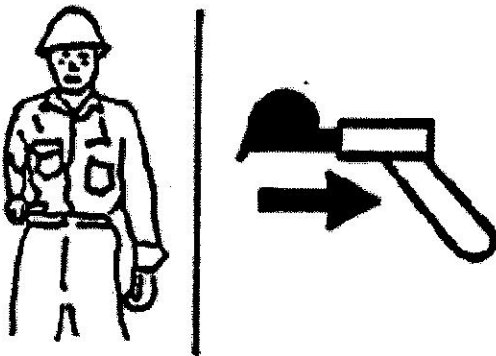
Emergency Stop

With both arms extended laterally, hands open downward, wave arms back and forth.



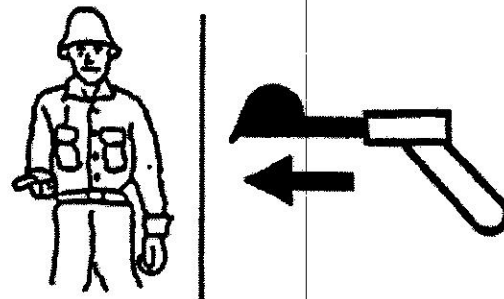
Stop Engine

Draw thumb or forefinger across throat.



Retract Telescopic Arm/Dipperstick

With either arm outstretched horizontally in front of body, close fingers and point thumb in direction of required movement.



Extend Telescopic Arm/Dipperstick

With either arm outstretched horizontally in front of body, close fingers and point thumb in direction of required movement.

REGULATION FILING AND PUBLICATION

1. Regulation Chapter Number and Heading:

520 CMR 6.00

2. Name of Agency:

Department of Public Safety

3. This document is reprinted from the Code of Massachusetts Regulations and contains the following:

520 CMR 6.01	<u>General Provisions, Scope, Definitions, Standards Adopted</u>
520 CMR 6.02	<u>General Administrative Provisions, Including Requirements for Licensure, Apprentice Licenses, and Renewals</u>
520 CMR 6.03	<u>Issuance of Temporary Permits to Operate Rented Compact Hoisting Machinery</u>
520 CMR 6.04	<u>Continuing Education and Training Facilities</u>
520 CMR 6.05	<u>Apprentice Licenses</u>
520 CMR 6.06	<u>Exempt Companies; Exemptions for Licensing Requirements, Pursuant to M.G.L. c. 146, Section 53</u>
520 CMR 6.07	<u>In-Service Training Program for Exempt Companies</u>
520 CMR 6.08	<u>Operating Procedures for Hoisting Machinery</u>
520 CMR 6.09	<u>Special Requirements for Cranes, Derricks, Pile Drivers, Excavating Machines, Fork Lifts, and Hoists</u>
520 CMR 6.10	<u>Classification of Licenses; Qualifications</u>
520 CMR 6.11	<u>Operation of Hoisting Machinery; Accident Reporting</u>
520 CMR 6.12	<u>Suspension, Revocation, and Appeals of Licensing, Certification, and Temporary Permitting</u>

520 CMR 6.13

Variance Procedure

Under the provisions of Massachusetts General Laws, Chapter 30A, Section 6 and Chapter 233, Section 75, this document shall not be used as evidence of the original documents on file with the State Secretary.

520 CMR 6.00: HOISTING MACHINERY

6.01: General Provisions, Scope, Definitions, Standards Adopted

(1) Scope.

520 CMR 6.00 is promulgated by the Department of Public Safety pursuant to authority granted by M.G.L. c. 146, §53. The purpose of 520 CMR 6.00 is to establish reasonable requirements to protect the public safety of the citizens of the Commonwealth from the hazards inherent in the operation of Hoisting Machinery by establishing the minimum standards necessary to obtain a Hoisting Machinery operator's License or Temporary Permit and the minimum safety standards to be followed during the operation of Hoisting Machinery. 520 CMR 6.00 shall apply to:

Hoisting Machinery as defined in 520 CMR 6.01 that is used on private or public property for the erection, construction, alteration, demolition, repair or maintenance of buildings, structures, bridges, highways, roadways, dams, tunnels, sewers, underground buildings or structures, underground pipelines or ducts and all other construction projects or facilities or other uses on private or public grounds including the warehousing and movement of materials, except when being used exclusively for agriculture purposes.

(2) Definitions.

The following words and terms, when used in 520 CMR 6.00 shall have the following meanings unless the context clearly indicates otherwise or the term is redefined for a specific section or purpose:

ANSI. American National Standards Institute.

Apprentice License. A document issued by the Department upon proof of registration at a Training Facility and with the Division of Apprentice Training within the Department of Labor Standards, which enables the holder to operate Hoisting Machinery under the direct guidance and supervision of a duly licensed person licensed to operate the category of Hoisting Machinery for which documentation is issued.

Apprentice Licensee. A person, who is at least 18 years of age, holds a valid driver's license, is registered with the Department of Labor Standards, and has obtained an Apprentice License to operate Hoisting Machinery while under the direct guidance and supervision of a duly licensed person.

ASME. American Society of Mechanical Engineers.

Cargo. A load, quantity, or volume that can be processed or transported.

Certificate of Completion. A uniform certificate issued by a Training Facility to a Licensee upon the satisfactory completion of a continuing education curriculum.

Chief. The Chief of Inspections – Mechanical of the Department of Public Safety.

Commissioner. The Commissioner of the Department of Public Safety.

Compact Hoisting Machinery. Hoisting Machinery with a gross vehicle weight not exceeding 10,000 pounds, excluding Class 1, Class 3, and Class 4 Hoisting Machinery as listed in 520 CMR 6.10. Hoisting Machinery operated under a Temporary Permit shall not exceed a gross vehicle weight 8,000 pounds.

Company License. A License issued by an Exempt Company that has a Department approved In-Service Training program and which is only valid for Hoisting Machinery used on Company Property.

Company Property. Property which is owned or under the care and control of a tenant company under a lease or rental agreement. No operation shall occur on any public or a private way, excluding Company Property.

Competent Person. One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate such conditions.

Department. The Department of Public Safety.

DAT. The Division of Apprentice Training.

DOT. The United States Department of Transportation.

Emergency Procedure. Actions required to be taken when imminent danger may occur to prevent damage to life, property, or to ensure public safety.

Fork Lift. Any mobile power-propelled truck used to carry, push, pull, lift, stack or tier materials. Earth moving and over the road haulage trucks are not included in the definition. Equipment that was designed to move earth but has been modified to accept forks are also not included.

Hoisting Machinery. Derricks, cableways, machinery used for discharging Cargoes, and temporary elevator cars used on excavation work or used for hoisting building material, when the motive power to operate such machinery is mechanical and other than steam, including but not limited to excavators, backhoes, front end loaders, unloaders, skid loader, skid steer loaders, compact loaders or similar devices, lattice cranes, derricks, cranes with or without wire rope; all Fork Lifts, powered industrial lift trucks, overhead hoists (underhung), overhead cranes, underhung cranes, monorail cranes, lifting devices, cableways, powered platforms and any other equipment that has the minimum capability of hoisting the load higher than 10 feet or that has the capability of lifting loads greater than 500 pounds or if the capacity of

the bucket exceeds 1/4 cubic yard capacity; overhead bridge cranes, electric or air driven hoists, pendant controlled hoists, specialty equipment as categorized by License grade in this regulation.

