FORKLIFT OPERATOR
SAFETY TRAINING

Introduction | Welcome to Forklift Safety Training

Forklift operators are the movers and shakers of the industrial world. Without forklifts everyday tasks (in warehouses, factories, and construction sites) would take much longer.

The forklift operator does important work, but that work isn't worth much if it isn't done safely. Forklifts are powerful machines. A carelessly driven forklift can injure or even kill. This course will provide you with the training you need to do valuable work – and do it safely.

When you finish this training and quiz, you should be able to complete the following tasks safely:

- Perform a pre-operation forklift inspection
- Drive a forklift
- Lift and place a load
- Work inside a truck, trailer, or rail car
- Park and leave a forklift
- Refuel a forklift

You should also be able to explain the following concepts:

- How the forklift differs from other vehicles
- The basics of the stability triangle
- The special features of motorized hand trucks and high lift units
- The guidelines for conducting regular maintenance on the forklift
- The guidelines for recording forklift modifications

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There are different forklifts for different work environments, and for different kinds of lifting and moving tasks. The most common type of forklift has a heavy counterweight over the rear tires to balance the load. These lifts usually have solid rubber tires, and are common in factories and warehouses. If equipped with pneumatic tires, this kind of lift can be used out of doors.

Other forklifts raise the operator with the forks, or are operated from a standing position. Hand lifts are operated while walking behind the lift – sometimes they lift the load only a few inches off the ground.

A forklift is any mechanical device, powered by an electric motor or internal combustion engine that is used to move or lift loads.

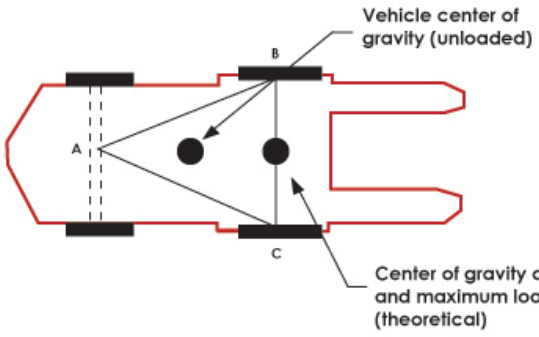
Don't expect a forklift to handle like a car or truck. Because of the counterweight over its rear wheels, a forklift is much heavier than a car. As a result, it can't stop or turn quickly.

Forklift steering is also different from automobile steering. Cars and trucks use their front wheels to steer. But a forklift uses its rear wheels, which allows it to turn in a very tight circle. But it means that the back end can swing out when turning.

When turning a forklift, watch behind you to make sure the rear end of the lift doesn't run into anything – or anyone. Also keep an eye out for your forks and any load you may be carrying.

The rear end of the forklift swings in a circle around the front wheels. Make sure there's room for the rear end to swing out when making turns. And if you're moving a load in reverse, don't forget to allow room for the load to swing too.

Most forklifts have a three-point suspension system. The three points are the two front wheels and the pivot point of the rear axle. Connect the three points, and you have what's called **the stability triangle**.



NOTES:

1. When the vehicle is loaded, the combined center of gravity (CG) shifts toward line B-C. Theoretically the maximum load will result in the CG at the line B-C. In actual practive, the combined CG should never be at line B-C.

2. The addition of more counterweight will cause the truck CG to shift toward point A and result in a truck that is less stable laterally.

One major difference between a forklift and a car is stability. Almost all counterbalanced powered industrial trucks have a three-point suspension system. That is, the vehicle is 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 at the axle's center. When the points are connected with imaginary lines, this three-point support forms a triangle called the stability triangle.

When at rest, on level ground, the forklift's center of gravity is within the stability triangle. But if the forklift is put in motion, or sits on a sloping surface, its center of gravity shifts. Any time the forklift's center of gravity moves outside the stability triangle, the lift will tip over.

The forklift's center of gravity moves when you accelerate, brake, or turn. An unloaded forklift can also tip from the weight of the counterbalance, so safe driving is just ask important with an unloaded lift.

