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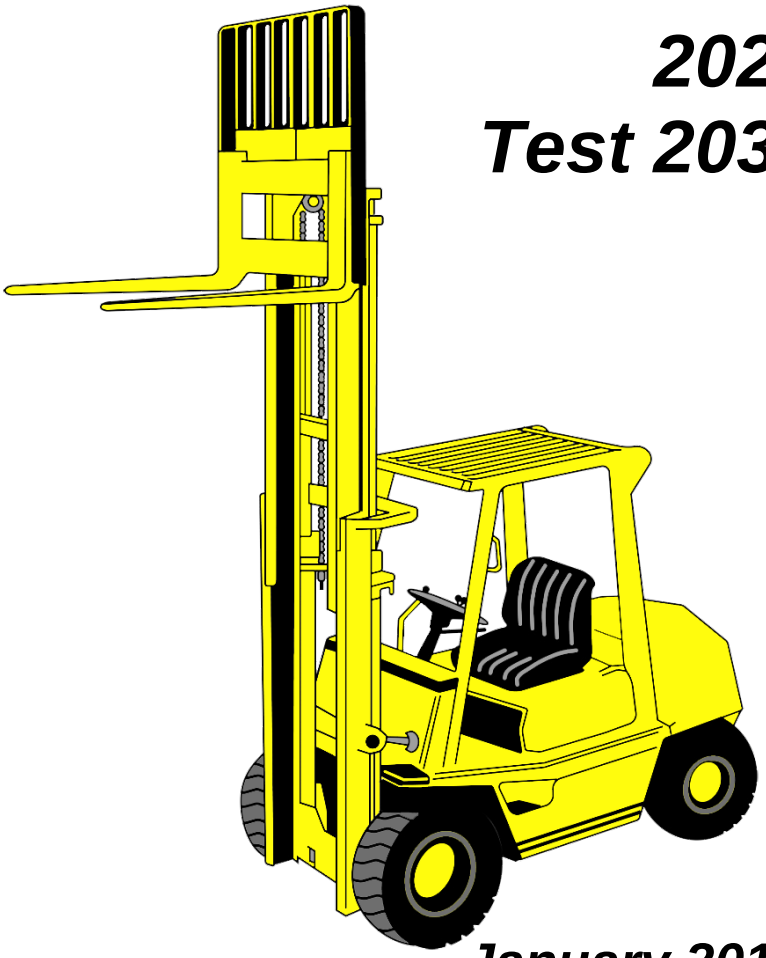
Forklift Safety Fundamentals

20299

Test 20300



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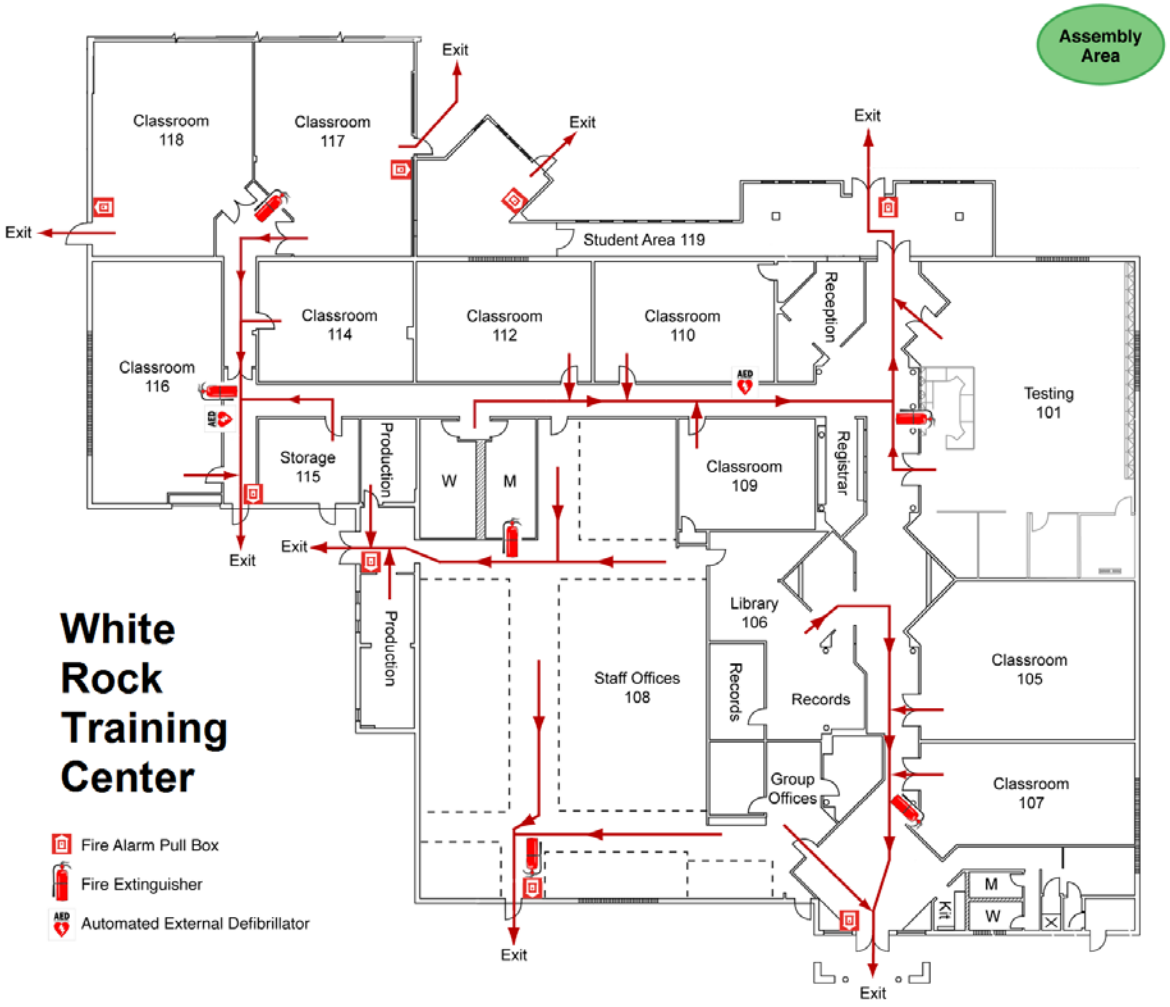

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Course 20299
January 2017
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Contents

Introduction

Course Overview

This course, *Forklift Safety Fundamentals* (20299), presents the types of forklifts and attachments used in the workplace, the basic components of a forklift, the general principles of safe forklift operation, and the potential hazards in the workplace that can affect safe forklift operation. This course is one element of Los Alamos National Laboratory's (LANL's) forklift training. Additional elements of LANL's forklift training include a written exam, practical training, demonstration of proficiency, and management authorization.

Course Objectives

Upon completion of this course, you will be able to recognize

- training requirements for operating a forklift at LANL,
- forklift classifications and limitations of forklift attachments;
- basic forklift components,
- forklift inspection requirements,
- fundamentals of forklift operation, and
- workplace factors that affect safe forklift operation.

Program Owner

This course was developed under the direction and technical oversight of the Industrial Safety and Hygiene Group (ISH), which is the functional program owner for this training.

About This Course

A powered industrial truck (PIT) is defined as a mobile, power-driven vehicle used to carry, push, pull, lift, or stack material (not including vehicles intended primarily for earth moving). There are many types of and names for PITs, including forklifts, trucks, fork trucks, platform lift trucks, motorized hand trucks, and tractors. Although not every PIT is a forklift, because PITs are commonly called “forklifts,” this course manual generally uses the term “forklift,” although at times the terms “truck” and “PIT” are also used.

29 CFR 1910.178 (__)

In some areas of this course, you will see green boxes that refer to the Occupational Safety and Health Administration (OSHA) regulation for PITs, which is 29 Code of Federal Regulations (CFR) 1910.178, *Powered Industrial Trucks*. The letter in the parentheses refers to the specific section of the regulation.

Course Limitations

This course does not authorize trainees to operate forklifts at LANL.

This course does not address site-specific training, hazard-specific training, forklift-specific training, or attachment-specific training.

This course does not address operating instructions, warnings, or precautions listed in the operator's manual for the types of forklift(s) that the employee is being trained to operate.

Target Audience

This course is designed for workers who currently operate or are being trained to operate LANL-owned, -rented, or -leased forklifts and PITs at LANL.

Definitions

attachment – a device other than a conventional fork or load backrest extension that is mounted on the elevating mechanism of a forklift and is designed to increase the versatility of the forklift. Attachments may be mounted permanently or may be removable, and they may alter the performance of the forklift.

capacity (rated capacity) – the weight at a specified load center that a given forklift can transport in a carry position and stack to a specified elevation. The capacity is used to designate the weight-handling ability of a particular forklift as equipped.

carriage – the part of the forklift to which the forks or other attachments are secured.

center of gravity (CG) – a point where an object is balanced in all directions. For symmetrical loads, the CG is located at the middle of the load.

classification – a system for designating different types of powered industrial trucks (see Module 1).

counterweight – the weight that is built into a forklift to offset the weight of the load and to reduce the possibility of the forklift tipping over.

forklift – a type of powered industrial truck with two power-operated prongs at the front that can be slid under heavy loads and then raised for moving and stacking materials.

forklift proficiency instructor (FPI) – a worker who trains forklift operators to safely operate forklifts and conducts proficiency evaluations to evaluate forklift operator competency.

free rigging – the direct attachment to or placement of rigging equipment onto the tines of a forklift for a below-the-tines lift without the use of an approved lifting attachment.

fulcrum – the pivot point between the load weight and the forklift counterweight. On a forklift, the front wheels (drive wheels) act as the fulcrum.

grade – the slope of a surface, usually measured as the number of feet of rise or fall over a 100-foot horizontal distance (often expressed as a percent).

hose reel – a device used to hold the hoses that provide fluid to a hydraulically operated attachment.

lateral stability – a forklift's resistance to tipping over sideways.

lift cylinder – cylinder that uses hydraulic power to extend the moveable rails of the mast and elevate the load.

load backrest – a rack-like extension, either bolted or welded to the carriage, that is designed to prevent the load from shifting backward and falling on the operator or damaging the forklift.

load center – the distance from the face of the forks to the load's CG. Many forklifts are rated using a 24-inch load center, which means that the load's CG must be 24 inches or less from the face of the forks.

longitudinal stability – a forklift's resistance to tipping over forward or backward.

mast – the vertical assembly that allows the load to be raised and lowered. Also called an upright.

nameplate – a plate, typically made of metal, that is attached to a forklift and that specifies the fuel type, forklift weight, load capacity, type designation, model, and serial number. Also called the data plate or capacity plate.

overhead guard – a framework designed to protect the operator from falling objects.

pallet truck – a nonmotorized or motorized low-lift truck equipped with wheeled forks having dimensions to go between the top and bottom boards of a double-faced pallet, the wheels fitting into spaces between the bottom boards so as to raise the pallet off the floor for transporting.

powered industrial truck (PIT) – A mobile, power-driven vehicle used to carry, push, pull, lift, or stack material (not including vehicles intended primarily for earth moving). Referred to as a "forklift" in this manual.

rated capacity – see "capacity."

rollover protection – a protective structure designed to protect an operator from injuries caused by a rollover or tipping over. Sometimes referred to as a rollover protective structure (ROPS).

stability – the resistance of a forklift to tipping over.

stability triangle – on a forklift, the three points made by the two drive wheels and the pivot for the steered (rear) wheels.

tilt cylinder – cylinder that uses hydraulic power to move the stationary rails of the mast backward or forward to assist in engaging a load.

Acronyms

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CCG	combined center of gravity
CFR	Code of Federal Regulations
CG	center of gravity
CNG	compressed natural gas
CO	carbon monoxide
DOE	Department of Energy
FFH	free-fork height
FOPS	falling object protective structure
FPI	forklift proficiency instructor
ISH	Industrial Safety and Hygiene Group (LANL)
ITA	Industrial Truck Association
ITSDF	Industrial Truck Standards Development Foundation
LANL	Los Alamos National Laboratory
LPG	liquid petroleum gas
MFH	medium fork height
NEC	National Electrical Code
NIOSH	National Institute for Occupational Health and Safety
NO_x	nitrogen oxides
OALH	overall lowered height
OARH	overall raised height
OSH	Occupational Safety and Health Division
OSHA	Occupational Safety and Health Administration
P	procedure (LANL)
PIT	powered industrial truck
RLM	responsible line manager
ROPS	rollover protective structure
S/CI	suspect/counterfeit item
S/S	sideshifter

Forklift Operator Training

29 CFR 1910.178 (l)

Training requirements for LANL forklift operators (from P 101-4, *Forklifts and Powered Industrial Trucks*) include the following:

Curricula #121 ►

- this class (#20299), initially and every 6 years;
- a written exam (#20300), initially and every 3 years;
- practical training for each class of forklift to be operated. This one-time requirement must be performed under the direct supervision of a forklift proficiency instructor (FPI) and documented by the FPI on Form 2040, *Forklift Training Evaluation and Documentation*.

Form 2040 ►

Form 1791 ►

- demonstration of proficiency, initially and every 3 years, on each class of forklift operated. The proficiency evaluation is documented by the FPI on Form 1791, *Forklift Proficiency Evaluation Checklist.*

Form 1567 ►

- authorization by the responsible line manager (RLM) on Form 1567, *Forklift Operator or Proficiency Instructor Authorization.*

Forklift operators may operate a class and capacity of forklift only for which they have documented training, proficiency, and authorization. For example, if a forklift driver has completed training and proficiency on a Class 5, 2-ton forklift, he/she can operate any Class 5 forklift with a capacity of 2 tons or less. To operate a Class 5 forklift with a greater capacity, additional training and demonstration of proficiency are required.

Additional training requirements:

Curricula #3065 ►

- Fire extinguisher training is required if the forklift to be operated has a fire extinguisher. A fire extinguisher may NOT be removed from a forklift to bypass this requirement.
- Forklift attachment training, as documented by an FPI on Form 2040, is required for each forklift/attachment combination used. Proficiency with the use of each forklift/attachment combination must be documented by an FPI on Form 1791 initially and every 3 years.
- Refresher training is required if a forklift operator is involved in an accident or a near-miss event, is observed operating the forklift in an unsafe manner, receives an evaluation that reveals unsafe operation of the forklift, is assigned to operate a different type of forklift and/or attachment, or is to perform operations in a workplace where conditions have changed in a manner that could affect the safe operation of the forklift.

Module 1: Forklift Classes and Attachments

Module Objectives

After completing this module, you will be able to recognize

- classes of forklifts and
- types and limitations of forklift attachments and the requirements for using them.

Forklift Classes

The Industrial Truck Association (ITA) has identified eight classes of lift trucks (forklifts). These classes depend primarily on the type of engine and tires that are used.

Class I: Electric-Motor Rider Trucks

Class I forklifts are electric-motor rider trucks, either standup-operator or seated three- or four-wheel units. Rider units are counterbalanced and may have solid or pneumatic (air-filled) wheels.

Three-wheel electric sit-down rider

Counterbalanced standup rider

Class II: Electric-Motor Narrow-Aisle Trucks

Class II forklifts are electric-motor trucks used for narrow aisles or inventory/order picking. Class II forklifts typically have solid tires and straddle legs; they may have extra reach or swing-mast functions. Examples include reach trucks, sideloaders, turret trucks, and order pickers (in which operators ride up and down with the load).

Reach truck

Order picker

LANL classifies a walk-behind, motorized drum hauler as a Class III forklift.

Class III: Electric-Motor Hand Trucks

Class III electric-motor trucks may be walk-behind (walkies) or standing-rider operated. Class III pallet trucks (pallet jacks) may use straddle legs or be counterbalanced and may be low lift (no mast) or high lift.

High-lift, electric hand pallet jack

Low-lift, electric hand pallet jack (walkie)

Low-lift electric rider

Class IV: Internal Combustion Engine Trucks (Solid Tires)

Class IV forklifts are counterbalanced fork trucks with cabs, seated controls, and solid tires. These forklifts are powered by internal combustion engines fueled by gasoline, diesel fuel, liquid petroleum gas (LPG), or compressed natural gas (CNG).

Sit-down rider forklift (LPG)

Class V: Internal Combustion Engine Trucks (Pneumatic Tires)

Class V forklifts are counterbalanced fork trucks with cabs and seated controls. Pneumatic tires allow them to operate on a variety of outdoor surfaces. These forklifts are powered by internal combustion engines, which are fueled by gasoline, diesel fuel, LPG, or CNG.

Sit-down rider

Sit-down rider (LPG)

Class VI: Industrial Tractor Trucks

Class VI forklifts are industrial tractor trucks having electric or internal combustion engines. ***Operators of Class VI industrial tractor trucks at LANL DO NOT require LANL forklift training*** or a forklift proficiency evaluation but may need equipment-specific training.

Farm tractor

Yard tractor

Class VII: Rough-Terrain Forklift Truck

A rough-terrain forklift is designed for carrying material over surfaces that could cause problems for normal pneumatic-tire forklifts. Rough-terrain forklifts have large tires with aggressive treads that allow them to be operated on bumpy, soft, or muddy terrain without getting stuck. Many models of rough-terrain forklifts are also four-wheel drive.

Rough-terrain reach forklift

Rough-terrain forklift

Class VIII: Hand Pallet Truck (Manual Pallet Jacks)

Manual pallet jacks are used to pick up and move pallets of material, but they do not have a powered drive or lift. ***A Class VIII hand pallet truck does NOT require LANL forklift training*** or a forklift proficiency evaluation but may require equipment-specific training.

Class: Other Unlisted Forklifts

Although not a forklift, a tug is used to tow small trailers in and around warehouses and manufacturing facilities. Most tugs are electrically powered. ***The Class "Other Unlisted Forklifts" does NOT require LANL forklift training*** or a forklift proficiency evaluation but may require equipment-specific training.

Forklift Attachments

A forklift **attachment** is a device for handling a load (other than conventional forks or a load backrest extension) that is mounted on the elevating mechanism or forks of the truck. An attachment may be mounted permanently, or it may be removable. Examples of attachments are listed on the next page.

OSHA considers attachments to be **modifications** that affect the capacity and safe operation of PITs. Therefore, attachment users must seek written approval from the PIT manufacturer before using an attachment. If the manufacturer does not respond, written approval of the modification from a qualified professional engineer who has performed a safety analysis may be used.

The DOE *Hoisting and Rigging Standard* (DOE-STD-1090-2007) requires that every removable attachment (excluding fork extensions) have a corrosion resistant nameplate with the following information:

- model number;
- serial number and maximum hydraulic pressure (for hydraulically actuated attachments);
- weight;
- capacity; and
- the following instructions (or equivalent): "Capacity of the truck and attachment combination may be less than capacity shown on attachment. Consult truck nameplate."

Some forklift manufacturers do not allow certain types of attachments to be used on their forklifts. For example, the Clark Material Handling Company will not approve the use of a jib boom on their forklifts.

Using Forklift Attachments at LANL

Ensure the following before using a forklift attachment at LANL:

- the manufacturer has approved the specific attachment/forklift combination, or a safety analysis has been conducted by a registered professional engineer;
- the attachment is labeled with required information (see above);
- the attachment has a current LANL annual inspection sticker;
- the forklift is labeled with the new attachment/forklift combination weight and capacity information; and
- the operator has documented training on the attachment/forklift combination, a documented proficiency evaluation with the forklift/attachment combination, and management authorization to operate the forklift/attachment combination.

Note: This course is NOT considered to be attachment training.

Examples of Forklift Attachments	
A . . .	**is used for . . .**
barrel grab	transporting drums.
gripping jaw(s)	moving drums.
carton clamp(s)	providing uniform pressure over the surface area of the load (by the use of one or two sets of pads).
rotator(s)	providing the force for rotating various types of containers.
load inverter	performing operations where loads must be stabilized during transport or loading or where it is necessary to exchange the pallet.
dumper-upender	dumping or pouring materials from drums, hoppers, or baskets.
load stabilizer	moving unpalletized loads or loads that may bounce in transit.
concrete pipe manipulator	handling concrete pipe.
boom	transporting loads that cannot be readily palletized or reaching into tight spaces to pick up or stack material.
drop-bottom box dumper	performing recycling operations or in factories and warehouses, where parts or bulk materials must be dumped.
scrap handler	working in areas where the amount of waste is significant.
side loader	performing narrow-aisle operations and for depositing and removing long or short loads.
snow blower, yard sweeper, scoop, and/or blade	converting the forklift into a snow-removal machine, a maintenance machine, a front-end loader, or a grader. Using these attachments does not require a forklift proficiency evaluation.
side-shift carriage	picking up and setting down loads in tight corners.
maintenance platform	performing maintenance and construction work in heights above floor level.

Free Rigging from Forks

Free rigging is the direct attachment to or placement of rigging equipment (slings, shackles, rings, etc.) onto the tines of a forklift for a below-the-tines lift without the use of an approved lifting attachment. ***Free rigging from the mast, carriage, or forks of a forklift is NOT allowed at LANL.*** In addition to being dangerous, this practice is prohibited by OSHA because free rigging is considered an addition or modification that affects the carrying capacity and handling of the forklift.

Free rigging from the mast, carriage, or forks of a forklift is NOT allowed at LANL.

Student Self-Assessment

Circle the correct answer. Answers are found on page 75.

1. Which answer below best describes the training required to operate a forklift with an attachment?
   a. the operator requires training only on the forklift on which the attachment will be used
   b. the operator requires general training on attachment use
   c. there are no training requirements for attachments
   d. the operator must be trained on the forklift/attachment combination, and the training must be documented
2. Free rigging is
   a. restricted to 2-ton and above forklifts
   b. approved by LANL
   c. approved by OSHA
   d. prohibited by LANL
3. Forklift attachments must have a current annual inspection label.

   True

   False
4. An operator must complete forklift training to operate a Class VII forklift.

   True

   False

Module 2: Forklift Components and Inspections

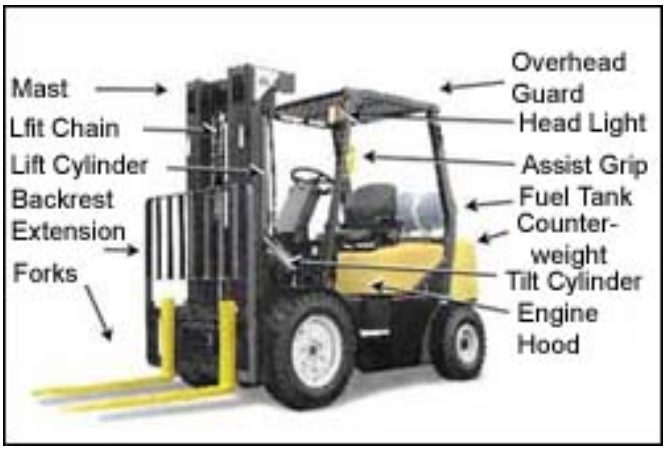
Module Objectives

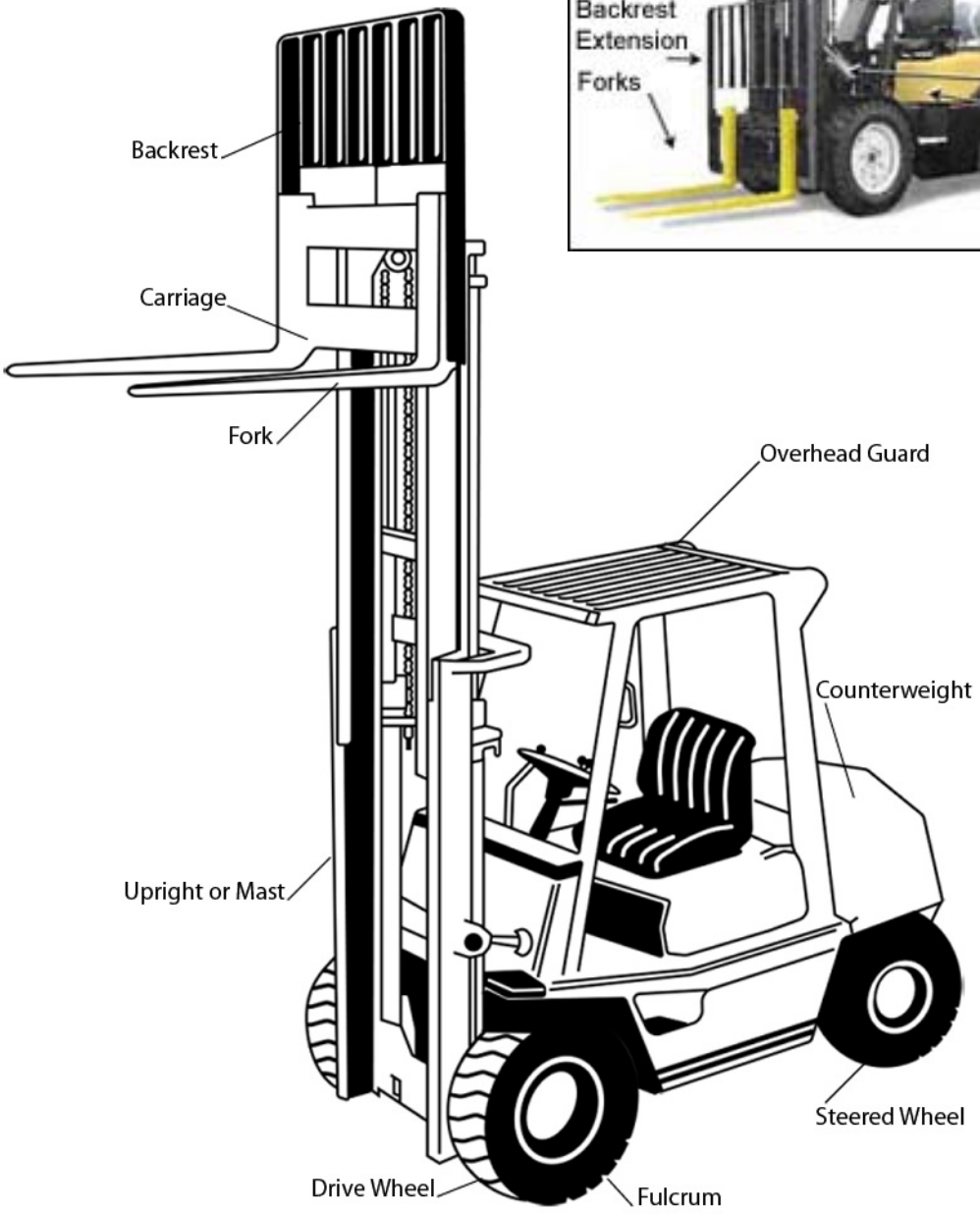
Upon completing this module, you will be able to recognize

- basic components of a forklift,
- forklift operator controls and how a forklift differs from a car,
- forklift inspection and maintenance requirements, and
- access control and placard requirements for forklifts at LANL.

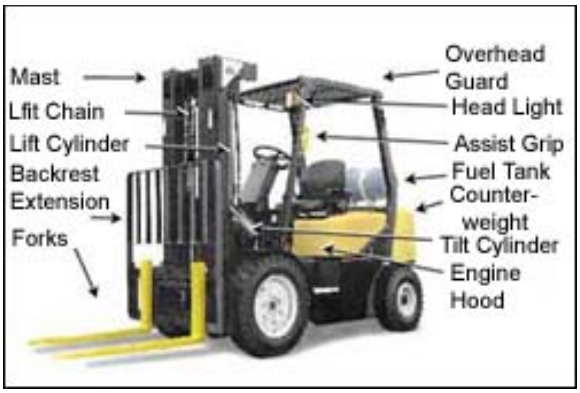
Forklift Components

Components of a typical forklift are shown in the diagrams below and are described on the following pages. Not all components of every forklift are listed. You will learn about the components of the specific forklift(s) you will operate from your FPI during practical training.





Carriage – The carriage is the part of the forklift to which the forks or other attachments are secured. The carriage is mounted into and moves up and down the mast rails by means of chains or by being directly attached to the hydraulic cylinder. As with the mast, the carriage may have either rollers or bushings to guide it in the interlocking mast rails. The carriage has notches on the top bar to receive the fork locks.



Danger, Warning, and Caution Labels – In addition to the nameplate, forklifts may have other warning labels or decals that provide safety information to operators. Safety labels should be clearly visible to the operator and must be replaced if missing, damaged, or illegible. Do not operate a truck with missing or illegible warning labels.

Forks – Forks support the load as it is lifted. Forks are mounted on the carriage, usually in pairs. There are different types of forks and different types of fork mountings. Hook-mounted forks hang from the top of the carriage and are secured from moving by a fork pin, which drops into notches cut out on the top carriage bar.

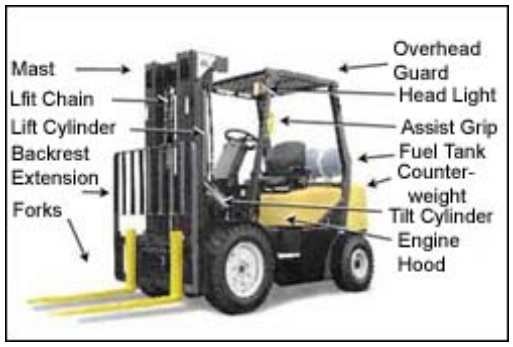
Hose Reel – A hose reel is a device used to hold the hoses that provide fluid to a hydraulically operated attachment. Hose reels normally are mounted near the top of the mast. The hose reel winds up the hose as the carriage nears the hose reel and lets out the hose as the carriage passes the hose reel.

