

Understanding the Workplace:

Physical Conditions

Surface or ground conditions are an important part of safe lift truck operation. Operating surfaces must be strong enough to support the forklift, its load and its operator. They must also be free of holes, grease, oil or obstructions that could cause the lift truck to skid or bounce, and possibly tipover.

Slippery Conditions

Potential Hazards:

- Danger of skidding when traveling on oil, grease, water or other spills.
- Danger of tipover when traveling on ice, snow, mud, gravel and uneven areas.

Requirements and Recommended Practices:

- Avoid the hazardous surface when feasible.
- Spread absorbent material on slick areas that you cannot avoid.
- Cross the slippery area slowly and cautiously.
- Report the area to prevent others from slipping.
- Post a sign or warning cones until the area can be cleaned.
- Drive slowly! (Figure 2)
- Maintain contact with the ground by crossing uneven areas at an angle. (Figure 3)
- Clean up the oil or grease spill before proceeding. Driving over an oil or grease spot will enlarge the hazardous area.



Figure 1. Do not drive over oil and grease spots. Use a dock board or plate to bridge the gap between the dock and the truck being loaded or unloaded.



Figure 2. Slow down to a speed at which you can maintain control.

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Figure 3. Maintain contact with ground by crossing uneven areas at an angle.



Obstructions and Uneven Surfaces

Potential Hazards:

- Danger of tipover when traveling over obstructions.
- Danger of tipover in holes and bumps.

Requirements and Recommended Practices:

- Keep all aisles clear.
- Watch out for overhead obstructions.
- Avoid the obstruction or get off the forklift and remove the obstruction. See [Parking](#).
- Never drive straight across speed bumps or railroad tracks. Cross slowly at a 45 degree angle.
- Maintain steering control by keeping contact with the ground at all times.
- If an area is cluttered, walk the route first to spot problems.



Figure 4. Get off the forklift and remove the obstruction.

For additional information, see [Operating a Forklift - Traveling & Maneuvering](#).

Floor Loading Limits

Potential Hazards:

- Danger of collapsing floor.

Requirements and Recommended Practices:

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- Observe posted floor loading limits.
- Inspect the condition of the floor. Look for holes or weakened flooring, loose objects or obstructions, protruding nails or boards.
- Inform supervisor immediately if flooring is defective.
- Do not travel over surface that cannot support the weight of the lift truck, its load and its operator.
- ***Do not enter a box car or semi-van without inspecting its floor and knowing its load limits.***



Figure 5. Forklift weight exceeded the load limit of the flooring.

For additional information, see [Load Handling: Operating the Forklift.](#)

Overhead Clearance

Potential Hazards:

- Damage to lights, stacks, doors, sprinklers, pipes.
- Damage to load.
- Danger of tipover.

Requirements and Recommended Practices:

- Be aware of the height of fixtures.
- Do not travel with loads elevated.



Figure 6. Ensure adequate overhead clearance.

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Pedestrian Traffic

Many pedestrians or bystanders are injured in forklift-related accidents. These injuries can occur when forklifts strike pedestrians or when pedestrians are struck by falling loads.

Pedestrian Traffic

Forklift operators should always be aware of conditions in their workplace, including pedestrian traffic. Forklift traffic should be separated from other workers and pedestrians where possible.

Potential Hazards:

- Danger of striking pedestrians and objects

Requirements and Recommended Practices:

- Yield right of way to pedestrians.
- When a person or group of people walks across your planned route:
 - Stop.
 - Wait until the pedestrians pass by.
 - Proceed cautiously through any congested area.
- If an area is cluttered, walk the route first to spot problems.
 - Check for situations that require a spotter and use one when traveling.
 - Warn pedestrians, by asking them to move, if there is not sufficient safe clearance.
 - Sound the horn at blind corners, doorways and aisles.



Figure 1. Operator cautioning pedestrian to stop.



Figure 2. Yield right of way to pedestrians.



Figure 3. Slow down, stop and sound horn at intersections and wherever your vision is obstructed.

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- Sound the horn or other alarm when you back up.