Now you've seen how a forklift's center of gravity can shift. It gets a lot more complicated when we add the weight of a load to the forklift, and raise that load in the air.

This is because the center of gravity for a loaded life is actually the combined center of gravity for both the lift and the load. The heavier the load – and the higher you lift – the further forward the combined center of gravity goes.

Imagine a vertical line passing through the combined center of gravity. This line is called the line of action. If the bottom of this line goes outside of the stability triangle – because a load is too heavy or too high, or because the forklift is not on a level surface – it will tip over.

A vertical line extending from the center of gravity of the vehicle-load combination must stay inside the stability triangle to prevent the forklift from tipping.

Forklift stability is based on keeping the center of gravity inside what's called the stability triangle. This stability triangle is made by connecting the two front wheels and the pivot point of the rear axle. The other concept to understand is the forklift's center of gravity. Notice that the front and rear edges of the stability triangle are high-lighted. When unloaded, the forklift's center of gravity is right about here. When a load is added, the forklift's center of gravity moves towards the forks. Heavier loads shift the center of gravity forward even further. Raising the load also shifts the center of gravity forward.
In order to prevent the lift from tipping, the combined center of gravity of the load and the lift must stay inside the stability triangle (at ground level) at all times. The same is true of side stability. If you have a balanced load, the load is unlikely to impact the side-to-side center of gravity. But if you drive on a sloped surface, your center of gravity could pass outside of the stability triangle and the lift could tip.

Every forklift has an identification plate that lists important information about the truck. This plate will tell you the model and serial number of the truck, the weight of the truck, and its load capacity. To be sure that the center of gravity of your forklift stays inside the stability triangle, don't try to lift anything heavier than the identification plate allows.

No matter how busy you are, you must inspect your forklift before using it. If you do find something that could affect the safety of the vehicle you must report it immediately. Do

not use the forklift until the problem is corrected. Follow the operator's manuals supplied by the equipment manufacturer. These manuals describe the safe operation and maintenance of forklifts. Remember, the operator is responsible for the safe operation of the forklift.

Do a pre-operation inspection before every shift. If the forklift is used around the clock, inspect it either before each shift or after each shift. The pre-operation inspection covers every aspect of the forklift. It is completed in two parts:

- the walk-around inspection, and,
- the seated inspection.

OSHA does not require documentation of a daily inspection. But it's a good idea to have a checklist to make sure you don't miss any steps. These checklists can also be saved as a part of the maintenance record.

Start with the walk-around inspection.

- Check the condition of the tires. If the forklift is an outdoor forklift with pneumatic tires, check the air pressure and look for excessive wear on the tires. A tire with low air pressure could cause the lift to tip when a load is raised. So could a tire failure.
- Inspect all hoses, belts, and cables. Look for cracks or other signs of wear.
- Check all fluid levels.
- Check the engine for any signs of wear, loose connections, or leaks. Wipe up any excessive oil or other flammable substance.
- Look for cracks or deformities in the forks, backrest, mast, and overhead guard.
- Check the identification plate to make sure it is intact and legible.

To begin the seated inspection, use the three-point technique to climb onto the forklift. Use three points of bodily contact: grab a secure part of the lift which each hand, and put one foot securely on the forklift. You'll learn more about the three-point technique in the next section.

Follow this checklist to conduct the seated inspection:

- If there is a seat belt, make sure it buckles and tightens correctly, and is accessible.
- Check safety equipment like safety lights to make sure they are working properly.
- Start the engine. Always start the engine while seated in the operator's position—never while standing alongside the forklift.
- Check all gauges and warning lights, and the battery or fuel level. Get familiar with the controls. Lift and lower the forks, and tilt the mast. Make sure that everything works smoothly and is clearly labeled.
- Test the horn. You'll need to sound the horn at intersections, and wherever vision is obstructed.
- Check the brakes by depressing the brake pedal. There should be some resistance.
- Set and test the parking brake.
- Check the steering. A lot of play or hard steering will reduce your control.