Lift and Tilt Cylinders – Lift cylinders use hydraulic power to extend the moveable rails of the mast and elevate the load. Tilt cylinders use hydraulic power to move the stationary rails of the mast backward or forward to assist in engaging a load.

Lift Chains – Lift chains are connected to the carriage and mast at points called anchors. The chains are looped over pulleys, called sheaves, attached to the lift cylinder or a set of rails. The chain provides a second indirect stage of lift in addition to the direct lift provided by the lift cylinders. Most forklifts use a type of chain called a leaf chain, which uses multiple links pinned together to form a chain.

Load Backrest – The load backrest is a rack-like extension, either bolted or welded to the carriage, that is designed to prevent the load from shifting backward when the carriage is lifted to its full height. NEVER use a load backrest as an anchor point for chains or ropes to pull objects.

Mast – The mast (upright) is the vertical assembly that allows the load to be raised and lowered and is made up of interlocking rails that also provide lateral stability. The interlocking rails may have either rollers or bushings as guides. The mast is operated by one or more hydraulic cylinders directly or by using chains from the cylinder(s).



Nameplate – The nameplate (also called the data plate or capacity plate) specifies the fuel type, forklift weight, load capacity, type designation, model, and serial number. All nameplates and markings must be in their correct location and remain legible.

Overhead Guards – Overhead guards are designed to withstand the impact of falling objects, such as small packages, boxes, and bagged material. Overhead guards DO NOT protect the operator from all falling objects, such as large, heavy loads or small objects that can fall through the overhead guard spaces. Even when operating forklifts with overhead guards, operators may be required to wear hard hats. An overhead guard is sometimes called a falling object protective structure (FOPS).

Note: *Overhead guards are NOT considered equivalent to rollover protection.*

Rollover Protection – A rollover protective structure (ROPS) is designed to protect an operator from injuries caused by rolling over or, more specifically, tipping over. [The hazard of concern is not rolling over (sideways), but rather tipping over (forward), where the forklift falls over 90 degrees and then comes to rest.]

Seat Belts – LANL policy requires you to wear a working seat belt to operate a sit-on-type forklift. Other types of forklifts may require the use of some other kind of restraint. You may not remove the seat belt or restraint to circumvent this requirement.

Wheels and Tires – The front wheels of a forklift (the drive wheels) act as a fulcrum, and the rear wheels are used for steering. Forklifts may have solid or pneumatic (air-inflated) tires. Solid tires are designed for smooth surfaces, whereas pneumatic tires are better at handling rough terrain.

Note: *The concept of a fulcrum is addressed in Module 4.*

Fire Extinguishers

Forklifts are NOT required to have a fire extinguisher. However, if the manufacturer equips a forklift with a fire extinguisher, LANL may not remove the extinguisher without written permission from the manufacturer. Therefore, if there is a fire extinguisher on your forklift:

- the fire extinguisher must be operable and meet all applicable inspections and
- operators of the forklift must be current in fire extinguisher training.

Forklift Components

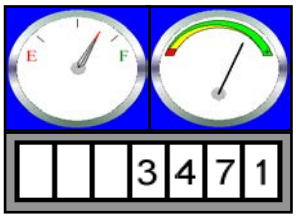
Common Forklift Gauges

Some of the more common gauges on a forklift are shown below. Not all gauges will be found on every forklift, and not all gauges look like the gauges shown on this page. Learn what each gauge means on the forklift you will operate, and never operate a forklift if a warning light or gauge signals an unsafe condition.

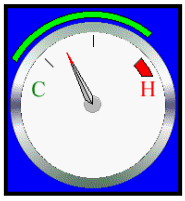

Fuel Level

The ***fuel level gauge*** *(left)* is often similar to those found in cars and trucks.

The ***engine hour meter*** *(right)* records the total number of hours that an engine has been in use and is often used to schedule maintenance.

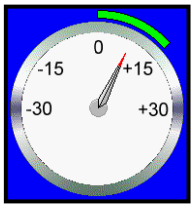


Engine hours

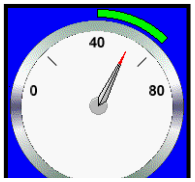


The ***engine temperature gauge*** (*left and right*) is similar to those found in cars and trucks. *Never operate a forklift that is overheating.*


Engine temperature



The ***amperes gauge*** *(left)* indicates that the engine's electrical generator is producing electricity. Readings in the plus (+) range mean that the generator is working. Readings in the minus (-) range mean that something is wrong and that battery power is being used to run the engine. *If the amperes gauge shows (-) readings, the forklift needs maintenance.*



The ***oil pressure gauge*** *(left)* indicates the engine oil pressure. Oil pressure readings that are low or drop to 0 indicate a serious problem with the engine.

Warning indicators *(left)* indicate concerns that need to be addressed, such as with the engine oil pressure or battery charge.

Operator Controls

Some operator controls on a forklift are similar to operator controls on cars and trucks, but some are very different.

The **steering wheel** is like the one in your car; if you turn the wheel to the right, the forklift will turn to the right. However, the rear wheels of a forklift are the wheels that turn, not the front wheels.

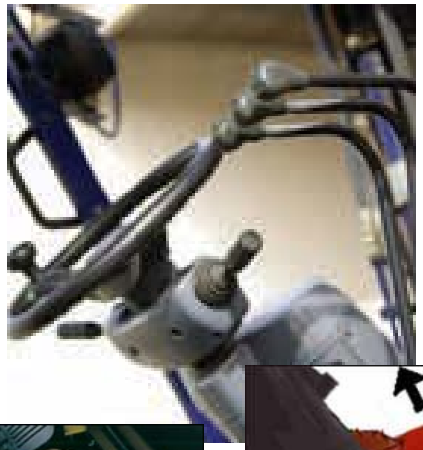
The **directional control lever** is often located to the left of the steering wheel. Pushing the lever forward will allow the forklift to go forward, and pulling the lever backward will allow the forklift go into reverse. Some directional levers must be in neutral before the forklift will start.

The **parking brake** on most sit-down rider forklifts is operated either by a lever actuated by hand or by a parking-brake pedal located on the left-hand side of the inching pedal.

Most gas- and diesel-powered forklift trucks have three pedals:

- The **accelerator pedal** is located on the right and is similar to that found in your car.
- The **brake pedal** is located between the accelerator pedal and inching pedal and is also similar to the one found in your car. However, on most sit-down, counter-balanced forklifts with rear-wheel steering, the brakes stop only the front (drive) wheels, which is unlike your car, which has four-wheel braking.
- The **inching pedal** is used when you need precision control while loading or unloading the forks.

Lever controls allow the operator to tilt the forks and raise and lower the forks. Some forklifts have lever controls that allow the forks to widen or narrow and/or allow the forks to shift to the left or the right.



Forklifts and Cars – Differences

Unlike a car, a forklift steers from the rear, making a wide swing.

Operating a forklift is very different from driving a car. A forklift

- steers from the rear, rather than from the front, and pivots around the inside front wheel, making a wide swing. Unlike a car, in which the driver must continue to apply force to the steering controls to remain in a turn, once a turn is started, a forklift may continue in the turn without additional steering input from the operator.
- often has brakes only on the front (drive) wheels, making them harder to stop (cars have brakes on all four wheels).
- often has reduced visibility.
- has a narrow track and short wheelbase, creating a higher CG and making it easier to turn over.
- has controls that are different and more complicated.
- is heavier than most cars and trucks (avg. auto 3000 lb.; avg. forklift 9000 lb.) and heavier in the rear.

Forklift Inspections

LANL forklift annual inspection sticker.

Annual Inspections

A forklift must have passed an annual inspection in the last 12 months, or it may not be operated. The date of the annual inspection is shown on a label located near the instrument panel. Annual inspections are scheduled by the inspection/maintenance coordinator. Attachments also require an annual inspection.

Preoperational Inspections

Forklifts must receive a preoperational inspection at least daily before use. Forklifts used on an around-the-clock basis must be inspected every 12 hours or before the vehicle is used. A forklift operator must be trained and authorized on each item that is to be inspected. The training must be documented, and the skill must be documented as part of the forklift operator proficiency evaluation. The item must also be listed in the inspection checklist.

Some operational checks can be performed with the key off, but some checks must be performed with the engine running.

Form 1568, *Inspection Checklist for Forklifts and Powered Industrial Trucks*, or an equivalent form must be used to document the inspection. Form 1568 serves as a guide only and may not identify all components needing inspection. Each type of PIT is unique, and checklists may need to be modified. A copy of Form 1568 is shown on the next page. Form 1568 can be accessed from the LANL homepage by clicking on “Forms Center” and searching for Form 1568.

Form 1568, Inspection Checklist for Forklifts and Powered Industrial Trucks

Los Alamos NATIONAL LABORATORY

SAVE PRINT

Inspection Check List for Fork Lifts and Powered Industrial Trucks

Any items not approved must be corrected before operating vehicle.

Responsible Group	Make and Model of Truck	Truck Property Number

ALL TRUCKS
(Check each approved item. Print N/A if not applicable.)

	Inspection #1	Inspection #2	Inspection #3	Inspection #4	Inspection #5	
Leaks under unit						None present
Tires and wheels						Good condition
Overhead guard posts						Good condition
Mast (upright)						Good condition
Forks						Not bent or broken
Hydraulic oil						Proper level, no leaks
Hour meter and gauges						Functioning properly and within proper limits
Lights						Proper operation
Hoist cylinders						Proper operation, no leaks
Tilt cylinders						Proper operation, no leaks
Steering and horn						Proper operation
Engine operation						Starts properly, runs smoothly
Exhaust system						No leaks, spark arrester
Service brakes						Proper operation
Fire extinguisher						Inspection current
Modifications affecting safe operation or capacity						Requires written approval from manufacturer
Verify annual inspection sticker						Legible and current
Placard						Legible and current
Seat belt						Operational

GASOLINE, DIESEL, OR PROPANE-POWERED TRUCKS

Fuel						Proper level, no leaks
Water or antifreeze						Proper level, no leaks
Fan belt						Good condition
Oil pressure and level						Proper level, no leaks
Battery						Water level, connection
Parking brakes						Proper operation

ELECTRICAL-POWERED TRUCKS

Seat brake						Proper operation
Limit switches						Proper operation
Battery plug connection						Good condition
Battery charge						Proper charge
Battery water level						Satisfactory

Date of inspection					
Hour meter reading					
Inspector's initials					
Inspector's Z number					

Form 1568 (11/98)

SAVE PRINT CLEAR FORM

Attachment Inspections

Attachments are inspected by the maintenance organization before being placed into service and annually. The attachment must be labeled with an annual inspection tag. Before operating a forklift with an attachment:

- inspect the attachment and document the inspection, along with the preoperational inspection of the forklift;
- ensure that the attachment is securely attached to the forklift; and
- inspect the load material to ensure that the forklift/attachment combination is used only for intended purposes and within design specification.

Additional Inspections

Inspection/maintenance coordinators and the maintenance organization are required to ensure that forklift inspections are performed and documented

- before a vehicle is first placed into service (as with newly purchased equipment),
- after transfer of ownership, and
- after each vehicle is repaired.

Inspection Record Retention

The inspection/maintenance coordinator must ensure that records of all maintenance, inspections, and modifications of forklifts in his/her inventory are retained. Pre-use inspection checklists must be kept for 3 months unless directly related to an event, accident, or forklift failure. Checklists so associated will be retained with the investigation report file or maintenance file. Annual inspection records must be kept for at least 1 year.

Removing a Forklift from Service

If a forklift does not pass a forklift inspection, the forklift must be removed from service and tagged out. The maintenance coordinator and the RLM must be notified, and the forklift must be repaired before being returned to service. If the forklift is overloaded or overstressed, it should be taken out of service, inspected, and issued a new annual inspection label. An example of overloading is when the rear wheels are lifted off the ground.

Forklift Maintenance

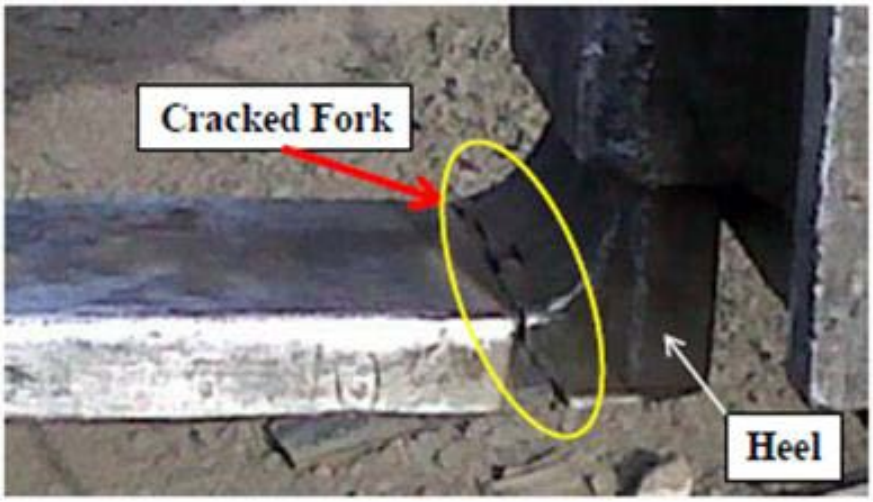

Los Alamos

The inspection/maintenance coordinator arranges the inspection and maintenance of forklifts. These processes include maintaining an inventory of active and out-of-service forklifts, coordinating annual inspections, coordinating preventive maintenance and repair, and maintaining copies of inspections and maintenance of assigned trucks. *Forklift operators are not responsible for repairs and must never attempt to repair a forklift.*

A vehicle that needs repair, is defective, or is unsafe must be tagged out and removed from service. Form 1569, *Defective Equipment Report for Forklifts and Powered Industrial Trucks*, may be used to record and report defective trucks to the RLM or inspection/maintenance coordinator and the maintenance organization. Form 1569 can be accessed from the LANL homepage by clicking on “Forms Center” and searching for Form 1569.

Maintenance Record Retention

Forklift yearly maintenance records must be kept for the life of the unit. These maintenance records are kept at LANL’s Heavy Equipment Shop. Records of defects and repairs must be kept for the life of the vehicle.



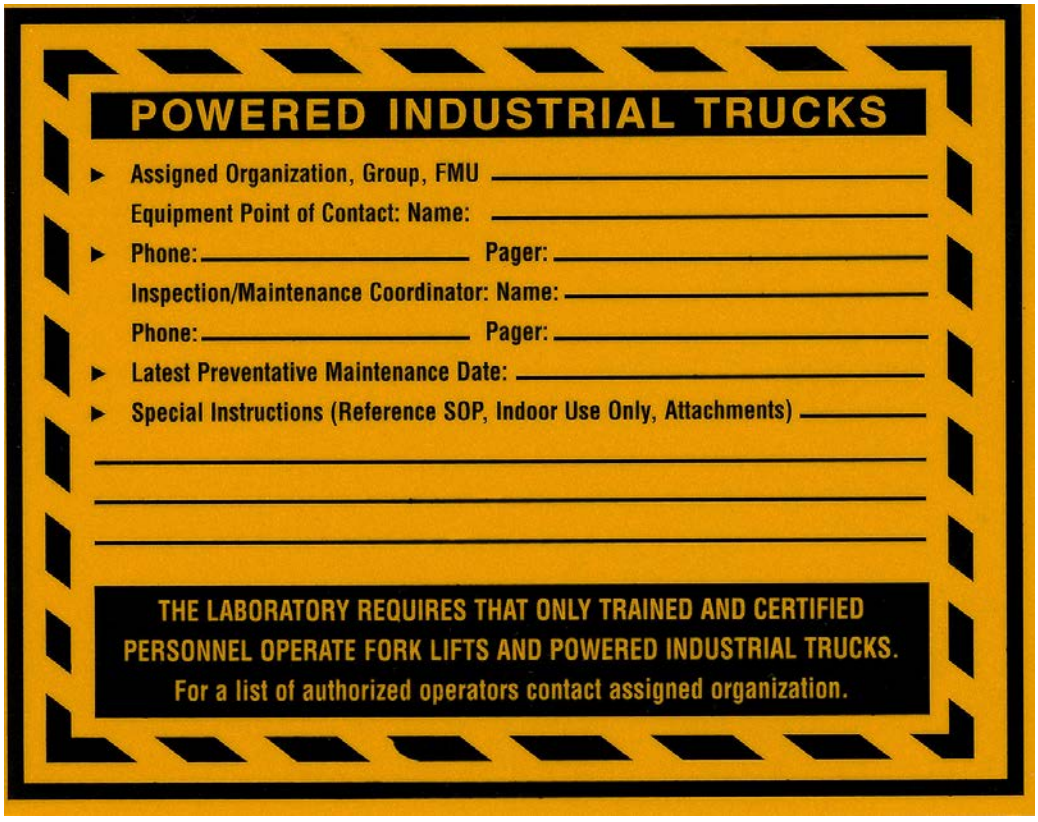
A forklift with a cracked fork such as that shown above must be removed from service immediately.

Access Control and Placards

Access control of forklifts is required by LANL P101-4. To prevent unauthorized use, forklifts must be controlled either administratively (such as with key control) or physically (such as with chains and locks).

LANL P101-4 also requires that **placards** be placed on all LANL forklifts. Placards indicate points of contact if you have questions or concerns about the operation or status of a forklift. Placards must be displayed on the left-hand side of the forklift and must contain the following information:

- assigned organization, group, and facility management unit;
- equipment point of contact;
- inspection/maintenance coordinator;
- annual inspection status; and
- special instructions.



LANL placard for forklifts (black on yellow background).

Video Activity—Preoperational Inspection of a Forklift

Watch the *Forklift Safety: Inspection* video. Write down the components that are inspected by the forklift operator in the video. Answers are found on page 75.

Discussion

1. What components did you see being inspected?

2. Did you see any components that were NOT inspected?

Student Self-Assessment

Choose the best answer. Answers are found on page 75.

1. A forklift preoperational inspection must be conducted when?
   a. after the forklift has been used a few times
   b. at least daily, before operation of the forklift
   c. any time during a shift
   d. at least monthly

2. After an inspection is performed, the operator must
   a. repair or replace any defective items
   b. document the inspection on Form 1568 or equivalent
   c. request line management authorization to begin work
   d. contact the inspection coordinator

3. Fluid on the floor under a forklift
   a. is normal for most commercial forklifts
   b. indicates the forklift is parked on a ramp
   c. must be reported if the volume exceeds one quart
   d. indicates a potential problem

4. To prevent the unauthorized use of forklifts, forklift owners and operators must use
   a. a badge reader with a password
   b. access control
   c. a LoJack
   d. an integrated theft alarm

5. Fuel leaks
   a. are an expected operating hazard
   b. should be checked for during every fifth inspection
   c. are of concern only with injector systems
   d. are always dangerous and must be corrected

6. Headlights and turn indicators on a forklift
   a. are considered to be optional equipment and do not need to be inspected
   b. must be inspected and working
   c. must be checked during every fifth inspection (weekly)
   d. must be inspected only if they are to be used

7. When a defect is discovered during a forklift preoperational inspection,
   a. verbal notice to a supervisor is sufficient
   b. the defect must be documented
   c. the operator must repair the defect
   d. the previous operator must be contacted

Module 3: Regulations and Responsibilities

Module Objective

Upon completion of this module, you will be able to recognize

- regulations and requirements that affect the safe operation of forklifts at LANL and
- responsibilities of forklift operators at LANL.

Regulations and Requirements

Regulations and requirements that affect the use of forklifts in the workplace include the following:

29 Code of Federal Regulations (CFR) 1910.178, *Powered Industrial Trucks*. Contains safety requirements relating to fire protection, design, maintenance, and use of fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines.

Department of Energy (DOE) Standard 1090-2007, *Hoisting and Rigging Standard,* Chapter 10, *Forklift Trucks.* Specifies operation, inspection, testing, and maintenance requirements for forklift trucks powered by internal-combustion engines or electric motors.

American National Standards Institute/Industrial Truck Standards Development Foundation (ANSI/ITSDF) B56.1-2012, *Safety Standard for Low Lift and High Lift Trucks*. Defines the safety requirements relating to the elements of design, operation, and maintenance of low-lift and high-lift powered industrial trucks controlled by a riding or walking operator and intended for use on compacted, improved surfaces.

LANL P101-4, *Forklifts and Powered Industrial Trucks*. Establishes safety requirements that must be implemented to ensure that forklifts and powered industrial trucks are operated, inspected, and maintained by trained and qualified personnel. P101-4 can be accessed from the LANL homepage by clicking on “Policies.”

Responsibilities

Listed below are some of the responsibilities of forklift operators as specified in LANL P101-4. Additional responsibilities for RLMs, forklift proficiency instructors, inspection/maintenance coordinators, and the Occupational Safety and Health Division (OSH) are found in LANL P101-4.

Forklift Operator Responsibilities

As a forklift operator, you are responsible for the safe operation of the forklift. Specific responsibilities from P101-4 are as follows:

- Operates only equipment that he/she is trained and authorized to operate.
- Performs preoperational inspections before each shift during which the vehicle is used, and documents the inspections with Form 1568 or equivalent.
- Determines if forklifts or PITs meet the definition of oversized vehicles in accordance with P101-7, *Vehicle and Pedestrian Safety Program.*
- Operates forklifts safely, within the manufacturers' guidelines, and in accordance with the requirements of P101-4, *Forklifts and Powered Industrial Trucks.*
- Must NOT operate a forklift or PIT under the influence of alcohol, illegal or controlled substances, or medications that could impair his or her ability to operate the vehicle safely.
- Must report all accidents to the RLM.
- Must NOT use cellular phones or perform other distracting activities while operating a forklift.
- Must possess a valid state motor vehicle driver's license.
- Must meet the requirements P101-4, Section 6.0, *Training*.

FPI responsibilities are addressed in *Forklift Proficiency Instructor Classroom Training* (#20355).

Forklift Proficiency Instructor Responsibilities

Forklift proficiency instructors provide initial and refresher training on forklift operation fundamentals, including attachment training, and conduct operator proficiency evaluations. Persons who are interested in becoming a LANL FPI must complete the training and authorization process specified in P101-4.

Module 4: Fundamentals of Forklift Operation

Module Objectives

Upon completion of this module, you will be able to recognize

- factors that affect forklift stability and capacity;
- criteria for critical lifts with a forklift at LANL;
- rules for working with loads, including load composition, manipulation, stacking, unstacking, and moving the load;
- forklift visibility restrictions and hand signals for operators and spotters;
- requirements for unattended forklifts and parked forklifts; and
- unacceptable forklift operations.

In July 2001, a warehouse laborer was fatally injured when the sit-down-type forklift he was operating tipped over and crushed him. The victim apparently lost control of the forklift, which had a load on its forks with the mast fully extended, as he was making a right turn, causing the forklift to tip over 90 degrees onto its left side. The unrestrained victim was crushed under the extended boom/mast of the forklift.

-NIOSH In-house FACE Report 2002-02

Video Activity

Watch the video *Forklift Safety: Operation*, and complete the statements below. Answers are found on page 75.

1. LANL requires operator _____ and _____ before workers are allowed to operate a powered industrial truck.

2. Forklift operation is a matter of _____.

3. A forklift acts as a _____.

4. The balance point or fulcrum of a forklift is the _____.

5. Every object has a _____.

6. A counterbalanced forklift has _____ support points.

7. A load that exceeds the truck's capacity will cause the _____ to move beyond the support area.

8. Each truck has a rated load capacity recorded on the _____ _____.

9. Before picking up a load, _____ it carefully.

10. To achieve maximum _____, set the forks at the greatest width that the pallet allows.

11. Use only enough backward _____ to stabilize the load.

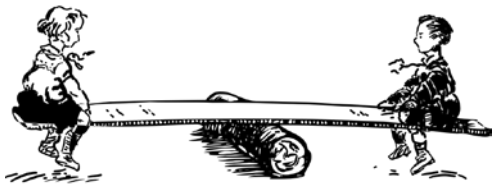
12. Never lift loads with a _____.

13. No matter which attachment is used, any truck must be operated as though it were _____.

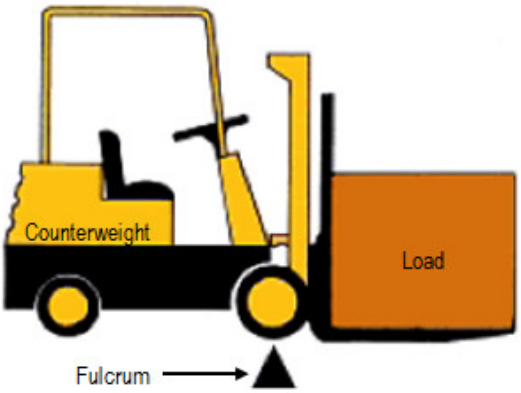
14. Keep your arms and legs _____ _____.

15. Do not drive up to anyone standing in front of a _____ or other fixed object.
16. Do not run over _____.
17. When approaching cross aisles or when vision is obstructed, _____ and _____.
18. Pass other vehicles only when it is _____ and clearly safe to do so.
19. Stay at least _____ truck lengths from the vehicle ahead.
20. You should travel in _____ whenever a load blocks your vision.
21. Always travel on a ramp with the load _____.
22. Unloaded trucks should be operated with the forks _____
23. Never _____ the truck on a ramp or platform.
24. Do not exceed the rated capacity of _____ plates.
25. Before entering a truck or railroad car, check the flooring for _____ or _____.
26. Set the brakes and _____ of a trailer.
27. Use _____ to support an uncoupled trailer.
28. When lifting personnel, a _____ must be firmly secured to the lift carriage or forks.

Forklift Stability



A forklift works like a teeter-totter.



Forklift – A Counterbalance System

A forklift is like a teeter-totter. A teeter-totter works by counterbalancing the weight of one person with the weight of another person over a pivot point. A forklift works the same way. A load on the forks of the forklift is counterbalanced by the counterweight* built into the body of forklift. The pivot point between the load weight and the forklift counterweight is called the **fulcrum**. On a forklift, the front wheels (drive wheels) act as the fulcrum of the counterbalanced system.

**In some forklifts, straddle legs are used in place of or in addition to a counterweight.*

A test performed at a lift truck producer's technical center involved a 5000-pound-capacity, unloaded lift truck. When the three-stage mast was fully extended and tilted back, a person was able to tip the truck over simply by grabbing and pulling on the overhead guard.

If the counterweight is heavier than the load weight, the forklift will, in most cases, pick up the load and remain stable. The **stability** of a forklift is the resistance of a forklift to tipping over. Many factors affect the stability of a forklift, including the

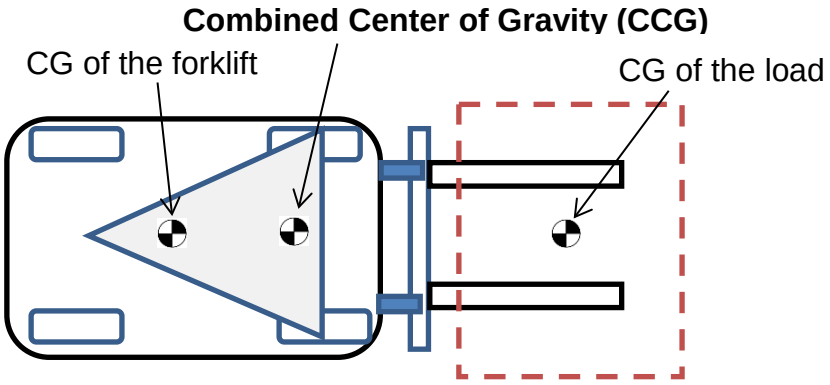
- load size, weight, load shape, and position of the load;
- height to which the load is elevated and the mast tilt;
- forces created by movement, such as acceleration, braking, and turning; and
- uneven surfaces and inclines/declines.

Each of the above factors will be addressed.

***Note:** The factors above apply to both loaded and unloaded forklifts. In many cases, an unloaded truck will tip over on its side more easily than a loaded truck with its load in the lowered position.*

Symbol for center of gravity.

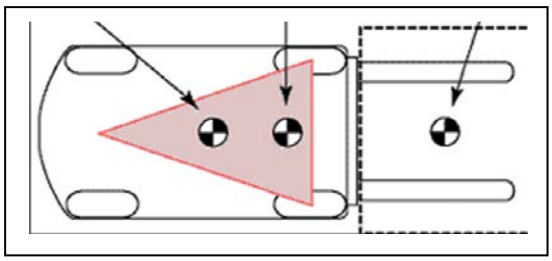
The **center of gravity (CG)** is a point where an object is balanced in all directions. Every object has a CG located within its boundaries. Every forklift has a CG, and every load has a CG. When a load is lifted with a forklift, the CG of the forklift and the CG of the load create a **combined center of gravity (CCG).** The CCG is always located somewhere between the load CG and the forklift CG. If the CCG moves in front of the fulcrum point (the drive wheels), the forklift will tip forward.



