Powered Industrial Trucks

Safe Operation of Powered Industrial Trucks

29 CFR 1910.178 Powered Industrial Trucks

Part I

Introduction

Objectives

- Understand the requirements of OSHA Powered Industrial Truck regulation 1910.178.
- Understand the requirements for safe operation of a powered industrial truck.
- Demonstrate the ability to safely operate a powered industrial truck.

The Importance of Safety

- On July 10th, 2000 a 17 year old worker was killed while operating a forklift. He made a right turn too sharply, which resulted in the vehicle overturning. His head was caught between the overhead guard and the ground, and was crushed.

The Importance of Safety

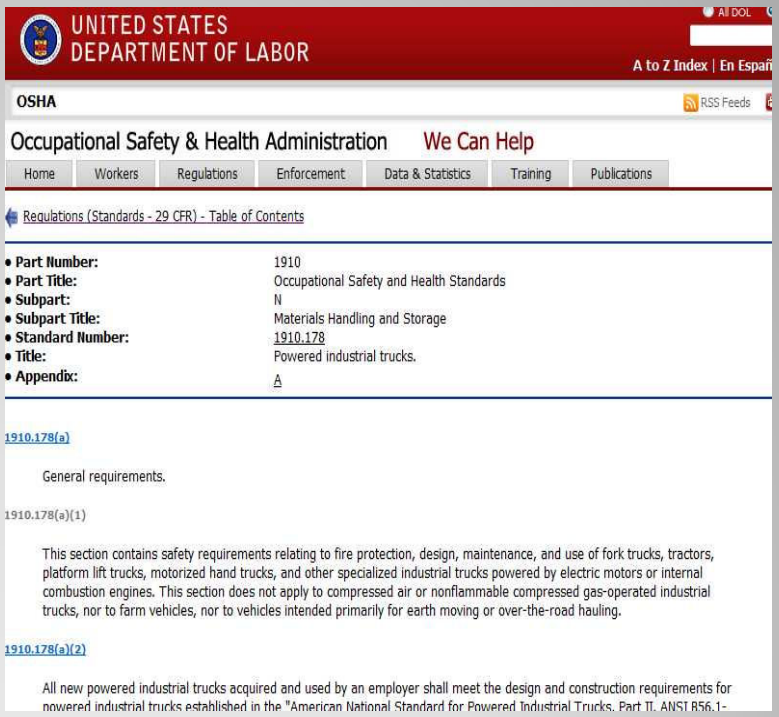
- The results of the investigation found that:

1. The employee had not been trained on forklift operation.
2. The vehicle was not fitted with an operator restraint system.
3. The vehicle had a passenger that it was not designed for.
4. The operator was under the legal age required to operate a forklift.

Notice how the seat was not secured to the vehicle, and it is missing a seatbelt.

Powered Industrial Truck Regulations

- The OSHA Powered Industrial Truck standard covers:
  - Fork trucks.
  - Tractors.
  - Platform lift trucks.
  - Motorized hand trucks.
  - Other specialized industrial trucks.
- 29 CFR 1910.178 contains all the rules and regulations that employers must comply with for operating powered industrial trucks.



OSHA regulations can be found at OSHA.gov.

Difference between Forklifts & Automobiles

- Cars and trucks are designed mainly to transport people.
- Their center of gravity does not change much.
- Forklifts stability, speed, breaking distance, and power vary depending on the size of the load and the position of the forks.

Part II

Powered Industrial Truck Basics

Powered Industrial Truck Types

- OSHA recognizes 11 different designations of industrial trucks.
- Each type of vehicle has specific safeguards.
- The employer must select the proper type of vehicle to match the hazard profile of the work environment.
- The letters designate the type of motive power.
- D = Diesel
- E = Electric
- G = Gas
- L= Liquefied Petroleum Gas

D Type Vehicles

- **D**
  - The D designated units are diesel powered units having minimum acceptable safeguards against inherent fire hazards.
- **DS**
  - Like D types, but have additional safeguards to exhaust, fuel, and electrical systems.
- **DY**
  - Like DS but do not have any electrical equipment and is equipped with temperature limiting features.

DS Type Forklift

E Type Vehicles

- **E**
  - Electrically powered units that have minimum acceptable safeguards against inherent fire hazards.
- **ES**
  - Like E types, but are provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.
- **EE**
  - Like ES, but the electric motors and all other electrical equipment is completely enclosed.
- **EX**
  - The electrical fittings and equipment are so designed, constructed and assembled that the units may be used in certain atmospheres containing flammable vapors or dusts.

An ES Forklift

G Type Vehicles

- **G**
  - The G designated units are gasoline powered units having minimum acceptable safeguards against inherent fire hazards.
- **GS**
  - The GS designated units are gasoline powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of a G unit may not be considered suitable.

