

Safe Operation of Forklifts and other powered industrial trucks (PITs)



Developed by the Division of Occupational Safety & Health (DOSH)
for employee training

May, 2010

Safe Operation of Forklifts and Other Powered Industrial Trucks

The following topics will be covered:

Forklift-related fatalities and injuries

Types of forklifts

How a forklift operates

Hazards of forklift operation

How to use forklifts safely



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You must be 18 years or older to operate a forklift



OSHA

The risk of ignoring forklift safety

Forklifts are extremely useful in a variety of workplaces, but there is great risk of property damage, injury or death if you:

- are not trained on forklift safety
- are not familiar with the specific forklift vehicle
- operate the forklift in an unsafe manner
- operate a forklift with a defect or missing parts



Source: New Zealand Dept. of Labor



Source: RiteHite Doors



Source: WorksafeBC

Forklift accident statistics

85 to 100 workers in the U.S. are killed every year in forklift accidents.

Fatal Accident Type	Per Cent
Crushed by vehicle tipping over	42%
Crushed between vehicle and a surface	25%
Crushed between two vehicles	11%
Struck or run over by a forklift	10%
Struck by falling material	8%
Fall from platform on the forks	4%

Approximately 35,000 serious injuries and 62,000 non-serious injuries involving forklifts occur in the United States every year. OSHA estimates 11% of all forklifts are involved in accidents every year.



[View Fatality examples](#)

Source: Monash University – Australia

Washington State forklift accidents & citations

13 employees were killed in forklift-related accidents from 2000 to 2009

1000+ employees were seriously injured (had to take time off from work to recover) in forklift-related accidents in the years 2006, 2007 & 2008



The 5 most common citations by L & I safety inspectors involving forklifts in last three years (2007 – 2009) were as follows:

- lack of training
- no seatbelt or not using seatbelt
- no inspection of the forklift for defects
- modification of forklift without manufacturer's approval
- no nameplate or unreadable nameplate

What is a powered industrial truck (P.I.T.)?

Definition: A powered vehicle used to carry, push, pull, lift, stack or tier materials.

Another way of describing powered industrial trucks is that they include standard forklifts and special use forklifts and industrial vehicles.

They are all regulated by the DOSH P.I.T. regulations – WAC 296 - 863

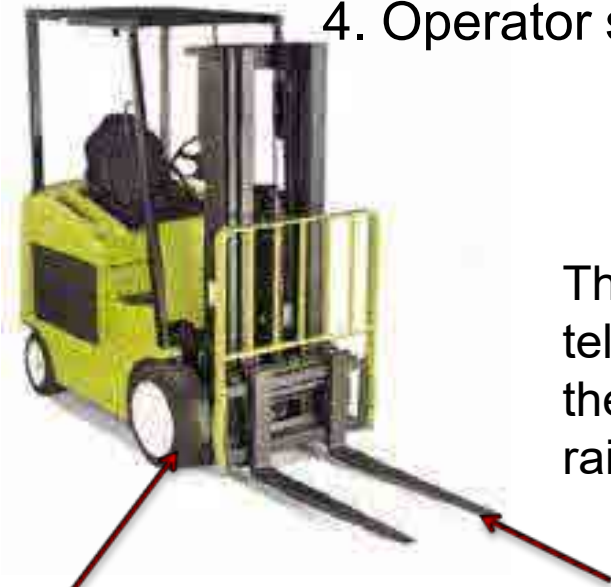


The Industrial Truck Association list seven classes of PITs

Class 1 Electric Truck

Has the following:

1. Electric motor
2. A counter-weight in the rear
3. Solid or pneumatic (air filled) tires
4. Operator sits and drives.



Solid tires for smooth surfaces. Pneumatic tires are used for rougher surfaces.

The "mast" is the telescoping track on which the forks and load are raised and lowered.

Forks on a forklift. Some trucks have a solid platform and are called "platform trucks" .



Counter-weight and battery.

Class 2 Electric Truck

Characteristics:

1. Electric motor
2. Narrow construction to fit in aisles
3. Solid tires

On some models, forks reach in and out as well as up, down and tilt. Other models have the forks on the side (called "Side Loaders") or allow the forks to pivot to the side (called "Front/Side Loaders").



The operator stands on a platform which moves up and down. Sometimes called an "order picker"



Order Picker



Rider Reach Truck



Straddle legs add stability for forklifts that don't use a counter-weight

Class 3 Hand Truck

Electric Motor Hand or Hand/Rider Trucks

Characteristics:

1. Motorized
2. Walk behind or ride
3. Low or high lift
4. Counter-weight or straddle



This motorized pallet jack has a counter-weight. Straddle legs are provided on more compact or reach models.



The operator can walk behind or stand on the platform and hold onto the grab bar.

Class 4 Truck

Characteristics:

1. Propane internal combustion engine
2. Solid tires
3. One of the most common types

Propane/liquid petroleum gas (LPG) fuel cylinder. Other forklifts run on diesel or gasoline.



Propane Solid Tire Forklift

Class 5 Truck

Characteristics:

1. Gasoline, diesel or propane engines
2. Pneumatic tires
3. Used outdoors in many cases.



Pneumatic (air filled) tires with tread are used for traction and stability on rough or wet surfaces.

Class 6 Industrial Tractor Truck

Characteristics:

1. Electric or internal combustion engine
2. Solid or pneumatic tires
3. Specialty vehicles
4. Pull or carry loads (no forks)



Industrial Tractor



Wikimedia Commons

Straddle carrier



Yard Tractor

Class 7 Rough Terrain Truck

Characteristics:

1. Used outdoors in uneven or muddy locations
2. Pneumatic tires
3. Gasoline or diesel-powered



Rough Terrain Reach Forklift

Boom both lifts and extends to place the load at an elevated location. Usually found on construction sites.



