Forklift Safety

University of Tennessee Safety Guide GS-130

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Purpose

The purpose of this guide is to inform operators and supervisors of operators of their obligation to follow OSHA, NFPA, and other federal, state and local regulations pertaining to the use of powered industrial trucks and forklifts operated at the University of Tennessee, Knoxville. It also outlines training and evaluation procedures. As a guide, it is not a substitute for the regulations themselves, but a summary of important considerations.

Scope and Applicability

This document is intended to provide guidance to faculty, staff, and students regarding use of powered industrial trucks, which include: forklifts, fork trucks, telehandlers, motorized pallet jacks, and motorized power jacks. It does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, farm vehicles, nor to vehicles intended primarily for earth moving or over-the-road hauling.

This document applies to all faculty, staff, students, and visitors who operate or anticipate operating a powered industrial truck or forklift on campus.

Abbreviations and Definitions

Abbreviations

ANSI: the American National Standards Institute

CFR: Code of Federal Regulations

NFPA: National Fire Protection Association

OSHA: Occupational Safety and Health Administration

PIT: Powered Industrial Truck

TOSHA: Tennessee Occupational Safety and Health Administration

Definitions

Powered Industrial Trucks: Any mobile power-propelled truck used to carry, push, pull, lift, stack or tier materials. Powered industrial trucks can be ridden or controlled by a walking operator. Earth moving and over-the-road haulage trucks are not included in the definition. Equipment that was designed to move earth but has been modified to accept forks are also not included. All powered industrial trucks are required to meet the design and construction requirements for powered industrial trucks established in the American National Standards Institute (ANSI) Standard for PITs, Part II, ANSI B 56.1.

Roles and Responsibilities

Forklift Operators shall:

- Be trained and evaluated before operating a powered industrial truck/forklift
- Be reevaluated by a competent person **every three years**.
- Operate and maintain PITs in a safe manner and according to the regulations and training provided.
- Report all vehicle problems to their supervisor.

Supervisors shall:

- Designate and identify employees responsible for operating powered industrial trucks/forklifts.
- Ensure that all employees under their direction, who operate a powered industrial truck/forklift are trained, evaluated.
- Maintain records of training and evaluation.
- Ensure that forklifts are repaired when malfunctioning and maintained, or taken out of service until such repairs can be made.

EHS:

- Shall provide program oversight.
- Review and audit powered industrial truck/forklift safety training as necessary.
- Provide forklift safety training upon request from the supervisor.
- May audit a department or responsible unit and assign training as necessary.

Visitors shall

- Ensure they have passed forklift training and evaluation before operating a powered industrial truck/forklift on campus.
- Comply with all regulations and UT's Powered Industrial Truck/Forklift safety guidance.

Inspection, Fueling, Charging, and Maintenance Procedures

The following section will review:

- **Pre-Use Inspection**
- **Fuel-Handling and Storage**
- **Battery Handling and Storage**
- **Maintenance**

Pre-Use Inspection

Engine-off Inspection

A pre-use inspection identifies potential hazards that may be encountered from a damaged forklift and **must be performed at least daily by the operator before operation**. If at any time a forklift is found to be in-need of repair, defective, or in any way unsafe, the forklift shall be removed from service until it has been restored to safe operating condition. Always refer to manufacturer provided manuals for appropriate inspections guidance. A forklift **does not** need to be inspected on any day that it is not used.

The pre-use inspection can include the following, however refer to the user's manual for the type of machine you are using:

- Verify that the data plate is present, legible, and represents the configuration in use.
- Verify that all safety and control stickers and labels are present and legible.
- Verify that all safety equipment is present.
- Inspect the mast for broken or cracked weld points and any other obvious damage.
- Ensure roller tracks are greased and that chains are free to travel.
- Forks should be equally spaced and free from cracks along the blade and at the heels.
- Check hydraulic fluid levels.
- Check each hydraulic line and fitting for excessive wear or crimping.
- Check hydraulic lines for breakage in the outer case or sheath.
- Check lift and tilt cylinders for damage or leaking fluid. Fluid leaks are not considered normal and must be repaired.
- Inspect mounting hardware on the cylinders.
- Check tires for excessive wear, splitting or missing tire material.
- Check pneumatic tires for proper pressure indicated on the tire.