G Type Forklift

L Type Vehicles

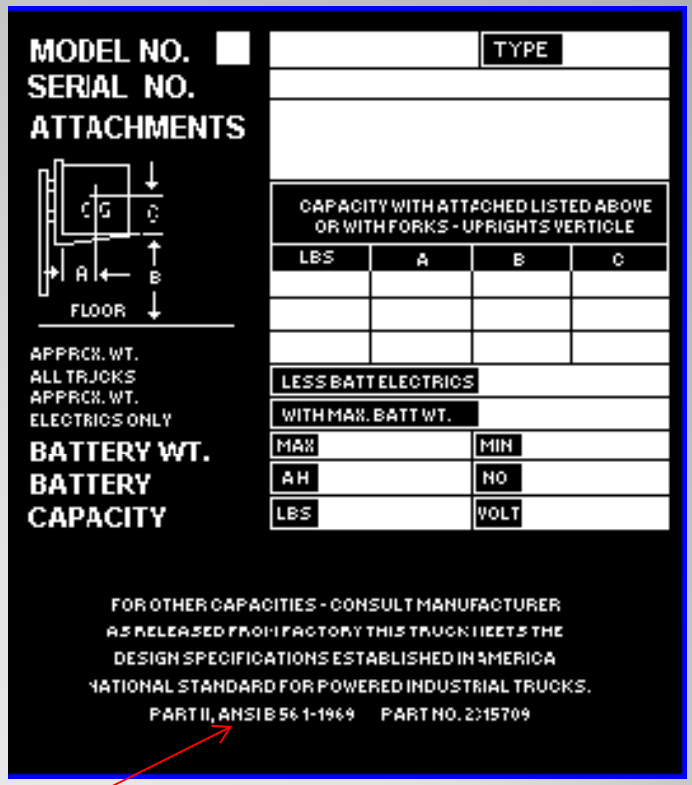
- **LP**
  - The LP designated unit is similar to the G unit except that liquefied petroleum gas is used for fuel instead of gasoline.
- **LPS**
  - The LPS designated units are liquefied petroleum gas powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of an LP unit may not be considered suitable.

LP Forklift

Vehicle Selection

- It is important select the type of vehicle that is appropriate for your work environment.
- Refer to Table N-1 in OSHA instruction 1910.178 for guidelines on appropriate vehicle selection.

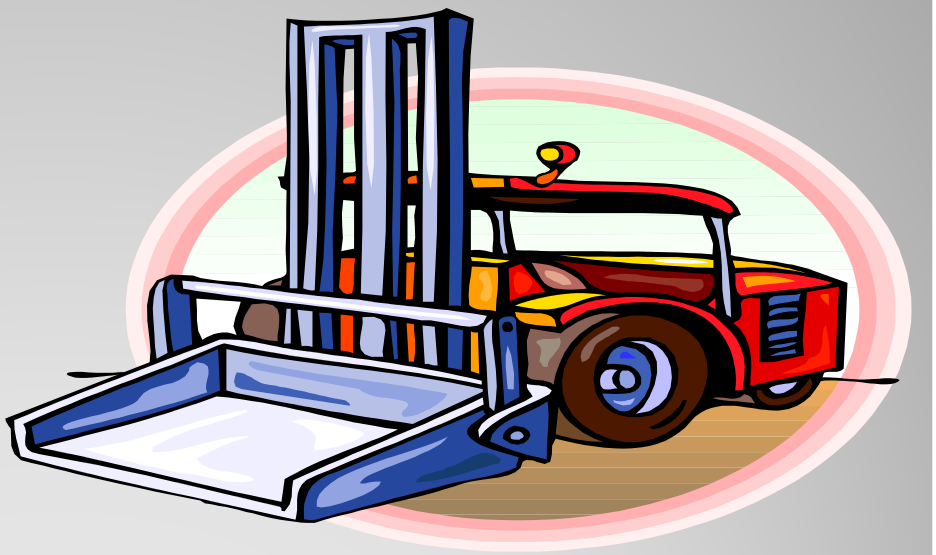
All labels on a vehicle must be legible.



Forklifts must also be labeled as being ANSI Certified.

Modifications and Additions

- Any modifications or additions that affect capacity or safe operation must have the written approval of the manufacturer.
- All marking plates, tags, or decals shall be changed accordingly.
- If front-end attachments are added, the truck must be marked to identify the attachment and truck weight with the load laterally centered at maximum elevation.



Additions and modifications affect balance and safety of the vehicles. It is important to get manufacturers permission, and to train employees on these alterations.

Atmosphere Requirements

- Powered industrial trucks can cause fires or other dangers in certain types of environments.
- PIT's are not allowed to be used in atmospheres containing hazardous concentrations of:
  - Acetylene
  - Butadiene
  - Ethyl Oxide
  - Hydrogen
  - Propylene Oxide
  - Acetaldehyde
  - Cyclopropane
  - Diethyl ether
  - Ethylene
  - Unsymmetrical dimethyl hydrazine

1910.178 has specific requirements about atmospheric requirements. If your workplace has atmospheric contaminants, consult the rules for proper vehicle selection.