Log Yard Forklift



Rough Terrain Mast Forklift

Ship Container PITs



Wikimedia Commons

These are not powered industrial trucks



Non-powered pallet jack



Farm vehicles



Self-propelled elevated work platform



Earth-moving vehicle



Bobcat skid steer with forks

How is a forklift different from a car or truck?

Usually steers from the rear, rather than the front, making it swing wide

Carries heavy loads, often in tight places and rough terrain

Can have reduced visibility

Can have a high center of gravity making it susceptible to turnover

Controls are different and more complicated

Heavier than most cars and trucks



Wikimedia commons



This.....

.....Doesn't operate like these.



Forklift Nameplate

The nameplate will list the type of forklift and the capacity

WARNING IMPROPER OPERATION OR MAINTENANCE
COULD RESULT IN INJURY OR DEATH

MODEL: [REDACTED] SERIAL No. 3121100000

TYPE: LP TRUCK WT. 8680 lbs

CAPACITY OF STANDARD TRUCK WITH SIMPLEX MAST
AND FORK: 4500 lbs AT 24 IN. LOAD CENTER WITH
MAXIMUM HEIGHT OF 136 IN. RATED CAPACITY WITH
OPTIONAL MAST AND/OR ATTACHMENT LISTED BELOW:

MAST	ATTACHMENT	ATTACHMENT	ATTACHMENT
VERTICAL			
4500			

ITCH/MODEL: [REDACTED]
FORK DESIGN: [REDACTED]

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This forklift is a propane (LP) powered forklift, weighing 8680 lbs. with a lifting capacity of up to 4500 lbs.

Forklift Operating Manual



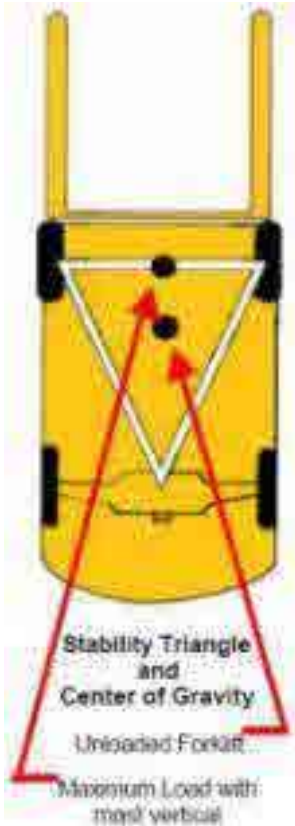
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Since there are numerous makes, models and types of forklifts, it is important to check for warnings in the specific forklift operator's manual.

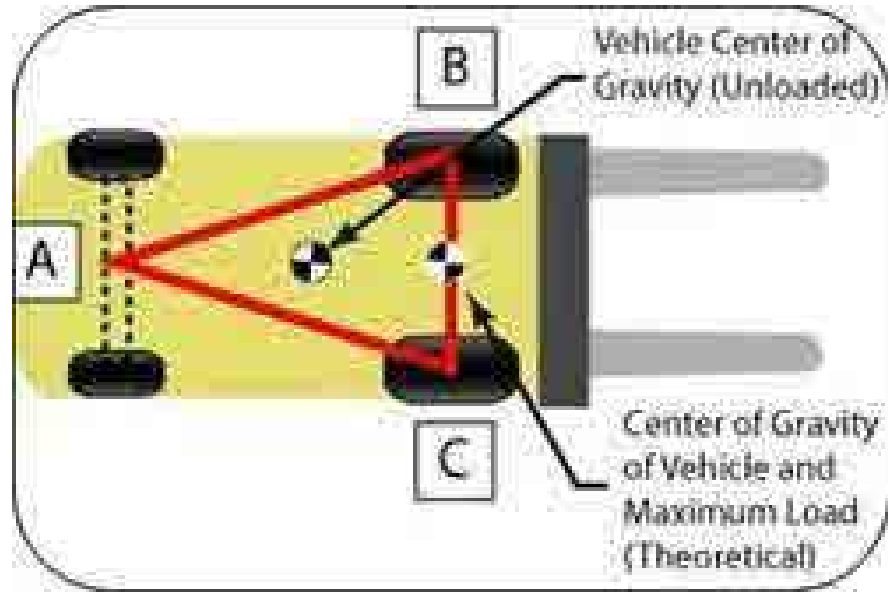
The manual should be kept on the forklift at all times.



