

Sit-down Counterbalanced Forklift Operator Safety Training



Welcome students to the class and see that each one has a student manual and a pencil.

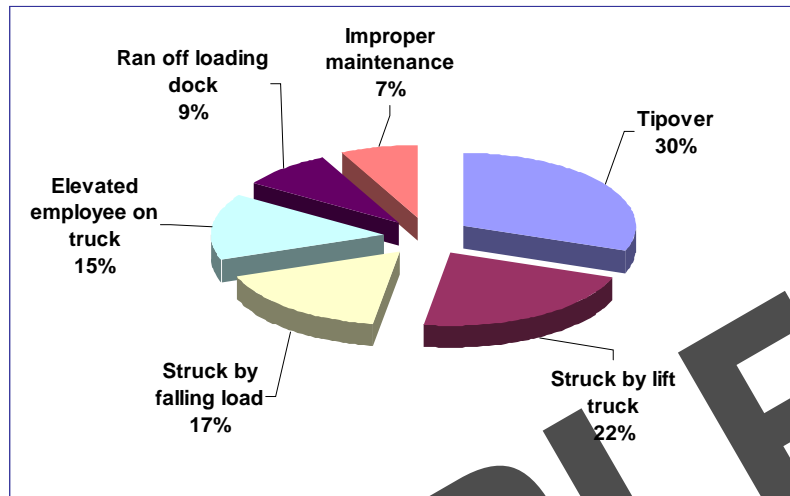
- Emphasize the three main reasons for this training:
 1. Training reduces the risk of accidents and injuries to you and those you work with
 2. Training reduces operating costs
 3. OSHA requires it.



Introduction

- There are millions of forklifts of all shapes and sizes in the United States.
- The most common is the sit-down counterbalance forklift in the 4,000-6,000 lb capacity range.
- Forklifts are designed for quick transportation of materials and goods in warehouses, plants, outside yards and construction sites.
- The number of attachments that can be fitted to a forklift are many, making a standard forklift even more versatile.
- The majority of forklifts are not difficult to learn to operate. Because of this, training and practice on the machine is given minimal priority.
- Because of the huge number of accidents and deaths involving forklifts, OSHA decided to change the standards. The standards adopted and put in force in Dec/1999 were many years in the making.
- These new laws make training and the monitoring and evaluation of that training mandatory.
- The responsibility and liability for training is placed squarely on the shoulders of the employer.

IMPORTANCE OF FORKLIFT OPERATOR SAFETY TRAINING



PURPOSE: Help the student understand why this training is so vital. Introduce the need for this type of training. Create an interest in the subject.

- For each category of accident give an example or two that is relative to your workplace.

Examples

What causes a forklift to tip over?

- The most common cause of tip over is going around a corner too fast without a load.
- Turning with the forks above travel height, loaded or unloaded.
- Handling a load that is too heavy for the forklift does not cause as many tipovers as one might think. Why? Because when engaging the load the forklift “gets light” and we learn to keep such a load close to the ground.

What are the most common reasons for being struck by a forklift?

- Driving with the load obstructing your vision.
- Turning and not watching the rear end swing of the forklift.
- Backing up.

For actual examples of forklift accidents, go to:

<http://www.osha.gov/cgi-bin/inv/inv1sr?query=Industrial+Truck&querytp=KEYW>

Refer to quiz on page 2 of the student manual. Take turns answering the questions.

WHAT IS A PROFESSIONAL?

- **You've carefully thought out all the angles.**
- **You've done it a thousand times.**
- **It comes naturally to you.**
- **You know what you're doing. It's what you've been trained to do your whole life.**
- **Nothing could possibly go wrong.**



PURPOSE: To instill in the student the importance of being a professional.

This slide and the next are meant to be humorous. They illustrate the suddenness of accidents even to the most experienced professional. It is human nature to think "it will never happen to me." This attitude can be dangerous.

Think Again.



Comment:

“Accidents that cause injuries and death often come suddenly and everyone is left scratching their heads and wondering what went wrong. Usually the cause is that people have been cutting safety corners for years and the “odds” finally caught up with them. After the accident, it becomes evident that they weren’t being as safe as they thought they were.

“How safe are we being?”

Captain E. J. Smith - 1907

“When anyone asks me how I can best describe my experience of nearly forty years at sea, I merely say uneventful....(I)n all my experience I have never been in any accident of any sort worth speaking about. I have seen but one vessel in distress in all my years at sea...I never saw a wreck and never have been wrecked, nor was I ever in any predicament that threatened to end in disaster of any sort.”

Captain Smith became the captain of the Titanic in 1912



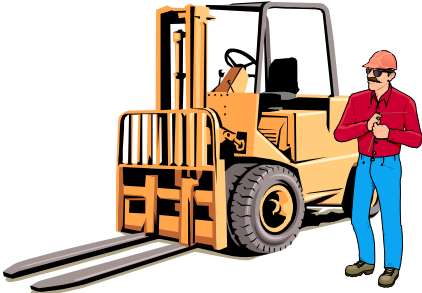
- You may wish to cover the bottom portion of this slide and let the class try to guess who this person is.
- This is a more serious version of the last slide. Here was a person that was a professional in every sense of the word but because of some mistakes on his last voyage his name and ship will always be infamous.
- You might ask what some of the mistakes were that caused the Titanic disaster:
 - Icebergs that far south were uncommon for that time of year
 - Desire to set a record for crossing the Atlantic Ocean
 - False sense of security that the Titanic was “unsinkable”
 - Not enough life rafts



PURPOSE: Describe the professional forklift operator.

- Discuss each item and give an example or two to explain each point. Personal examples are best, but avoid relating incidents from the workplace which may embarrass individuals.
- You may wish to ask everyone to think of a professional athlete that is admired not only for his or her ability in their sport but also as human being. (Michael Jordan, Tiger Woods, etc.)
- What sets them apart from others?
- Have you ever worked with someone who is a joy to work with?
- What sets them apart from others?


FORKLIFT FUNDAMENTALS



Introductory slide

SAMPLE

WARNING PLATE



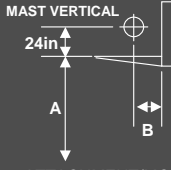
WARNING

IMPROPER OPERATION OR MAINTENANCE
COULD RESULT IN INJURY OR DEATH.

MODEL	TY-3600	SERIAL No.	3FM 00000000
TYPE	LPS	TRUCK WT.	8,680 lbs

CAPACITY OF STANDARD TRUCK WITH DUPLEX MAST AND FORK **5,000 lbs** AT 24 IN. LOAD CENTER WITH MAXIMUM HEIGHT OF 130 IN. RATED CAPACITY WITH OPTIONAL MAST AND/OR ATTACHMENT LISTED BELOW

MAST VERTICAL



A in.	B in.	FORKS ONLY lbs.	ATTACH lbs.
156	24		4,500

ATTACHMENT/MODEL: **Sideshifter B-80012**

MEETS ANSI DESIGN SPECS



PURPOSE: Explain the purpose of warning plate.

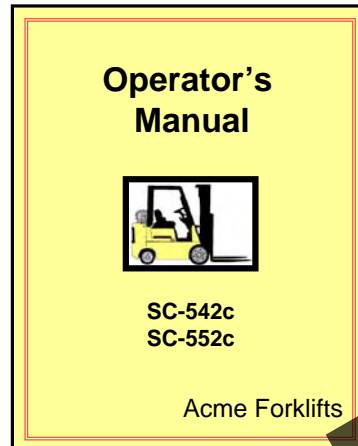
- Discuss the different pieces of information provided on the plate.
- Discuss the three levels of warnings found on the plate, as explained on page 3 of the student manual.

DANGER—If not avoided, **WILL** cause death or serious injury.

WARNING—If not avoided, **CAN** cause death or serious injury.

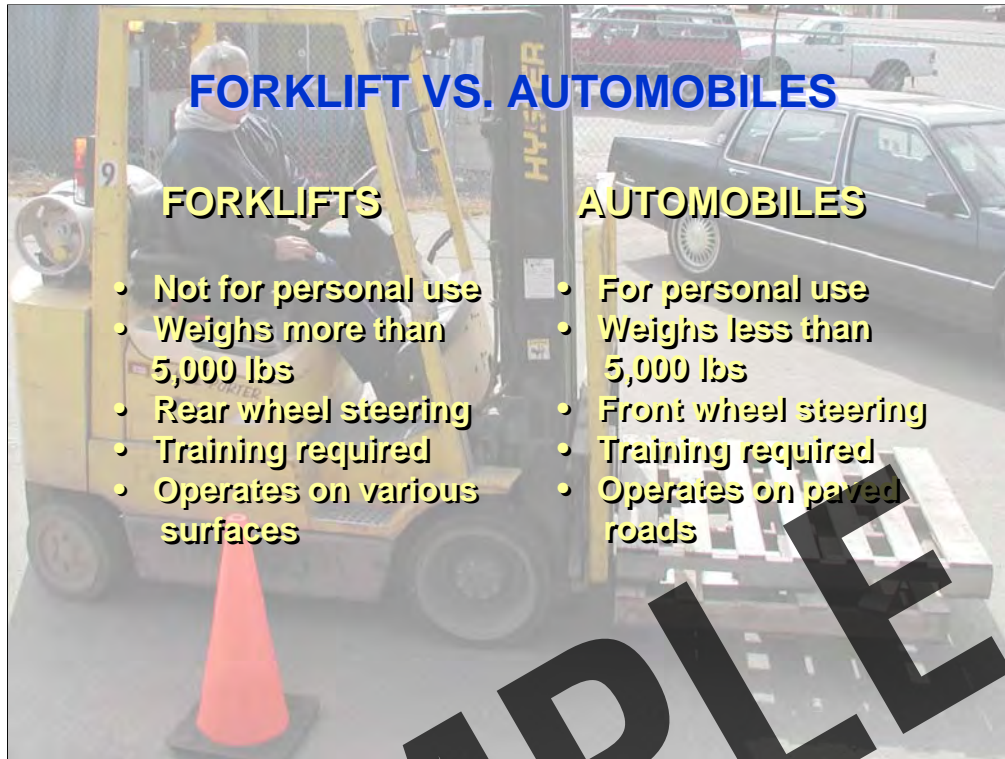
CAUTION—If not avoided, **MAY** cause minor or moderate injury.