- Move the forklift forward a few feet. Set the parking brake and climb out of the forklift to check the floor for leaks. Leaks could indicate a hydraulic problem, and fluids left on the floor are a slipping hazard.
- Also look for sparks or flames coming out of the exhaust system.
- Listen for any unusual sounds. If you find anything wrong with the forklift during the walk-around or seated inspection, do not operate it until it has been repaired.

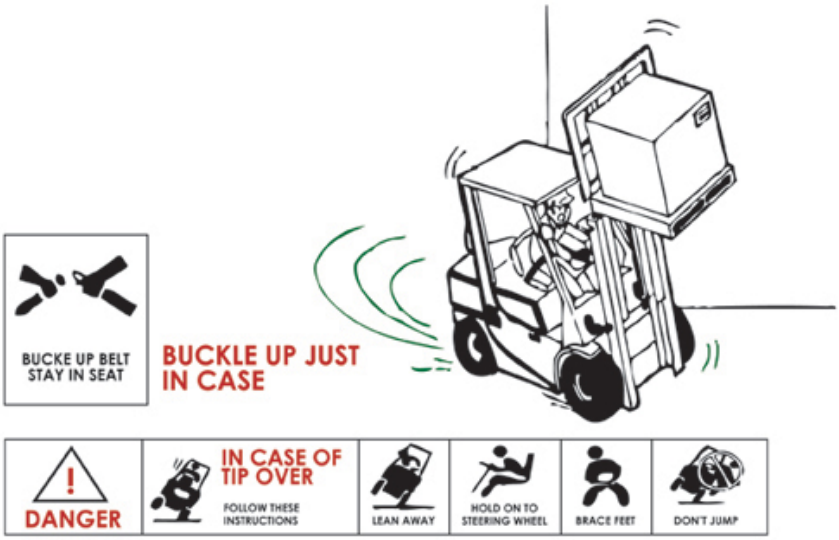
Section 2 | Driving, Lifting, and Placing

Whenever you climb onto the forklift, use the three-point technique. Make three points of contact with the forklift. Grab a secure part of the lift with each hand, and put one foot securely on the forklift.

These basic precautions will increase your safety and the safety of those around you.

- On smooth indoor surfaces, keep your forks as low as possible – only three of four inches off the floor.
- Don't give anyone a ride on the forklift, and don't do any stunt driving or horseplay.
- Keep all your limbs inside the forklift. When driving in reverse, don't wrap your hand around any outside guards – if the lift runs into something, your hand will be crushed.
- Always fasten your seat belt. If the truck has a safety belt, you're required to wear it.
- Never exceed the speed limit in your work area.
- Avoid loose objects, bumps, or depressions in the floor. Collisions could cause you to lose control of the steering, bring the forklift to a sudden stop, or tip the forklift.
- Avoid wet, oily, or icy surfaces. Clean up fluids as soon as possible.
- If your work area has convex mirrors at corners and blind spots, use them.
- Sound your horn at corners and blind spots and then proceed slowly.
- Never approach a person head-on, especially a person standing in front of a fixed object like a wall or rack. If you can't stop the forklift, or it lurches forward, the worker will be crushed. Instead, approach parallel to the person.
- Don't let anyone walk or stand under the elevated forks.
- Stay at least three forklift lengths away from forklifts ahead of you.
- Don't pass a forklift traveling in the same direction if you're at a blind spot, an intersection, or any other dangerous spots. Avoid passing at all if you can.

Never jump off of a forklift. If the forklift is tipping over, do not attempt to jump off, because you could be pinned under the lift.



If the forklift is tipping over, protect yourself by staying put:

- Stay in your seat and do not attempt to jump off.
- Lean away from the falling direction of the lift.
- Hold onto the steering wheel and make sure you're stable.

Your never want to lean toward your fall. You should hold onto the steering wheel, make sure you're stable and lean away from your falling direction.

Before you pick up a load, make sure the load does not exceed the capacity of the forklift. The identification plate tells you three things:

- The maximum load that's safe to life.
- The maximum height for lifting.
- How far the load center is in front of the forks.

