Best Practices Guide
For
Powered Industrial Truck
"Forklift"
Safety

The Hazards of Powered Industrial Trucks

Powered industrial trucks, such as forklifts, tow motors, clamp trucks, and order pickers present serious hazards to employees, the public, and to property. Although these vehicles are usually operated in a limited manner by municipal entities, a comprehensive safety program for them is necessary to avoid the serious injury, liability, and property loss exposures associated with their operation.

Each year in the U.S., over 100 employees are killed and 36,000 are seriously injured in accidents involving these trucks. This is the second leading cause of occupational fatalities in "industrial" type workplaces. In public entities, powered industrial trucks are found in transfer/recycle facilities, public works operations, wastewater and water treatment facilities, civic center/sports complexes and airports.

As dangerous as they are, these industrial vehicles usually do not get the respect due to them by managers and operators. They simply don't "look" all that dangerous. The truth is, however, that the average forklift weighs as much as a mid-size car. Forklifts have no "crush zones" to absorb energy in a collision, no padded dash or safety glass windshield in front of the operator to reduce injury in a collision, and by the very nature of the job that they do, they can easily tip over.

The most common forklift mishaps, resulting in fatal injuries are, in descending order of frequency:

- Tip-overs
- Pedestrians struck by trucks
- Bystanders and operators struck by falling loads
- Falls from the seat, forks or improper make-shift personnel lifts
- Pinned by the mast or a roll away truck
- Collisions with fixed objects
- Driving off loading docks
- Maintenance mishaps including fuel and battery accidents

Serious liability exposures exist when forklifts operate near the public or on/around privately owned vehicles or railcars. "Roll-away" trucks, due to improper maintenance or parking practices are not uncommon and can endanger people and property near where a truck is parked.

Trucks that are inadequately maintained and not cleaned frequently enough often catch fire. Mishandling of LP gas fuel or batteries can also create the potential to have a serious fire or explosion. Inadequate engine tuning can also result in unsafe indoor carbon monoxide levels.

For this reason, this guide has been provided to help you develop and fully implement a comprehensive powered industrial truck safety program that includes: truck selection, inspection/maintenance, operator training, and rules for safe operation.

Applicable Standards

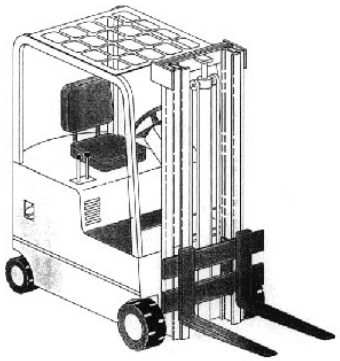
ME 1910.178 "Powered Industrial Trucks" is the OSHA Standard for operation of forklifts and similar vehicles, that has been adopted by Maine to protect public sector employees. It provides minimum safety standards for the selection and operation of trucks. In 1998, the standard was amended to require more extensive training and supervision of forklift operators.

ANSI B56.1 "Powered Industrial Trucks" This recommended standard, published by the American National Standards Institute, includes a current industry "consensus" of what safety features a forklift should have and how one should be operated safely.

Types of Powered Industrial Trucks

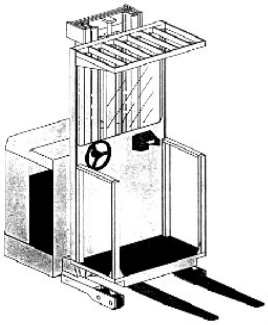
Powered industrial trucks can be described by their load handling configuration (forklift, clamp truck, high lift, low lift, powered hand truck, walkie pallet jack, order picker, etc.) and by their power types- diesel, gasoline, LP, or electric.

The most common type in municipal service is the basic electric or LP gas powered, sit down, counterweight forklift.



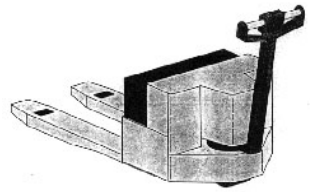
However, the safety standards also apply to several other types of equipment. These include:

Stand-up forklifts and order pickers

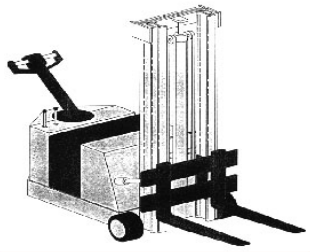


Order Picker

“Walkie type forklifts, pallet jacks and powered carts.