OPERATOR'S MANUAL



PURPOSE: Operator and Maintenance Manual is required to be on-board for each lift.

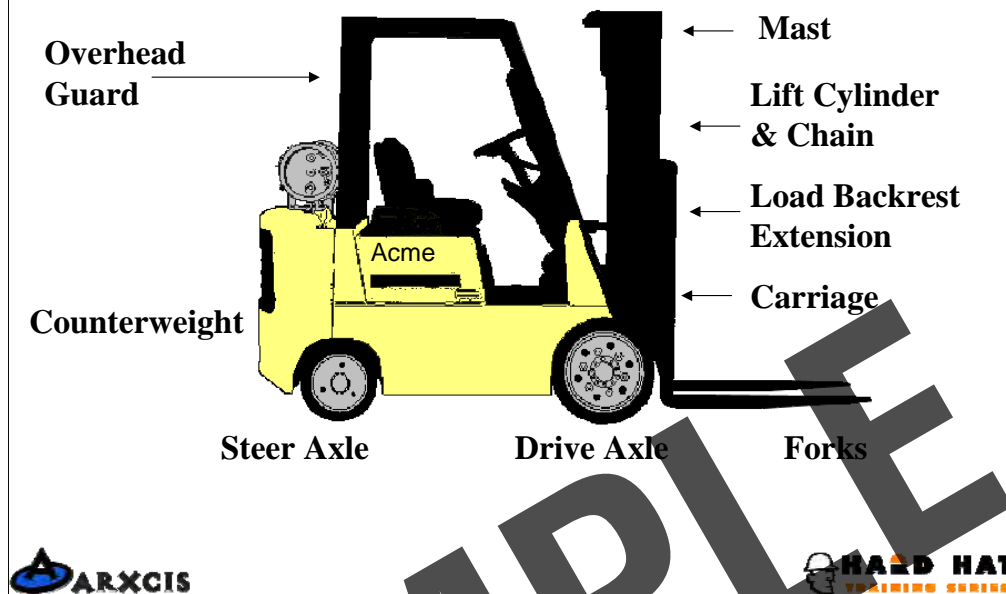
- The operator is required to have read and understand the Operator and Maintenance Manual prior to making a lift.
- Remind the operator that the manual is to remain on the forklift.
- Use the Operator and Maintenance Manual for the daily/shift inspections.



PURPOSE: Emphasize the unique characteristics of forklifts. *This can be accomplished by comparing the differences and similarities between automobiles and forklifts.*

- Forklifts should *never* carry passengers.
- Forklifts are heavy. They are easily 2 or 3 times heavier than an automobile.
- The most significant difference between the two is that a forklift has rear wheel steering. The steering wheels can pivot almost 180 degrees. *Emphasize that this feature is what gives the forklift its unique maneuverability.*
- Depending on the type of tires and chassis design, a forklift can operate on various surfaces.

FORKLIFT TERMINOLOGY



PURPOSE: Create a standard set of terms for the various parts of a forklift.

- Point out each part of the forklift and explain a little about each one's function.
- Refer to page 4 of the student manual.

MAST TERMINOLOGY

- **Overall Lowered Height**
- **Free Fork Height**
- **Maximum Fork Height**
- **Overall Height Raised**

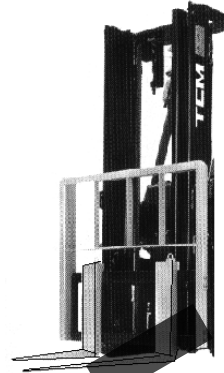


PURPOSE: Help the operator understand the terms used to describe the mast.

- Overall Lowered Height is the distance from the floor to the top of the mast when the sections of the mast are fully lowered.
- Free Fork Height refers to how high the forks can be raised before the overall height of the mast increases.
- Maximum Fork Height refers to how high the forks can be raised. This information can be found on the warning plate, which identifies the capacity of the forklift.
- Overall Height Raised is the height from the ground to the top of the backrest extension when the forks are raised to the maximum height.

MAST TYPES

- **Simplex**
 - Two stages
 - Limited free lift (4-6")
- **Duplex**
 - Two stages
 - Free lift (50-60")
 - Load and unload capabilities
 - Lift height about 144"



PURPOSE: The next two slides describe the different types of masts and their features.

- Simple Mast is not very common. The free lift is very limited, which means the overall height starts to increase after the forks are raised only 4 to 6 inches.
- Duplex Mast is more common. It allows the forks to be raised 50 to 60 inches before the overall lowered height begins to increase. This is important when loading trucks inside spaces with low overhead structures.

MAST TYPES

- **Triplex**
 - Three stages
 - Free lift (50-60’)
 - Load and unload
 - High stack heights (190’)
- **Quad**
 - Four stages
 - Free lift (50-60’)
 - Load and unload plus high stacking (276’)



- Triple Mast is similar to duplex mast with an increase in the fork height.
- Quad Mast is similar to the duplex and triple masts and is used where fork heights to 23 feet are required.

FORKLIFT TIRES

- **Cushion**
 - Smooth, dry surfaces
 - Less traction
 - Low ground clearance
 - More compact dimensions
 - Not for uneven, rough or wet surfaces
- **Pneumatic**
 - Indoor or outdoor
 - Better traction
 - Greater ground clearance
 - Larger dimensions
 - Optional solid, softer tires



PURPOSE: Identify the different characteristics of cushion and pneumatic tires.

** Point out the benefits and limitations of each type of tire.*

Cushion Tire

- Often referred to as hard rubber tires. They have little or no tread.
- Forklifts with these types of tires have minimum ground clearance, some as low as 3 inches.
- Traction decreases greatly with these tires on smooth, wet surfaces.

Pneumatic Tire

- Usually larger than cushion tires.
- May come with duals.
- Has tread.
- Provides some shock absorbency.



Have the students complete the quiz
in the student
manual before proceeding.

Discuss the answers.

THE VISUAL INSPECTION

- **Structure & Frame**
- **Welds & Fasteners**
- **Tires & Wheels**
- **Forks**
- **Carriage & Mast**
- **Hydraulic Leaks**
- **Hoses, Lift Cylinders**
- **Chain Lubrication**
- **Battery Restraint**
- **LP components**
- **Electric components**
- **Capacity plates**
- **Warning decals & plates**
- **Engine compartment**
- **Operator's compartment**
- **Attachments**



PURPOSE: Help students understand that inspections are important for safe forklift operations.

- Emphasize that the forklift is to be inspected before each day's use or at the start of each shift. A record of the inspection is recommended.
- The above checklist is for discussion purposes. The manufacturer typically can provide a more definitive checklist for a particular forklift.
- Discuss each item briefly.
- The user shall see that all nameplates and markings are in place and are maintained in a legible condition.
- **29 CFR 1910.178(q)(7)** Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.
- **29 CFR 1910.178** No truck shall be operated with a leak in the fuel system until the leak has been corrected.
- **29 CFR 1910.178(q)(10)** Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease.

THE OPERATIONAL INSPECTION

- Operator restraint system
- Horn
- Warning devices
- Unusual engine noise
- Fuel level
- Gauge readings
- Hydraulics
- Controls
- Steering lock to lock
- Service brake
- Park brake
- Plugging on electric powered trucks



PURPOSE: Student needs to understand that he/she is responsible to continuously monitor the condition of the forklift.

- Briefly review each item and give examples where appropriate.

COMPLETION OF INSPECTION

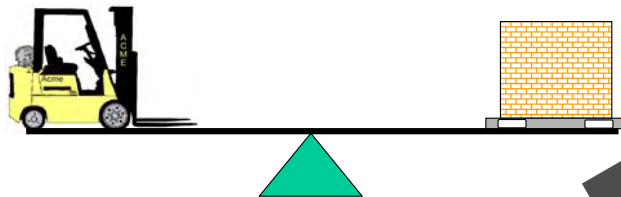
- Report defects to appropriate personnel
- Never operate a truck in need of repair
- Authorized & trained personnel repair forklifts



PURPOSE: Emphasize that it is the operator's responsibility to refrain from operating an unsafe forklift.

- Forklifts with defects should not be operated.
- Emphasize that inspections can
 1. Reduce downtime
 2. Increase productivity
 3. Reduce costs
 4. Improve safety
- **29 CFR 1910.178(p)(1)** If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition.
- **29 CFR 1910.178(q)(1)** Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.

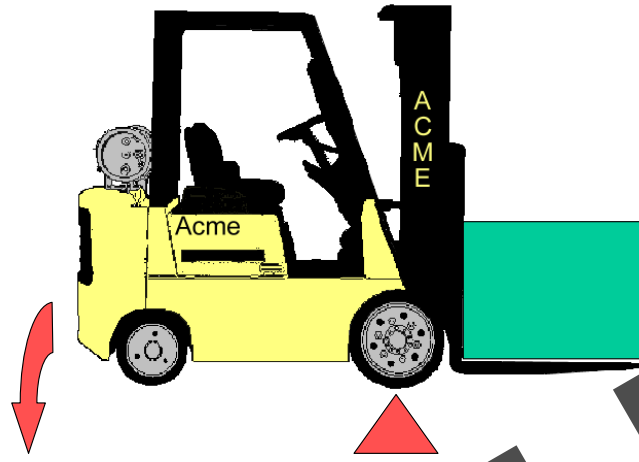
FORKLIFT BALANCE, STABILITY & CAPACITY



Before proceeding, have students complete the quiz in the student manual.

Discuss the answers.

FORKLIFT BALANCE



Weight in front offset by weight in back



PURPOSE: Introduce the “principle of balance” with respect to forklifts.

- Point out that the drive axle is the pivot point of balance in the fore and aft direction.
- The weight of the forklift behind the drive axle must be greater than the weight of the load and weight of the forklift ahead of the drive axle.
- The term “counter balance” as used to describe this type of forklift is based on the principle of balance.

