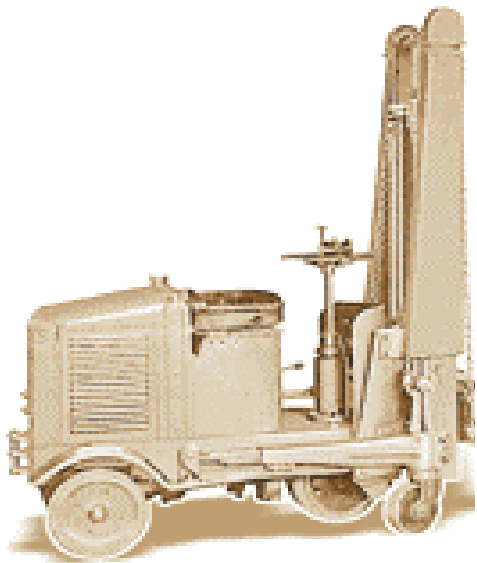


# Forklift Safety

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



1924



2004



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



## OR-OSHA Mission Statement

To advance and improve workplace safety and health for all workers in Oregon.

### Consultative Services

- Offers no-cost on-site safety and health assistance to help Oregon employers recognize and correct safety and health problems in their workplaces.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, new-business assistance, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

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- Offers pre-job conferences for mobile employers in industries such as logging and construction.
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- Inspects places of employment for occupational safety and health rule violations and investigates workplace safety and health complaints and accidents.

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- Provides the opportunity for employers to hold informal meetings with OR-OSHA on workplace safety and health concerns.
- Discusses OR-OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

### Standards & Technical Resources

- Develops, interprets, and provides technical advice on safety and health standards.
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## Introduction

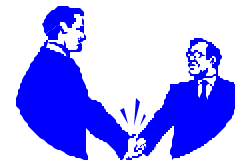
Whether you call them jitneys, hi los, forklifts, or lift trucks, powered industrial trucks are as widely used as your debit card. It seems everywhere you look these days, lift trucks are unloading trailers at department stores, tiering product in a warehouse, or loading material at a construction site. 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?

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

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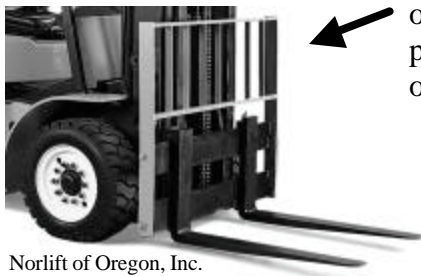
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A load backrest (LBR) must be provided when handling small objects or unbanded units. The LBR must be capable in size and strength to prevent the load, or any part of the load from falling toward the operator.

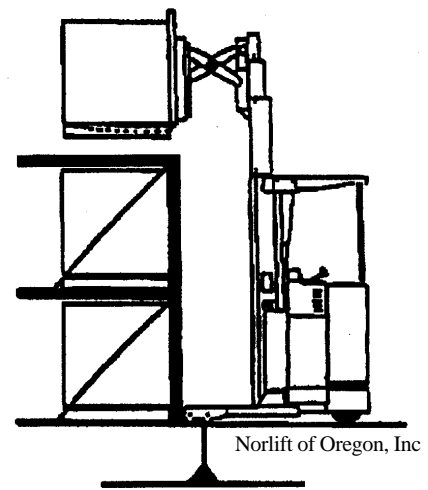
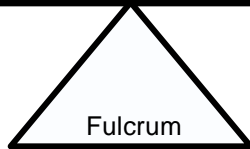
*NOTE: Both the FOPS and LBR must not interfere with the operator's visibility and guard openings must not be larger than 6 in. in one of the two dimensions. More specifications can be found in OR-OSHA Div 2/Sub N OAR 437-002-0227(1) & (2).*