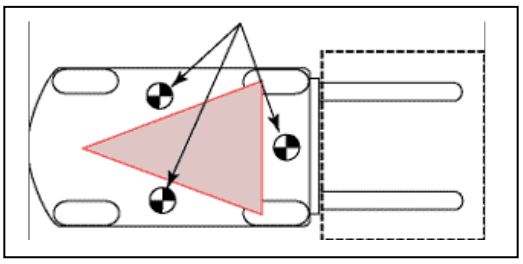
The Stability Triangle

Almost all counterbalanced forklifts are considered to have a three-point suspension system, even if the vehicle has four wheels. The three points are the two drive wheels and the pivot for the steered (rear) wheels. The truck's steer axle is attached to the truck by a pivot pin in the axle's center. When the points are connected with imaginary lines, this three-point support forms a triangle called the ***stability triangle***, as shown in the figures below. As long as the CCG stays within the boundaries of the stability triangle, a forklift should not tip over.

Truck is steady



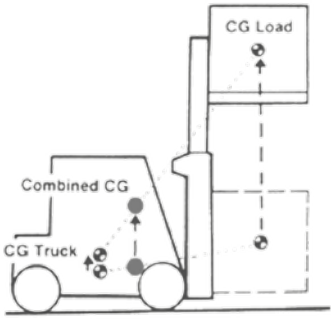
Truck will tip over



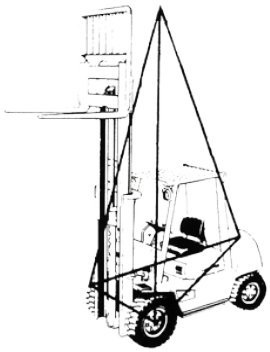
When the CCG stays within the stability triangle, the forklift will not tip over.

The Stability Pyramid

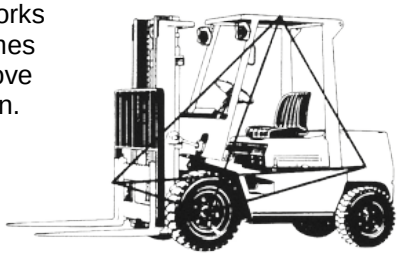
Viewed from the side, the stability triangle looks like a pyramid. The peak of the pyramid moves higher or lower as the load is raised or lowered. The higher the CCG, the less room there is within the pyramid. As with the stability triangle, if the CCG moves outside of the stability pyramid, the forklift will tip over.



As the load is raised, the CCG moves closer to the peak of the stability pyramid.



The peak of the stability pyramid moves up and down as the forks (and sometimes the mast) move up and down.



Stability Factors

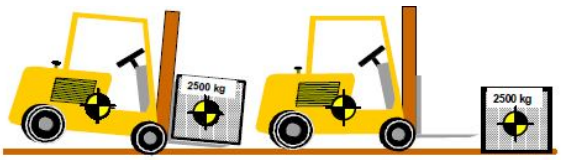
Factors that affect the stability of a forklift are created when the vehicle and/or load are put into motion. Such factors include

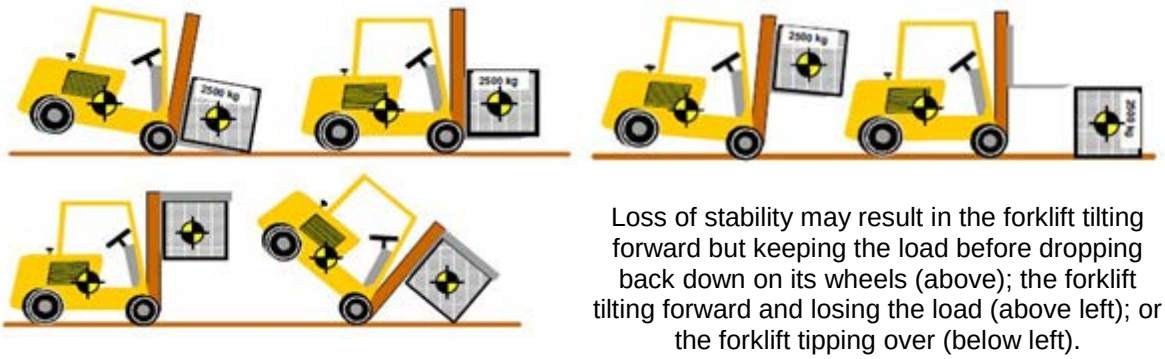
- force, caused by accelerating, braking, and turning;
- the tilt of the mast;
- the lifting, lowering, and side shifting of the load; and
- sloped or uneven surfaces.

These factors can act from front to back and from side to side. The result can be movement of the load, loss of the load, and/or the forklift tipping over. Combining the factors increases the risk of losing the load or tipping over the forklift. For example, turning at speed, turning with the mast elevated, turning across a slope, driving over potholes or floor obstructions, driving with offset forks or offset loads, driving off the edge of raised surfaces such as docks or sidewalks, or any combination of the above can cause a loss of load or the forklift to tip over, as shown on the next page.

Tilting the mast forward with an elevated load can cause the CCG to move outside of the stability pyramid, resulting in tipping over.

When braking or accelerating backward, the forklift may tilt and the load may slide off so that the forklift drops back down on its wheels.





Loss of stability may result in the forklift tilting forward but keeping the load before dropping back down on its wheels (above); the forklift tilting forward and losing the load (above left); or the forklift tipping over (below left).

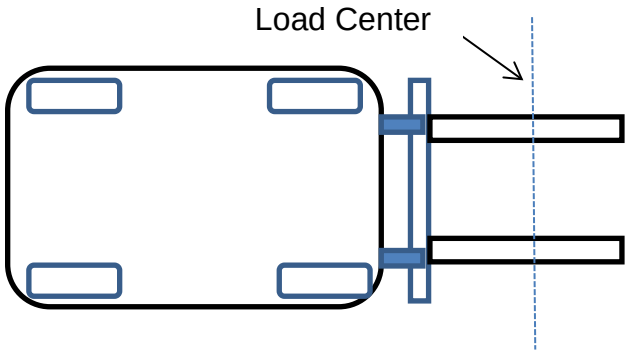
Factors that affect forklift stability include accelerating, braking, turning, tilting the mast, and lifting or lowering the load.

Turning at speed, turning with the mast elevated, turning across a slope, driving over potholes or floor obstructions, driving with offset forks or offset loads, driving off the edge of raised surfaces such as docks or sidewalks, or any combination of the above can cause a loss of load or the forklift to tip over.

Forklift Capacity

Load Center

The load center is the distance from the face of the forks to the load's CG. When the distance from the face of the forks to the CG of the load is less than or equal to the load's center, maximum lifting capacity may be achieved. When the distance from the face of the forks to the CG of the load is greater than the load center, the lifting capacity is reduced. Most (but not all) forklifts are rated at a load center of 24 inches. Some forklifts have more than one identified load center.



The load center refers to a point located a specified distance from the face of the forks. A distance of 24 inches is common.

Rated Capacity

The rated capacity of a forklift is the weight of a load at a specified load center that a given forklift can transport in a carry position and stack to a specified elevation. The rated capacity (or capacities) of a forklift is listed on the capacity plate. Some considerations when working with forklift rated capacities are as follows:

- rated capacities may be listed for more than one load center.
- moving the CG of the load away from the face of the forks and beyond the load center will reduce the capacity of the forklift.
- the load to be lifted must never exceed the rated capacity listed for the forklift, even at a distance that is less than the listed load center(s).
- if the steering wheels of the forklift come off the ground as the load is lifted, the load exceeds the rated capacity.

Capacity Plate

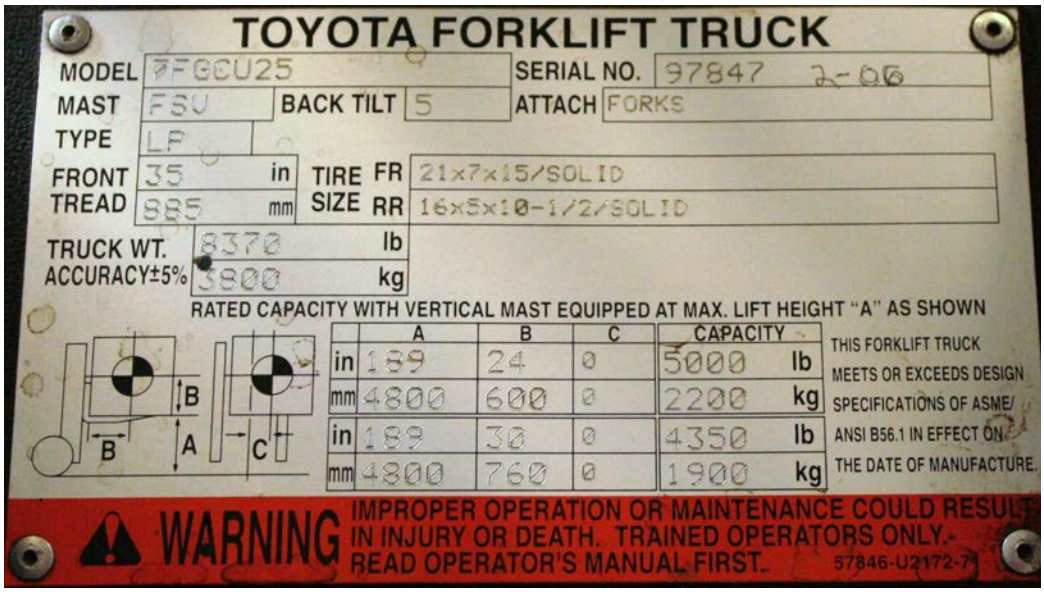
The capacity plate may also be called a data plate or a nameplate.

The capacity plate provides information needed for the safe operation of the forklift, including the

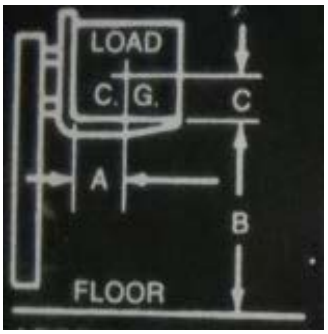
- model number/serial number,
- forklift type (addressed in Module 5),
- rated capacity,
- forklift weight,
- battery weight and voltage information (if the forklift is electric), and
- attachment information (attachments that can be used on the forklift without affecting the rated capacity).

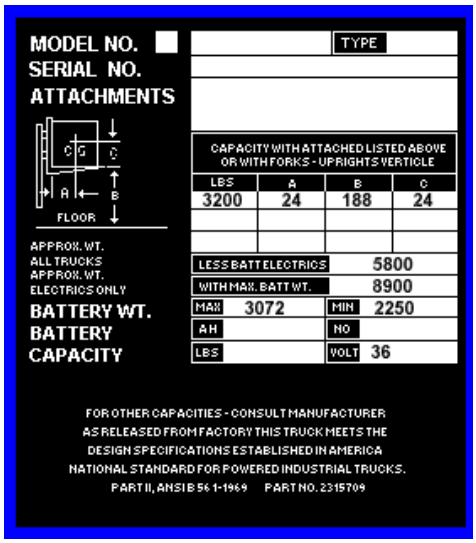
Some considerations when using the capacity plate are that

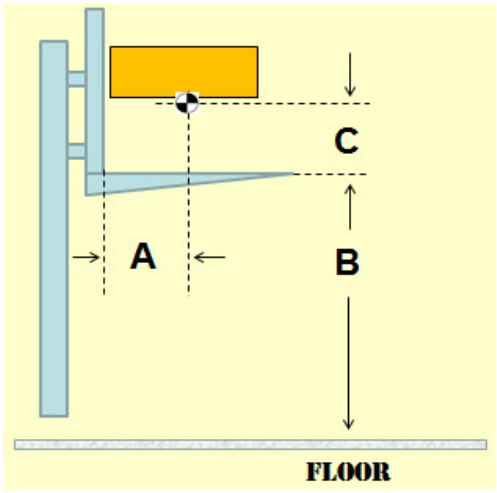
- There are many types of capacity plates. Some capacity plates list maximum load weights at more than one load center, whereas older capacity plates may not contain load center information.
- The rated capacity on the capacity plate assumes that the CG of the load is at the load center shown on the plate. The size, position, or weight distribution of some loads may affect the location of the CG of the load in relation to the load center.
- The rated capacity on the capacity plate assumes that the mast (uprights) is vertical, not tilted.
- The capacity plate often includes a diagram with additional distances that affect the maximum load that can safely be lifted (see next page).



Forklift capacity plate.







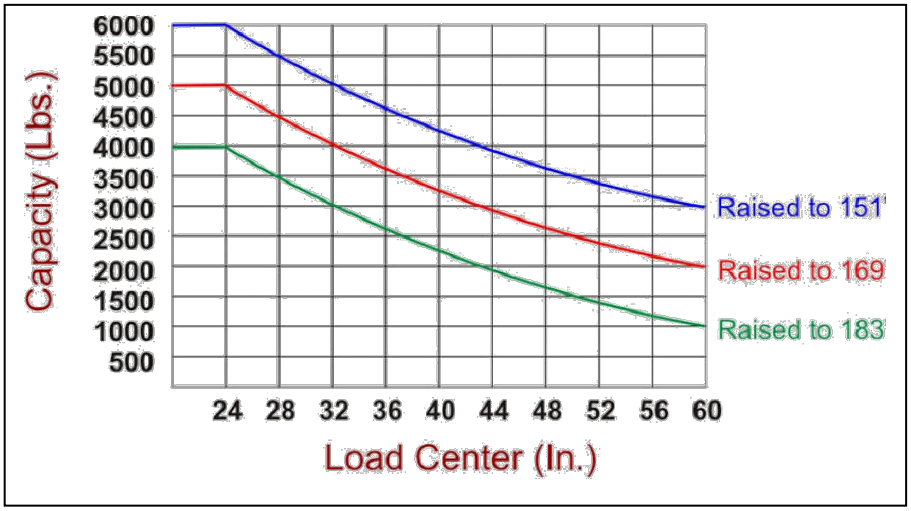
Above right – forklift capacity plate.

Left – close-up of capacity plate diagram referring to the maximum distances for a peak load (shown on the capacity plate above) as follows:

$A_{(inches)}$ = maximum distance from face of forks to load center.

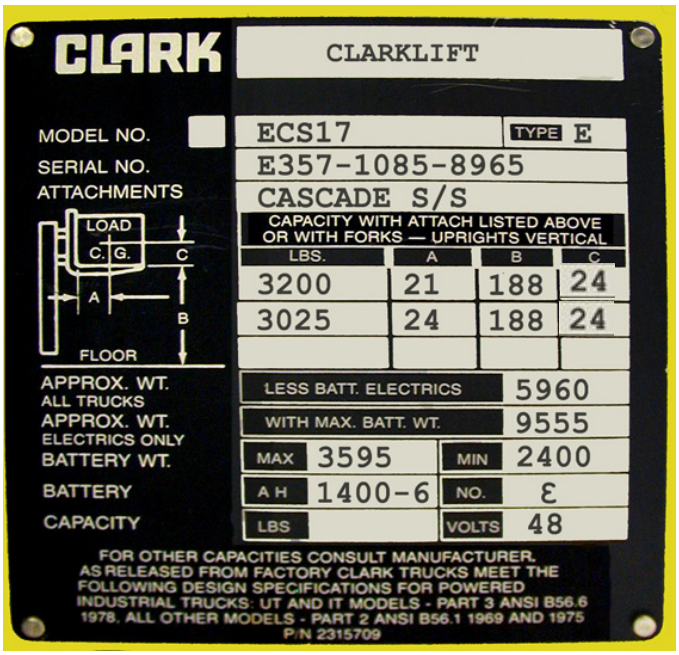
$B_{(inches)}$ = maximum distance from floor to the highest fork position.

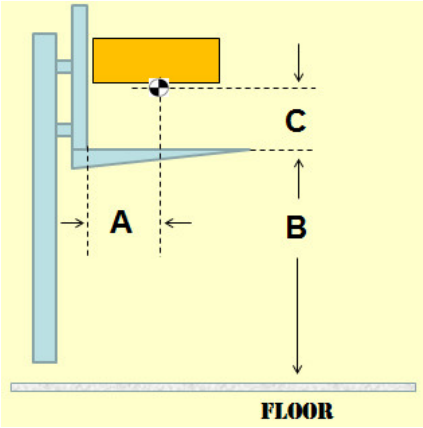
$C_{(inches)}$ = maximum distance from top of the forks to the CG of load (vertical).



Left – another type of capacity plate. Note the following:

- The capacity remains unchanged at less than or equal to the 24-inch load center.
- The capacity is reduced as the load center is increased and the load is raised higher.





The capacity plate shown at left indicates the following:

- This model ECS17 Clark forklift will lift 3025 pounds if the CG of the load is no more than 24 inches from the face of the forks (A), the load is no more than 24 inches from the top of the forks (C), and the forks are lifted no more than 188 inches off the floor (B).
- The capacities are based on the uprights (the mast) being vertical.
- This forklift has the following approximate weights:
  - The forklift weighs ~5960 lb. without a battery.
  - The maximum weight of a battery that can be installed in this forklift is 3595 lb.
  - The minimum weight of a battery that can be installed in this forklift is 2400 lb.
  - The forklift weighs ~9555 lb. with the maximum battery weight installed.
- A Cascade* sideshifter (S/S) attachment can be used, and the listed capacities can still be met.

*Cascade is the name of a manufacturer.

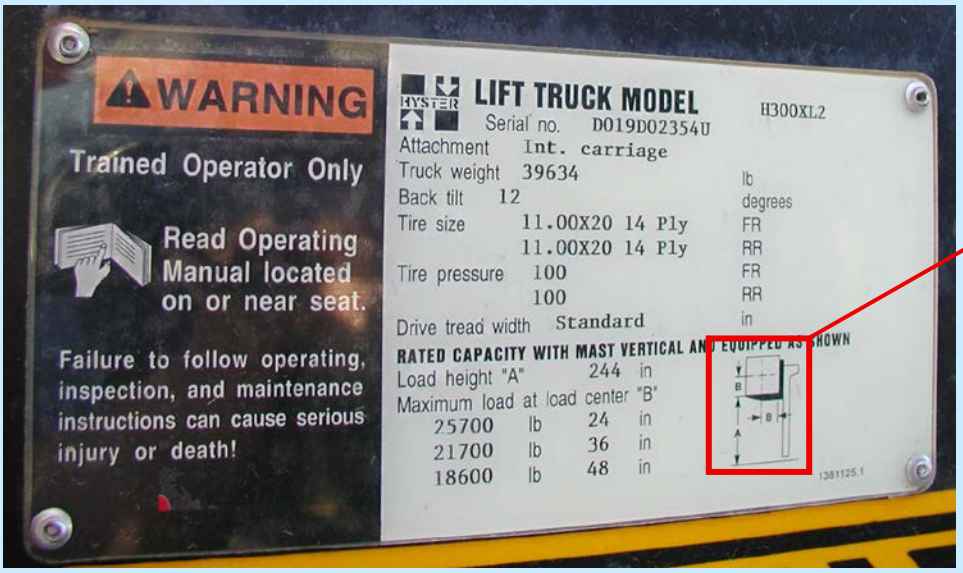
Sideshifters (S/Ss) (*example shown at right*) are a standard attachment used with many forklifts. S/Ss allow the operator to make small side-to-side adjustments to the forks, allowing alignment with pallets without moving the entire forklift.

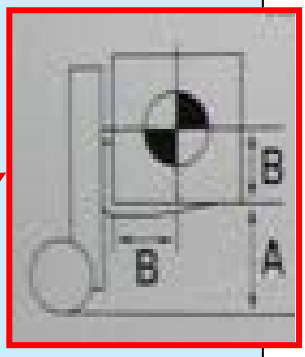
Critical Lifts

If the planned forklift operation will meet any of the following criteria, a critical lift plan is required. Refer to P101-4, *Forklifts and Powered Industrial Trucks.*

Critical Lift Criteria
If the load item is damaged or upset, it would result in a release into the environment of radioactive or hazardous material exceeding the established permissible environmental limits.
The load item is unique and, if damaged, would be irreplaceable or not repairable, and it is vital to a system, facility, or project operation.
The cost to replace or repair the load item, or the delay in operations of having the load item damaged would have a negative impact on facility, organizational, LANL, or National Nuclear Security Administration budgets to the extent that it would affect program commitments.
If the load were mishandled or dropped, the event would cause consequence to nearby installations or facilities.
The lift exceeds 75% of the manufacturer's rated capacity for the industrial truck or mechanized equipment to be used in the lift.
The load item requires special care in handling because of weight, size, asymmetrical shape, undetermined center of gravity, installation tolerances, or other unusual factors.
The lift is an otherwise noncritical lift that must be made in close proximity to critical or expensive items that could be damaged.
The lift uses two or more lift trucks or a combination of such equipment.
Any mobile or industrial boom crane lift in which the crane, hoist, mechanized equipment or load and line could at any time contact an energized power line or enter the minimum distance specified in 29 CFR 1926.1408, *Power Line Safety* (Up to 350 kV) Equipment Operations, Table A.
The lift requires personnel to be lifted.
There is a significant risk of personal injury or property damage.
The failure of the lift could significantly impact the confidence of Laboratory customers or sponsors in LANL's ability to safely execute current or future missions.
The shape configuration and potential instability of the object on the forks may be critical to the proper handling. Workers must secure the load so it is safely arranged and stable. Workers must not carry merchandise or off-center loads unless they have been secured by wrapping or banding. A special platform or attachment may need to be designed to carry the merchandise or off-centered load.

Activity – Hyster 300 Capacity Plate





Answer the following questions using the information from the capacity plate above. Answers are found on page 76.

1. What is the rated capacity of the Hyster 300 forklift? _____
2. Will the Hyster 300 forklift lift a 15,000 pound load if the CG is 36 inches from the face of the forks?_____
3. Is the lift described in question #2 a critical lift? _____
4. Will the Hyster 300 forklift lift a 15-ton load?_____
5. Will the Hyster 300 forklift lift 15,000 pounds if the CG of the load is 48 inches from the face of the forks?_____
6. Is the lift described in question #5 a critical lift? _____

Working with Loads

As a forklift operator, you must understand the load and the rated capacity of your forklift. Before and during a lift:

- Check the configuration and condition of the load.
- See if the forklift can move the load.
- Check the travel path and destination.
- Lift the load.
- Tilt and move the load.

If your load meets any of the criteria for a critical lift, you will need a **Critical Lift Plan**.

Check the Configuration and Condition of the Load

Check the load before you pick it up. If you have concerns about the load stability, shifting of components, loss of items, or damage during travel, consider the following:

- Replace heavily damaged pallets.
- Restack the load to improve stability (see graphics below).
- Secure the load to itself and/or the pallet (if one is used) with rope, straps, or plastic shrink-wrap.

  Note: *Tying an off-balance load to the forks or the carriage to keep it in place is NOT considered a safe work practice.*

Block
The most common. The upper level may require wire or strapping for stability.

Brick
Containers are interlocked by turning each level 90 degrees.

Pinwheel
Used where a brick pattern is unstable.

Irregular Stacking Patterns
Wood strips, plywood, or heavy cardboard between layers can help stabilize castings, bags, and other irregular shapes.

See if the Forklift Can Move the Load

Compare the load weight and load CG to the rated capacity of the forklift that you plan to use. To determine the load weight:

- look for labels on the load;
- look at the shipping manifest;
- look for weights on similar loads;
- contact the load's source;
- weigh one piece and calculate the total weight on loads of identical, multiple pieces, such as a pallet of concrete blocks; or
- estimate the weight using load dimensions and known weights of common materials or similar items.

After determining the load weight, estimate the CG of the load. Consider whether the load is not centered on the pallet, the load is nonsymmetrical, and the CG of the load is farther from the face of the forks than the designated load center of the forklift.

Finally, compare your information with the capacity of the forklift that you intend to use. Note the following limitations and requirements:

If the rear wheels of a forklift ever come off the ground as a result of overloading, the forklift should be taken out of service until an annual inspection is performed.

- NEVER exceed the maximum load capacity provided on the forklift's capacity plate. Note that if the load is oversized, irregularly shaped, or loaded incorrectly, the CG of the load could exceed the forklift's load center distance, causing the capacity to be exceeded.
- NEVER add more weight to the counterbalance of the forklift to lift a heavier load. The forklift's components will be strained and may be damaged.
- If the truck is overloaded for any length of time or for any reason, the truck should be taken out of service until it has been inspected and issued a new annual inspection label. A truck is considered to have been overloaded if the rear wheels have lifted off the ground.

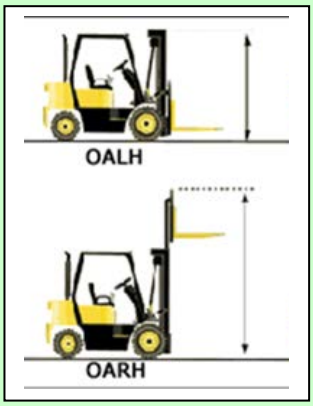
The load, travel path, or destination may cause the planned lift to be considered a critical lift, per the criteria in P101-4.

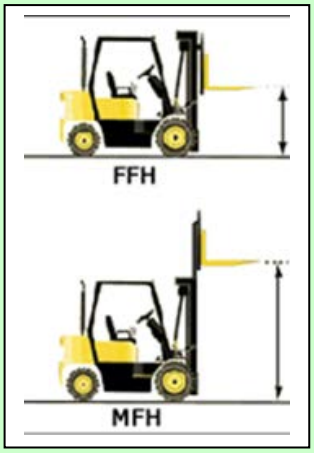
Check the Travel Path and Destination

Walk the area in which you will be moving the loads. Consider the following:

- Travel path size – Is the path wide enough? Are there curbs, potholes, or drop-offs? Are there overhead hazards that could interfere with forklift operation? (See forklift height limitations below.)
- Travel path surface conditions – Are there nails, debris, potholes, rough surfaces, liquid spills, ice, etc.?
- Travel path configuration – Are there blind spots? Areas where a spotter will be needed? Areas where the forklift will need to travel forward or backward because of inclines or declines?
- Travel path environment – Are there workers on foot or nonworker pedestrians along the path? Is expensive equipment located on and/or are adjacent operations occurring along the path?
- Condition of destination – Is the planned destination large enough to handle the load? Is it sturdy enough to handle the forklift and the load?

Know the measurements of your forklift to make sure the forklift can do the job in the space available.





Forklift Height Limitations

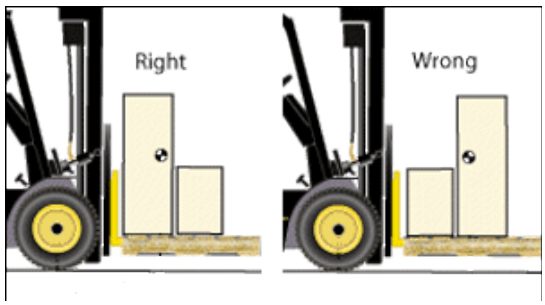
Overall lowered height (OALH): The distance from the floor to the tallest part of the forklift when the forks are at the normal traveling height. Consider OALH when determining whether your forklift can enter doorways, aisles with low-hanging ceiling fixtures (lights, sprinklers), trucks and semi-trailers, and other confined areas.

Overall raised height (OARH): The distance from the floor to the fully extended mast height. Consider OARH when determining whether your forklift can lift the load to the needed rack or stack height with adequate mast clearance.

Free-fork height (FFH): The distance from the floor to the top face of the forks with the mast in its lowest position. Consider FFH when determining whether your forklift can lift the load to the needed stack height without extending the mast or exceeding the overall lowered height of the mast.

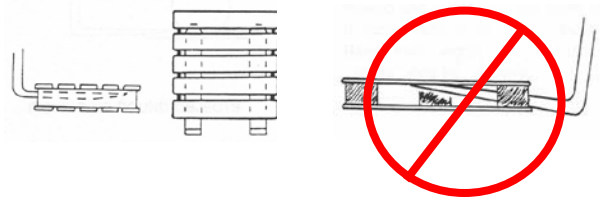
Maximum fork height (MFH): The distance from the floor to the top face of the forks with the mast fully extended. Consider MFH when determining whether your forklift can lift the load to the highest stack with adequate fork clearance.

Lift the Load (Unstacking)



Approach and lift the load as follows:

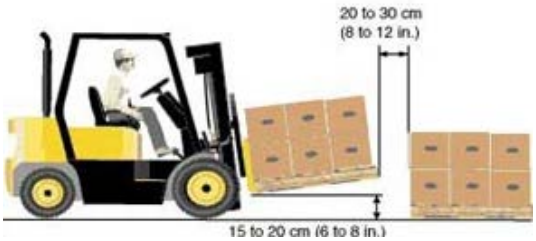
- Whenever possible, orient the load so the CG of the load is as close as possible to the face of the forks.

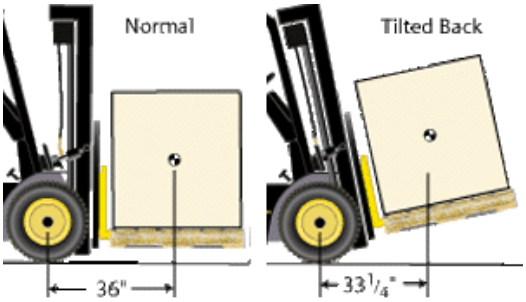


- With the mast vertical and the tines about 1 foot from the load, verify the position of the forks in relation to the load and raise, lower, or tilt the forks as needed. Spread the forks as far apart as the load permits.