OFFSETTING WEIGHTS

- **Internal Combustion**
 - Counterweight
 - Engine
 - Transmission
 - Frame
 - Steer Axle
- **Electric Powered**
 - Industrial battery
 - Control Panel
 - Motors & Pumps
 - Frame
 - Steer Axle
 - Counterweight

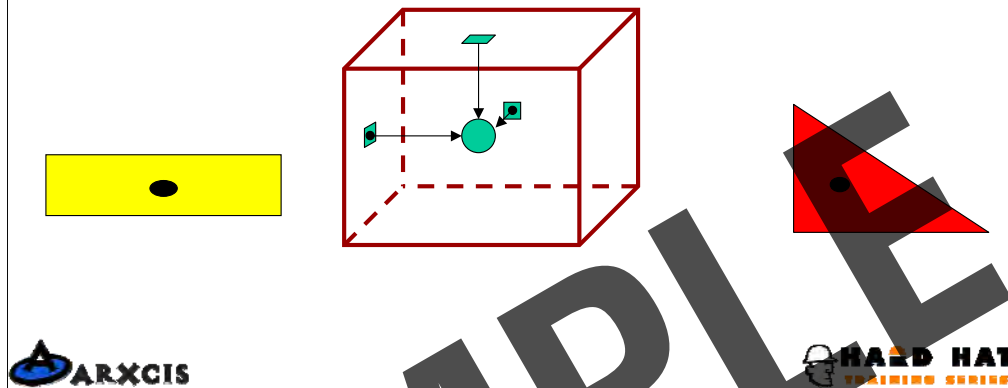


PURPOSE: Students should understand what constitutes the forklift's offsetting weights.

- Before showing this slide you may want to ask the students what components of the forklift make up the offsetting weights.
- Record on the white board their answers.

LOAD'S CENTER OF GRAVITY

A point in the load around which all weight is evenly distributed

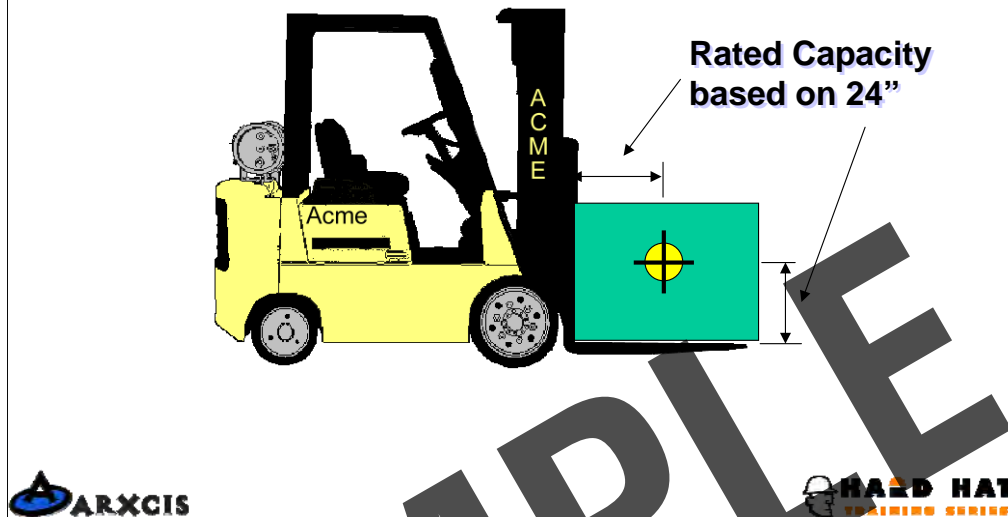


PURPOSE: Introduce the concept of “center of gravity.”

- Using a box as a visual aid, help students to visualize where the center of gravity is located in a load.
- The load’s center of gravity is the point in the load around which all weight is evenly distributed.
- **Center of gravity** is the point on an object at which all of the object's weight is concentrated. For symmetrical loads, the center of gravity is at the middle of the load. (Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Definitions.)

LOAD CENTER

Measured from face of forks to
center of load

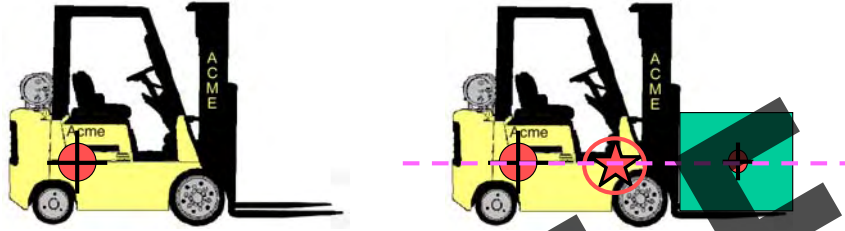


PURPOSE: To understand what is meant by the term “Load Center.”

- The manufacturer rates the capacity of a forklift for a specific weight located at a specific point on the forks.
- If the load's center of gravity varies from this specific “load center” then the capacity of the forklift changes.
- **Load center** is the horizontal distance from the load's edge (or the fork's or other attachment's vertical face) to the line of action through the load's center of gravity. (Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Definitions.)

FORKLIFT CENTER OF GRAVITY

A lift truck has its own center of gravity. When picking up a load, a combined center of gravity is produced (indicated by the star).



The combined center of gravity will always be on a straight line between the load and the forklift centers of gravity



PURPOSE: To show how the forklift center of gravity combines with that of the load when it is lifted.

- When the load is lifted, the combined center of gravity shifts forward.
- Emphasize that the combined center of gravity changes constantly as the load is moved around.

STATIC & DYNAMIC CONDITIONS

- **Static Conditions**
 - Load size
 - Load shape
 - Load position on forks
 - Lift height
 - Amount of tilt
 - Tire pressure on pneumatics
- **Dynamic Conditions**
 - Acceleration
 - Speed
 - Braking
 - Ramps & other uneven surfaces



PURPOSE: To show how static and dynamic conditions can affect the stability of a forklift.

- Static conditions are those that remain constant regardless of motion.
- Dynamic Conditions are created as the forklift moves the load around.
 - Acceleration and braking can cause additional load forces to be placed on a forklift. Emphasize how braking can cause the forklift to tip forward. This effect is increased as the load is raised.
 - Uneven surfaces can also cause a forklift to become unstable - again the degree of instability is primarily affected by the height of the load.
- A-7.1. Up to this point, the stability of a powered industrial truck has been discussed without considering the dynamic forces that result when the vehicle and load are put into motion. The dynamic forces created by the movement of weight and the resulting shift in the center of gravity when the machine is moving, braking, cornering, lifting, tilting, and lowering loads, etc., are important stability considerations. (Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Dynamic Stability.)

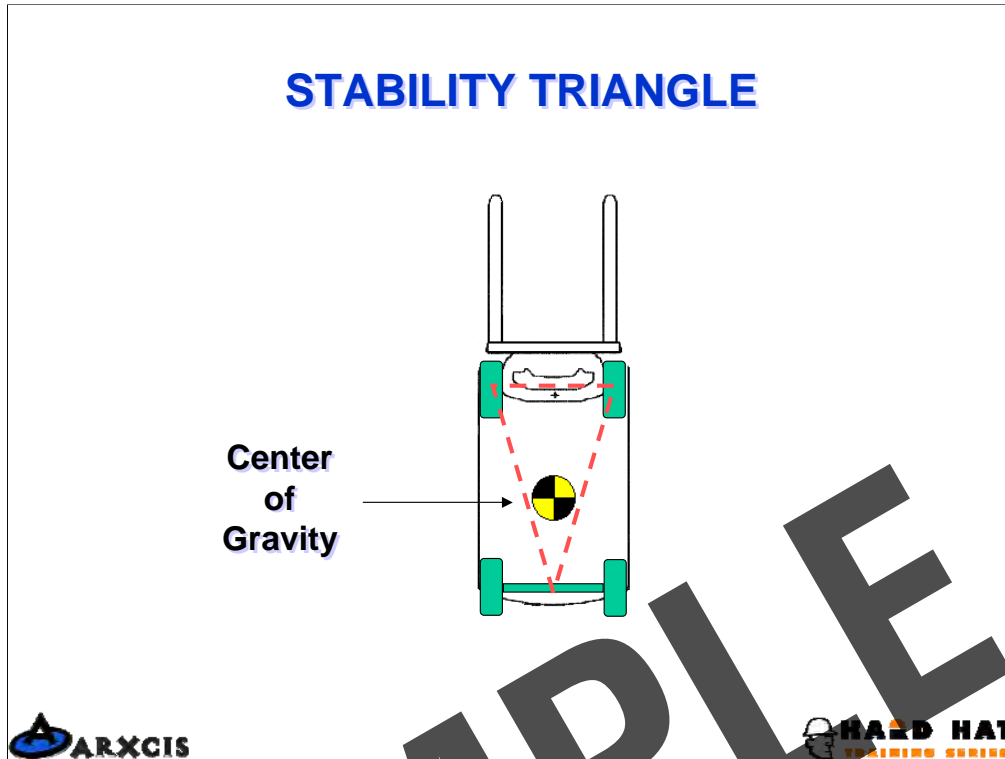
ATTACHMENTS

- **Affect capacity**
 - **Additional weight**
 - **Extended load center**
- **If added after forklift is received**
 - **Prior written approval from forklift manufacturer is required**
 - **New capacity plate is required**



PURPOSE: Help students understand that attachments of any type need to be approved by the manufacturer.