Reminders for the Driver:

- Slow down, stop 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.
- Do not move the truck if you do not have a clear view of travel.
- Use a spotter for blind spots.
- Always look in the direction of travel.
- Keep a clear view.
- Start, stop, travel, steer and brake smoothly.
- Signal to pedestrians to stand clear.
- Do not allow anyone to stand or pass under the load or lifting mechanism.
- When possible, make eye contact with pedestrians or other forklift operators.



Figure 4. Sign posted in area with high pedestrian traffic.

Reminders for the Pedestrians:

- Be aware that lift trucks cannot stop suddenly. They are designed to stop slowly to minimize load damage and maintain stability.
- Stand clear of lift trucks in operation.
- Avoid a run-in. The driver's visibility may be limited due to blind spots.
- Be aware of the wide rear swing radius.
- Use pedestrian walkways, or stay to one side of the equipment aisle.
- Never ride on a forklift, unless authorized and the forklift is designed for riders.
- Never pass under an elevated load.

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Reminders for Plant Safety Managers:

- OSHA requires that permanent aisles and passageways be free from obstructions and appropriately marked where mechanical handling equipment is used. [[29 CFR 1910.176\(a\)](#)]
- Consider separating pedestrians from lift trucks by providing:
 - Pedestrian walkways,
 - Permanent railings or other protective barriers,
 - Adequate walking space at least on one side, if pedestrians must use equipment aisles,
 - Pedestrian walkway striping on the floor, if barriers cannot be used.
- Install convex mirrors at blind aisle intersections.
- Post traffic control signs.
- Post plant speed limits.

Moving Personnel

Passengers should not be allowed on forklifts unless the forklift is specifically designed to accommodate passengers.

Potential Hazards:

- Danger of falling

Requirements and Recommended Practices:

- The OSHA standard [[29 CFR 1910.178\(m\)\(3\)](#)] states that unauthorized personnel are prohibited from riding on a forklift. If riders are authorized, a safe place must be provided.
- Unless authorized, never carry passengers -- NO RIDERS.
- Use only specialized equipment designed to raise personnel.



Figure 5. Do not carry passengers.

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- Never transport employees on a platform. Employees can only be hoisted up and down.
- Never transport employees on the forks.



Figure 6. Specialized platform for lifting coworker. Note: There is a guard on the back of the platform to keep the person in the platform and protect the worker's arms and hands.

Maintain Distance

Forklift operators should keep a safe distance from workers on foot and other pedestrians.

Potential Hazards:

- Danger of striking pedestrians

Requirements and Recommended Practices:

- Warn pedestrians of your approach by horn, hand signal, or warning light.
- Maintain a safe clearance from coworkers.
- Employees should stay out of the potential path where a load can fall.



Figure 7. Operator signaling to coworker to stand back.

Additional Resources:

- [NIOSH Alert: Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts](#). DHHS (NIOSH) Publication No. 2001-109, (2001, June). Forklift overturns are the leading cause of fatalities involving forklifts; they represent about 25 percent of all forklift-related deaths.

Understanding the Workplace:

Ramps and Grades

Forklift operators should follow certain general rules of the road when traveling on ramps and other inclines.

Traveling on Ramps and Grades

Potential Hazards:

- There is a danger of tipover when traveling on ramps and grades.

Requirements and Recommended Practices:

- Always look in the direction of travel.
- Never turn on a ramp or incline. Turn prior to the ramp or incline to place forks in proper direction.
- Keep a safe distance from the edge of a ramp.



Figure 1. Drive loaded trucks forward going up a ramp.

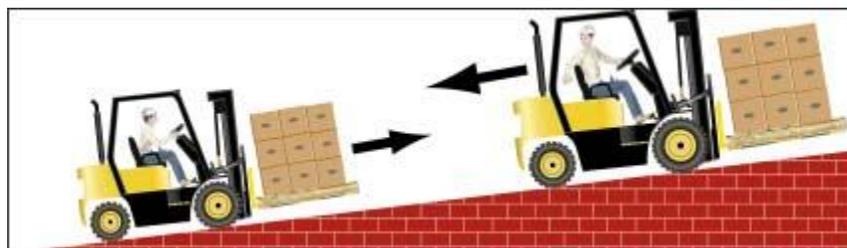


Figure 2. Traveling down ramp without load.

