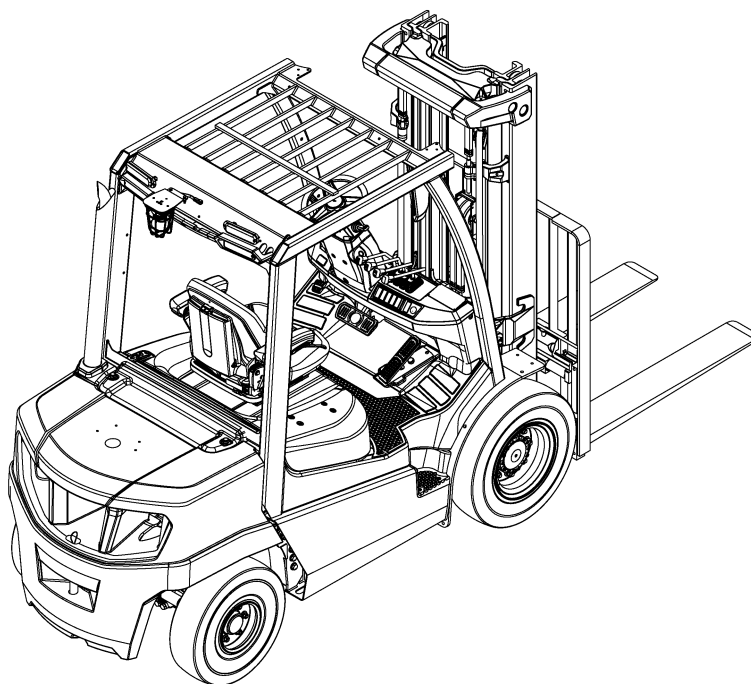




Maintenance

GUIDE TO LIFT TRUCK USE AND MAINTENANCE



SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Yale® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand; always use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section of the service manual.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **YALE® APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Strictly follow all **WARNING** and **CAUTION** notes in the operating manual, safety labels, service manual, and other instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), Hydrogen Gas (H₂), and Diesel fuels are flammable and potentially explosive. Hydraulic, transmission, and other fluids and oils are also flammable. Be sure to follow the necessary safety precautions when handling these substances or working on systems containing these substances.
- Lead acid batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.
- Lithium-ion batteries should only be used in working environments where the temperature is within the recommended operating range (typically between 0 - 45°C (32 - 113°F)). Extreme temperatures, moisture, improper charging or damage to the battery can cause a fire or explosion.
- Whenever Diagnostic tools are needed for engine, only licensed or certified persons can use Diagnostic tools.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the **WARNING** symbol (and word, if present) are on orange background. The **CAUTION** symbol (and word, if present) are on yellow background.



WARNING

Installing improper electrical accessories or installing an electrical accessory incorrectly can increase the risk of equipment damage, personal injury and fire. **DO NOT** install electrical accessories to the truck unless you have been trained and authorized to do so. Personnel installing the electrical accessories must document the changes made to the truck. **DO NOT** install accessories which affect the truck's compliance with standard ANSI/ITSDF B56.1, UL 558, or UL 583, or which otherwise affect the safe operation of the truck.



WARNING

California Proposition 65 - Operating, servicing and maintaining a powered industrial truck can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

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Note To Users

This booklet addresses lift truck safety in the workplace. It discusses the role of the user in material handling safety. Direction for this role is provided by the Occupational Safety and Health Act (OSHA), standards of the American National Standards Institute (ANSI), the Canadian Standards Association (CSA), and the Industrial Truck Standards Development Foundation (ITSDF), among other industry standards, and various trade associations.

Lift trucks are heavy-duty industrial tools designed to perform certain tasks, and are unlike any other type of machinery. Therefore, they require special operator training and special operating conditions. Lift trucks must not be used for any purposes other than those for which they were designed.

There are industry standards which apply to the design, manufacture, and testing of material handling equipment. Your Yale lift truck, as manufactured, meets the applicable mandatory design and construction requirements of ANSI/ITSDF B56.1 Safety Standard for Powered Industrial Trucks. In addition, Yale lift trucks are designed and manufactured to meet the standards established by Underwriter's Laboratories, Inc. for each truck's specific type designation.

Lift truck safety involves more than the machine and the operator. It involves management, the operating environment, lift truck maintenance, operator training, and direct supervision.

Safety attitudes start with top management and are reflected in each employee's actions. Operators will not be impressed with the need for safe job performance if they feel that management permits other unsafe conditions to exist. Management has direct control of the operating environment, maintenance, training, and supervision. Each of these is described in this section.

OPERATING ENVIRONMENT

This not only includes the facility but also the people who work in or visit an area where material handling equipment is used.

MAINTENANCE

Good maintenance practices for all equipment and facilities play a major role in a safe environment. Pre-

shift inspection of powered industrial lift trucks is required by OSHA standards. Recommended inspection procedures are covered in the Operating and Periodic Maintenance manuals supplied with your lift truck.

Many users perform repair work on their equipment. To assist these users, Service Manuals are available from your local Yale dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death. Repair procedures contained in the Service Manual must be carefully read and understood before attempting any repair work. When in doubt of any repair procedure, contact your local lift truck dealer.

TRAINING

An effective material handling safety program is required to enable productive, safe material handling while limiting the potential for accidents, property damage and injury. An important part of this program is operator selection and training. There are federal and industry standards which cover both operator selection and training. These standards and other material handling references are covered in this manual.

SUPERVISION

Supervisors have the best opportunity to observe and influence the daily activities in your facility. They must also receive training in material handling safety and be aware of applicable laws, standards, regulations, and practices.

Lift truck manufacturers produce a variety of literature covering their products. This literature may include material for sales, operation, servicing, or parts information for various lift truck models.

Some materials are provided with Yale lift trucks; additional materials are available through Yale lift truck dealers.

Materials provided with each new Yale unit include:

- ☑ One Operating manual.
- ☑ Periodic Maintenance Section of the applicable Service Manual;
- ☑ Applicable warranty statement(s);
- ☑ Applicable diagrams and schematics.

Materials available online from Hyster at www.yale.com include:

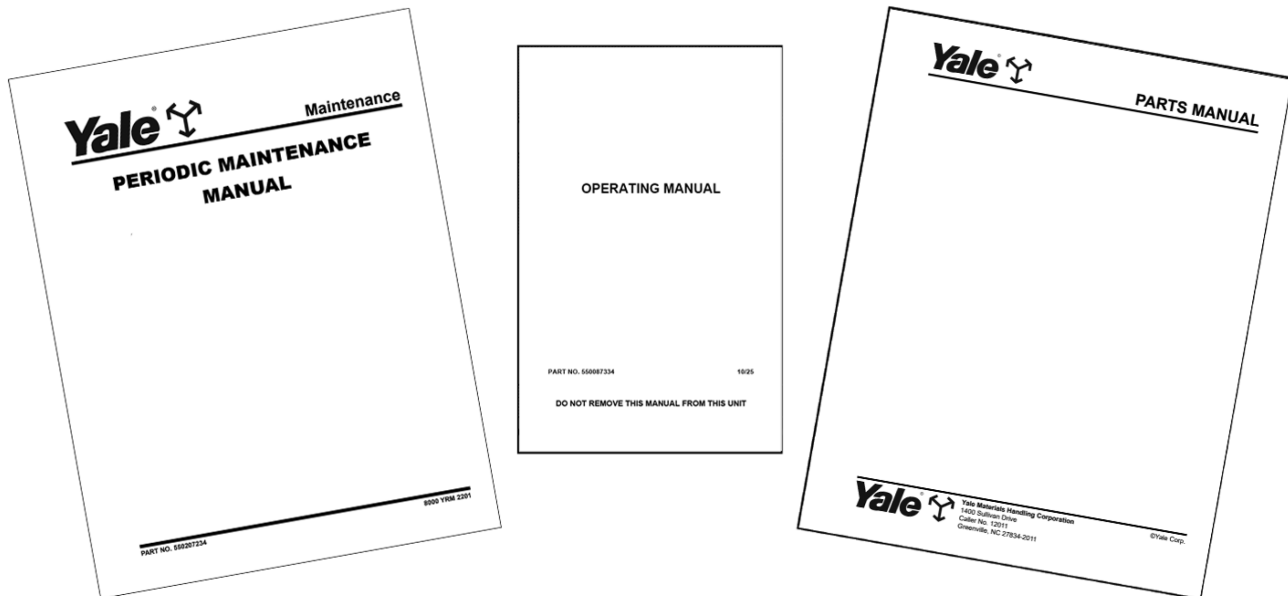
- ☑ Guide to Lift Truck Use and Maintenance.
- ☑ Special Equipment Options.

This information lists examples of the special equipment and accessories available for Yale lift trucks. Your local Yale dealer also will have access to all options available for your Yale truck.

Materials available through Yale lift truck dealers include:

- ☑ Additional copies of operating and periodic maintenance manuals.
- ☑ Parts manuals
- ☑ Operator training and operator training material.
- ☑ Service manuals.
- ☑ Service training.
- ☑ Maintenance contracts.

The next three sections will cover the information in more detail, and reference other source material which will be helpful in maintaining a material handling safety program.



YO260062

Figure 1. Yale Company makes these three manuals available for each lift truck.

Standards

This section identifies selected federal and industry regulations and standards, and other sources of information which apply to material handling and may be applicable to your operation. Individual states also regulate occupational safety and health in many workplaces. Check with your state and local governments for regulations which may affect your workplace.

OSHA OCCUPATIONAL SAFETY AND HEALTH STANDARDS 29 C.F.R. SECTION 1910

- ☑ Subpart D – Walking – Working Surfaces.
 - Section 1910.22, General requirements.
 - Section 1910.23, Guarding floor and wall openings and holes.
- ☑ Subpart J – General Environmental Controls.
 - Section 1910.147, The control of hazardous energy (lockout/tagout).
- ☑ Subpart N – Materials Handling and Storage.
 - Section 1910.176, Handling materials - general.
 - Section 1910.177, Servicing multi-piece and single piece rim wheels.
 - Section 1910.178, Powered industrial trucks.
- ☑ Subpart Z – Toxic and Hazardous Substances.
 - Section 1910.1000, Air contaminants.
 - Section 1910.1200, Hazard communication.

<http://osha.gov/laws-regs/regulations/standardnumber/1910>

ANSI/ ASME/ CSA/ ITSDF

ANSI: American National Standards Institute.

ASME: American Society of Mechanical Engineers

CSA: Canadian Standards Association

ITSDF: Industrial Truck Standards Development Foundation.