Carbon Monoxide

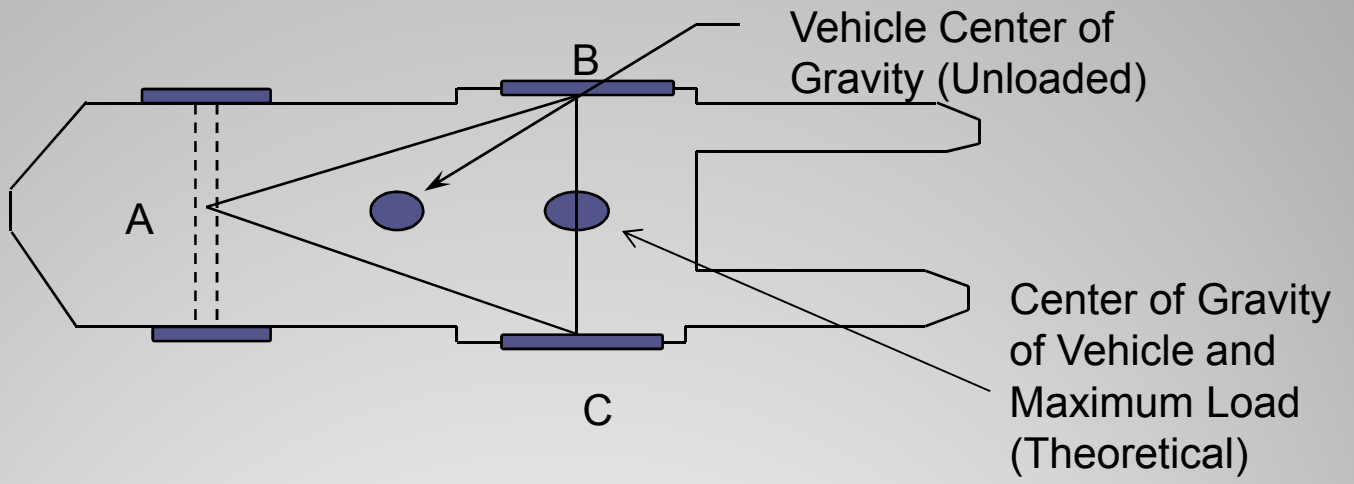
- Powered Industrial Trucks can emit carbon monoxide.
- In enclosed environments, this could raise the level of carbon monoxide to a point that is hazardous to employees.
- Carbon monoxide levels may not exceed 55 mg/m^3.
- Make sure there is adequate ventilation in areas where powered industrial trucks are used.

Carbon monoxide levels are regulated by 29 CFR 1910.1000.

Part III

Powered Industrial Truck Operation

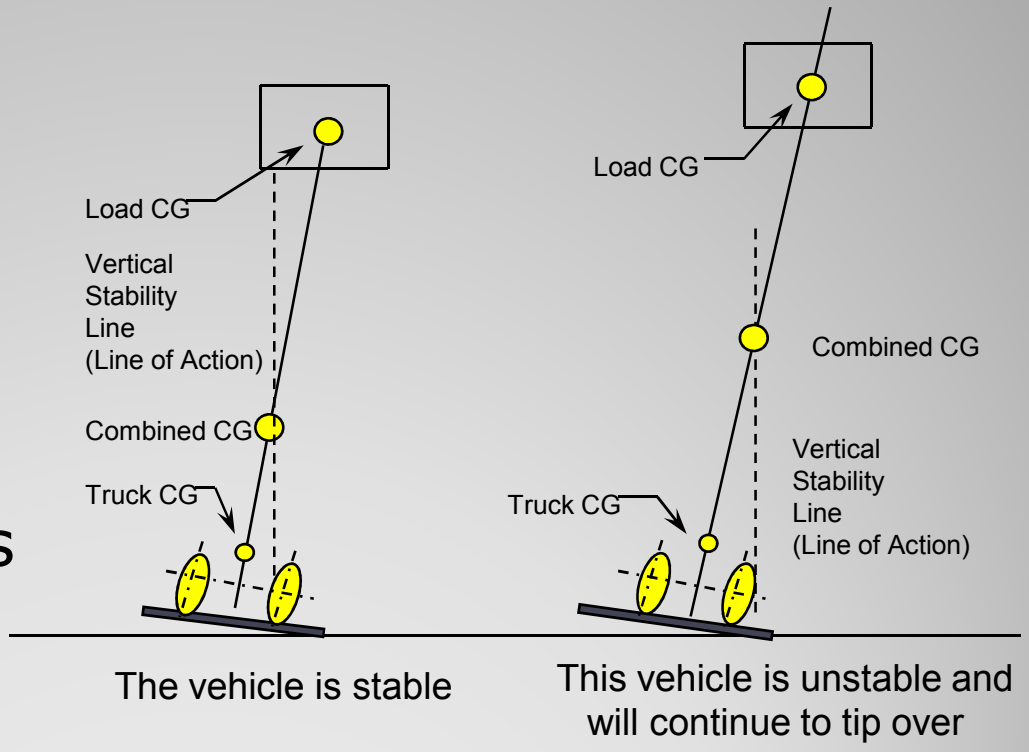
The Stability Triangle



- Nearly all counterbalanced PIT's have a three-point suspension system.
- When the load center is inside the stability triangle, the load is balanced.
- When the load center is outside the triangle, the vehicle will tip over.

Vehicle Stability

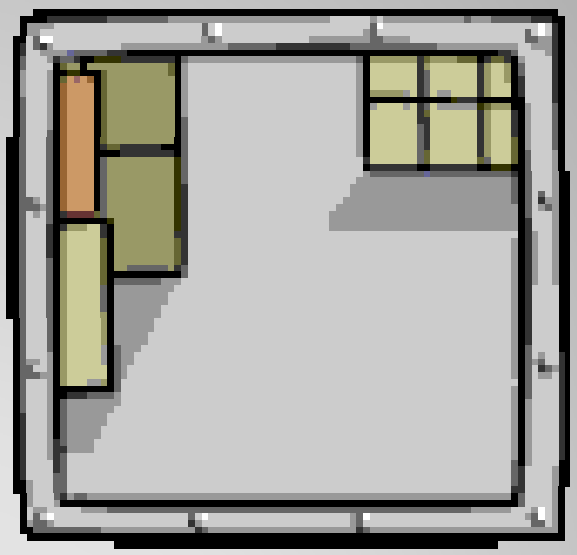
- Longitudinal stability is the trucks resistance to turning over forward or rearward.
- Lateral stability is the trucks resistance to overturning sideways.



