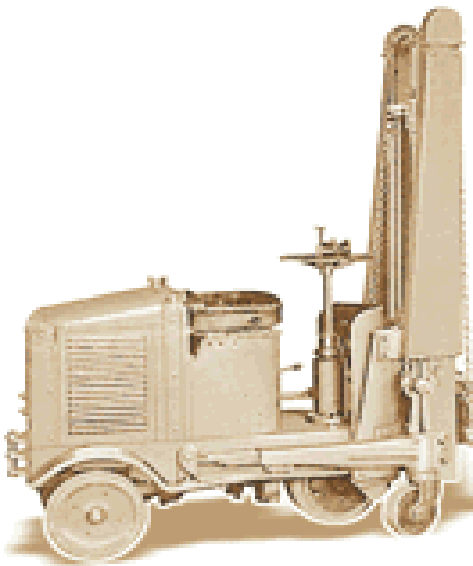


Forklift Safety

A review of safe operations and work practices when operating and working around powered industrial trucks.



1924



2004



Presented by the Public Education Section
Oregon OSHA
Department of Consumer and Business Services



Oregon OSHA Public Education Mission:

We provide knowledge and tools to advance self-sufficiency in workplace safety and health

Consultative Services:

- Offers no-cost on-site assistance to help Oregon employers recognize and correct safety and health problems

Enforcement:

- Inspects places of employment for occupational safety and health rule violations and investigates complaints and accidents

Public Education and Conferences:

- Presents educational opportunities to employers and employees on a variety of safety and health topics throughout the state

Standards and Technical Resources:

- Develops, interprets, and provides technical advice on safety and health standards
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health rules

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Introduction

Whether you call them jitneys, hi los, forklifts, or lift trucks, powered industrial trucks are as widely used as your debit card. It seems everywhere you look these days, lift trucks are unloading trailers at department stores, tiering product in a warehouse, or loading material at a construction site. Powered industrial trucks are also moving lumber in a sawmill and dropping stock in a grocery store aisle.

With well over one million lift trucks in operation today, emphasis must be placed on both worker and pedestrian safety. This program will help you understand OR-OSHA safety and health regulations governing these pieces of equipment in addition to providing you with assistance in developing training for your lift truck operators and other affected employees.

Objectives:

- ☒ Review OR-OSHA Div 2/Sub N 29 CFR 1910.178 Powered Industrial Trucks
- ☒ Discuss fundamental safe work practices for the operation of powered industrial trucks

A special thank you to Norlift of Oregon, Inc., The Hyster Company, and The Halton Company for the use of their materials and extensive knowledge. Craig Hamelund, OR-OSHA Public Education



The Powered Industrial Truck

A powered industrial truck is defined as a mobile, power-driven vehicle used to carry, push, pull, lift, stack, or tier material. *Vehicles NOT covered by the Powered Industrial Truck standard are compressed air or nonflammable compressed gas-operated industrial trucks, farm vehicles, and vehicles intended primarily for earth moving or over-the-road hauling.*



Norlift of Oregon, Inc.



Manitou

Please Note: This material or any other material used to inform employers of safety and health issues or of compliance requirements of Oregon OSHA standards through simplification of the regulations should not be considered a substitute for any provisions of the Oregon Safe Employment Act or for any standards issued by Oregon OSHA.

Pictures on cover courtesy of Clark and Norlift of Oregon, Inc.

General Requirements

Design and construction of powered industrial trucks must be in compliance with the current revision of *ANSI B56.1. ASME B56.1-1993, Safety Standard for Low Lift and High Lift Trucks, is the latest revision.*

All nameplates and markings must be in place and _____.

All modifications and additions which affect the safe operation and capacity must be approved by the manufacturer.

- *data labels must be changed accordingly*
- *the approval must be in writing*

If using front-end attachments (other than the manufacturers'), the truck must be marked identifying the attachment and listing the approximate combined weight of the truck and attachment at maximum elevation with a centered load.



A winch was welded on the boom of this telescoping truck without the manufacturer's approval.

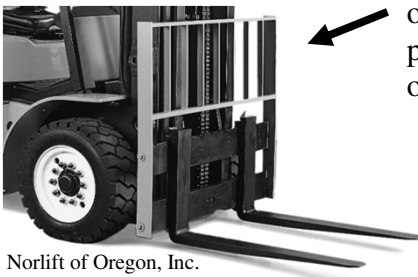
FOPS



Most vertical mast forklifts are equipped with FOPS (Falling Object Protective Structure).

What does FOPS protect you from?

What does FOPS **not** protect you from?



A load backrest (LBR) must be provided when handling small objects or unbanded units. The LBR must be capable in size and strength to prevent the load, or any part of the load from falling toward the operator.

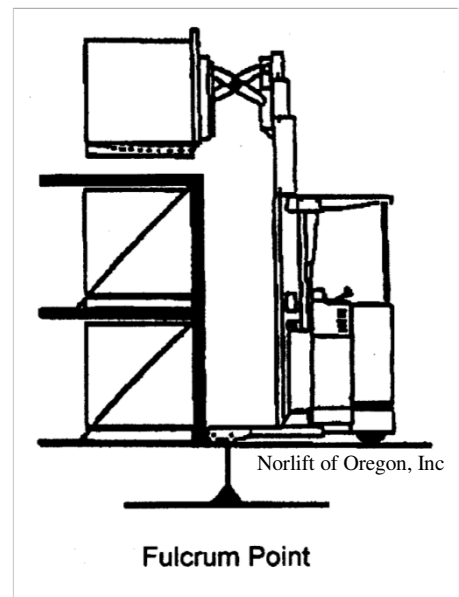
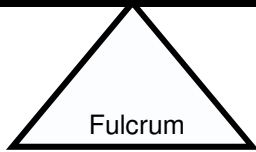
NOTE: Both the FOPS and LBR must not interfere with the operator's visibility and guard openings must not be larger than 6 in. in one of the two dimensions. More specifications can be found in OR-OSHA Div 2/Sub N OAR 437-002-0227(1) & (2).

Stability

1. Balancing Both Ends

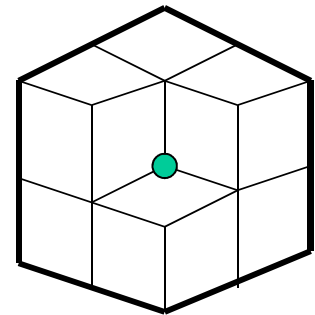
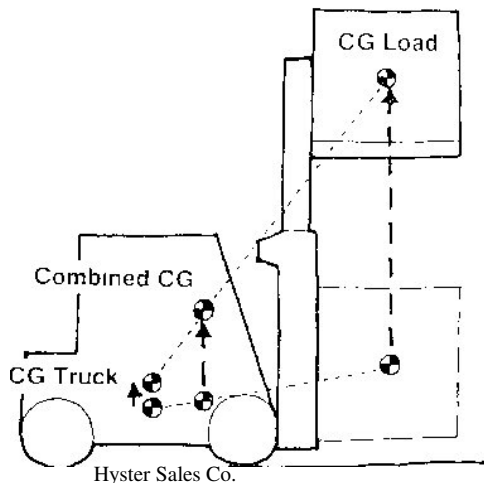
The lift truck is based on the principle of two weights balanced on opposite sides of a pivot point (_____). The forward wheels are the *fulcrum*. This is the same principle used for a teeter-totter. In order for this principle to work for a lift truck, the load of the forks must be balanced by the weight of the lift truck.

A properly loaded lift truck does not exceed the rated capacity of the truck (as listed on the truck's data plate).



2. Balancing In All Directions

The _____ (CG) of any object is the single point about which the object is balanced in all directions. Every object has a CG.



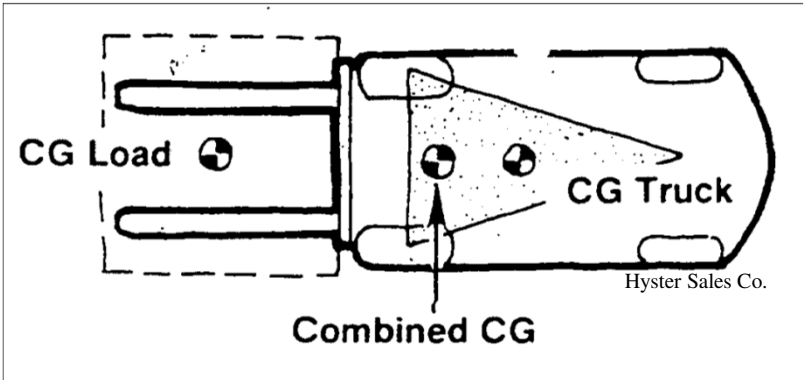
The lift truck has moving parts and therefore has a CG that moves. The CG moves forward and back as the upright is tilted forward and back. The CG moves up and down as the upright moves up and down.