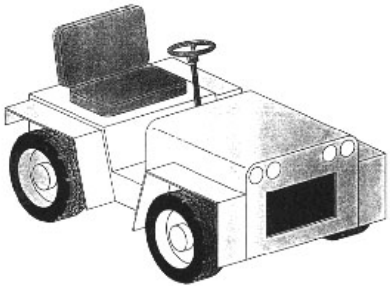


Low Lift
Walkie Pallet

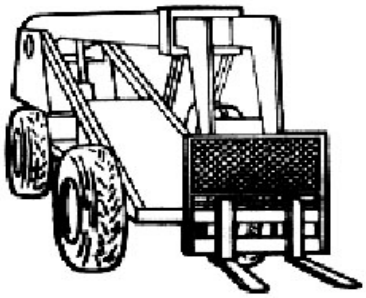


High Lift
Counterbalanced

Tow tractors and Tugs.
(Usually found at municipal airports.)



Outdoor, rough terrain forklifts.
(This category includes skid steer and payloaders if equipped with forks or lifting platforms)



Intermodal rail tractors, lifts and straddle carriers.

Selecting Powered Industrial Trucks

Many forklifts currently in municipal service are surplus units from industry and the military. This is fine as long as they are being used within their design limitations, on the surfaces that they were designed for, and are being maintained in accordance with the manufacturer's recommendations. However, many serious forklift accidents are the result of the wrong truck being used for the job at hand. Whether you are specifying a new truck, shopping for a used truck, or considering a "gift" from the private sector or another governmental entity, there are several factors that need to be considered:

1. **Indoor Operation** - Generally, only electric and some specially designed LP or diesel trucks are suitable for indoor use. Gasoline powered trucks should never be used indoors. Considerations include maintenance of the engine and exhaust systems and ventilation of the building.
2. **Load Rating** - Before selecting a truck, you should survey the loads that it will handle and the reach required for each task. Don't forget that the paper and cardboard bales commonly handled in municipal recycling can easily weigh twice as much when wet. Each truck is factory load rated at different mast extension heights. The higher the mast is extended, the less that the truck can safely handle. As a rule, you should never acquire a truck that cannot handle the likely heaviest load without exceeding 80% of load rating. As a truck approaches 100% of its rated capacity, small errors in load handling, steering, or braking can result in tip-overs.
3. **Load Handling Equipment** - The truck should be acquired with the proper fork lengths, load backrest extensions and any special attachments needed for its assigned work. Remember, you cannot modify load handling equipment or counterweights without written approval from the manufacturer.
4. **Tires/Work Surface Design** - Be sure that you select a truck designed to operate on the surfaces that it will be run on. Most hard tired forklifts are designed to operate on level concrete and are dangerous on loose gravel, snow, or ice. Hard tires are also a bad choice if the truck will be run for extended periods over floor joints and different floor surfaces. The small "bumps" can cause cumulative trauma back problems for operators over time. Pneumatic or "Solid pneumatic", or "Airless pneumatic" tires made of flexible plastic are available in designs for outdoor use, but must be well maintained for safety.
5. **Incline and Clearance** - Each type of truck has a maximum ramp slope and approach (front) and departure (rear) clearances for transition in floor and pavement slope. Use of trucks on ramps that are too steep, or pavement with changes in slope too abrupt for their design is very dangerous.
6. **Floor Loading** - Care should be taken to ensure that the truck is not too heavy for the floors, ramps, hatches, truck trailers etc. on which it is to operate. An engineer should determine the safe "wheel load" for floors, ramps etc., and a truck selected that is within this parameter. Since it is the "wheel load", not gross weight that counts, the smallest truck isn't necessarily the right one for the job.

