OSHA 7005

Public Warehousing and Storage

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Objectives

- Explain the hazards of operating powered industrial truck in warehouse and storage facilities
- Explain the hazards associated with material handling in warehouse operations
- Identify the purpose of the Hazard Communication Standard and describe employer and employee responsibilities under HazCom
- Discuss exit routes and emergency action and fire prevention plans
- Describe hazards of wall and floor openings

OSHA 7005: Public Warehousing and Storage

Table of Contents

Background

- OTI developed this course in 2004, in response to high incident rates and high fatality rates in Public Warehousing and Storage.
- Fatality rate in 2001
  - Warehousing: 7.24%
  - All industry: 5.3%

Most Common Injuries/Illnesses in 2001

- Strains/sprains
- Fractures
- Bruises
- Cuts/punctures
- Multiple trauma

Most Cited Violations in 2002

1. Powered Industrial Trucks
2. Hazard Communication
3. Portable Fire Extinguishers
4. Wiring Methods, Components, Equipment
5. Guarding Floor and Wall Openings
6. Control of Hazardous Energy (Lockout/Tagout)
7. Means of Egress
8. Personal Protective Equipment
9. Respiratory Protection
10. Electrical Systems Design

Module 1

Powered Industrial Trucks

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Common Hazards

- Falling off loading dock/other surface
- Moving trucks/railroad cards during loading/unloading
- Slipping on dockboards
- Pedestrian injuries
- Instability of loads
- Tipover
- Surface conditions
- Potholes/cracks in floor
- Narrow aisles
- Ramps

Page 27 (Module 1.1, page 1)

Washington State forklift accidents & citations

The 5 most common citations by L & I safety inspectors involving forklifts in 2007 – 2009 were as follows:

1. Lack of training
2. No seatbelt or not using seatbelt
3. No inspection of the forklift for defects
4. Modification of forklift without manufacturer's approval
5. No nameplate or unreadable nameplate

13 employees were killed in forklift-related accidents from 2000 to 2009

1000+ employees were seriously injured (had to take time off from work to recover) in forklift-related accidents in the years 2006, 2007 & 2008

Parts of a Forklifts

Wikimedia commons

Types of Forklifts

Class 1 Electric Truck

Has the following:

1. Electric motor
2. A counter-weight in the rear
3. Solid or pneumatic (air filled) tires
4. Operator sits and drives

The "mast" is the telescoping track on which the forks and load are raised and lowered.

Counter-weight and battery.

Forks on a forklift. Some trucks have a solid platform and are called "platform trucks".

Solid tires for smooth surfaces. Pneumatic tires are used for rougher surfaces.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

Class 2 Electric Truck

Characteristics:

1. Electric motor
2. Narrow construction to fit in aisles
3. Solid tires

Rider Reach Truck

Order Picker

The operator stands on a platform which moves up and down. Sometimes called an “order picker”

On some models, forks reach in and out as well as up, down and tilt. Other models have the forks on the side (called "Side Loaders“) or allow the forks to pivot to the side (called "Front/Side Loaders”).

Straddle legs add stability for forklifts that don't use a counter-weight

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

Class 3 Hand Truck

Electric Motor Hand or Hand/Rider Trucks

Characteristics:

1. Motorized
2. Walk behind or ride
3. Low or high lift
4. Counter-weight or straddle

The operator can walk behind or stand on the platform and hold onto the grab bar.

This motorized pallet jack has a counter-weight. Straddle legs are provided on more compact or reach models.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

Class 4 Truck

Characteristics:

1. Propane internal combustion engine
2. Solid tires
3. One of the most common types

Propane/liquid petroleum gas (LPG) fuel cylinder. Other forklifts run on diesel or gasoline.

Types of Forklifts

Class 5 Truck

Characteristics:

1. Gasoline, diesel or propane engines
2. Pneumatic tires
3. Used outdoors in many cases.

Pneumatic (air filled) tires with tread are used for traction and stability on rough or wet surfaces.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

Class 6 Industrial Tractor Truck

Characteristics:

1. Electric or internal combustion engine
2. Solid or pneumatic tires
3. Specialty vehicles
4. Pull or carry loads (no forks)

Wikimedia Commons

Yard Tractor

Wikimedia Commons

Industrial Tractor

Wikimedia Commons

Straddle carrier

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

Class 7 Rough Terrain Truck

Characteristics:

1. Used outdoors in uneven or muddy locations
2. Pneumatic tires
3. Gasoline or diesel-powered

Log Yard Forklift

Rough Terrain Reach Forklift

Rough Terrain Mast Forklift

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Types of Forklifts

These are not powered industrial trucks (forklifts).

