

FORKLIFT SAFETY: How to Keep Safety Within Reach

AUDIENCE:

Certified and to-be-certified forklift personnel, including facility operations personnel, equipment operators on construction projects, maintenance personnel and flight hardware technicians

SMaFocus

3 KEYS TO FORKLIFT SAFETY: TRAINING, INSPECTIONS AND CERTIFICATIONS

According to the National Institute for Occupational Safety and Health, “nearly 100 workers are killed and 20,000 more are seriously injured in forklift-related incidents each year.”



Forklifts, or powered industrial trucks, are so common that many operators may find it easy to overlook the hazards they entail. Since they're relatively easy to operate, some untrained personnel in general industry may not think twice about jumping into the driver's seat and taking control of this powerful piece of equipment.

Common forklift hazards include the following:

- Forklift tipovers/overturns
- Forklifts striking nearby workers
- Operators falling from forklifts or jumping off due to restraint devices (seat belts) not being used properly or being removed

Many unsafe operating practices seem inconsequential until they cause an accident. It's important that you always use caution when controlling equipment to avoid risking damage to the load, the facility or nearby structures, and also to avoid injuring yourself or nearby workers.

TRAINING, INSPECTIONS AND CERTIFICATIONS HELP MITIGATE RISK

To keep forklift operations safe, you should complete the required training and obtain necessary certification. Forklift training includes learning to properly

inspect the forklift and surrounding environment before operation.

1 TRAINING

Forklift training involves both classroom and hands-on training. Training is vital for learning proper forklift operation and inspection.

At each NASA center, the following are generally included as part of forklift safety training:

• Check clearances in all directions

- Keep the lifting forks 4–6 inches from the ground when driving to lower the center of gravity — whether loaded or unloaded.
- Exercise caution when performing turning maneuvers and always check for obstacles within the truck's swing radius.

• Manage the load properly

- Use a stability triangle to determine the center of gravity (balance point)

NASA-STD-8719.9,
Standard for Lifting
Devices and Equipment

**American National
Standards Institute**
- Industrial Truck
Standards

OSHA Standards
for Powered Industrial
Trucks

**National Fire
Protection
Association 505 Fire
Safety Standard** for
Powered
Industrial Trucks

UL 583 Standard
for Electric-Battery-
Powered Industrial
Trucks

UL 558 Standard
for Industrial Trucks,
Internal Combustion
Engine-Powered

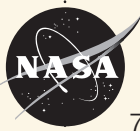


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- of a load. (When the center of gravity shifts, a tipover can occur.)
- Adhere to load capacities provided by the manufacturer.
- Determine the load-bearing capacity of the rack or storage loft.
- Observe carton labels. Follow recommendations for maximum stacking quantities and load orientation.
- Position forks at an appropriate width to keep the load balanced.
- Place the heaviest items at the bottom of the load.
- Always balance and secure the load properly.

- **Load and unload the forklift safely**
 - Raise the bottom of the load to the proper traveling height.
 - Tilt the mast backward slightly to stabilize the load and lift.
 - Drive with the forks fully beneath the load.
 - Do not allow anyone to stand beneath a raised load.
 - Back down the incline when carrying a load on an incline (This orients the load toward the upgrade, minimizing the load's risk of sliding off.)
 - Face forks downhill when moving an empty forklift on a ramp — regardless of the direction of travel.

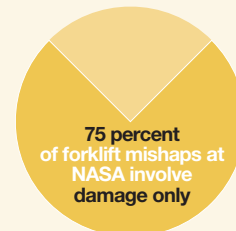


FORKLIFT MISHAPS AT NASA

At NASA, forklift mishaps and close calls are still happening — with damage occurring more often than injuries. (Almost 75 percent of forklift mishaps at NASA involve damage only.) In 2018, a NASA employee suffered a foot fracture due to the lift shifting on the forklift unexpectedly, causing it to land on the employee's foot. Identifying the center of gravity, center of the load and the true capacity of a forklift can be challenging.

The following table documents forklift-related mishaps (19 total; 5 related to injuries) at NASA from 2013 to 2018:

Forklift Mishaps at NASA



ASAP Initiating Event

Type and Sub-Type	Damage	Injury or Illness	Grand Total
Aircraft_Ground	1		1
Ground handling	1		1
Damage_Leak_Spill_or_Release	1		1
Chemical	1		1
Damage_Mechanical	5		5
Impact from being dropped	1		1
Impact, other than dropping	4		4
Damage_Transportation	7		7
Jack knifed or overturn no collision	1		1
Vehicle struck by object	1		1
Vehicle struck object	4		4
Vehicle struck object - parked vehicle	1		1
Injury_Contact_with_Objects		5	5
Caught in or compressed or crushed by object or equipment		2	2
Struck against object or equipment		1	1
Struck by object or equipment		2	2
Grand Total	14	5	19



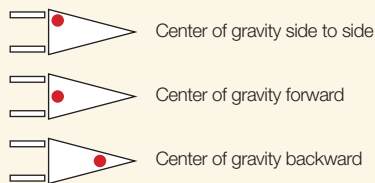
• Wear a seatbelt

- Seatbelts protect the operator in case of an incident or tipover.
- Repair or replace defective seatbelts.