Forklift Stability Triangle

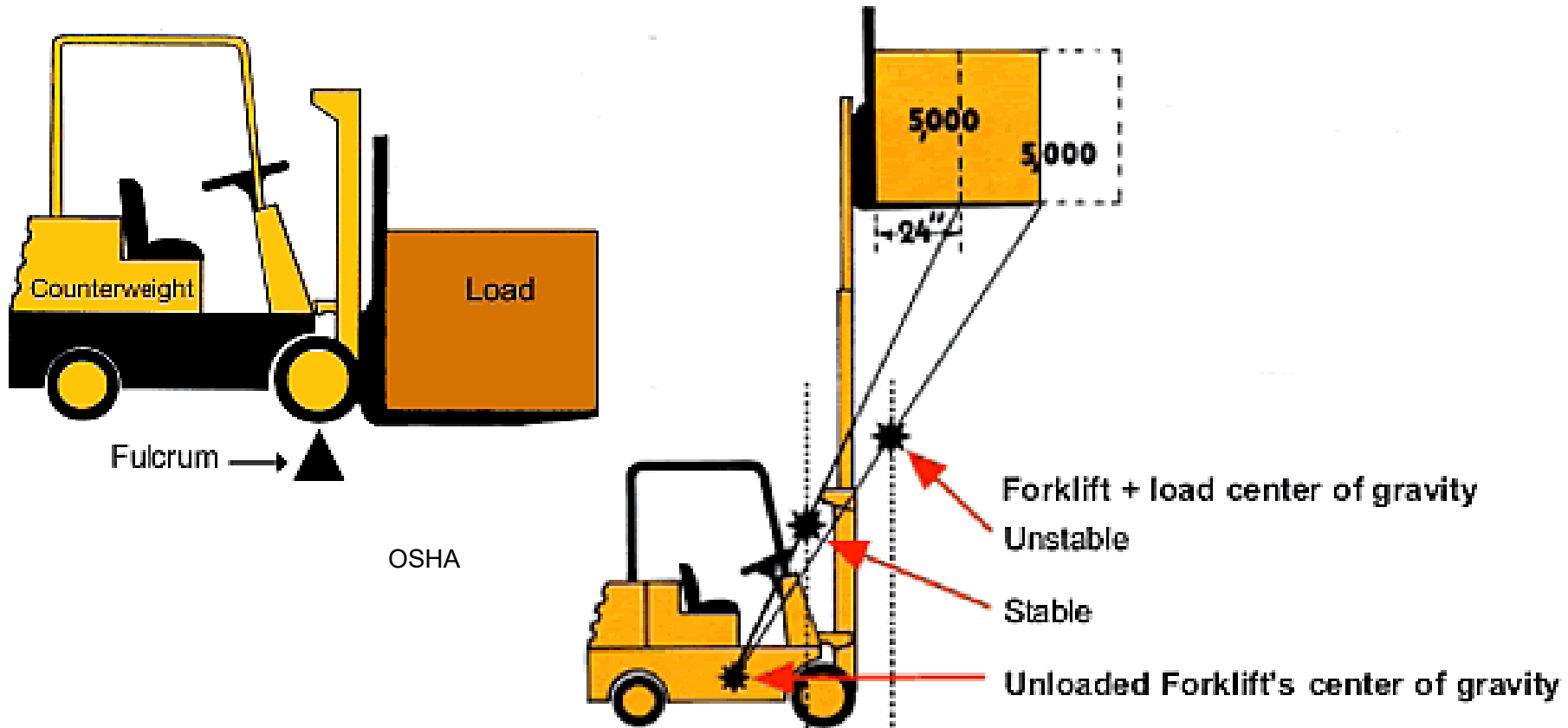


OSHA



Almost all counterbalanced powered industrial trucks supported at three points. This is true even if the vehicle has four wheels. The truck's steer axle is attached to the truck by a pivot pin in the axle's center. When this point is connected to the front wheels with imaginary lines, this three-point support forms a triangle called the stability triangle. So long as the center of gravity remains within this stability triangle, the truck is stable and will not tip over.

How loads affect forklifts

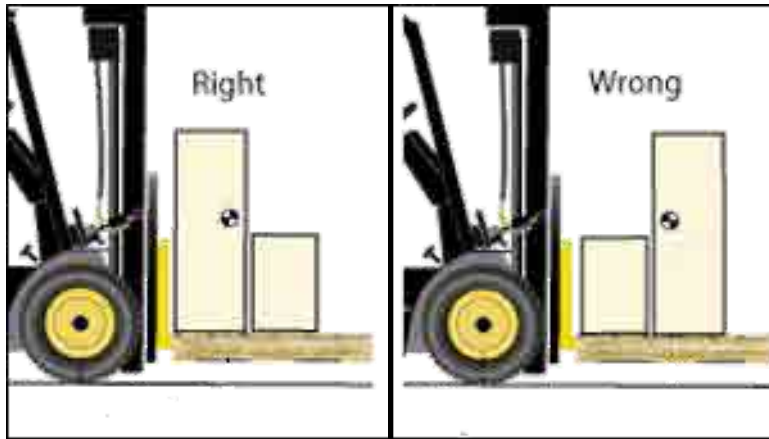


A forklift balances a load with a counterweight at the back. The front wheels act as a fulcrum or balance point. The center of gravity moves upward when the forks are raised.