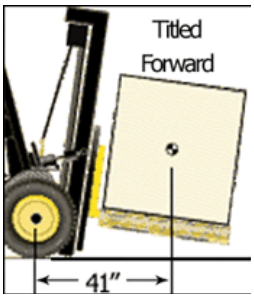
- Slowly move the forks beneath the load. Position the forks as far as possible under the load: at least two-thirds of the load length. If the forks are longer than the base of the load, use caution to avoid damaging objects on the far side of the load.

- When the forks are as far under the load as possible and the load is secure and balanced, carefully lift the load about 4 inches.





Slightly tilting the mast back moves the load CG closer to the fulcrum and helps stabilize the load. Tilting the load forward increases the load distance and makes the load less stable.



Employee Killed when Struck from Behind by Forklift

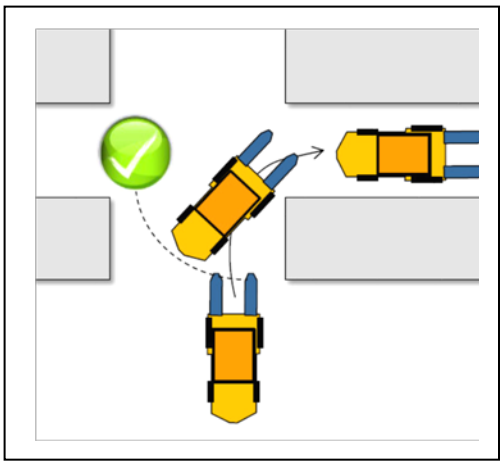
Employee #1 was walking along a blacktop driveway on her way to clock in for work when she was struck from the rear [by a forklift]. The right front and rear tires ran over her body, and she was killed. The forklift operator was not properly trained, was not looking straight ahead, was driving with the forks raised approximately 30 inches above the driveway, and had an obstructed view.

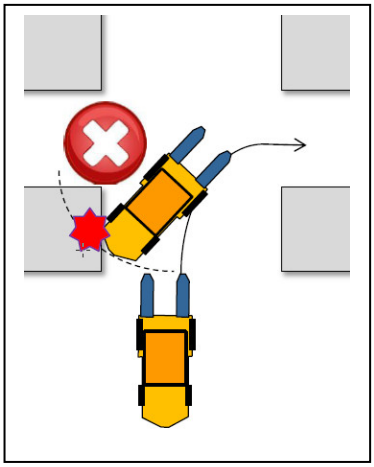
~OSHA Accident Investigation Search #014539258

Tilt and Move the Load

- With the load on the forks, check behind and on both sides for persons on foot and for other traffic. Slowly back up until there is 8–12 inches between the palletized loads.
- Never transport a load in an elevated position. Lower the load to about 4–8 inches from the ground. Bring the load to a slow, smooth stop. A sudden stop could cause the machine to tip forward.
- Tilt the mast back slightly to make the forklift and load more stable. The amount of tilt depends on the load and might not be possible when carrying open-top liquids or similar items. If the load starts to fall as you tilt the load back, remain inside your truck. Never transport a load with the mast tilted forward.
- Travel with the load about 4–8 inches off the floor to keep the CG as low as possible. You may need to elevate the load slightly higher when driving over rough terrain, but remember that the higher the load, the closer the CCG moves to the edge of the stability pyramid.
- Accelerate and brake slowly and evenly. Make turns with the load riding as low as possible.
- Avoid lifting, lowering, tilting, or shifting the load during travel. Stop first, and perform these functions one at a time.
- Maintain three truck lengths between your forklift and vehicles traveling in the same direction.
- Sound your horn when approaching corners and blind areas. Slow down or stop before making a turn.
- Begin a right-hand turn close to the right side of an aisle. Turning the steering wheel as the right front wheel passes the corner. Begin a left-hand turn close to the left side of an aisle. (*See graphics on next page.*)

Remember, operating a forklift is different from driving an automobile because a forklift is steered with the rear wheels, not the front (drive) wheels. Begin a right turn near the right side of the aisle, and a left turn near the left side of the aisle. The rear end of the forklift will swing in the opposite direction of the turn.





Stacking a Load

Keep personnel away from your forklift while placing a load into or removing a load from an elevated position.

- Be sure you have enough headroom when lifting a load.
- Never raise the load while turning into the stack. Make the turn, then raise the load into position.
- Try to keep the mast vertical when performing high lifts. Use only enough backward tilt to stabilize the load.
- When stacking palletized loads, set the top pallet down gently to avoid damaging loads on lower pallets.
- Place each loaded pallet squarely on top of the pallet below. Too much overhang could cause the stack to tip over.

Employee Killed When Struck by Forklift

Employee #1 was walking in the same aisle in which a forklift was traveling with two raised bins of scrap metal, which were obstructing the driver's forward view. The forklift struck Employee #1 from behind and killed him.

~OSHA Accident Investigation Search #000642736

Visibility – Spotters and Signals

The operator must look in the direction of the path of travel and keep a clear view of the path. If the load obstructs the operator's forward view, the operator must travel with the load trailing.

If you cannot see past the load, use a spotter. Always keep the spotter in sight to ensure that the spotter is out of the path of travel. If you lose sight of the spotter, stop until you regain eye contact. When driving in reverse, check over both shoulders and constantly check your path of travel.

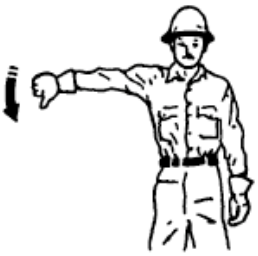
If you use hand signals, be sure that you and the spotter agree on their meanings. LANL uses standard hand signals (adapted from ANSI and found in DOE-STD-1090-2007, *Hoisting and Rigging*) to aid in communication between forklift operators and spotters.

Raise the tines. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

Lower the tines. With arm extended, palm down, lower arm vertically.

Move tines in direction finger points. With arm extended, palm down, point forefinger in direction of movement.

Tilt mast back. With forearm vertical, thumb extended, jerk thumb over shoulder.



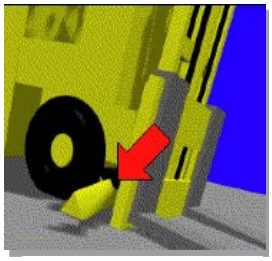
Tilt mast forward. With arm extended, thumb down, lower arm vertically.

Stop. Extend both arms, palms down.

Unattended Forklifts and Parked Forklifts

A forklift is considered "unattended" when the operator is 25 feet or more away from the vehicle OR the vehicle is out of view. Before leaving a forklift unattended, you must

- fully lower the load-engaging means (see the LANL forklift/vehicle accident at the end of Module 5),
- neutralize the controls,
- shut off the power,
- set the brakes, and
- chock the wheels if the forklift is parked on an incline.



Chock the wheels if the forklift is parked on an incline.

If the operator of a forklift is dismounted AND within 25 feet of the truck still in his or her view,

- fully lower the load-engaging means,
- neutralize the controls, and
- set the brakes.

Park in Approved Areas

NEVER park in front of a fire aisle, stairway access, or fire equipment.

If you must park near railroad tracks, park at least 8 feet from the center of the tracks.

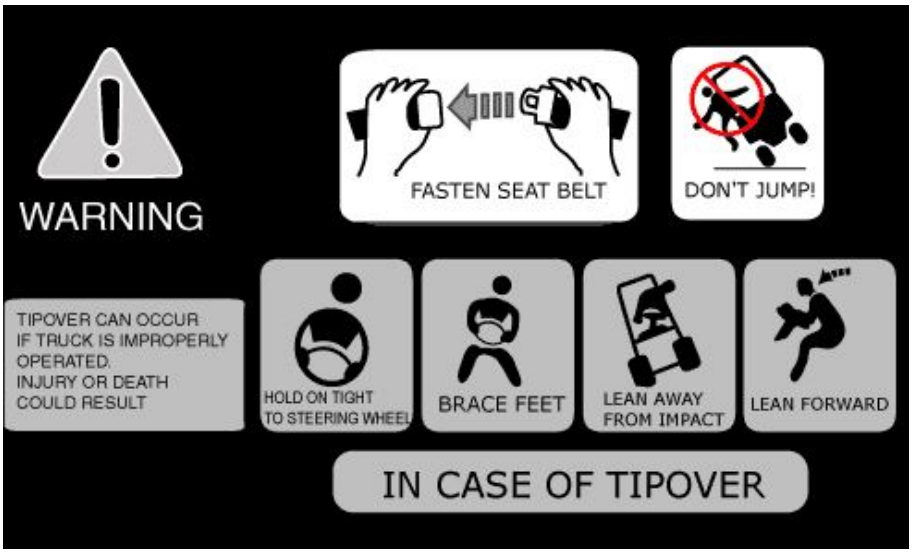
Employee's Head Crushed between Forklift and Pickup Truck

Employee #1 had just finished using a forklift truck to pull a pickup truck out of some sand. He dismounted the forklift to remove the sling, which had been used to hook on to the pickup, leaving the forklift running and in low reverse gear. As he was removing the sling, the forklift backed into him, crushing his head between the back of the forklift and the front of the truck.

~OSHA Accident Investigation Search # 014342406

If a Forklift Tips Over

The two basic types of tip overs in a forklift are (1) a forward, or longitudinal tip; and (2) a lateral, or side tip. The procedure to follow in the event of a forklift tipping over varies, depending on the type of tipover and the class of forklifts that you may use in your facility.



Example of warning label showing actions to take in the event that a sit-down, counterbalanced truck tips over. Note that the operator's seat belt should already be fastened.

For tipovers on sit-down, counterbalanced trucks:

- DO NOT JUMP! Stay in the forklift.
- Hold tight to the steering wheel.
- Brace your feet.
- Lean away from the impact.
- Lean forward.

Tipover procedures for other types of forklifts may vary. For example, operators of stand-up forklifts with rear-entry access should step backward off the forklift if it tips over.

Unacceptable Operations

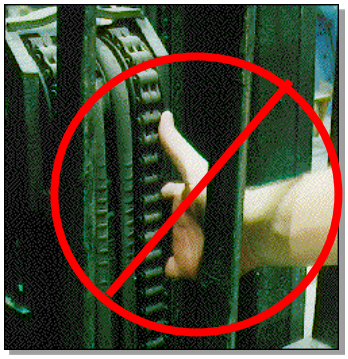
These general rules of conduct apply when operating a forklift:

Never start a forklift when you are not in the proper operator's position!

Employee Killed when Run Over by Reversing Forklift

Employee #1 stepped behind the right front wheel of a forklift to start the engine and raise the forks. The forklift was in reverse gear and the transmission was in first or second gear when Employee #1 turned the ignition key. The engine started, and the forklift rolled in reverse, pulling Employee #1 under the front tire. A coworker ran to help and moved the forklift off Employee #1, who rolled away. Employee #1 died as a result of his injuries. The forklift's parking brake was set but did not prevent the vehicle from moving.

~OSHA Accident Investigation Search #014548408



Never place any part of your body through the mast! If you lean through the mast, your stomach may press on the controls and inadvertently activate them.

Employee Killed when Crushed in Mast of Forklift

On June 6, 1992, Employee #1 was loading a semi-trailer at a dock. He had a load on the forks and was inside the trailer. He apparently stood and reached with his right arm through the opening of the mast between the stationary horizontal frame member and the sliding portion of the mast, possibly to read numbers on the boxes or to retrieve his paperwork, which was lying on top of the load. His right leg struck the mast control lever, causing the mast to lower and crush his head, neck, right arm, and shoulder in the pinch point. Employee #1 died.

~OSHA Accident Investigation Search #170123426

Never ask a coworker to sit on the back of the forklift to provide extra counterweight.

Never use the fork as a ladder or step!

Always keep your entire body within the running lines of the forklift!

Employee Struck and Killed by Forklift

Employee #1 was leaning outside the protection of the roll bar cage on her forklift while talking to the operator of another forklift. Both forklifts were moving. Employee #1 was struck on the head by the other forklift and fell onto its forks. She died from a severe skull injury.

~OSHA Accident Investigation Search #170122121

Never let anyone ride on the forklift or forks at any time!

Employee Killed when Run Over by Forklift

Employee #1 and a coworker were securing a set of warehouse doors. For an unknown reason, the coworker needed to go to the other end of the warehouse. The warehouse was not lighted at the other location, so the coworker took the forklift to provide lighting. As the coworker started the vehicle, Employee #1 mounted the forks. The coworker told him not to ride the forks but began driving toward the east end of the warehouse without waiting for Employee #1 to get off the forks. As they approached the midway point of the warehouse, Employee #1 lost his footing, fell, and was run over by the forklift. He was killed.

~OSHA Accident Investigation Search #04400352

Never participate in horseplay or stunt driving!

Employee Run Over by Forklift during Horseplay

Employee #1 and two other employees were preparing to resume work after a rest break. Employee #1 and another worker were engaged in horseplay, chasing and throwing soda at each other, while the third worker backed a forklift out of the loading dock. The forklift began pulling forward when Employee #1 jumped onto its left side, rode for a moment, slipped off, and was run over by the left rear wheel. The entire event took place within 3 to 10 seconds as the forklift traveled forward 15 to 30 feet.

~OSHA Accident Investigation Search #000566380

Never allow anyone to walk or stand under the elevated portion of a truck, whether loaded or empty!

Never attempt to perform more than one function at a time! For example, do not raise or lower the forks while traveling in forward or reverse, and always come to a complete stop before reversing your direction of travel.

Employee Killed when Caught between Forklift and Door

Employee #1 was using a sit-down electric forklift to transport two cardboard boxes containing miscellaneous scrap to a remote trash compactor outside the building. He apparently backed the forklift to a roll-up door that led to the trash compactor, keeping the forklift in reverse. He then apparently reached behind the forklift with his left hand to grasp the door latch. As he did this, his head came between the inside of the door and the forklift's back vertical overhead guard support. Employee #1 apparently pressed the accelerator by mistake and the forklift moved backward, catching his head and killing him.

~OSHA Accident Investigation Search #170060800

Never drive up to anyone standing next to a bench or a fixed object.

Never trap an individual between the load and a stationary object.

Employee Crushed to Death by Forklift

Employee #1, a helper in a steel billet loading operation, was standing at the rear of a flatbed trailer on which billets were being loaded. A forklift carrying a billet load approached him from behind and struck him with the load. Employee #1 was caught between the billet load and the trailer. He was crushed and killed. The forklift [had] defective brakes.

~OSHA Accident Investigation Search # 000724369

Never use your forklift as a battering ram or butt any load with the forks or the rear end of the truck. Forklifts are not designed to withstand this type of impact.

Never use your forklift to open freight doors. Forklifts are not designed for this, and you may damage the overhead door.

Never use your forklift as a tow truck, unless your forklift has a hitch.

Never transport loads or miscellaneous items within the operator's compartment or other areas of the truck, unless a secure area has been provided and designated by the user.

Never use the forklift to lift a coworker, unless you are using a platform that complies with American National Standards Institute (ASME) B56.1, are following paragraph 4.17 of that standard, and are using a critical lift plan.

Platform designed for lifting personnel. Note the guard on the back of the platform used to keep the person on the platform and protect the worker's arms and hands. At LANL, lifting personnel with a forklift requires a critical lift plan.

Student Self-Assessment

Choose the best answer. Answers are found on page 76.

1. If your machine is equipped with a seat belt,
   a. you are not required to wear it
   b. you may remove it to facilitate your operation
   c. you are required by LANL to wear it at all times
   d. you must wear it only if you are operating the machine outdoors

2. The center of gravity (CG) of an object
   a. is found on the forklift data (capacity) plate
   b. is a point where an object is balanced in all directions
   c. must always remain at least 189 inches from the center of gravity of the forklift
   d. is bounded by the fork tips and the rear wheels

3. When moving a load, you may
   a. only back up and lower at the same time
   b. only tilt and lower at the same time
   c. perform any combination of two or more functions at the same time
   d. perform only one function at a time

4. Securing a load to the forklift
   a. may be done at any time
   b. is allowed when the load is less than 75 percent of the forklift capacity
   c. is not a safe work practice
   d. may be done only to keep it from falling off the forks

5. If the rear wheels lift up when you attempt to lift a load,
   a. your machine is underrated for the load
   b. you may ask a coworker to sit on the back of the forklift for additional counterweight
   c. gently lower the load and try to get the forks further under the load before attempting another lift
   d. raise the load until the CCG reenters the stability triangle

6. When may a coworker hitch a ride on the forks?
   a. When the forklift is being operated on smooth terrain
   b. never
   c. as long as both forks are positioned together
   d. When the travel distance does not exceed 100 feet

7. When turning a rear-wheel-steered forklift,
   a. the machine will react the same as an automobile
   b. come to a complete stop first
   c. tap the brake pedal
   d. the rear end swings wide, opposite the direction of the turn

8. Where must the combined center of gravity (CCG) be located for the forklift to remain stable?
   a. inside the stability pyramid
   b. outside the stability pyramid
   c. behind the counterbalance
   d. outside the stability triangle

9. A forklift is considered unattended when the operator is
   a. 25 feet or more away from the forklift, or if the forklift is out of the operator's view
   b. engaged in communication using a telephone or radio
   c. dismounted and within 25 feet of the forklift and within view
   d. dismounted and within 15 feet of the forklift and within view.

Module 5: Workplace Factors

Module Objectives

Upon completion of this module, you will be able to recognize

- how surface conditions affect the safe operation and stability of the forklift;
- do's and don'ts for traveling on ramps and sloped surfaces;
- hazards and controls that affect forklift operations in areas with pedestrian traffic;
- requirements for safe forklift operation on roads and other operating areas;
- factors that affect safe forklift operation in narrow aisles and restricted places;
- forklift designations (types) that may be operated in hazardous locations;
- safe practices for refueling and/or charging batteries; and
- other potentially hazardous environmental conditions in the workplace that could affect safe forklift operation, including closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide (CO) or diesel exhaust.

Surface conditions such as mud or ice can affect the stability of a forklift.

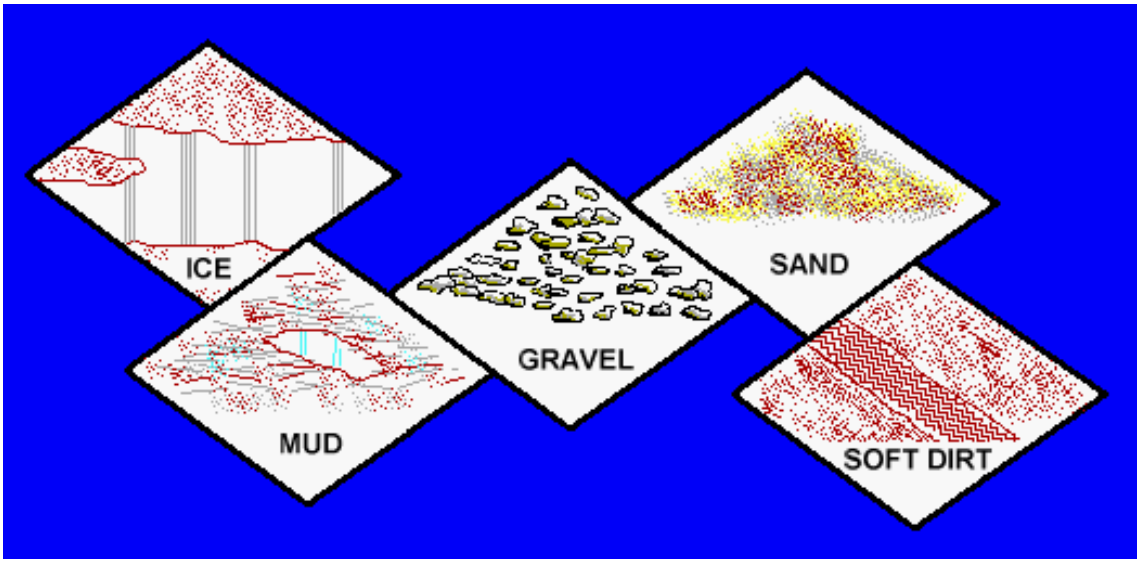
Surface Conditions

Surface conditions affect the stability and stopping distance of a forklift. Consider the following before beginning operations:

Slow down for wet or slippery floors. Request that floors be cleaned up as soon as possible. Allow extra distance to brake on wet surfaces and in areas with grease or oil spills on the floor.

Do not run over loose objects or debris in your path. Take the time to move them out of the way. A single piece of 2-x-4 lumber could be large enough to tip a forklift over under certain circumstances. Banding material can pop up and severely cut a forklift driver who runs over it.

Know your travel route before you travel with your load. If you are in an unfamiliar area, scout the path before driving it. Look for potential hazards, including potholes, speed bumps, and uneven surfaces. These conditions could cause the forklift to tilt suddenly, and sudden tilting under loaded circumstances could cause the forklift to tip over. When possible, remove obstructions such as lumber, stones, or debris from the path. Ensure that the surface will support the forklift and load.



Consider the condition of the road or other surface before operating a forklift.

Ramps and Other Sloped Surfaces

DO NOT elevate loads on an incline. Set the fork height before assessing the grade.

Chock the wheels. If the forklift is unattended on an incline, the wheels must be chocked.

Maintain a safe distance from the edge. Because most forklifts are steered by the rear wheels, it is very easy to drop a wheel off an edge and tip a forklift over a ramp or incline.

A **5% grade** is a 5-foot rise over a 100-foot run.

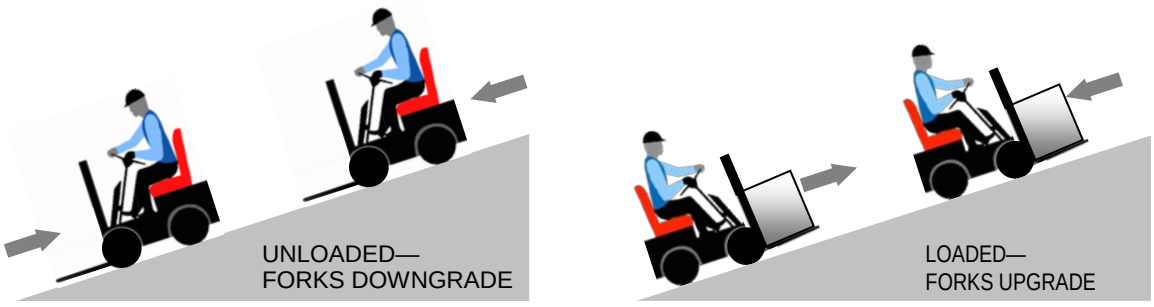
Travel up or down the ramp or incline—never across. When ascending or descending ramps, inclines, or any sloped surface with a grade that exceeds 5%, travel slowly, cautiously, and generally straight up and down. If you are not sure if a grade exceeds 5%, assume that it does and act accordingly. Traveling across a slanted surface greatly increases the chance of tipping over, especially when you are traveling with a load.

When traveling up a ramp or incline with a load, travel with the load facing up (upgrade). Traveling on an upward angle may require the aid of a spotter if the load obscures your vision.

When traveling down a ramp or incline with a load, travel in reverse with the load upgrade**.**

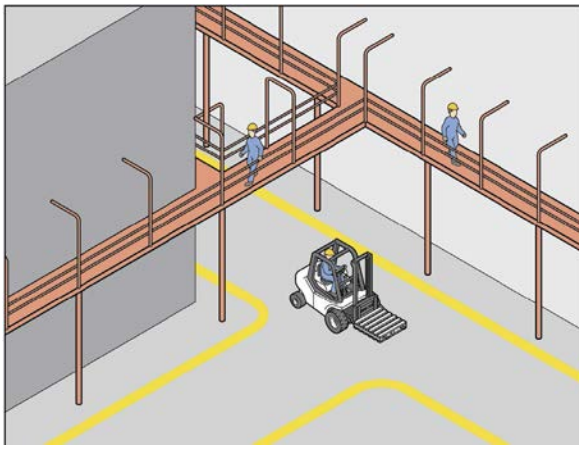
When traveling down a ramp or incline without a load, you may travel facing forward. The brakes actually perform better when traveling forward (downhill) because the force of momentum during braking puts more weight on the drive wheels.

Keep your forks as low to the ground as the floor or terrain permits, but be careful not to run the forks into the ground or ramp. Never travel with the forks elevated.

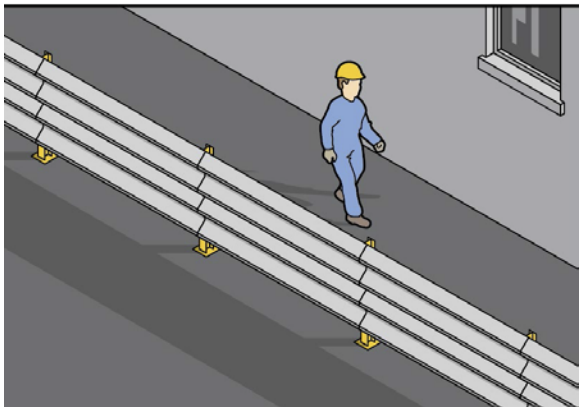


Traveling on an incline without and with a load.

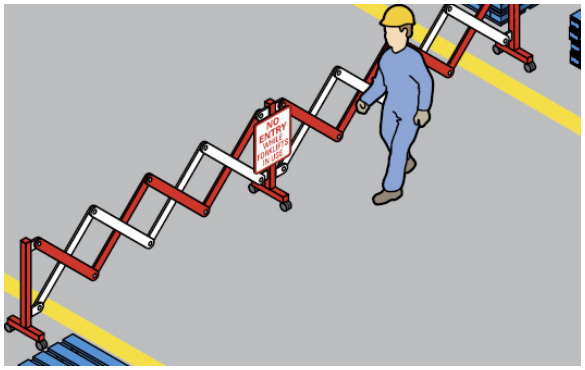
High-Traffic Areas



Overhead walkways (*above*); high impact barriers (*below*).



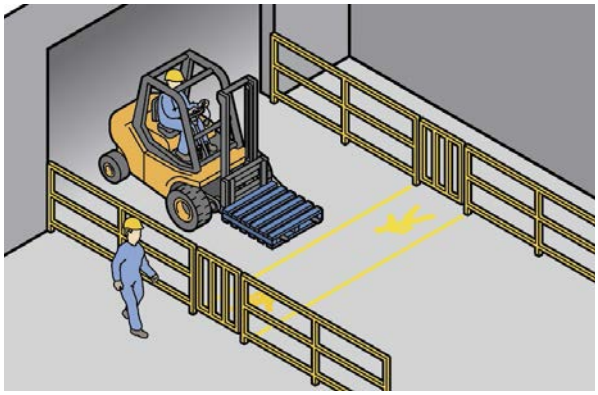
Guardrails (*right*); walkways marked with lines and/or bollards (*lower right*); temporary physical barriers (*below*).

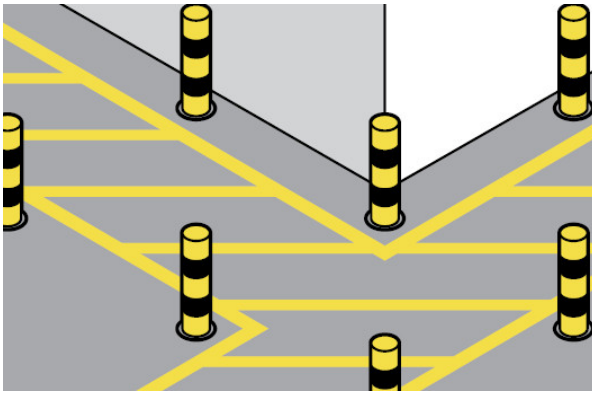


Workers on Foot

According to the National Institute for Occupational Safety and Health (NIOSH), nearly 20% of all forklift accidents involve a pedestrian being struck by the forklift. The best way to protect workers on foot is to ensure that people and forklifts do not unintentionally interact. Consider the following controls to separate workers on foot and forklifts:

- overhead walkways,
- high-impact barriers,
- guardrails,
- temporary physical barriers, and
- walkways marked with lines and/or bollards.





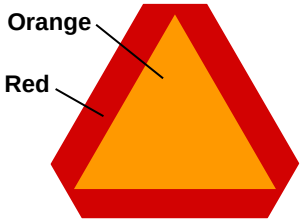
Safety mirrors (*above*) increase visibility at blind corners; strobe lights that activate when the operator backs up can be used to warn workers in the area (*below*).

Additional controls that can be used to separate workers on foot and forklifts include the following:

- Always yield the right of way to workers on foot – Pedestrians have the right of way over forklifts, even if the pedestrian is outside a designated pedestrian lane or completely unaware of nearby activities. Be especially careful when approaching pedestrians from the rear.
- Prohibit or restrict traffic in certain areas – Prohibit the use of forklifts near time clocks, break rooms, cafeterias, entrances, and exits. Make some aisles "forklift only" or "pedestrian only." Restrict forklift traffic in times of peak pedestrian traffic, such as during prescheduled breaks or lunchtime.
- Increase visibility – Install safety mirrors at blind corners. Ensure there is sufficient lighting in the workplace, especially at crossing areas, shared doorways, and racking aisles.
- Use audible and visual warnings – Ensure that backup alarms, strobe lights, and horns are operational and are used to warn workers in the area. Post signs in areas where forklifts frequently operate.
- Warning systems are available that will caution a forklift driver when a pedestrian is detected within 3–5 feet of the forklift.