Non-powered pallet jack

Farm vehicles

Self-propelled elevated work platform

Earth-moving vehicle

Bobcat skid steer with forks

All photos – Wikimedia Commons

Forklift Attachments

Forklifts can have a variety of attachments which affect their performance and use.

The load capacity of the forklift is reduced by the weight of the attachment.

The attachment must be approved by the forklift manufacturer.

Be sure you know how to use the specific attachment on the forklift you will be operating or get training if you don't.

Crane Attachment

Drum Grabber Attachment

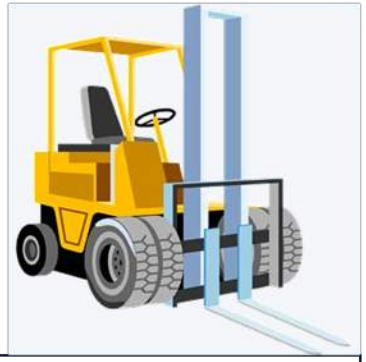
Carpet Lifting Attachment

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Forklifts are Different from Cars and Trucks

- Heavier and cannot stop quickly
- Steer from the rear, backswing
- High center of gravity, susceptible to tipover
- Reduced visibility
- Controls are more complicated



This…..

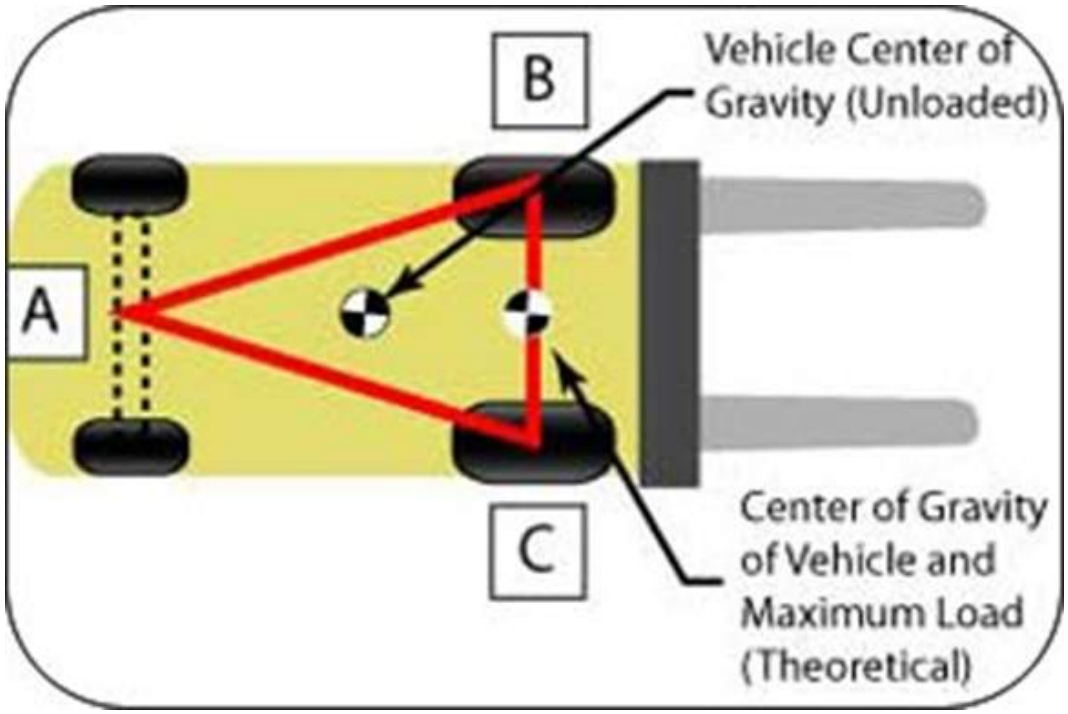
…..doesn't operate like these.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Balance