Make sure you know exactly what you will be lifting:

- There's a big difference between a light load and a heavy, off-center load.
- If the load is unstable, restack it or attach the load securely to the pallet with banding or stretch wrapping.
- If you'll be handing a load with an unusual shape, know where and how you'll safely stack the load before you lift it.

Always take these precautions when lifting a load:

- If you're going to raise the load, check for overhead obstructions. Look for lights, pipes, or sprinkler systems.
- Center the forks under the load so the weight is evenly distributed.
- Drop the forks to the floor and slowly position them under the load.
- Drive forward until the load is resting against the backrest.
- Tilt the load against the backrest. If the load is unstable, lift the load slightly first, then carefully tilt it back so that the load stays tight against the backrest. If it's a stable load and secure on the pallet, tilt first, then lift.

- Once the load is lifted, lower it to a safe traveling height. Keep the forks two to four inches off the floor if driving on a smooth surface.

Follow these precautions when traveling with a load:

- Keep your forks at the lowest safe height. Raise them slightly if you come to bumps or seams in the floor. On a smooth, indoor floor, keep the forks about two to four inches off the floor.
- Don't raise or lower the forks while driving. This causes the center of gravity to shift unpredictably.
- Pedestrians always have the right of way. Look out for them. Always look in the direction of travel. Travel in reverse if you load blocks your vision.
- If a load is so tall that you can't see over it, try to split the load and carry it on two separate pallets, on two separate trips.
- If you can't split a tall load, either drive in reverse or use a spotter. Make sure you understand the hand signals the spotter will use.
- On ramps and inclines, keep the load on the uphill side of the forklift. Try to travel straight up and down grades, ramps, and inclines. The forklift could tip if you turn on a slope.

Before placing a load, check the destination. Is it flat and stable? Will the load tilt or lean? Follow these guidelines when placing a load:

- Never place heavy loads on top of light loads.
- If you're placing loads onto a rack or storage loft, be sure the structure can support the load.
- If any rack legs or support members are bent or disconnected, wait until the rack is repaired to place the load.
- Make sure the rack decking is in good condition.
- If you're stacking, the bottom pallets must be in good condition and able to support the load.
- Stop the forklift in front of where you want to place the load.
- Slowly raise the load to the required height.
- Move forward slowly with the raised load.
- Position the load for placement, and tilt it forward so that it's level.
- Place the load squarely and straight.
- Once the load settles, check behind you for pedestrians and other traffic. Then back up slowly.
- Make sure the forks clear the pallet before turning or lowering the forks.
- Lower forks before moving again.

Section 3 | Trucks, Trailer, and Rail cars

It's John's first day driving forklift at the plant. A driver backs up to the dock to pick up his load. John flips the switch on the restraint system that's supposed to latch onto the rear of the trailer, but it won't work. He looks for the wheel chocks, but he can't find them.

The driver is in a hurry to hit the road. He sets the tractor parking brake and tells John it's safe to load the trailer. John doesn't want to hold him up, but he's not sure if it's safe to load the trailer.

Is it safe for John to load the trailer?

Be careful! That trailer isn't secured to the dock. Even with the tractor attached, it could rock forward or be unstable.
John calls maintenance to get the restraint system working, and maintenance comes down and makes the repairs. But the truck driver is still giving him a hard time. John takes the time to walk into the trailer and make sure it's well lit and that the floor is solid.

John finds the wheel chocks, and chocks the wheels of the trailer.

Is it safe for John to load the trailer?

It's safe for John to load the trailer. The trailer is secured with a restraint system and wheel chocks, John has inspected the inside of the trailer, and he's using a dock plate to enter the trailer.

John loads the trailer, and the truck driver finally leaves. A new trailer is backed up to the dock for unloading. The trailer is left without a tractor. John engages the restraint system, but it isn't working again.

John's coworker finds an extra set of wheel chocks at his dock, and walks them over. John puts the wheel chocks under the rear wheels, and the coworker puts a trailer jack under the front of the trailer. She also puts a warning sign at the front of the trailer to make sure that no one moves it while John is working inside. John inspects the inside of the trailer and puts down a dock plate.

Is it safe for John to load the trailer?