Stability

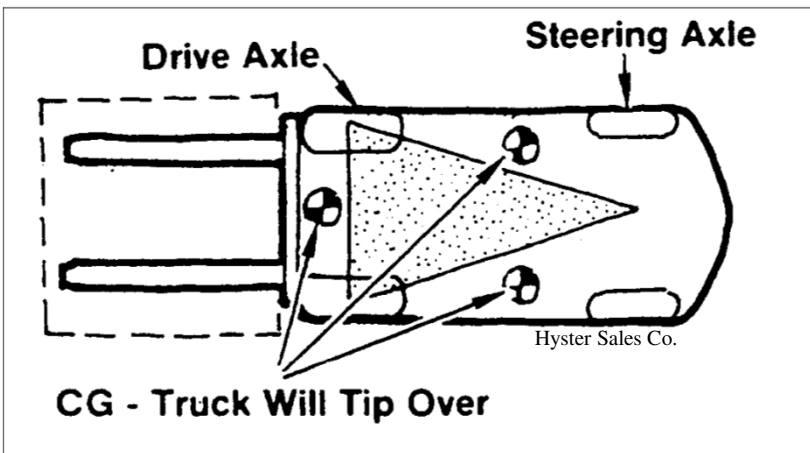
3. Our Triangle on Wheels

When the lift truck picks up a load, the truck and load have a new **combined** CG. The stability of the lift truck is determined by the location of its CG, or if the truck is loaded, the **combined** CG.

In order for the lift truck to be stable, the CG must stay within the area represented by a triangle drawn between the drive wheels and the pivot of the steering axle. This triangle is routinely called the _____.



- ❑ Think of riding a tricycle around corners. If you lean forward you will overturn as you moved your CG to the narrowest portion of the tricycle. If you lean back, applying your CG over the two rear wheels, you are less likely to tip as you moved your CG to the widest portion of the tricycle.



If the CG moves forward of the drive axle, the truck tends to tip forward (longitudinal). If the CG moves outside of the stability triangle, the truck tends to turn on its side (lateral).

What factors have caused trucks to tip forward?



What factors have caused trucks to tip over on their side?



Stability

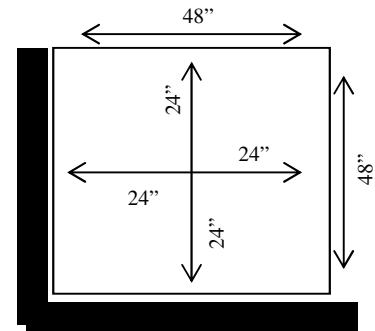
The center of gravity, and therefore the stability, of the loaded truck is affected by a number of factors including size, weight, shape, and position of the load. Also, the height to which the load is elevated, the amount of forward or backward tilt, tire pressure, and the dynamic forces created when the truck is moving. These dynamic forces are caused by things like acceleration, braking, operating on uneven surfaces or on an incline, and turning. These factors must be considered when traveling with an unloaded truck, as well, because **an unloaded truck will tip over to the side easier than a loaded truck** with its load in the lowered position.

A recent test was done at a lift truck manufacturer's technical center involving a 5000 pound capacity, unloaded lift truck. The three-stage mast was fully extended and tilted back. One man was able to tip the truck over by simply grabbing and pulling on the overhead guard.

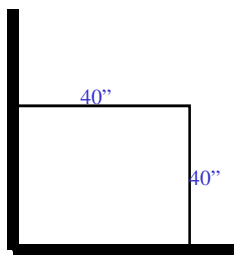
4. Load Center

The distance from the front face of the forks (or the load face of an attachment) to the center of the load is called the _____. The load center is determined by the location of the CG of the load. Most lift trucks are rated at a load center of 24 inches.

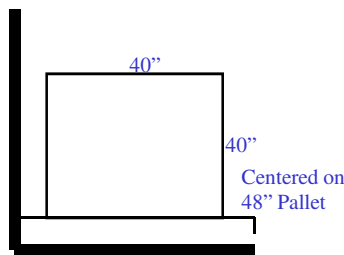
When the load is carried at a greater distance than the load center, the maximum capacity of the truck is _____. The use of special attachments instead of forks will also _____ the nominal capacity of the lift truck.



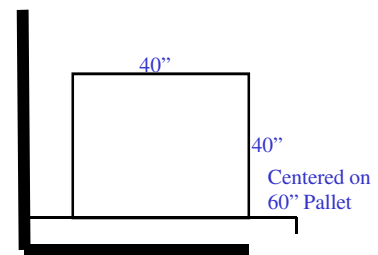
Let's take a look at this 7000 lb. load...



Load Center? _____
Capacity = 8050 lbs.



Load Center? _____
Capacity = 7350 lbs.



Load Center? _____
Capacity = 6550 lbs.

The capacity is the maximum load the lift truck can handle. The capacity of the lift truck, at load center, is shown on the **data plate**. The capacity is listed in terms of weight and load center at a specified load height.

Load Center → *Reverse it* → **Center of the Load**

Operator Seat Restraints

OSHA's Powered Industrial Truck safety standard does not *specifically* require the use of seat belts; however, employers are required to protect workers from serious and recognized hazards as well as require all employees to make full use of safety devices. The current version of ASME B56.1-1993 does contain provisions for operator restraint use.

Furthermore, employers are expected to strictly adhere to equipment manufacturer recommendations. Most (if not all) industrial truck manufacturers recommend the use of operator restraints and install operator restraint systems on new sit down trucks. Depending on the manufacturer, operator restraints normally include seat belts and side seat retention devices. Most (if not all) manufacturers offer *approved* conversion kits for older models.

If your truck comes equipped with seat restraints, **employees must use them when exposed to an overturn hazard or traveling in areas where an operator can be thrown from the operator's compartment.** If your existing trucks are not equipped with seat restraints and your employees operate the trucks in areas where overturning or being thrown from the truck is possible (i.e. the dynamic forces associated with an unloaded truck, unguarded docks & ramps, unstable loads, uneven terrain, other vehicle traffic, etc.), it is recommended to contact your manufacturer representative for an *approved* conversion kit.



Norlift of Oregon, Inc.

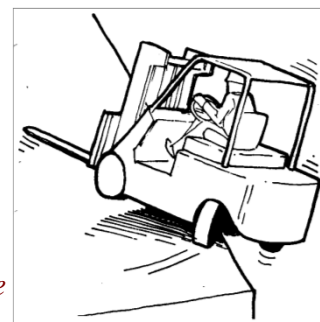
OR-OSHA can cite employers for not requiring/enforcing seat restraint use when operators are exposed to hazardous areas where overturning or being thrown from the truck can occur. In addition to evaluating other contributing factors, the Compliance Officer will evaluate training and supervision to substantiate a citation.

OR-OSHA can also cite employers for not taking advantage of the approved retrofit kit if any of those hazards exist.

Bottom Line - Effective Training & Supervision. Competent operators should be able to recognize those hazardous areas or exposures where overturning or being thrown from the truck can exist.

Evaluating the potential hazards:

- ▣ *Speed*
- ▣ *Loading docks*
- ▣ *Ramps/Inclines*
- ▣ *Other vehicle traffic*
- ▣ *Defined traffic lanes*
- ▣ *Driving surface (rough or uneven)*
- ▣ *Tight areas*
- ▣ *An unloaded truck is less stable than a properly loaded truck!*
- ▣ *Speed bumps*
- ▣ *Debris in roadway*
- ▣ *Tire pressure*
- ▣ *Railroad tracks*
- ▣ *Potholes*
- ▣ *Slick surfaces*
- ▣ *CG outside of stability triangle*



Hyster Sales Co.

- Is my trainer(s) qualified? How have my operators been determined competent?
- Are we evaluating our operators and training program in regards to seat belt use?

Safe Operations

Picking up a load

- Ensure the load does not exceed the forklift's capacity
- Ensure forks are positioned properly
- Ensure the load is balanced and secure
- Ensure bottom of the load is _____ to the proper traveling height
- Drive as far into the load as possible
- Slightly tilt _____ and lift
- Back, stop, and lower load 2-6 inches from the floor

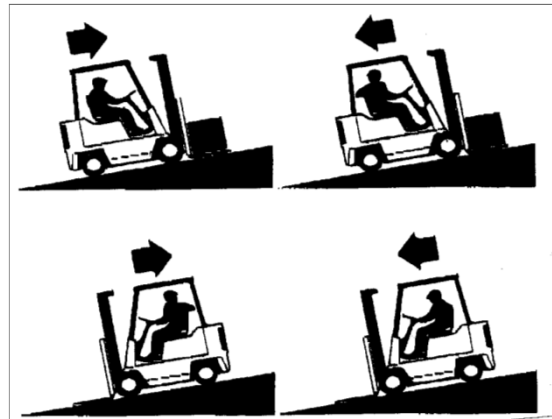


Earthworks Training and Assessment Services

Before backing up, check _____ and on both sides for pedestrians or other traffic

Traveling with a load

- The operator and pedestrians must _____
- No riders/passengers
- Travel at walking speed
- All traffic regulations must be met, including plant speed limits (if established)
- Maintain at least _____ truck lengths
- Be aware of the traveling surface
- Keep the load slightly off grade
- Avoid sudden braking
- Turn in a sweeping motion
- Keep the load slightly tilted back
- Sound _____ when approaching corners and blind areas
- Lift and lower the load only when stopped



Hyster Sales Co.