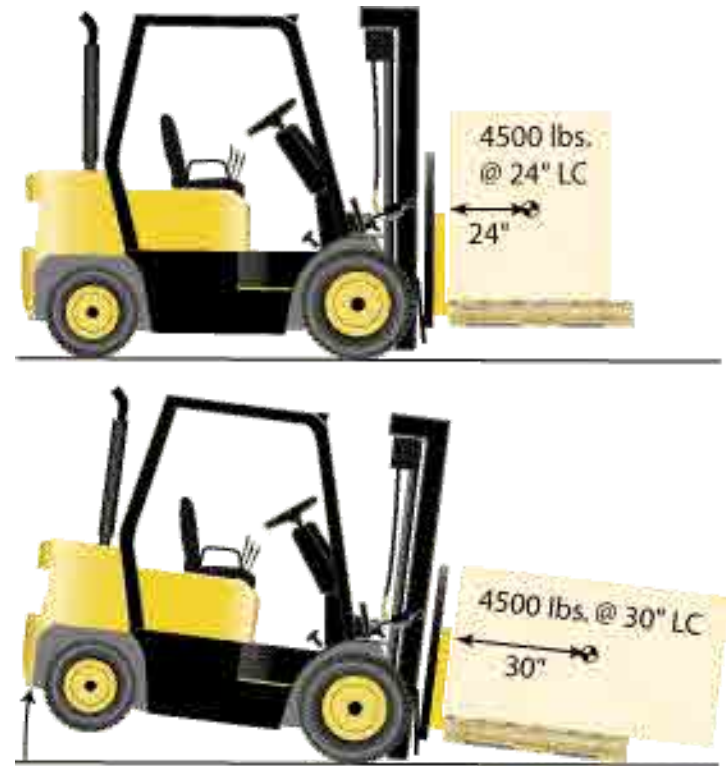
Don't travel with a raised load



Forklift Load Capacity



OSHA



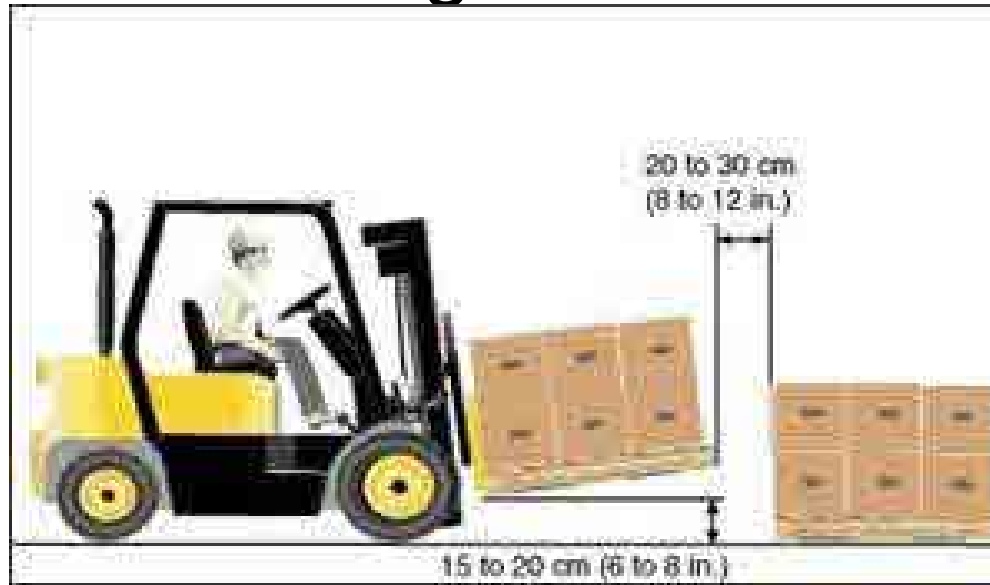
While carrying a load near the maximum allowable capacity, be aware of the following:

Danger of tipover

Danger of losing load

Danger of being struck by falling load

Moving the load



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Use extra caution when handling loads that approach the truck's maximum rated capacity:

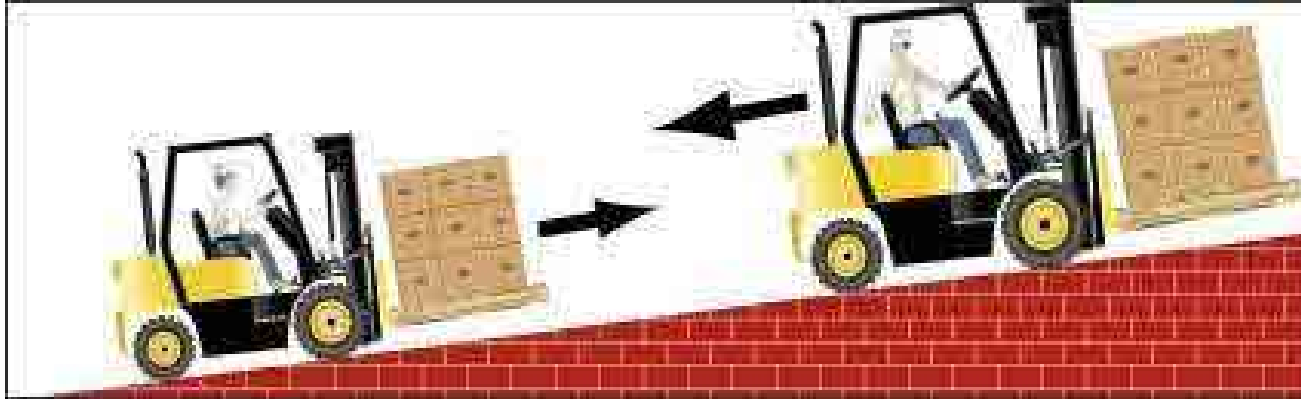
Tilt the mast & forks back and position the heaviest part of the load against the carriage.

Travel with the mast tilted back to keep the load stable.

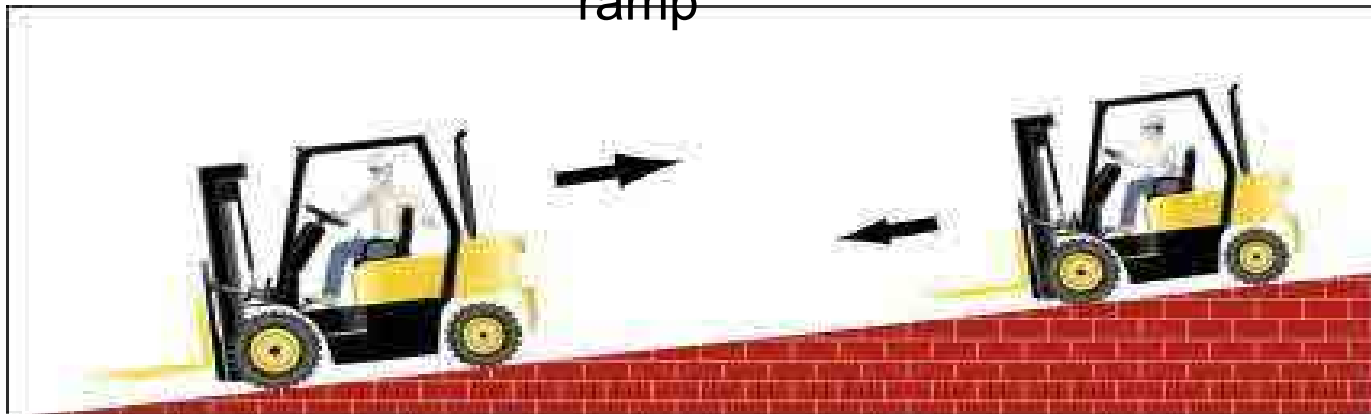
Never travel with the load tilted forward. Tilting the load forward increases the load distance and makes the load less stable

Driving on an incline

Always drive with the load on the uphill side - go backwards driving down the incline and frontwards going up the incline to prevent tipping or losing control of the forklift.