7. **Auxiliary Equipment** - All ANSI B56 compliant trucks will have a basic lighting system, horn, backup alarm, and warning light. There are however differences in warning lights and different backup alarm wattages for indoor vs. outdoor use. “Smart alarms” that adjust to ambient noise levels are also available. Speed governors are available, as are special seats for extended operation. Each truck should have a fire extinguisher, unless it operates exclusively in an area where a Class B extinguisher is always within 50’.
8. **Fire Prevention Rating** - The basic trucks are listed by letter designation by fuel/power type. G- for gasoline, D- for diesel, LP- for LP gas, and E- for electric. The basic “LP” or “E” truck is suitable for most municipal work. However, there are several special ratings for specific fire hazards. These are addressed by ME 1910.178, so you should look carefully at the fire hazards present in the area where the truck will operate.
    a. **GS, DS, and LPS** trucks have special controls installed for operation in areas where accumulations of combustible dust are possible. They are required in areas where paper dust, wood dust, and combustible fibers are present in quantities where they form accumulations, and dust fires can be expected.
    b. **DY** - This is a diesel truck with no electrical system. It is most often found in coal mining and not usually seen in municipal workplaces.
    c. **EE** - An electric truck with an enclosed motor, required for environments where combustible metal, or explosive organic dusts are present. It is not likely to be found in municipal service.
    d. **EX** - This is an electrical truck approved for areas where a flammable atmosphere could occur during normal operation. It is required for trucks working in warehouses where flammable liquids are stored and handled by trucks and in areas of industrial plants where flammable gas or vapor excursions are possible.

Maintenance and Inspection of Powered Industrial Trucks

Repairs and maintenance of powered industrial trucks should be performed only by mechanics trained and qualified in powered industrial truck service. All major manufacturers of trucks certify dealers and provide training for mechanics to work on their trucks.

ANY MODIFICATION of a truck’s load handling equipment, counterweights, or safety related equipment (seatbelts, backup alarm etc.) requires manufacturer approval. In some cases, modification to load handling equipment will require installing new load rating plates.

Each manufacturer provides a recommended preventative and predictive maintenance (PPM) schedule for each truck model. This is usually found in the operator’s manual. When a truck is placed in service, this should be developed into a “tick file” system of some type and strictly adhered to.

DANGER! - *Failure to perform proper PPM on LPG powered forklifts can result in dangerous levels of carbon monoxide gas in the workplace. This can occur with no changes detectable to the human senses.*

Areas where LPG trucks operate indoors for extended periods should be equipped with fixed carbon monoxide monitors to provide early warning of problems.

An inspection is required before each truck is used for the first time each shift. This should include a visual walk-around to look for leaks, tire condition, damage, worn hoses etc., checking all fluid levels and belt condition, a check of all safety equipment, and starting the truck to check proper control operation and listen for unusual noises. This should be documented in writing. **APPENDIX A** is an example of a pre-shift inspection checklist.

If safety related issues are discovered on a truck during operation or inspection, it should be immediately taken out of service and tagged out until repaired.

OPERATOR TRAINING

Only individuals trained to current standards and authorized by the employer can operate powered industrial trucks. More stringent training and education requirements were added to ME 1910.178 in 1998, as an effort to reduce employee deaths and serious injuries associated with powered industrial truck accidents. State law prohibits operation of powered industrial trucks by persons under 18 years of age.

The employer should maintain written records of operator training, evaluations and authorization to operate specific types of trucks. Although not specifically required by the standard, many employers issue employees “Forklift Licenses” valid for 3 years, the maximum allowed period between operator evaluations.

Training is required both initially, before being allowed to operate a truck, and periodically thereafter. Each employer is responsible for selecting a designated trainer with education, training, and experience to effectively deliver training and evaluate operators. Some municipal and quasi-municipal organizations find it effective to have an in-house trainer. Manufacturers, distributors, and several safety organizations provide Train-The-Instructor classes and training materials. Other employers find it more practical to have training provided directly by a forklift dealer, consultant, or other outside entity. Either way, the employer must ensure that the training is specific enough to the trucks and operating environment in their workplaces. There is no “generic” or “national” certification to meet this requirement.

Training Requirements:

1. **Initial Operator Training**
    a. Must be a combination of classroom and hands on operation.
    b. Must include “Truck related” topics:
        - Instructions, precautions and warnings
        - Differences from an automobile
        - Controls and instrumentation
        - Engine/motor operation
        - Steering and maneuvering
        - Visibility
        - Attachment use
        - Capacity and stability
        - Operator inspection and maintenance
        - Refueling, recharging, and battery changes
        - Limitations for safe operation
        - Personal protective equipment
    c. Must include “Workplace Related” topics:
        - Surfaces
        - Type and stability of loads
        - Stacking and handling procedures
        - Pedestrian traffic
        - Difficult and restricted areas
        - Operating on ramps and slopes
        - Trailer/rail car securing and safety precautions
        - Hazardous environmental conditions
    d. Must include the requirements of ME 1910.178.
2. **Initial Operator Evaluation**
    a. Must simulate or be representative of the actual workplace requirements
    b. May be a laid out “skills course” type exercise or performing actual workplace operations under supervision of a trainer.
    c. Should utilize an objective checklist.
3. **Refresher Training- Required if:**
    a. Unsafe operation is observed
    b. An accident or near miss occurs
    c. Evaluation indicates a need
    d. New types of trucks are brought in
    e. Workplace conditions change

4. **Operator Evaluation – Required:**
    a. After refresher training as outlined in No. 3, above
    b. At least every 3 years

APPENDIX B is an example of a refresher evaluation checklist to be used by a trained supervisor or trainer.