When traveling with a load, drive up and back down inclines and ramps

Placing and stacking a load

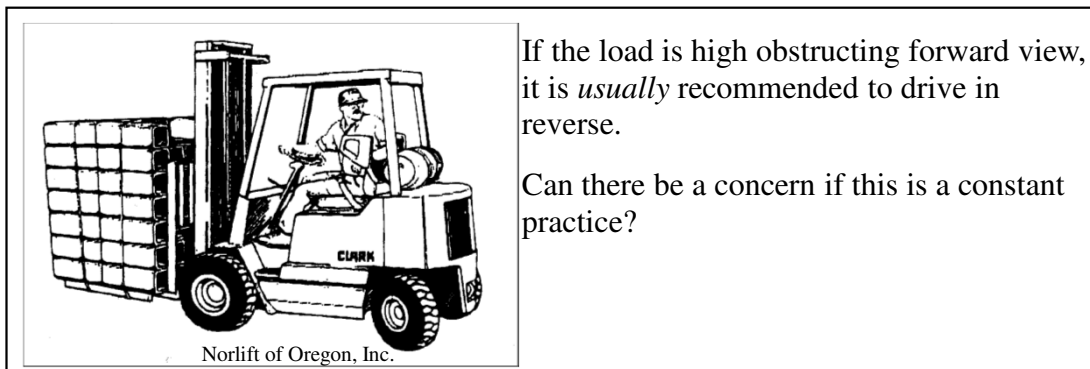
- Completely stop before raising a load
- Never walk, stand, or allow anyone to pass _____ a raised load
- Move slowly after raising the load
- Tilt forward, level only when over a stack or rack
- Make sure forks have cleared the pallet when backing out & before turning or changing height
- Before backing up, check _____ and on both sides for pedestrians or other traffic
- Caution must be exercised when handling unusually shaped and off center loads

Always stack the load square and straight



Safe Operations

- Only loads within the rated capacity must be handled
- Trucks equipped with _____ must be operated as partially loaded trucks even when unloaded
- Avoid running over loose objects
- Under all travel conditions, the truck must be operated at a speed that will permit it to be brought to a stop in a safe manner
- No horseplay or stunts
- Cross railroad tracks _____
- Never park closer than eight feet from tracks
- Right of way must be given to emergency vehicles
- Keep arms and legs from the mast and within the running lines of the truck
- Never drive up to someone standing next to a fixed object
- Powered hand trucks must enter enclosed areas load end forward
- Never pass another truck traveling in the same direction at blind corners, intersections, or other dangerous areas
- Lower forks, neutralize controls, shut off, and set brakes (block if on an incline) if truck will be unattended



Lifting People

- A work platform equipped with a standard railing firmly secured to the carriage or forks must be used
- Falling object protection must be provided if a hazard exists
- An operator must attend the forklift while workers are on the platform
- The operator must be in the normal operating position while raising/lowering the platform
- A guard must be provided between the worker(s) and the mast if exposure to the chains and/or shear points exist
- Maintain stability of the truck and ensure the load capacity is not exceeded (account for platform, workers, materials, etc.)



Some trucks are designed to lift workers.



Training

Federal OSHA proposed the revised training rule in the Federal Register on 12/1/98. Oregon OSHA adopted this rule by reference effective 5/26/99. The date by which employers were required to be in compliance with this revised rule was 12/1/99. OR-OSHA's revised operator training requirements {Div 2/Sub N 29 CFR 1910.178(l)} apply to general industry, construction, and maritime activities.

OSHA estimates compliance with this revised training rule will prevent fatalities and injuries to the nearly 1.5 million employees who operate forklifts. Furthermore, complying with this revision will reduce the significant risk of death and injury to others caused by the unsafe operation of powered industrial trucks driven by untrained or inadequately trained operators.

Based on the number of forklifts (1 million), approx. 2/3 are involved in a mishap during their normal 8 year work life.

Studies showed a 70% reduction in operator errors following training.

OSHA estimates this revised rule will prevent 11 deaths and 9,422 injuries per year in general industry workplaces and 3 to 4 deaths and 463 to 601 serious disabling injuries each year in the construction industry.

The rule before the 1999 revision:

“Only trained and authorized operators shall be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks.”



Wow.
That was it.

The rule after the 1999 revision:

- Clarifies training methods and content
- Requires evaluation and retraining
- Requires “certification”
- Provides an avoidance of duplicative training
- Includes info on stability!



Wow!
Much better.

The first change occurs early in the revised rule. It basically replaces the word “trained” with “competent”.

Each powered industrial truck operator must be competent to operate a powered industrial truck safely.

The employer should determine that each potential operator of a powered industrial truck is capable of performing the duties that are required of the job.

What is your definition of competent?

What abilities should be considered?

Training

Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer must ensure that each operator has successfully completed the training required by this rule, except as permitted under *Duplicative Training* (p. 11).

The Trainer

The person(s) training your powered industrial truck operators must have the **knowledge, training, and experience** to train operators and evaluate their competence.

What do you look for when determining your trainer?

Training Methods

Operator training must consist of a combination of:

- 1. Formal training
- 2. Practical training

_____	_____
_____	_____
_____	_____

- 3. Evaluation of their performance in the workplace



Retraining

When must retraining be conducted?

- When the operator has been observed to operate the vehicle in an _____ manner
- When the operator has received an _____ that reveals unsafe operation
- When the operator has been involved in an _____ or _____
- When the operator is assigned to operate a _____ type of truck
- When a _____ in the workplace changes in a manner that could affect safe operation of the truck

Training Content

The following topics must be covered unless they're not applicable to the particular workplace:

Truck-Related Topics:

- ___ All operating instructions, warnings, and precautions for the types of trucks the operator will be authorized to operate (operator's manual)
- ___ Differences between the truck and the automobile
- ___ Controls and instrumentation (location, what they do, how they work)
- ___ Engine or motor operation
- ___ Steering and maneuvering
- ___ Visibility (including restrictions due to loading)
- ___ Fork and attachment adaptation, operation, and use limitations
- ___ Vehicle capacity (weight and load center)
- ___ Vehicle stability (with and without load and attachments)
- ___ Vehicle inspection and maintenance the operator will be required to perform
- ___ Refueling and/or charging and recharging batteries
- ___ Operating limitations

*Other items to consider:
Variations and characteristics from other trucks in the plant; data plates; braking methods (with and without loads); guarding; vehicle traffic; approved methods of when to remove a truck from service; parking and shutting down; docks; loading/unloading trailers & railcars; and dockplates.*

Workplace-Related Topics:

- ___ Surface conditions where the vehicle will be operated
- ___ Composition of probable loads 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
- ___ Operating in hazardous (classified) locations
- ___ Operating the truck on ramps and other sloped surfaces that could affect the vehicle's stability
- ___ Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace
- ___ Operating the vehicle in closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust
- ___ All other requirements found in the standard

Duplicative Training

If an operator has previously received training in a topic specified above, and such training is appropriate to the truck and working conditions encountered, additional training in that topic is **not** required if the operator has been evaluated and found competent to operate the truck safely.

How have you evaluated them?

How have you found them competent?

Evaluation

An evaluation of each powered industrial truck operator’s performance must be conducted at least once every **three** years.

What should this evaluation look like?

Observe/audit their performance while they’re working

– performing the duties they get paid to do:

- loading
- stacking
- fueling/charging
- inspecting
- pedestrians
- parking/shutting down
- maneuvering
- horn
- driving in reverse
- ramps/inclines
- ALL traveling
- using attachments
- tiering
- visibility
- lifting/lowering
- docks
- floor surfaces
- accessing/egressing truck



What does your evaluation look like?

Follow this up with Q&A, quizzes, etc. This may take an hour (or less) or occur at different times of the week - you must evaluate their primary tasks. This is basically a continuing demonstration of safe skill and knowledge.



OSHA’s training rule also requires you to evaluate the **effectiveness** of your training. How is this accomplished?

Certification

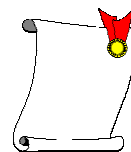
Employers are required to “certify” that each operator has been trained and evaluated as required by this rule.

What does “certify” mean?

What must be documented? (*at a minimum*)

What else can you document?

*This rule **does not require** the employer to use outside training services.*



Operating Around Pedestrians

What safety instruction would you provide employees exposed to lift truck traffic?