Incident. A situation that results in Serious Injury, Property Damage, or any condition that is necessary for the preservation of the public health or safety at a site.

Injury and Incident Documentation. A form furnished by the Department of Public Safety detailing all specific information regarding any Serious Injury or Mechanical Failure that may have occurred.

In-Service Training. A company program that has been approved by the Department and is required for issuance of a Company License by those companies that have been exempted from hoisting licensing requirements, pursuant to M.G.L. c. 146, Section 53.

Inspector. District Engineering Inspector employed by the Department of Public Safety.

Instructor. An individual duly licensed by the Department as a Hoisting Machinery operator who educates and trains Licensees and Apprentice Licensees in the operation of Hoisting Machinery.

License. A document issued by the Department to an individual to operate a certain type and class of Hoisting Machinery.

Licensee. A person who is at least 18 years old, holds a valid driver's license and has completed the necessary requisites for licensure to operate Hoisting Machinery.

Mechanical Failure. Damage to Hoisting Machinery which affects the capacity or safe operation of the equipment per the manufacturer's specifications.

Modification. Alterations, extensions or repairs made to Hoisting Machinery which alter the machinery's original structure.

Operator's Manual. The document created by the manufacturer of the Hoisting Machinery that contains the required procedures and forms for the safe operation of Hoisting Machinery at the stated site pertaining to that specific equipment.

Placard. A Department issued certificate posted on Hoisting Machinery which acts as a notice of the unsafe condition of the machinery.

Property Damage. Damage of private or public property that exceeds \$5,000 per Incident.

Qualified Welder. A welder certified by the American Welding Society (AWS) or an acceptable alternative welding certification.

SAE. Society of Automotive Engineers.

Serious Injury. A personal injury/illness that results in death, dismemberment, significant disfigurement, permanent loss of the use of a body organ, member, function, or system, a compound fracture, or other significant injury/illness that requires immediate admission and observation by a licensed physician.

Signal Person. A trained individual qualified in the use of signals to direct the operator of Hoisting Machinery and warn of possible or existing hazards through the use of hand signals, audible signals, or flashing lights. (See Appendix A)

Short-Term Rental Entity. A person or organization approved by the Department, who is in the business of renting Compact Hoisting Machinery for which a Temporary Permit is required.

Short-Term Rental Entity Facilitator. An employee of the Short-Term Rental Entity who holds a Massachusetts Hoisting License issued by the Department and is responsible for the written and practical training, examinations, and issuance Temporary Permits.

Temporary Permit. A non-renewable permit to operate Compact Hoisting Machinery, with a gross vehicle weight not exceeding 8,000 pounds, issued by a Department approved Short-Term Rental Entity for no more than 14 consecutive days.

Temporary Permit Holder. A person who is at least 18 years of age, holds a valid driver's license, and has obtained a Temporary Permit to operate Compact Hoisting Machinery with a gross vehicle weight not exceeding 8,000 pounds.

Training Facility. A site including buildings and machinery located thereon, that has been approved by the Department to train individuals in the safe operation of Hoisting Machinery and may also provide courses in continuing education for individuals licensed to operate Hoisting Machinery.

Training Period. Time during which an Apprentice Licensee participates in a training program on-site at a Training Facility.

Utility. Any organization or company which provides electricity, natural gas, phone or cable services to the public.

(3) Regulations and Standards Adopted. The standard for operation of Hoisting Machinery shall be in accordance with the following:

ANSI/ASME
B30.2-2011

Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

B30.3-2012

Tower Cranes

B30.5-2011

Mobile and Locomotive Cranes

B30.9-2010	Slings
B30.10-2009	Hooks
B30.11-2010	Monorails and Underhung Cranes
B30.16-2012	Overhead Hoists (Underhung)
B30.17-2006 (R2012)	Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
B30.20-2010	Below-the-Hook Lifting Devices
B30.22-2010	Articulating Boom Cranes
B30.26-2010	Rigging Hardware, Includes Errata (2011)

SAE

J1307-2002	Excavator and Backhoe Hand Signals
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The Occupational Safety and Health Administration (OSHA) Regulations

29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1910	Occupational Safety and Health Standards

Regulations

220 CMR 99	Procedures for the Determination and Enforcement of Violations of MGL c.82, sec.40 ("Dig Safe")
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6.02: General Administrative Provisions, Including Requirements for Licensure, Apprentice Licenses, and Renewals

- (1) Scope. 520 CMR 6.00 establishes general administrative provisions including License issuance, License renewals, fees, examinations, and appeals for all Hoisting Machinery licensure.
- (2) General requirements for licensure.
 - (a) All applicants, including those applying for an Apprentice License, must be at least 18 years of age.
 - (b) All applicants must submit the following documentation:
 1. A completed application on a form authorized by the Department to operate Hoisting Machinery as provided by the Department;
 2. A fee to be determined annually by the Secretary of Administration and Finance under the provisions of M.G.L. c. 7, §3B;
 3. A legible photocopy of the applicant's valid DOT medical certificate or ANSI/ASME B30.5-2011 qualifications for operators. In the event that the DOT medical certificate expires prior to the expiration of the Hoisting License, the Licensee shall submit a legible photocopy of the new certificate;
 4. A photograph or permission to gain access to the Massachusetts Registry of Motor Vehicles database if

- applicant is a resident of Massachusetts;
5. A legible photocopy of the applicant's valid driver's license. In the event that the applicant's driver's license expires prior to the expiration of the Hoisting License, the applicant shall submit a legible photocopy of the new driver's license when it is received;
 6. In addition to the requirements of 520 CMR 6.02 (2)(b)(1-5), applicants for an Apprentice License must also submit a copy of their Annual Apprentice ID Card issued by the DAT

(3) Examination for License to Operate Hoisting Machinery.

(a) Written:

(1) All applicants for a License to operate Hoisting Machinery License shall pass a written examination administered by the Department by earning a minimum grade of 70% and must demonstrate knowledge of the following:

- a. the operation of the equipment for which they are being examined;
- b. the ability to comprehend and interpret all Placards, operation manuals, safety codes and other information pertinent to safe hoisting operations in the English language;
- c. Emergency Procedures;
- d. Massachusetts General Laws and regulations as they relate to Hoisting Machinery.

(2) Individuals receiving a failing score may not retake an examination for a License to operate Hoisting Machinery within 90 days of the previous examination.

(3) In addition to the written examination, applicants for licensure to operate Hoisting Machinery may be required to pass a practical examination at the discretion of the Department or if required by Federal law for the specific type of equipment for which they have applied to operate.