• Handle forklift tipovers safely

- Do not jump out during a tipover. (Operators who have attempted to jump from an overturning forklift have been killed when the overhead guard pinned them to the ground.)
- Stay inside the truck, lean in the direction opposite the tipover and hold on firmly.

What Can Cause a Tipover?



Combination of actions or circumstances can cause a tipover

• Manage forklift and foot traffic

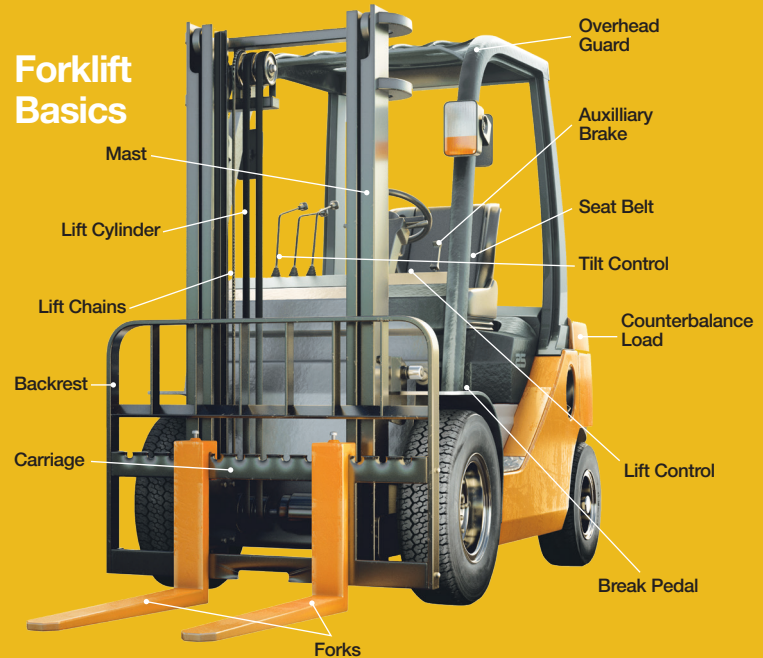
- Alert workers when forklifts are nearby. (It is not always practical to separate forklift and foot traffic.) Use horns or other alarms between aisles, corners, doorways and areas where vision is obstructed. Activate flashing lights, especially in areas where high ambient noise could muffle auditory signals.
- Adhere to safe speed limits and complete stops at intersections.

In addition, forklift training covers inspection of the forklift itself as well as the surrounding environment.

OTHER SAFETY-RELATED ITEMS TO CONSIDER:

- Parking
- Ramps and railroads
- Docks
- Refueling or recharging

Forklift Basics



2 INSPECTIONS

Safe forklift operation is made possible through regular inspections and maintenance. Inspection frequency should be determined by the following schedule:

- Daily inspections by the operator (when forklift is in use)
- Monthly (frequent) inspections by the maintenance contractor
- Annual (periodic) inspections as specified in the project management schedule

Prior to each shift, you should inspect forklifts by

- Ensuring that the lights and horn function properly.
- Inspecting the tires for proper inflation. (Underinflated tires could cause the forklift to tip.)
- Checking the hydraulic system for operation and control as well as leaks or deterioration.
- Watching for excessive grease buildup, exposed battery terminals or sparks from the exhaust, which are all fire hazards.
- Verifying that brakes are reliable and that steering is responsive. Report any malfunctions immediately. Do not operate defective trucks.

NOTE: If any issues are found during inspection, be sure to notify the personnel responsible for maintenance so that issues are addressed quickly.



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Analyze the environment by

- Examining the ground surface condition. Soft or unstable surfaces could cause wheels to sink, which could destabilize the load. Potholes, bumps or other obstacles could dislodge the load or impede steering.
- Locking dock plates securely to prevent forklifts from falling into gaps.
- Exercising caution around ramps and grades. When navigating these areas, orient the forklift so that the load always faces uphill.

To complete training, you must perform an inspection of the vehicle and the environment. Then, you must demonstrate the ability to maneuver the forklift. Only trained and certified personnel are permitted to operate forklifts.



3 CERTIFICATIONS

Certification is awarded if you can successfully perform an inspection of the vehicle and environment, and then maneuver the forklift safely.

Training, certifications and inspections must be properly documented. Forklifts must have a legible nameplate that includes information on the forklift, attachments, maximum load capacity, load center, etc.

SEE SOMETHING? SAY SOMETHING!

If you observe unsafe forklift operating practices in your workplace, consider their causes. For example, are job pressures causing personnel to rush without considering safety procedures? Make suggestions for eliminating unsafe practices or situations. Your efforts to identify unsafe practices could reduce mishaps and close calls, saving thousands of dollars in repairs and replacements while reducing or eliminating injuries.

ADDITIONAL RESOURCES

- Occupational Safety and Health Administration (OSHA) Powered Industrial Trucks/ Forklifts Overview
- OSHA Quick Card: Safe Forklift Operation
- Forklift Action

TRAINING

- National Safety Compliance: Forklift Operator Safety Training Materials



National Aeronautics and Space Administration

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Notice: SMA Focuses are not meant to take the place of official NASA documents. Please refer to NASA directives, policies, standards and procedures for guidance.

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