Emedco

The following is taken from a very informative NIOSH Alert (Pub. # 2001-109) titled: Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts. *This 12 page document can be downloaded at www.cdc.gov/niosh*

Workers on Foot

- Separate forklift traffic and other workers where possible
- Limit some aisles to workers on foot only or forklifts only
- Restrict the use of forklifts near time clocks, break rooms, cafeterias, and main exits, particularly when the flow of workers on foot is at a peak (such as at the end of a shift or during breaks)
- Install physical barriers where practical to ensure that workstations are isolated from aisles traveled by forklifts
- Evaluate intersections and other blind corners to determine whether overhead dome mirrors could improve the visibility of forklift operators or workers on foot
- Make every effort to alert workers when a forklift is nearby. Use horns, audible backup alarms, and flashing lights to warn workers and other forklift operators in the area
- Flashing lights are especially important in areas where the ambient noise level is high

Work Environment

- Ensure that workplace safety inspections are routinely conducted by a person who can identify hazards and conditions that are dangerous to workers
e.g. obstructions in the aisle, blind corners and intersections, and forklifts that come too close to workers on foot
- Install the workstations, control panel, and equipment away from the aisle when possible
- Do not store bins, racks, or other materials at corners, intersections, or other locations that obstruct the view of operators or workers at workstations
- Enforce safe driving practices such as obeying speed limits, stopping at stop signs, and slowing down and blowing the horn at intersections
- Repair and maintain cracks, crumbling edges, and other defects on loading docks, aisles, and other operating surfaces

OSHA Trade Release
October 2, 2003



OSHA Aligns with Wage and Hour Division to Remind Employers of Prohibition for Young Workers to Operate Forklifts

WASHINGTON -- Employers should note that most workers under the age of 18 are prohibited from operating forklifts, according to a new Safety and Health Information Bulletin issued today by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) and the Wage and Hour Division. Federal regulations prohibit **most** workers in non-agricultural employment under the age of 18 from operating forklifts.

"Young people are more likely to be injured in the workplace due to their lack of experience and maturity," said OSHA Administrator John Henshaw. "This bulletin is one way to remind employers of the standards that are in place to protect working teens from being seriously injured or killed. Nearly 70 teens lose their lives in workplace accidents each year."

"The restrictions on youth employment are designed to provide young workers with safe and positive early work experiences," said Tammy D. McCutchen, administrator of the Wage and Hour Division. "Employers must understand and comply with these laws to prevent serious occupational injuries and fatalities among youth. The bulletin highlights the relevant restrictions on forklifts and provides employers with access to additional compliance information."

The new bulletin was developed jointly by OSHA and Wage and Hour to inform employers that the Fair Labor Standards Act prohibits workers under the age of 18 from operating forklifts for non-agricultural operations. The bulletin also reminds employers OSHA's Powered Industrial Truck standard requires that forklift operators who are 18 or older must be trained and certified as competent to operate forklifts.

The bulletin cites two recent fatal forklift accidents that occurred in warehouses in Georgia and Massachusetts. Both operators were under 18 years of age.

Additional information on federal child labor laws is available on the Internet at www.youthrules.dol.gov or through the department's toll-free number at 1-866-4USWAGE (1-866-487-9243).

OSHA is dedicated to assuring worker safety and health. Safety and health add value to business, the workplace and life. For more information, visit www.osha.gov.

Occupational Safety & Health Administration
200 Constitution Avenue, NW
Washington, DC 20210

References

Maintenance

Lift Truck Safety Inspection Guide

Unauthorized Modification of a Forklift Carriage Assembly

Truck Designations

Fuel/Battery & Loading Trucks, Trailers, and Railcars

Inspection of Suspension-Type Highway Trailers Prior to Loading and Unloading with Powered Industrial Trucks

Forklift Safety: A Rule Revisited!

Developing A Training Program For Powered Industrial Truck Operators

Sample Powered Industrial Truck Operator Training Outline

Sample Lift Truck Hazard Assessment

Quick Quiz and Answer Key

For Additional Assistance:

- Trade organizations & Unions
- Employer associations
- Professional trade publications
- Safety consultants
- Internet
- Manufacturers/Manufacturer Representatives
- Equipment Dealers/Vendors
- OSHA
- NIOSH
- ANSI/ASME B56.1



Maintenance

Trucks must be removed from service when not in safe operating condition.

Examples of these conditions can include:

- Defective/unadjusted brakes
- Damaged mast chain
- Play in steering
- Sparks from exhaust/truck
- Inoperable horn
- Defective controls
- Damaged chain anchor pin
- Worn tires/damaged rims
- Inoperable gauges
- Not running well/missing
- Dislodged/defective counterweight
- Damaged overhead guard/LBR
- Wear/defects in the forks/carriage
- Cracks/defects in mast/structure
- Missing/nonlegible data plate
- Evidence of leaks (i.e. hydraulics, fuel)



Forklifts must be inspected at least once a day when used daily (before shift). When used around the clock, they must be inspected after each shift. Best practice: Before and After each shift!

Inspections should cover everything between the tips of the forks to the back of the counterweight. Common items to inspect include brakes, horn, overall cleanliness, steering, controls, hoses, ropes, fittings, power plant, carriage and forks, mast chain, chain anchor pins, tires/rims, counterweight, gauges, guarding, data plate, fluids, battery, attachments, etc.

Replacement parts must be equivalent in safety with those used in the original design.

Recommended reference: ASME B56.1-1993 Safety Standard for Low Lift and High Lift Trucks. This industry consensus standard is available (for view) in our Resource Center located in the Labor & Industries Building, 350 Winter St. NE Salem 97310 (800) 922-2689. You can also purchase a copy from the American Society of Mechanical Engineers 345 East 47th St, New York, NY 10017 (www.asme.org). This standard describes specific maintenance, inspection, testing, and repair criteria.

Of course, your operator's manual should have maintenance and inspection guidance - often in checklist form. Federal OSHA also has some inspection criteria in addition to sample inspection checklists. Check out <http://www.osha.gov/SLTC/powerindustrialtrucks/index.html>



This lever locking brake application device (MICO Lock) is not a **substitute** for the mechanical parking brake. This is a supplemental brake only! They can be used *in addition* to the primary mechanical parking brake.

These devices lock the brake fluid in the system. The holding power can be reduced by declining ambient temperatures as well as very small amounts of internal fluid leakage or actual external leakage.

TECH NOTES

OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION STANDARDS AND TECHNICAL RESOURCES SECTION

TOPIC: LIFT TRUCK SAFETY INSPECTION GUIDE

How many of us have looked at a piece of equipment during an inspection or consultation and thought to ourselves what am I looking at? There has to be more here to look at than does the horn blow and is the capacity posted (as important as they are). Having spent some time involved with testing lift trucks in years gone by I would like to share some ideas with you. **This is not however, intended to be a complete list of things to evaluate as you consider the overall condition of a vehicle.**

Brakes:

Is there a mechanical park brake and is it used when the vehicle is parked? Is it actually holding sufficiently to keep the truck from rolling when parked loaded on the steepest ramp found in the facility.

If a ramp is not available, park brakes can normally be checked by having the operator apply the brake, put the transmission in gear then add power until it is obvious that the brake is holding.

NOTE: Do not ask the operator to do this any longer than necessary due to potentially excessive heat that can build up in the transmission or the clutch.

NOTE: Lever lock brake assemblies that lock the brake fluid pressure in the system are not a substitute for a mechanical parking brake.

Chain anchor pins:

On the end of each lift chain will be a chain anchor pin. It will be a hardened, ground steel pin made especially for holding the chain to the chain anchors. It should have some visible means of retention, possibly a shoulder on one end and a cotter key, snap ring or roll pin on the other. Since these pins carry the load it is very important that these pins meet the equipment manufactures specifications, bolts from the local hardware store will not do the job, for long. If in doubt about a pin, check other pins on the same truck to see if it matches. Each hoist chain will have two, one at each end.

Hydraulic cylinders:

Mast tilting, carriage side shifting and in most cases steering are accomplished by means of a hydraulic cylinder doing the work. These cylinders will have pins that anchor each end of the cylinder, it is important that these pins also have a visible means of retention.

TECH NOTES

OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION STANDARDS AND TECHNICAL RESOURCES SECTION

TOPIC: LIFT TRUCK SAFETY INSPECTION GUIDE

Hydraulic lines:

Hose failures can create two very serious problems, one is the equipment probably will fail, and or some one can be severely burned. Hydraulic systems can carry very hot oil, up to 160 degrees and in some very extreme cases temperatures can exceed that. This makes hose routings and connections something to look at. Hoses need to be routed to avoid sharp corners, steel tubing used to carry fluid should be secured to keep them from moving and chaffing in brackets etc. As components are moved by hydraulic cylinders, hoses and tubing that operate these cylinders need to be routed to avoid interferences that can cause damage.