- ☑ **ANSI/ITSDF B56.1:** Safety Standard for Low-Lift and High-Lift Trucks
- ☑ **ANSI/ITSDF B56.5:** Safety Standard for Driverless, Automatic Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles
- ☑ **ANSI/ITSDF B56.8:** Safety Standard for Personnel and Burden Carriers
- ☑ **ANSI/ITSDF B56.11.4:** Hook-Type Forks and Fork Carriers for Powered Industrial Forklift Trucks
- ☑ **ASME A17.1-2022 / CSA B44-2022:** Safety Code for Elevators and Escalators
- ☑ **CSA HPIT 1:15 (R2024):** Compressed hydrogen powered industrial truck on-board fuel storage and handling components
- ☑ **CSA B335-15:** Safety Standard for Lift Trucks (harmonized with design, classification, and maintenance requirements of ANSI/ITSDF B56.1)

NOTE: Many of these standards are updated annually. Be sure to obtain copies of all updating addenda when reviewing these standards.

<http://www.itsdf.org> (ANSI/ITSDF B56 series standards)

<https://webstore.ansi.org/> (ANSI, ASME, CSE standards)

<https://www.csagroup.org/store/> (CSA standards)

MHI

Material Handling Institute

Advanced Energy Council

<https://www.mhi.org/>

- ☑ Customer Technical Reference: Lithium-Ion Battery Safety Guidelines & Best Practices for Operation in Electric Lift Trucks, Document No. ER000867_00 Rev A

NFPA NATIONAL FIRE PROTECTION ASSOCIATION

<https://www.nfpa.org/for-professionals/codes-and-standards>

- ☑ **NFPA 30:** Flammable and Combustible Liquids Code
- ☑ **NFPA 58:** Standard for the Storage and Handling of Liquefied Petroleum Gases
- ☑ **NFPA 70:** National Electrical Code
- ☑ **NFPA 70E:** Standard for Electrical Safety in the Workplace
- ☑ **NFPA 77:** Recommended Practice on Static Electricity
- ☑ **NFPA 505:** Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance and Operation

NSC NATIONAL SAFETY COUNCIL

<https://www.nsc.org/shop/work-place-safety>

- ☑ Accident Prevention Manual for Business & Industry: Engineering and Technology, 14th Ed.

- ☑ Accident Prevention Manual for Business & Industry: Administration & Programs, 14th Ed.
- ☑ Accident Prevention Manual - Essentials
- ☑ Supervisors' Safety Manual, 11th Ed.

UL UNDERWRITER'S LABORATORIES, INC.

<https://standardscatalog.ul.com/Catalog.aspx>

- ☑ **UL 583:** Standard For Safety; Electric-Battery-Powered Industrial Trucks.
- ☑ **UL 558:** Standard For Safety; Industrial Trucks, Internal Combustion Engine Powered.
- ☑ **UL 2271:** Batteries For Use In Light Electric Vehicle (LEV) Applications.
- ☑ **UL 2580:** Batteries for Use In Electric Vehicles.

Employer's Operation

A safety inspection of your operation is recommended to assist in determining possible problem areas. There are several sources which may be called upon for assistance in conducting a safety inspection. These sources include the local fire marshal and various safety consultants. Do a thorough online search for listings of safety consultants in your area. Another source for a safety inspection is your insurance carrier. Many insurers provide services such as an inspection of your:

- Facilities
- Equipment
- Maintenance procedures
- Material handling procedures

This section will discuss, generally, what must be checked in these areas. However, as you inspect your operation, look for problems unique to your business. Inspections must take place as often as necessary, as determined by you and your inspecting consultant.

FACILITIES

Fire Hazard Areas

Fire hazard areas are defined as areas where fire or explosion hazards exist due to the presence of flammable gases, vapors, liquids, dust, or other combustible material. Definitions are provided in NFPA 70 and NFPA 505. In such locations, only trucks classified by a nationally recognized testing laboratory (such as UL and FM) of the appropriate type (DS, DY, DX, ES, EE, EX, GS, LPS) may be used. Before using a powered industrial lift truck, it must be determined if any fire hazard locations exist in your facility. Areas which have been identified as fire hazard locations must be classified and marked as such per NFPA 505 (see sample in Appendix B). The type of powered industrial lift truck used must be of the same or higher classification as the area in which they are used. **Do not use unclassified or inappropriately classified powered lift trucks in classified locations as this can significantly increase the risk of fire and explosion.**

Powered industrial lift truck types and areas of use are also covered in OSHA 1910.178 (see Appendix A). If you are not sure whether fire hazard locations exist in your facility, check with your insurance carrier, local fire marshal, or other experts in this field.

It should also be noted that an area not listed as a fire hazard area may become so due to accidents, spillage, or equipment failures.

Hazardous Substances

OSHA Standard 29 CFR Subpart Z "Toxic and Hazardous Substances" discusses the employer's obligation to employees where toxic and/or hazardous substances are present.

- ☑ Section 1910.1000, **Air Contaminants**. This section states employee exposure limits to toxic and hazardous substances including air contaminants generated by internal combustion engine powered lift trucks.
- ☑ Section 1919.1200, **Hazard Communication**. This section discusses how information concerning hazardous substances is communicated to employees. This involves identifying the hazardous substances to which employees are exposed, the health and physical hazards of these chemicals, how to detect the presence of the substances, and what controls are to be used. The controls include ventilation, work practices, and protective gear.

Operating Surfaces

Floor, ground, and other surface conditions where lift trucks operate are an important part of safe lift truck operation.

In general, operating surfaces must be firm enough to support the lift truck, its load, and the operator. Areas where a lift truck operates must be free of holes, grease, oil, or anything which can cause trucks to skid or bounce. Floor loading limits must be posted and observed.

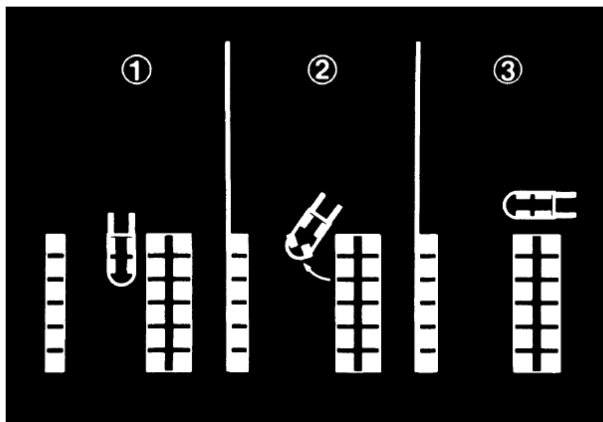
Ramps and dockboards must have curbs to deter trucks from going off the edge, and be clean to deter trucks from sliding. Dockboards must be large and strong enough for the maximum weight they will carry. The maximum allowable weight must be marked on them per ANSI/ITSDF B56.1. Dockboards should also have a method for easy handling. Once in place, they must be secured to the dock to prevent them from moving due to the operation of the lift truck.

Dock Equipment

Trailer creep and trailer pull-away are common causes of accidents resulting in lift trucks dropping from trailer beds, dockboards, and docks. Such accidents can cause serious injury or death to operators.

Certain equipment is required to support or prevent movement of trailers and railroad cars. Items such as wheel chocks, restraining devices, and trailer jack stands must be included and readily available in the facilities equipment inventory. Operators must be trained in their use. (Ref. ANSI/ITSDF B56.1)

Aisles



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Co-workers and other pedestrians should be separated from lift truck traffic wherever and whenever possible, as this is the best method to minimize lift truck accidents. If pedestrians must use equipment aisles, adequate walking space must be provided on at least one side. Barriers like permanent railings are best for this. However, if barriers cannot be used, pedestrian walkway striping on the floor can be used to separate pedestrians and lift trucks in an aisle. Convex mirrors and traffic control signs may be installed at blind aisle intersections to help prevent truck or pedestrian accidents. Keep all aisles clear. (Ref. ANSI/ITSDF B56.1)

It is important that pedestrians be aware that lift trucks are being used in an area, and how the lift truck is used and operated. Pedestrians must also be instructed of their role in safe operation. Those working or passing through an area where lift trucks operate must be aware that most lift trucks are steered

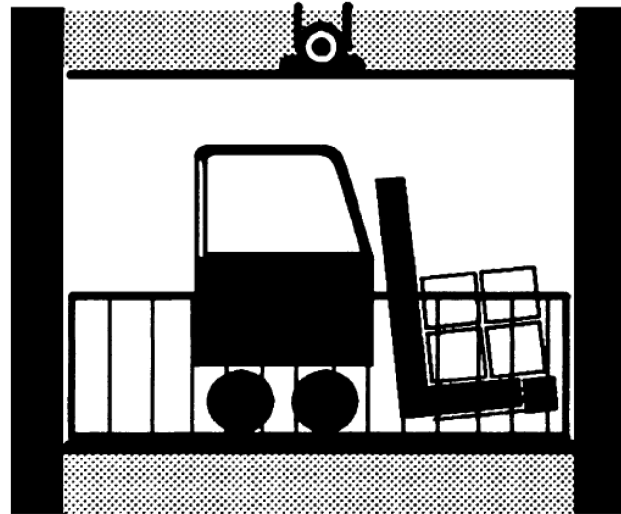
by the rear wheels and that the rear of the lift truck can move to the side very fast during a turn. This is also true for front end equipment and loads. Pedestrians standing or walking too close to a lift truck while it is turning may be injured or killed.

Pedestrians must watch out for lift trucks. They must stay out of the path of travel and away from the lift truck while it is operating. Likewise, to avoid striking pedestrians, operators must look out for pedestrians and maintain control of their lift truck. Consideration by both the operator and the pedestrian is required. You may want to consider the use of audible or visible devices in areas where lift trucks and pedestrians coexist. If used, pedestrians must be trained to recognize and react to these devices. See "Audible and Visual Signaling Devices" later in this section for considerations.

Overhead Conditions

Make sure doors, mezzanines, electrical lines, lights and utility pipes are as high as possible to reduce chances of trucks hitting them. Overhead obstacles which cannot be moved must be marked with a low clearance warning.

Elevators



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Elevators must be inspected regularly. Load capacity must be posted. Never exceed maximum capacity. (Ref. ASME A17.1 / CSA B44-2022: Safety Code For Elevators and Escalators)

Ventilation

OSHA requires that enclosed or confined areas be well-ventilated. This is to remove fumes or gases created by lift trucks and other sources in the facility. When considering ventilation, remember that some fumes and gases, like liquefied petroleum gas, are heavier than air and will accumulate near the floor or in low areas. Other gases such as Compressed Natural Gas (CNG) and Hydrogen gas are lighter than air and will accumulate near the ceiling. Still other fumes, like carbon monoxide, are nearly equal to or lighter than air and will rise or mix well with air. See Appendix C for a more detailed description of the dangers of carbon monoxide.

Internal combustion engine powered lift trucks (whether powered by gasoline, LPG or diesel) all produce carbon monoxide, which is a colorless, odorless, poisonous gas that can overcome people without warning.

Ventilation problems become more apparent as natural ventilation is reduced when weather turns cold and windows and doors are kept closed. Well-tuned and maintained machines will reduce exhaust emissions but will not eliminate the need for proper ventilation.