Notice how the load center on the right is outside the stability triangle, which will cause the vehicle to tip over.

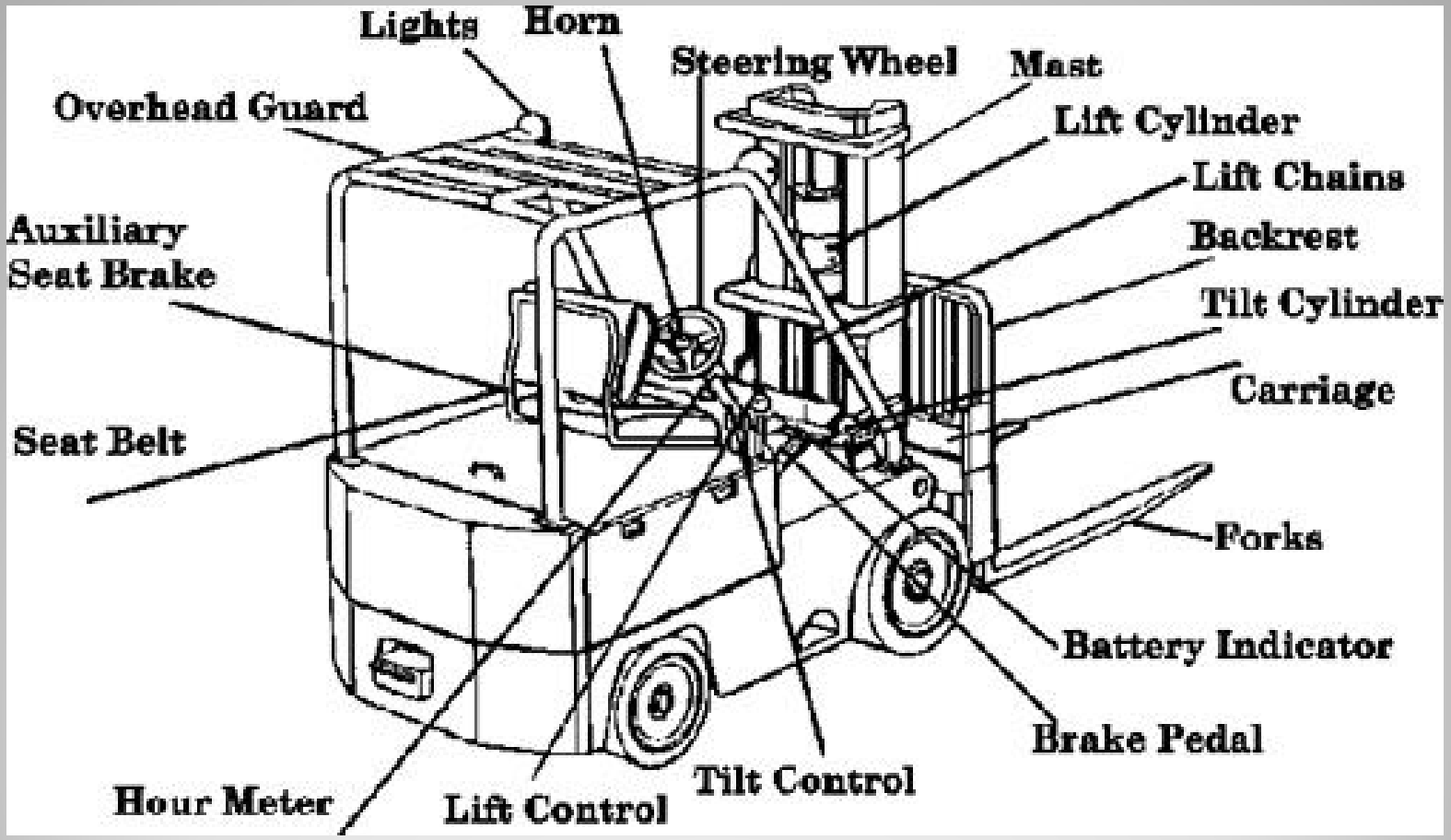
Dynamic Stability

- Dynamic stability is the affect that dynamic forces have on the load center when the machine is moving, braking, cornering, lifting, tilting, and lowering loads.
- Dynamic stability varies depending on the size of the load, speed of motion, and angle.



There are no specific guidelines for managing dynamic stability. Always drive slowly and carefully, and keep loads low.

Vehicle Components



Safe Vehicle Operations

- Common sense can be your best protection when using powered industrial trucks.
- Always drive slowly and carefully. Your speed dramatically affects your load center and its position in the stability triangle.
- When travelling with a load, keep it low.
- Areas should be well lit. Use truck lights if the lighting is poor.
- Stunt driving and horseplay is not tolerated and will result in immediate dismissal.

Sometimes common sense isn't that common.

Forklift Operator Protection

- If the forklift has seat belts, the operator must use them.
  - If the forklift does not have a seatbelt, but a seatbelt retrofit is available from the manufacturer, the retrofit must be installed.
- There must be an overhead guard to protect operators from falling objects.
- Load backrests must be used when necessary to prevent the load from falling back towards the operator.

Vehicle Inspection

- The operator should perform a brief vehicle inspection prior to every shift.
- Include these basic inspection items, as well as any required by the owners manual.