If no load on the forklifts, do the opposite with forks pointing down the ramp



More reasons why forklifts tip over

Driving too fast around a corner

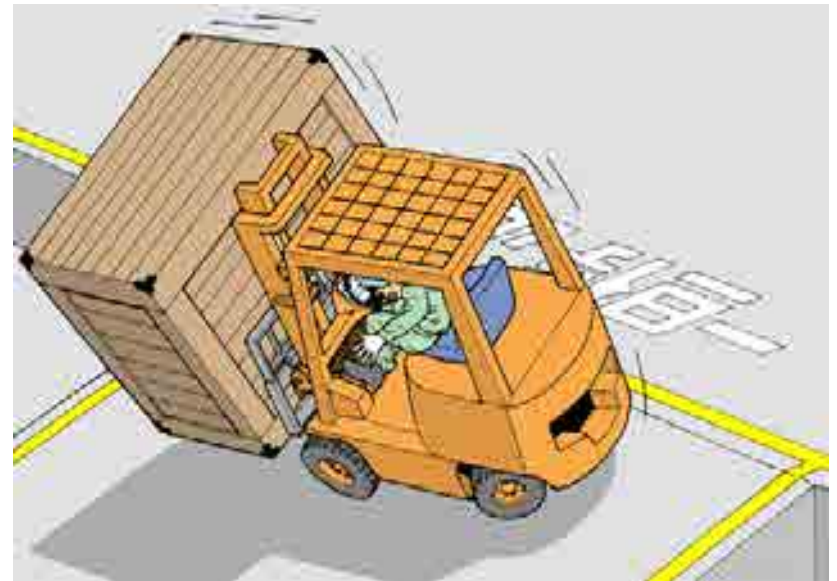
Driving off edge of platform, ramp, road or other surface

Driving an indoor forklift outdoors on rough, uneven ground

Turning on an incline or hill

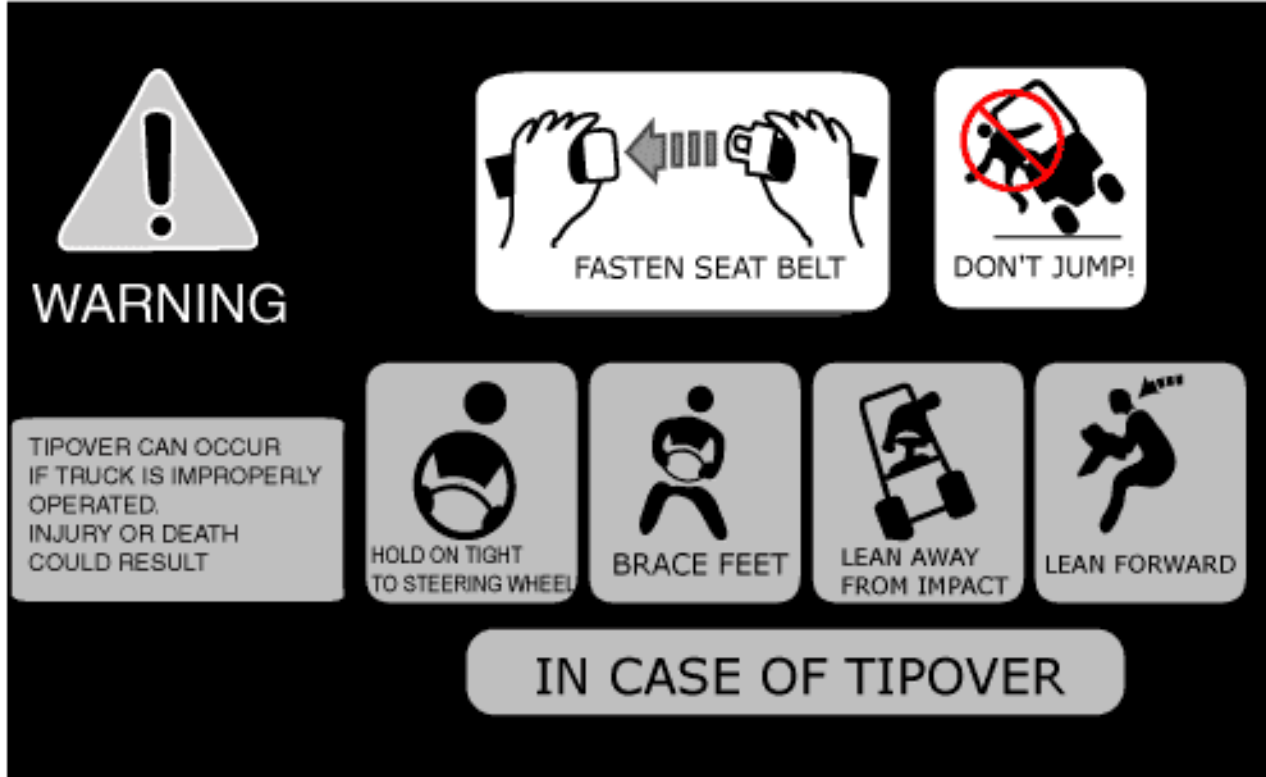


Source: RiteHite Doors



Source: JICOSH

What do in case of a tip-over



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If the forklift tips, keep your arms and legs inside and hold on to the steering wheel. Don't attempt to jump out – you can't move faster than the forklift can tip over. Most people who attempt to jump are killed by the impact of the overhead guard.