Electric battery powered lift trucks are well suited for indoor operating conditions and should be considered as an alternative to internal combustion engine, powered lift trucks.

Lighting

OSHA standard 1910.178 (h)(2) specifies minimum requirements for lighting in work areas. This is another case where a safety professional can be of assistance.

Plant Safety Equipment

Your safety inspection will also indicate where safety equipment is appropriate. Safety items include, but are not limited to, sprinkler systems, first aid stations, safety glasses, hearing and breathing protection, fire alarms and exits, safety signs, and emergency lighting. Fire extinguishers must be the correct type and size, and must be properly located for ready access. Employees should be trained to use them correctly.

Refueling Area

Refueling must be performed at designated locations, preferably in the open air, with the filling hose and equipment properly grounded. Locations outside of main buildings should be selected to minimize the chances of involving combustible material in a fire. See NFPA 30 (Flammable and Combustible Liquids Code); NFPA 58 (Standard for the Storage and Handling of Liquefied Petroleum Gases); and NFPA 505 (Fire Safety Standard for Powered Industrial Trucks).

Battery Charging Area

Battery charging must be done only in areas designated for that purpose. Facilities must be provided for flushing and neutralizing spilled electrolyte, for fire protection, and for protection of charging apparatus from damage by trucks.

The following precautions must be taken:

- ☑ Employees must wear eye protection and have eyewash facilities immediately available.
- ☑ Adequate ventilation must be provided to disperse flammable hydrogen gas and fumes from batteries.
- ☑ Battery support racking must be made of materials which will not generate sparks, or must be coated or covered to prevent spark generation.
- ☑ Smoking in battery charging areas must be prohibited.
- ☑ Electrical installations must comply with local codes and NFPA 70.

Precautions must be taken to prevent open flames, sparks, or electric arcs in battery charging areas. See NFPA 505.

A roller conveyor, overhead hoist, or equivalent material handling equipment must be provided for battery removal and installation. Chains, hooks, yokes, and other parts of the battery hoisting mechanism must be insulated or non-conductible to prevent short circuiting.

Lithium-ion Batteries

Lift trucks powered by lithium-ion batteries require battery specific approved chargers and charging cables. Charge the battery in environments that meet the following conditions:

- Clean, dry and well ventilated
- No direct exposure to sunlight
- Away from moisture (water - rain or other sources - or excessive humidity)
- Away from external heat sources
- Away from corrosive chemicals or gas

Lithium-ion batteries should only be used in working environments where the temperature is within the allowable operating range (typically between 0 and 45°C (32 and 113°F) 0C and 45C (32F and 113F)). Extreme temperatures, moisture, improper charging, or damage to the battery can cause a fire or explosion. If a lithium-ion battery suffers from exposure to water, fire, or physical damage, including potential damage from an impact, tip-over or off dock incident, it must be inspected by an appropriately trained and certified service technician before the battery can be returned to service.

Thermal runaway is a chain reaction of heating and chemical reaction that occurs when a system's temperature increases, causing more heat to be generated in a self-sustaining cycle. This process can lead to fires or explosions and is a potential hazard in lithium-ion batteries. A leading cause of temperature increase leading to thermal runaway in lithium-ion batteries is an overcurrent situation.

An overcurrent situation exists when the amount of electrical current flowing through a circuit exceeds the rated or safe limit, which can cause overheating and damage to equipment or lead to thermal runaway. Common causes of overcurrent include:

- **Short Circuits:** Short circuits occur when there is an unintended electrical connection between the positive and negative terminals of the battery. This results in a sudden surge of current.

- **Overcharging:** Charging a lithium battery beyond its recommended voltage or current limits can also lead to an overcurrent situation. Overcharging can be caused by faulty chargers, incorrect charging algorithms, or by damaged battery cells.
- **Over-Discharging:** Similar to overcharging, discharging a lithium battery beyond its safe voltage limits can result in overcurrent. This type of over-discharging event can occur when a device continues to draw power from the battery even when its voltage has dropped below the recommended minimum threshold.
- **Sudden Load Spikes:** Rapid changes or spikes in load demand can cause overcurrent if not managed properly by the battery management system.

Refer to the operating and maintenance manuals for your specific lift truck and battery for important instructions, cautions and warnings regarding the use, charging and maintenance of lithium-ion batteries.

Access

Certain items in your facility must always be accessible. This means the ground or floor area accessing these items must never be used as storage areas. Items requiring access include electrical panels, firefighting equipment, first aid equipment, stairways, aisles, and exits.

Exits

Exits must be clearly visible, illuminated, provided with signs and clear of obstacles. Where the exit is identified as a safety exit, make sure the doors are not locked.

Again, to keep your working environment safe, a safety inspection is recommended. Contact your insurance carrier or safety professional.

Equipment Considerations

It has been mentioned that each lift truck is designed to perform a certain task. It is important that lift trucks in your operation are doing the correct job and that your operators have been trained how to do the job correctly and safely.

GENERAL APPLICATION

As there are several types of powered lift trucks, your local lift truck dealer can provide assistance in determining which types may best be suited to your operations.

The various types of fork lift trucks include:

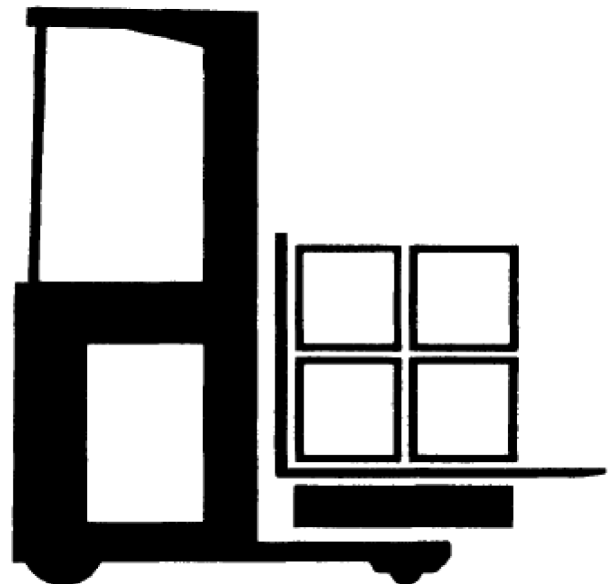
- Electric Motor Rider Trucks.



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This type consists of counterbalanced, electric motor driven rider trucks. These lift trucks may be equipped with either pneumatic or solid tires.

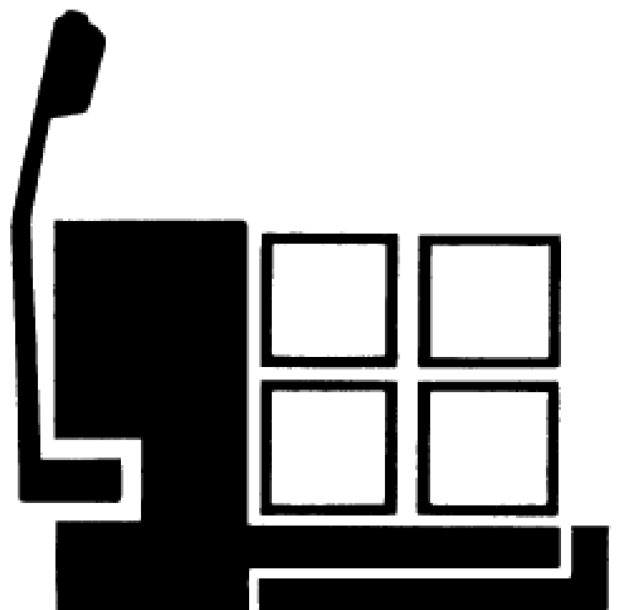
- Electric Motor Narrow Aisle Trucks.



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These units are electric motor driven rider type trucks. Examples: high lift straddle trucks, order pickers, and low-lift pallet and platform rider trucks.

- Electric Motor Hand Trucks.



BO193332

This type consists of pedestrian/rider-controlled electric motor, low-lift and high-lift trucks. Some types of these units may be ridden by the operator. Travel and lift movement are powered.

- Internal combustion engine trucks with pneumatic or solid tires.



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Includes gasoline, LP-gas, or diesel internal combustion engine powered, counterbalanced, rider type trucks.

Some items to look at when considering types of lift trucks: size and weight of load, stacking height, aisle widths, indoor or outdoor use (or both), distance loads are moved, and whether the load requires a special handling attachment. These are just a few. Contact your local lift truck dealer for professional assistance.

SPECIAL EQUIPMENT OPTIONS

While operators in typical applications will appreciate the standard features included on Yale lift trucks to promote enhanced operational security, safety and productivity, not all applications in which lift trucks operate are the same. Unlike automobiles, which generally operate under common conditions and follow consistent rules of the road, lift trucks often operate in highly varied working environments and applications, each of which present unique challenges. These unique challenges drive customers to insist on application-specific lift truck solutions. For your application-specific needs, consider special equipment

options from Yale and work with your Yale dealer to determine which options meet your operational requirements.

Audible and Visual Signaling Devices

Yale lift trucks can be equipped with audible or visual devices if you determine their use would be beneficial in your work environment. Employers must assess the need to warn workers, pedestrians, or vehicle traffic as determined by the conditions of their operations. No single array of signaling devices is optimum for all applications. The following points must be considered prior to their selection, installation, and use. Employees must be made aware that these devices are not a substitute for safe practices by lift truck operators and fellow workers, and of their responsibility to be watchful for one another.

Visual Devices

Flashing, Rotating, and Strobe Lights

The placement of visual devices must be considered based on use of the lift truck and workplace conditions. Installed lights must clear low overhead obstructions and must not shine or reflect excessively into the operator's eyes. If shielding is added, it may limit the light's visibility to pedestrians.

The color of the light should be different from lights used on stationary equipment or background colors in the workplace. The presence of light-bearing emergency equipment should also be considered when choosing the color.

Workplace lighting conditions and reflective surfaces should be considered when selecting the type of light. Brightly lighted or outdoor areas may necessitate bright or intense strobe lights or may make the use of lights ineffective.

Audible Devices

Backup or Motion Alarms

The sound produced by a motion-activated audible device must be loud enough to be heard over other noise in the lift truck operating area. The sound should be readily distinguishable from other noise or audible devices in the work area.

In certain operating conditions, the use of additional audible devices may help enhance truck proximity awareness. In other applications, the use of audible devices may not be effective, and may even be counterproductive.

Be aware that audible devices contribute to employee and bystander noise exposure. Also, hearing protection makes it more difficult to hear the audible device and to determine the direction and distance from which the sound is coming.

You must evaluate the utility of audible devices to determine if such devices will be helpful in their application. Various types of audible devices are available. Your Yale dealer can help you choose a configuration to fit the needs of your application.