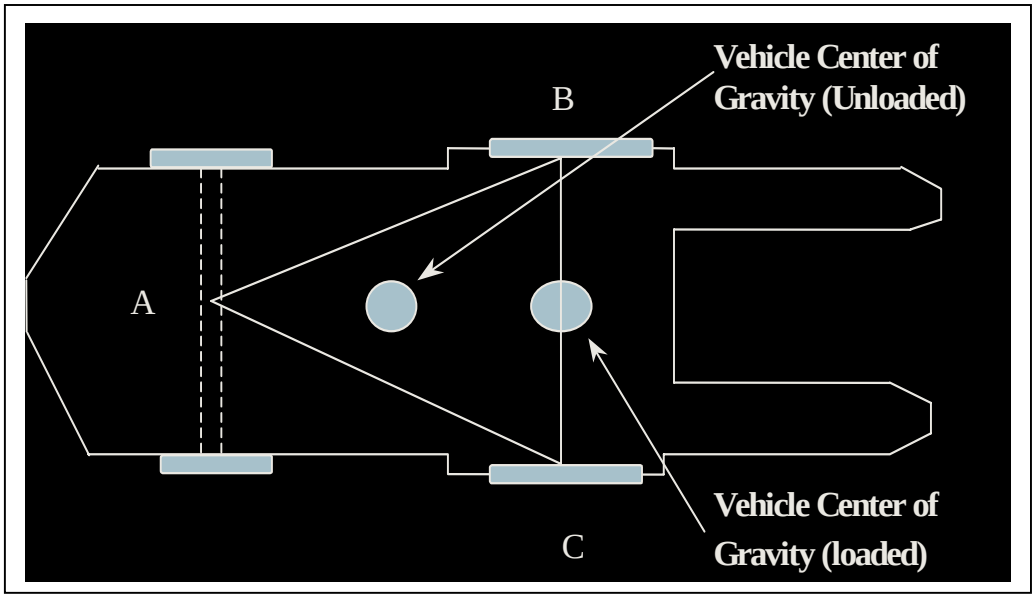
Training Records - must at a minimum include:

1. Name of operator
2. Date of training
3. Date of evaluation
4. Name of trainer/evaluator

Safe Operation of Powered Industrial Trucks

1. **Truck Stability**

The center of gravity of an unloaded forklift is designed to be along the centerline, half way between the rear and front axles. The "stability triangle" of a truck is represented in the diagram below. If the center of gravity moves outside of the triangle, the truck will tip over, with potentially fatal results. Loading of the forks, raising the forks, and braking all move the center of gravity forward. Turning or the mast being struck by falling material moves the center of gravity side to side.



With the truck loaded to capacity, the center of gravity is at the front axle. Any further force in this direction will cause the truck to roll forward.

Truck stability is effected by:

1. Load weight
2. Load stability (shifting loads can cause tip-overs!)
3. Truck speed
4. Cornering technique
5. Braking technique/brake condition
6. Driving surface (slippery, uneven, depressions etc.)
7. Objects striking the mast (i.e. falling bales)

Remember – Tip-overs are the leading cause of fatal and serious accidents. Seat belts are nearly 100% effective at preventing death during a tip-over!

2. **Attachments**

These affect the load rating and stability of the truck. Common attachments include jib booms, personnel platforms, and pans/plows. Care must be taken to ensure that these are securely attached to the truck and that the load rating is appropriately decreased when they are attached. Supplemental load rating plates should be installed showing the impact of the attachment on the truck's rating.

3. **Safety equipment**

a. Overhead Guard ("cage") - is designed to protect the operator from falling objects.