Signs may be helpful when posted in areas where forklifts frequently operate (*below*).

Roads and Other Operating Areas



Use a slow-moving vehicle emblem or an amber beacon on public roads.

An amber beacon may be used in place of the slow-moving vehicle emblem.

Follow all traffic regulations.

Equip forklifts operated on public roads with a slow-moving vehicle emblem. This emblem consists of a fluorescent orange triangle with a dark red reflective border. An amber beacon may be used in place of the slow-moving vehicle emblem.

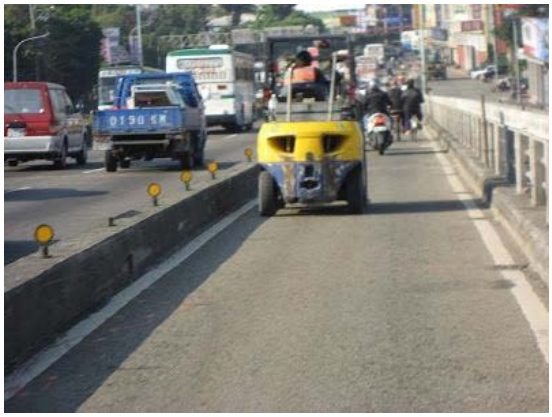
Slow down. The speed at which you drive a forklift is always dictated by your situation. Travel at a speed that will permit the forklift to stop quickly and safely in unexpected situations.

Yield the right of way to emergency vehicles, such as ambulances, fire trucks, and others. Always look to see that the way is clear before moving.

Maintain at least three truck lengths from the vehicle ahead when traveling. Taking this precaution allows more time to slow down or stop if some unplanned event occurs to the forklift ahead of you and reduces your risk of having to stop suddenly.

Use care when passing other forklifts. Do not pass other forklifts traveling in the same direction. Do not pass other forklifts at blind spots or other dangerous locations.

Be alert at cross aisles. Slow down and sound the horn at cross aisles and other locations where your vision is obstructed. Use your horn to warn others—not to demand the right of way.



Narrow Aisles and Restricted Places

The arrows show how the lower horizontal crossbar of a storage rack can enter the operator's compartment when the forklift is driven below the crossbar.

Narrow Aisles

Many rack storage systems are designed for the counterbalanced lift truck, which requires about a 12-foot aisle width. Narrow-aisle storage systems provide more storage space but require reach trucks and order pickers to operate in much narrower aisle widths and to lift loads to a greater height. The operator must take great care when operating in a narrow-aisle environment. Potential hazards include

- falling loads;
- reduced visibility; and
- horizontal intrusion injuries caused when a Class II stand-up forklift passes beneath a horizontal rack beam, crushing the operator.

Keep the wheels a safe distance (at least 12 inches) from the edge of a dock or elevated surface.

Docks, Dock Boards, and Bridge Plates

When operating on docks, dock boards, and bridge plates, maintain a safe distance (at least 12 inches) from the forklift's wheels to the edge of a dock or elevated surface. Use caution when steering and maneuvering in these small areas. The rear-end swing of rear-wheel-steered forklifts can propel you and the forklift off the dock.

Before you cross dock boards or bridge plates, be sure your forklift and its load do not exceed the rated capacity. The rated capacity should be marked on the device. Be sure such surfaces are of adequate width and are properly secured. Drive over these surfaces carefully.

Operator Killed when Crushed by Falling Forklift

At approximately 4:35 pm on August 8, 1996, Employee #1 was loading a tractor-trailer using a forklift. While he was backing out of the trailer, he backed off the loading dock. He was crushed between the forklift and the loading dock stairs and died of massive internal injuries.

~OSHA Accident Investigation Search #014317077

Trailers, Trucks, and Railroad Cars

Use chocks to ensure that trucks and trailers will not roll unexpectedly.

Take the following precautions when driving a forklift into a truck, trailer, or railroad car:

- Before entering a truck or trailer with your forklift, chock the trailer's rear wheels and ensure that the brakes of the trailer and tractor are set.
- Use wheel stops or other positive means to prevent railroad cars from moving during boarding operations.
- If the tractor has been detached, use trailer jacks under the front end of the trailer to prevent upending. For work in a trailer that has its rear wheels set forward, consider placing support jacks beneath the rear end of the trailer to help keep it from tipping.
- Inspect the flooring in trailers and railroad cars to be sure that it will support the forklift and load.
- Ensure that the height of the entry door is high enough for your vehicle, and remember to add the height of the loading platform.
- Drive straight across the bridge plates when entering or exiting the truck trailer or railroad car.
- Use dock lights and headlights when working in a dark trailer.
- Sound the horn when entering or exiting a truck, trailer, or railroad car.

Employee Killed When Forklift Falls off Trailer

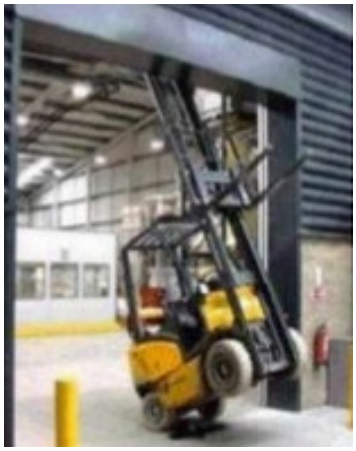
Employee #1 was using a forklift to remove three pallets of cardboard feeder lids from the back of a tractor-trailer rig. He had removed one pallet and was reentering the trailer when the forks of the lift struck a raised portion of the metal trailer floor. The lift truck bounced back, and as Employee #1 started forward a second time, the forks struck the floor again. This time the trailer moved forward, and the forklift fell on the bridge plate between the dock and the trailer, with the forks resting on the trailer and the rear of the forklift resting on the ground. Employee #1 was killed when he was crushed between the dock and the steering wheel.

~OSHA Accident Investigation Search #014341101

Railroad Tracks

When you are traveling across railroad tracks (or similar surfaces), cross diagonally whenever possible, one wheel at a time. This method reduces the jarring action on the forklift and minimizes the possibility of tipping over the load. If you must park near railroad tracks, park at least 8 feet from the center of the tracks.

Overhead Hazards



Be constantly aware of overhead hazards within reach of your forklift's parts, such as ventilation ducts, lights, electrical wiring, heaters, water lines, and sprinkler systems, as well as partially open overhead doors. To increase awareness of such obstacles, some facilities hang ribbons from overhead obstructions or paint poles at a height readily visible to forklift operators.

Warning: *Never use a forklift to open or close freight or overhead doors.*

Electric Shock—Contact with Overhead Line through Forklift

Some employees were using a rough-terrain forklift to move a tower scaffold. The scaffold contacted an overhead power line, and two employees who were walking alongside to steady the load received electrical shocks. One of them was electrocuted; the other was hospitalized with injuries.

~OSHA Accident Investigation Search #014320188

Elevators

Before entering an elevator on a forklift, ensure that the elevator's capacity will handle your forklift and your load. After the elevator car is properly leveled, approach slowly, on a straightforward line of approach. Once you have driven the forklift into the elevator,

- neutralize the forklift's controls,
- completely lower the load-engaging device,
- shut the power off, and
- set the brakes.

Electric-motor hand trucks must enter elevators or other confined areas with the load end forward. This method reduces the chance that the operator will be crushed between the hand truck and the elevator wall. NEVER place yourself between a load and a fixed object.

Note: *Freight must not be taken onto passenger elevators because the cable that raises and lowers the elevator cars is not reinforced to hold the extra weight.*

Forklift Designations and Hazardous Locations

1910.178 (c)

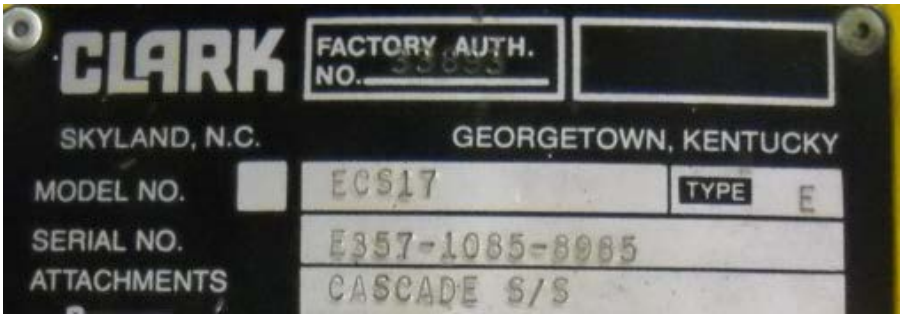
Hazardous Location Classification

The National Electrical Code (NEC) classifies hazardous locations where fire or explosion hazards may exist because of the presence of flammable or explosive substances. NEC hazardous locations are classified by type, condition, and group.

- **Type** identifies three classes of hazardous locations based on the type of fire or explosion hazard:
  - Class I contains flammable gases or vapors
  - Class II contains combustible dust
  - Class III contains easily ignited fibers or filings
- **Condition** addresses the two conditions under which these hazards may be present: normal and abnormal.
  - Division 1 (normal) - the hazard is expected to be present.
  - Division 2 (abnormal) - the hazard may occur from accidental rupture, breakage, or unusual faulty operation.
- **Groups** address the flammable characteristics of substances according to their properties, such as ignition temperature and explosion pressure.

Depending on the hazardous location classification, a forklift will need certain safeguards to safely operate in such an area. Newer forklifts have an assigned hazard designation, shown as “type” on the capacity plate. Forklifts authorized for use by types in groups of classes and divisions are presented in 29 CFR 1910.178. Forklift designations are shown on the next page.

On newer capacity plates, the forklift designation is shown next to the word “TYPE.” The “E” on the plate at right indicates an electric forklift.



Note: *Before operating a forklift in a hazardous location, contact your health and safety professional.*

Forklift Designations and Safeguards[a]	
Type	**Built-In Safeguards against Fire Hazards**
D (diesel forklift)	Minimum
DS	D + additional for fuel, exhaust, and electrical systems
DY	DS + all electrical equipment enclosed
E (electric forklift)	Minimum
ES	E + prevents sparks and limits surface temperatures
EE	ES + all electric motors and equipment completely enclosed
EX	Can be used in flammable vapor or dust atmospheres
G (gasoline forklift)	Minimum
GS	G + additional for fuel, exhaust, and electrical systems
LP (liquid petroleum)	Minimum
LPS	LP + additional for fuel, exhaust, and electrical systems

[a] See OSHA 1910.178 for more complete information.

Refueling Safe Practices

1910.178 (f)

When refueling or recharging any forklift, regardless of fuel type, observe the following standard safety precautions:

- Ensure you have documented training by an FPI on the type(s) of fueling or charging you will perform.
- Do not smoke or allow any open flames or spark-/arc-generating equipment in the refueling/charging area.
- Ensure that the area is well ventilated.
- Park in areas designated for the purpose.
- Set the parking brake.
- Wear personal protective equipment.
- Ensure that all required emergency equipment, such as fire extinguishers, eyewashes, safety showers, and spill kits, are in place.
- Ensure that a barrier exists to protect the pump or charger against vehicle damage.

Refueling Liquid Petroleum Gas (LPG) Forklifts

If your forklift is powered by LPG, you may be expected to change out LPG tanks on your forklift. If so, an FPI will train you in the specific steps. In general, change out an LPG cylinder as follows:

- Don eye protection and gloves.
- Close the valve on the tank.
- Run the engine until it stops, and shut off the engine.
- Open the connecting nut, and inspect valves for leaking. DO NOT use metal tools.
- Disconnect the hose and the holding straps, and remove the empty tank.
- Replace the empty tank with a full tank in the proper position (see below).

  Note: *A tank that is not properly aligned could prevent the pressure relief valve from operating as designed.*
- Connect the holding straps.
- Tighten the connecting nut.
- Slowly open the valve on the tank, and check for leaks. If the valve leaks, tighten the nut, then try to open the valve again, and check for leaks once more. If the valve continues to leak, change the tank. If you still find a leak, have the hose changed or repaired.
- Secure the tank.

Use your senses when checking for leaks: look, listen, and smell. You can also use a solution of soap and water.

Forklift propane tank alignment with new series tanks. Photo at left shows the correct alignment of tank on pin; photo at right shows incorrect alignment.

Refueling Gasoline or Diesel Forklifts

- Turn the engine and electrical systems (lights) OFF.
- Ensure contact between spout and fill pipe before pumping.
- Clean up any spilled fuel before restarting the engine.

Charging Batteries

29 CFR 1910.178 (g)

Electrically powered forklifts must be periodically recharged in a designated recharging area. Electrical, flammable, and corrosive hazards are associated with charging forklift batteries. Before recharging a forklift battery, ensure the following:

- materials, such as spill kits for flushing and neutralizing spilled electrolyte (acid), are in place;
- eyewashes and/or safety showers are available if the eyes or body of any person may be exposed to corrosive materials;
- fire protection, such as fire alarms, sprinklers, and/or fire extinguishers, is in place, and;
- ventilation for gases released during recharging is in place.

During the recharging process, batteries give off hydrogen gas, which is highly flammable!

If you are trained and authorized to recharge forklift batteries, turn off the motor, apply the parking brake, turn off all forklift lights, and follow the manufacturer's instructions. While recharging batteries,

- keep the battery compartment lid open because recharging batteries produces heat;
- keep tools and other metal objects (such as rings and watches) away from the tops of uncovered batteries so that electrical arcing does not ignite any hydrogen that may be present;
- take precautions to prevent open flames and spark, *and NEVER smoke in the charging area*; and
- wear all prescribed safety equipment (face shield, rubber gloves, rubber apron, etc.).

Charging a forklift battery requires training and authorization and must be performed in a designated area with controls.

Potentially Hazardous Environmental Conditions

29 CFR 1910.178 (i)

Forklifts powered by the internal combustion of gasoline, natural gas, or propane will emit carbon monoxide (CO). CO is a colorless, odorless, tasteless gas that is often called “the silent killer” because it gives no clear warning to its victims. Dangerous levels of CO may build up, especially in enclosed areas.

Symptoms of CO exposure include headache, faintness, dizziness, confusion, nausea, weakness, rapid breathing, and irregular heartbeat. A worker who is not aware of the hazards of CO exposure might ignore these early symptoms or consider that he/she is being afflicted by a minor illness. Continuing exposure can cause confusion, loss of consciousness, and even death. Exposure to high concentrations may be rapidly fatal without producing significant warning symptoms. Workers who have been exposed to CO need immediate medical attention.

Diesel powered forklifts can emit nitrogen oxides (NO_x). Exposure to low levels of NO_x can irritate the eyes, nose, throat, and lungs. Exposure to high levels of NO_x or long-term exposure may damage lung tissue and reduce lung function.

To reduce the possibility of exposure, consider the following controls:

Poorly maintained equipment usually emits more CO than well-maintained equipment. A poorly tuned gas engine may give off up to 12 times as much CO as a well-tuned one.

- use electric forklifts for indoor work;
- regularly maintain forklifts to reduce emissions;
- remove forklifts suspected of emitting high levels of CO or NOx from operation;
- do not allow forklifts to idle indoors while waiting to resume operations;
- for rental forklifts, ask the vendor how much CO is emitted; and
- ventilate enclosed work areas.

If you are concerned about the exposure level in an enclosed area where a forklift operates, contact a qualified industrial hygienist to take measurements and make recommendations to address the concern.

In November 1994, three employees at a food processing plant were rushed to the hospital complaining of splitting headaches, blurred vision, and dizziness. An investigation by the department revealed that the employees had been working in a freezer for 1 hour using a propane forklift to arrange pallets. The forklift produced levels of CO greater than the allowable exposure limit, causing CO poisoning among the workers.

-Washington State Dept. of Labor and Industries, December 1996

Review of 2016 LANSCE Vehicle/Forklift Accident

At 0925 on May 18, 2016, the driver of a government vehicle struck a stationary 15-ton Taylor forklift with its tines raised; the tines penetrated the windshield on the driver's side of the vehicle in the parking lot of Technical Area 53, Building 315. Upon impact, one of the forklift tines rested on the dashboard of the government vehicle. The driver and two passengers were in the government vehicle at the time and sustained no injuries. The driver subsequently stated that he took a wide turn into the parking lot to avoid striking pedestrians standing nearby and to avoid a flatbed truck parked in the immediate area. An oversized tank located along the roadway into the parking lot obstructed the driver's view of the stationary forklift. The forklift operator realized that he should have lowered the forklift tines before he exited the cab.

What's important to know?

The following existing conditions were contributing factors to the incident:

- A large tank and office trailer impaired the view of oncoming traffic and pedestrians.
- Employees felt stressed.
- The visitors were not aware of forklift activities in the area, and the forklift operators were not aware of the planned tour; therefore, neither was expecting the other in the area.
- The rainy overcast day contributed to the poor visibility and the inability to see the forklift tines.

What failed?

- Employees were performing work in a parking lot.
- Multiple tasks were occurring in the parking lot: vehicle traffic and an unloading operation.
- A mirror for blind spots had been purchased, but funding was not available to install it correctly.

- No signs, cones, or people were used to convey to oncoming traffic that forklift operations were in progress or to direct traffic away from the forklift operations.
- The forklift operator did not lower the tines of the forklift before exiting the forklift because he thought the short amount of time the tines would be up while he had a brief conversation would not expose others to any risks.

What was surprising?

- How invisible the tines were in the weather.
- How much the presence of pedestrians draws your attention away from the roadway.
- How easy it is to make an in-the-moment assessment that a risk is negligible (the tines could stay up for a very short period because no one would happen to drive by at that instant) but have the risk turn out to be very real.
- How everyone missed the warning at this point and continued with their business.

Error Precursors

Task Demands

- Time Pressure – The company personnel delivering the shielding blocks called the day before the delivery and said they were sending a new driver, which required submitting paperwork and getting the appropriate approvals before the driver arrived the next day.
- Time Pressure – The delivery driver arrived earlier than anticipated.
- Simultaneous/Multiple Tasks – The tour group was unaware of the shielding block delivery activity in the parking lot and vice versa.
- LANL employees helping with the block removal and subsequent placement were concerned about the hourly rate for the truck driver and the cost to their project.

Work Environment

- Workarounds – The shielding block delivery was occurring in a parking lot because one of the two storage areas is located at the edge of that parking lot, and the other is just outside of the roll-up door. The storage area was there because it was the only nearby space available. Therefore, workers were performing their duties in a parking lot with vehicular traffic.

Individual Capabilities

- Inexperience – The staff has forklift training but were not traffic safety SMEs.
- Imprecise Communication Habits – The visitors were not aware of forklift activities in the area, and the forklift operators were not aware of the planned tour, so neither was expecting the other in the area.

Human Nature

- Stress – One of the LANL employees was escorting higher-level staff from an outside organization for a higher-level LANL manager.
- Stress – The forklift operator did not lower the tines on the forklift.
- Habit Patterns – Personnel did not put out traffic cones for the forklift activity because they did not properly recognize the hazards that the traffic path, signage, and blind spots create around the tank while performing their work in this area of the parking lot.
- Mental Shortcuts – The forklift operator did not lower the tines on the forklift because it would “just take a minute” to talk with his colleague, who was helping remove the blocks.

Forklift Rollover at LANL - Activity

In November 1995, a LANL worker (who was not trained in forklift operation) obtained a battery-powered forklift to retrieve several gas cylinders. He inserted the forklift tines into the tine slots of a gas cylinder rack and drove the loaded forklift out of the building.

Using a rocking motion, he maneuvered the forklift up over a 4-inch lip at the edge of a sidewalk. The forklift left skid marks and scratches on the sidewalk's surface. Obstructions narrowed the right edge of the sidewalk to a width of about 5 feet. The left edge of the sidewalk dropped sharply into a steeply sloped, 3 foot-deep grassy ditch.

After successfully reaching the sidewalk, the worker drove the forklift slowly forward. As he was watching the left front wheel, which was near the left edge of the sidewalk, he turned the steering wheel to the right. However, the unfamiliar vehicle had rear-wheel steering, and its left rear wheel passed over the edge.

The forklift slid off the sidewalk and toppled onto its left side, settling on the grassy slope of the ditch running along the sidewalk. The operator was pinned beneath the overhead guard, which lay wedged across his neck just below his jaw; his left foot was pinned beneath the forklift's body. His foot was crushed, two of his vertebrae were broken, and his jawbone was cracked.

First responders propped the forklift off his neck so he would not suffocate. Emergency personnel freed the operator from beneath the forklift and transported him to the hospital. He has since recovered from his injuries.

Question - What factor(s) may have contributed to this accident?

Student Self-Assessment

Choose the best answer. Answers are found on page 76.

1. Right of way is granted to
   a. larger forklifts
   b. senior operators
   c. propane-powered forklifts
   d. pedestrians

2. Traffic regulations
   a. must be observed at all times
   b. are not relevant to forklift operation
   c. apply only in public areas
   d. can be ignored at speeds under 10 mph

3. When negotiating a ramp or incline,
   a. always travel with the load up the grade (upgrade)
   b. always travel with the load down the grade (downgrade)
   c. travel diagonally across the slope to reduce strain on the machine
   d. have a coworker to ride along with you to help watch for obstacles

4. After driving a forklift on an elevator,
   a. leave the motor running in case of emergency
   b. maneuver in diagonally to help spread the load over the floor of the elevator
   c. neutralize the controls, set the brakes, lower the load, and shut off the power
   d. turn it around to facilitate exiting

Answers to Activities

Module 1 Self-Assessment (p. 14)

1. d
2. d
3. true
4. true

Module 2 Forklift Inspection Video Activity (p. 26)

Data plate, mast, overhead guard, tilt cylinder, wheel nuts, leaks, fluid levels, tires, parking brake, brakes, steering, horn, clutch, hours meter

Forks and hydraulic hoses

Module 2 Self-Assessment (p. 27)

1. b
2. b
3. d
4. b
5. d
6. b
7. b

Module 4 Forklift Operation Video Activity (p. 32)

1. training, driver certification	11. tilt	21. upgrade
2. balance	12. single fork	22. downgrade
3. seesaw	13. partially loaded	23. turn
4. drive axle	14. inside operator's compartment	24. dock
5. center of gravity	15. wall	25. breaks, weakness
6. three	16. loose objects	26. block the wheels
7. combined center of gravity	17. stop, sound the horn	27. jacks
8. name plate	18. necessary	28. safety platform
9. inspect	19. three	
10. stability	20. reverse	

Module 4 Hyster Capacity Plate Activity (p. 43)

1. Three choices are correct:
   a. 25,700 pounds if the CG of the load is within 24 inches of the face of the forks, the CG of the load is within 24 inches of the top of the forks, and the forks are lifted no more than 244 inches off the ground.
   b. 21,700 pounds if the CG of the load is within 36 inches of the face of the forks, the CG of the load is within 36 inches of the top of the forks, and the forks are lifted no more than 244 inches off the ground.
   c. 18,600 pounds if the CG of the load is within 48 inches of the face of the forks, the CG of the load is within 48 inches of the top of the forks, and the forks are lifted no more than 244 inches off the ground.
2. Yes
3. No. 15,000 ÷ 21,700 = 69% of capacity
4. No. Maximum load is 25,700 pounds.
5. Yes
6. Yes. 15,000 ÷ 18,600 ≈ 81%, which exceeds 75% of rated capacity critical lift criteria.

Module 4 Self-Assessment (p. 57)

1. b
2. b
3. d
4. b
5. a
6. b
7. d
8. a
9. a

Module 5 Forklift Rollover (p. 73)

The operator was not trained; the forklift was not locked; the load was unbalanced; and the operator drove on a sidewalk.

The operator made a sharp right-hand turn while the forklift's left-side wheels were next to a sharp drop off. Being untrained and inexperienced, the operator was unaware of forklift rear-end swing.

Module 5 Self-Assessment (p. 74)

1. d
2. a
3. a
4. c

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American National Standards Institute (ANSI), *Safety Standard for Low Lift and High Lift Trucks* (ANSI/ITSDF B56.1-2005). Washington, DC, ANSI 2005. [Online] Available at http://www.itsdf.org/.

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National Fire Protection Association (NFPA), *NFPA 70, National Electric Code.*

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Occupational Health and Safety Administration (OSHA), Department of Labor, 29 Code of Federal Regulations (CFR) 1910.178, *Powered Industrial Trucks*, (US Government Printing Office, Washington, DC 1998). [Online] Available at http://www.osha.gov/.

Powered Industrial Trucks. Notice 70:57146 (September 30, 2005). Describes corrections to 29 CFR 1910.178.

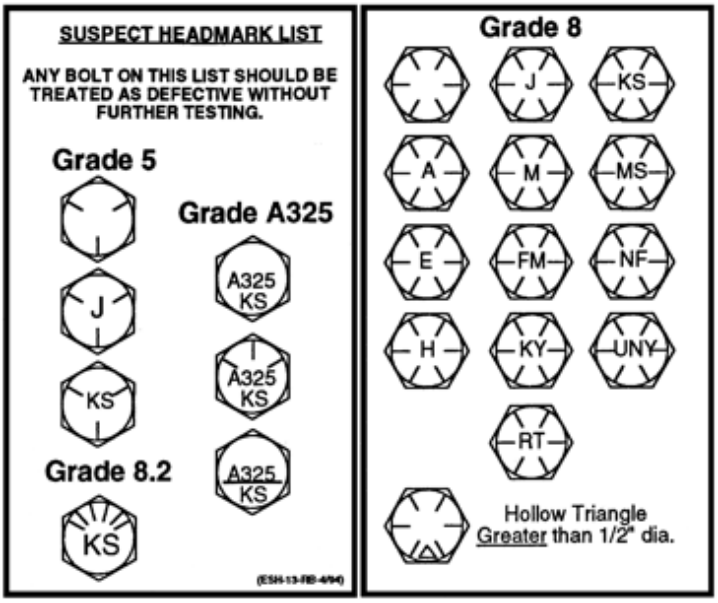
Notes. . .

Appendix A: Counterfeit Bolts

Suspect Counterfeit Bolts Found on Several Forklifts

In September 2008, a Fermilab quality assurance supervisor identified a suspect/counterfeit item (S/CI) bolt on a 1960–70 vintage forklift truck. The supervisor had taken an S/CI course. In December 2008, an S/CI bolt inspection of all forklifts found that 37 out of 126 forklifts had a total of 139 S/CI bolts. These forklifts were removed from service until the S/CI bolts in load-bearing positions could be replaced. Most of the S/CI bolts on 1950s through 1999 model forklifts appeared to be original equipment. The number of suspect bolts per forklift varied between 1 and 10 on average. The bolts were found in various locations, from load-bearing mechanisms, such as the mast, to incidental locations, such as light fixtures on the forklift. None of the post-2000 model forklifts were found to have any S/CI bolts.

~paraphrased from Occurrence Report Number: SC—FSO-FNAL-FERMILAB-2008-0005



Taking the Quiz

To receive credit for this self-study, you must complete the associated quiz in UTrain. You can access the quiz in either of two ways.

CRYPTOCard

If you have a CRYPTOCard that is assigned to you with administrative authorities to LANL's Integrated Computing Network (ICN):

1. Click on the link below to return to UTrain.
2. Click on the "Return to Content Structure" button.
3. Click on the "Quiz" link to begin the quiz.

To return to UTrain, click on the following link:

http://int.lanl.gov/training/tools/wrapper/submit.html

No CRYPTOCard

If you *do not* have a CRYPTOCard or if you have a CRYPTOCard *without* administrative authorities to LANL's ICN, you will need to locate a worker with UTrain proxy authority to grant you access to the quiz.