Mirrors

Yale trucks are designed in their standard configuration to provide operators with excellent visibility in the direction of travel, an OSHA requirement. Operators are normally able to see pedestrians, other equipment operators and objects without mirrors. In certain applications, mirrors may aid operators in viewing the sides of the truck, the tail swing area or other areas not in their direct view when properly positioned, adjusted and maintained. Mirrors on lift trucks are not driving mirrors and must not be used as driving mirrors when operating in forward or reverse. Operators must always look in the direction of travel to avoid property damage or personal injury, as the view provided by mirrors is not as complete or effective as physically looking in the direction of travel.

Mirror Considerations:

- May decrease operator vigilance or attentiveness
- The field of vision offered by mirrors represents a small portion of what an operator would see with direct vision
- Can distort image and impact depth perception
- Mirror placement and light reflection may cause potential impairment of visibility
- Truck vibration may cause blurred image
- Overall effectiveness can be dependent on environmental factors (e.g., temperature, moisture, light, mirror cleanliness, etc.)

Supplemental Viewing Equipment Video Camera and Monitor

Cameras can be mounted on industrial trucks if you determine their use would be beneficial in your environment. Employers must assess the need to assist an operator to check in a forward or reverse direction of travel before movement of the industrial truck. An operator must always look in the direction of travel. A camera and monitor should never be used to view the path of travel while the industrial truck is in motion. On smaller industrial trucks, a camera and monitor may not be appropriate because a monitor can obstruct the operator's forward visibility. Each employer should assess their operating environment before mounting a camera and monitor on an industrial truck.

Pedestrian Awareness Lighting

Based on facility layout, lighting conditions and worksite-specific operational rules, pedestrian awareness lighting options may help customers achieve optimum truck visibility and aid in pedestrian safety.

Pedestrian awareness lighting, such as strobe lights, provide a flashing light on top of the truck and may alert pedestrians of the truck's presence. Red zone lights project a red beam of light from the overhead guard onto the floor, presenting a visual reminder for pedestrians to walk or work outside of the curtain area. Blue or red LED spotlights cast a light in front of or behind the truck's directional path, assisting with truck awareness around corners or in congested spaces with poor visibility.

Before purchasing and installing any light option, carefully review the information listed under "Lighting Considerations" below.

Lighting considerations

- Light placement must be considered based on truck usage and environment; low overhead clearances may not permit light installation on top of the overhead guard.
- Lights placed where they shine or reflect into operator's eyes must be shielded; however, shielding may also limit pedestrian visibility.
- Selected light color should differ from lights on stationary or background equipment; the presence of emergency equipment should also be considered during selection process.

- Take floor coloring into account when selecting light colors for LED pedestrian awareness light options, as floor coloring can have a significant impact on the effectiveness of LED lights.
- Workplace lighting conditions (daylight, indoor brightness, dim light, etc.) and the potential for wet or reflective surfaces should be considered when selecting light types:
 - Well-lit areas may necessitate bright or intense strobe lights
 - Very bright indoor areas or daylight outdoor use may make lights ineffective
 - Wet surfaces may significantly limit the effectiveness of lights
- Pedestrians and operators may become accustomed to or ignore auxiliary lights, particularly when multiple lights are in operation.
- Pedestrians and operators can become dependent on lights, therefore less likely to look in the direction of travel or to watch for moving equipment and pedestrians.
- Inconsistent utilization of light kits can create confusion or indifference.
- Blue LED lights have been classified by some entities as falling within risk group 2 of EN 62471; persons should avoid looking directly into blue LED lights to minimize the potential for eye injury.

Special Equipment and Operator Assist Considerations

Employers should also consider the following when using signaling and viewing devices. Operations and training should be adjusted to counter these and any other potential negative effects.

- Operators and pedestrians can become accustomed to, and may ignore, special equipment and systems such as visual and audible signaling devices.
- Operators and pedestrians can become dependent on special equipment and operator assist systems and be less likely to watch for pedestrians and moving equipment.
- Multiple signaling devices in the same area can create confusion or indifference for operators and workers.
- Constant exposure to these devices can be fatiguing to operators and workers.
- Always look in the direction of travel, even when lift trucks are equipped with audible or visual devices, or supplementary viewing equipment. None of these are adequate substitutes for looking in the direction of travel.

Other Operator Assist Systems

Telematics

Telematics can help enhance operator and truck security, as well as aiding in optimized fleet utilization and productivity. Yale offers a scalable telematics solution that can be installed on new or existing materials handling equipment. In addition to limiting truck access to trained and authorized operators, Yale Tracker can track training updates, provide impact monitoring and alerts, and incident data for route optimization. It also requires the completion of OSHA pre-shift checklists before the truck will operate.

Operator Assist Systems

Certain applications may have high volumes of pedestrian or mobile equipment, and/or complex operational rules and traffic patterns. Depending on the application, the use of operator assist systems may help enhance truck, pedestrian and other mobile equipment proximity awareness. Yale offers a suite of operator assist systems designed to reinforce proper lift truck operation and support operator awareness, tailored to the unique challenges of specific applications. This technology can limit truck performance based on equipment status, location and operating conditions, while keeping control of the truck in the hands of your properly trained lift truck operator.

Depending on truck configuration and application needs, the available options include advanced dynamic stability, traction control, hydraulic control, overload control, object detection, proximity detection, and pedestrian detection. See your local Yale dealer to learn more about the latest operator assist technology available, and whether it is suited to your workplace.

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LIFTING OF PERSONNEL WITH LIFT TRUCKS



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Lift trucks are designed and intended for handling materials. Most lift trucks are not designed to lift people.

Do not use a lift truck to lift people, except those specially designed to lift people. Yale recommends that you utilize equipment specifically designed to lift people for elevated work (scaffolds, elevated work platforms, aerial baskets, etc.).

MODIFICATIONS AND ATTACHMENTS

OSHA standard 1910.178 and ANSI / ITSDF standard B56.1 require that modifications which affect the capacity and safe operation of the truck must have the manufacturer's prior written approval. Due to the variety of factors which can affect the capacity and

safe operation of an industrial truck, check with your lift truck dealer before making any modification.

Generally speaking, putting on an attachment different from what came with the truck from the factory constitutes a modification requiring approval from the manufacturer and a new nameplate. Additionally, for electric trucks, changing from a lead-acid battery to an alternative energy storage system such as a lithium-ion battery or a hydrogen fuel cell battery box replacement constitutes a modification which requires manufacturer approval and a new nameplate listing the new power source.

Once you have written approval for a modification or attachment installation, make sure the nameplate reflects the capacity or equipment change. Your dealer can tell you whether operation and maintenance instruction tags and labels must be changed.

The use of an attachment usually requires a reduction in the lift truck's capacity rating. If you order a truck with an attachment, the truck's nameplate will show a capacity rating for the truck and attachment combined. If an attachment is installed other than at the factory, the owner or equipment dealer must get a new nameplate with the proper capacity rating for the lift truck with the attachment. If you have a question about the capacity rating of your equipment, contact your lift truck dealer.

The installation and use of electronic devices can interfere with the correct operation of electronically controlled systems of the lift truck. For safety, operator exposure to radio frequency energy must be within FCC specified limits, and truck operation must not be adversely affected. Independent labs can test for radio frequency energy levels. Contact your lift truck dealer for assistance.

OPERATOR PROTECTION EQUIPMENT

Operating Manual

An operating manual contains information necessary for the operation and maintenance of a basic forklift truck. Optional equipment is sometimes installed that can change some operating characteristics described in the basic manual. Make sure the necessary instructions are available and understood before operating the lift truck. **This manual must remain with the lift truck at all times for operator reference.** If your manual is lost or damaged, contact your lift truck dealer to obtain a replacement.

Nameplate

The capacity for the lift truck, as it is equipped, must be shown on the nameplate. If the lift truck nameplate already has a rating for special load handling equipment, it will be shown. If the lift truck nameplate does not show the capacity, or if the lift truck equipment does not match that shown on the nameplate, the lift truck must not be operated until its capacity is known. Contact your local Yale dealer for new or correct nameplates.

Warning Labels

Warning labels are installed on the lift truck to give information about possible hazards. OSHA standard 1910.178 requires that all warning labels be in place on the lift truck and are readable. Warning labels for Yale lift trucks are shown in the operating manual. Replacement labels are available from your Yale dealer.

Overhead Guards

The overhead guard is intended to offer reasonable protection to the operator from falling objects, but cannot protect against every possible impact. OSHA requires that all high-lift, rider-type trucks be equipped with overhead guards, unless the operating conditions do not permit. These guards are designed and built to meet ANSI/ITSDF standards for impact. If the facility has low clearance areas that prevent the use of an overhead guard, every effort must be made to increase clearance or avoid operating in these areas. If a change cannot be made and the lift truck without an overhead guard must be used, it must only be used in the low clearance area. Lift trucks with overhead guards must be used in all other areas. (Ref. ANSI/ITSDF B56.1)

Load Backrest

This feature is the integral part of the carriage and forks which serves to restrain the load when the mast is tilted rearward.

Load Backrest Extension

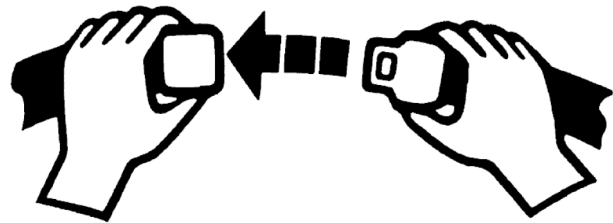
A load backrest extension increases the load restraining area beyond that provided by the load backrest. If the lift truck is equipped with a load backrest extension, it must be high enough, with openings small enough to prevent parts of the load

from falling backwards. If a load backrest extension is different from the one installed on your truck is required, contact your lift truck dealer.

Operator Restraint

The seat belt supplied on Yale sit-down rider lift trucks provides the primary means to help the operator keep the head and torso substantially within the confines of the truck frame and overhead guard if a tip-over or off-dock event occurs. This protection system is intended to reduce the risk of the head and torso being trapped between the truck and the ground, but it cannot protect the operator against all possible injuries in these situations.

Hip restraints and arm rests (when properly maintained and positioned in the down position) will help the operator resist side movement even if the seat belt is not fastened. It is not a substitute for the seat belt, which is the primary means of helping the operator stay in the lift truck during a tip-over or off-dock event. Always fasten the seat belt. When so equipped, operate the forklift with arm rests in the down position.



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If you presently own sit-down rider lift trucks which do not have operator restraint systems, speak with your lift truck dealer about acquiring a new lift truck with modern safety equipment appropriate for your operating conditions.

Battery Restraint

Battery restraint systems are installed on electric powered lift trucks. These systems are intended to hold the battery substantially within the battery compartment during the course of operation, and in the event of a tip-over or off-dock accident, thereby reducing the risk of injury. Battery restraint systems must be installed and properly maintained to protect the operator in these situations.