1. ALL RIDER FORKLIFTS must have this guard. If yours does not, take it out of service until replaced.
2. Removal of the guard is allowed if the truck must be used in an area where it will not fit, but the truck must be restricted to this area only until it is replaced.
3. Damaged or bent guards must be repaired or replaced per manufacturer specifications.

b. Passive Restraint ("Seatbelt")

1. Is required on all trucks originally so equipped and on all trucks for which the manufacturer has offered a retrofit kit. (This is virtually every truck in service today.) No trucks are "grandfathered".
2. Its use, at all times when the truck is in operation, is required to assure operator safety. Failure to do so can be cited by MBOL under Section 5(a)(1), the "general duty" clause.
3. The passive restraint is highly effective at preventing death and reducing injury in the event of a tip-over, collision, drive off from a dock or oversteering/fell off truck type accident.
4. Most newer trucks also have side guards and other seat attachments to help keep the operator in the seat if a tip-over occurs.

c. **Horn-** This is required equipment. It must be sounded when approaching doorways, aisles, corners, and other limited visibility areas.

d. **Backup alarm** - This must be in working order. Do not modify, remove, install a switch or change it without written manufacturer approval. If a truck frequently operates in areas of high pedestrian traffic (i.e. civic center), it should be equipped with a bi-directional alarm that sounds when the truck moves in either direction.

e. **Driving, directional lights** - Driving (headlights) lights are required if operated in areas not lighted to ANSI industrial lighting standards. All original equipment lights on a truck should be kept in good order and inspected each shift.

f. **Warning Light** - Most trucks are delivered with a small single flash strobe. This is acceptable for many workplaces, but if you have high pedestrian traffic and blind corners or aisles, you may want to specify or request manufacturer approval to replace it with a rotating halogen beacon on top of the overhead guard. This will reflect off walls etc. and better warn of an approaching truck.

g. **Load Backrest Extension** - This is the steel "fence" like guard behind the forks to keep material from falling back toward the operator. They are mandatory on high lift type rider forklifts.

h. **Fire Extinguisher** - If the truck operates exclusively indoors, in areas where a class B extinguisher is available within 50' at all times, then it is not required. Otherwise, a 2.5# minimum dry chemical extinguisher should be mounted in an approved vehicle bracket. It must be maintained annually and inspected monthly.

4. **Truck Docks**

a. Truck trailer floors and landing gear (if tractor is detached) must be visually inspected before entering the truck/trailer.

b. Jack stands should be used under the front of trailers if the tractor is detached.

c. Trailers/trucks must be secured to the loading dock by:

1) A mechanical lock that secures to the ICC bar, or

2) Substantial chains secured to the dock and around the ICC bar, or

3) Wheel chocks meeting DOT standards

d. Communication with the driver must be clear and concise. Even a well secured truck can pull away under the right conditions. Some entities require the driver to stay in a designated area until loading/unloading is finished.

e. Dock plates must be checked and securely in place before crossing them.

f. No matter who performs the above duties, it is the responsibility of the powered industrial truck operator to verify that they are done before entering the truck.

5. **Rail Cars**

a. Rail car doors may not be pushed open or closed with forks. Special devices are available if forklifts must be used to open/close cars.

b. Rail cars must be chocked before being opened.

c. Loading tracks must be protected by derails and blue flags during loading/unloading operations.

d. Dock plates must be checked and securely in place before crossing them.

e. No matter who performs the above duties, it is the responsibility of the powered industrial truck operator to verify that they are done before entering the car.

6. **Safe Operating Practices**

a. Observe safe operating speeds for conditions.

b. Always keep the load UPGRADE on ramps or steep hills. Trucks must back down if loaded.

c. Travel in reverse if carrying a load that obstructs forward vision.

d. Sound horn when approaching doorways, aisles, pedestrian walkways, pedestrian doors, and blind corners.

e. Cross railroad tracks at an angle.

f. Keep the load high enough to avoid fetching up on inclines or uneven surfaces.

g. Mast (tilt) the load back as soon as possible after picking it up.

h. NO RIDERS!

i. Keep people away from raised loads.

j. NEVER reach or put any part of your body between the mast and truck.

k. NEVER carry a “spare” fuel cylinder.

l. Don’t carry cargo on the truck body or cage.

m. Don’t add field counter weights. (people, concrete blocks etc.)

n. ALWAYS be aware of your rear swing zone.

o. Proper PPE must be worn. Hearing protection and safety glasses are needed for typical forklift operations. Other PPE may be needed for some tasks.

p. To prevent fire, the engine compartment, radiator, and drive train areas must be kept free of accumulations of dust, paper, grease etc. Periodic blow down with compressed air or pressure washing is necessary. (Observe proper compressed air safety.) The frequency varies from several times per year in “clean” areas to once per shift where debris/dust is an issue.