(b) Practical Examination:

Applicants taking the practical examination must demonstrate knowledge of the following:

- (1) The ability to operate the equipment for which they are being examined;

- (2) The ability to comprehend and interpret all Placards, operators' manuals, safety codes and other information pertinent to safe hoisting operations;
 - (3) The ability to comprehend and interpret hand signals;
 - (4) The ability to communicate in English;
 - (5) Emergency Procedures;
 - (6) Applicable Massachusetts General Laws and regulations as they relate to Hoisting Machinery.
- (4) Hoisting Licenses shall be carried on the person of the operator during all times the operator is operating Hoisting Machinery and shall be furnished for inspection by the operator at the request of the Chief or Inspector or the Commissioner.
- (5) Denial; appeals.
 - (a) The Department may refuse to issue a License to an applicant based on the following grounds:
 - (1) Submittal of an incomplete application or submittal of an application on a form not authorized by the Department;
 - (2) Failure to submit required fees;
 - (3) Submittal of false, invalid, incorrect or fraudulent information;
 - (4) If at the time of application, the applicant is under investigation by the Department;
 - (5) Failure to pass a practical examination (if required);
 - (6) Failure to pass the required written examination.
 - (b) If the Department refuses to issue a License based upon any of the reasons set forth in 6.02 (5)(a)(1-6) it shall notify the applicant in writing, setting forth the reasons for the denial. Within one week of receipt of the denial, the applicant may make written demand on a form authorized by the Department to the Chief for a hearing before a board of appeals consisting of three Department Inspectors appointed by the Chief or the Chief and two Inspectors. The hearing shall be held promptly and in accordance with MGL c. 30A and 801 CMR 1.02.
 - (c) Failure to Pass Written Examination as required by 520 CMR 6.02(5)(a)(6):The results of the written examination shall be posted on the Department's website (www.mass.gov/dps). If an applicant receives a failing score, the applicant may make written demand upon the Chief for a hearing. The written demand must be submitted on a form authorized by the Department within one week of the examination score being posted on the website. The hearing shall be held before a board of appeals consisting of three Department Inspectors appointed by the Chief or the Chief and two Inspectors. The hearing shall be held promptly and in accordance with M.G.L. c. 30A and 801 CMR 1.02.

(d) If, after a hearing pursuant to 520 CMR 6.02(5)(b) or (c), the Board denies the issuance of the License, it shall notify the applicant in writing. Such notice shall be sent by certified mail and/or first class mail and shall contain the reasons supporting the denial. Within 30 days after receipt of the notice, the applicant may appeal such denial to Superior Court in accordance with MGL c. 30A, § 14.

(6) License Renewals:

All applicants for renewal licensure shall submit the following to the Department:

- (1) A Certificate of Completion evidencing the satisfaction of continuing education hours required pursuant to 520 CMR 6.04;
- (2) A completed application with a valid and current mailing address and email address on a form authorized by the Department to operate Hoisting Machinery as provided by the Department;
- (3) A fee to be determined annually by the Secretary of Administration and Finance under the provisions of MGL c. 7, §3B; A legible photocopy of the applicant's valid DOT medical certificate or ANSI/ASME B30.5-2011 qualifications for operators. In the event that the DOT medical certificate expires prior to the expiration of the Hoisting License, the Licensee shall submit a legible photocopy of the new certificate;
- (4) A photograph or permission to gain access to the Massachusetts Registry of Motor Vehicles database if applicant is a resident of Massachusetts;
- (5) A legible photocopy of the applicant's valid driver's license. In the event that the applicant's driver's license expires prior to the expiration of the Hoisting License, the applicant shall submit a legible photocopy of the new driver's license when it is received.

In accordance with MGL c. 146, § 67, a notice of the date of expiration of a License shall, at least 30 days prior to such date, be sent to the Licensee. It is the responsibility of the Licensee to notify the Department of any changes to their mailing address and email address. Failure to provide the Department with a valid and current mailing address and email address may result in the delay of a License renewal. Licenses not renewed at expiration date shall become void, and shall after one year be reinstated only by re-examination of the Licensee.

(7) Renewals of Apprentice Licenses:

- (a) Apprentice Licenses shall be valid for the term of registration. Apprentice Licenses may be renewed upon the submission of a copy of

the applicant's Annual Apprentice ID Card issued by the DAT as proof that the Apprentice Licensee remains registered with the Division of Apprentice Training of the Department of Labor Standards.

(b) Applicants for Apprentice License renewals shall also submit the following:

1. A complete application with a valid and current mailing address and email address for renewal of an Apprentice License to operate Hoisting Machinery as provided by the Department;
2. A fee to be determined annually by the Secretary of Administration and Finance under the provisions of MGL c. 7, §3B;
3. A valid DOT medical certificate documenting that the applicant meets the criteria for a DOT medical examination or ANSI/ASME B30.5-2011 qualifications for operators;
4. A Certificate of Completion;
5. A photograph or permission to gain access to the Massachusetts Registry of Motor Vehicles database if applicant is a resident of Massachusetts;
6. A legible photocopy of a valid driver's license.

In accordance with MGL c. 146, § 67, a notice of the date of expiration of an Apprentice License shall, at least 30 days prior to such date, be sent to the Apprentice Licensee. It is the responsibility of the Apprentice Licensee to notify the Department of any changes to their mailing address and email address. Failure to provide the Department with a valid and current mailing address and email address may result in the delay of an Apprentice License renewal. Apprentice Licenses not renewed at expiration date shall become void, and shall after one year be reinstated only by re-examination of the Apprentice Licensee.

6.03: Issuance of Temporary Permits to Operate Rented Compact Hoisting Machinery

(a) Approval by Department: All individuals or organizations seeking approval to issue Temporary Permits as Short Term Rental Entities shall submit for the Department's approval, the following:

1. A completed application on a form furnished by the Department;
2. A copy of the training program to be used by the Short Term Rental Entity in accordance with 520 CMR 6.00;
 - (1) A list of all instructors employed by the rental company, including the names, License numbers with designated type and class of Hoisting Machinery, and expiration

- dates;
- (2) A course syllabus for each equipment type to be used in the training program;
 - (3) The minimum topics and texts included as part of the training program curriculum shall include but may not be limited to:
 1. MGL c. 146;
 2. 520 CMR 6.00;
 3. 520 CMR 14.00;
 4. OSHA Standards 29 CFR 1926;
 5. MGL c. 82, §40;
 6. MGL c. 82A;
 7. MGL c. 164, §76D;
 8. 220 CMR 99.00 (Dig Safe).
 3. A copy of the examination(s) to be used;
 4. The make and model of the equipment to be used in the training program;
 5. the name and Massachusetts Hoisting License number of at least 1 individual who will act as the Short Term Rental Entity Facilitator;
 6. A legible photocopy of the Short Term Rental Entity Facilitator's Massachusetts Hoisting License;
 7. A legible photocopy of the Short Term Rental Entity Facilitator's driver's license.

The Department shall issue a certificate of approval to individuals or organizations seeking approval to issue Temporary Permits as Short Term Rental Entities. Approval shall be contingent upon having a Short Term Rental Entity Facilitator that holds a valid Massachusetts Hoisting License in the applicant entity's employ.

- (b) The Short Term Rental Entity shall have a Short Term Rental Entity Facilitator to monitor all permitting requirements. The Short Term Rental Entity Facilitator shall hold a Massachusetts Hoisting License of equal or greater grade of Massachusetts License than the Compact Hoisting Machinery to be rented and will verify by their signature on the Temporary Permit that all those issued Temporary Permits have fully participated in the Short Term Rental Entity's training program and passed the examination;
- (c) If the Short Term Rental Entity Facilitator is no longer employed by the rental entity or is no longer going to serve as the Facilitator, the Short Term Rental Entity shall notify

the Department of the new facilitator within 14 days of the change on a form authorized by the Department. No Temporary Permits shall be issued by the Short Term Rental Entity without a valid Short Term Rental Entity Facilitator approved by the Department.