Tipover procedures for other types of forklifts may vary. For example operators of stand-up forklifts with rear-entry access should step backwards off the forklift if a tipover occurs.

Seatbelts

Seatbelts are required on all forklifts manufactured since 1992 and can be retrofitted on all older models.

You are required to use it when it is supplied with the forklift. It will save your life.

Click it - before
you drive!!



OSHA



L & I



worksafeVictoria

A common cause of forklift fatalities is from the operator not having or using a seatbelt.

Forklift video clip from Worksafe B.C.

Forklift inspection and maintenance

All forklifts be examined at least daily before being used. Forklifts used on a round-the-clock basis must be examined after each shift.

Check the following:

- Fluid levels -- oil, water, and hydraulic fluid.
- Leaks, cracks or other visible defect in hydraulic hoses and mast chains.
- Tire pressure and tire cuts or gouges.
- Condition of the forks, including the top clip retaining pin.
- Safety decals and nameplates in place and legible.
- All safety devices working properly including the seat belt.

A vehicle that is damaged, defective or otherwise unsafe must be removed from service. Report the problem to your supervisor immediately.



U.S. Army



MSHA

Refueling a propane powered forklift

Liquid propane is extremely cold when released to the atmosphere. If your skin is exposed to propane while refueling, you can get frostbite.

Shut off the engine before refueling.

Don't leave propane-powered forklifts near high heat sources.

When parking propane-powered forklifts for a long period of time, turn the tank valve off.

Any propane leak must be taken seriously. Propane vapor is heavier than air and will tend to sink to the lowest lying area. If not adequately dissipated, it will ignite when exposed to a spark or flame.



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Charging or changing batteries on electric forklifts

The battery changing/charging area should have the following:

- no smoking signs.
- adequate fire protection.
- plenty of water for flushing and neutralizing spilled battery acid.
- an eyewash that provides at least 15 minutes of flowing water
- enough ventilation to remove hydrogen gas during battery charging.



If you have to add water, to batteries or handle battery acid, be sure to wear personal protective equipment.

Forklift Attachments

Forklifts can have a variety of attachments which affect their performance and use.

The load capacity of the forklift is reduced by the weight of the attachment.

The attachment must be approved by the forklift manufacturer.

Be sure you know how to use the specific attachment on the forklift you will be operating or get training if you don't.



Jib Crane Attachment



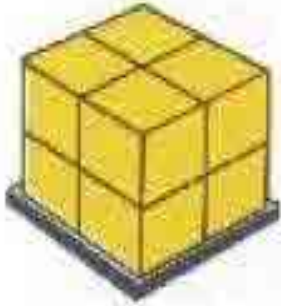
Drum Grabber Attachment



Carpet Lifting Attachment

Stacking loads on pallets

Loose loads are subject to falling. Off center loads can also be subject to falling or cause the forklift to tip over. The photos below show the correct way to load pallets.



Block

The most common.
The upper level may be unstable if not encircled with wire or strapping.



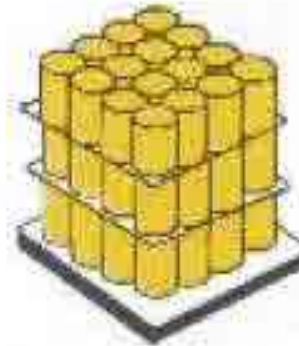
Brick

Containers are interlocked by turning each level 90 degrees.



Pinwheel

Used where brick pattern is unstable.



Irregular Stacking Patterns

Wood strips, plywood or heavy cardboard between layers can help stabilize castings, bags, and other irregular shapes.



Avoid using damaged pallets.



Forklift Work Platforms

Never lift other workers on forks unless you use an approved work platform with railings as shown.



U.S. Army

Dangerous!!

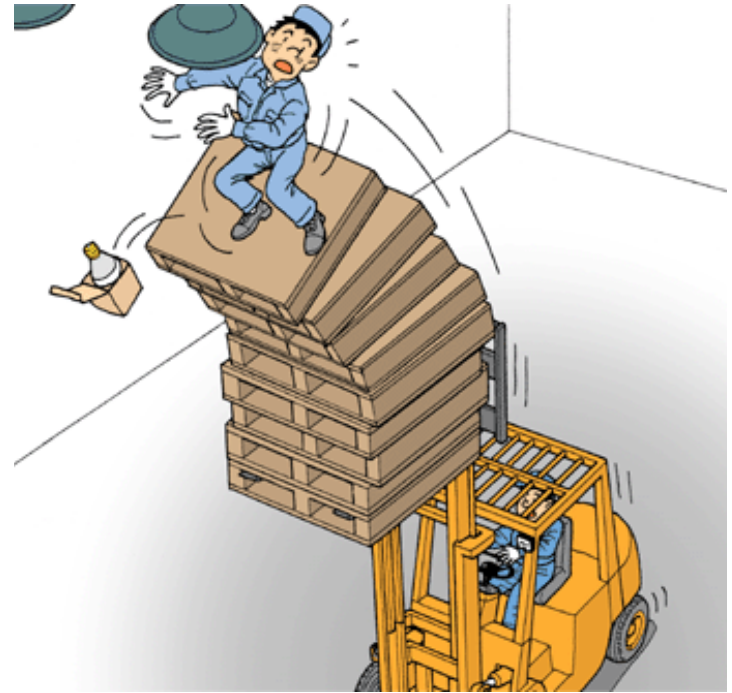
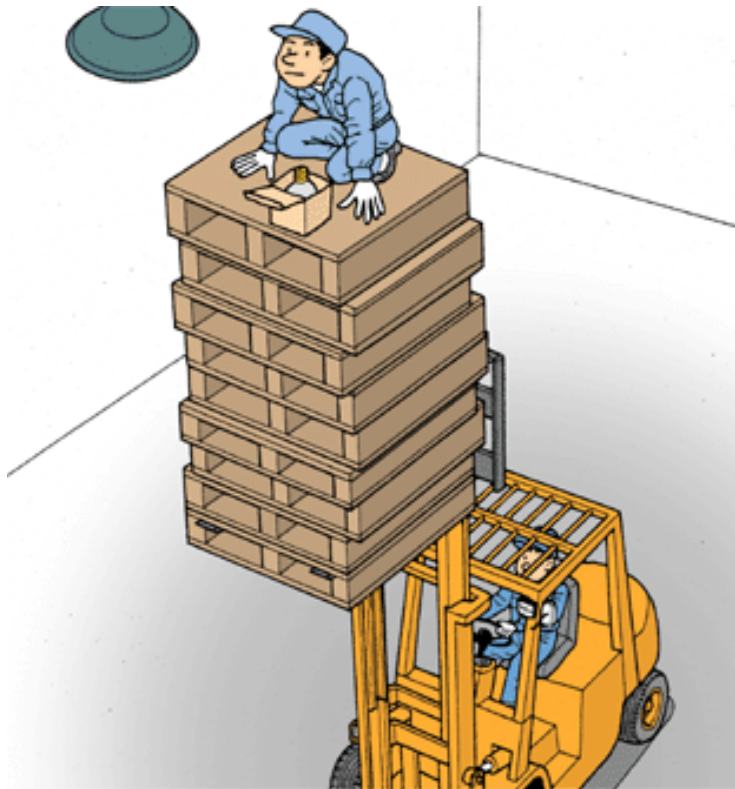