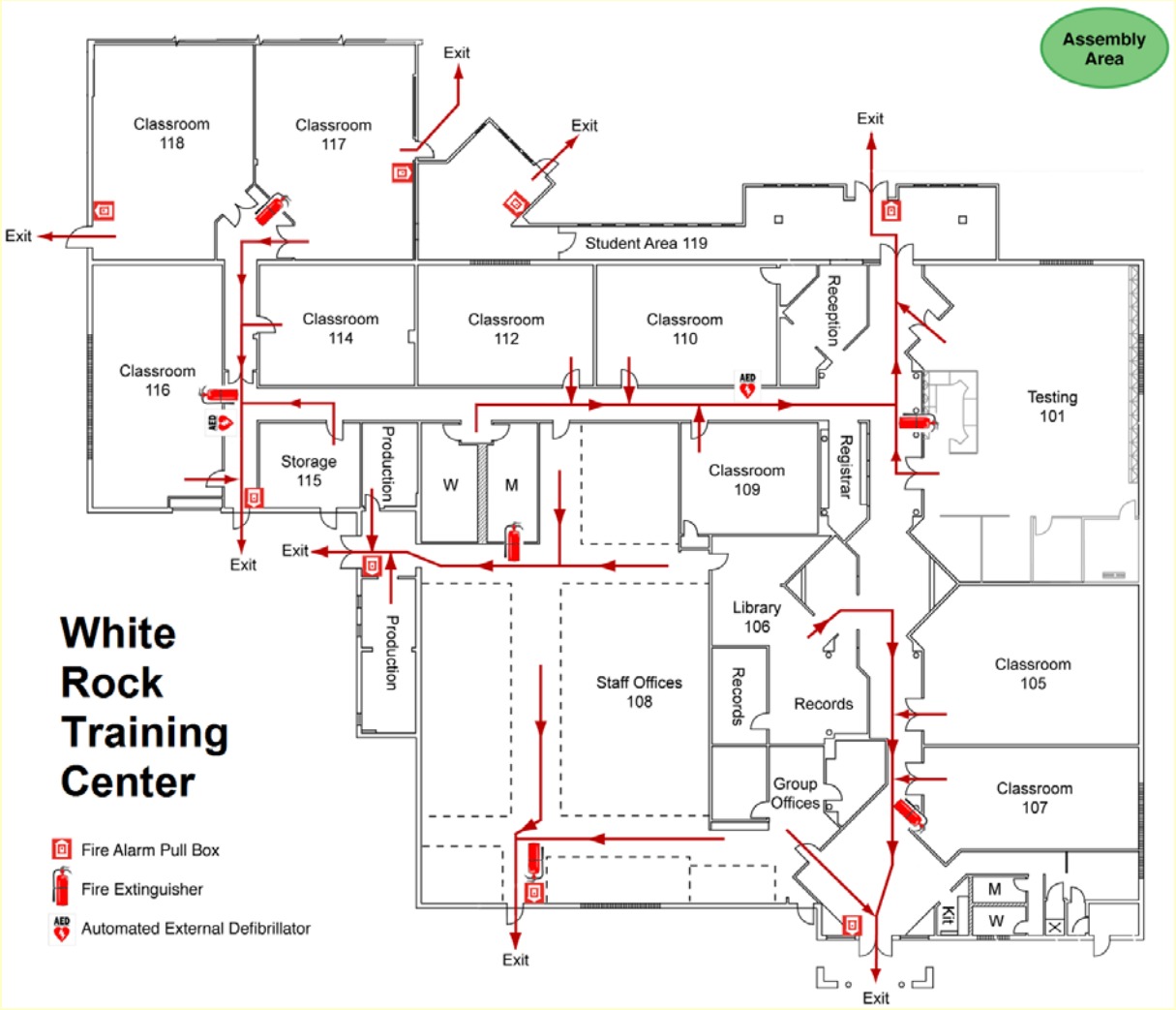
Call or email your training administrator for assistance. The following link should help you find your training administrator.

http://int.lanl.gov/services/training/admin-proctor-proxy.shtml

Forklift Safety Fundamentals

Course #20299 January 2017

Emergency Evacuation

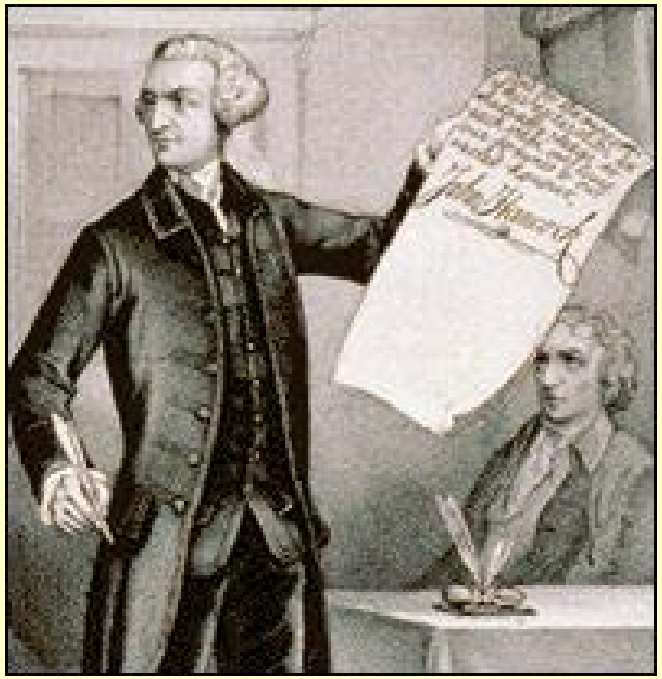


Go to the assembly area when you exit for an emergency.

- **DO NOT LEAVE AREA**
- **NO FOOD OR DRINK**
- **NO SMOKING**
- **MINIMIZE TALKING**

Administrivia

Sign the roster in ink if you want credit



Set your cell phone on stun

Course Objectives

Recognize forklift

- classes and attachments
- components
- inspection requirements
- fundamentals for safe operation

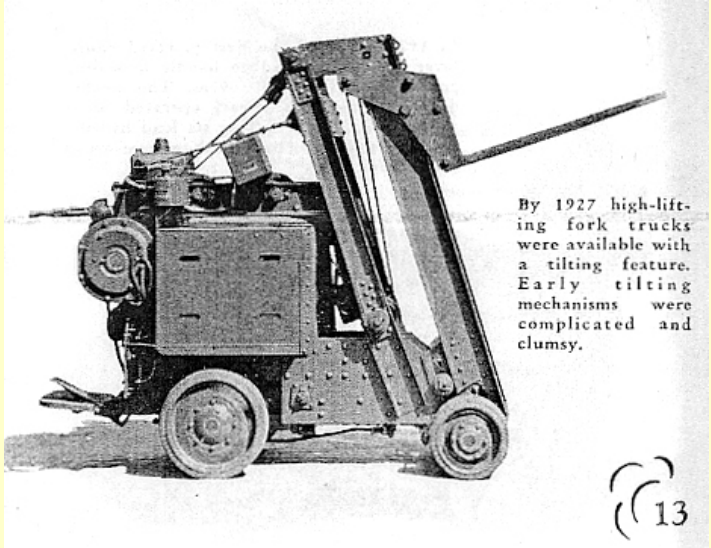
Recognize

- workplace factors that affect safe operation

Course Limitations

This course DOES NOT

- address all hazards
- provide equipment-specific training
- replace site-specific training



LANL Forklift Operator Requirements

This class (#20299)

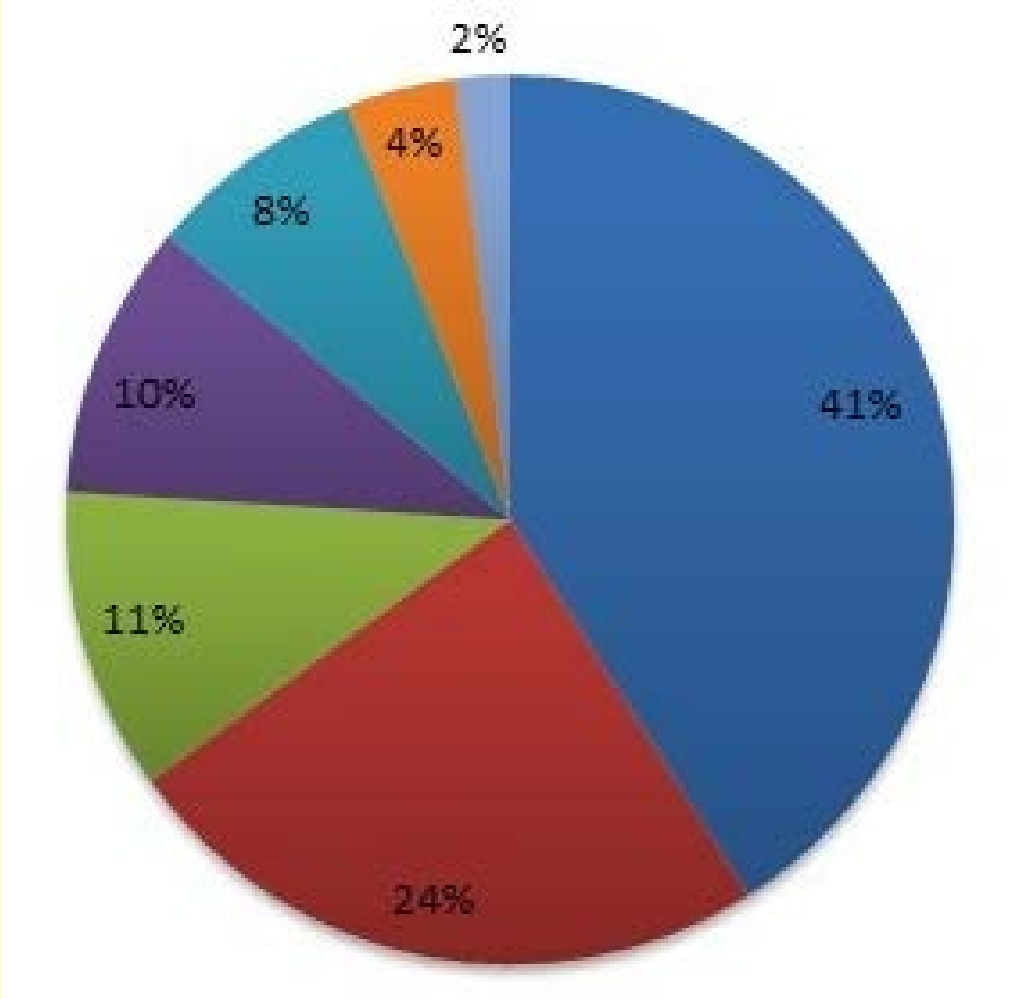
Exam (#20300)

Practical training (Form 2040)

Demonstrate proficiency (Form 1791)

Authorization (Form 1567)

Why Are We Here?



Types of forklift injuries

Module 1 Objectives

Recognize

- Forklift classes and attachments

Class I	**Electric-Motor Rider Trucks**
Class II	**Electric-Motor, Narrow-Aisle Trucks**
Class III	**Electric-Motor Hand Trucks**
Class IV	**Internal-Comb. Engine Trucks (solid tire)**
Class V	**Internal-Comb. Engine Trucks (pneumatic tire)**
Class VI	**Industrial Tractor Trucks**
Class VII	**Rough-Terrain Trucks**

Class 1 Electric-Motor Rider Trucks

Class 2 Electric-Motor, Narrow-Aisle Trucks

Class 3 Electric-Motor Hand Trucks

Class 4 Int.-Comb. Engine Trucks (solid tire)

Class 5 Int.-Comb. Engine Trucks (pneumatic tire)

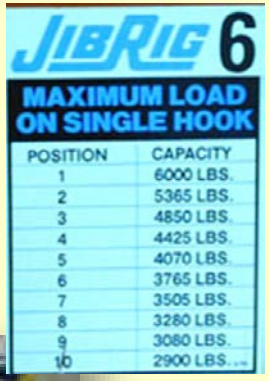
Class 6 Industrial Tractor Trucks

Class 7 Rough-Terrain Trucks

Manual Pallet Jacks and Others

PIT? If so, what class?

Attachments



Other Modifications

Module 2 – Forklift Components and Inspections

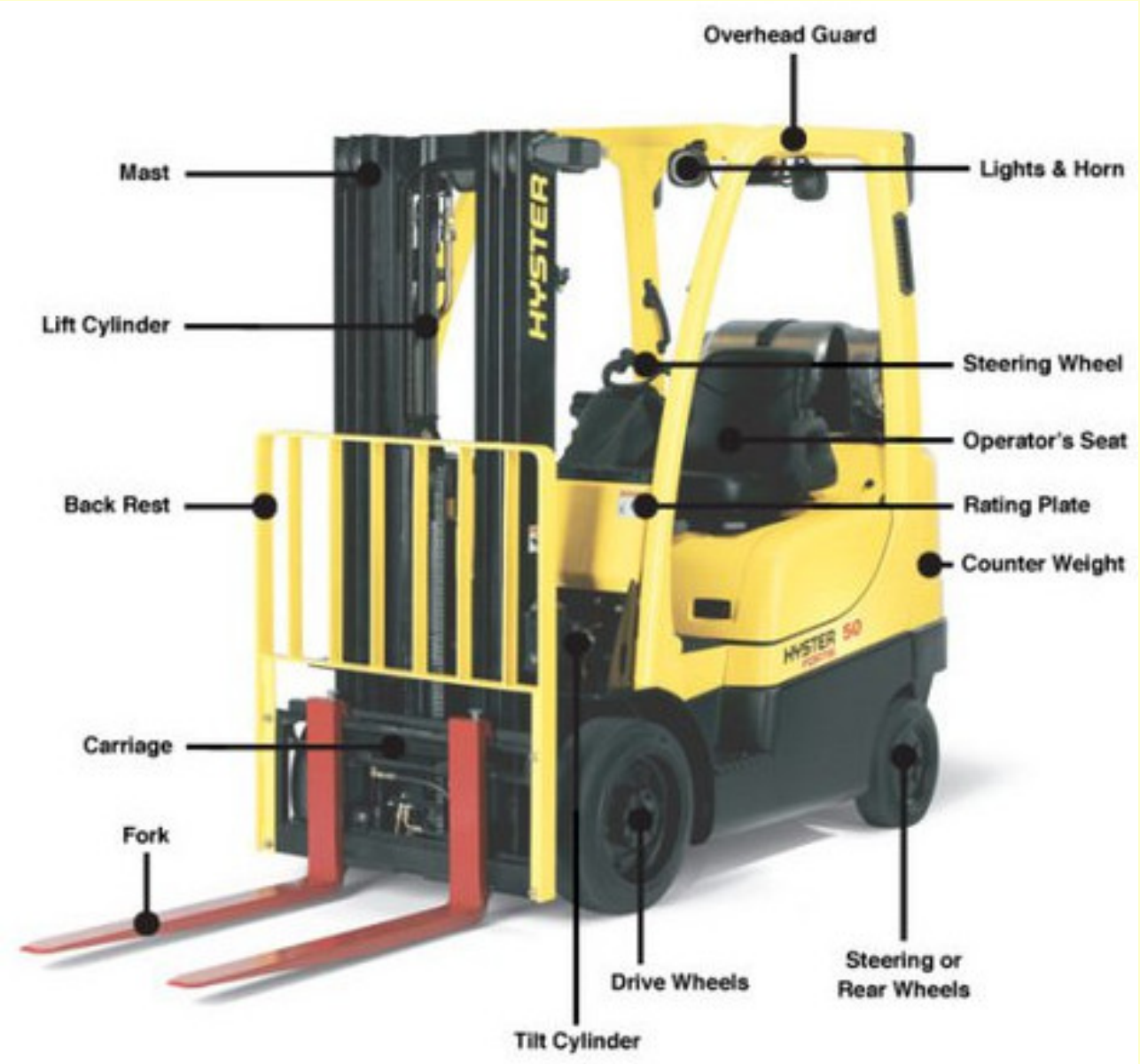
Recognize forklift

- components
- inspection and maintenance requirements

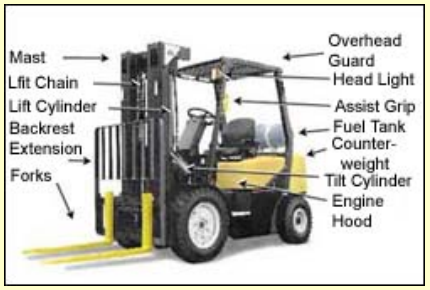
Forklift Inspection Video

Los Alamos

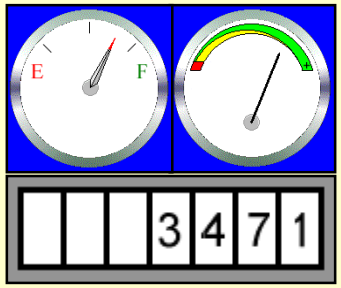
Forklift Components



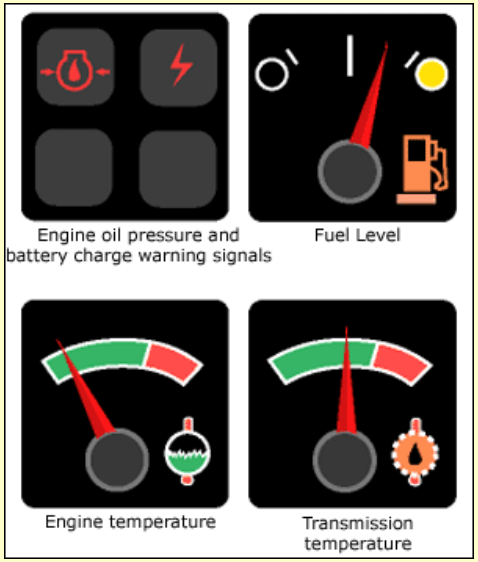
Forklift Components

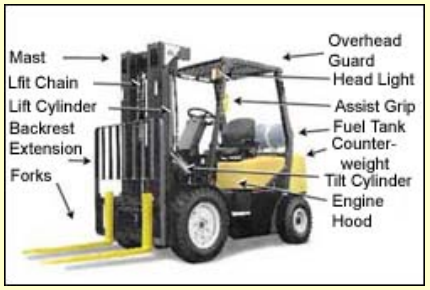


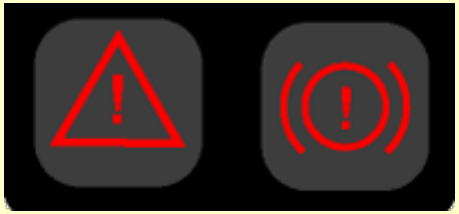
Forklift Components



Engine hours







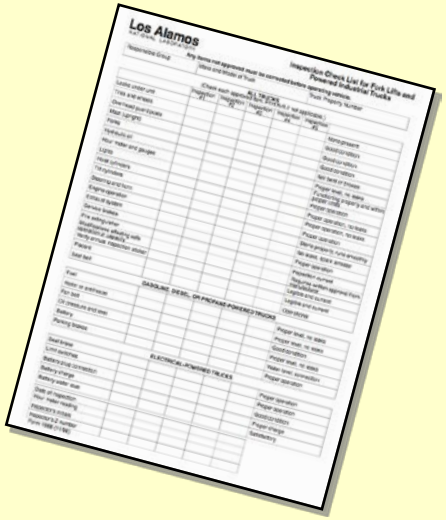
Forklift vs Car

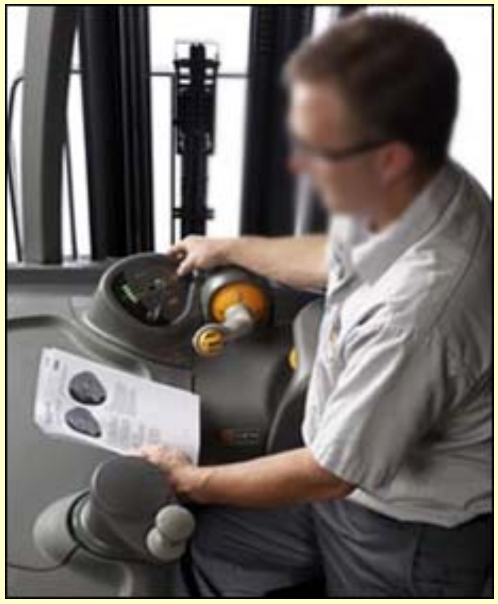
≠

Forklift Inspections

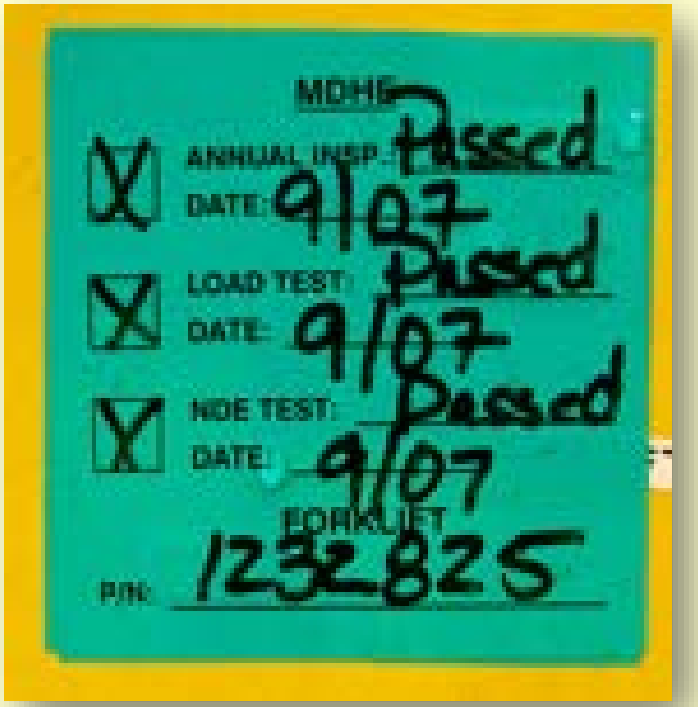
Form 1568 – PIT Inspection Checklist

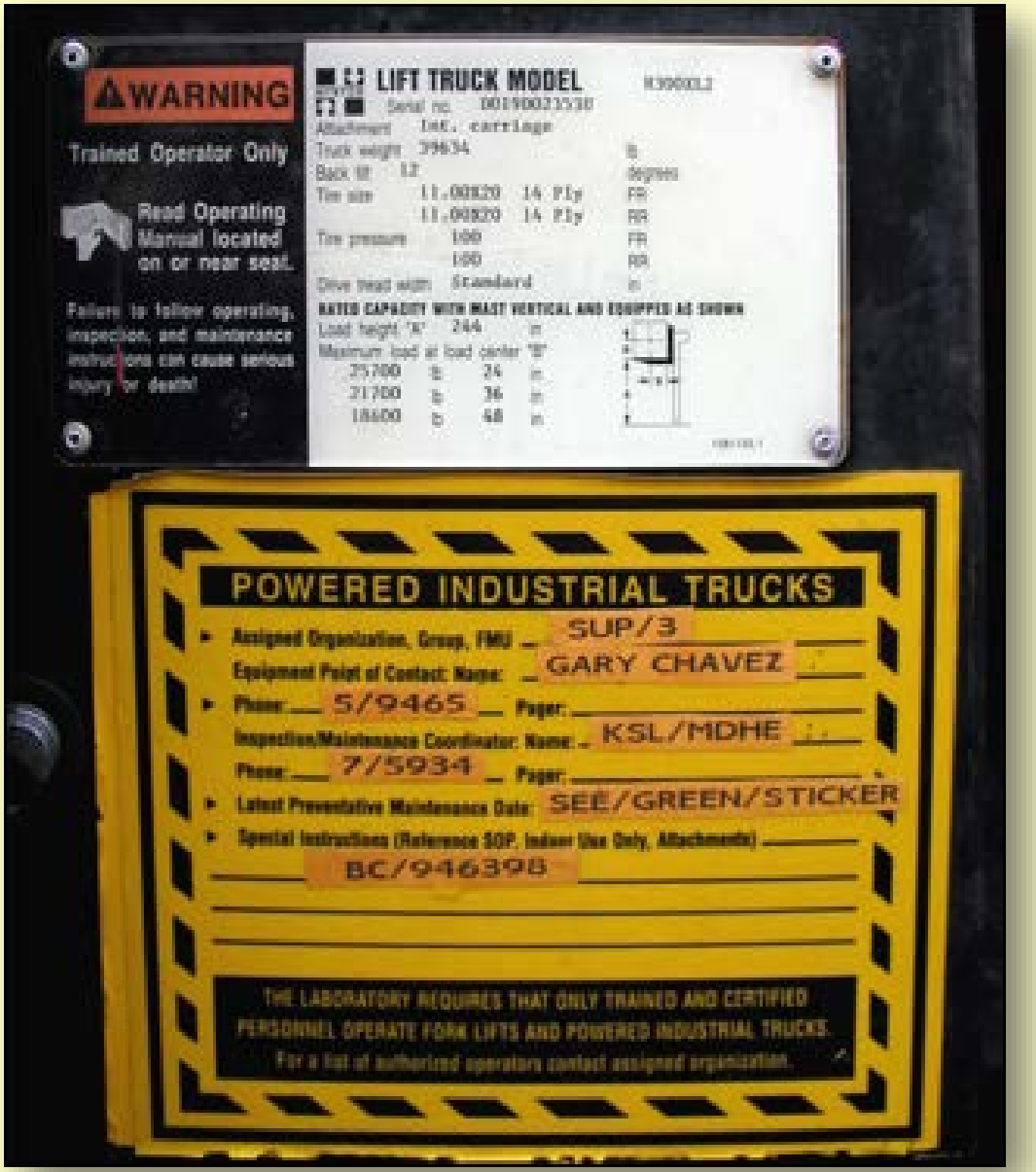
Form 1569 – PIT Defective Equipment





Forklift Placarding





Module 3 – Regulations & Responsibilities

Recognize

- Regulations (29 CFR 1910.178)
- Requirements (P101-4)
- Roles
- Responsibilities

R^4

Forklift Operation Video

Los Alamos

Module 4 – Forklift Fundamentals

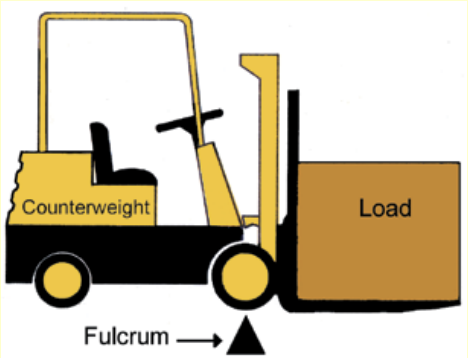
Recognize factors that affect

- the stability and capacity of the forklift
- safely lifting and moving the load

Forklift Stability

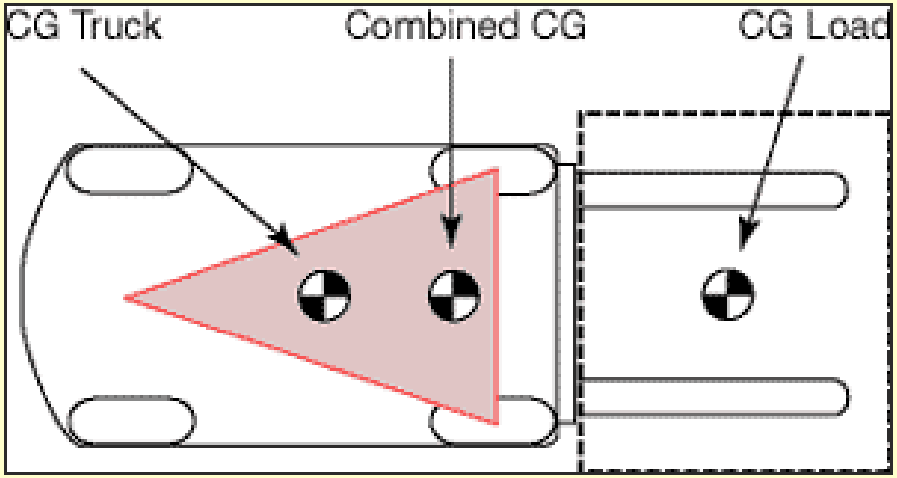
= symbol for center of gravity

Fulcrum



Center of Gravity (CG)

Combined Center of Gravity (CCG)