(d) Requirements for Short-Term Rental Entity Training Program. Short Term Rental Entities shall comply with the following requirements:

- (1) Any entity that has been approved by the Department to issue Temporary Permits must have a valid certificate of approval posted visibly at the rental location.
- (2) No person shall be issued more than 1 Temporary Permit in any 45 day period from the expiration of said Temporary Permit.

(e) Requirements for Temporary Permits:

- (1) All applicants must be at least 18 years of age.
- (2) All applicants must possess a valid driver's license to operate a motor vehicle.

(f) All applicants must submit the following documentation to the Short-Term Rental Entity prior to taking the examination for a Temporary Permit:

- (1) A complete application to operate a specific type of Compact Hoisting Machinery as provided by the Short-Term Rental Entity;
- (2) A legible photocopy of the applicant's valid driver's license.

(g) Issuance of Temporary Permits.

- (1) Only upon compliance with the requirements described in 520 CMR 6.03, the Short Term Rental Entity may issue a Temporary Permit to operate the rented Compact Hoisting Machinery during the rental terms. The Temporary Permit shall not be valid for more than 14 consecutive days.
- (2) This Temporary Permit shall be on a form authorized by the Department.
- (3) The Short Term Rental Entity shall retain the original Temporary Permit application, the examination(s), and duplicates of the Temporary

Permit for a period of 3 years.

- (4) Rental facilities shall issue a Temporary Permit (provided on a standard form by the Department) to those who satisfactorily complete and pass an examination. Temporary Permits shall contain the following information:
 - a. Name of Temporary Permit Holder;
 - b. Address of Temporary Permit Holder;
 - d. Name and address of Short Term Rental Entity issuing the Temporary Permit;
 - e. The printed name and legible signature of the Short Term Rental Entity Facilitator verifying that the participant has completed the permit requirements;
 - f. the issuance and expiration date of the Temporary Permit;
 - g. the description of Compact Hoisting Machinery for which the Temporary Permit is valid;
 - h. the make and model of the piece of Compact Hoisting Machinery that is being rented;
 - i. a photograph of the Temporary Permit holder.
- (h) Short Term Rental Entities that are approved to issue Temporary Permits shall keep uniform records of Temporary Permit Holders documentations and have those records readily accessible to Inspectors of the Department upon request for a period of 3 years. They shall be responsible for the security and retention of all uniform permits and the proper issuance thereof.
- (i) Falsification of Documents. The fraudulent issuance of Temporary Permits by any Licensee shall be grounds for initiating formal proceedings under MGL c. 146 § 59 and c. 30A and may be grounds for the Department to immediately suspend or revoke its approval of the Short Term Rental Entity to issue Temporary Permits.
- (j) A Temporary Permit is only valid for Compact Hoisting Machinery as defined in 520 CMR 6.01.
- (k) A Temporary Permit and a valid driver's license shall be carried on the person of the operator during all times the

operator is operating rented Compact Hoisting Machinery, pursuant to MGL c. 146 § 54, and shall be furnished for inspection by the operator at the request of the Chief or Inspector or the Commissioner.

- (l) If a person wishes to rent a piece of Compact Hoisting Machinery more than 45 days after the expiration of a Temporary Permit they must go through an approved Short Term Rental Entity's training program and take the examination again to have a new temporary permit issued.

6.04: Continuing Education and Training Facilities

All Hoisting License holders must complete continuing education requirements of this section prior to license renewal, unless a request for an inactive license status has been made pursuant to 520 CMR 6.04(3).

(1) Continuing Education and Training Facilities.

(a) Approval by Department

All individuals or organizations seeking approval to operate as a Training Facility that offers one or more continuing education course(s) shall submit, for the Department's approval, an application on a form furnished by the Department as well as a copy of all curriculum, training materials, certificates of completion to be used by the facility, and a list including the names and Massachusetts Hoisting Machinery License numbers of all Instructors. Curriculum must contain the minimum topics and associated hours for those topics as listed in 520 CMR 6.04(b)6.

(b) The following provisions are required in order for any institution or organization to have their continuing education program considered for approval:

1. A copy of all curriculum, training material, and Certificate of Completion to be used must be provided to the Department.
2. Curriculum must contain the minimum topics and associated hours for those topics as listed in 520 CMR 6.04(b)6.
3. All courses must be monitored by a Massachusetts Hoisting Licensee of equal or greater grade of Massachusetts License, who will verify by their printed name, legible signature, and hoisting license number on the Certificate of Completion, that all those issued a Certificate of Completion have fully participated in the program for which they have been issued a certificate.
4. Instructors may receive continuing education credits for providing instruction, however Instructors shall only be credited hours for the actual non-redundant time that they have spent actively participating in the

instruction of the program.

5. Method of Verification. Each program must provide a means to ensure certificate authenticity. Such means shall include, but not be limited to:

- a. School embossment of certificate; or
- b. Computer data transfer of program participants to the Department; or
- c. Signature verification; or
- d. Numbered certificates and a list of corresponding Licensees.

6. Curriculum. Continuing education programs approved by the Department shall offer a curriculum that, at a minimum, complies with the following requirements for each associated class of Hoisting Machinery licensure:

a. Class 1 (Hoisting) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 1A, 1B, or 1C License shall be four (4) classroom hours and two (2) classroom hours for the renewal of a 1D License.
- ii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 1A, 1B, 1C, or 1D License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. 520 CMR 14.00;
4. OSHA Standards 29 CFR 1926;
5. OSHA Standards 29 CFR 1910;
6. ANSI B30;
7. MGL c. 82, §40;
8. MGL c. 82A;
9. MGL c. 164, §76D.

b. Class 2 (Excavation) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 2A, 2B, 2C, and 2D License shall be four (4) classroom hours.
- ii. The minimum topics and texts included as part of the continuing education curriculum

for purposes of renewing a 2A, 2B, 2C, or 2D License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. 520 CMR 14.00;
4. OSHA Standards 29 CFR 1926
5. MGL c. 82, §40;
6. MGL c. 82A;
7. MGL c. 164, §76D;
8. 220 CMR 99.00 (Dig Safe).

c. Class 3 (Tower and Electric) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 3A License shall be four (4) classroom hours.
- ii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 3A License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. OSHA Standard 29 CFR 1926;
4. OSHA Standard 29 CFR 1910;
5. ANSI B30.

d. Class 4 (Specialty) Licenses:

- i. The minimum number of continuing education hours required for renewal of a 4A License shall be four (4) classroom hours.
- ii. The minimum number of continuing education hours required for renewal of a 4B, 4C, 4D, 4E, 4F, or 4G License shall be two (2) hours.
- iii. The minimum topics and texts included as part of the continuing education curriculum for purposes of renewing a 4A, 4B, 4C, 4D, 4E, 4F, or 4G License shall include but may not be limited to:

1. MGL c. 146;
2. 520 CMR 6.00;
3. 520 CMR 14.00
4. OSHA Standards 29 CFR 1926;
5. OSHA Standards 29 CFR 1910;
6. ANSI B30;
7. MGL c. 82, §40
8. MGL c. 82A;
9. MGL c. 164, §76D;
10. 220 CMR 99.00 (Dig Safe).

7. List of Instructors. Each program must provide a list including the names and Massachusetts Hoisting Machinery License numbers of all continuing education Instructors employed by the Training Facility. Names and applicable License numbers of Instructors shall be updated by the Training Facility operator within 14 days of the employment or the cessation of employment of an Instructor by a Training Facility on a form furnished by the Department.

(c) Certificates of Completion.