# 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.

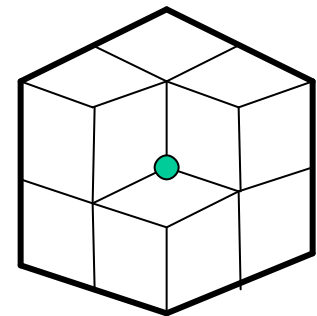
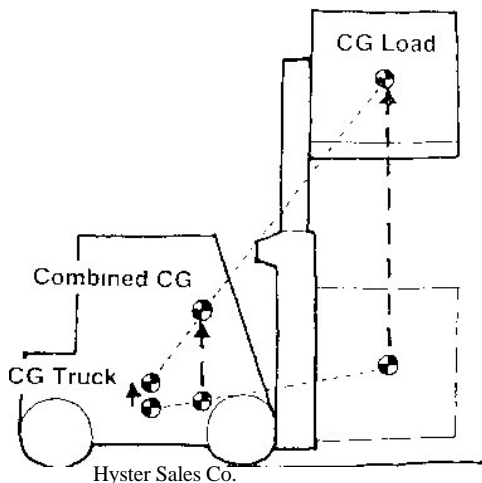
A properly loaded lift truck does not exceed the rated capacity of the truck (as listed on the truck's data plate).



Fulcrum Point

## 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.



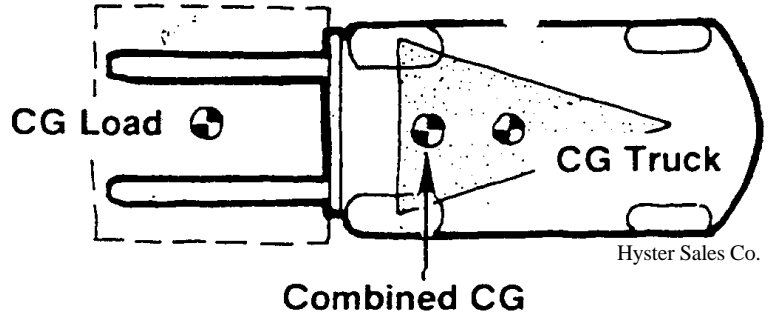
The lift truck has moving parts and therefore has a CG that moves. The CG moves forward and back as the upright is tilted forward and back. The CG moves up and down as the upright moves up and down.

## Stability

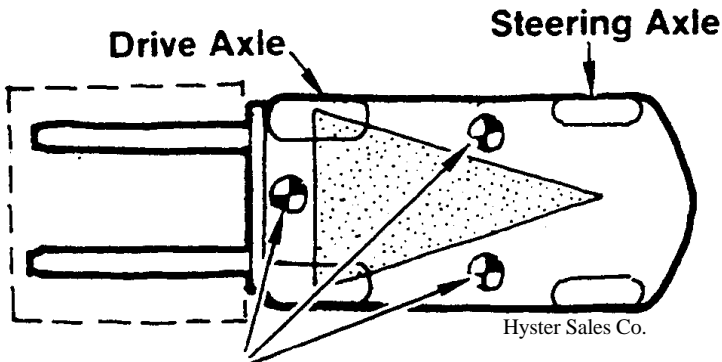
### 3. Our Triangle on Wheels

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.



**CG - Truck Will Tip Over**

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

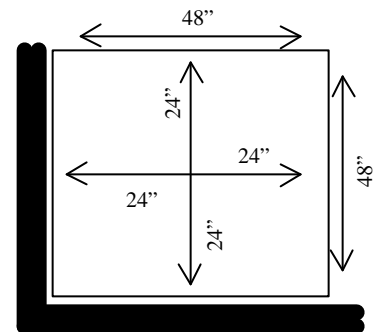
The center of gravity, and therefore the stability, of the loaded truck is affected by a number of factors including size, weight, shape, and position of the load. Also, the height to which the load is elevated, the amount of forward or backward tilt, tire pressure, and the dynamic forces created when 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.*

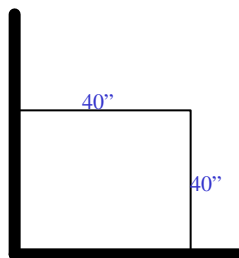
### 4. Load Center

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.