Power Source Inspection

Battery Power

Batteries contain acid, so protective gloves, goggles, and long sleeves must be worn when working with batteries. Batteries systems should be inspected for:

- Cracks or holes
- Securely sealed cells
- Frayed cables
- Broken insulation. This can occur when a cord rubs against the forklift casing.
- Tight connections
- Clogged vent caps

Propane Power

Before replacement, all LP-gas containers should be examined by the operator for the following defects or damage:

- Dents, scrapes, and gouges of the pressure vessel
- Damage to the various valves and liquid level gauge
- Debris in the relief valve
- Damage to or loss of the relief valve cap
- Indication of leakage at the valves or threaded connections

Engine-on Inspection

Once the engine off inspection has been completed. Mount the forklift safely, put on your seat belt and make any personal adjustments to the seat and wheel.

- Start the engine and verify that all controls operate as they should including: lift, tilt, and shift controls, lights, horns, backup alarms etc.
- The wheel should have appropriate free play.
- Move forward and brake, ensuring travelling and stopping operates as it should.

- Check the floor for evidence of fluid leaks. Again, fluid leaks are not normal and must be fixed.

Once operational aspects are verified, you may begin work.

Fuel Handling and Storage

Fuel storage and

- Liquid fuels such as gasoline and diesel not stored in underground or aboveground storage tanks should be stored in approved safety cans.
- The engine should be stopped, and the operator should not be on or inside the truck during refueling.
- A soap solution should be used to check for LPG gas leaks. A match or open flame should not be used.
- Smoking is prohibited in the container refilling area and in the exchange area during the exchange of containers.
- Cylinders for liquefied petroleum gas (LPG) shall be stored in the following manner:
    - Cylinders in storage having individual LPG capacity greater than 1-pound shall be positioned so that the relief valve is in direct contact with the vapor space of the cylinder.
- Cylinders not in use shall be protected by one of the following:
    - screw-on-type caps
    - collars
    - closed, plugged, or capped cylinder outlet valves
- Cylinders stored within buildings shall not be located:
    - near exits, stairwells, or in areas normally intended to be used for the safe egress of occupants
    - near athletic fields, or other areas of public gathering
- Cylinders stored within buildings frequented by the public shall
    - not exceed an LPG capacity of 1 pound per cylinder, and
    - be limited to a total combined capacity for all cylinders of less than 20 pounds of LPG.
- Cylinder storage within buildings not frequented by the public shall be limited to a total maximum quantity of no more than 300 pounds of LPG per storage location.
- Empty cylinders that have been in LPG service shall be considered as if full for the purposes of determining the maximum permissible quantity of LPG cylinders emptied.
- Cylinders storage locations outside of buildings shall
    - be at least 5 feet from any doorway or openings in a building, or, for buildings with only one means of egress cylinders, be no closer than 10 feet from any doorway or opening;
    - be at least 20 feet from any automotive fuel dispenser;
    - be enclosed with at least a 6-foot high industrial-type fence, chain link fence, or equivalent protection;
    - have at least two means of egress from the enclosure, unless the enclosure is not over 100 square feet in area, the containers are not filled within the enclosure, and the point of transfer is within 3 feet of the gate; and have lighting provided to illuminate storage containers, containers being loaded, control valves, and other equipment if operations are normally conducted during hours other than daylight

Battery Handling and Storage

Designated Charging Areas

- Battery charging installations should be located in designated charging areas that provide flushing

(eyewashes/safety showers) and spill neutralizing materials for spilled electrolyte, fire protection, protection of charging apparatus from damage by trucks, and adequate ventilation for dispersal of battery gassing fumes.