DAILY INSPECTION CHECKLIST
Electric Forklift Truck

KEY OFF Procedures

The vehicle inspection
- " Overhead guard
- " Hydraulic cylinders
- " Mast assembly
- " Lift chains and rollers
- " Forks
- " Tires

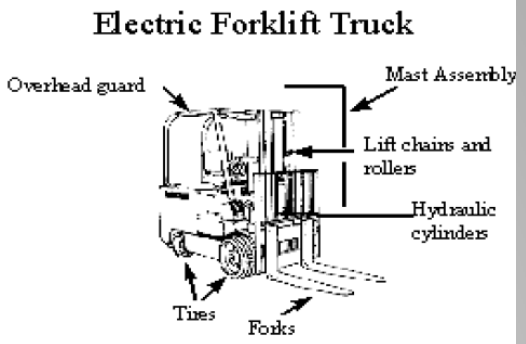
Examine the battery
Check the hydraulic fluid level

KEY ON Procedures

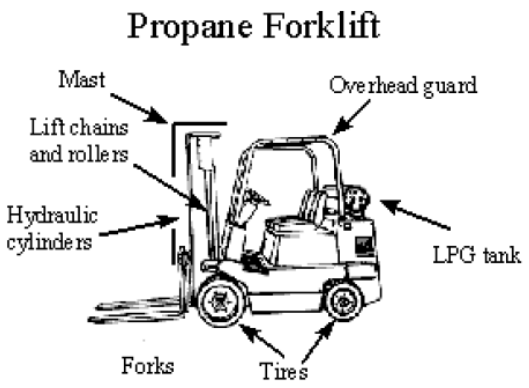
Check the gauges
- " Hour meter
- " Battery discharge indicator

Test the standard equipment
- " Steering
- " Brakes
- " Front, tail, and brake lights
- " Horn
- " Safety seat (if equipped)

Check the operation of load-handling attachments



DAILY INSPECTION CHECKLIST
Propane Forklift Truck



KEY OFF Procedures

The vehicle inspection
- " Overhead guard
- " Hydraulic cylinders
- " Mast assembly
- " Lift chains and rollers
- " Forks
- " Tires
- " LPG tank and locator pin
- " LPG tank hose
- " Gas gauge

Check the engine oil level
Examine the battery
Check the hydraulic fluid level
Check the engine coolant level

KEY ON Procedures

Test the front, tail, and brake lights

ENGINE RUNNING Procedures

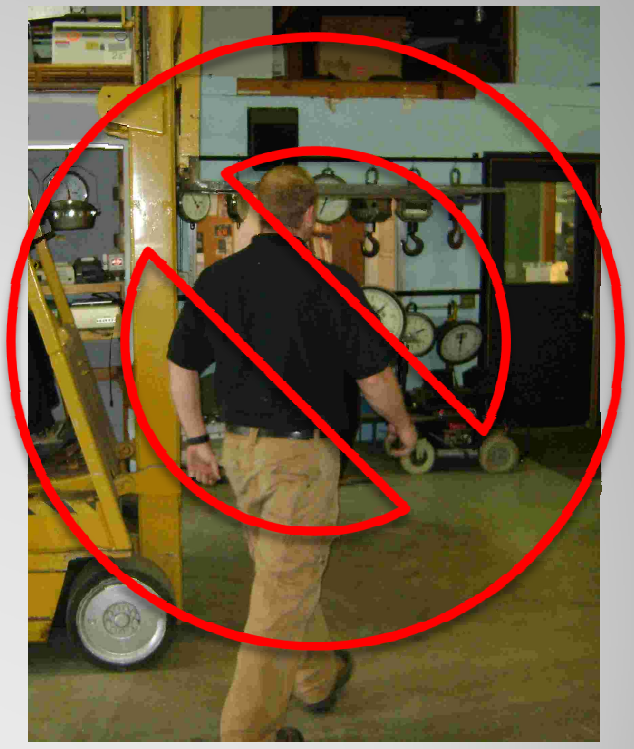
Check the gauges
- " Oil pressure indicator lamp
- " Ammeter indicator lamp
- " Hour meter
- " Water temperature gauge

Test the standard equipment
- " Steering
- " Brakes
- " Horn
- " Safety seat (if equipped)

Check the operation of load-handling attachments
Check the transmission fluid level

Working On and Around Vehicles

- Do not drive trucks up to people standing or sitting in front of fixed objects. They could be crushed.
- People should not pass below elevated portions of the truck.
- Only vehicles designed for carrying a passenger may have one.
- Arms and legs may not be placed outside the masts or the running lines of the vehicle.



Vehicle Entry and Exit

- Always enter and leave a powered industrial truck facing the vehicle.
- If a sit-down vehicle tips over, remain seated in the operators seat and lean away from the direction of the fall.
- If a stand-up rider truck tips over, step backwards off the vehicle to get clear.

Most people attempt to jump clear of a tipping vehicle, and are crushed by the overhead guard.

Leaving Vehicles Unattended

- A PIT is considered to be unattended when the operator is greater than 25ft from it, or the vehicle is not in his view.
- When a vehicle is unattended, it must:
  - Have its controls neutralized.
  - Have load engaging means fully lowered.
  - Have its power shut off.
  - Have its brakes set.
  - Have its wheels blocked if it is on an incline.
- Forklifts may not be parked within 8 feet of railroad tracks.

Never block fire routes, stairway access or fire equipment.

Travelling with the Vehicle

- When travelling with the vehicle:
  - Follow all traffic regulations, including stop signs and speed limits.
  - Maintain three lengths from the vehicle ahead.
  - Yield the right away for emergency vehicles.
  - Slow the vehicle and sound the horn when crossing areas with obstructed views.
  - Cross railroad tracks diagonally when possible.
  - Ascend and descend grades slowly.