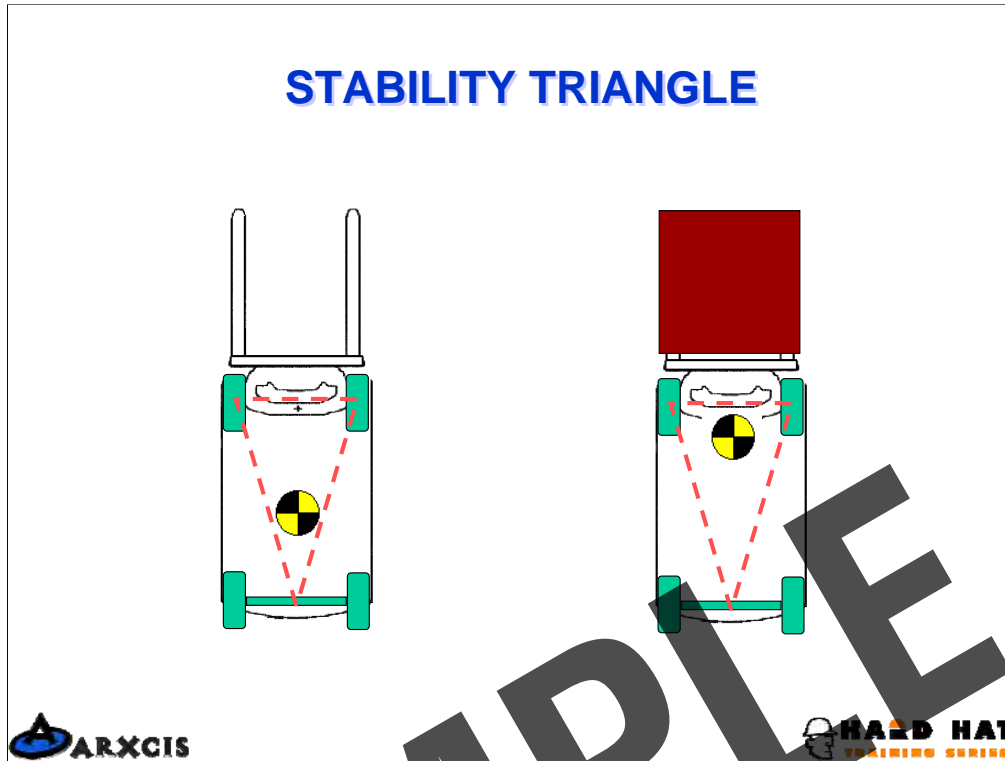
- Attachments alter the forklift's load capacity and stability.
- The warning plate needs to be changed to reflect the forklift's current configuration.
- **29 CFR 1910.178(a)(4)** Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.
- **29 CFR 1910.178(a)(5)** If the truck is equipped with front-end attachments other than factory installed attachments, the user shall request that the truck be marked to identify the attachments and show the approximate weight of the truck and attachment combination at maximum elevation with load laterally centered.
- **29 CFR 1910.178(o)(4)** Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.



PURPOSE: Explain how the stability triangle is derived.

- Forklifts have a 3-point suspension: each drive wheel plus the center point of the steering axle.
- The stability triangle is created by drawing a line between the three-points of suspension.
- To maintain stability, the center of gravity needs to remain within the stability triangle.
- **A-4. The Stability Triangle.**
 - **A-4.1.** Almost all counterbalanced powered industrial trucks have a three-point suspension system; that is, the vehicle is supported at three points. This is true even if the vehicle has four 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. (**Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Definitions.**)

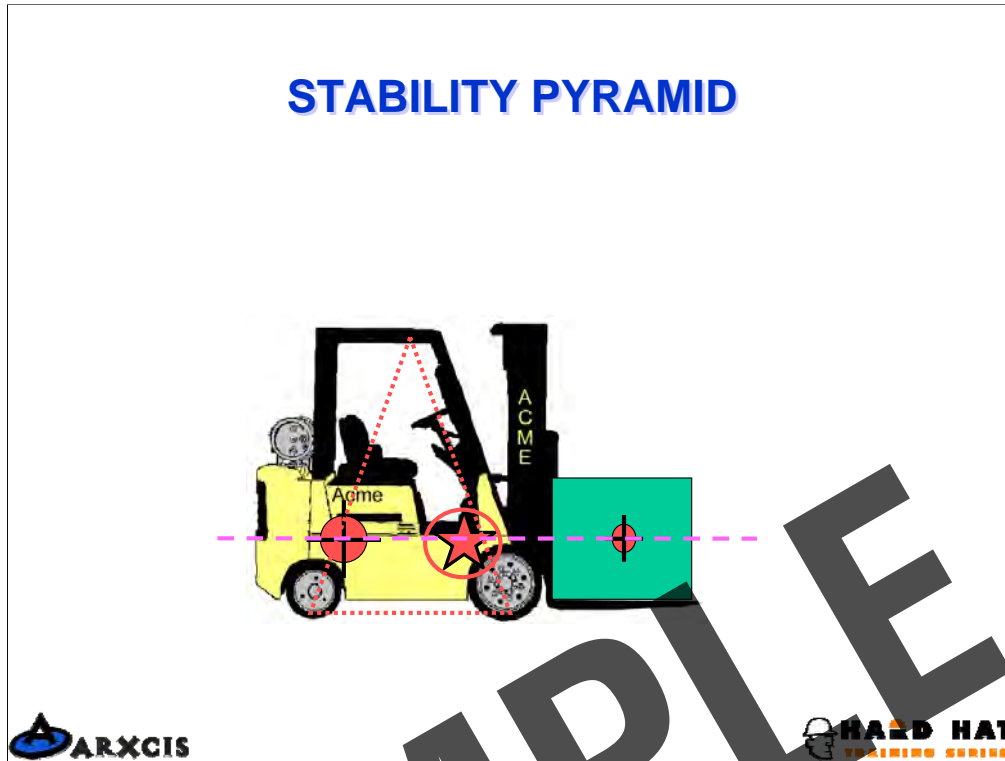
STABILITY TRIANGLE



PURPOSE: Show how the combined center of gravity moves when a load is lifted.

- When a load is picked, the combined center of gravity moves closer to the drive axle.
- Note how the center of gravity approaches the edge of the stability triangle when a load is lifted and unloaded.

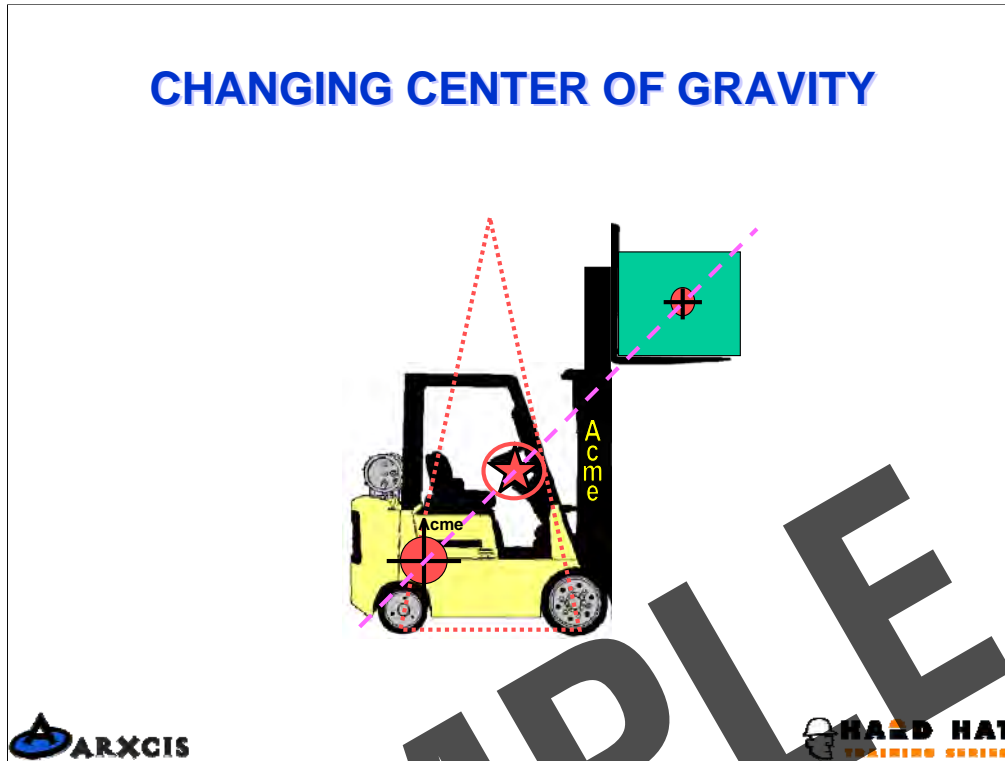
STABILITY PYRAMID



PURPOSE: Introduce the concept of the Stability Pyramid and how it is used.

- The Stability Pyramid includes the stability triangle as its base and the shape of the Pyramid varies as the load is raised and lowered.
- A-5. **Longitudinal Stability**
- A-5.1. The axis of rotation when a truck tips forward is the front wheels' points of contact with the pavement. When a powered industrial truck tips forward, the truck will rotate about this line. When a truck is stable, the vehicle-moment must exceed the load-moment. As long as the vehicle-moment is equal to or exceeds the load-moment, the vehicle will not tip over. On the other hand, if the load-moment slightly exceeds the vehicle-moment, the truck will begin to tip forward, thereby causing the rear to lose contact with the floor or ground and resulting in loss of steering control. If the load-moment greatly exceeds the vehicle moment, the truck will tip forward. (**Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Definitions.**)

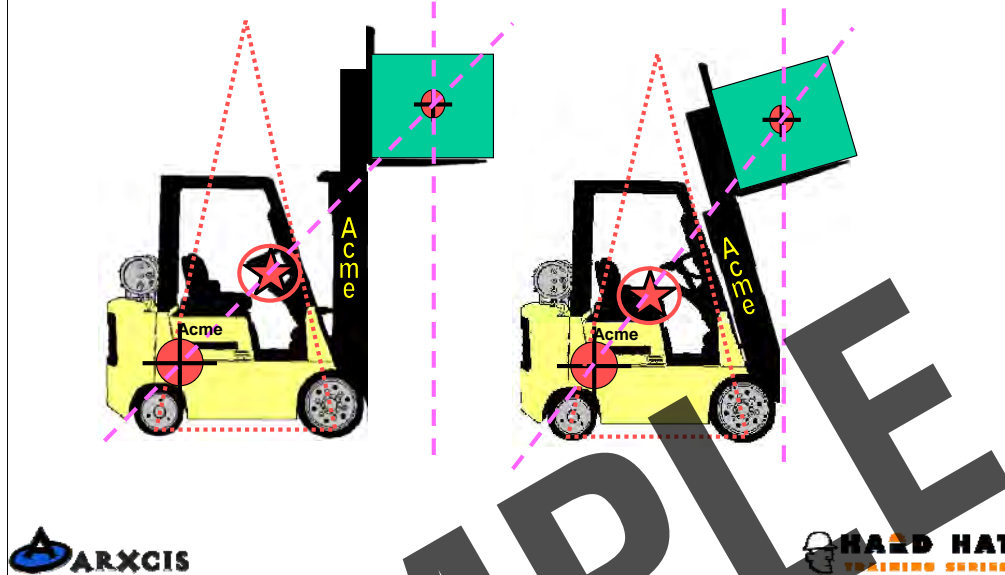
CHANGING CENTER OF GRAVITY



PURPOSE: Show how the combined center of gravity can move to the edges of the pyramid as a load is raised.