Forks:

Where the forks attach to the carriage there should be some form of restraint to prevent the forks from sliding to the side during turns, this can cause a load to become unstable or spill.

Operators compartment:

Check for missing or loose deck plates that might allow the operators feet or legs to come in contact with rotating members of the drive line or cause the operator to trip during access/egress of the vehicle.

Other items that might have worked loose over the years include the seat mounting bolts, the steering wheel mounting nut, foot pedals, levers and etc. These items are intended to be areas that can be visually evaluated during a walk around of the vehicle.

Although this information has been slanted towards lift trucks, some of it will apply to almost any type powered equipment that you will find in the work place. Thanks to Bob Thiessen (July 1995) for compiling this guide.

June 20, 1996



SUBJECT: Unauthorized Modification of a Forklift Carriage Assembly

The Chicago Regional Office brought to our attention an accident that resulted in a fatality. At the time of the accident, the employer had engaged in the unsafe practice of modifying a forklift truck attachment.

Workers in a company that fabricates material handling equipment for the road paving industry were welding a 216 3/4-inch long 3" by 3" angle iron that was bent into a semicircular shape onto the top side of a cylindrical silo. This step occurs at the end of the silo fabrication process. When completed, the silo is about 11 1/2 feet in diameter, 50 feet long, and weights 10,000 lbs. To perform this task, the silo was placed on its side on a set of power-driven rollers with a crane. To weld the semicircular angle iron onto the silo, the welding end of the silo had to be lifted up. To lift the silo, an eight-foot long boom was attached to the fork carriage of a forklift. The forklift operator inserted the extended boom 3' into the silo, tilted the mast 15 degrees backward, and raised the fork carriage. A worker then went underneath the fork carriage to measure the diameter of the silo. He was crushed to death when the 500 lb. fork carriage and 250 lb. extension boom disengaged from the top truck carriage bar and fell on him.

Attaching an eight-foot boom to the fork carriage to do the above task is a modification of the forklift. This modification affects the capacity and the safe operation of the forklift and must have the forklift manufacturer's prior written approval [29 CFR 1910.178 (a)(4)]. Also, 29 CFR 1910.178 (m)(2) prohibits a worker from attempting to measure the diameter of the silo from under the fork carriage. It states, "No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty".

The fork carriage was mounted on the top truck carriage bar with two top hooks engaged and two bottom hooks bolted onto the lower pads of the fork carriage. The fork carriage is an Industrial Truck Association Class II attachment with capacity ratings between two thousand and fifty-five hundred lbs. When the load of the silo was placed at the tip of the extended eight-foot boom, it may have exceeded the capacity of the attachment, causing the attachment to jump off the top truck carriage bar.

OSHA Compliance and consultation personnel should remind users of forklifts that any modifications that affect the capacity and safe operation of a forklift must have written approval from the manufacturer. Please distribute this bulletin to Area Offices, State Plan States, Consultation Projects and appropriate local labor and industry associations.

*The Directorate of Technical Support issues **Hazard Information Bulletins (HIBs)** in accordance with OSHA Instruction CPL 2.65 to provide relevant information regarding unrecognized or misunderstood health hazards, inadequacies of materials, devices, techniques, and safety engineering controls. HIBs are initiated based on information provided by the field staff, studies, and concerns expressed by safety and health professionals, employers and the public. Information is compiled based on a through evaluation of available facts, and in coordination with the appropriate parties.

Industrial Truck Designations

Only approved (designated) powered industrial trucks can be used in flammable or explosive environments. The complete listing of approved trucks and the certain atmospheres they can be operated in is found in OR-OSHA's Division 2/Subdivision N 29 CFR 1910.178(c) and Table N-1. You may also seek additional guidance by consulting with the forklift's manufacturer.

If you work in potentially flammable or explosive environments, please verify you are operating the approved truck. For example, atmospheres containing acetone, ammonia, benzene, lacquer solvent vapors, natural gas, and vinyl chloride, in quantities sufficient to produce explosive or ignitable mixtures, are specifically addressed in this standard. Also, locations where volatile flammable liquids or gases are handled, processed or used (even when normally confined within closed containers or systems) or locations where combustible dust or easily ignitable fibers or flyings exist are covered in this safety standard.

- D** Diesel powered trucks having minimum acceptable safeguards against fire/explosion hazards.
- DS** Diesel powered trucks with safeguards to the exhaust, fuel, and electrical systems.
- DY** Diesel powered trucks with all the safeguards of DS trucks plus temperature limitation features and no electrical equipment.
- E** Electrically powered trucks having minimum acceptable safeguards against fire/explosion hazards.
- ES** Electrically powered trucks with safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.
- EE** Electrically powered trucks with all the safeguards of ES trucks in addition to the electric motors and all other electrical equipment completely enclosed.
- EX** Electrically powered trucks that differ from the E, ES, or EE trucks in that the electrical fittings and equipment are so designed, constructed and assembled that the trucks may be used in certain atmospheres containing flammable vapors or dusts.
- G** Gasoline powered trucks having minimum acceptable safeguards against fire/explosion hazards.
- GS** Gasoline powered trucks with safeguards to the exhaust, fuel, and electrical systems.
- LP** Liquefied petroleum powered trucks having minimum acceptable safeguards against fire/explosion hazards.
- LPS** Liquefied petroleum powered trucks with safeguards to the exhaust, fuel, and electrical systems.
- CNG** Compressed natural gas powered.

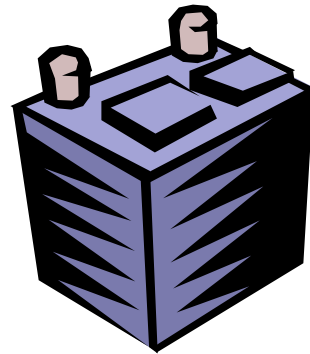
If operating in potentially flammable or explosive environments, please verify you are using the appropriate truck.



Naval Facilities
Engineering Command

Fuel/Battery

- Battery charging must be done in a designated area.
- Protect charging device(s) from damage/collisions.
- Keep metal tools and objects away from uncovered batteries.
- Provide adequate ventilation.
- Use a hoist or other device(s) when handling batteries.
- When charging and fueling, set brakes!
- No open flames, sparks, or electric arcs! NO Smoking!
- Wear personal protective equipment (as recommended on the material safety data sheet).



- ☞ In Oregon, you must be licensed to make any repairs or modifications on a LP tank
- ☞ Never overfill a propane tank and check the certification date on the tank periodically to determine compliance

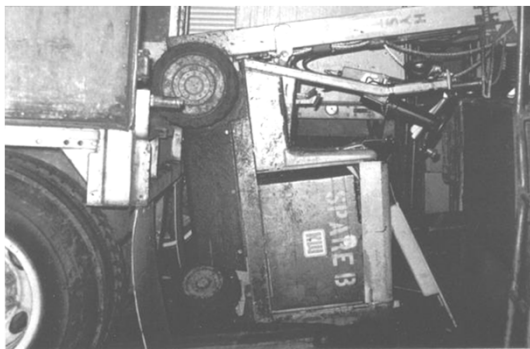


Storage and handling of gas and diesel must be in accordance to NFPA No. 30-1969. LP gas must be in accordance with NFPA No. 58-1969.

The Oregon State Fire Marshall provides an abundance of helpful information in addition to useful programs and services. Learn more at <http://www.sfm.state.or.us/>

The National Propane Gas Association has produced an informative bulletin titled: "Safe Use of LP-Gas in Industrial Trucks". They can be found at www.npga.org.

Loading Trucks, Trailers, and Rail Cars

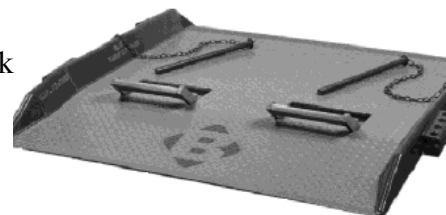


Let's prevent this!

- Trailer brakes set and wheels chocked
- Inspect the trailer floor for weakened sections, holes, rot, slick conditions, etc. (See p. 23)
- Directional lighting might be needed
- Use fixed jack stands to support a trailer when not coupled with the tractor
- National consensus standards allow powered industrial trucks equipped with a specially designed device to open and close railroad freight car doors
 - this is addressed in OR-OSHA's Program Directive A-53

At a minimum, dockplates must:

- Be adequately secured between the truck and dock
- Have an anti-slip tread
- Have loops or handles for safe handling
- **Know the capacity and never exceed it**



Norlift of Oregon, Inc.



U. S. Department of Labor
Occupational Safety and Health Administration
Directorate of Science, Technology, and Medicine
Office of Science and Technology Assessment

Inspection of Suspension-Type Highway Trailers Prior to Loading and Unloading with Powered Industrial Trucks

Technical Information Bulletin (TIB 00-07-31)

Purpose

The purpose of this Technical Information Bulletin is:

1. To alert employers and employees regarding the need to inspect suspension-type highway trailers to ensure that the trailers will support powered industrial trucks during loading and unloading operations; and
2. To provide a list of inspection check points for employers and employees to use in order to determine whether it is safe to use powered industrial trucks for loading and unloading such trailers.