- Facilities for quick drenching or flushing of the eyes and body (approved emergency eyewash and safety shower) must be provided at or near (within 10 seconds) the charging area.
- Smoking and other ignition sources are prohibited in the charging area. "No Smoking" signs must be posted. Additional precautions must be taken to prevent open flames, sparks or electric arcs in battery charging areas.

Charging Batteries

- Properly position forklift and apply brake before attempting to change or charge batteries.
- Rubber gloves must be worn when handling lead/acid batteries. Eye or face protection must also be worn when connecting a charger to a battery.
- Chargers must be turned off when leads are being connected or disconnected.
- All leads and cables must be checked and in good condition.
- When moving batteries, vent caps must be kept firmly in place to avoid electrolyte splashing. When charging batteries, ensure vent caps are functioning and the battery (or compartment) cover(s) are open to dissipate heat. When charging is complete, be sure to replace the vent cap firmly.
- Keep tools and other metallic objects away from the top of uncovered batteries.
- Properly position and secure reinstalled batteries in the forklift.
- Reinstalled batteries or new batteries shall be equivalent to, or shall be rated higher than, the battery type indicated on the truck nameplate.
- Any additional safety requirements or operating procedures specified by the manufacturer of the forklift, battery or charging system must be followed.

Maintenance

- Do not use open flames to check for electrolyte level in batteries or liquid fuel level in tanks
- Do not conduct repairs to fuel and ignition systems of forklifts in areas where fire hazards exist.
- Disconnect batteries prior to repairing electrical systems. Follow all lockout tag out procedures related to the release of hazardous energy.
- Use only replacement parts equivalent with those in the original design.
- Do not alter the relative positions of various parts from how they were received from the manufacturer. Do not add any parts not supplied by the manufacturer nor delete any parts supplied by the manufacturer. No additional counterweighting of forklifts is permitted unless approved by the manufacturer.
- Keep forklift mufflers in proper working condition and free of debris.
- Keep the forklift in clean condition, free of lint, excess oil, and grease.
- When antifreeze is used in the engine-cooling system, only glycol-based material should be used.

Operating Procedures

The following section will review:

- **Basic Operating Rules**
- **Handling and Moving Loads**

Forklift Operating Rules and Guidelines

There are several rules and best practices for operating a forklift. They can be summarized very briefly with three concepts. Ensure you are aware of the:

1. **Forklift's capabilities and inspection status**
2. **Workspace conditions**
3. **Load's size, stability, and weight distribution**

More Details

- Only trained and authorized personnel eighteen (18) years old and older are permitted to operate a forklift.
- Do not operate a gasoline-powered or diesel-powered forklift in a poorly ventilated area. Carbon monoxide gas, an odorless poisonous gas made by internal combustion engines, can build up.
- Do not stand or pass under the elevated portion of any forklift.
- Passengers are prohibited from riding on forklifts.
- Do not place arms or legs between the uprights of the mast or outside the running lines of the truck. Keep all body parts inside the vehicle. When back do not hold the outer post. Fingers may be easily crushed or sheared off if outside the vehicle during a collision.
- When mounting or dismounting a forklift:
    - face the vehicle,
    - never jump off,
    - use a three-point stance (always have both hands and one foot or vice-versa in contact with the unit)
- Wear proper shoes (oil resistant and non-slippery),
- Wear proper clothing (do not wear loose clothing or dangling jewelry), and restrain long hair.
- After mounting the vehicle, fasten the seat belt, apply the brake, and shift to neutral. Also, check around the forklift for clearance and pedestrians before moving.
- **When dismounting a forklift** you must secure it properly. **You must**:
    - **Fully lower load or empty forks to the floor**
    - **Place controls in neutral**
    - **Set the parking brake**
- If you are going to be **more than 25 feet away** from the vehicle or it will be **out of you line of site** you must:
    - **Shut off power**
- Maintain a safe distance from the edge of ramps or platforms while on any elevated dock or platform.
- Forklifts are not to be used to open or close freight doors.
- Forklifts should not be used in areas of poor lighting (less than two lumens per square foot) unless they are equipped with auxiliary directional lighting and the lighting is turned on.
- Fixed jacks may be necessary to support a semitrailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor.
- Set brakes and block wheels with wheel chocks to prevent movement of trucks and trailers while loading or unloading when they are boarded by forklifts.
- Check the flooring of trucks and trailers for breaks and weakness before loading or unloading.
- Check for sufficient headroom under overhead hazards such as lights, pipes, or sprinkler systems.
- Do not lift personnel or allow personnel to be lifted or work from the fork lift without a properly