Pedestrians have the right of way. Always be alert for them.

Travelling with the Vehicle

- When travelling with the vehicle:
  - Maintain a safe distance from the edge of elevated areas, such as loading docks or platforms.
  - Drive at a speed that allows the forklift to stop in a safe manner.
  - Slow down for wet or slippery floors.
  - Avoid driving over loose objects.
  - Make sure that dockboards and bridgeplates are secured before driving over them. Do not exceed their capacity.

This operator got too close to the edge of a loading dock and died in the accident.

Turning and Cornering

- The momentum of the vehicle and the load can easily cause a forklift to turn over while cornering.
- When turning, reducing the speed of the forklift.
- Turn the steering wheel at a moderate, even rate.
- Be especially careful when turning with a loaded forklift.

This operator turned to quickly and tipped over the forklift. The operator was killed in the accident.

Loading

- Only stable and safely arranged loads should be handled.
- Loads must be below the rated capacity of the vehicle.
- Make sure there is sufficient space beneath overhead installations such as lights and sprinklers.
- Trucks with attachments must be operated as partially loaded trucks, even when not carrying a load.

Before engaging a load, make sure it is below the rating of your vehicle.

Engaging a Load

- When engaging a load, the engaging means must be placed under the load as far as possible.
- The mast must be carefully tilted backwards to stabilize the load.
- Do not tilt the engaging means forward, except when picking up a load.

Tilt the load backwards slightly for stability.

Trucks and Railroad Cars

- Highway trucks must have their brakes set and rear wheels chocked while they are boarded by forklifts.
- Trucks may require fixed jacks for extra weight support when forklifts are being driven in and out.
- Railroad cars must have wheel stops engaged or other protection to prevent the car from moving during loading and unloading.

Travelling with a Load

- When travelling with a load:
  - If possible, the load engaging means should be tilted back slightly.
  - The load should only be raised enough to clear the road surface.
  - When traveling grades in excess of 10%, loaded trucks must be driven with the load upgrade.

When travelling with a load, try and keep it as low as possible.

Limited Visibility

- Sometimes visibility will be limited by the load or the area.
- In limited visibility, always operate slowly and carefully.
- Frequently sound the horn to alert others.
- Use the mirrors.
- If the load obstructs forward view, travel with the load trailing.

You may have to travel in reverse if the load obstructs your view.

Narrow Aisles and Spaces

- You may be required to drive the forklift through narrow openings.
- Drive slowly and carefully.
- Ask a coworker to help guide you through the space.
- If necessary, measure the space to make sure it fits.

If there is any doubt, there is no doubt. Don’t try it!

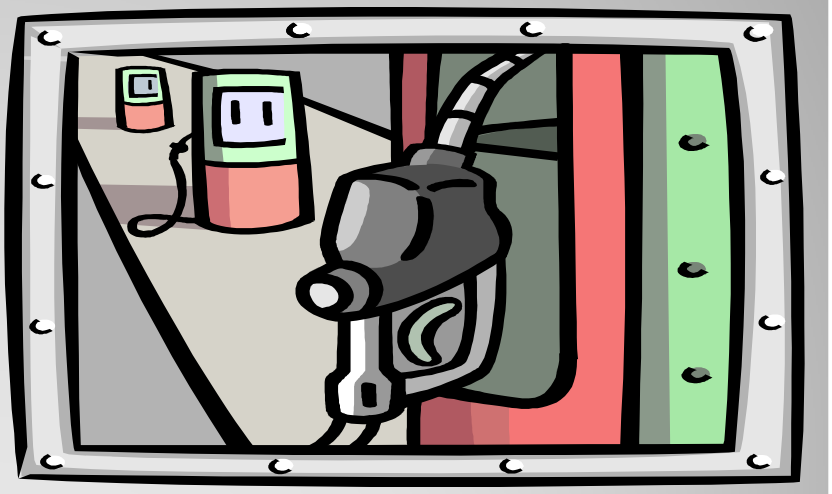
Fuelling

- Fuel tanks may not be filled while the engine is running.
- Fuel spills must be completely washed away or evaporated before starting the engine.
- Trucks may not be operated with fuel systems leaks.
- No smoking or open flames in fueling areas.

Fuel Storage

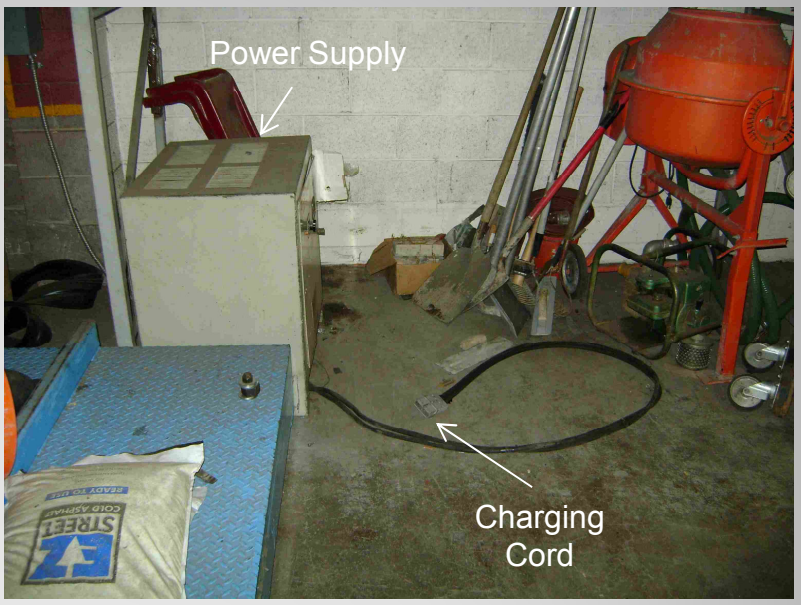
- The storage and handling of liquid fuels, such as gasoline and diesel, must be in accordance with NFPA Flammable and Combustible Liquids Code 30-1969.