This TIB is not a new standard or regulation and it creates no new legal obligations. It is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. *For a more detailed description of the nature and effect of Technical Information Bulletins, see the Important Information box at the end of this bulletin.*

Background

The Directorate of Safety Standards Programs brought to the attention of the Directorate of Technical Support the fact that workers engaged in the loading or unloading of suspension-type highway trailers may be at an increased risk of injury due to the inability of damaged trailers to support the weight of the powered industrial truck used to load or unload the trailer. These trailer designs present hazards not encountered with trailers of older, traditional designs. OSHA has received several reports of trailer collapse accidents in situations in which the employees attempted to enter a trailer and to load or unload that trailer with a powered industrial truck.

Technical Information

There are three trailer designs of primary concern: (1) the fiberglass-reinforced panel; (2) the sheet and post; and (3) the plate trailer.

These trailers are designed and manufactured in a manner similar to a suspension bridge with the weight of the floor and the load supported by the walls, which hang from the roof of the trailer. The roof of the trailer, in turn, is supported at the four corners of the trailer. The undercarriage of the trailer consists of a series of parallel rails that run laterally across the trailer. The rails are attached to the remainder of the trailer by a group of four to six rivets at each end of the rail.

These trailer designs were developed to decrease the weight of the trailer, thereby increasing the allowable weight of the load that the trailer can carry. The trailers can be identified by the absence of an I beam running fore and aft under the full length of the trailer floors.

Recommendations

Suspension-type trailers should be inspected before they are loaded or unloaded with a powered industrial truck. Any of the following types of damage to the trailer should be identified and documented. A determination should be made whether the trailer can or cannot be loaded or unloaded safely prior to using a powered industrial truck. In the event that the trailer cannot be loaded or unloaded safely with a powered industrial truck, an alternative means of loading or unloading must be used. If the integrity of the trailer cannot be assured and no other reasonable means exists to complete the operation, the trailer should be taken out of service.

Inspection Check Points

1. Examine the rear impact guard (the ICC bar). Damage to this guard may indicate the presence of other damage to the trailer, thereby decreasing the trailer's ability to support the weight of the load and the powered industrial truck used to load or unload the trailer. Also, when a trailer restraint is used, a damaged ICC bar may prevent the trailer restraint from effectively engaging, thus permitting the trailer to roll away from the dock.
2. Examine the front landing gear of the trailer. Damage to this part of the trailer could cause the trailer landing gear and the front of the trailer to collapse when the weight of the powered industrial truck is added to the weight of the trailer and the load being supported by the front landing gear.
3. Examine the cross members of the undercarriage for missing pieces, excessive corrosion, or permanent deformation. For example, deformation of the cross members caused by missing rivets at the ends of the cross members can indicate damage to the trailer floor. In such cases, the trailer may not support the weight of a powered industrial truck.
4. Examine the exterior sides of the trailer for tears or cuts of the skin that exceed 21 inches or that would affect more than one trailer side post.
5. Look for missing rivets, particularly near the bottom of the trailer. Damaged or missing rivets may indicate that the ability of the undercarriage to support the weight of the load and the powered industrial truck used to move the load has been compromised.
6. Look at the rear doors of the trailer. Damage to the rear doors of the trailer may indicate that the trailer was struck in the rear, thereby possibly causing other damage to the trailer and possibly creating a hazard when opening and closing doors.
7. Look at the hinges that support the rear doors. Damage to these hinges could indicate damage to the floor of the trailer or a shifting of the load during transit. Damage to the hinges could include broken or missing rivets, damage to other means of hinge attachment (e.g., welds), broken hinges, or missing hinge pins. Damage of this nature may compromise the ability of the trailer to support the weight of the powered industrial truck.

8. Examine the interior walls of the trailer for breaks, tears or other damage, particularly within two feet of the floor of the trailer. Tears or cuts in more than one post could adversely affect the ability of the trailer to support the weight of the load and the powered industrial truck being used to move the load. On sheet and post trailers, vertical posts (most commonly on 16" - 24" centers) should not be severed. A vertical post that is severed presents a hazard.

9. Look at the roof of the trailer. Damage to the roof of the trailer may indicate the mishandling of the load when the trailer was being loaded and unloaded. Such mishandling could produce other structural damage to the trailer that may be visually apparent. Damage to the roof structure of the trailer could allow trailer walls to fold in or out resulting in a floor collapse.

10. Examine the floor of the trailer; look for imperfections or abnormalities, including an excessively wavy appearance of the laminated floor, delamination of the floor, cracks, and/or missing pieces of flooring. When unloading the trailer, the powered industrial truck operator should continually check the condition of the newly exposed portion of the floor as the unloading proceeds. The powered industrial truck operator also should check for water stains on the floor, which may indicate that the floor has been damaged by water [see 29 CFR 1910.178 (m)(7)].

The existence of any one, or even several, of the above listed deficiencies does not necessarily render the trailer unsafe to enter with a powered industrial truck. However, such deficiencies are indications of possible serious damage, and the employer will need to exercise professional judgement to determine whether it is safe to use a powered industrial truck for loading and unloading the trailer.

***Important Information on the Nature and Effect of Technical Information Bulletins**

OSHA's Directorate of Technical Support (DTS) issues Technical Information Bulletins (TIBs) to provide information about occupational hazards and /or to provide information about noteworthy, innovative, or specialized procedures, practices and research that relate to occupational safety and health. DTS selects topics for TIBs from recognized scientific, industrial hygiene, labor, industry, engineering, and/or medical sources.

The *Occupational Safety and Health Act* requires employers to comply with hazard-specific safety and health standards. In addition, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm under Section 5(a)(1), the General Duty Clause of the Act. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take appropriate steps to prevent or abate the hazard. However, the failure to implement TIB recommendations is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

Further information about this bulletin may be obtained by contacting OSHA's Directorate of Technical Support at 202-693-2300.

Occupational Safety & Health Administration
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Washington, DC 20210
www.osha.gov

Forklift Safety: A Rule Revisited!

By Craig Hamelund, OR-OSHA Public Education

I have been presenting our four-hour *Forklift Safety* educational workshop for quite a few years now. These sessions have been incredibly entertaining and informative simply because everyone participating has either had or currently has relevant, practical experience and are generally willing to share.

Let's, for a moment, take another look at those words *practical experience*. Most lift truck operators I have bumped into along the way have received their training this way - exclusively! To validate this, I conducted some random, informal surveys in my workshops asking 10+ year experienced operators if today was their first **formal** forklift safety education? Guess what the response was nearly 100% of the time?

Yep.

Trainer Qualifications

Is experience a bad thing? Of course not! But can be.

OSHA revised it's operator training rule within their powered industrial truck safety standard in 1998 (this was the only rule within the entire standard that changed). This revised rule basically specifies that the person training forklift operators be knowledgeable, trained, and experienced to train operators and evaluate their competence. First of all, this rule should urge many of you to "train your trainer", if you haven't already.

Most organizations I have worked with will generally rely on their most experienced operator to be their "new" trainer. Please be careful with this and qualify their experience. Consider what comes with experience: Complacency, tricks, and/or unsafe habits. And it's no surprise when operating a lift truck for an extended period of time in the same or similar settings, operating the same or similar truck, seeing the same people, negotiating the same blind corners, and so on. An experienced operator, who has been deemed the "trainer", may subsequently teach their habits and tricks to a trainee and not even realize it!

An Overlooked Requirement?

There is a new requirement within this revised rule that always catches my eye. This requirement, found in OR-OSHA Division 2 Subdivision N 29 CFR 1910.178(l)(4)(i) reads, "Refresher training, including an evaluation of the effectiveness of that training, shall be conducted as required by paragraph (l)(4)(ii) to ensure that the operator has the knowledge and skills needed to operate the powered industrial truck safely". *{Paragraph (l)(4)(ii) requires, at a minimum, when retraining is required}*

A potential problem I have learned when evaluating retraining programs is the lack of including the affected operator into the training. For example, an operator reportedly is speeding through areas of the plant where speed is supposedly restricted. The operator is disciplined and is required to watch a safety video (which, with all due respect, can be discipline enough). Another example is operating the lift truck with either no load or a light load but with the mast raised significantly high causing the forklift to become unstable. The operator is warned and told to keep the load low to the ground because "...OSHA requires it".

Neither of the above scenarios included the operator in an educational opportunity – they were included solely in the discipline aspect. Please don't misunderstand me. Accountability and discipline must be established; but education should come first. Why not ask the first operator what he/she thinks a safe speed should be and why? Have him/her explain the hazards surrounding excessive speeds relating to the truck (instability) but also the pedestrian exposure. Determine why speeds have been excessive, i.e. production pressures, lack of enforcement, lack of training, etc. Allow some time to demonstrate both to this operator and all others that a safe controlled speed is as productive as an excessive speed. Include the operator(s) in developing the new/revised policy. Then ensure it's consistently enforced!