engineered, manufacturer approved, and properly attached lifting carriage. Whenever a truck is equipped with a lifting carriage or forks for lifting personnel, take the following precautions:

- Ensure the platform is firmly secured to the lifting carriage and/or forks
- Provide means whereby personnel on the platform can shut off power to the truck
- Provide protection from falling objects

Handling and Moving Loads

To Pick Up a Load

- Only pick up stable and safely arranged loads within the rated capacity of the forklift.
- Adjust long or high (including stacked) loads which may affect capacity.
- Square up on the center of the load and approach it straight with forks in traveling position.
- Stop when the tips of the forks are about a foot away from the load.
- Level the forks and slowly drive forward until the load is resting against the backrest.
- Lift the load high enough to clear whatever is under it. If lifting from a rack be mindful of the shelving above the load; ensure you do not strike or catch on shelves above. Use a spotter as necessary.
- If working in and around racks, ensure that other workers will not be at risk of falling objects; consider the risk of pushing objects off the other side of rack (clear aisles of people as necessary).
- Carefully tilt the mast back to stabilize the load.

Driving With a Load

- Always travel with a load tilted slightly back for added stability.
- Starts and stops should be gradual; Avoid sudden acceleration or braking.
- Observe all traffic regulations and keep forklift under control at all times.
- Reduce speed and sound horn at intersections and other locations where vision is obstructed
- Keep a clear view of the path of travel. Always look in the direction of travel.
- Drive in reverse rather than looking around the load if you are unable to see over it.
- Pedestrians have the right-of-way. Always be aware of their presence especially in aisles and doorways.
- Never drive a forklift directly towards anyone standing in front of a wall or other fixed object
- Do not lift or lower the load when the forklift is in motion.
- Travel with the load at a height of four to six inches at the tips and two inches at the heels to clear most uneven surfaces and avoid debris.
- Horseplay is not permitted.
- Slow down for wet, slippery, or uneven floors.
- Avoid running over loose objects on the roadway surface.
- Properly secure dock boards and bridge plates before driving over them. Drive over slowly and never exceed their rated capacity.
- When **traveling on a ramp** (ascending or descending grades in excess of 10%):
  - Ascend or descend grades slowly
  - Never turn on a ramp
  - Drive **loaded trucks with the load upgrade** regardless of the direction of travel
  - Drive **empty trucks with the forks downgrade**, regardless of the direction of travel
  - Use low gear or the slowest speed when descending a grade.

Safe Steering

- **Slow down** to maintain balance.
- Remember that the rear wheels turn. Turns can be made from the centerline of a turn or slightly to the inside. With a front wheel steering car our tendency is to swing wide. On a forklift, “swinging wide” can result in the back end striking any objects, walls, or racks on the outside of the turn.
- Allow enough room for forks to clear the sides before turning, when backing out of an aisle.
- When negotiating turns, turn the steering wheel in a smooth sweeping motion. At very low speeds, turn the steering wheel at a moderate, even rate.
- Never turn a forklift with the load or empty forks lifted higher than the travel height (i.e. four to six inches at the tips and two inches at the heels on flat terrain; a few inches higher may be appropriate on slightly uneven terrain).