- Point out that the combined center of gravity always will lie on a line drawn between the forklift's center of gravity and that of the load.
- As the load is raised, the combined center of gravity moves upward along this line.
- Note that the higher the load is raised, the closer to the edge of the pyramid the combined center of gravity moves thereby decreasing stability.

CHANGING CENTER OF GRAVITY



PURPOSE: Show how tilting the load forward can adversely affect a stability.

- Tilting the load forward will move the combined center of gravity forward and closer to the side of the stability pyramid.
- Point out how instability is greatly increased from forward tilts at higher load heights.
- **29 CFR 1910.178(o)(6)** Extreme care shall be used when tilting a load forward or backward, particularly when high tiering. Tilting a load forward is prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is to be deposited over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

IMBALANCE

- **Moving center of gravity outside stability triangle creates**
 - **Loss of steering**
 - **Loss of traction**
 - **Unstable load**
 - **Potential for a tip over situation**



PURPOSE: Point out how moving the combined center of gravity affects the forklift's balance.

- Moving the combined center of gravity outside the stability triangle can cause additional problems besides the potential for tip over.

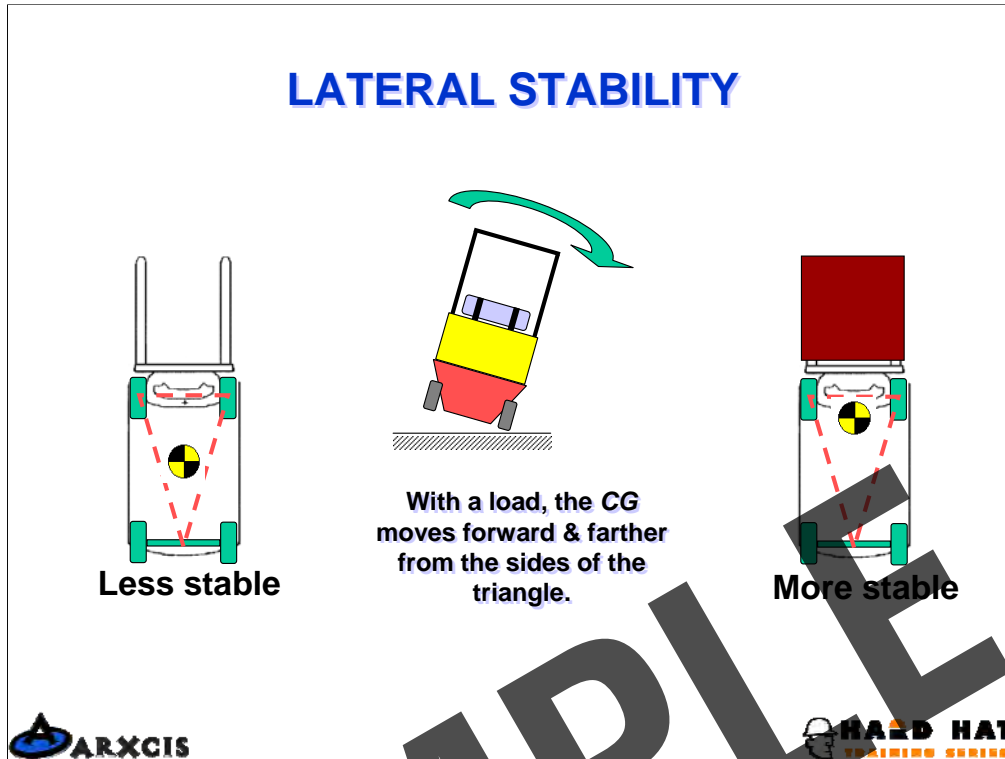
TIP OVER CAUSES

- **Overloading**
- **Load too high**
- **Mast tilted beyond vertical**
- **Sharp turns**
- **Braking abruptly**
- **Excessive speed**
- **Pot holes**
- **Overhead obstructions**
- **Wet, uneven surfaces**
- **Ramps**
- **Low tire pressure**



PURPOSE: Review the causes of tip overs.

- Tip overs account for 25% of all accidents.
- When two or more of the above causes are combined, the potential for a tip-over is greatly increased.



PURPOSE: Show how a load affects lateral stability.

- A lateral tip over is to one side or another.
- These tip-overs are caused by uneven or sloping surfaces or turning.
- Note how the distance from the combined center of gravity moves farther away from the sides of the stability triangle when a load is lifted.
 - * This movement forward increases the lateral stability.

•A-6. Lateral Stability.

•A-6.1. The vehicle's lateral stability is determined by the line of action's position (a vertical line that passes through the combined vehicle's and load's center of gravity) relative to the stability triangle. When the vehicle is not loaded, the truck's center of gravity location is the only factor to be considered in determining the truck's stability. As long as the line of action of the combined vehicle's and load's center of gravity falls within the stability triangle, the truck is stable and will not tip over. However, if the line of action falls outside the stability triangle, the truck is not stable and may tip over. (**Standards - 29 CFR, Powered industrial trucks. - 1910.178 App A, Definitions.**)



Before proceeding, have students complete the quiz in the student manual.

Briefly discuss each answer.

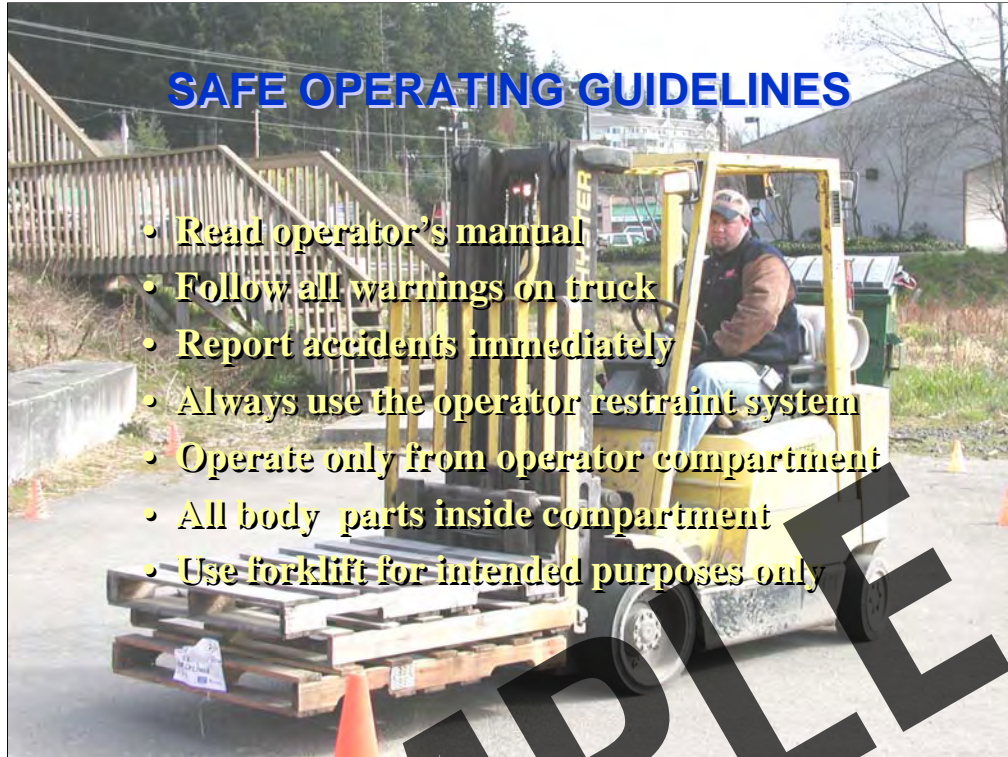
CLIMBING ON & OFF A FORKLIFT

- **Check hands & feet**
- **Squarely face vehicle**
- **Two hands & a foot**
- **Avoid grabbing steering wheel**
- **Don't jump on or off the vehicle**



PURPOSE: Show how operators can be injured by not climbing on and off the forklift properly.

- Begin discussion by asking students to share examples of how one can get hurt climbing on or off a forklift.
- Point out how being in a hurry can result in climbing accidents.



PURPOSE: Encourage the operator to use safe operating procedures.

- Discuss each item and have a students share their thoughts on how these guidelines could help avoid accidents.

SAFE OPERATING GUIDELINES

- **Wear PPE in enclosed areas**
- **Obey company safety rules, traffic signals and signs**
- **Follow normal traffic patterns**
- **Stay in approved aisles**
- **Maintain clear view of travel**
- **Travel in reverse if forward vision is blocked**



PURPOSE: Encourage the operator to follow safe operating procedures.

- Operators should wear the proper personal protection equipment (PPE.)
- Emphasize the importance of following company safety rules.
- 29 CFR 1910.178(n)(6) The driver shall be required to look in the direction of, and keep a clear view of the path of travel.

SAFE OPERATING GUIDELINES

- **Sound horn and slow down when approaching**
 - Intersections, blind corners
 - Sharp curves
 - Pedestrians
 - Other vehicles
- **Three truck length following another vehicle**
- **Watch rear end swing**
- **Watch overhead obstructions**



Continuation of previous slide.

- Discuss each item and ask for examples.
- **29 CFR 1910.178(n)(4)** The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.
- **29 CFR 1910.178(n)(1)** All traffic regulations shall be observed, including authorized plant speed limits. A safe distance shall be maintained approximately three truck lengths from the truck ahead, and the truck shall be kept under control at all times.