(1) Training Facilities shall issue a Certificate of Completion to Licensees who satisfactorily complete a continuing education course. Upon completion, all Massachusetts operators of Hoisting Machinery shall receive a Department approved certificate, a copy of which shall be retained by the Training Facility. It shall be furnished at the request of the Department. Certificates of Completion shall contain the following information:

- a. Name of participant;
- b. Address of participant;
- c. E-mail address of participant;
- d. Massachusetts License grade and number of participant;
- e. Name and address of the institution or organization providing the continuing education/assessment;
- f. A printed name and legible signature of a Licensee verifying participant has completed the hours as listed on the certificate; and. The License number of the Licensee endorsing the certificate;
- h. Date of issuance.

(2) Each program must provide a means to ensure certificate authenticity and shall provide evidence of the means of certification to the Department. Such means shall include:

- a. School embossment of certificate; or
- b. Computer data transfer of program participants to the Department; or
- c. Signature verification; or
- d. Numbered certificates and a list of corresponding Licensees.

(d) Program Instructors who are approved to conduct continuing education programs shall keep uniform records of attendance of Licensees and have those records readily accessible to Inspectors of the Department upon request for a period of 3 years. They shall be responsible for the security and retention of all uniform certificates and the proper issuance thereof. Instructors shall verify by signature that participants in continuing education programs have satisfactorily completed the necessary training.

(e) Falsification of Documents. The falsification of attendance records or fraudulent issuance of certificates of completion by any Licensee shall be grounds for initiating formal proceedings under MGL c. 146 § 59 and c. 30A and may also result in immediate suspension or revocation of the License.

(2) Continuing Education Requirements for License Renewal

(a) Subsequent renewals of any License other than Apprentice Licenses that expires in an even year shall expire on the next anniversary of the Licensee's date of birth occurring in an even year. Subsequent renewals of any License other than an Apprentice License that expires in an odd year shall expire on the next anniversary of the Licensee's date of birth occurring in an odd year.

(b) Renewals of Licenses shall be granted upon submission of required documentation pursuant to 520 CMR 6.02.

(c) The Department may accept education, training, or service completed by an individual as a member of the armed forces, as defined in M.G.L. c. 4 § 7, clause 43, or the United States military reserves as an alternative or in addition to submission of required documentation pursuant to 520 CMR 6.02. The applicant shall submit a license renewal application along with a Verification of Military Experience and Training form and any other supporting documentation. The education, training, or service submitted to the Department shall have been completed within 24 months of submission.

(3) Inactive Status.

(a) Any operator of Hoisting Machinery who is unable to obtain the required continuing education necessary to renew their License may request that the License be placed in inactive status for up to 1 continuing education cycle. Such request shall be made in writing on a form furnished by the Department.

(b) Operators holding a License on inactive status shall not be authorized to operate Hoisting Machinery for the time period that the License is inactive.

(c) A determination by the Department that a Licensee may return to active status shall be made following the Department's receipt of a written request by the Licensee on a form furnished by the Department, the required renewal fee, a Certificate of Completion, and submission of required documentation pursuant to 520 CMR 6.02(6).

- (4) Expiration. Pursuant to M.G.L. c. 146, Section 67, Licenses not renewed on or before the expiration date shall become void, and shall, after one year, be reinstated only by re-examination of the Licensee in accordance with 520 CMR 6.02. This provision does not apply to Licenses which are considered in inactive status.

(a) License Extension – Military Service. If the licensee is on active duty with the armed forces of the United States, as defined in M.G.L. c. 4 § 7 clause forty- third, the license shall remain valid until the licensee is released from active duty and for a period of not less than 90 days following that release. For this section to apply, the licensee must be given an Honorable Discharge, a General Discharge, or an Under Other than Honorable Conditions (UOTHC) Discharge as noted on their discharge and separation papers.

6.05: Apprentice Licenses

- (a) The Department may issue an Apprentice License to currently unlicensed individuals who are registered as apprentices at a Training Facility and submit proof of registration with the Department of Labor Standards pursuant to M.G.L. c. 146, §53A. The Apprentice License shall allow for operation of Hoisting Machinery during the Training Period, provided that the holder operates the Hoisting Machinery only while under the direct guidance of a duly licensed person. The Apprentice License shall be kept on the person of the Apprentice Licensee at all times during the operation of Hoisting Machinery and shall be valid for the term of registration with the Department of Labor Standards.

(b) Training Facilities for Apprentice Licensees Only:

(1) All individuals or organizations seeking approval to operate a Training Facility offering courses limited solely to Apprentice Licensee training courses and not continuing education shall submit a list including the names and Massachusetts Hoisting Machinery License numbers of all Instructors employed by the Training Facility.

(2) Enforcement Date. In order to provide adequate time for individuals and organizations to implement these regulations, the Department shall begin enforcement of 520 CMR 6.05 on January 1, 2014.

6.06: Exempt Companies; Exemptions for Licensing Requirements, Pursuant to M.G.L. c. 146, Section 53

LICENSES FOR OPERATING HOISTING MACHINERY NOT RUN BY STEAM.

Section 53. Necessity of license for operating hoisting machinery not run by steam; exemption.

No person shall operate derricks, cableways, machinery used for discharging cargoes, temporary elevator cars used on excavation work or used for hoisting building material, when the motive power to operate such machinery is mechanical and other than steam, unless he holds a license as hereinafter provided. The owner or user of such hoisting machinery shall not operate, or cause to be operated, such machinery, unless the person operating it is duly licensed. Any operator of such hoisting machinery when it is being used exclusively for agricultural purposes shall be exempt from the provisions of this section.

For licensing purposes, the commissioner shall classify hoisting machinery by categories, depending on size, weight, common usage, capacity, power source or such other characteristics as he may find appropriate; provided, however, that at least one category shall include cranes and other similar equipment, and one category shall include excavating equipment.

The commissioner shall adopt rules and regulations under the provisions of chapter thirty A, embodying the classifications of hoisting machinery and establishing criteria and procedures for the issuance, denial, renewal, suspension and revocation of licenses to operate hoisting machinery; provided, however, that a final adjudication that there has been a violation of federal or state occupational safety and health regulations, or any other rule adopted by the department,

shall be cause for the denial, suspension or revocation of any license issued under this section. Criteria for issuance of such license shall include, but not be limited to, training and experience requirements appropriate to the categories of machinery for which the license is intended.

Notwithstanding any other provisions of this chapter, actions taken or decisions reached by the department or a representative thereof regarding the issuance, denial, renewal, revocation or suspension of a license to operate hoisting machinery, or appeals resulting therefrom, shall be taken or made on the basis of the rules and regulations adopted under the provisions of this section.

In cases where a district engineering inspector finds that the immediate suspension or revocation of a license to operate hoisting machinery is necessary for the preservation of the public health or safety, he may order such suspension or revocation pending the outcome of a hearing, in accordance with the procedures set forth in the regulations promulgated and adopted under this section.

A public utility company which has self propelled truck mounted cranes, derricks and similar hoisting equipment which is used for the maintenance and construction of the equipment of such company and which has at least one supervisory employee who holds a license issued by the department and is designated as the responsible person in charge of hoisting equipment shall be exempt from the provisions of this section. Such exemption shall only apply if such company has an inservice training program for employees approved by the department. The inservice training program shall be audited twice annually at approximately six month intervals by three inspectors of the department. The company shall issue to each trained and certified employee a company license which shall contain a picture of the licensee, a list of the specific hoisting equipment that the licensee has been qualified to operate and the signature of the supervisor who holds a department license.