The second scenario may encompass more. And it has always been my opinion lift truck stability should warrant most attention. I do not wish to imply pedestrian exposures are not as important – they are. Some studies have shown that 70% of all forklift incidences (including “near misses”) involve them and pedestrians being struck by forklifts are the second leading forklift-related fatality. However, the leading cause of death and serious injury involving forklifts are overturns.

When thinking stability, I think grade school!

I like to describe forklift stability in four primary elements: Fulcrum point, center of gravity, the stability triangle, and load center. And I relate it to growing up in the playground. We all played teeter-totter (or seesaw, as we sometimes called it in Michigan). The plank is balanced on a pivot, or fulcrum. Our fulcrum point on the forklift is the front axle as we balance our load with the counterweight.

In addition to balancing both ends of the lift truck, we must also balance in all directions; hence, center of gravity (CG). Operators should always remember that a combined CG is created when handling a load - a *new* CG combining both the load's CG and the trucks'. I relate this principle to riding a tricycle (or Big Wheel, as we called it in Illinois). If we operate this *triangle on wheels* around a corner but shift our CG forward, over the narrowest portion, you are more likely to turn over. If we shift rearward, we then place our CG over the widest portion and are less likely to tipover.

This brings us to the third element: The stability triangle; our *triangle on wheels*. Visualize a triangle where the base of the triangle is created at the fulcrum point (front axle) and forming the apex at the center of the rear axle (pivot point of a rear steering axle), or the steer wheel on three wheel models. The mobile combined CG (imagine this combined CG as a single, moving object) must stay within this triangle in order for the lift truck to be stable.

The most stable area when handling a load is keeping it close to the base, or fulcrum point. If this combined CG moves forward of the fulcrum point, the truck will have the tendency to tip forward (longitudinal). *Factors causing this instability include carrying the load to high, load placed outward, excessive forward tilt, operating on a decline, heavy braking, and the inappropriate use of attachments.* Furthermore, if the combined CG moves outside of the stability triangle, the truck will have a tendency to overturn on its side (lateral). *Factors causing this instability include off center loads, tire pressure, unlevel terrain, and quick turns.* Finally, if the combined center of gravity moves rearward, toward the apex of the stability triangle, it may simply take a pothole or 2x4 to easily move outside of the stability triangle and possibly overturn the truck. *Factors that can move the combined CG towards the apex include carrying a load to high and operating on an incline.*

This principal brings us to seatbelt use. Seat restraints must be worn when the hazard of overturning or being thrown from the truck exist, or potentially exist. A seatbelt is designed to restrain the operator from being ejected and pinned between the overhead guard and solid surface, or propelling the operator into the mast structure. *If involved in a lateral overturn, it is also recommended to brace yourself and lean away from the impact.* If your truck is not equipped with a seatbelt, please call your manufacturer representative to obtain an approved retrofit kit.

Finally, load center is the center of the load (measured from the heel of the forks). All forklifts have a rated capacity and most are rated at a 24-inch load center (center of the standard 48-inch long forks). The further you move from load center, the further your rated capacity drops. A general rule of thumb is for every inch you move out from load center, the nominal capacity of your unaltered* truck can drop a few hundred pounds. It is important to note this is a general rule and does not include the use or placement of any type of front-end attachments, including fork extensions. I cannot emphasize enough the importance of knowing how front end attachments, including fork extensions, effect the capacity of your truck. And how much they **reduce** your capacity!** This, by the way, is enhanced with rough terrain telescoping reach trucks due to boom extension and angle.

* without front-end attachment

**Some professional trade publications have provided a calculation to determine the estimated lost capacity when using front-end attachments (other than the manufacturers).

Important Note: Modifications and/or additions which affect capacity or safe operation must be approved by the manufacturer. This prior approval must be in writing.

There's More Where This Came From!

OR-OSHA continually offers a four-hour workshop on powered industrial truck safety throughout Oregon. For more information, please call (888) 292-5247 option 2 or www.orosha.org. The workbook used in this workshop can also be downloaded from our site! Click on the Education link!

OR-OSHA's Resource Center offers professional publications, textbooks, journals as well as an extensive audiovisual lending library including forklift safety videos. For more information, please call (800) 922-2689 or visit our website!

Of course, there are numerous vendors, manufacturer representatives, and other resources available to you. Also, your worker's compensation carrier may be able to assist you.



DEVELOPING A TRAINING PROGRAM FOR POWERED INDUSTRIAL TRUCK OPERATORS

This handout is intended to be used for training purposes only. It is not a substitute for any provisions of the Occupational Safety and Health Act of 1970, or for any standards issued by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA).

HOW DO I DEVELOP A POWERED INDUSTRIAL OPERATOR TRAINING PROGRAM?

Before you begin developing your operator training program you should become familiar with the OSHA standard for powered industrial trucks and any operator's manual pertinent to the equipment you have in your workplace.

IDENTIFY YOUR OPERATORS

First, you need to determine the employees that will be required to operate powered industrial trucks in your workplace. If an employee has other duties, but sometimes operates a powered industrial truck, training must be provided.

IDENTIFY THE TYPES OF POWERED INDUSTRIAL TRUCKS YOU HAVE IN YOUR WORKPLACE AND THOSE EMPLOYEES WHO WILL BE REQUIRED TO OPERATE THE VEHICLES.

There are many different types of powered industrial trucks. Typically, these types of vehicles are known as forklifts or lift trucks. Some types of trucks are not capable of being ridden by the operator. These are also covered by the OSHA standard and training is required. Some trucks are fitted with attachments purchased from the manufacturer. The use of these attachments may affect the manner in which the truck is handled; therefore training on the use of the attachment would also be required. If your employees will be expected to operate several different types of powered industrial trucks, then training is required on the unique handling characteristics of the vehicles.

METHODS OF TRAINING

Once you have identified your truck operators and types of trucks you have in your workplace, you should determine the methods of training you will use.

Training must consist of a combination of formal instruction and practical training. Using both methods is the only way to ensure that the trainee receives and comprehends the instruction and uses the information to safely operate a powered industrial truck. Note that the formal training need not take place in a classroom. Discussions can consist of the trainer talking to the trainee and explaining the training material, either in the workplace or in another location. The training must, however, include an explanatory element as well as a practical element.

Formal instruction may include lectures, conferences, classroom discussions, demonstrations, and written or oral tests. To enhance the training and make it more understandable to the employee, employers and other trainers may use movies, slides, computers, video tapes and other visual presentations.

Using visual aids has several advantages, including:

- The employees being trained remain more attentive, thereby increasing the training's effectiveness
- The trainer can use visual presentations to ensure that the necessary information is covered during the training
- Graphical presentations make better use of the training time by decreasing the need for the instructor to carry on long discussions about the instructional material
- Trainees have greater retention of information learned from graphical presentations

While some employees can learn instructional material while seated in a classroom, other employees may learn best by observing an operation (demonstration) and/or by personally performing an operation (practical exercise). In most cases, a combination of different training methods provides the best training in the least amount of time.

Once you have selected the method of training, then the content of the training program must be considered to include all pertinent training items.

TRAINING PROGRAM CONTENT

Because each type (make and model) of powered industrial truck has different operating characteristics, limitations, and other unique features, a good employee training program for powered industrial truck operators should be based upon the type of vehicles that the employee will be trained and authorized to operate. The training should also emphasize the workplace's features that will affect how the vehicle must be operated. Finally, the training should include the general safety rules applicable to operating any powered industrial truck.

The following is an outline of a generic powered industrial truck operator training program:

Characteristics of the powered industrial truck(s) the employee will be allowed to operate:

- Differences from the automobile
- Controls and instrumentation: location, what they do, and how they work
- Engine or motor operation
- Steering and maneuvering
- Visibility
- Fork and/or attachment adaption, operation, and limitations of their use
- Vehicle capacity
- Vehicle stability
- Vehicle inspection and maintenance the operator will be required to perform
- Refueling or charging and recharging batteries
- Operating limitations
- Any other operating instruction, warning, or precaution listed in the operator's manual for the type of vehicle the employee is being trained to operate

The operating environment:

- Floor surfaces and/or ground conditions where the vehicle will be operated
- Composition of probable loads and load stability
- Load manipulation, stacking, unstacking
- Pedestrian traffic
- Narrow aisle and restricted place operation
- Operating in classified hazardous locations
- Operating the truck on ramps and other sloped surfaces that would affect the stability of the vehicle
- Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace
- Operating the vehicle in closed environments and other areas where insufficient ventilation and/or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust

After the training program has been completed, the employer must evaluate the trainee's knowledge and skills and determine that the employee is competent to operate the truck safely.