Do not travel on ramps with slopes or other conditions that exceed the manufacturer's recommendation.

Traveling With a Load (Forks Upgrade)

Forklift operators should be aware of procedures to follow when traveling on ramps and other inclines with a load.



Potential Hazards:

- Danger of tipover.
- Danger of losing load.

Figure 3. Traveling with a load. Note that ramps should have railings or bull rails.

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Requirements and Recommended Practices:

- When traveling with a load, the load should point up the incline, regardless of direction of travel.
- Going up the incline:
 - Drive forward.
 - Forks pointed upgrade.
 - Use a spotter if load blocks the driver's view.
- Going down the incline:
 - Drive in reverse.
 - Turn head and face downgrade.
 - Forks pointed up the grade.



Figure 4. Traveling up ramp with load.



Figure 5. Traveling down ramp with a load.

NOTE: When walking with a pallet truck with or without a load, the forks should be pointed downgrade, regardless of direction of travel.

Traveling Empty (Forks Downgrade)

Forklift operators should follow certain procedures when traveling on ramps and grades without a load.

Potential Hazards:

- Danger of tipover.

Requirements and Recommended Practices:

- When traveling without a load, the forks should point downgrade, regardless of direction of travel.

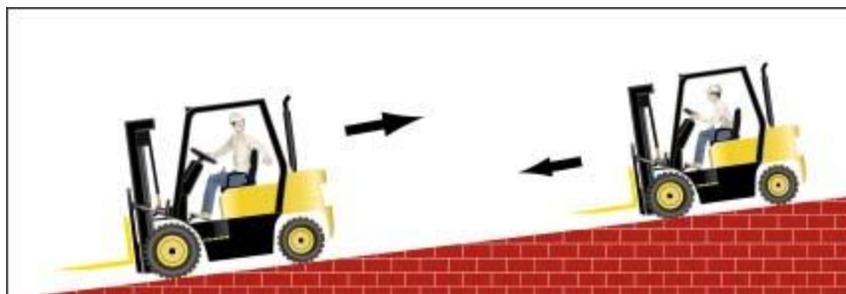


Figure 6. Traveling without a load. Note that ramps should have railings or bull rails.

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- Going up the incline:
 - Drive in reverse.
 - Turn head and face upgrade.
 - Forks pointed downgrade.
- Going down the incline:
 - Drive forward.
 - Forks pointed downgrade.



Figure 7. Traveling down ramp without load.

For more on maneuvering and handling loads, please see the [Operating the Forklift](#) module.

Loading Docks

Loading docks can be dangerous places for forklifts. Falls from a loading dock in a forklift can be fatal.

Loading Docks

When operating a forklift on a loading dock, slow down, watch out for others, and be aware of the edge of the dock.



Figure 1. Always look in the direction of travel. Be careful at the edges of the loading docks.

Potential Hazards:

- Falling off the edge of the dock.
- Skidding or slipping due to wet or icy conditions.

Requirements and Recommended Practices:

- Maintain a safe distance from the edge of loading dock.
- Watch out for tail swing.
- Keep working surfaces clear and clean.
- Paint the edges of the loading dock to improve



Figure 2. Use curbed ramps and dockboards to keep lift trucks from sliding.



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visibility.



Figure 3. Paint the edges of loading docks to improve visibility. Check for pedestrians, over vehicles, and other obstacles when exiting trailers.



Figure 4. Painted edges of loading docks to improve visibility.

For information on entering truck trailers and railroad cars, see [Truck Trailers and Railroad Cars](#).

Narrow Aisles

Conventional rack storage systems were designed for the counterbalanced lift truck which requires about a 12 ft (144 in) aisle width. Narrow aisle storage systems provide more storage space, but require reach trucks and order pickers to operate in much narrower aisle widths.

