



FORKLIFT SAFETY

SAFETY PRACTICE COMPLIANCE PROCEDURE T17



Moving things - heavy things, is at the heart of every industrial operation and Layne Christensen Company is no different. Everyday Layne personnel are engaged in moving heavy pallets of sand, betonite, etc or handling pipe in the yard or on job sites. Most of the time these materials are moved with powered industrial trucks, better known as forklifts. The forklift is a valuable tool, but only in the hands of an operator trained in the safe and correct methods of operations. This safety compliance procedure will give a basic overview of forklifts and their safe operation.

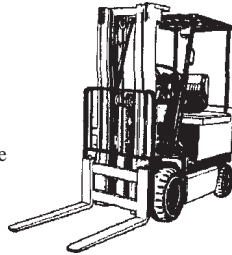
CLASSES OF POWERED INDUSTRIAL TRUCKS

The following are classes of industrial lift trucks as defined by the Industrial Truck Association (ITA). All types meet the ANSI/ASME B56.1 safety standard.

CLASS I

Electric Motor Rider Truck (Cushion and Pneumatic Tire)

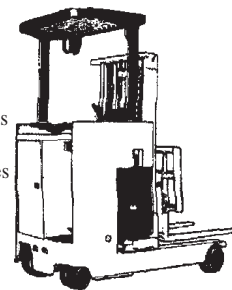
- Counterbalanced, electric powered truck. Fume free, quiet operation, for indoor use.
- Cushion tires intended for use on smooth, hard surfaces. Pneumatic tires intended for use on outdoor improved surfaces.
- Steering performed by rear wheels. Drive power maintained by front wheels. Travels equally well in forward or reverse.
- Maximum grade is approximately 10%.
- Material carried by forks or attachments mounted on a hydraulically operated mast at front of unit. Material travels vertically on mast. Mast may tilt forward or backward.



CLASS II

Electric Motor Narrow Aisle Truck

- Electric powered truck. Operator usually stands and faces in either direction of travel. Used in warehouse or general storage operations. Types include high lift, reach outrigger, and front side loader.
- Steering and drive power supplied by wheel(s) located opposite the load end of truck. Travels equally well in forward or reverse.

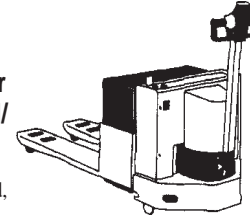


- Material carried by forks or attachments mounted on a hydraulically operated mast which elevates vertically.

CLASS III

Electric Motor Hand or Hand/Rider Truck

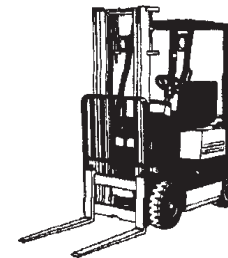
- Electric powered, pedestrian controlled with a stand up riding position available. Used in areas where loads do not require stacking.
- Travel is controlled with an arm that controls direction, speed and forks. Operator walks in front of unit, controlling arm.
- Unit can steer 90 degree turns. Maximum grade is approximately 5%. Intended for use on smooth, hard surfaces. Travels equally well in forward and reverse.
- Material carried by forks which elevate vertically.



CLASS IV

Internal Combustion Engine Truck (Cushion Tire)

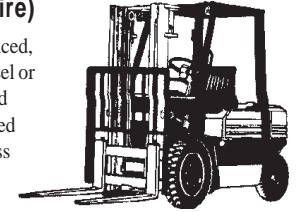
- Counterbalanced; gasoline, diesel or LPG powered truck. Intended for use on smooth, hard surfaces. Fumes generated require good ventilation.
- Steering performed by rear wheels. Drive power maintained by front wheels. Travels equally well in forward or reverse.
- Maximum grade is approximately 15%.
- Material carried by forks or attachments mounted on a hydraulically operated mast at front of unit. Material travels vertically on mast. Mast may tilt forward or backward.



CLASS V

Internal Combustion Engine Truck (Cushion Tire)

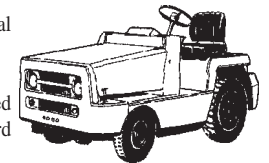
- Counterbalanced, gasoline, diesel or LPG powered truck. Intended for use on less than ideal surfaces. Fumes generated require good ventilation or outdoor use.
- Steering performed by rear wheels. Drive power maintained by front wheels. Travels equally well in forward or reverse.
- Maximum grade is approximately 15%.
- Material is carried by forks or attachments mounted on a hydraulically operated mast at front of unit. Material travels vertically on mast. Mast may tilt forward or backward.