Any other company which has equipment such as cranes, derricks and similar hoisting equipment used only upon utility company property shall also be exempt from the provisions of this section; provided, however, that all of the requirements of the preceding paragraph have been complied with.

Section 53A Criteria for issuance of license of apprentice operators

The Commissioner shall issue rules and regulations, pursuant to chapter 30A, embodying the classifications of hoisting machinery and establishing criteria and procedures for the issuance, denial, renewal, suspension and revocation of licenses of apprentice operators of such machinery. However, a final adjudication that there has been a violation of federal or state occupational safety and health regulations, or any rule or regulation adopted by the department, shall be cause for the denial, revocation or suspension of any license issued under this section. Criteria for issuance of such licenses shall include, but not be limited to, training and experience requirements appropriate to the categories of machinery for which the license is intended, and registration with the apprenticeship council within the department of labor and workforce development. A holder of such apprentice license may operate hoisting machinery only under the guidance and supervision of a holder of a license to operate for the category of hoisting machinery to be operated by the apprentice.

Section 54. Carrying license.

A license to operate hoisting machinery shall be carried on the person of the operator or apprentice operator while operating such hoisting machinery.

Section 54A. Violation of Sec. 53 or 54; punishment.

Whoever violates any provision of section 53, 53A or 54, or any rule or regulation made thereunder, shall be punished by a fine of not less than five hundred dollars and not more than three thousand dollars, or by imprisonment for not more than three months, or both such fine and imprisonment. Whoever prevents or attempts to prevent any inspector from entering on any premises in the discharge of his duty with respect to sections fifty-three and fifty-four, shall be punished by a fine of not less than two hundred and fifty dollars and not more than three thousand dollars, or by imprisonment for not more than three months, or both such fine and imprisonment.

Any person who permits an unlicensed person to operate hoisting machinery shall be subject to a fine of not less than one thousand dollars and not more than three thousand dollars, or by imprisonment for not more than three months, or both such fine and imprisonment.

Section 55. Violation of secs. 42--51; punishment.

Whoever violates any provision of sections forty-two to fifty-one, inclusive, or any rule made thereunder, or prevents or attempts to prevent an inspector from entering on any premises in the discharge of his duty with respect to said sections, shall be punished by a fine of not less than ten nor more than three hundred dollars, or by imprisonment for not more than three months.

EXAMINATIONS OF APPLICANTS FOR LICENSES, ETC.

Section 56. Examiners; administration of oath to applicants.

The chief and inspectors of the division shall act, as provided in sections fifty-seven to sixty-seven, inclusive, as examiners of applicants for certificates of competency to inspect boilers, and for licenses as engineers or firemen or operators of hoisting machinery. The chief or any such inspector may administer the oath to applicants.

Section 57. Application; fees, number of examinations; frequency of applications.

Each application for a license as an engineer or fireman of a class specified herein or as an operator of hoisting machinery not run by steam shall be made upon a blank furnished by the department, signed and sworn to by the applicant, and shall show the total experience of the applicant. Each such application for a first class engineer's license, second class engineer's license or for a special license; for a third class, fourth class or portable class engineer's license

or a steam fire engineer's license; for a first class or second class fireman's license; and for a license for operating hoisting machinery not run by steam shall be accompanied by an examination fee to be determined annually by the commissioner of administration under the provision of section three B of chapter seven. Each such application shall entitle the applicant to one examination only, except in case of an appeal under section sixty-six; provided, however, that no person shall make application hereunder for a license of any particular class oftener than once in ninety days. The fee for an examination on appeal shall be determined annually under the aforementioned chapter seven provision.

Section 58. Taking notes at examinations and on appeals; representative of insurer.

In all examinations or appeals the applicant may have one person present who may take notes if he so desires. In case of applicants for certificates of competency to inspect boilers such person shall be a representative of an insurance company employing the applicant or wishing to do so.

Section 59. Suspension, revocation, loss or destruction of certificates or licenses; fee.

A certificate of competency to inspect boilers shall be revoked and a license as engineer or fireman or operator of hoisting machinery shall be suspended or revoked for incompetence or untrustworthiness of the holder thereof. A wilfully false statement in the application shall be sufficient cause for revocation at any time. If a certificate or license is lost or destroyed a new certificate shall be issued without examination upon satisfactory proof thereof. The fee for such new certificate shall be determined annually by the commissioner of administration under the provision of section three B of chapter seven.

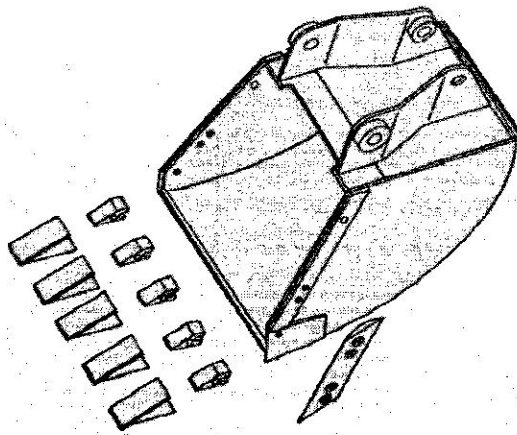


Figure 18.7 Backhoe Bucket

~~on the back of the steel cleats and can be turned to permit operation on asphalt or concrete without any damage.~~

~~The TLB is most always equipped with a 4 speed transmission and torque converter that can be shifted without stopping. The TLB also has independent brakes that are used to aid in steering and traction in slippery conditions. The seat will swivel to operate either the loader or backhoe one at a time without the operator leaving the operators seat.~~

Uses Of Tractor Loader Backhoes

~~One of the most basic pieces of excavating equipment is the TLB. Digging is done by pulling the hoe bucket towards the machine. TLB's are especially useful in digging trenches and basements, and can be used for loading trucks. The strength of the TLB is that it can dig effectively below the level of its wheels. The TLB is a small, powerful, and fairly economical package. It can be driven between jobs or carried on a light trailer. As a ditch digger it can work places that are difficult or impossible for larger machines, cross lawns without damage (except under unusually soft conditions), make narrow ditches, and show a high production rate. It does not trench as fast as the continuous type ditchers but it can handle special situations that are difficult for them it can work in rocky soil, and can handle oversized pieces. It is also a utility tool. It can dig out stumps and boulders so big that it cannot possibly lift them. The TLB can load trucks with either the hoe or front end loader bucket in many situations on projects, and serve as a light duty crane, but it is very jerky.~~

FORKLIFTS

The forklift is a primary piece of equipment that is used to support construction operations whenever there is a need to lift, load, or unload materials or supplies. Forklifts are classified as material-handling equipment. The term "material handling" describes an ongoing activity for every construction project or operation that requires the picking up and moving raw materials, processed parts, finished products, tools, equipment, supplies, or maintenance items. Every operation that requires raising, lowering, or moving an item is classified as material handling. Forklifts are specifically designed to ensure efficient handling of materials under varied

conditions. Design specifications and performance characteristics of forklifts define their limitations and capabilities under adverse conditions.