SAFE OPERATING GUIDELINES

- **Slow down on wet, slippery or uneven floors**
- **Avoid obstacles - remove if possible**
- **Hazardous materials**
 - Know what it is
 - How to handle
 - How to clean up
 - Refer to appropriate MSDS sheet
- **Cross railroad tracks & rough surfaces at an angle**



Continuation of previous slide.

- Discuss each item and ask for examples.
- 29 CFR 1910.178(n)(5) Railroad tracks shall be crossed diagonally wherever possible. Parking closer than 8 feet from the center of railroad tracks is prohibited.

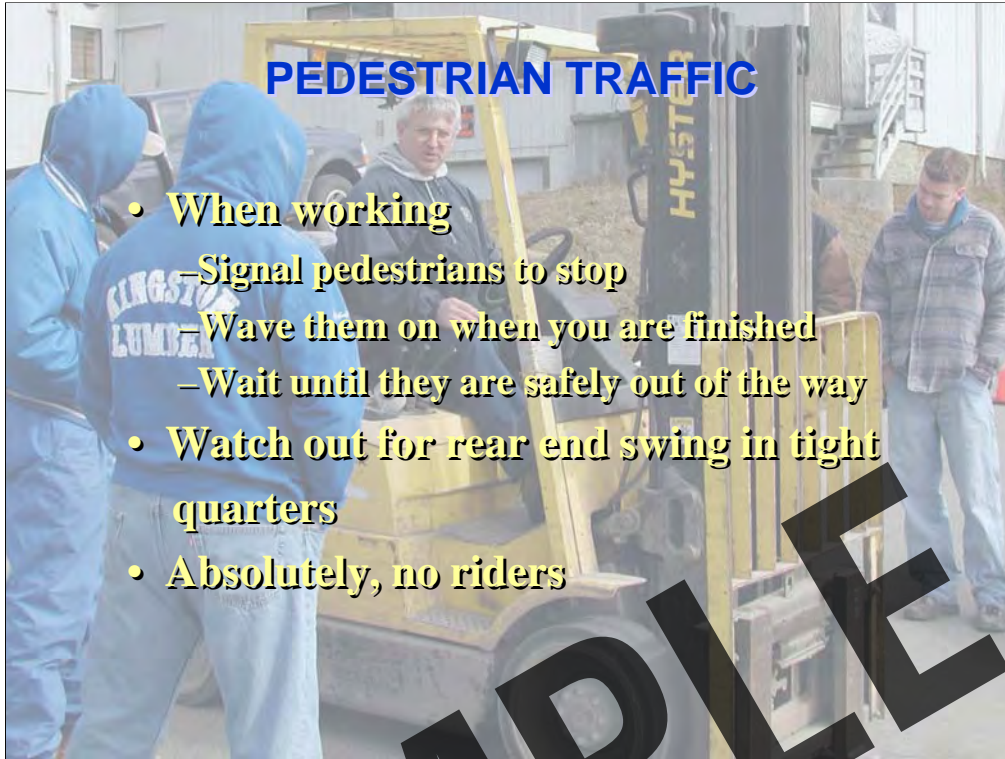
PEDESTRIAN TRAFFIC

- **Pedestrians have right of way**
- **When approaching corners, intersections**
 - Slow down
 - Sound horn
 - Check convex mirrors
- **When passing pedestrians**
 - Sound horn
 - Establish eye contact
 - Stay clear of pedestrians



PURPOSE: Make the operator aware of his responsibilities with respect to pedestrians.

- Emphasize that the operator is responsible for looking out for pedestrians.
- Establishing eye contact with a pedestrian assures that he/she is aware of your presence.



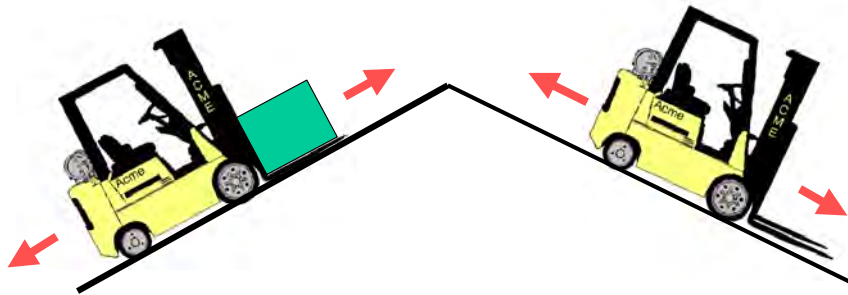
PEDESTRIAN TRAFFIC

- **When working**
 - Signal pedestrians to stop
 - Wave them on when you are finished
 - Wait until they are safely out of the way
- **Watch out for rear end swing in tight quarters**
- **Absolutely, no riders**

Continuation of previous slide.

- Emphasize that forklifts are not to carry riders.

RULES FOR RAMPS



- **With a Load**
 - Load pointing up the grade

- **Without a Load**
 - Forks pointing down the grade



PURPOSE: Inform the student about the proper way to travel up and down ramps.

- Operating the forklift in above shown manner helps to maintain stability.
- 29 CFR 1910.178(7) Grades shall be ascended or descended slowly.
- 29 CFR 1910.178(7)(i) When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.

TRACTOR TRAILERS & RAIL CARS

- **Chock trailer wheels**
- **Secure trailer or rail car to dock**
- **Support front end of trailer if no cab**
- **Check floor capacity and dock plates**
- **Be aware of pedestrian & truck traffic around dock area**
- **Enter rail car at an angle**
- **Communicate with tractor driver when finished**



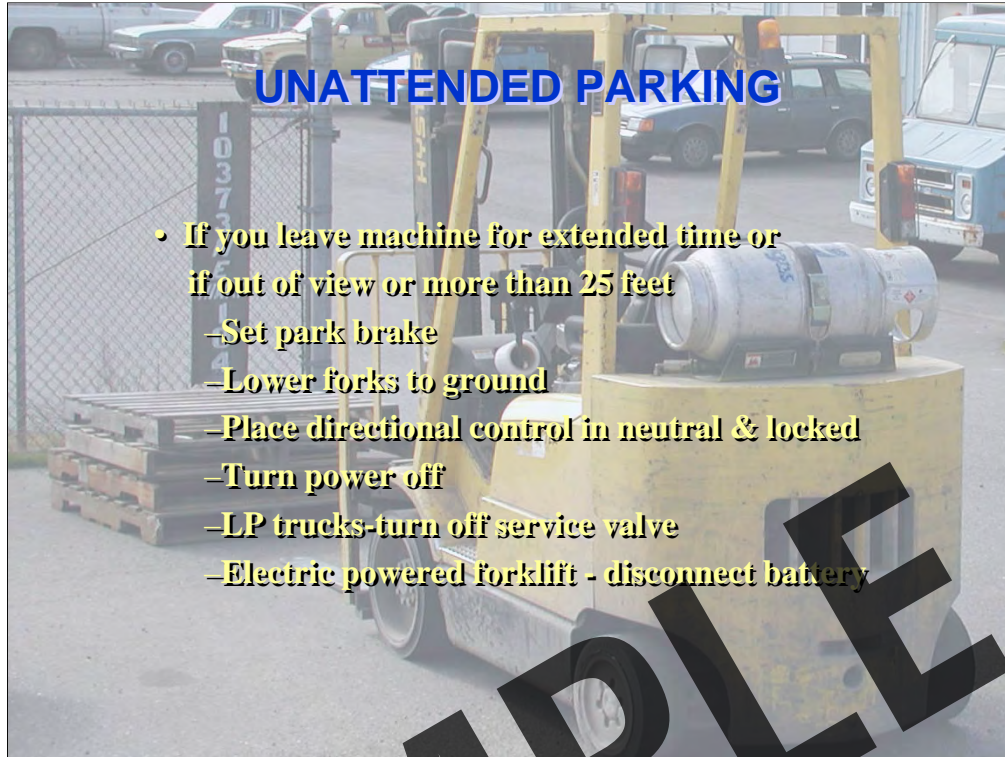
PURPOSE: Provide guidelines for operating forklifts in trailers and rail cars.

- Review each item and ask students to comment on why each is important.
- **29 CFR 1910.178(n)(11)** Dockboard or bridgeplates shall be properly secured before they are driven over. Dockboard or bridgeplates shall be driven over carefully and slowly and their rated capacity never exceeded.
- **29 CFR 1910.178(m)(7)** Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor. The flooring of trucks, trailers, and railroad cars shall be checked for breaks and weakness before they are driven onto.



PURPOSE: Teach the operator the proper way to park a forklift.

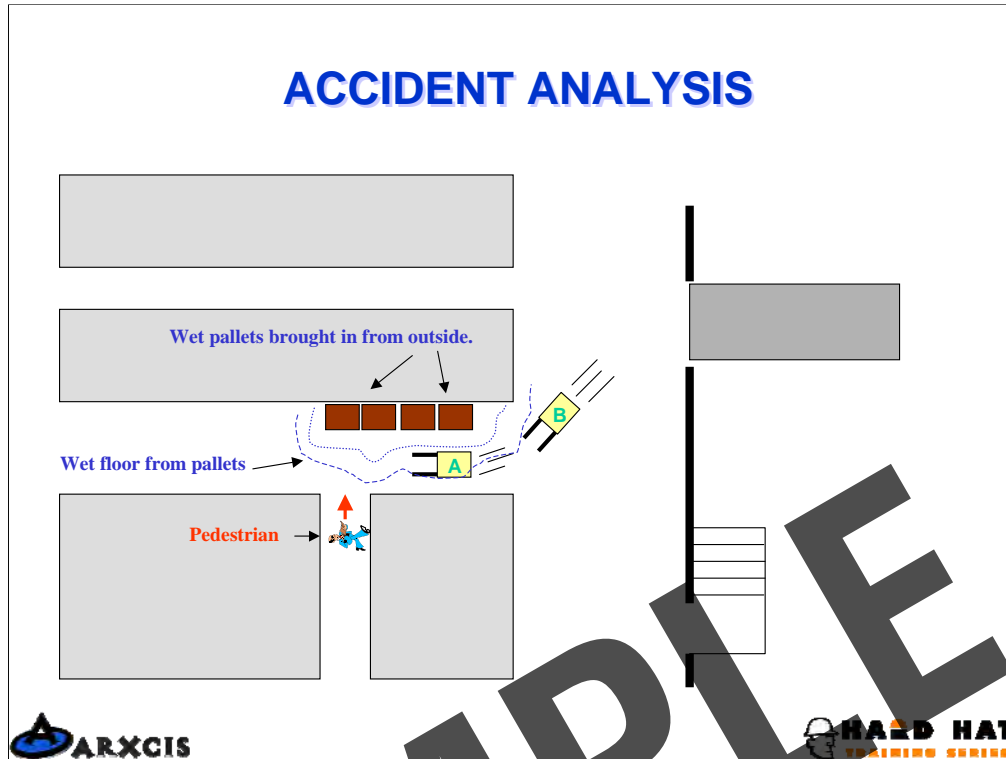
- Emphasize the 25 feet distance in full view of the truck.
- It is important that the operator set the parking brake every time he/she leaves the forklift.
- **29 CFR 1910.178(m)(5)(iii)** When the operator of an industrial truck is dismounted and within 25 ft. of the truck still in his view, the load engaging means shall be fully lowered, controls neutralized, and the brakes set to prevent movement.