CLASS VI

Electric or Internal Combustion Engine Tow Tractor

- Electric or internal combustion powered truck. Operator is seated and faces forward with excellent visibility. Intended for use on smooth, hard surfaces.
- Steering performed by front wheels. Drive power maintained by rear wheels. Travels equally well in forward or reverse.
- Material carried horizontally on trailers or carts. No vertical movement of load.

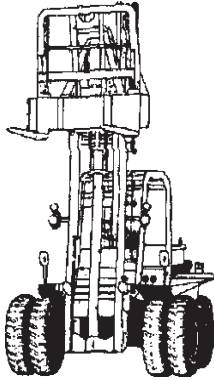


CLASS VII

Rough Terrain Lift Trucks

- Gasoline, diesel or LPG powered truck. Operator is seated and faces forward. Intended for use on outdoor, unimproved surfaces or disturbed terrain.

- Steering performed by rear wheels, four wheel skid, or articulated frame skid. Drive power from front wheels or four wheel drive. Travels equally well in forward or reverse.



- Maximum grade is approximately 45%.
- Material carried by forks or attachments mounted on a hydraulically operated mast, linkage mechanism, or horizontally mounted telescoping boom which pivots upward. Material travels vertically on mast. Mast may tilt forward or backward.

POWER SOURCES

The two basic power sources for lift trucks are internal combustion or battery powered electric.

Internal combustion engines may be powered by diesel fuel, gasoline or liquified petroleum gas (LPG).

Diesel powered lift trucks are most often “heavy duty” trucks. Diesel fuel is less expensive but has less clean emissions.

Gasoline is expensive, but readily available and offers high horsepower. Gasoline engines generate carbon monoxide emissions.

LPG is clean burning and low cost, but generates lower horsepower.

Battery powered electric lift trucks have the advantage of being emission free and can be used indoors. They use fewer parts and are more compact in size. The batteries must be frequently charged and can generate hydrogen gas during the charging process.

Power sources may be connected to automatic or standard transmissions. Automatics are more expensive but make for easy operation and less operator fatigue. Manual transmissions are less

expensive, easier to maintain and offer greater “inching” control.

LOAD HANDLING SYSTEMS

The mast assembly is the most important piece of the lift truck for powered materials handling. The mast is mounted at the front of the truck and supported by the front axle and the lift cylinders. The function of the mast is to lift the load to the desired height and tilt it to the desired angle. Lifting and tilting functions are controlled by hydraulics.

The two-stage mast has two sections - inner and outer rails, or channels. Through extension of the inner rail, maximum height can be reached.

The two-stage full-free lift mast also has inner and outer rail sections, but is designed to maximize free lift. Free lift is the maximum vertical distance traveled before any extension of the mast. The standard two-stage may have a free lift of 4 to 6 inches, the full-free mast can have a free lift from 20 to 40 inches.

The three stage mast works in the same manner as the two stage, but has inner, outer and middle rails. It has the ability to reach extended heights, but still retract to a low profile.

FORKS AND ATTACHMENTS

Forks are probably the most common attachment used to carry loads. Forks are easily mounted and removed. Adjustment of the spread or spacing of the forks is done easily.

Forks should always be shorter than the load you are carrying. A protruding fork could damage another load when handled. However, if the forks are too short, the load will be unstable. The forks should extend three-fourths of the distance under the load. Always use proper length and proper spacing of the forks.

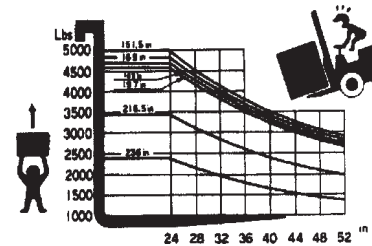
Other attachments allow the lift truck to perform specific functions. Drum handlers and dump bins are examples. The most important thing to remember is load capacity. Do not overload the unit. Clearance is another issue. Attachments may change the height, width and turning radius of the lift truck.

LIFT TRUCK CONCEPTS OF OPERATION

The front wheels act as the center point between the load and the overall truck counterweight. It works much like the pivot-point of a see-saw. The amount of weight on each end and the position of the center point determines which end will lift up.

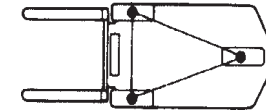
In the case of the lift truck, if the load weight is greater than the counter weight, (overall weight of the truck), stability cannot be maintained and the truck will lift, or worse! A lift truck’s rated capacity is indicated on a name plate. The plate will list maximum lift weight and the maximum distance between the center of the weight and the front vertical face of the forks. This is called the load center distance.

Lift trucks also have a load capacity chart in the operators manual. The chart displays load weight on the left, with load center distance along the bottom. Curves given show maximum fork height, used when load center distances differ from those stated on the name plate.