Fall Protection

On elevated platform equipment, such as Yale order pickers and Yale very narrow aisle operator-up turret trucks, the operator's compartment moves up and down with the forks. The operator can be at various heights above the floor up to the full height of the truck. The operator retrieves parts of the load from racks and assembles the load on a pallet or platform on the lift truck's forks. The pallet or platform must be attached to the truck with a pallet clamp or other securing device. Because of the potential for a fall, industry regulations require that elevated platform equipment be fitted with fall protection systems. Yale order pickers come standard with a full body harness and energy-absorbing tether, and very narrow aisle operator up turret trucks include a retractable tether with full body harness.

OSHA updated its fall protection requirements in 2017, and ANSI/ITSDF B56.1 updated its requirements to match OSHA with the 2018 update. The table below, found in B56.1-2020 section 4.17.2, provides personal fall protection system configurations.

Table 1(a) Personal Fall Protection System Configuration (pounds) ANSI/ITSDF B56.1-2020, section 4.17.2				
Fall Protection Prevention Device	Operator Weight (lbs.)			
	<311*		311-400*	>400*
Full Body Harness	X	X	X	Contact Truck Manufacturer
Energy Absorber max total length (6ft.)	X			
Self Retracting Lanyard		X	X	
Maximum Arresting Force Permitted (lbs.)	1800	1800	1800	
*Truck capacity must be reduced if operator weight is in excess of 220 lbs.				

NOTE: See your Yale dealer to learn more about available fall protection systems and options, as well as the individual components of the various fall

protection systems based on operator weight, operator ease of use and comfort, and your application's specific materials handling needs.

The operator must wear an appropriate harness with the tether line attached. The tether line limits how far the operator can fall and is designed to lessen the severity of the shock of the fall. Inspect the harness and tether for damage or wear daily before use, pursuant to the harness and tether manufacturer's recommendations.

Operator Presence Systems

All Yale lift trucks are equipped with an Operator Presence System (OPS) which prevents operation of the lift truck if the operator is not in the seat. For sit-down rider trucks, the OPS feature has a sensor in the seat which detects the presence of the operator. The OPS allows for forward or reverse travel and hydraulic function of the lift truck only when the operator is in the seat. The OPS is designed with a slight delay in the seat sensor to allow the operator to reposition within the seat without locking out truck functions.

For stand-up lift trucks, the OPS verifies operator presence through detection of the operator within the operator compartment. Certain stand-up lift trucks utilize light sensors to detect the presence of the operator. Other stand-up lift trucks detect the presence of the operator when the operator depresses a pedal on the floor of the operator compartment.

Always refer to the operating manual for your specific lift truck for additional information, instructions and warnings related to the OPS.

OPERATOR PROTECTION EQUIPMENT FOR UNIQUE APPLICATIONS

While operators in typical applications will appreciate the standard features included on Yale lift trucks to promote enhanced operational security, safety and productivity, not all applications in which lift trucks operate are the same. Unlike automobiles, which generally operate under common conditions and follow consistent rules of the road, lift trucks often operate in highly varied working environments and applications, each of which present unique challenges. These unique challenges drive customers to insist on application-specific lift truck solutions.

To support customers and operators in applications with unique requirements, Yale makes available special options so you can configure your worksite and equipment in the manner you deem appropriate. The "Special Equipment Options" information discussed previously (available online) lists examples of the special equipment and accessories available for Yale lift trucks. In addition to these examples, Yale Company offers a wide variety of additional special features and options for your lift truck operations. Talk with your local Yale dealer to access all options available for your Yale lift truck.

Rear Doors

Rear doors for stand-drive forklift trucks are one example of special equipment options made available by Yale Company for customers with unique, application-specific requirements. Rear doors help protect the operator from serious injury where objects (such as bar stock) may intrude into the operator's compartment. However, some workplaces are more likely to have types of accidents where quickly exiting the truck may be the best way of avoiding injury or death. These types of accidents may include those where the truck tips over or falls off a loading dock.

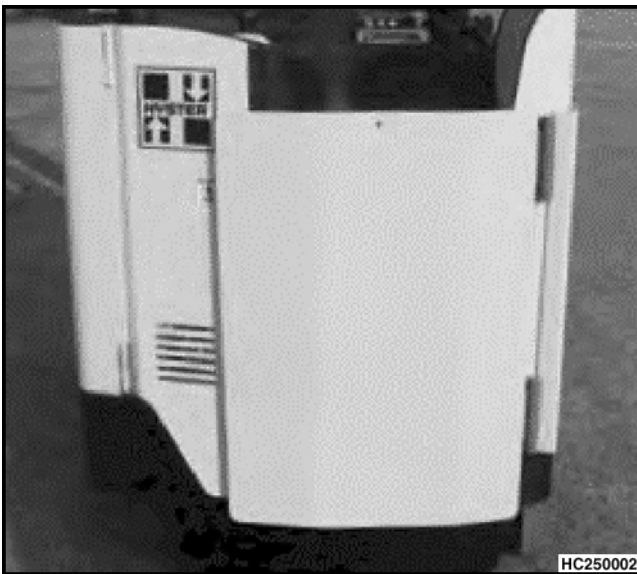


Figure 10. Rear Door

Studies have shown that the presence of a rear door slows the egress of the operator from the operator compartment. However, the optional rear door offered by Yale has been designed to permit as-quick-as-possible egress during normal operation or in the event of an accident.

Given the large variety of different warehousing applications in which customers utilize stand-up lift trucks, you, the user, are responsible for determining whether an open-back configuration or a configuration including a rear door is best suited to your unique application requirements. Accordingly, Yale makes both configurations available for selection by the customer.

You should assess your workplace environment and evaluate whether potential intrusion hazards warrant the selection of a rear door for your stand-drive trucks, compared with any risks posed by the delay in exiting a unit equipped with a door in the event of a tip-over or off-dock accident.

Rear Posts

Yale stand-up lift trucks come standard with a rear post and a heightened frame in the backrest area, which are intended to provide reasonable protection to the operator in standard warehouse shelving configurations.

In some warehouse environments, adding an additional rear post should be thoroughly investigated by your safety officer. The safety officer should take into consideration potential hazards including, but not limited to, possible pinch / contact points (such as potential for contact with the operator's head and pinch or shear point for the operator's arm), effectiveness of under-ride prevention and visibility reduction / limitations.

Make sure to consult with a racking specialist to determine the appropriate racking system for your warehouse.

Fire Extinguishers and Suppression Systems

OSHA does not require that lift trucks be equipped with fire extinguishers as standard equipment. However, depending on the application and potential situational hazards, OSHA may have requirements for fire protection in specific locations. Yale offers a lightweight yet powerful fire extinguisher. Brackets allow for convenient mounting on the lift truck.

Yale also offers fire suppression systems on certain lift trucks, for customer use in unique applications.

Paper Application Kit

Lift trucks working in the paper industry or other similar applications can be exposed to heavy dust, organic

debris, or loose flammable material and debris, such as recycled paper, wood chips, wood fibers and cotton. These types of environments can lead to accumulation of dust and debris within the engine compartment.

Yale offers a paper application kit for trucks used in these types of applications. The kit is intended to reduce the accumulation of paper or other debris in the engine compartment and to help keep debris away from the hottest portions of the engine. By doing so, the kit helps lessen the potential for ignition of the dust or debris, as long as the truck and components of the paper application kit are properly maintained and regularly cleaned.

Maintenance

Good maintenance practices are essential to keep trucks safe and productive. Maintenance procedures must also be safe for those who perform the maintenance.

TRAINED MECHANICS

Mechanics must be trained in safe maintenance and repair practices, such as securing moveable parts, proper use of tools, wearing of protective clothing, use of protective equipment, and safe operating procedures of the lift trucks and their attachments. In order for the mechanic to test drive a repaired fork lift, the mechanic must be a trained operator.

Lift trucks contain heavy components and powerful systems. OSHA standard 29 CFR 1910.147 "The control of hazardous energy" (lockout/tagout) is an important part of maintenance and repair procedures.

If your personnel lacks the knowledge, equipment, or tools to perform any maintenance, service, or repair procedure, or if they do not fully understand the task they are assigned to perform, they must not undertake the job. Your local lift truck dealer has the trained personnel, with proper equipment and tools to perform such tasks. Utilize the services of your lift truck dealer to perform tasks your personnel are not trained or equipped to perform safely themselves. Permitting untrained or improperly equipped personnel to work on lift trucks subjects them and others to an unnecessary and unreasonable risk of serious injury or death.

PRE-SHIFT INSPECTIONS

The pre-shift inspection, as required by OSHA, is an inspection of the truck and attachment by the operator or a mechanic prior to the beginning of each work shift. The purpose of this inspection is to locate conditions that can adversely affect the truck's safe operation. All such conditions must be corrected prior to the use of the lift truck. Items which must be checked are described in the maintenance section of the operating manual and the periodic maintenance section of the service manual. Records of pre-shift inspections should be maintained.

PERIODIC MAINTENANCE

Periodic maintenance is inspection, lubrication, and maintenance of the lift truck based on a specified time period or accumulated operating hours. The recommended maintenance intervals are shown in the maintenance schedule of the operating manual and the periodic maintenance section of the service manual. The recommended time intervals are based on eight hours of operation per day. The time intervals must be decreased from the recommended hours if the lift truck is used more than eight hours per day, or if the lift truck must work in dirty operating conditions.

Your lift truck dealer has the equipment and trained service personnel to do a complete program of inspection, lubrication, and maintenance. A regular program of periodic maintenance will help your lift truck provide efficient performance and operate for a longer period.

Some users have service personnel and equipment to do the inspection, lubrication, and maintenance shown in the maintenance schedule. Service manuals are available from the lift truck dealer to assist authorized and trained mechanics in making repairs.

LEAD-ACID BATTERY MAINTENANCE

Keep the battery clean, and visually inspect the battery and power cables for damage or cracks. Check to assure proper electrolyte levels are maintained. Batteries in electric powered units also require charging at regular intervals. Contact your local battery dealer for battery maintenance beyond cleaning, inspection, filling and charging.

LITHIUM-ION BATTERY MAINTENANCE

If your lift truck is equipped with a lithium-ion battery, the battery and battery system should be inspected and verified daily in accordance with the operating and maintenance manuals for your specific lift truck and battery. These manuals contain important instructions, cautions and warnings regarding the use, charging and maintenance of lithium-ion battery systems.

As part of each pre-shift inspection, confirm the following:

Check the display to ensure there are no error or fault codes displayed.

Check the State of Charge (SOC) for the battery. If the SOC is low, charge the battery before use.

Check to confirm there is no physical damage to any of the battery system components, including charging ports.

Check to confirm the battery and battery components are clean, dry, free of debris, and in good condition.

In the event your lithium-ion battery needs to be serviced or repaired, contact your local Yale dealer.