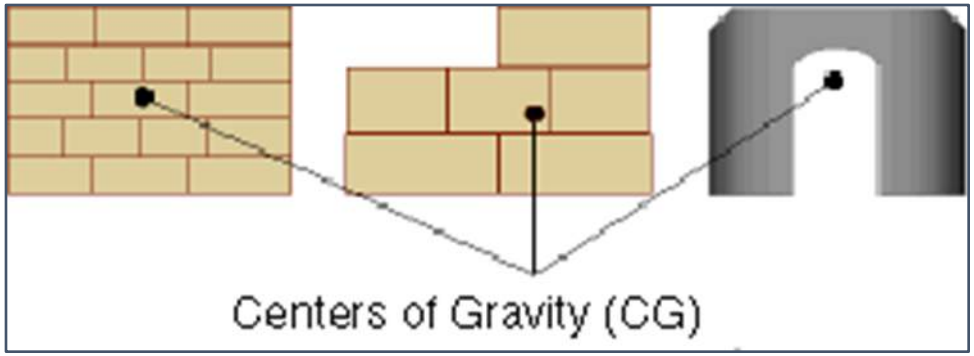
- Center of Gravity (CG)
- Shifting Center of Gravity (with load)
- Fulcrum point and seesaw effect

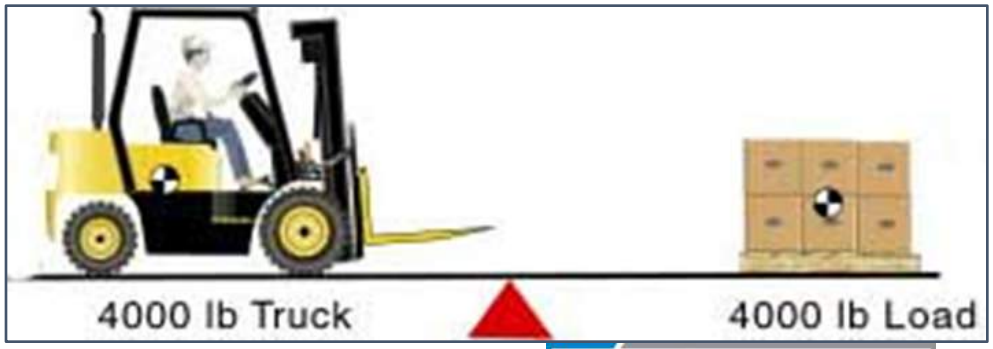


Page 34 (Module 1.1, page 8)

Center of Gravity

- The point on an object at which the object's weight is concentrated.
- CG is in the center of a regular load and off-center for an irregular load.

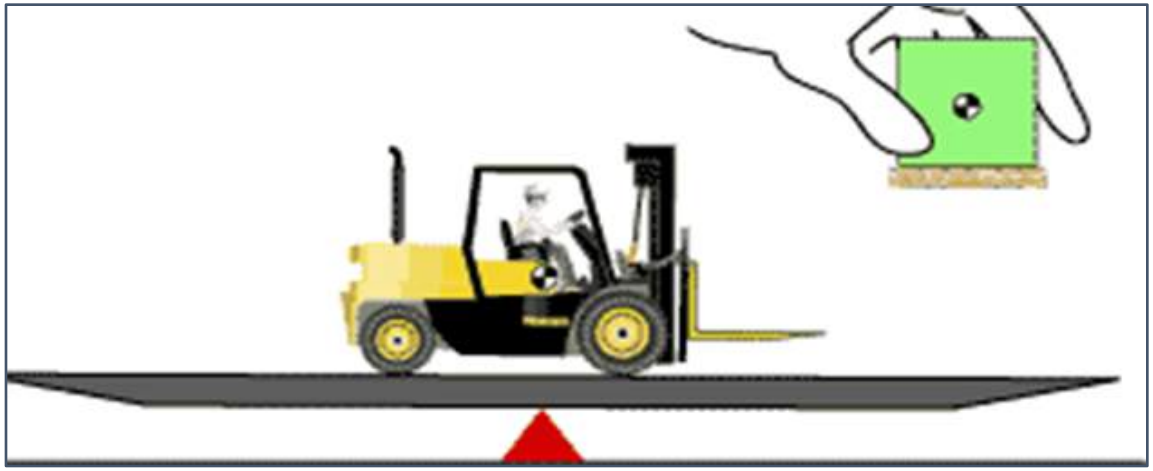




Page 34 (Module 1.1, page 8)