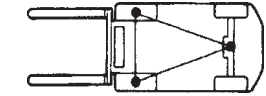


To read the chart, first check the truck’s name plate for the maximum fork height. Next determine the load center distance (usually ½ the length of the load). Trace up from the load center distance to the appropriate mast curve, and over to the capacity scale. This number must be greater than the weight of the load to be lifted. Increased load center distances usually decreases the lift capacity.

Remember, every truck is different. Also, load charts do not take into account environmental conditions and truck maintenance. Don’t forget to add the weight of packing materials and pallets to the load. Always leave a safety cushion when deciding if the load is safe to lift.



Three wheel truck, three point suspension.

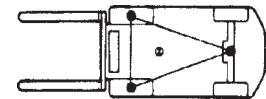


Four wheel truck, three point suspension

STABILITY

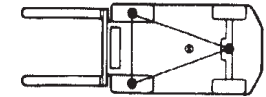
Three and four wheel trucks have a three point suspension. On three wheel trucks, the two drive and one steering wheel provide the suspension. On four wheel trucks, the two front wheels and center of the rear axle provide the suspension. The three points provide the stability triangle.

The lift truck is only stable when the combined center of gravity of the load is within the stability triangle.



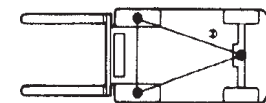
Combined center of gravity, truck and load

If the center of gravity moves outside the triangle, the truck may tip over. For example, if the load is lifted and the mast is tilted back, the center of gravity will also move back.



Center of gravity, with load tilted back

Below, the center of gravity has moved outside the stability triangle, and the potential for tip over has increased. A bump in the road could cause this truck to overturn.



Accidents can be avoided if the operator always is aware of load weights, load center distances, and the rated capacity of the truck.

OPERATION

Only fully certified employees will operate the lift truck. Employees must be familiar with all aspects of the unit, including those listed in the previous sections.

A pre-operation check must be performed. It should include checking for fluid leaks, oil, coolant, brake and hydraulic fluid level check, and tire/lug nut inspection. The operators seat must have a seat belt. A fire extinguisher must be present, the horn and all lights must be operational, and the unit should be equipped with a functioning back-up alarm. Finally, inspect the load handling system for damage. Adjust the forks to the desired width.

The employee should also be familiar with the instruments, controls and body components. Before starting the unit, check the area. Make sure the gear shift is in neutral and parking brake is set. When starting the unit, all dials and gauges should be noted. If any gauges are not functional or reading out of the normal, the unit should not be used until repaired. Any warning signals (such as the brake accumulator) should not be ignored.

Take extra care to familiarize yourself with the load controls. Know how to raise and lower, or tilt the mast. Cycle through all the controls to make sure they are functioning. Detecting a faulty control in advance can save personal injury and property damage.

Disengage the parking brake and proceed. Always obey the rules of the road. Speed limit and traffic rules should be followed. Any type of horseplay is strictly prohibited.

The forklift should be used for its intended purpose. Never carry riders. There is only room for one person on the forklift - the operator. When using the forklift as a manlift, use only an approved basket. Rails should be four feet high, with intermediate rails every foot. Proper fall protection must be worn when in the basket. Never leave the forklift unat-

tended with an employee in the basket.

Before picking up the load, set the forks to the maximum width the load will allow. This will keep the load stable. When leaving the driver's seat, make sure the unit is in neutral, with the parking brake engaged.

Before picking up the load, check the load weight and load center. Don't forget to include the weight of any packing material. Position the load evenly on the forks. Off center loads will affect vehicle stability. Position the load against the backrest, with the mast tilted back. Make sure the forks are completely under the load.

When traveling, carry the load as low to the ground as possible. A low center of gravity increases load stability. When carrying large loads, travel in reverse. This improves operator visibility. Watch overhead, side and rear end swing clearance. Avoid loose objects, bumps, wet areas and other vehicles. If you have to travel over railroad tracks, cross at an angle, one wheel at a time. Look both ways for traffic, the noise of your engine may mask oncoming traffic.

Go slow around corners and sound your horn. Come to complete stops at stop signs. Never travel across an incline. Only travel straight up or down an incline. When traveling up or down an incline, travel with the load facing uphill. This improves stability. Always travel slow on inclines. If your load blocks your visibility, use a spotter. Keep the spotter in your line of sight at all times.

When entering a truck or driving on a trailer to pick up a load, ensure adequate clearance. Also, make sure the floor will support the weight of the forklift. Make sure the trailer is stable. The weight of the forklift on one end might cause it to tip.

Unload material slowly, with the unit at a complete stop. Never move the mast while the forklift is traveling.

At the end of the job, inspect the unit. Report any problems to your supervisor. Leave the unit as you found it, with parking brake set, gear in neutral and all power off.