GENERAL MAINTENANCE AREAS, TOOLS, AND EQUIPMENT

A safe maintenance area includes good lighting, proper ventilation, and adequate work space. It should be clean and well organized.

Lift truck maintenance requires the use of special tools and equipment. These include heavy duty jacks, jack

stands, wheel blocks, and lifting equipment of sufficient capacity. The service of pneumatic tires requires additional equipment (see OSHA 1910.177, available online).

REPAIRS AND PARTS

Repairs

Repairs to lift trucks must only be done by mechanics who have received proper lift truck service training.

Repairs which require welding must be approved through your local dealer as some parts of a lift truck must never be repaired by welding. Persons welding on lift trucks must pass the welding certification requirements of American Welding Society standard B2.1/B2.1M "Specification for Welding Procedure and Performance Qualification."

Parts

Per OSHA 1910.178 (q)(5) "All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design."

Training

Federal and state regulations mandate documented training for all lift truck operators. In this section we summarize the Federal OSHA requirements for training as well as additional content to consider including in your operator training program. If your state has a state OSHA plan, you should also consult the requirements of your state OSHA plan to assist you in putting together compliant and effective operator training.

Federal OSHA 29CFR 1910.178 (I): This regulation requires employers to ensure and certify that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by successful completion of the specified training and evaluation. See Appendix A in this Guide for link to the full text of OSHA 1910.178(I).

This training consists of a combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video, written material), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee), and evaluation of the operator's performance in the workplace and on the type of truck the operator will use.

All operator training and evaluation must be conducted by persons who have the knowledge, training, and experience to train powered industrial truck operators and evaluate their competence.

Prior to permitting an employee to operate a powered industrial truck, employers must ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by the successful completion of the training and evaluation required by OSHA 1910.178(I).

Training program implementation: **§1910.178(I)(2)(i)**

OSHA mandates that trainees may operate a powered industrial truck only:

- *“Under the direct supervision of persons who have the knowledge, training, and experience to train operators and evaluate their competence; and*
- *“Where such operation does not endanger the trainee or other employees.”*

Training program content: **§1910.178(I)(3)**

OSHA requires powered industrial truck operators to receive initial training in the requirements of section 1910.178(I), specific truck-related topics, and specific workplace-related topics, listed for reference below.

Truck-related topics: §1910.178(I)(3)(i)

- *“Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate;”* See operator's manual for the specific industrial truck your employee will operate;
- *“Differences between the truck and the automobile;”*
- *“Truck controls and instrumentation: where they are located, what they do, and how they work;”*

NOTE: Operators must become familiar with the location and function of each control on the lift truck prior to operating the lift truck. Locations and functions of some controls may vary between types of lift trucks. Controls may include, but may not be limited to, the power on/off switch, direction control, range selection, speed, braking, steering, lifting/lowering of the forks or attachment, tilting of the mast, and attachment functions.

- *“Engine or motor operation;”*
- *“Steering and maneuvering;”*

NOTE: Most lift trucks are steered by the rear wheels and the rear of the lift truck can move to the side very fast during a turn while traveling forward. This movement is called “tail swing.” Operators must be aware of tail swing and always check to make sure the tail swing area is clear before turning.

- *“Visibility (including restrictions due to loading);”*

NOTE: Lift trucks are designed to lift and carry loads in front of the machine. There may be times when the load obstructs or reduces the operators' forward visibility. As a general rule, the truck must be operated in reverse for better visibility when a load obscures forward visibility. However, there are some tasks which require the operator to move in a forward direction regardless of forward visibility. This happens when operators are moving in and out of trailers, traveling up grades, and picking up or depositing loads. Visibility can also be restricted by building structures, storage systems, or materials. Where operators have to move in a direction in which visibility is blocked, the area must be cleared of personnel and another person (spotter) must assist the operator.

- *"Fork and attachment adaptation, operation, and use limitations;"*

NOTE: There is a wide range of lift truck attachments. All attachments require operator training prior to use. Attachment manufacturers provide training materials that can be used to help operators better understand the features and limitations of these products. Operators must also be aware of how attachments affect the capacity of the lift truck.

- *"Vehicle capacity;"*

NOTE: *On lift truck capacity:* The capacity and weight of the lift truck as equipped are shown on the nameplate. The capacity is listed in terms of weight and load center. The capacity is the maximum load the lift truck can handle. The load center of a load is determined by the location of its center of gravity. The load center shown on the nameplate is the distance from the front face of the forks, or the load face of an attachment, to the center of gravity of the load. It is also assumed that the location of the center of gravity in the vertical direction is no greater than the specified horizontal load center dimension.

Operators must know that the weight and load center of a load is within the capacity of the lift truck before the load is handled.

The weight of the lift truck is important to operators if they operate in elevators, rail- road cars, tractor trailers, on wood floors, or any elevated floor. Operators must be aware of the combined weight of the lift truck and the load being carried as they operate on different surfaces.

On some electric powered trucks, the battery is part of the counterweight. The nameplate gives the

approximate weight of the truck with the battery installed. It also gives minimum and maximum battery weights. If a battery is changed or replaced, the weight of the battery must meet the specifications found on the nameplate and must be properly located within the battery compartment.

- *"Vehicle stability;"*

NOTE: *On lift truck stability:* It is important to remember that if lift trucks are not operated properly they can tip over, which can result in serious injury or death.

Operators must be aware that a lift truck, while turning, will actually tip over easier when empty than when loaded with the load lowered.

In all cases (loaded and unloaded) stability is affected by the surface on which the truck is being operated; by turning, especially at high speeds or on an incline; by running over objects, or into overhead structures. In order to maintain stability, keep loads within the rated capacity of the lift truck, keep loads centered and balanced, keep loads at a low height when traveling, and do not tilt the mast too far forward or backward with a raised load.

Lift truck stability is affected by several factors, including the following:

Load weight and size.

Center of gravity of the load.

Position of the load on the forks.

Height of forks or attachment while traveling or turning.

Speed of the truck, especially while turning.

Sharpness of turn.

Floor or ground conditions.

Tire type and inflation pressure.

Accelerating or braking.

- *"Any vehicle inspection and maintenance that the operator will be required to perform;"*
- *"Refueling and/or charging and recharging of batteries;"*
- *"Operating limitations;"*
- *"Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of vehicle that the employee is being trained to operate."*

Workplace-related topics: §1910.178(l)(3)(ii)

Federal OSHA also requires that training cover the following workplace topics. Because these will change from worksite to worksite, this training will change from worksite to worksite.

- *“Surface conditions where the vehicle will be operated;”*
- *“Composition of loads to be carried and load stability;”*
- *“Load manipulation, stacking, and unstacking;”*
- *“Pedestrian traffic in areas where the vehicle will be operated;”*
- *“Narrow aisles and other restricted places where the vehicle will be operated;”*
- *“Hazardous (classified) locations where the vehicle will be operated;”*
- *“Ramps and other sloped surfaces that could affect the vehicle’s stability;”*
- *“Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust;”*
- *“Other unique or potentially hazardous environmental condition in the workplace that could affect safe operation.”*

ADDITIONAL TRAINING TOPICS

In addition to providing a thorough education of all topics required by federal and state OSHA regulations, a professional trainer will also cover additional topics important to lift truck operators. Yale Company recommends that the following additional topics immediately below, as well as those listed in the General Lift Truck Operation section and in the Safety – Key Training Points section, be covered as part of an effective, comprehensive operator training program.

Pre-Shift Inspection

A pre-shift inspection is an OSHA requirement and a fundamental for safe, productive lift truck use. Lift truck operators must know how to perform the pre-shift inspection. Operators must be trained on and understand that if anything affecting the safe use of the truck is found, the truck must be taken out of operation immediately (truck tagged out and key removed). The fault must be repaired by a trained

mechanic prior to the unit being placed back in service.

Typical procedures for conducting a pre-shift inspection are covered in operating manuals for Yale lift trucks. Items to be checked include, but are not limited to:

- The operator protection equipment.
- Fork condition and wear.
- Tire condition and pressure.
- Fluid levels.
- Fuel levels.
- Battery condition and electrolyte level.
- Steering.
- Controls and instruments.
- Overall check for cracks, damage or leaks.
- Brake operation.
- Correct operation of the lift mechanism.

Always refer to the Operating Manual for pre-shift inspection procedures and precautions.

Operator Protection Equipment

Operators must become familiar with the lift truck equipment and instructions that are designed to help protect them. These items include information in the operating manual, the overhead guard, load backrest, operator restraint system, the battery restraint system, and various warning labels that provide the operator and mechanics with pertinent safety information.

Audible and Visual Signaling Devices

All Yale lift trucks come equipped from the factory with an operator-controlled horn. This device should be used to alert pedestrians and operators of other equipment in the presence of the lift truck. Also, use the horn at blind corners and busy intersections. In addition, lift trucks can be equipped with other devices such as flashing lights or audible alarms. Operators must know they cannot rely on signaling devices to clear a path when operating near pedestrians or fellow workers. Operators must continue to use caution and maintain a proper lookout and control of the truck at all times. See Equipment Considerations, Audible and Visual Signaling Devices, above.

General Lift Truck Operation

In addition to instruction on general lift truck operation, operators being trained need to operate the machine and have a closely supervised opportunity to practice the tasks required to do their job.

General safety points are found in the OSHA standards, in ANSI/ITSDF B56.1, in the Operating Manual, and on the warning labels on the lift truck. Key points are detailed below.

Trained Operators Only

It is important to stress that only trained and authorized operators, pursuant to OSHA 1910.178(l), are allowed to operate powered industrial lift trucks. Lift trucks are serious industrial tools that require professionally trained operators for safe, productive operation. Allowing untrained or unauthorized persons to operate lift trucks is an unsafe and illegal practice and puts the operators and those around them in danger.

Operator Instructions

Operators must read, understand, and follow the operating manual instructions and warning labels on the unit prior to operating the truck. If operators have any questions about proper and safe use of a lift truck, they should contact their supervisor. If supervisors have questions, they should contact their lift truck trainer or their local Yale dealer.

Refueling:

Gasoline/LPG/Diesel/Hydrogen

General safety information regarding gasoline, LPG and diesel fuels is covered in the lift truck operating manual. Additional safety information may be found in the standards listed in the Standards section above. For trucks powered by hydrogen, consult the applicable hydrogen fuel cell operating manual. Caution must be exercised to ensure that operators follow all safety rules when refueling lift trucks. Improper refueling of trucks powered by gasoline, LPG, diesel, or hydrogen fuel can lead to a fire or explosion.

Battery Changing/Charging

As with refueling, general safety information for checking, changing, and charging batteries is covered in the operating manuals for the lift truck and battery. Further general and safety information can be found in NFPA 70 and 505.