7. **Safe Parking**

   a. The parking brake must be set before the operator leaves. (If the parking brake does not work, tag the truck out of service and apply wheel chocks immediately.)

   b. If the operator is more than 25' from the truck, or out of direct sight of it, the engine must be shut off.

   c. Wheel chocks must be used if parking on inclines.

8. **Safe Fueling**

   a. The LP gas cylinder storage area should be outside, if possible.

   b. Whether indoors or out, a cylinder cage or other protective enclosure should be used.

   c. LP storage cannot be within 50' of an exit.

   d. Limit LP storage to the minimum required. Under no circumstances should the capacity of full and empty cylinders indoors exceed 300#.

   e. The storage area should be located or protected to avoid being damaged by vehicles.

   f. Seasonal overfilling can result in indoor gas leaks. Be sure that your fuel vendor strictly adheres to Compressed Gas Institute standards for cylinder fills in cold weather.

   g. When changing cylinders, the engine must be turned off.

   h. All tools used in refueling must be non-sparking.

   i. Eye protection and neoprene gloves should be worn when changing cylinders.

   j. Check for leaks before starting truck.

   k. If you have a leak- **EVACUATE**. Follow the facility emergency plan for a hazardous materials incident.

9. **Safe Battery Charging/Changing**

   a. A designated battery charging area should be set up with adequate ventilation to avoid explosive hydrogen gas buildups and be free of potential ignition sources.

   b. A water hose is required for flushing spills.

   c. The charging area must have a safety eye wash station.

   d. If batteries are removed from trucks, an approved battery hoist must be provided.

   e. Indirect vent goggles must be worn when checking or adding electrolyte.

   f. Batteries must be properly secured in the truck.

   g. Inspect cables and replace any with visible insulation damage/deterioration.

10. **Use of Trucks to Elevate Personnel**

   a. Only engineer designed and approved platforms (manlifts) should be used to elevate personnel. People should never climb or stand on the mast or forks.

   b. Approved personnel platforms must be securely attached.

   c. An emergency stop must be provided at the platform.

   d. Proper restraint fall protection must be worn by elevated personnel. Tie off to objects outside the platform must be prohibited.

Sources of Additional Help

MMA, Risk Management Services - Please call Loss Control Services at (800) 590-5583 or visit our website at www.memun.org/rms/lc/default.htm.

OSHA Highlights – http://www.mhstraining.com/osha_highlights.htm

APPENDIX A
PRE-SHIFT POWERED INDUSTRIAL TRUCK INSPECTION

Department _____ Truck _____

Date _____ Operator _____

Item	Satisfactory	Corrected	Unsatisfactory
Visual for leaks, worn parts, damage			
Tire inflation/condition			
Fluid levels- oil, hydraulic, coolant, electrolyte			
Engine compartment, radiator cleanliness			
Fire extinguisher (if equipped)			
Lights, backup alarm, horn			
Overhead guard			
Seatbelt			
Start- normal operation, noises etc.			
Proper control function, return to neutral			
Steering, brakes- proper operation			

Total engine hours _____

Comments:

_____

_____

_____

_____

_____

TAG OUT UNSAFE TRUCKS AND SEEK MAINTENANCE

APPENDIX B
PERIODIC POWERED INDUSTRIAL TRUCK OPERATOR EVALUATION

Date _____ Operator _____

Location_____Truck(s) _____

Task(s)Performed_____

Observable Safe Behavior	Safe	At Risk	Comments
Completes Pre-shift Inspection.			
Wears seatbelt.			
Wears proper PPE			
Operates at safe speed for conditions.			
Uses smooth and safe turning technique.			
Eyes on workpath, looks where going, before backing.			
Sounds horn at corners, doors, blind spots.			
Travels in reverse when load obstructs vision.			
Observes load handling/stacking rules.			
Keeps load uphill on ramps/hills.			
Observes safe battery charging, refueling rules.			
Parks truck properly- brake.			

Reviewed safe and at risk items with operator _____

___ Operator evaluation satisfactory
___ Operator evaluation satisfactory after coaching on at risk items
___ Operator referred for refresher training/follow-up evaluation

Evaluator _____