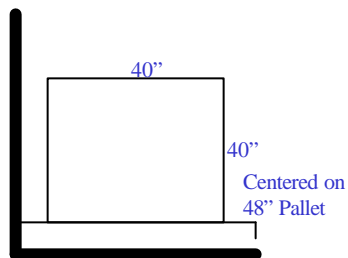
When the load is carried at a greater distance than the load center, the maximum capacity of the truck is \_\_\_\_\_. The use of special attachments instead of forks will also \_\_\_\_\_ the nominal capacity of the lift truck.



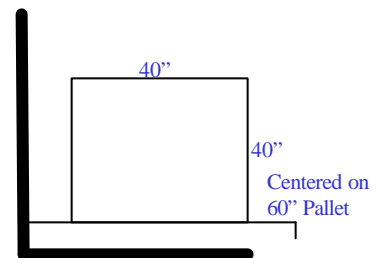
Let's take a look at this 7000 lb. load...



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.

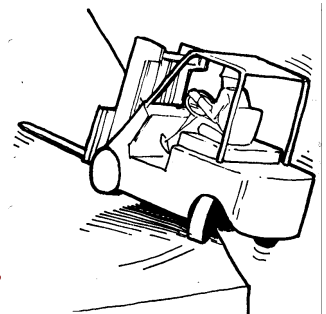
*OR-OSHA can cite employers for not requiring/enforcing seat restraint use when operators are exposed to hazardous areas where overturning or being thrown from the truck can occur. In addition to evaluating other contributing factors, the Compliance Officer will evaluate training and supervision to substantiate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

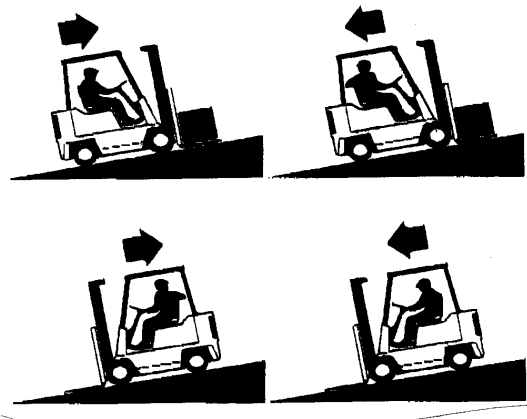


Earthworks Training and Assessment Services

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

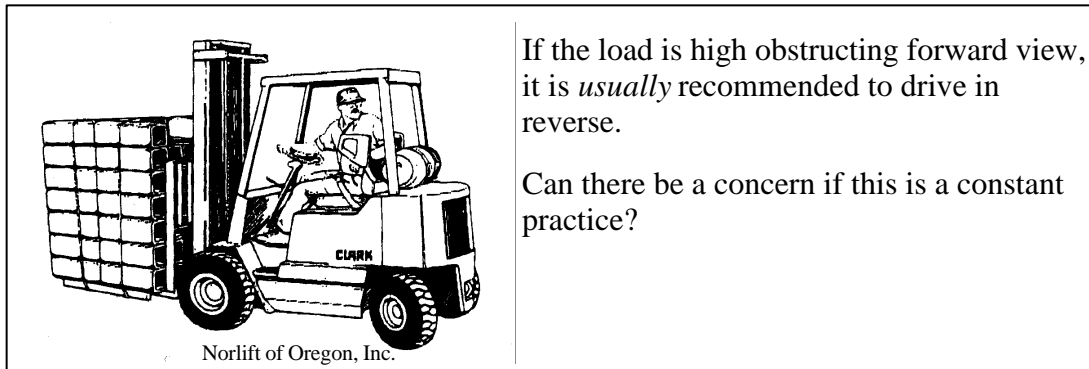
- Completely stop before raising a load
- Never walk, stand, or allow anyone to pass \_\_\_\_\_ a raised load
- Move slowly after raising the load
- Tilt forward, level only when over a stack or rack
- Make sure forks have cleared the pallet when backing out & before turning or changing height
- Before 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?
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# 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?

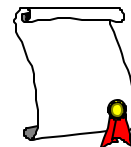
What must be documented? (*at a minimum*)

\_\_\_\_\_

\_\_\_\_\_

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?



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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](http://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

## 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)