Source: Pelsue Co.

Safe



An extremely dangerous practice



Source: JICOSH

A risky way to change a light bulb!!

Order Picker Fall Protection

In warehouses “order picker” forklifts, the vehicle must have either:

- Standard guardrails on all open sides
- or
- A safety harness and lanyard



OSHA



CDC

Why a safety harness is needed on an order picker forklift



While working in a warehouse using an order picking forklift, a worker tried to stand on a shelf to adjust the position of the load on the pallet. His foot slipped from the rack and he fell from the fourth tier to the floor.

A safety harness would have stopped his fall.



Forklifts have reduced visibility

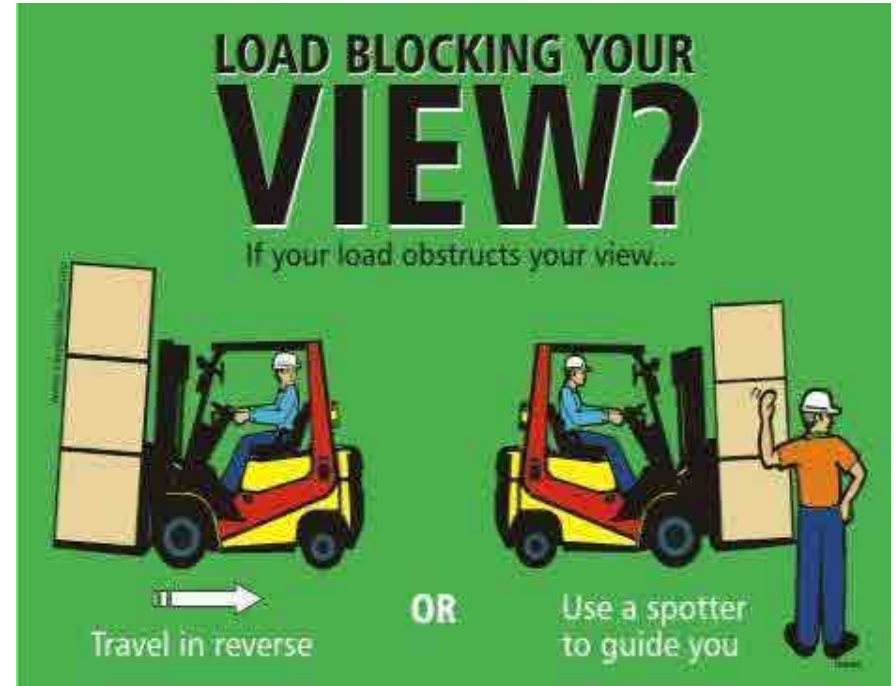
Both the forklift mast and a large load on the forks reduce forward visibility.



Older mast design



Newer mast design



In warehouses or other indoor workplaces, aisles of material, walls, doors and other building configurations can create blind corners.

Forklift Blind Spot



Blind spot

Forklifts and Pedestrians

Slow down and sound horn at intersections, corners, and wherever your vision is obstructed.

When provided, use flashing warning light or backup alarms when traveling in reverse.

Always look in the direction of travel.

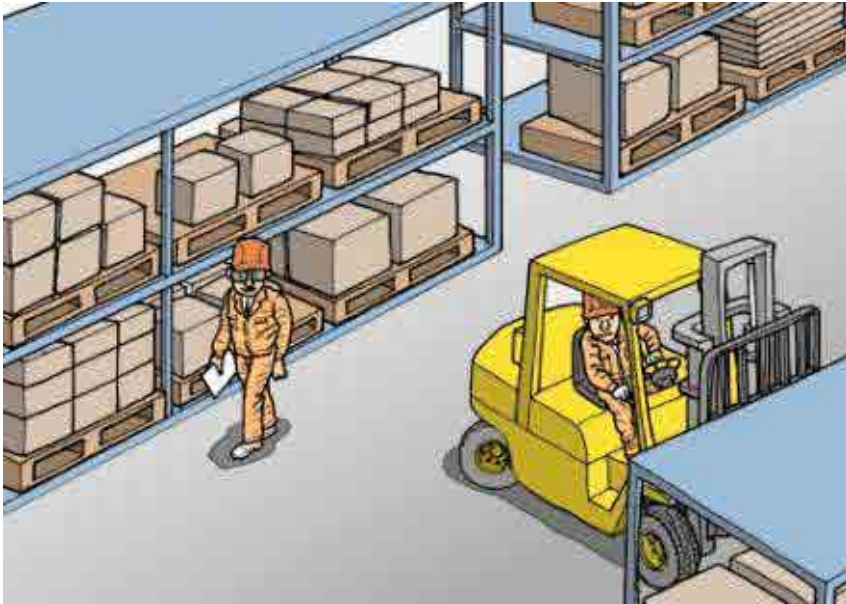
Signal to pedestrians to stand clear.