Leaving the Truck

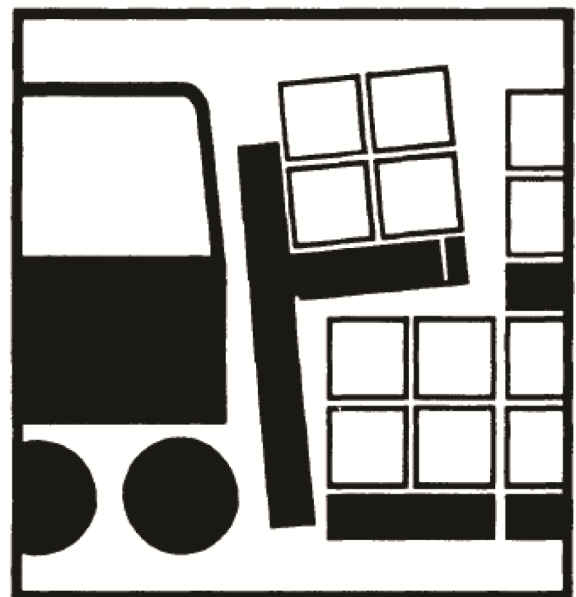
Whenever the operator leaves the truck, the forks or attachment must be fully lowered and tilted forward (fork tips must touch the ground), the controls must be in neutral and the parking brake set. If the operator goes more than 25 feet from the truck or out of sight of the truck, the power must be shut off, and the LPG tank valve (if LPG fueled) must be closed. If electric powered, turn the key switch to off or disconnect the battery.

Yale strongly recommends that trucks not be parked on inclines. However, if a lift truck must be left on an incline, set the park brake, put blocks/chocks on the downhill side of the wheels, and lower the attachment and carriage to the ground so that the lift truck cannot move.

Visibility

Operators must always look in the direction of travel and have a clear view of the path in which the lift truck is traveling. A spotter must be used when forward travel is necessary with a view-obstructing load.

Load Handling



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Instruct operators to handle only stable and safely arranged loads within the rated capacity of the truck. Operators must never be asked to handle loads that are heavier than the lift truck's rated capacity. Other load handling instructions include the following:

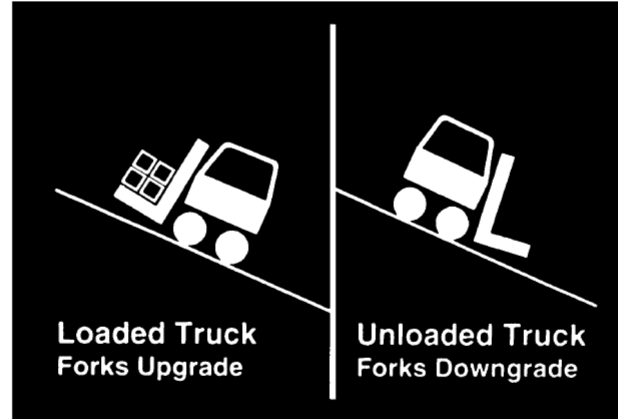
- When handling long, wide or high loads, watch all clearances and be aware that these loads may affect the handling characteristics of the lift truck.
- When picking up a load, the forks must be placed under the load as far as possible with the mast carefully tilted backward just enough to stabilize the load.
- Caution must be used when the load is raised. An elevated load must not be tilted forward except when it is in the correct position to be deposited. When stacking, use only enough backward tilt to stabilize the load.
- Travel with the load lowered. Keep the load against the carriage and the mast tilted fully backward. This will help keep the load on the forks and give good forward and side stability. Travel with the lift mechanism raised only enough to clear the ground or obstacles.

Elevators

Operators must be aware of elevator weight limits. They must also know the combined weight of the load, the truck (see nameplate), and the operator. If an operator is not absolutely certain the elevator will handle the lift truck, he must not enter it.

Elevators must be approached slowly and entered squarely. Once on the elevator, the truck's controls must be placed in neutral, the power shut off, and the parking brake set. Motorized hand trucks must enter the elevator with the load end forward.

Travel on Grades

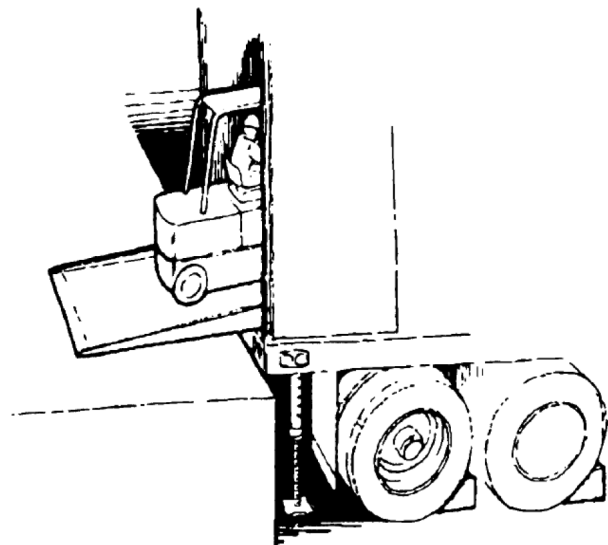


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Operators must be instructed on the following:

- Travel up and down grades slowly.
- Do not turn the lift truck on a grade.
- When travelling on a grade greater than 10 percent loaded trucks must be operated with the load up- grade in both forward and reverse travel. The only exception is the operation of powered pallet trucks. In this case, the operator must always be upgrade of the truck.
- Unloaded units must travel with the forks or attachment downgrade.
- The load must be fully tilted back and raised only as high as necessary to clear the surface.

Loading Dock Operations



BO193339

Docks present special problems, especially if they are located outdoors. Operators must know the rules for the dock area and be warned of the potential hazards involved.

Docks that are wet or icy can become slippery causing the truck to slide or skid.

Operators must be trained to maintain a safe distance from the edge of docks, ramps, platforms and other similar working surfaces, to travel slowly on dock plates and bridge plates, and to watch out for tail swing.

Before entering a trailer operators must ensure the following:

- The trailer is squarely aligned with the dock.
- If the tractor is not attached to the trailer, the trailer landing gear must be secure and jacks in place, front and rear, as necessary.
- Levelers, dock plates, and ramps are in place and secured.
- The trailer has been secured to the dock by either a trailer restraint system or by blocked wheels.
- Dock plates are marked with maximum capacity and securely in place.

Lifting Personnel

Yale recommends against the use of lift trucks for lifting people (other than lift trucks specially designed for that purpose, such as order pickers). If you choose to go against this recommendation and lift people, you must ensure the following:

- A safety platform that fully conforms to ANSI/ITSDF B56.1 and any local requirements must be utilized, and must include the following:
 - a solid floor with a surface to prevent the feet of the worker from slipping,
 - handrails,
 - toe board, and
 - a screen or shield at least 7 feet high between the people on the platform and the lift mechanism.
- The platform must be attached to the forks and carriage.
- While empty, the platform must be raised and lowered to confirm the mast functions properly.
- The lift truck has been correctly positioned on a flat, level surface and the parking brake has been applied.

- No overhead obstructions exist.

During the entire lifting operation, operators must stay with the truck to operate the controls and prevent the lift truck from moving. Most lift trucks sold and on the market today do not have an automatically applied park brake, so an operator who either leaves the lift truck or who neglects to set a manually applied park brake jeopardizes the safety of the individual raised up in the safety platform.

Never lift people who are standing on the forks of the lift truck. Never lift people other than in a safety platform that fully conforms to ANSI/ITSDF B56.1.

Safety - Key Training Points

Lift truck safety has been discussed as applied to owners, operators, mechanics, and those who work in or visit areas where lift trucks operate. This recap will again point out potential hazards which must be of concern to all involved in your operation.

Fire Hazard Areas

Fire hazard areas must be identified and marked. Lift trucks which operate in fire hazard areas must be equipped and marked the same as or higher than the classification of the area. Employees must be trained on appropriate use of properly rated lift trucks in fire hazard areas. See discussion above on this topic (Employer's Operation, Facilities, Fire Hazard Areas).

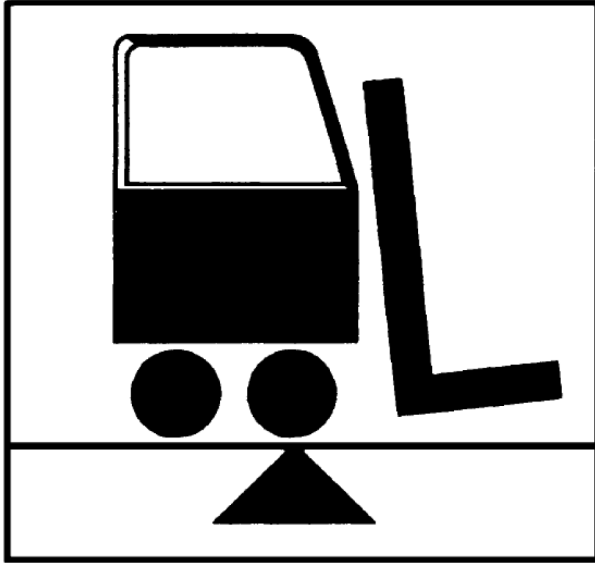
Faulty Equipment and Maintenance

Operators must understand that if their truck is not functioning properly, they must stop the truck immediately and report the problem to their supervisor. The truck must be taken out of service until repaired (truck tagged and key removed).

Operating Surfaces

All lift truck operating surfaces must be in good condition and be capable of supporting the truck, operator, and the load.

Loads



BO193340

Operators must:

- Know the weight and center of gravity of the load.
- Center the load evenly on the forks.
- Adjust the forks as required for the load.
- Make sure that loads stacked on pallets are stable before lifting them.
- Be aware that long, wide or high loads can affect the stability of the lift truck. These loads also require that special attention is given to clearances while traveling.
- Move slowly and smoothly when turning.
- Watch overhead clearances.

Parking Lift Trucks

Lift trucks must be parked in a safe position. Operators must know to:

- Stop the truck and apply the parking brake.
- Fully lower the forks or attachment.
- Tilt mast forward until the fork tips touch the ground.
- Powershift transmissions should be placed in neutral (if so equipped).
- Shut off the power by turning the key switch to off. Remove the key to prevent unauthorized use.

- Do not park on an incline. If the truck must be left on an incline, put blocks/chocks on the downhill side of the wheels and lower the forks/carriage so the truck cannot move.
- If the lift truck is equipped with an LPG fuel system and is parked more than momentarily, close the fuel valve at the tank. If the lift truck is going to be left overnight or longer, the truck must be parked outside or the LPG tank must be removed and stored outside.
- Do not park the lift truck so that it limits access to fire aisles, stairways and fire equipment.

Grades, Ramps, Slopes, and Inclines

When operating on grades:

- ☒ Travel slowly.
- ☒ Never turn; travel straight up and down.
- ☒ Without a load, travel with the forks pointing downgrade.
- ☒ With a load, travel with the load pointing upgrade (does not apply to pallet type units).