PURPOSE: Show the proper way of parking a forklift in an unattended mode.

- Point out the differences between attended and unattended parking.
- For unattended parking
 - Turn off the engine
 - Turn off service valve on LP trucks
 - Disconnect battery on electric fork trucks
- **29 CFR 1910.178(m)(5)(i)**
 - When a powered industrial truck is left unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shall be shut off, and brakes set. Wheels shall be blocked if the truck is parked on an incline.
- **29 CFR 1910.178(m)(5)(ii)**
 - A powered industrial truck is unattended when the operator is 25 ft. or more away from the vehicle which remains in his view, or whenever the operator leaves the vehicle and it is not in his view.

ACCIDENT ANALYSIS



This is the layout of an accident that resulted in a fatality. Here are the facts:

- Forklifts **A** and **B** were bringing palletized loads from the back of the warehouse. **A** would place his load on the loading dock up front and **B** would stack his load on top of **A's** load. The loads would then be loaded onto the trailer by another forklift.
- They were operating electric forklifts, which are very quiet.
- They were going a little too fast for the conditions.
- No horns were used around corners or at intersections.
- **B's** forks were not fully lowered after stacking his pallet on top of **A's**.
- Empty Pallets were stacked in the main aisle and were wet from being outside. Some water was being tracked up and down the aisle.
- **B** was right on **A's** tail coming around the corner.
- The pedestrian, not paying attention, walked out into the aisle.

Before reading what happened, ask if anyone would like to complete the story. Most think the pedestrian is going to be the victim.

When the pedestrian walks out, **A** hits the brakes on the wet floor, which causes his forklift to turn sideways. **B** is not able to react quickly enough and his forks, which are not fully lowered yet, skewer the thigh of **A**, causing **A** to bleed to death before medics arrive.

Have class name 10 things that could have prevented the fatality. (going slower, using the horn, keep forks low, maintain 3 vehicle lengths, avoid pallets in aisle, avoid water on floor, warn pedestrians, install convex mirror at intersection, mark path for pedestrians, set up signs warning of forklift operation, etc.)



Before proceeding, have students complete the quiz in the student manual.

Briefly discuss each answer.

GENERAL HANDLING TECHNIQUES

- **Check condition and weight of load**
 - Poorly balanced?
 - Loose loads?
 - Overweight?
- **Forks should be**
 - Correct length & capacity
 - Completely under load
 - Wide as load permits



PURPOSE: Review general handling techniques.

- The operator needs to assess the condition of a load to determine if it can safely be lifted and transported.
- The forks need to be properly set to support the load correctly.
- **29 CFR 1910.178(o)(1)** Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.
- **29 CFR 1910.178(o)(2)** Only loads within the rated capacity of the truck shall be handled.
- **29 CFR 1910.178(o)(3)** The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted.

GENERAL HANDLING TECHNIQUES

- **Caution when handling long, high & wide loads - use spotter if necessary**
- **Special care when operating without**
 - **Load backrest extension**
 - **Overhead guard**
- **No pedestrians or other traffic under forks**



Continuation of previous slide.

- An unusually large load can be awkward to handle and special care needs to be taken. Remind the spotter to avoid attempting to control a load that is starting to fall.

ENGAGING A LOAD

- **Squarely engage load until it touches carriage**
- **Don't slam into loads**
- **Lift load to clear stack**
- **Check clearance on middle rack positions**
- **Check for rear obstacles**
- **Sound horn & back away**
- **Lower to travel position**
- *Never turn forklift with a load in the air*



PURPOSE: Review with students the basic techniques for engaging a load.

- Review each item and give examples of improper load engagements.
- Emphasize the need to use the horn as a warning device.
- Discuss the risk of turning a forklift with a load in the air. Stress the fact that the forklift becomes more susceptible to lateral tipping as the load gets higher.
- **29 CFR 1910.178(7)(iii)** On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.

INCHING PEDAL

- **Purpose of inching pedal**
 - **Faster lifting speeds at creep speed**
 - **Brakes applied when depressed to floor**
 - **Do not ride pedal**
 - **Check your operator's manual for your vehicle**
 - **No inching pedal on electric trucks**



PURPOSE: Explain the use of the inching pedal.

- Point out that not all forklifts have an inching pedal.
- Operators of a forklift with an inching pedal should review the operator's manual to understand how the manufacturer intended this feature to be used.

TRAVELING WITH A LOAD

- **Maintain control at all times**
- **Start, turn, brake smoothly**
- **Maintain clear view of travel**
- **Travel in reverse if forward vision is blocked**



PURPOSE: Review with students the basics for safe traveling with a load.

- Emphasize that speed is one of the primary causes of losing a load when traveling.
- Starting, stopping and turning impose forces on a load. Performing these operations smoothly is crucial.
- The operator must have a clear view of travel. Encourage the operator to take time to travel in reverse or get a spotter.

TRAVELING WITH A LOAD

- **Slow down and sound horn when approaching**
 - Pedestrians
 - Intersections
 - Blind corners
 - Sharp curves
 - Ramps
 - Dips
 - Wet & rough surfaces

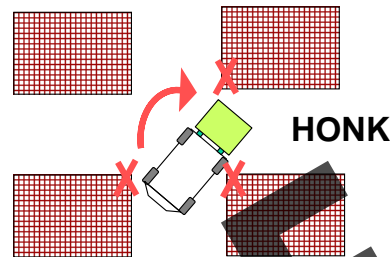


Continuation from previous slide.

- Again, the emphasis here is speed.
- Re-emphasize the responsibility of the operator to watch for pedestrians.
- **29 CFR 1910.178(n)(8)** Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.
- **29 CFR 1910.178(n)(9)** Stunt driving and horseplay shall not be permitted.
- **29 CFR 1910.178(n)(10)** The driver shall be required to slow down for wet and slippery floors.

EXECUTING TURNS

- Approach & turn slowly
- Sound horn
- Stay close to inside corner
- Watch rear end swing



PURPOSE: Discuss the techniques for safely executing a turn.

- Reduce speed when making a turn to avoid making sudden stops or other maneuvers which could shift the load.
- Blind corners are very dangerous and need to be executed carefully.
- To ensure adequate rear end swing space and maneuvering room for the load, stay close to the inside corner. Remind students to wait until the drive wheel is at the corner of the intersection before beginning a turn.
- In tight areas the operator will continually need to check the rear end swing and the load swing.
- **29 CFR 1910.178(n)(15)** While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.

DEPOSITING LOADS

- **Align forklift & position mast**
- **Watch rear end swing in narrow aisles**
- **Raise load and inch into position**
- **Lower forks to place load**
- **Watch top clearance for middle rack position**
- **Do not over-lower forks**



PURPOSE: Review the proper procedures for depositing the load.

- When depositing a load on a shelf or stack, it is important to avoid raising the load as you approach the shelf or stack. Raising could affect the stability of the load.
- Remind the operator to avoid lowering the forks too much. Doing so could cause the forks to drop suddenly when they slide out from under the load, which could damage the load or the forks. Over-lowering forks can be avoided by watching for slack in the hoisting chains.

DEPOSITING LOADS

- **Check for rear obstacles**
- **Sound horn and back away**
- **Do not shove a misplaced load around with forks**
 - **Reposition load instead**
 - **Use sideshifter if truck is equipped**
- ***Never turn forklift with load raised in air***



Continuation of previous slide.

- The operator needs to make sure no obstacles have entered into his path.
- Avoid shoving the load around with the forks. This movement could damage the load pallet or cause the load to fall.

ELEVATING PERSONNEL

- **OSHA/ANSI approved platform**
- **Properly secured platform to truck**
- **Operator is to remain with forklift**
- **Never move forklift with personnel on platform**
- **Never elevate anyone on forks**



PURPOSE: Discuss the proper way to lift personnel.

- Only OSHA/ANSI approved platforms should be used.
- The platform needs to be properly secured to the forklift as prescribed by the platform manufacturer.
- Emphasize that the operator should never lift anyone standing on the forks or on a pallet placed on the forks.