It is safe for John to unload. But it's a good thing his coworker put down the trailer jack. Without it the trailer might tip forward as John unloaded.

As a forklift operator, you may be required to load or unload trucks, semi trailers, or railroad cars. The first thing you should do each time is walk into the trailer to make sure it's safe:

- Make sure the trailer is well lit inside.
- Check that your lift mast will clear the ceiling.

Check the floor for obstructions or loose objects, and look for holes or weak points.

Dock plates are used to bridge the gap between the dock and the trailer.
When using a dock plate, take these precautions:

- Make sure that your dock plate is designed for the combined weight of the load, the forklift, and you.
- Inspect dock plates every day for cracks, bends and any other signs of failure.
- When using a portable dock plate, make sure that the dock plate overlaps both the dock and the trailer by at least eight inches.

- Secure the dock plate before walking or driving over it. Portable dock plates usually have a vertical divider to prevent slipping.

A great deal of the danger in working inside a trailer comes from the chance that the trailer will creep away from the dock. This is called trailer creep.

If a trailer is left at a loading dock without the tractor attached, the trailer is likely to creep forward as you work in it. Don't take chances. Several restraint systems and tools are available.

Wheel chocks must be placed in front of the rear wheels of the trailer. Note that wheel chocks can be loosened by the movement of the trailer.

Trailer-mounted vehicle restraints clamp onto the trailer's rear impact guard. This system will signal when the restraint is engaged or if there is a problem.

Wheel-mounted vehicle restraints latch onto the trailer's rear wheels. They can be used when the trailer doesn't have a rear impact guard, or the guard is damaged.

Trailer jack stands keep a trailer from up-ending when a forklift drives to the front of the trailer, or the trailer is unbalanced by loading or unloading. Don't depend on the trailer's landing gear alone.

Take these precautions when working with trailers:

- Make sure the truck or trailer is properly secured and the engine is off before you load or unload.
- If you don't have a restraining system with indicator lights, post signs warning not to move the trailer.
- At some loading docks, the pavement slopes downhill to the dock—this is not a substitute for wheel chocks and restraint systems.
- If the trailer is not ventilated, take care that you are not at risk of carbon monoxide poisoning. Exhaust fumes and emissions from the forklift may build up inside.

Ramps and inclines are common to loading areas. Inclines can cause a forklift to tip over. On inclines greater than ten percent, keep the load on the uphill side of the forklift.

Section 4 | Parking & Refueling

Take care when you park a forklift:

- Consider the safety of your co-workers.
- Never park near walkways or stairways, or in front of an exit.
- Lower the forks so they don't create a tripping hazard.

When you will leave the lift unattended and out of your sight, take these precautions: Set the controls to Neutral, set the parking brake, and turn off the engine.

- To be really safe, take the key with you.

- If the lift is parked on an incline, chock the wheels.

If you park a forklift but stay within 25 feet, and in sight of the lift, you can leave the engine running, but you must lower the forks to the ground, set the controls to Neutral, and set the parking brake.

Always wear the appropriate protective equipment when fueling any kind of forklift. Do not smoke while refueling, and keep any open flames away from refueling areas.

When refueling a propane-powered forklift, follow these steps:

- Park the lift and close the fuel line valve on the cylinder. Let the engine run until it stops. This guarantees that the connection hose is empty of propane.
- Shut off the ignition.
- Put on protective gloves.
- Disconnect the hose and the holding straps, and lift the empty cylinder free.
- Replace the empty cylinder with a full one. The locating pin should go through the hole in the cylinder handle. When the tank is seated, the relief valve should point straight up, in the 12 o'clock position.
- Connect the holding straps.
- Tighten the connecting nut.
- Slowly open the valve on the cylinder halfway, and check for leaks.
- Smell, listen, and look. You can also use a solution of soap and water, and look for bubbles. Never use matches or a flame.
- If the valve leaks, tighten the nut, then try to open the valve again, and check for leaks once more.
- If the valve continues to leak, change the cylinder. If you still find a leak, have the hose changed or repaired.
- Once there are no leaks, slowly open the cylinder all the way.