Warehouse Forklifts

The most common type of forklift used are either electric, gasoline, diesel, or propane powered. They can have solid, semisolid, or pneumatic rubber tires (figure 18.8). These forklifts are used in warehouses or on hard-surfaced outdoor storage areas. The standard warehouse forklifts have lifting capacities from 2000 to 15000 pounds and lifting heights from 100 to 210 or more inches. Warehouse forklifts are equipped with a telescopic mast that permits loads to be lifted beyond the height of the collapsed mast.

Most warehouse forklifts steer from the rear, which can effect its handling characteristics. Forklifts can have transmissions and clutches like automobiles although most newer ones have hydrostatic drive.

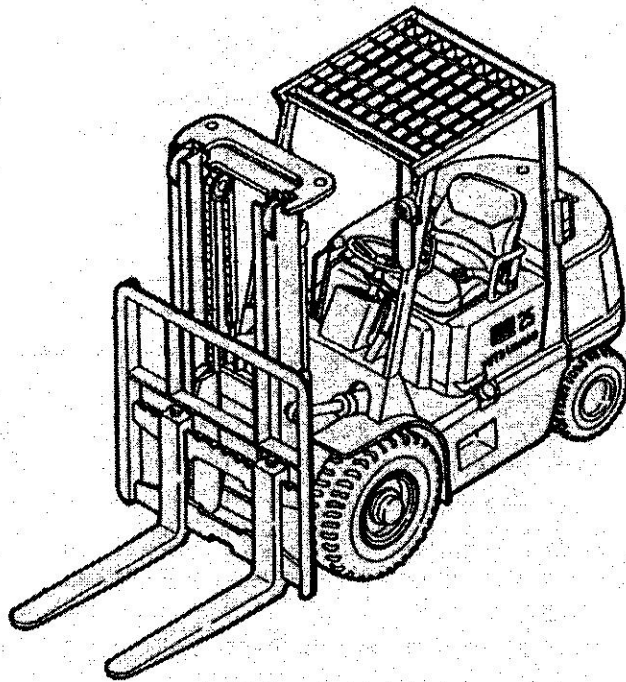


Figure 18.8 Warehouse Forklift

Rough Terrain Forklifts

A Rough Terrain Forklift is defined as a wheel-type rubber tired machine designed primarily as a fork truck with a vertical mast and/or a pivot boom, variable reach or of fixed length, which may be equipped with attachments. These forklifts are intended for operation on unimproved natural terrain as well as the disturbed terrain of construction sites.

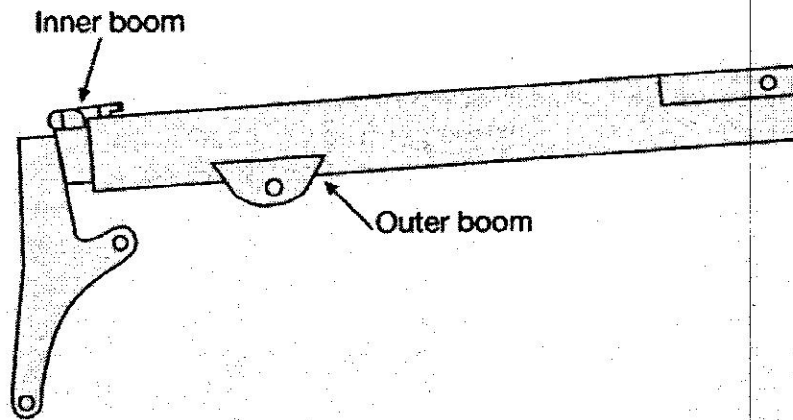


Figure 18.20 Telescoping Boom For Rough Terrain Forklift

With very few exceptions, the backrest and carriage assembly is a combined structure (figure 18.21). The backrest portion provides added stability for large or loose loads when traveling. Two popular types of carriage assemblies are shown in figures 18.21 & 18.22.

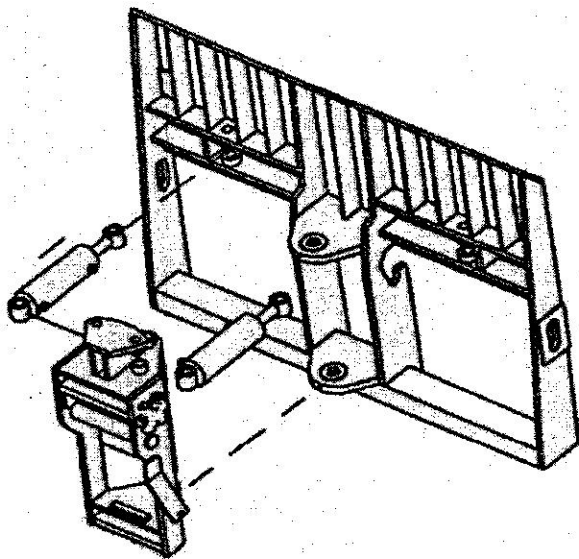


Figure 18.21 Swing Carriage

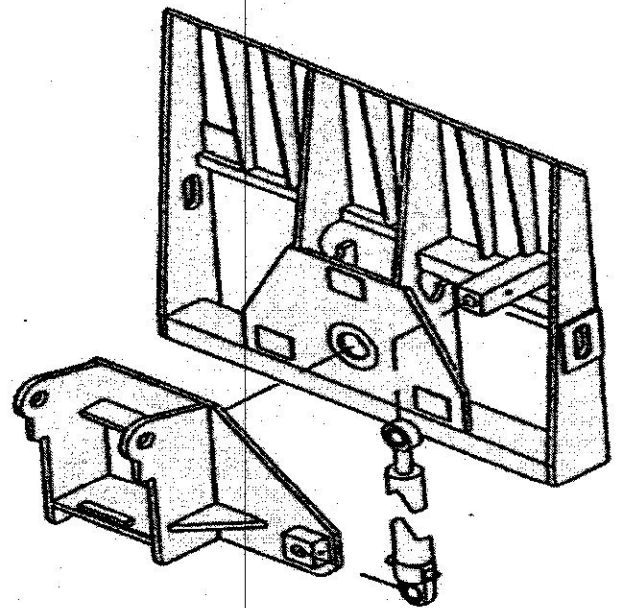


Figure 18.22 Tilt Carriage

~~RUBBER-TIRED TRACTOR DOZERS~~

~~Crawler tractors are the most compact, powerful, all-purpose pulling and pushing machines that have been developed. However, they are handicapped by low operating speed and by the large number of track parts which are subject to wear. In addition, unless equipped with special shoes, they wear and damage the pavements on which they work. There also seems to be a gradually rising limit on their maximum size, imposed by the limitations of the alloy steels commercially available and by transportation between jobs.~~

Forks are the most common type of lifting attachments used. Figure 18.11 shows some of the most popular forks. The backrest (figure 18.12), or extension, provides added stability for larger loads when traveling. The mast, or upright channel, supports the forks, carriage and extension when being raised or lowered. Forklifts come with various types of masts. The one shown in figure 18.13 is a two-stage mast. Every set of uprights or channels is a "stage". If you work in areas that have low overhead clearance, what you will mainly be concerned with is the amount of free-lift you have available (figure 18.14). Free-lift is the distance your forks can travel upwards from the lowest point (ground) without the second stage of your mast increasing height. On three stage masts the carriage or backrest will affect the amount of free lift available. The mast can be tilted forward or backward with hydraulic cylinders mounted to the main truck frame.