EMPLOYEE EVALUATION

When the employee completes the training exercises and prior to operating the truck in the workplace, an evaluation of the employee must be performed. This evaluation will determine the adequacy of training and the ability of the employee to perform truck operations safely in the workplace. The OSHA standard also requires that an evaluation of the operator's performance be conducted at least once every three years and after refresher training.

The employer should then complete a certification of training record containing the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.

REFRESHER TRAINING

During the course of truck operation, the supervisor may observe the employee performing an unsafe act, such as riding with the load too high or traveling at an unsafe speed. The person making the correction should point out the incorrect manner of operation of the truck or other unsafe act being conducted, tell the employee how to do the operation correctly, and then ensure the employee does the operation correctly. When there have been multiple on-the-spot corrections, the employer may decide to conduct a more structured retraining program which would include the following information:

- Common unsafe situations encountered in the workplace
- Unsafe operating methods observed or known to be used
- The need for constant attentiveness to the vehicle, the workplace conditions, and the manner in which the vehicle is operated

The above subject areas need to be taught so that the trainee receives all the information needed for safe vehicle operation. Specific details of the above subject areas may be found in the vehicle manufacturers' literature, the national consensus standards [e.g., the ASME B56 series of standards (current revisions)], and the OSHA standards relating to powered industrial truck operator training.



SAMPLE POWERED INDUSTRIAL TRUCK (PIT) OPERATOR TRAINING PROGRAM OUTLINE

1. Introduction
 - a. Overview of the program
 - b. Goal of the program: to provide a training program based on the trainee's prior knowledge, the types of vehicles used in the workplace, and the hazards of the workplace.
 - c. Course will utilize video, group discussion and hands-on practice. Each operator must obtain the knowledge and skills needed to do their job correctly and safely.
2. Types, Features, and Physics
 - a. Familiarize each operator with the basic types and functions of powered industrial trucks.
 - b. Develop an understanding of the information shown on a data plate.
 - c. Understand the critical truck measurements that affect safety.
 - d. Understand the forces that cause tipovers, and the truck design considerations and safety ratings that help prevent them, including the "stability triangle."
3. Inspecting the vehicle
 - a. Understand the purpose and importance of pre-operational checkouts.
 - b. Provide a basic understanding of areas covered during a pre-operational checkout.
 - c. Familiarize each operator with a checklist for pre-operational checkouts, and what to do if a problem is discovered.
4. Driving the Truck
 - a. Understand the elements of safe movement of a powered industrial truck.
 - b. Understand the differences between an automobile and a powered industrial truck.
 - c. Recognize the safety hazards associated with operating a powered industrial.
5. Load Handling
 - a. Understand the elements of load lifting safety.
 - b. Understand the safe operating procedures for raising and lowering loads in aisles.
6. LPG for Lift Trucks
 - a. Discuss LPG and its properties.
 - b. Understand the elements and procedures of safely refueling internal combustion vehicles.
 - c. Describe tank components: service valve, surge valve, relief valve, etc.
 - d. Discuss related safety issues.
7. Battery and Charging
 - a. Understand the elements and procedures of safely changing and charging batteries.
 - b. Discuss filling procedures and maintenance.
 - c. Discuss related safety issues.

8. Safety Concerns

- a. Review/reinforce potential of serious injury
- b. Review/reinforce safety procedures in your facility.

9. Specific Truck and Workplace Training/Hands-On

- a. Review features of specific PIT's to be operated.
- b. Review operating procedures of specific PIT's to be operated.
- c. Review safety concerns of specific PIT's to be operated.
- d. Review workplace conditions and safety concerns of areas where PIT's will be operated.
- e. Learn/practice actual operation of specific PIT's to be operated and specific workplace conditions where PIT's will be operated.
- f. Demonstrate proficiency performing the powered industrial truck operator duties specific to the trainee's position and workplace conditions.

10. Certification of Completion of the Course

** This outline is intended as a resource in implementing a powered industrial truck operator training program. It is not a substitute for any standards issued by the U. S. Department of Labor's Occupational Safety and Health Administration (OSHA). OSHA's Office of Training and Education wishes to acknowledge Material Handling Services for contributing some of the information used in this outline. This acknowledgment does not imply endorsement by the U. S. Department of Labor.*

Sample Lift Truck Hazard Assessment

As a group, list as many **unsafe** operating practices as you can (for example, hazardous practices during loading/unloading, when traveling, when lifting workers, etc.).

Note: Hazardous pedestrian traffic can also be mentioned here!



Driving up to someone next to fixed structure
Standing/passing under elevated load
Extra riders
Arms and legs outside running lines of truck
Unattended trucks
No seatbelt use when exposed to hazards
Opening/closing freight doors using forks
Raising close to overhead installations
Obstructed aisles/fire exits
MICO Locks
Operating defective truck
Fueling/charging when running
No fall protection when elevated
Platform not secured
Unattended lift truck while workers are on platform
Raising/lowering workers NOT in normal operating position
Speeding
Operating on wet/slippery conditions
Not maintaining at least 3 truck lengths
Passing at blind corners & intersections

Forks rubbing on ground
Reckless off-center loads
Tilting forward w/ load
No inspections
Pedestrians!
Inappropriate designations in hazardous locations
Passing in same direction
No horn use
Disrespecting Right-Of-Way
Not Paying Attention
Driving forward with obstructing load
Crossing RR tracks straight on
Parking < 8 ft from tracks
Descending ramp with load downgrade
Altering counterweight
Horseplay/stunts
Loads not tilted back
Running over loose objects
Exceeding truck capacities
Laser sights for high production?
Unapproved attachments

Unattended truck: When operator is more than 25 ft (foot travel) from truck in view or any distance from truck when no longer in view. Attended truck: When operator is within 25 ft and still in his/her view.

To name a few...

Sample Lift Truck Hazard Assessment

From the list, what are some **common** unsafe practices you see?

List possible **causes** for each of these practices.

What can **you** and **your company** do to reduce and/or eliminate these practices?

Speeding

Job pressures
More thrilling
Culture
How we're trained
No speed limits
Inadequate supervision
Not consistently enforced

Hire/train more operators
Establish accountability
Sell importance of safety to mgt.
Establish speed limit
Consistently enforce speed limit
Establish policy
Evaluate training prg.
Re-Qualify trainer
Recognize safe speeds

Extra riders

Not recognizing the hazard
Not addressed in training
Inadequate supervision
Nobody held accountable
No policy
No other provision to quickly get people to where they want to go

Hold supervisors accountable
Establish policy
Offer other transportation
Evaluate and enhance training
Inform folks of the hazard
Post signs/markings

...and on the subject of recognizing hazards. This situation involved a straight-mast forklift, a front-end loader, and a white van. The forklift and loader lifted the van (in tandem) to allow a worker to stand atop the van in constructing this metal building.



Quick Quiz

- T F Forks should only enter the pallet halfway.
- T F Operators *should* inspect their forklifts before and after each shift.
- T F Burning a hole in the fork tip can greatly affect the fork's integrity.
- T F You should always travel down a ramp with the load upgrade.

A forklift is “attended” when:

- (a) the operator is within 25 ft. from the truck
- (b) the operator is further than 25ft. from the truck
- (c) the operator is within view of the truck
- (d) the operator is not within view of the truck
- (e) a and c above
- (f) b and c above



- T F Front-end attachments can reduce the nominal capacity of your truck.
- T F Personnel, other than the operator, are always welcome to ride on a moving truck.
- T F Powered pallet trucks (“Walkies”) are not covered in this safety standard.

When traveling across aisles or around blind corners:

- (a) yell “COMING THROUGH!”
- (b) slow down and honk the horn
- (c) slow down and look in all directions
- (d) b and c above
- (e) all of the above

If the load is high obstructing forward view:

- (a) travel in reverse
- (b) reduce the load
- (c) stand up so you can see ahead
- (d) use a guide person to help you
- (e) hire a very tall operator

- T F You should always estimate the load you are about to lift so you don't exceed the forklift's rated capacities.
- T F Off-center loads must never be handled by a forklift.

When trucks are used daily (one shift), operators must examine their trucks at least:

- (a) monthly (b) when necessary (c) weekly (d) once a day (e) supervisors inspect lifts
- T F Right of way must be given to emergency vehicles.
- T F Do not pass another truck traveling in the same direction at intersections and/or blind spots.



When loading and unloading trailers, trucks, and railcars:

- (a) brakes must be set
- (b) wheels blocked
- (c) flooring inspected for cracks, slippery conditions, etc.
- (d) fixed jacks used when tractor has been disengaged
- (e) all of the above

(answer key on p. 38)

Quick Quiz

- F Forks should only enter the pallet halfway.
- T Operators *should* inspect their forklifts before and after each shift.
- T Burning a hole in the fork tip can greatly affect the fork's integrity.
- T You should always travel down a ramp with the load upgrade.

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