- The storage and handling of liquefied petroleum gas must be in accordance with NFPA Storage and Handling of Liquefied Petroleum Gasses Code 58-1969.



Battery Charging Facilities

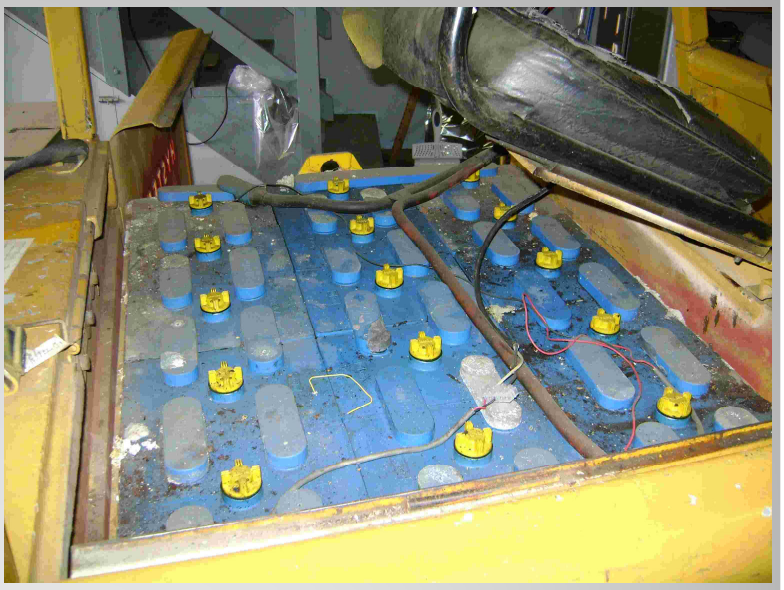
- Battery charging must be performed in areas designated for that purpose.
- This area must have:
  - Fire protection.
  - Protection from damage by trucks.
  - A way to flush and neutralize spilled electrolyte.
  - Adequate ventilation for dispersal of fumes from gassing batteries.
  - Material handling equipment for moving or changing batteries.
- Trucks must be properly positioned with brakes applied before batteries are charged or changed.



What could be done to improve this battery charging area?

Handling Batteries

- Tools and other metallic objects must be kept away from uncovered batteries.
- Precautions must be taken to prevent open flames, sparks and electric arcs in the battery charging areas.
- A carboy tilter or siphon must be used for handling electrolyte.
- Always pour acid into water, never pour water into acid.
- Ensure that the vent caps are functioning.
- Reinstalled batteries must be properly positioned and secured in the truck.
- Smoking is prohibited in charging areas.



A typical E type battery well. What could be done to improve safety and cleanliness?

Maintenance

- Vehicles not in a safe operating condition must be removed from service.
- Only authorized personnel can make repairs.
- Repairs to fuel and ignition systems must be made in designated areas.
- The battery must be disconnected before repairs on the electrical system can occur.
- The vehicle must be kept in a clean condition, free of lint or excess oil and grease.
- Maintenance must be performed in accordance with the procedures and schedules in the owners manual.

Overheated vehicles must be immediately removed from service.

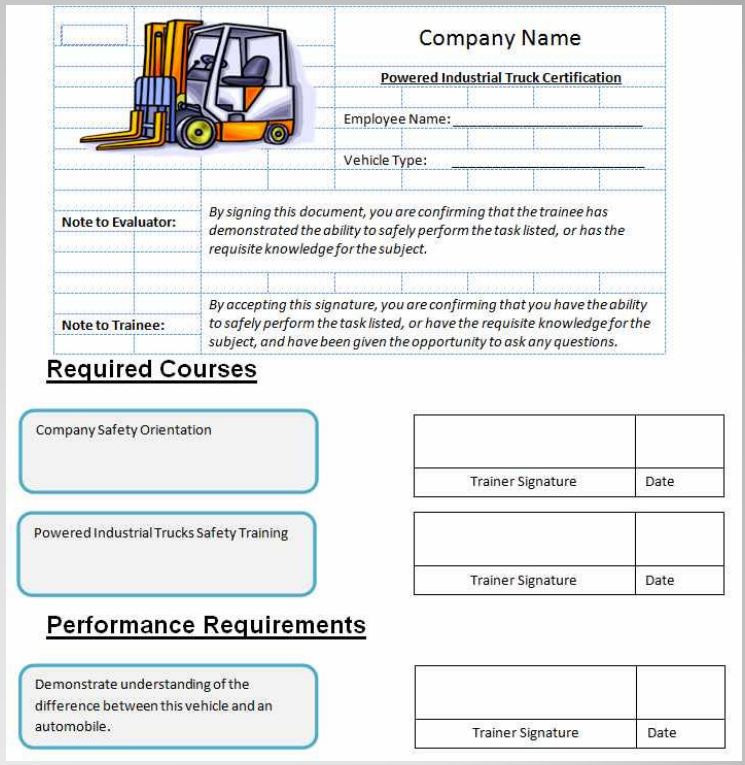
Training Requirements

- No one is allowed to drive powered industrial trucks until they have been trained and certified by the employer.
- Drivers must be at least 18 years old.
- Trainees must be supervised at all times while operating, and must be in an area that does not put other employees in danger.