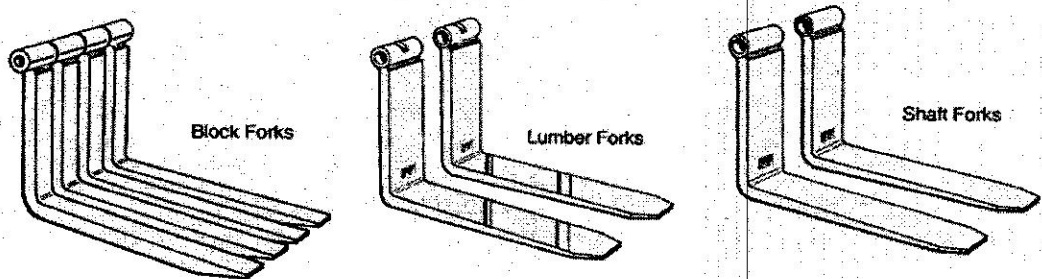


Figure 18.11 Forklift Forks

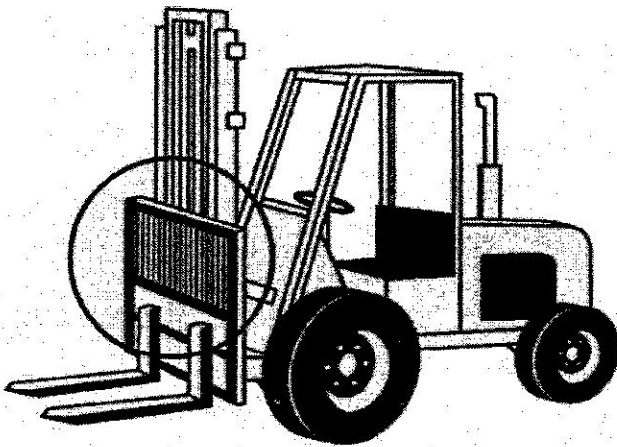


Figure 18.12 Forklift Backrest

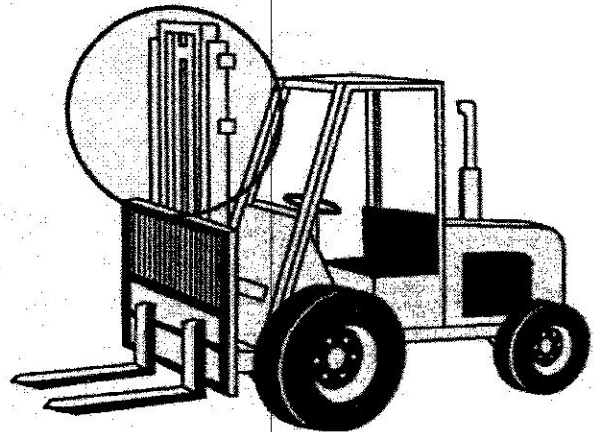
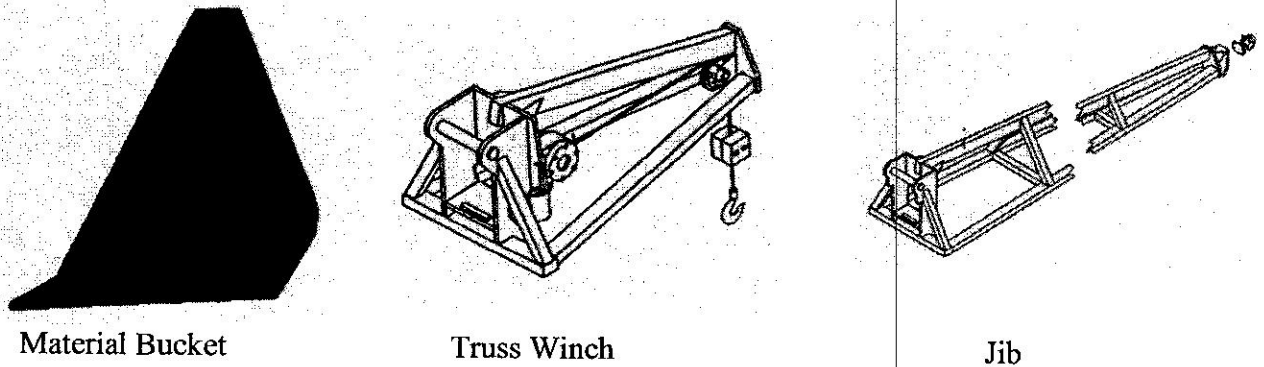


Figure 18.13 Forklift Two-Stage Mast

manufacturers are producing more attachments for them. Rough-terrain telescopic forklifts are mostly all wheel-drive, all-wheel steer material-handling equipment capable of handling loads of 6,000-pounds to a height of 23 feet or more. They are designed to handle loads over rough terrain consisting of unprepared or unstable surfaces, mud, and other conditions found on construction sights.



Material Bucket

Truss Winch

Jib

Figure 18.16 Rough Terrain Forklift Attachments

Forks are the most common type of attachment used on telescopic boom forklifts. The forks in figure 18.11 show the three most popular types. However, there are many other types of lifting attachments available (figure 18.16). Most of these forklifts are either 2-wheel / 4-wheel drive or full time 4-wheel drive. The front drive axle (figure 18.17) is attached with a pivot pin and the power head frame can be adjusted (tilted) to level an uneven terrain. The rear axle "floats" up and down to follow the terrain.

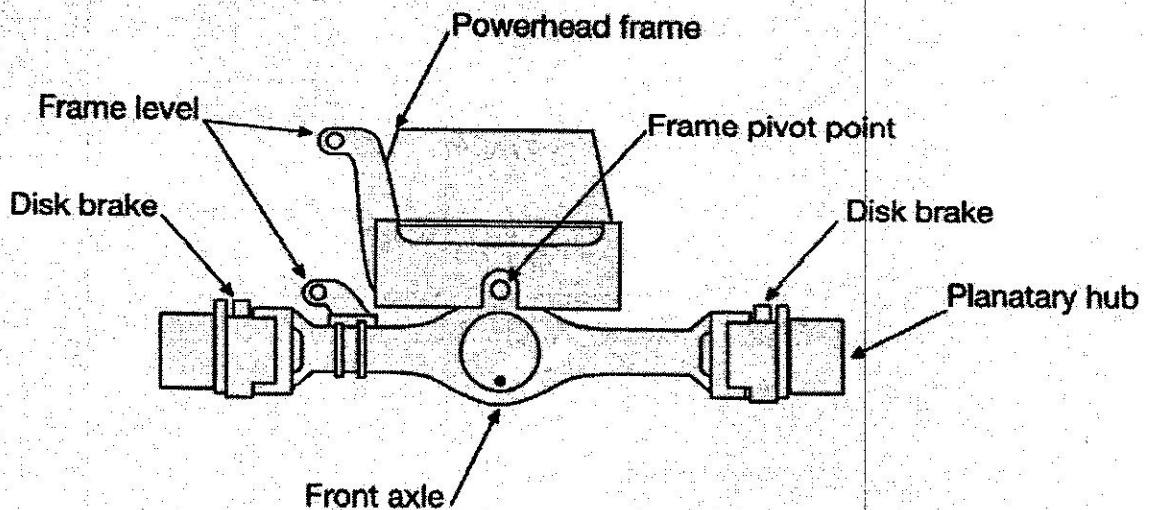


Figure 18.17 Rough Terrain Forklift Front Axle