HOW TO SURVIVE A TIP OVER

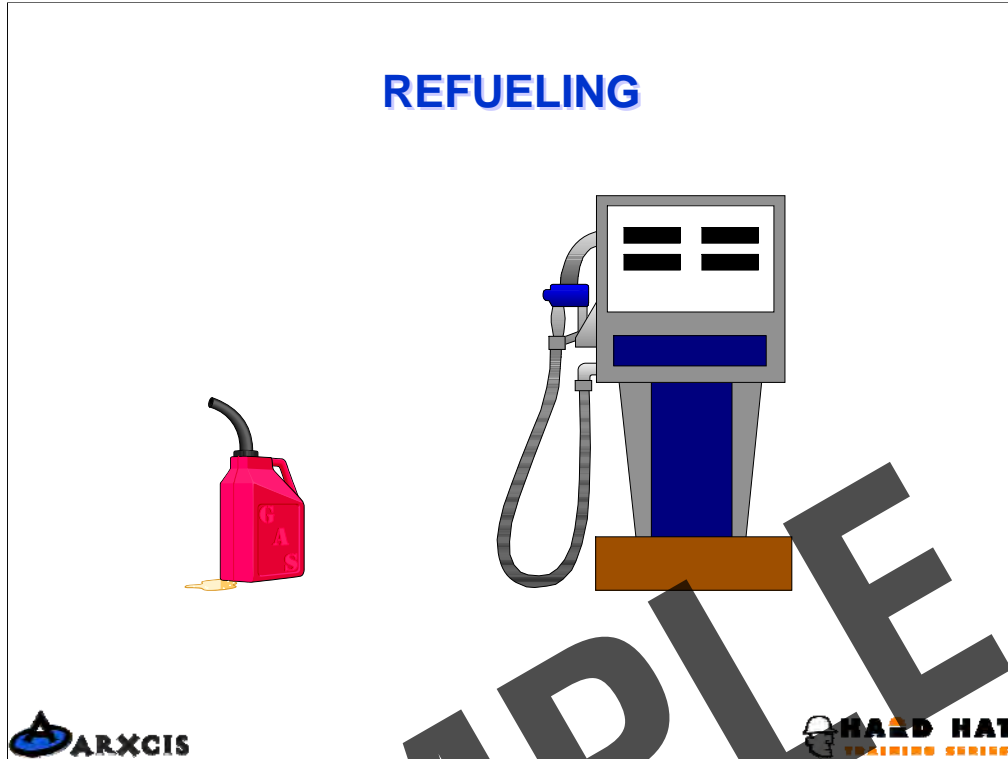
- **Always fasten operator restraint system**
- **Brace feet**
- **Hang on tight**
- **Lean forward and away from fall**
- *Don't jump!*



PURPOSE: How to survive a tip over.

- Principal points: always use the operator restraint system and never jump.
- Review other points and discuss how to avoid a tip over.

REFUELING



Before proceeding with the next section, have students complete the quiz in the student manual.

Discuss the answers.

REFUELING GASOLINE, DIESEL & LIQUID PROPANE FORKLIFTS

- Refuel when engine is cool
- Start shift with a full tank
- In designated areas only
- No smoking, flames or sparks



PURPOSE: Understand the general rules for refueling the forklift.

- Review each item and discuss how it makes refueling safer.
- Emphasize that starting the work shift with a full tank could avoid an unsafe situation where the forklift ran out of gas when making a difficult lift.
- 29 CFR 1910.178(p)(2) Fuel tanks shall not be filled while the engine is running. Spillage shall be avoided.

REFUELING GASOLINE & DIESEL FORKLIFTS

- **Fire extinguishers in area**
- **Park in “unattended parking” mode**
- **Use correct type fuel**
- **Clean up spills**
- **Do not completely fill container**



PURPOSE: Review the special safety precautions regarding gasoline and diesel forklifts.

- A fire extinguisher is to be in the refueling area.
- Avoid topping off the tank, which could result in a spill and the creation of a fire hazard.
- **29 CFR 1910.178(p)(3)** Spillage of oil or fuel shall be carefully washed away or completely evaporated and the fuel tank cap replaced before restarting engine.

CHARACTERISTICS OF LP FUEL

- **Heavier than air**
- **Extremely flammable**
- **Extremely cold**
- **Odorless in its natural state**



PURPOSE: Review the characteristics of liquid propane fuel.

- The primary characteristic of LP fuel is that it is heavier than air and therefore will settle into confined spaces. A spark could then ignite the fuel.
- LP fuel can cause frostbite if it comes in contact with skin.

LP GUIDELINES

- **No refueling or parking LP forklift in**
 - **Confined areas**
 - **Near high heat sources or open flame**
 - **Near stairways, exits, safe egress passageways**
- **Turn off service valve when**
 - **Forklift is parked for extended periods**
 - **LP tanks is empty**
- **Don't drop, roll or strike LP tank**



PURPOSE: Review the general guidelines for LP fueled forklifts.

- Discuss why it is important not to park or refuel in confined spaces, near heat sources, or exits.

Explanation for not refueling in exit area: others attempting to escape a fire could have their only means of escape blocked.

- Care needs to be used when handling an LP tank to avoid damage.
- **29 CFR 1910.178(m)(14)** Fire aisles, access to stairways, and fire equipment shall be kept clear.

REPLACING LP TANKS

- **Trained and authorized personnel only**
- **Wear protective clothing**
- **In designated areas**
- **Use “Attended parking” mode**
- **Turn off service valve**
- **Run fuel line out**
- **Try to restart engine**
- **Disconnect fuel line & remove LP tank**



PURPOSE: Review the guidelines for replacing LP tanks.

- Wear protective clothing. Eye and face protection is important to avoid injury from any escaping fuel.
- The service valve needs to be turned off prior to removing the tank. *Explain that running the engine with the service valve closed will empty the fuel line and therefore eliminate the possibility of gas escaping when the fuel line is disconnected.*

REPLACING LP TANKS

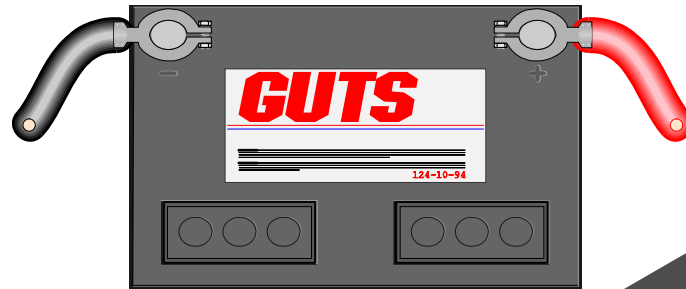
- Check new tank for damage
- Tank must be compatible and fit within profile of forklift
- Place LP tank in proper position
- Secure tank with bracket restraints
- Open service valve *slowly*
- Check for leaks



Continuation from previous slide.

- The service valve needs to be opened slowly to avoid the back pressure check valve from shutting off fuel flow. If check valve engages, shut the valve off, wait five seconds and slowly open the valve.
- Use a soapy solution to check for propane leaks.

BATTERY CHARGING & RECHARGING



Before proceeding, have students complete the quiz in the student manual.

Review all answers.

BATTERY CONFIGURATION

- **Primary voltage in North America**
 - 24, 36 and 48 volts
- **Battery size affects**
 - Vehicle lifting capacity
 - Vehicle stability
 - Charge life
 - Work cycle duration



PURPOSE: Review general characteristics of industrial batteries.

- Industrial batteries typically consist of six or more cells connected in series.
- Since the battery is one of the principal offsetting weights, its size affects the lifting capacity of the vehicle.

WHAT IS AN INDUSTRIAL BATTERY?

- Six or more cells connected in series
- Cell consists of positive & negative plates
- Plates are submerged in electrolyte
- Each cell equals 2.2 volts
- Number of cells times two = battery voltage



PURPOSE: Review the general characteristics of an industrial battery.

- Briefly discuss each item.

BATTERY HAZARDS

- **Battery weight**
- **Battery acid**
- **Explosive fumes**
- **Electrical shorts**



PURPOSE: Extra attention to safety is required when working with industrial batteries.

- Batteries can weigh 2,000 pounds or more. Always use proper lifting equipment when changing them.
- Batteries contain sulfuric acid, which is highly corrosive. Always wear proper protective clothing when working around a battery.
- Toward the end of the battery charging process, batteries give off highly explosive hydrogen fumes. The charging area must be properly ventilated.
- When working around batteries, remove all conductive jewelry. Contact with electrical cells can cause an electrical short and severe injury.

GENERAL SAFETY RULES

- **Follow company policies**
- **Observe all safety rules**
- *Use trained and authorized personnel*



PURPOSE: Review the general rules for working with batteries.

SAMPLE

CHANGING & CHARGING BATTERIES

- **Use proper equipment**
 - **Insulated battery beam**
 - **Plywood cover *if terminals exposed***
 - **Hoist with enough lifting capacity**
 - **Personal protective equipment**
 - **Face shield & glasses**
 - **Rubber apron**
 - **Rubber gloves**



PURPOSE: Review the use of proper equipment when working with batteries.

- When changing a battery, make sure an adequate lifting device is used.
- The proper personal protective equipment must be worn when working around batteries.

CHANGING & CHARGING BATTERIES

- **Work in designated areas only**
- **Use “Unattended parking” mode**
- **Clear removal route**
- **Fully expose battery**
- **Connect battery plug to compatible charger**
- **Check cables & plug**
- **When disconnecting, *turn charger off first***



PURPOSE: Review the precautions to be used when changing and charging batteries.

- Batteries need to be fully exposed when charging to allow the hydrogen to escape.
- When disconnecting the charger, be sure to turn it off first. If the cables are disconnected before the charger is turned off, a spark could be created, which in turn could ignite the hydrogen gas.

WATERING BATTERIES

- Always add water *after* charge
- Use distilled or approved tap water
- Add water before charging only if separator plates are exposed
 - Then, add just enough to cover plate
- Never attempt to add acid



PURPOSE: Review the process for adding water to a battery.

- Adding water prior to charging could cause a boil over. Water should only be added before charging when the separator plates are exposed.
- It should never be necessary to add additional acid to a battery. Doing so causes a hazardous situation.

INSURING MAXIMUM BATTERY LIFE

- **Discharge battery to recommended levels**
- **Battery life = 1,500 to 2,000 cycles**
- **Avoid quick or opportunity charges**
- **Follow 8 - 8 - 8 rule**
- **Do not overcharge battery**
- **Do not undercharge battery**
- **Clean battery periodically**



PURPOSE: Discuss the ways for insuring maximum battery life.

- The typical recommended discharge for an industrial battery is 80%.
- Quick charges can actually shorten a battery's life.
- Over-charging creates high battery temperatures and can cause a boil over.
- Under-charging a battery can cause the plates to become dry and brittle (sulfation) and will shorten the battery's life.
- Clean batteries with neutralizing detergent and water.
- Have students complete the quiz on page 35 of the student manual. Discuss each answer.