Placing a Load on an Elevated Surface

- Square up and stop about a foot away from the rack on which the load is to be placed.
- Raise the load 5-10 inches above the unloading point (space permitting).
- Drive forward stopping 3-4 inches in front of deposit point.
- Tilt mast forward to a right angle position so load is level.
- Drive forward until load is aligned with the deposit point. Stop.
- Gently lower load to resting-place.
- Stack pallets loaded with cases, cartons straight and square. Stagger the top tier to "tie-in place".
- Tilt the forks slightly forward to avoid hooking the load
- Look over both shoulders and back straight out until the forks clear the rack. Stop.
- Once clear lower the forks to about 2-4 inches above the ground, then continue to backup or turn to proceed to the next location. Do not turn with elevated forks.

Placing a load on the ground/floor

- Square up the forks, approach the landing place.
- Level the forks and then drive the rest of the way in.
- Lower the load.
- Tilt the forks slightly forward to avoid hooking the load.
- Look over both shoulders and back straight out until the forks clear the pallet.

Training & Evaluation

Each powered industrial truck operator must be determined to be competent to operate one safely, as demonstrated by the successful completion of **training *and* evaluation**. Employers shall certify that each operator has been trained and evaluated. The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation. Certification of training is not a license and there is no such thing as a state issued forklift license. EHS may, at its discretion, implement certification plans that include carrying a record of training (such as a wallet or lanyard card).

Training shall consist of a combination of **formal instruction** (lecture, discussions, interactive computer learning, video, written material, etc.), and **practical training** (demonstrations performed by the trainer and practical exercises performed by the trainee).

Evaluation consists of successful **demonstration of the operator’s performance in the workplace** and can include interaction and follow-up questions. Operator training and evaluation will be conducted by

EHS personnel who have the knowledge, training, and experience to train forklift operators and evaluate their competence. EHS may designate qualified individuals to conduct evaluations of their workers. EHS representatives may audit and evaluate individuals and departments at their discretion.

Upon completion of the training program, all operators must be evaluated for performance of proper procedures prior to receipt of an operator certificate.

Required Training Topics

All powered industrial trucks/forklift operators shall receive initial training in the following topics:

- Operating instruction, warning and precautions for the types of trucks the operator will be authorized to operate.
- Truck controls and instrumentation
- Differences between a PIT/forklift and an automobile
- Engine and motor operation
- Steering and maneuvering
- Visibility (including restrictions due to loading)
- Vehicle Capacity
- Any vehicle inspection and maintenance that the operator will be required to perform
- Refueling and or changing of batteries
- Operating limitations, and any workplace related topics (e.g. surface conditions, narrow aisles, pedestrian traffic, and hazardous locations).

Refresher training in all the above listed topics, and other relevant topics, will be provided to all powered industrial truck/forklift operators:

- when the operator has been observed to operate the vehicle in an unsafe manner;
- when the operator has been involved in an accident or near-miss incident;
- when the operator has received an evaluation that reveals that the operator is not operating the truck safely;
- when the operator is assigned to drive a different type of truck, or
- a condition in the workplace changes in a manner that would affect the safe operations of a forklift.

Other Training Notes

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. For example, training on a standup narrow-aisle forklift does not mean a forklift operator is trained on a sit-down LPG forklift, but retraining on all components is not necessary if they are documented in prior training.

For this to qualify at UTK, **evidence of prior training** as well as a **record of evaluation conducted here at UTK** must be documented. However, each employer must ensure that each powered industrial truck operator is competent to operate a truck safely, as demonstrated by the successful completion of the training and evaluation.

As stated above, the OSHA Powered Industrial Trucks standard requires additional training for forklift operators who change and charge batteries; handle propane tanks; fuel diesel or gasoline engines; and repair

and maintain powered industrial trucks.

Recordkeeping

Employers who evaluate the operator's performance more frequently than every three years may retain the most recent certification record. Otherwise, certification records must be maintained for three years.

An individual training record shall be maintained for each employee and kept for period of employment + 5 years. The training instructor will document/certify the training and evaluation and will include in the documentation the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.

References

OSHA: 29 CFR 1910.178 (Powered Industrial Trucks)

OSHA: 29 CFR: 1926.602 (Material Handling Equipment)

NFPA: 505 (Fire Safety Standard for Powered Industrial Trucks)

Appendices

None

Disclaimer

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

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