Trainees must be supervised at all times.

Training Requirements

- Forklift trainers must have the knowledge, training and experience to train operators and evaluate their competence.
- Training must include:
  - Formal instruction.
  - Hands on practical training.
  - Operator performance evaluation.



Company Name

Powered Industrial Truck Certification

Employee Name: _____

Vehicle Type: _____

Note to Evaluator:	*By signing this document, you are confirming that the trainee has demonstrated the ability to safely perform the task listed, or has the requisite knowledge for the subject.*
Note to Trainee:	*By accepting this signature, you are confirming that you have the ability to safely perform the task listed, or have the requisite knowledge for the subject, and have been given the opportunity to ask any questions.*

Required Courses

Company Safety Orientation	Trainer Signature	Date
Powered Industrial Trucks Safety Training	Trainer Signature	Date

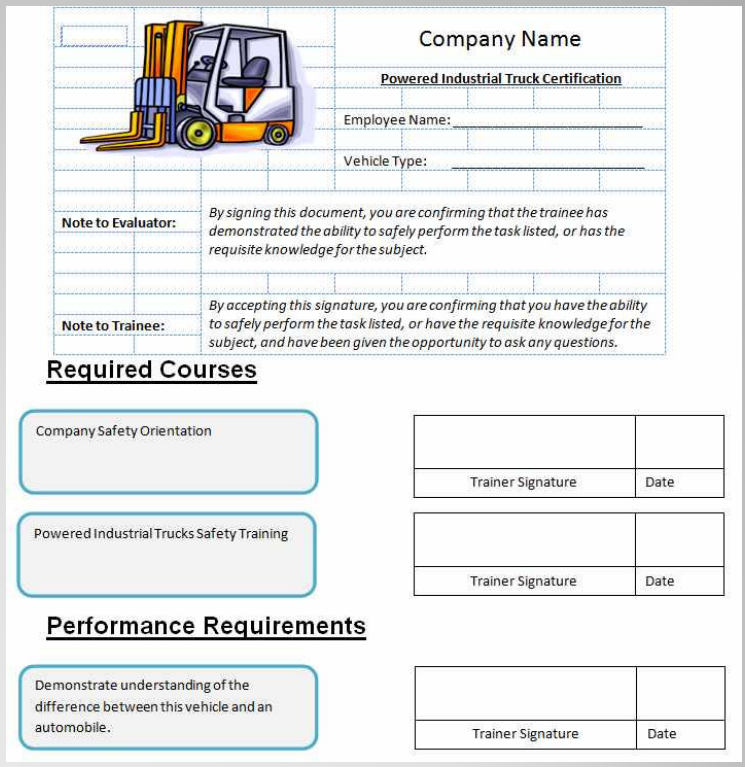
Performance Requirements

Demonstrate understanding of the difference between this vehicle and an automobile.	Trainer Signature	Date

Operators must successfully complete a hands on operational evaluation.

Training Requirements

- Forklift operators must be recertified when:
  - The operator has been observed operating unsafely.
  - The operator is involved in an accident or near miss.
  - The operator receives a poor operational evaluation.
  - The operator is assigned to drive a different type of vehicle.
  - There is a change in workplace conditions that may affect safe operation of the vehicle.



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Required Courses

	Trainer Signature	Date
Company Safety Orientation		
Powered Industrial Trucks Safety Training		

Performance Requirements

	Trainer Signature	Date
Demonstrate understanding of the difference between this vehicle and an automobile.		

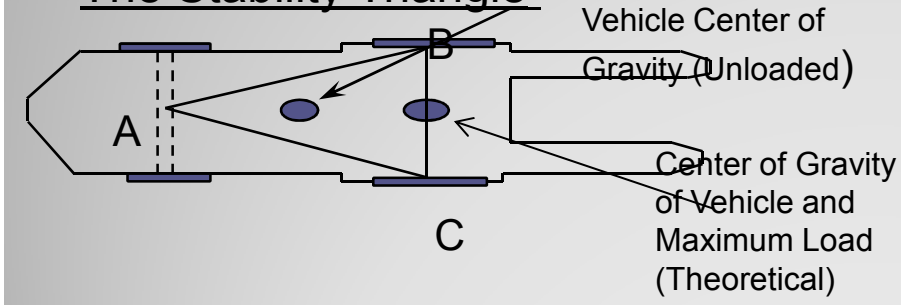
Forklift operators must be evaluated and certified at least every three years.

Summary

•The four major classifications of Powered Industrial Trucks are:

- E – Electrically
- D – Diesel Powered
- G – Gasoline Powered
- L – Liquefied Petroleum Gas

•The Stability Triangle



•Longitudinal stability is the trucks resistance to turning over forward or rearward.

•Lateral stability is the trucks resistance to overturning sideways.

•Dynamic stability is the affect that dynamic forces have on the load center when the machine is moving, braking, cornering, lifting, tilting, and lowering loads.

•The minimum age to drive a powered industrial truck is 18.

•Employees must be trained and evaluated in forklift operations prior to operating them alone.

Questions?