Reach Trucks

Reach trucks are a type of Class II electric motor narrow aisle truck. These trucks are used for high tiering, which involves storing material in multiple tiers high off the ground.



Figure 1. Reach truck.

Potential Hazards:

- Danger of overloading, especially on high lift.

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- Danger of tipover.

Requirements and Recommended Practices:

- Check pallet weight before lifting.
- Place heaviest loads on the bottom racks, and lighter loads on the top.
- Do not exceed the load capacity of the lift truck with attachments such as a pantograph attachment. (Figure 2)
- Do not lift the heaviest load to the maximum lift or stacking height. There may be a loss of stability.



Figure 2. Reach truck with pantograph attachment that scissors forward from the mast to retrieve the pallet.

Order Picker

Order picker trucks are another type of Class II electric motor narrow aisle truck. These trucks are designed to lift the operator to retrieve items.

Potential Hazards:

- Falling

Requirements and Recommended Practices:

- Wear appropriate fall protection equipment that is properly fitted and adjusted. Ensure that employees are trained in the proper use of the fall protection equipment.



Figure 3. Order picker operator using full body harness.

Additional Information:

- OSHA strongly encourages the use of body harnesses on elevated platforms of powered industrial trucks. [OSHA Standard Interpretation: Fall protection requirements for elevated platforms of powered industrial trucks; body belts versus harnesses.](#) (June 28, 2004)

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Safe Stacking Rules

Potential Hazards:

- Falling loads
- Tipover

Requirements and Recommended Practices:

OSHA's Powered Industrial Truck Standard includes a series of rules for safe stacking:

- Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered. [[29 CFR 1910.178\(o\)\(1\)](#)]
- Only loads within the rated capacity of the truck shall be handled. [[29 CFR 1910.178\(o\)\(2\)](#)]
- The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted. [[29 CFR 1910.178\(o\)\(3\)](#)]
- Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load. [[29 CFR 1910.178\(o\)\(4\)](#)]
- A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load. [[29 CFR 1910.178\(o\)\(5\)](#)]
- Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used. [[29 CFR 1910.178\(o\)\(6\)](#)]



Figure 4. Stored material stacked safely.

In addition, the following are recommended:

- Move forks as far apart as the load will permit. Be sure the load is centered and the forks are completely under the load before lifting.
- When stacking use only enough backward tilt to stabilize the load.

Elevators

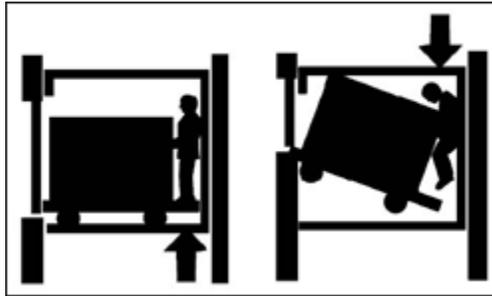


Figure 1. Dangerous loading of a freight elevator.

Potential Hazards:

- Overloading. Know the combined weight of the load and the truck.
- Damage to floor.
- Insufficient overhead clearance and space in elevator.

Requirements and Recommended Practices:

- Ensure the elevator has a rated capacity to safely lift the combined weight of the load and the truck.
- Approach elevators slowly and enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off the power, and set the brakes. [[29 CFR 1910.178\(n\)\(12\)](#)]
- Ensure adequate overhead clearance for truck and space in elevator for the truck and operator.

Understanding the Workplace:

Enclosed and Hazardous Areas

Only designated types of forklifts can be used in certain hazardous locations in the workplace.

Designated Locations

Be familiar with OSHA's truck designations and hazards. Do not use powered industrial trucks that have the correct classification. Post signs in hazardous areas. [[29 CFR 1910.178\(c\)](#)]



Figure 1. Danger of carbon monoxide poisoning in confined spaces.