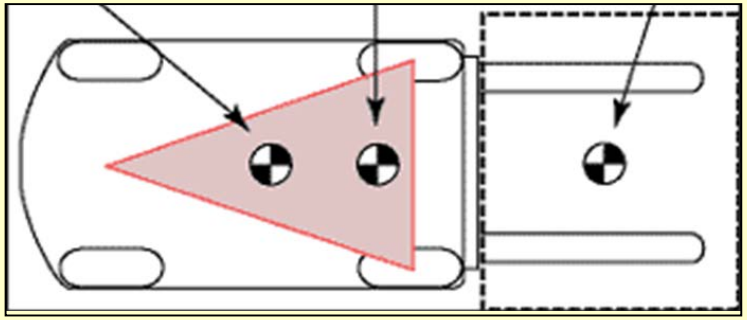



lawebbcam.net

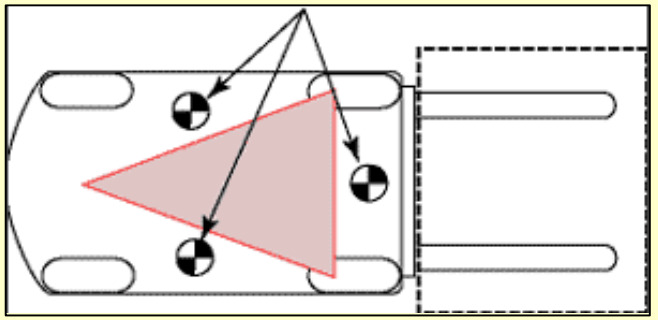
Forklift Stability

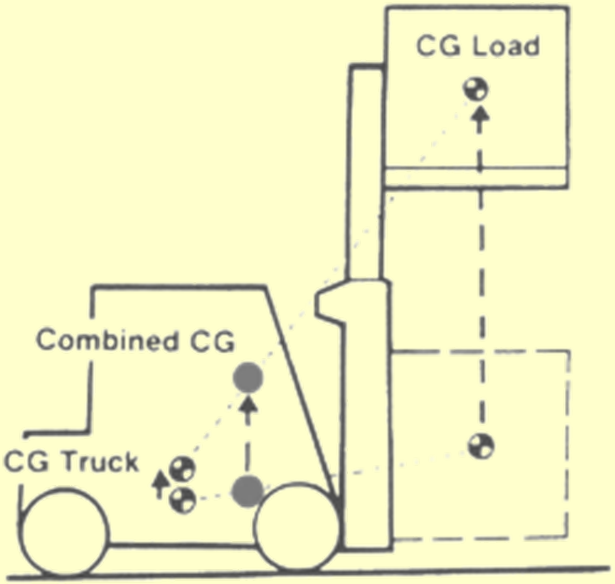
Stability triangle

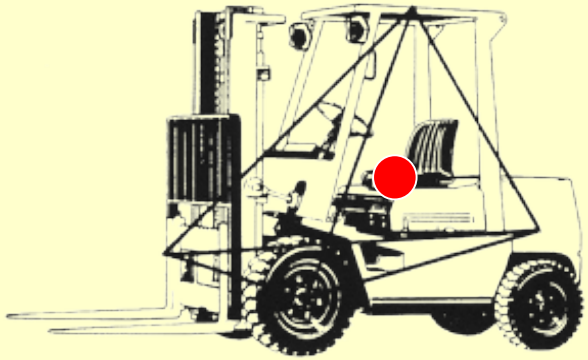
Truck is steady

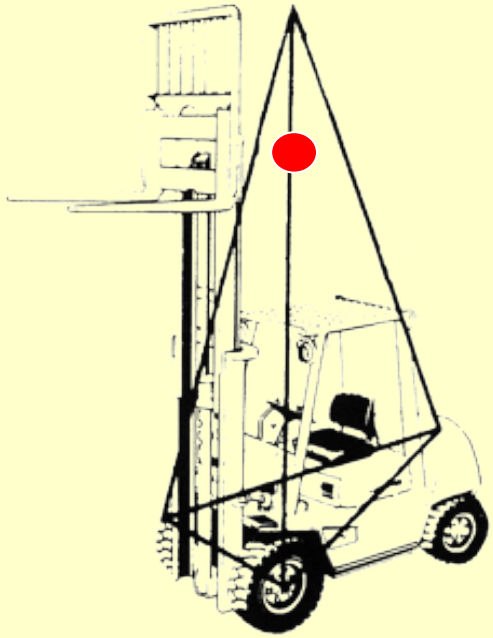


Truck will tip over





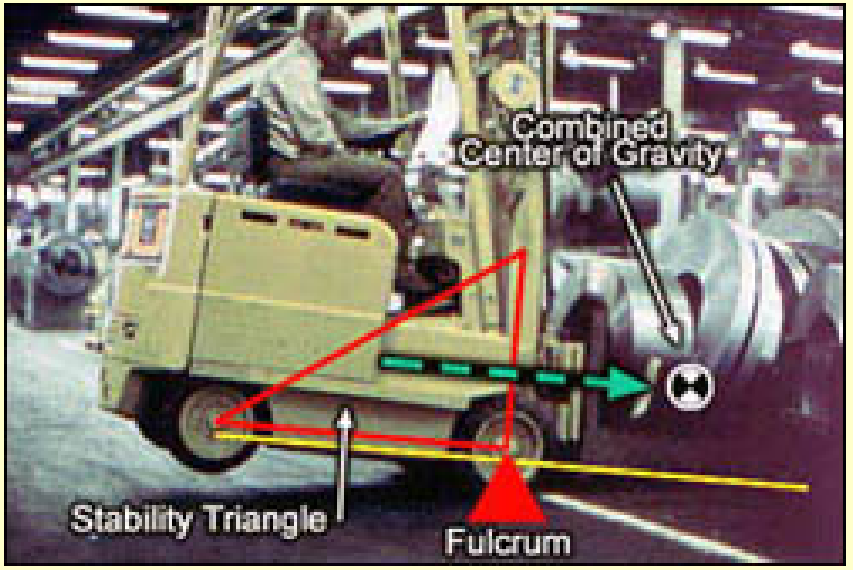




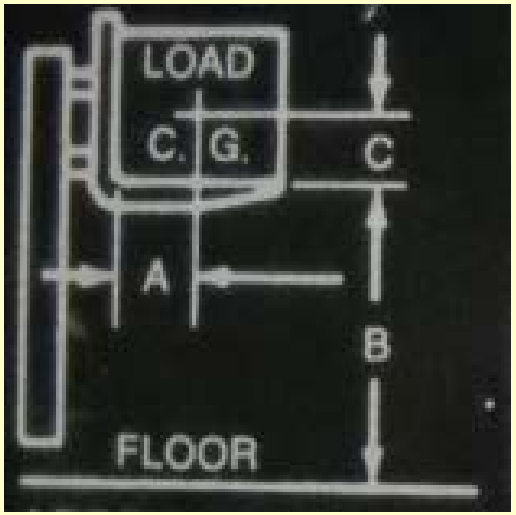
Forklift Capacity

Load Center

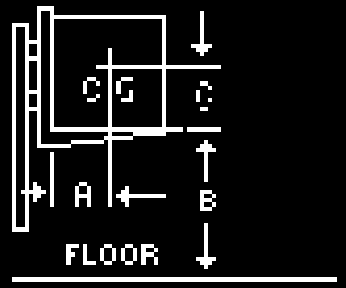
Rated Capacity



Capacity Plate



MODEL NO.
SERIAL NO.
ATTACHMENTS



APPROX. WT.
ALL TRUCKS
APPROX. WT.
ELECTRICS ONLY
BATTERY WT.
BATTERY
CAPACITY

	TYPE	

CAPACITY WITH ATTACHED LISTED ABOVE OR WITH FORKS - UPRIGHTS VERTICLE

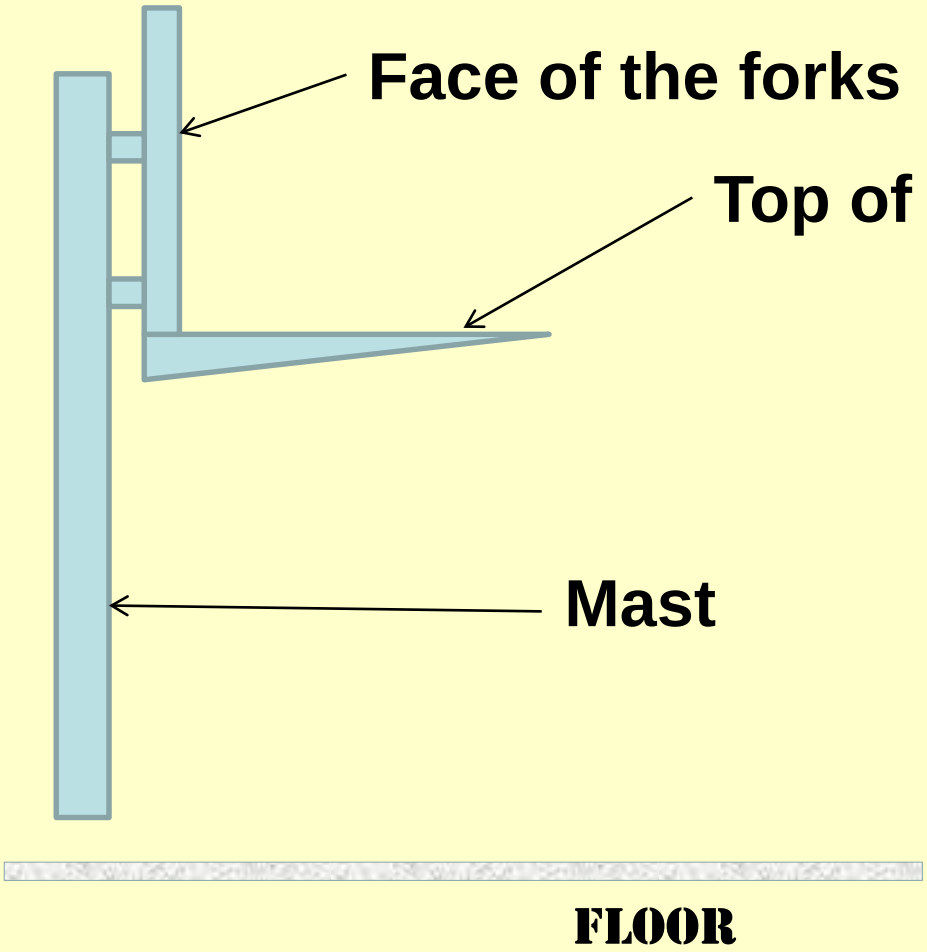
LBS	A	B	C
3200	24	188	24

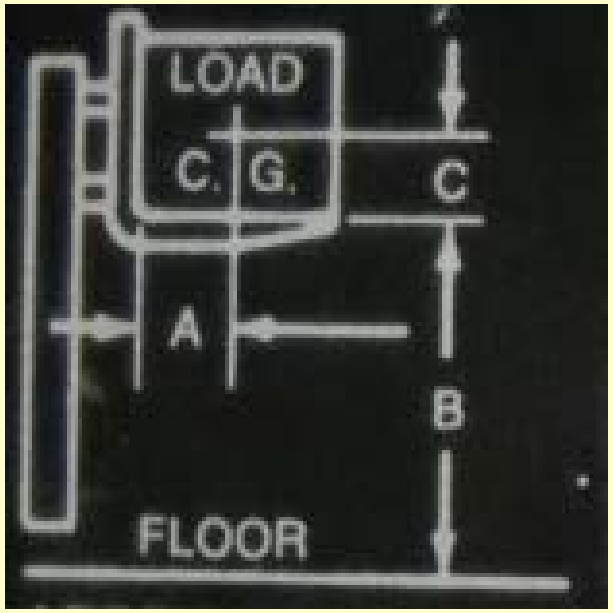
LESS BATT ELECTRICS	5800
WITH MAX. BATT WT.	8900

MAX	3072	MIN	2250
AH		NO	
LBS		VOLT	36

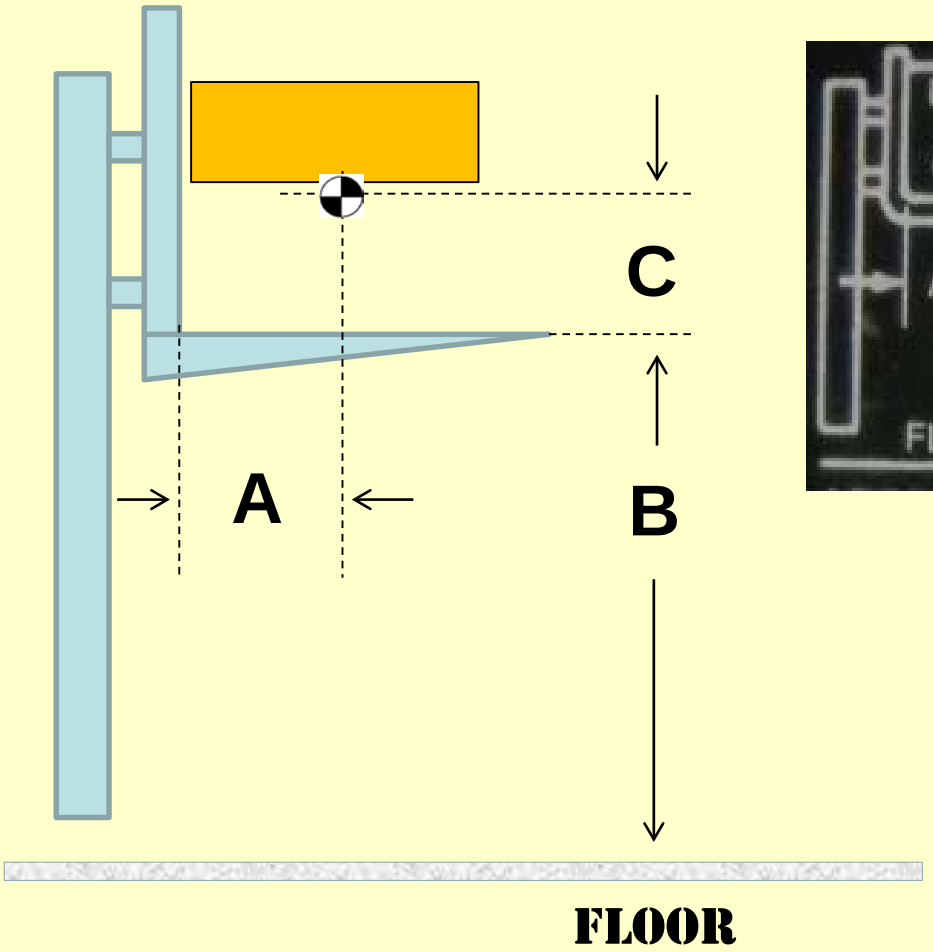
FOR OTHER CAPACITIES - CONSULT MANUFACTURER
AS RELEASED FROM FACTORY THIS TRUCK MEETS THE
DESIGN SPECIFICATIONS ESTABLISHED IN AMERICA
NATIONAL STANDARD FOR POWERED INDUSTRIAL TRUCKS.
PART II, ANSI B 56.1-1969 PART NO. 2315709

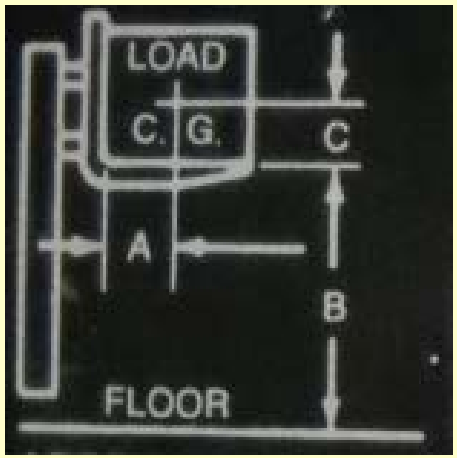
Capacity Plate

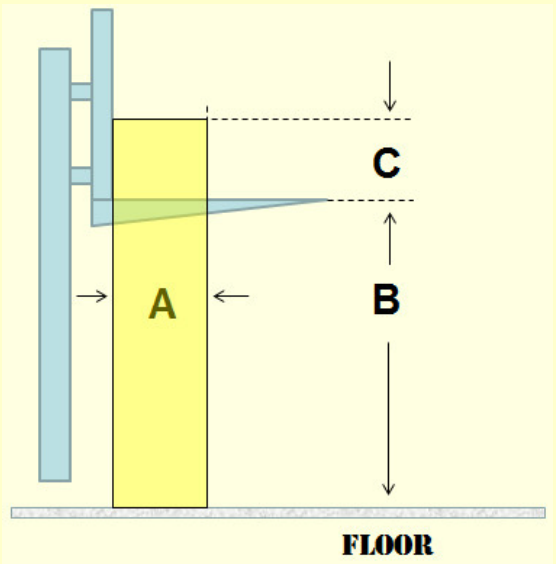




Capacity Plate





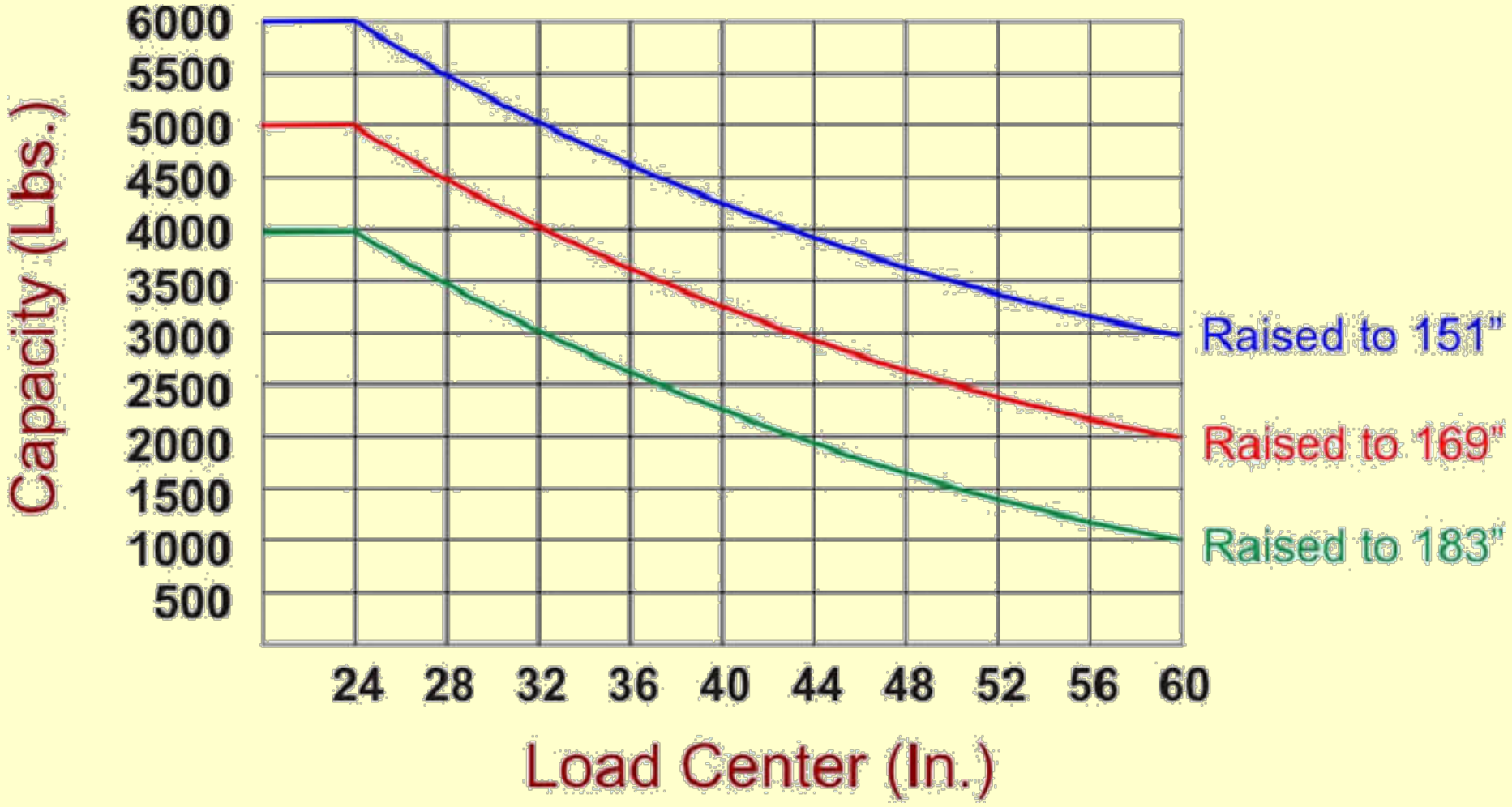


A = distance from face of forks to load center

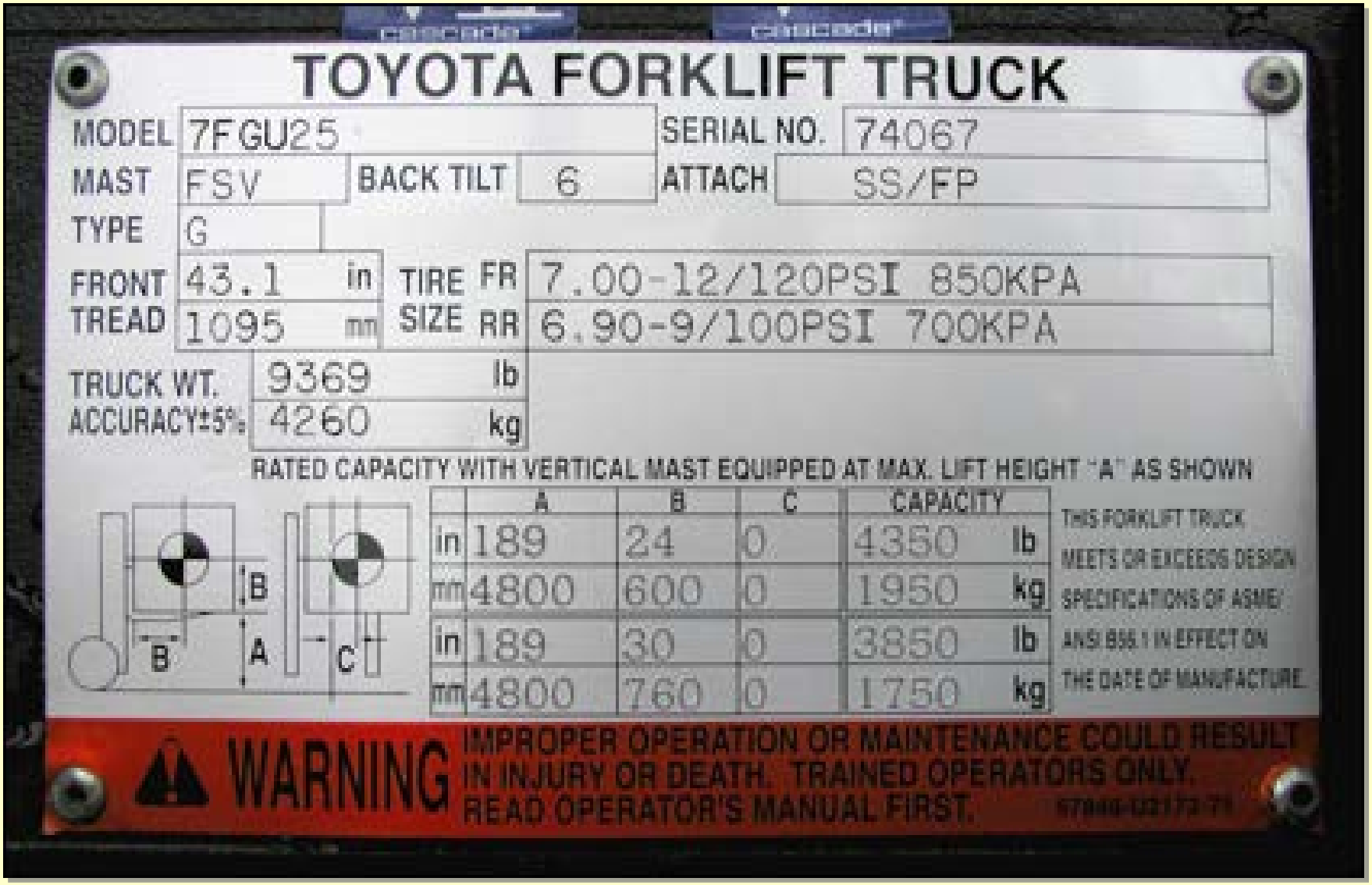
B = distance from floor to highest fork position

C = distance from top of forks to the load CG (vertical)

Capacity Plate

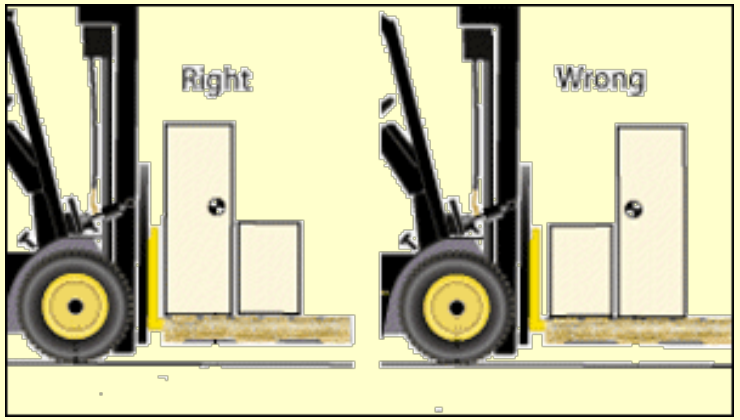


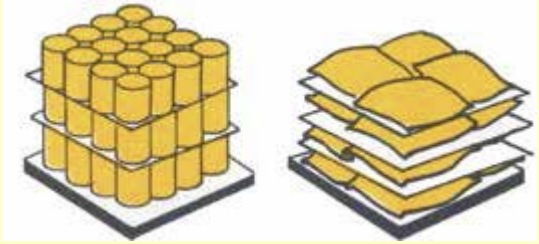
Capacity Plate Exercise



Working with Loads

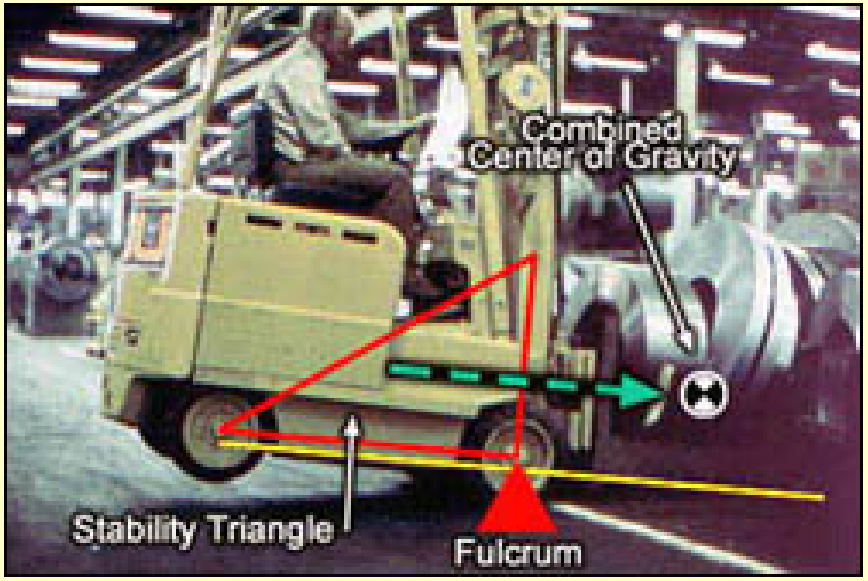
Check configuration and condition of load





Working with Loads

See if the forklift can move the load

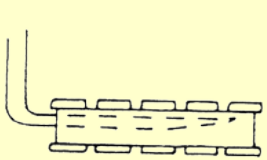


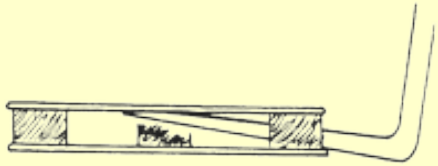
Working with Loads

Check the path

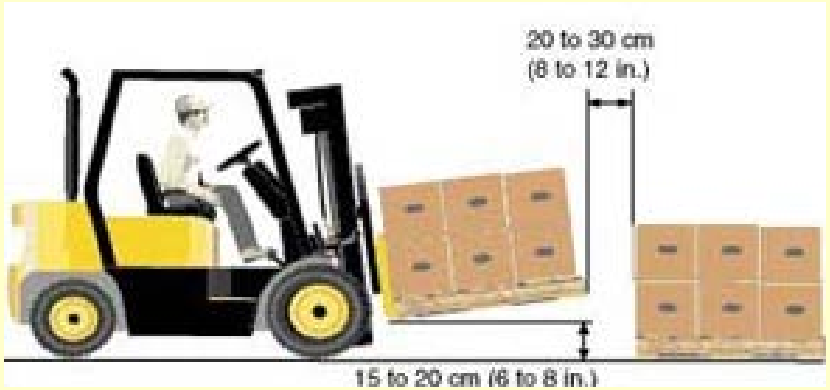
Working with Loads

Approach and lift the load



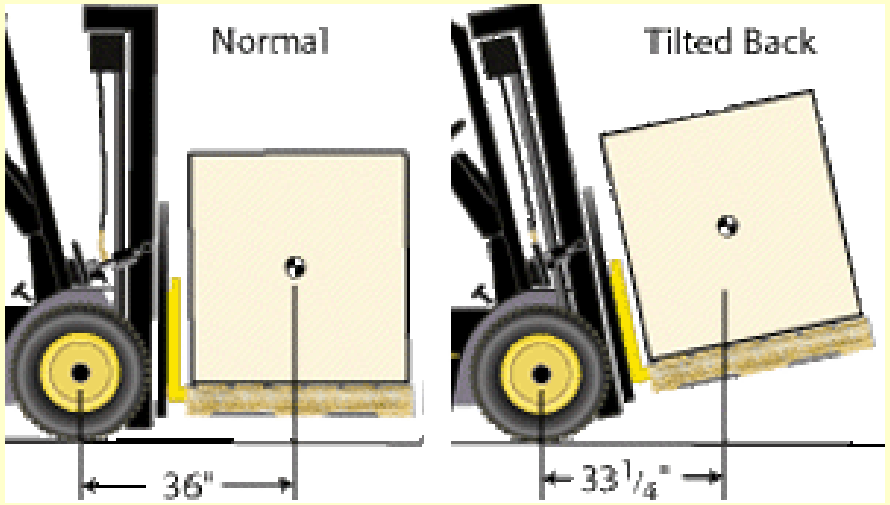


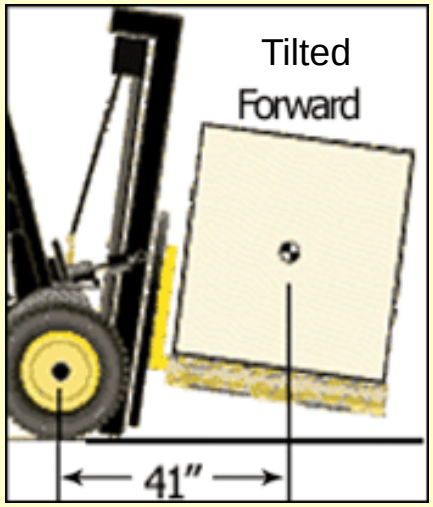
Correct! **Incorrect!**



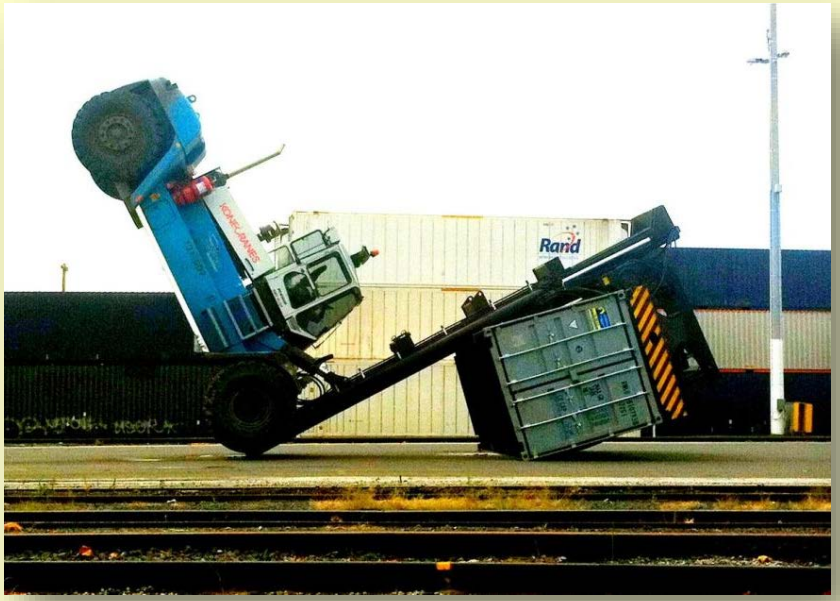
Working with Loads

Tilt and move the load



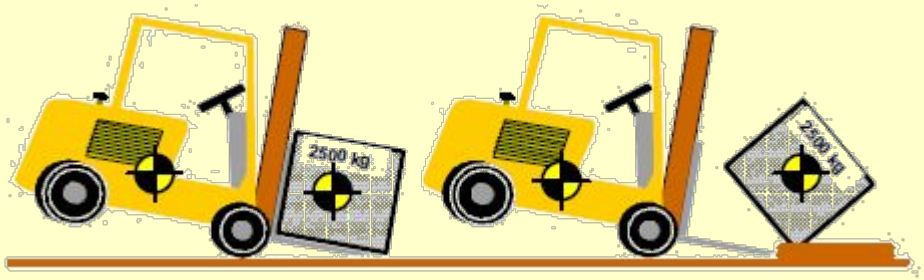


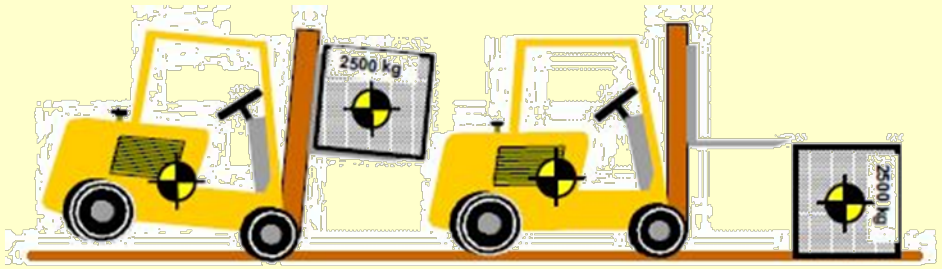
Do Not Overload!