Pedestrians



BO193342

The best method for preventing accidents involving pedestrians and lift trucks is to completely separate pedestrians from lift truck operating areas. However, where lift trucks and pedestrians must be in the same area, both parties must be aware of the other's presence and lift trucks should operate at a lower speed. Both have a responsibility for safety and must work in cooperation with each other.

Operators must be aware that they are responsible for the safety of co-workers and other pedestrians. Operators should be alert for, and report, any observed unsafe conditions or near accidents.

Operators must be trained to:

- Use designated equipment aisles.
- Use extra caution at crosswalks and blind intersections; sound horn, slow speed.
- Be watchful for pedestrians at all times. Always look in the direction of travel. If you can't see, don't move.
- Use a spotter when necessary to move forward when view is blocked by load or don't move.
- **Never** allow pedestrians to be near a running or moving truck. When turning, always make sure pedestrians are clear of tail swing.
- If lift trucks must operate in close proximity to pedestrians, make certain pedestrians are aware of truck presence before moving, and move **slowly**.
- **Never** move when someone is positioned directly in front of, or to the rear or sides of the truck.
- Keep pedestrians well away from the mast and load area, even when stationary.
- **Always** maintain control of your lift truck.

Loading Dock Operations

Operators must maintain a safe distance from the edge of the dock. Employers must make sure that docks are kept clean and well maintained. Trailers and railroad cars must be restrained from moving.

Lift Truck Tipover



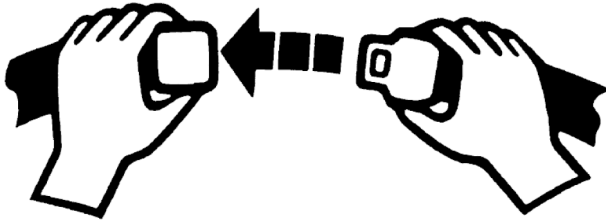
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Operators need to know that failure to follow all safety precautions can cause a lift truck to tip over. For sit-down rider trucks, instruct operators that if the truck tips over, do not jump off! Hold firmly to the steering wheel, brace your feet, and lean forward and away from the point of impact. For stand-drive trucks, instruct the operator to step off or jump clear of the truck in the event of a tip-over, or in the event of an off-dock accident in which the unit is traveling forks-leading.

Rear Doors

Operators of stand-drive trucks equipped with rear doors should be instructed to step off or jump clear of the truck in the event of a tip over, or in the event of an off-dock accident in which the unit is traveling forks-leading. Because of the absence of known scientific data, it is not possible to provide guidance as to whether an operator should either attempt to exit the truck or attempt to stay within the operator's compartment in the event of an off-dock accident in which the truck is traveling with forks trailing. Operators should also be instructed to inspect any rear doors installed on trucks they will operate for proper operation. A rear door that does not properly open and close can create significant additional hazards and must be properly serviced before further operation of the lift truck.

Seat Belts



BO193344

Operators must be instructed to always fasten the seat belt, as it will reduce the risk of entrapment of the head and torso in case of a tip-over. The seat belt is the operator's primary means of staying inside a sit-down rider truck during a tip-over.

Stunt Driving and Horseplay

Stunt driving and horseplay must not be permitted. Employers and operators must take safety seriously. Playing games with lift trucks could cause serious injury or death.

Carbon Monoxide Gas

Employees must understand that internal combustion powered units must not operate in enclosed, inadequately ventilated areas. Carbon Monoxide is a colorless, odorless, poisonous gas which can seriously or fatally injure employees without warning.

Operator Training and Evaluation

OSHA makes it clear that you, the employer, are responsible for ensuring the operators are properly trained and certified pursuant to OSHA 29 CFR 1910.178(l).

Your training program should provide complete safety and operational instruction. It should demonstrate proper equipment checks, establish awareness of hazardous situations, provide the unique rules of operation in your specific applications, and encourage a safe environment. It must also include an evaluation process to assure operators have acquired the knowledge, skill, and understanding they need to safely operate the material handling equipment in your application.

An effective evaluation should consist of a combination of formal instruction, practical training, and evaluation of the operator's performance in the workplace. Refer to OSHA 29 CFR 1910.178(l).

Your training program should also include periodic retraining (at least once every three years) of all operators, to reinforce safety practices and to introduce any procedural changes to strengthen the program.

There are many added benefits to a good training and evaluation program: increases in operator productivity and efficiency, promotes longer truck life, and reduced load damage.

Yale offers a basic operator training program that satisfies both OSHA 1910.178 and ANSI/ITSDF B56.1 training requirements and meets your tough standards.

For more information on lift truck operator training, contact your Yale Lift Truck Dealer.

Appendices

APPENDIX A

Occupational Safety and Health Act 29 CFR §1910.178, Powered Industrial Trucks

<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.178>



BO211434

Appendix A - Stability of Powered Industrial Trucks:
Non-mandatory Appendix to Operator Training requirements found in OSHA 1910.178(l)

<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.178AppA>

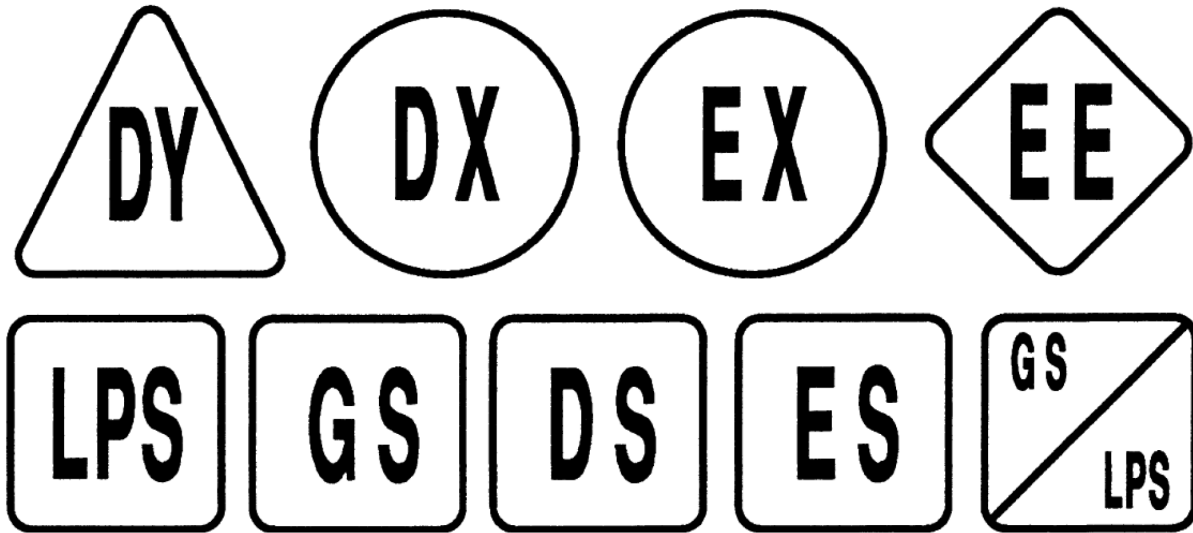


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APPENDIX B

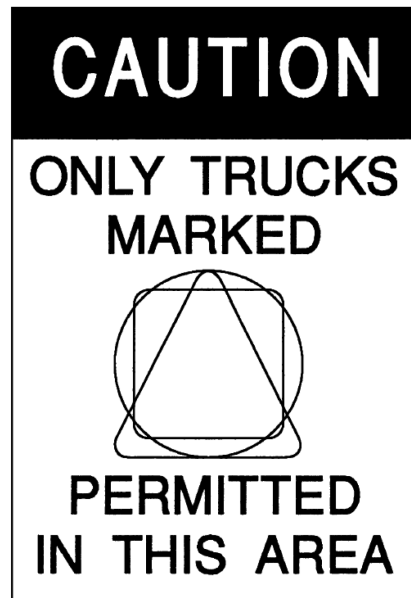
Markings of Types DS, DY, DX, ES, EE, EX, GS, LPS, and GS/LPS Industrial Trucks and Their Areas of Use

See OSHA 1910.178 (link found at Appendix A of this Guide) for explanation of Class and Type designation.



BO193336

Figure 20. Markers to Identify Types of Industrial Trucks



BO193334

Figure 21. Building Signs for Posting at Entrance to Hazardous Areas

APPENDIX C

CARBON MONOXIDE GAS

Exhaust gas from all engine-powered lift trucks contains carbon monoxide in normal operation. Carbon monoxide is a colorless, odorless, poisonous gas that can cause unconsciousness or death without warning. The initial symptoms of exposure to carbon monoxide are flu-like and include headache, dizziness, fatigue, nausea, and disorientation. Carbon monoxide is especially hazardous to those with heart and respiratory ailments. If symptoms occur, engines and other sources of carbon monoxide should be shut off and immediate medical attention sought for affected personnel. Your prompt attention to employee complaints of symptoms and to eliminating sources of excessive carbon monoxide can be vitally important.

Carbon monoxide depletes the available oxygen in air in enclosed areas without adequate ventilation, and can quickly become dangerously concentrated in trailers, coolers, freezers, and unventilated buildings. OSHA specifies a time-weighted average 8 hour worker exposure level to carbon monoxide of 50 ppm (parts per million) (0.005%) maximum. See Human Response to Carbon Monoxide Table. Adequate ventilation must be provided when operating any engine-powered lift truck in an enclosed area.

OSHA requires employers to maintain a safe work environment, which includes providing adequate ventilation to prevent the buildup of carbon monoxide and other harmful air contaminants. Carbon monoxide levels must not exceed those specified in CFR1910.1000, Appendix C. A qualified industrial hygienist should be consulted to determine carbon monoxide concentrations levels and means of providing adequate ventilation.

Table 1. Human Response to Carbon Monoxide

Concentration of CO in Air	Inhalation Time and Toxic Symptoms Developed
50 ppm	Maximum allowable concentration for continuous exposure for healthy adults in any 8 hour period, according to OSHA.
100 ppm	Slight headache within 2 to 3 hours.
400 ppm	Frontal headache within 1 to 2 hours, becoming widespread in 2.5 to 3.5 hours.
800 ppm	Dizziness, nausea, and convulsions within 45 minutes.
1600 ppm	Headache, dizziness, and nausea within 20 minutes. Death within 30 minutes.
6400 ppm	Headache, dizziness in 1 to 2 minutes. Death in 10 to 15 minutes.

Engine carbon monoxide emission can change with engine use and maintenance. Recommended engine maintenance intervals and procedures must be followed, and carbon monoxide emissions checked against specified limits. Fuel, ignition, and exhaust systems should not be altered, as increased engine carbon monoxide emission levels can result. Operator complaints about exhaust smell indicates that carbon monoxide may be present in more than normal amounts; check truck exhaust emissions and operating areas for carbon monoxide levels.