OSHA Powered Industrial Truck Designations

The OSHA standard specifies 11 designations of powered industrial trucks [[29 CFR 1910.178\(b\)](#)]:

1. **D.** Diesel powered units with minimal acceptable safeguards against inherent fire hazards.
2. **DS.** Diesel powered units with additional safeguards to the exhaust, fuel, and electrical systems.
3. **DY.** Diesel powered units that have all the safeguards of DS units, plus do not have any electrical equipment including the ignition. They have temperature limitation features.
4. **E.** Electrically powered units with minimal acceptable safeguards against inherent fire hazards.
5. **ES.** Electrically powered units with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.
6. **EE.** Electrically powered units that have all the safeguards of the E and ES units, plus the electric motor and all other electrical equipment are completely enclosed.
7. **EX.** Electrically powered units with electrical fittings and equipment designed, constructed, and assembled so that the units can be used in certain atmospheres



Figure 2. Posted chemical hazard area.

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- containing flammable vapors or dusts.
8. **G.** Gasoline powered units with minimal acceptable safeguards against inherent fire hazards.
 9. **GS.** Gasoline powered units with additional safeguards to the exhaust, fuel, and electrical systems.
 10. **LP.** Liquefied petroleum gas units with minimal acceptable safeguards against inherent fire hazards.
 11. **LPS.** Liquefied petroleum gas units with additional safeguards to the exhaust, fuel, and electrical systems.

Designated Locations

The OSHA standard [[29 CFR 1910.178\(c\)](#), see Table N-1] provides a listing of classified locations where trucks with each type of designation can operate.

Indoor Air Quality

When used indoors, forklifts powered with internal combustion engines can present indoor air quality hazards. Cold weather, with the closing of doors and windows, may increase the risk.

Potential Hazards:

- Concentration of fumes.

Requirements and Recommended Practices:

- Do not operate a gasoline/propane/diesel engine for long periods of time in a confined area, such as a truck trailer
- Shut the engine off when staying inside a small confined area like a trailer.
- Do not operate a combustion engine within a warehouse, plant or onboard ship without adequate ventilation.
- Be careful in cold weather. Doors and windows which are normally open may be closed and exhaust and other gases may concentrate.
- Be careful in small rooms or blocked off areas where gases may accumulate.



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- Drive sensibly. Avoid racing the engine or idling for long periods of time.
- Properly maintain engines and do not operate an engine requiring servicing. [[29 CFR 1910.178\(p\)\(1\)](#)]
- Consider switching to battery-powered forklifts, if much of the work is in poorly ventilated spaces or operators may be over-exposed to exhaust byproducts.
- Consider upgrading the ventilation system.
- Install CO monitors to detect levels.

Note: Special Precautions Onboard Ship

If the space to be entered contains an oxygen deficient atmosphere, the space shall be labeled "Not Safe for Workers" or, if oxygen-enriched, "Not Safe for Workers - Not Safe for Hot Work." If an oxygen-deficient or oxygen-enriched atmosphere is found, ventilation shall be provided at volumes and flow rates sufficient to ensure that the oxygen content is maintained at or above 19.5 percent and below 22.0 percent by volume. The warning label may be removed when the oxygen content is equal to or greater than 19.5 and less than 22.0 percent by volume. [[29 CFR 1915.12\(a\)\(2\)](#)]



Figure 3. Powered industrial truck engaged in roll-on roll-off (Ro-Ro) operations and subject to [29 CFR 1915.12](#).

For additional information, see the [Materials Handling: Hoisting and Hauling Equipment](#) module of the Shipyard Employment eTool.

Carbon Monoxide

Forklifts powered with internal combustion engines can cause high levels of carbon monoxide in enclosed work areas.

Potential Hazards:

- Unconsciousness and death may result from carbon monoxide overexposure as the concentration in the bloodstream rises.

Requirements and Recommended Practices:

Understanding the Workplace:

- Train employees to recognize the warning signs of excessive exposure.
- Learn to recognize the symptoms and signs of carbon monoxide overexposure.
- Be especially aware of the dangers onboard ship. [[29 CFR 1915.12](#)]



Figure 4. Danger of carbon monoxide poisoning in confined spaces.