Do not allow anyone to stand or walk under upraised forks.

When possible, make eye contact with pedestrians or other forklift operators before moving in their path.



Forklift-pedestrian accident example



Neither the pedestrian or the forklift operator were paying attention!!

Loading truck trailers and railroad cars

Make sure:
truck trailer wheels are chocked,
dock board is secure and can
handle weight,
you use horn or warning lights
when exiting trailer or railcar.



OSHA



OSHA

Wide or irregular size loads



Source - New York Dept. of Health



OSHA

Distribute the weight evenly when carrying irregular sized loads.

Keep the center of gravity of the load as near as possible to the center going horizontally across the forks.

Keep the center of gravity of the load as near to the front wheels as possible.

Loading/unloading High Storage Racks



When removing a load from a high rack:

Slowly back out with the load

Stop when it clears the rack

Lower the load to the floor

Don't lower the load while moving!

Forklift do's and don't's

No one else on the forklift except the operator, unless the forklift has a seat for a rider.

Always drive with the forks lowered and lower forks to floor when parking the forklift.



Source: JICOSH



Watch overhead clearances – especially entering or exiting buildings or when you are raising a load on the forks.

[Yale forklift company safety poster](#)

The risk to a rider



A seasoned forklift operator sat next to the operator's seat while showing a new operator how to operate the forklift.

The new operator accidentally performed the wrong maneuver, causing the forklift to run into one of the pillars at the site. The worker who had been training him was crushed between the support pillar and the forklift.



Stay out of the mast!!



While using a forklift to transport 15 cardboard boxes at once, some of the boxes started to slip. The operator climbed into the mast to adjust the falling boxes.

When the worker stepped between the operator's seat and the mast (without turning off the engine first) he accidentally hit one of the control levers, causing the mast to move. He was crushed between it and the overhead guard.



No Speeding!!



Wikimedia commons

Don't leave your forklift unattended

A forklift is considered "unattended" when the operator is 25 ft. or more away from the vehicle even if it remains in his view, or whenever the operator leaves the vehicle and it is not in his view.

When a forklift is left unattended, forks must be fully lowered, controls neutralized, power shut off, and brakes set. Wheels must be blocked if the truck is parked on an incline.

Wisconsin Dept of Health Services



Where's the operator??

When the operator of a forklift is within 25 ft. of the truck still in his view, the load engaging means must be fully lowered, controls neutralized, and the brakes set to prevent movement, but the power does not need to be shut off.

Propane-powered forklifts and carbon monoxide

Propane powered forklifts produce carbon monoxide. The amount depends on how well they are tuned, but should be 1% or less at the tailpipe.



Source: Worksafe BC

Carbon monoxide poisoning can occur when propane forklifts are used in cold rooms, controlled atmosphere rooms, truck trailers or shipping containers, or in warehouses or other enclosed areas that do not have enough fresh air ventilation.

If propane powered forklifts are used indoors, they should be tuned up regularly and tested for carbon monoxide emissions periodically.

[Link to more information on carbon monoxide and forklifts](#)

You must also have hands-on training on the specific truck you will operating

... truck controls and handling are different



[Click here to see L & I forklift operator training requirements](#)

Forklift Safety Quiz Questions

1. Because a forklift weighs more, it is easier to stop it with the brakes than a car.

a) True

b) False

2. When driving down an incline with a loaded forklift, you should:

- a) Go down the incline backwards.
- b) Raise the load before going down the incline.
- c) Go down the incline frontwards.
- d) Honk the horn.

3. If you are driving a forklift and it hits a hole and starts to turnover, you should:

- a) Jump out away from the direction it's falling.
- b) Quickly turn off the engine.
- c) Pull your arms in and hold on.
- d) Crank the wheels the opposite way it's falling.

4. If you see a large puddle of hydraulic fluid under the forklift, the first thing you should do is:

- a) Use it to finish your task and then take it to maintenance.
- b) Clean up the puddle before someone slips on it.
- c) Inform maintenance or your supervisor and not operate the forklift.
- d) Find out where the leak is coming from.

5. Before you first enter a truck trailer with a forklift you should:

a) Check to make sure the trailer has been secured with wheel chocks

b) See if there is a spotter inside the trailer.

c) Get your supervisor's approval to enter.

d) Jump up and down on the dockboard.

6. Special attachments to a forklift can be used when:

a) The production manager approves it.

b) The forklift manufacturer approves it.

c) You have checked that it doesn't change the forklift operation.

d) None of these.

7. The best way to handle a large load that reduces visibility is to:

- a) Honk the horn continuously so other workers know you are moving.
- b) Drive in reverse or use a spotter.
- c) Raise the load so you can see under it.
- d) Walk the route first so you know where to go.

8. A propane powered forklifts doesn't cause a carbon monoxide hazard if:

- a) It is well-tuned and there is plenty of ventilation.
- b) It is driven slowly.
- c) It is used in place of a gasoline-powered forklift.
- d) It is a brand-new model.