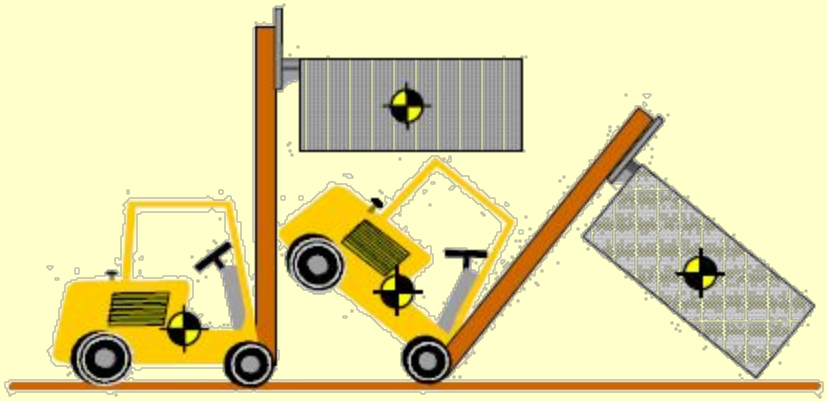


Moving the Load - Lateral Stability

Moving the Load - Braking







Moving the Load - Activity

Visibility

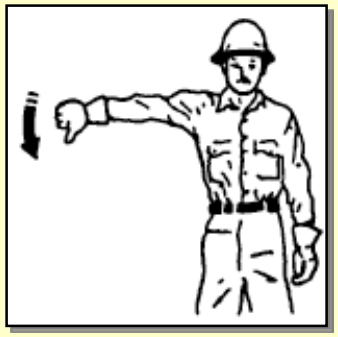
Visibility

Visibility

Spotters and Signals

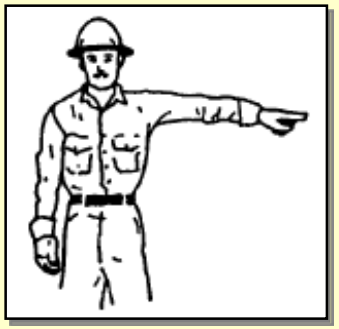
Raise Tines

Lower Tines

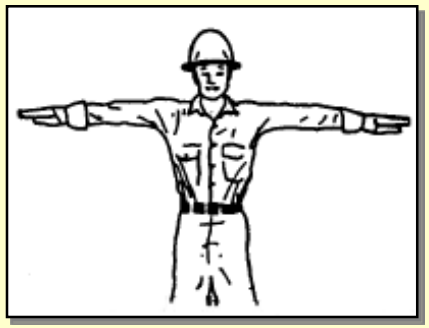


Tilt Mast Forward

Tilt Mast Back



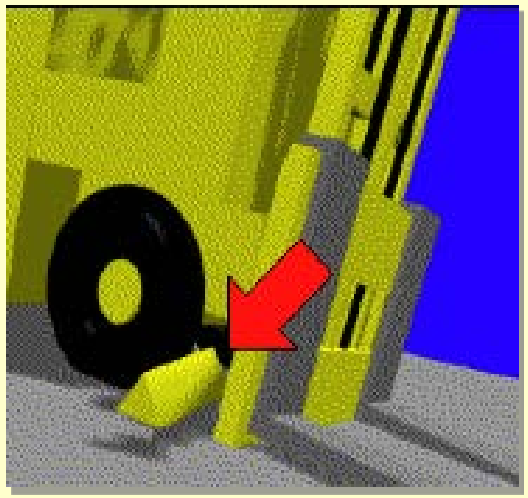
Move Tines in Direction Finger Points



Stop

Critical Lifts

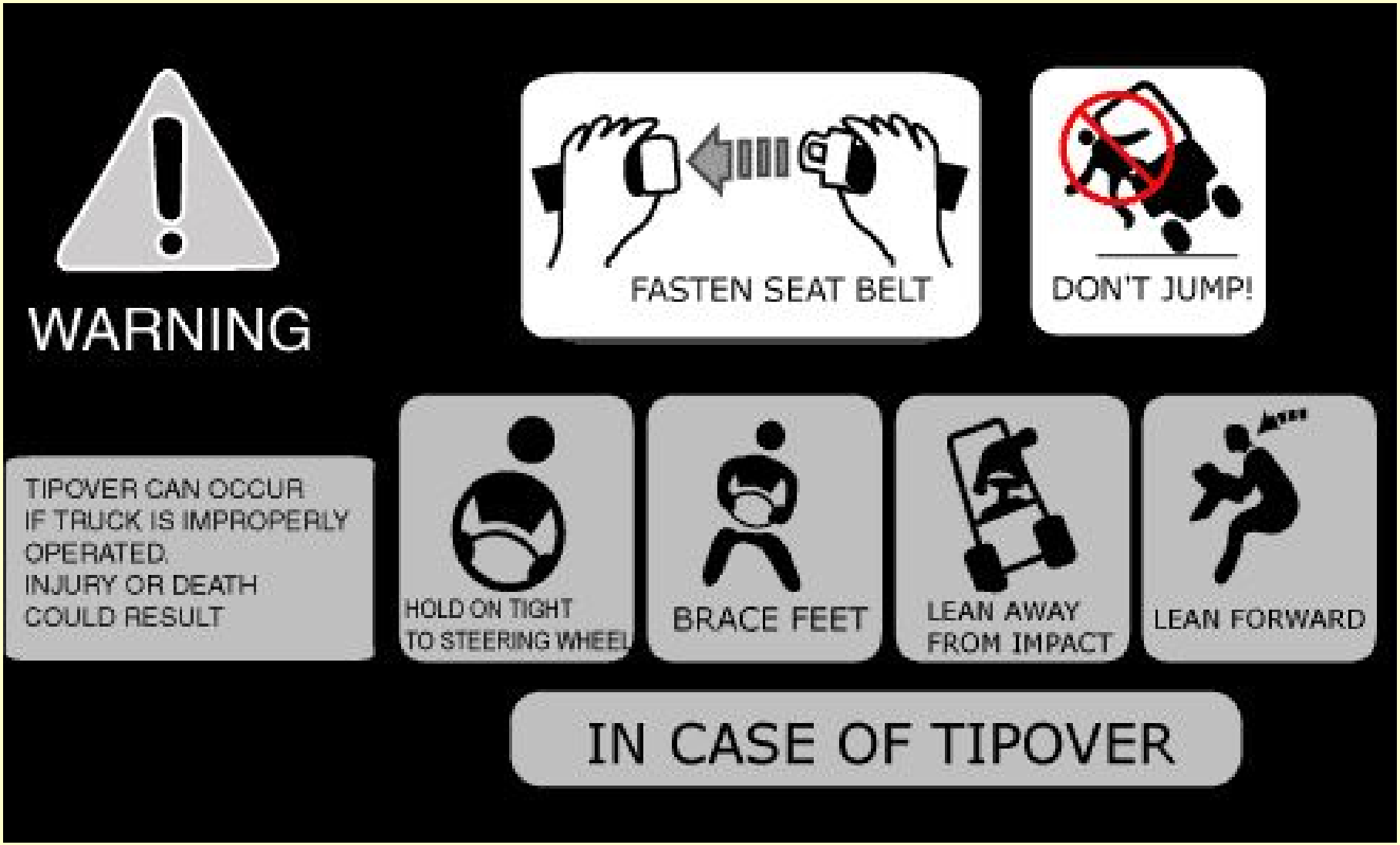
Dismounting / Parking



Off-Normal Events

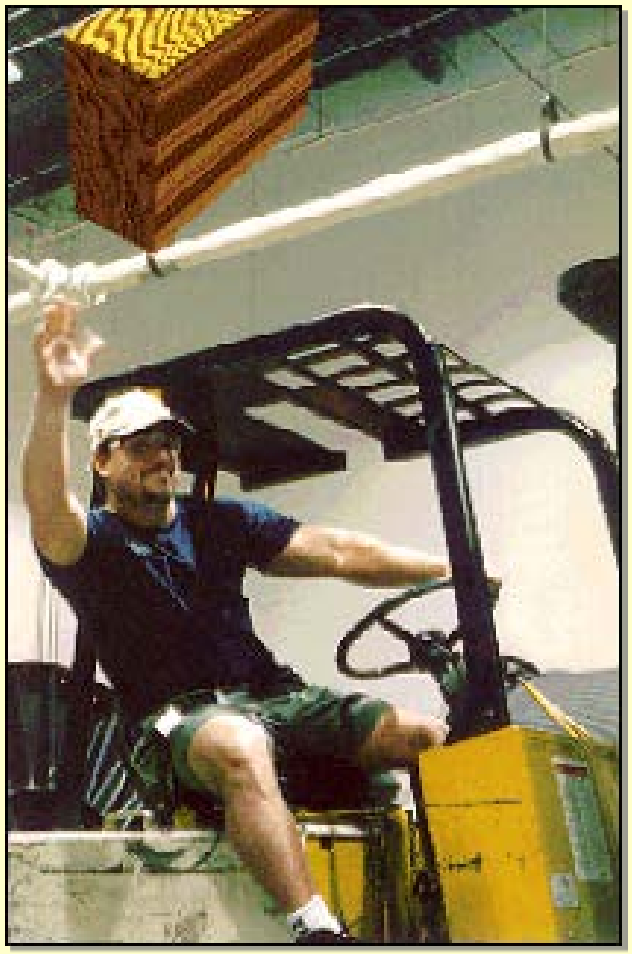
What would you do if…?

Tipover

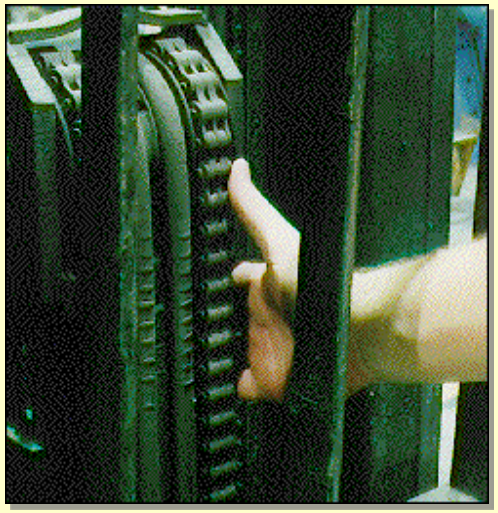

WARNING
FASTEN SEAT BELT
DON'T JUMP!
TIPOVER CAN OCCUR
IF TRUCK IS IMPROPERLY
OPERATED.
INJURY OR DEATH
COULD RESULT
HOLD ON TIGHT
TO STEERING WHEEL
BRACE FEET
LEAN AWAY
FROM IMPACT
LEAN FORWARD
IN CASE OF TIPOVER

Unacceptable Operations

Unacceptable Operations



Unacceptable Operations



Unacceptable Operations

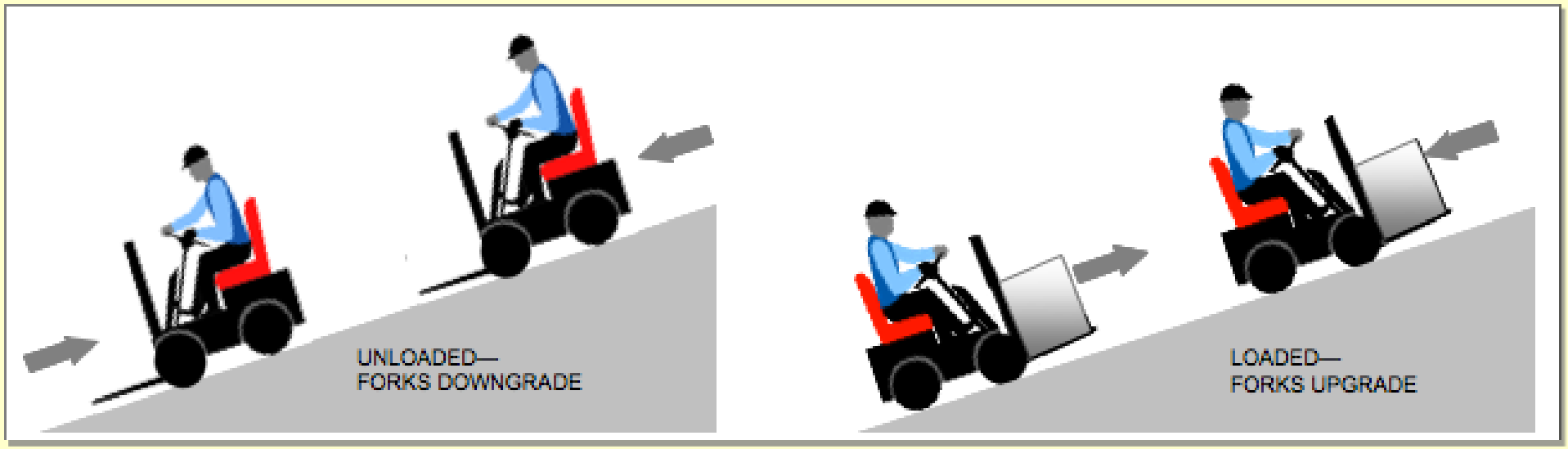
Module 5 – Workplace Factors

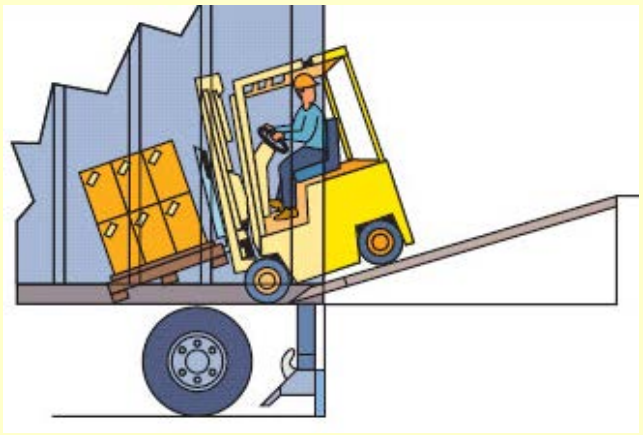
Recognize hazards and controls associated with

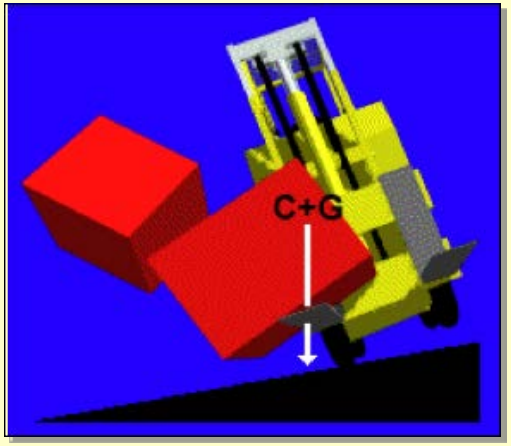
- Surface conditions
- Ramps and sloped surfaces
- High-traffic areas
- Narrow or restricted places
- Hazardous locations
- Fueling and recharging
- Closed or hazardous environments

Surface Conditions

Ramps and Sloped Surfaces

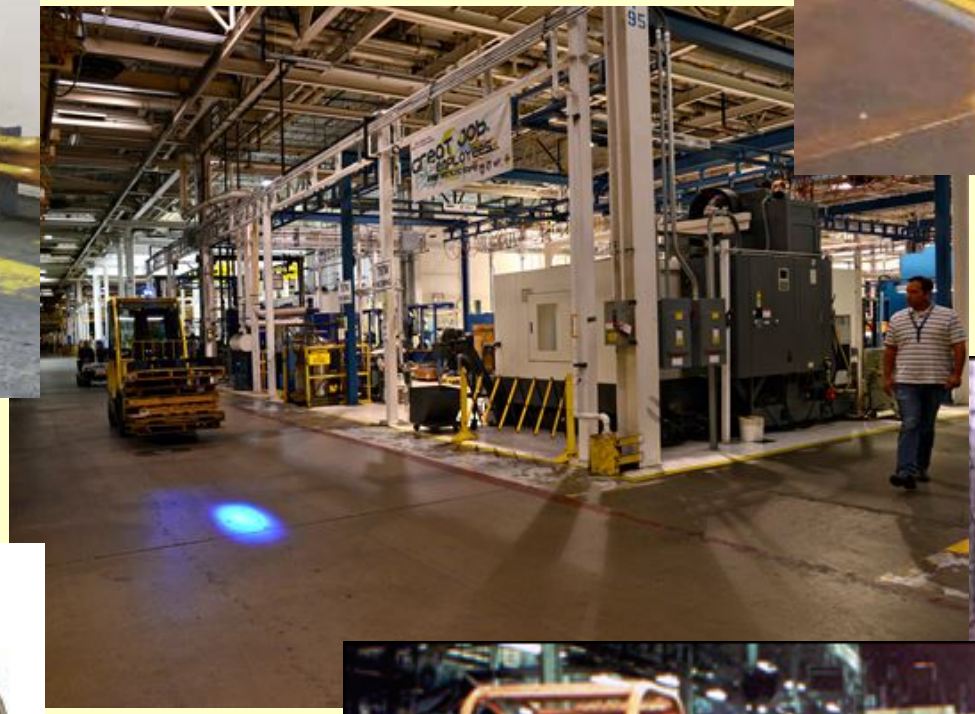






High-Traffic Areas

Traffic Controls



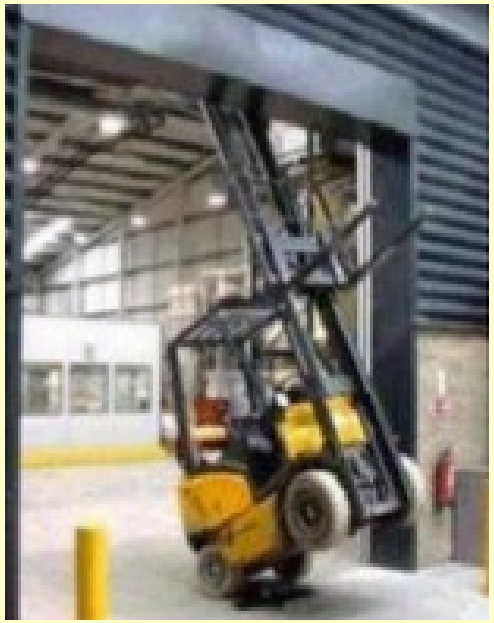
Narrow or Restricted Places - Aisles

Narrow or Restricted Places - Docks

Narrow or Restricted Places - Trailers

OSHA

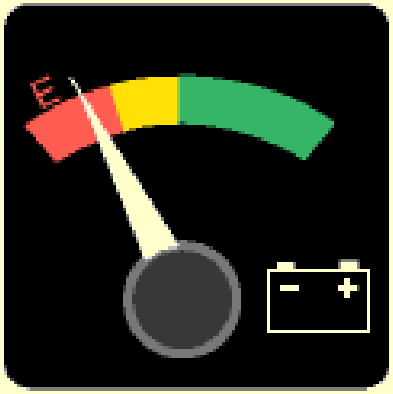
Narrow or Restricted Places - Overhead



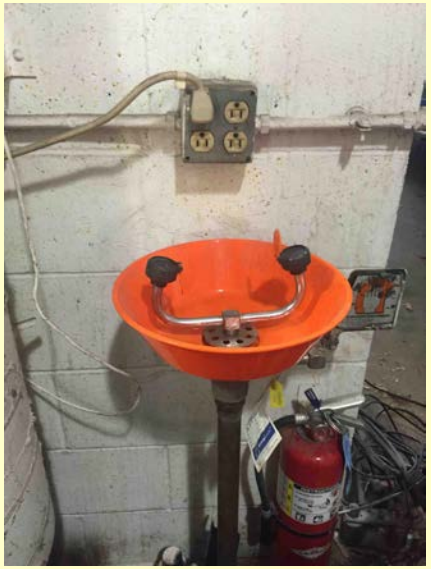
Look up!

Narrow or Restricted Places - Elevators

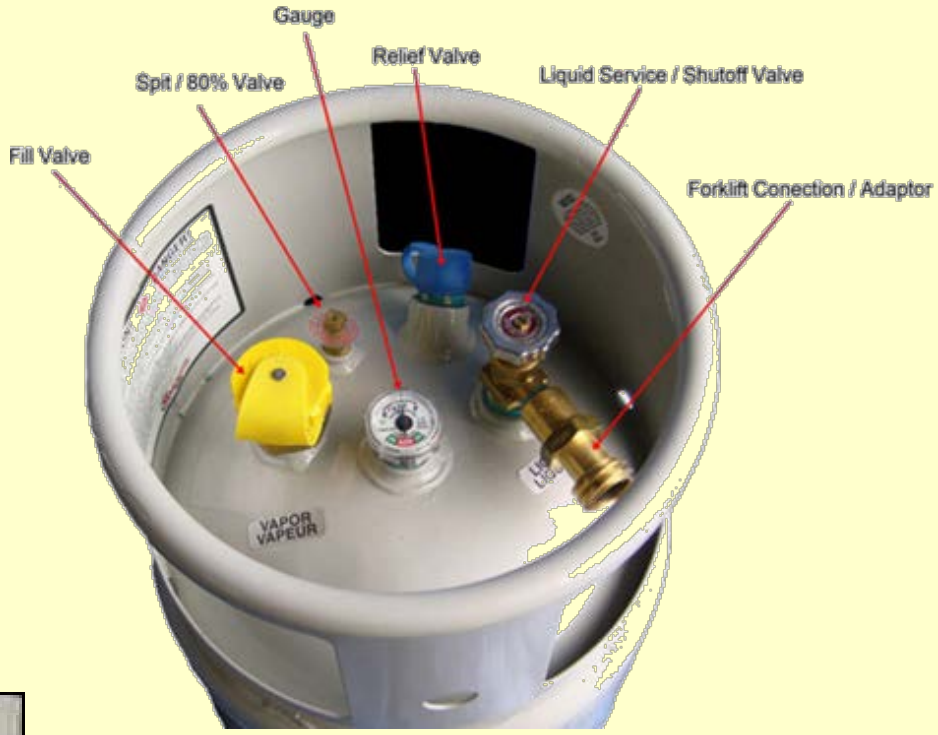
Fueling and Charging



Battery



Fueling and Charging



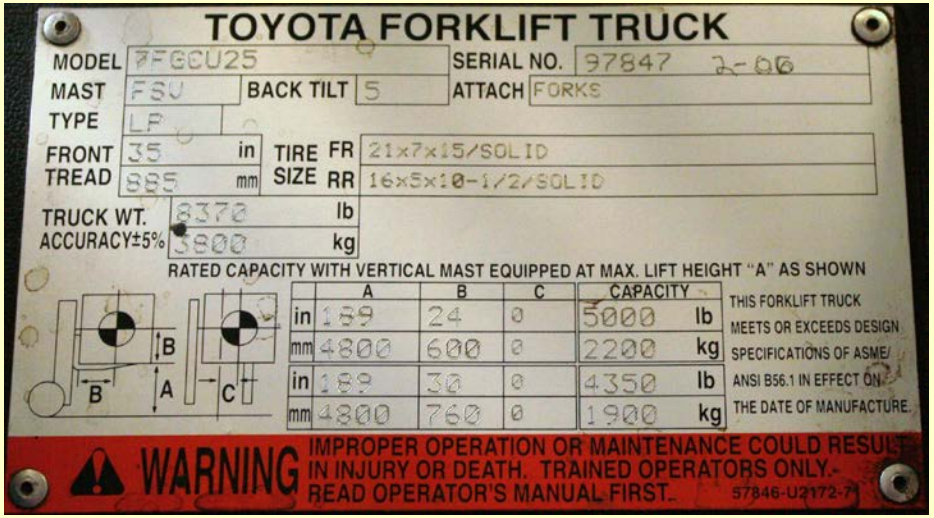
Locating pin

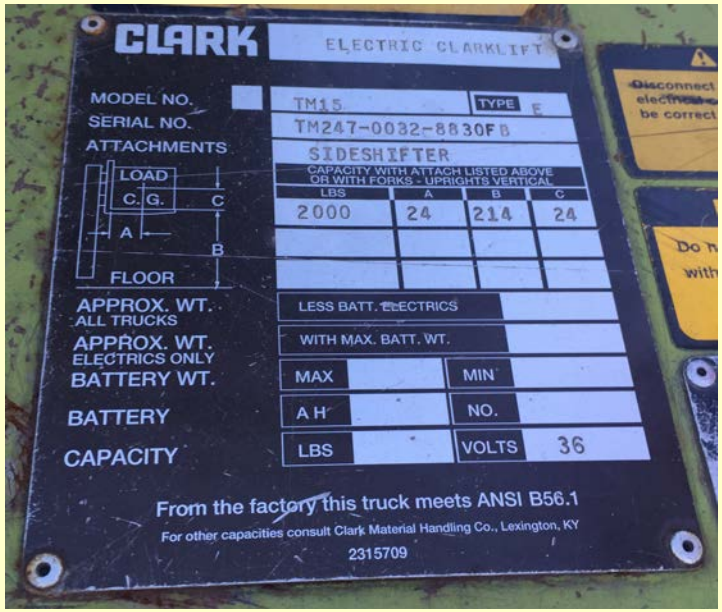
Hazardous Locations

- Areas with a greater risk of fire or explosion from flammable liquids, vapors, gases, or dusts.
- Use the right type of forklift in such areas.

D, DS, DY, E, ES, EE,

EX, G, GS, LP, LPS.





Enclosed and Hazardous Areas

- Carbon monoxide (CO) can become hazardous when operating in areas with insufficient ventilation
- Symptoms of CO exposure -
- Controls
  - Electric forklifts
  - Forklift maintenance
  - Air monitoring
  - Ventilation
  - Reduce idling time
  - Training

Forklift Rollover at LANL

Forklift Rollover at LANL

Any Questions?

Visibility