If you forklift is powered by liquid petroleum gas, or LPG, you refuel by changing cylinders. Wear protective gloves, because contact with liquid propane can cause freeze burn.

Before you begin, close the fuel line valve on the cylinder, but in this case keep the engine running until it stops.

Shut off the ignition. Disconnect the hose and the holding straps, and remove the empty cylinder.

Never use metal tools to change a cylinder. Replace the empty cylinder with a full one in the proper position. The locating pin should engage the hole in the cylinder handle so that the release valve is straight up in the twelve o'clock position.

Connect the holding straps. Tighten the connecting nut. Check the hose to make sure it's tight. Slowly open the valve on the cylinder part way and check for leaks.

If the valve leaks, tighten the nut and continue. If it still leaks, change the cylinder. And if it still leaks after that, have the hose changed or repaired. Once there are no leaks, slowly open the valve all the way. Secure the cylinder. Start the engine and resume operation.

When you're refueling a gasoline or diesel lift, follow these steps:

- Make sure you have the proper fuel.
- Turn off the engine and set the parking brake.
- Don't overfill the tank. Replace the fuel cap and clean up any spilled fuel.

Start the engine and continue.

Wear eye and skin protection when changing a battery—battery acid is corrosive! Follow these steps when changing a battery:

- Set the forklift parking brake and shut off the engine.
- Make sure the battery is secure before lifting it.
- Stay clear of the battery when moving it.

When charging a forklift battery, wear protective eyewear and skin protection, and know the location of the nearest eyewash station or shower. Also know where to find materials for neutralizing spilled electrolyte.

- Be sure the ventilation system is working before charging a battery.
- If the battery is on the forklift, uncover the battery compartment to prevent a build-up of heat or hydrogen gas.
- Make sure the vent caps are not plugged.
- Turn the charger off before connecting it to the battery.
- Don't let any metal objects come in contact with the battery terminals.
- Carefully clean up any spilled electrolyte using proper safety procedures.

When adding water to top off a battery, be sure to wear safety goggles to protect against electrolyte splash or spray. A face shield is even better.

If you dilute concentrated sulfuric acid with water to make battery acid, remember to always add the acid to the water. Adding water to acid can esult in a dangerous chemical reaction. Wear eye and skin protection when changing a battery—battery acid is corrosive! Also know where the eyewash station and the shower are, and supplies for cleaning up hazardous spills. Follow these steps when changing a battery:

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Section 5 | Special Units and Maintenance

If you are using a high-lift truck, take these precautions:

- Always use the proper fall protection equipment and safety devices.
- Use a safety guard to protect you from falling objects and overhead hazards.
- Do not travel with the operator or the load in a raised position.
- When using a two-person unit, maintain communication with the operator at all times.

Take these precautions when using a walk-along unit like a hand truck or pallet truck:

- Always drive at a normal walking pace.
- Bring the unit to a complete stop when stopping to pick up a load.
- Be sure the controls return to neutral when you take your hands off of the lift.
- If you enter an elevator or confined area, move forward, so that the load enters first.

When riding a low-lift truck, take the following precautions:

- Use coasting features with caution.
- Do not coast in pedestrian aisles or when approaching intersections.
- Always sound the horn when approaching aisles and before turning corners.

OSHA requires that a forklift be inspected before each use. If the forklift is used continuously, it must be examined before or after each shift. The owner's manual also lists necessary routine checks and maintenance. These should be done by someone trained in forklift maintenance. Keep a record of all maintenance and repair work done on the forklift.

Before you make any modifications or additions to a forklift, which might affect its safe operation or capacity, you must get those changes approved in writing by the

manufacturer. You also need to change the identification plate, and the operating instructions, to reflect those changes.

If the forklift has a non-standard front-end attachment, the identification plate must identify the attachment. The plate must show the combined weight of the truck and the attachment at the maximum mast height, with a centered load.

Section 6 | Conclusion

Now that you've covered everything in this course, it's time to review for the exam. To help you prepare for the exam, you can now move back and forth within the course. Please take the online quiz in the safety section of the MASCO.net web site.

This exam will include 25 questions.