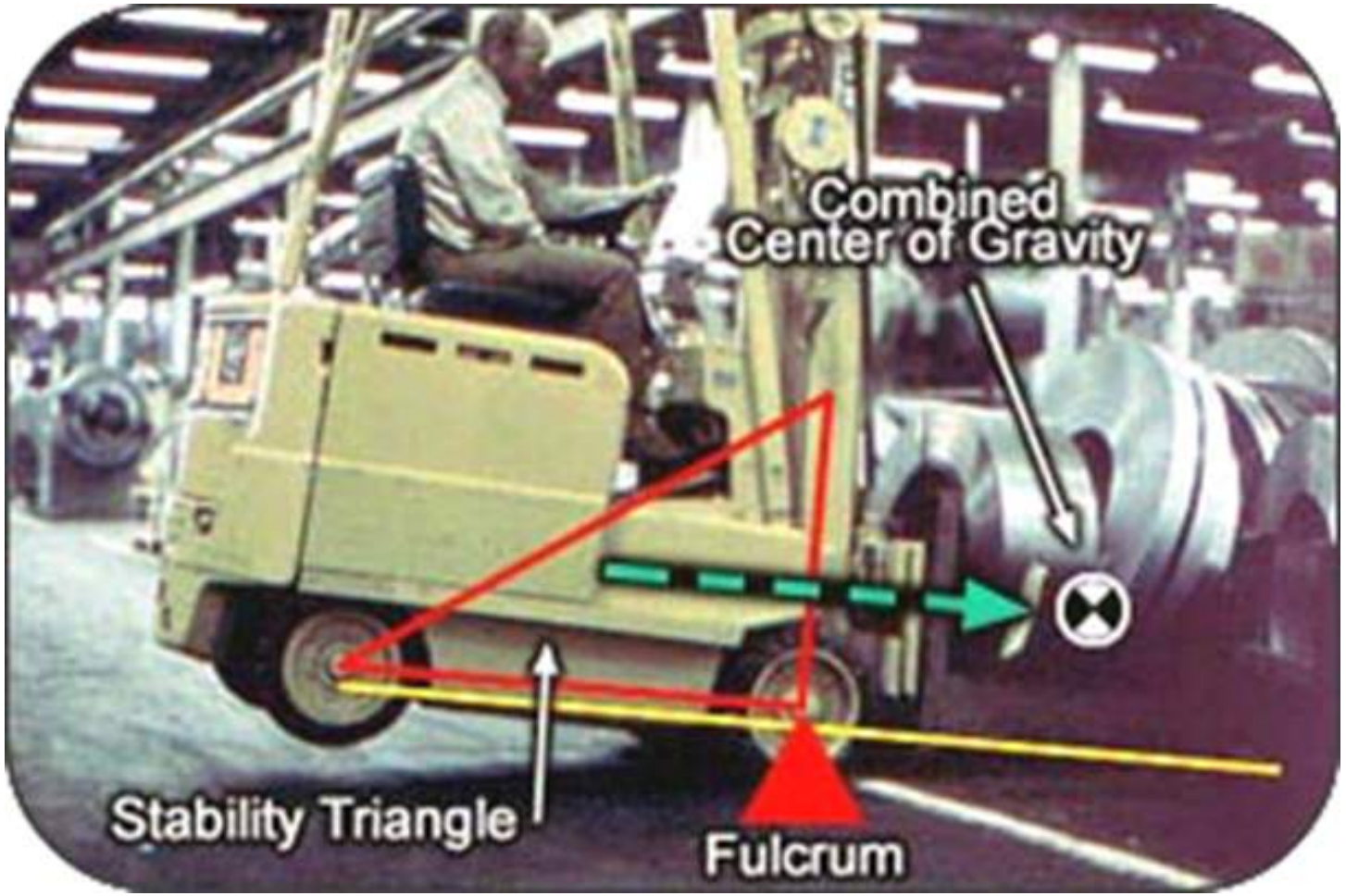
Combined Center of Gravity

- When the forklift picks up a load, the combined center of gravity shifts towards the front of the forklift.
- If the back wheel lifts off the ground, the forklift is overloaded.
- **Do not operate an overloaded forklift!**

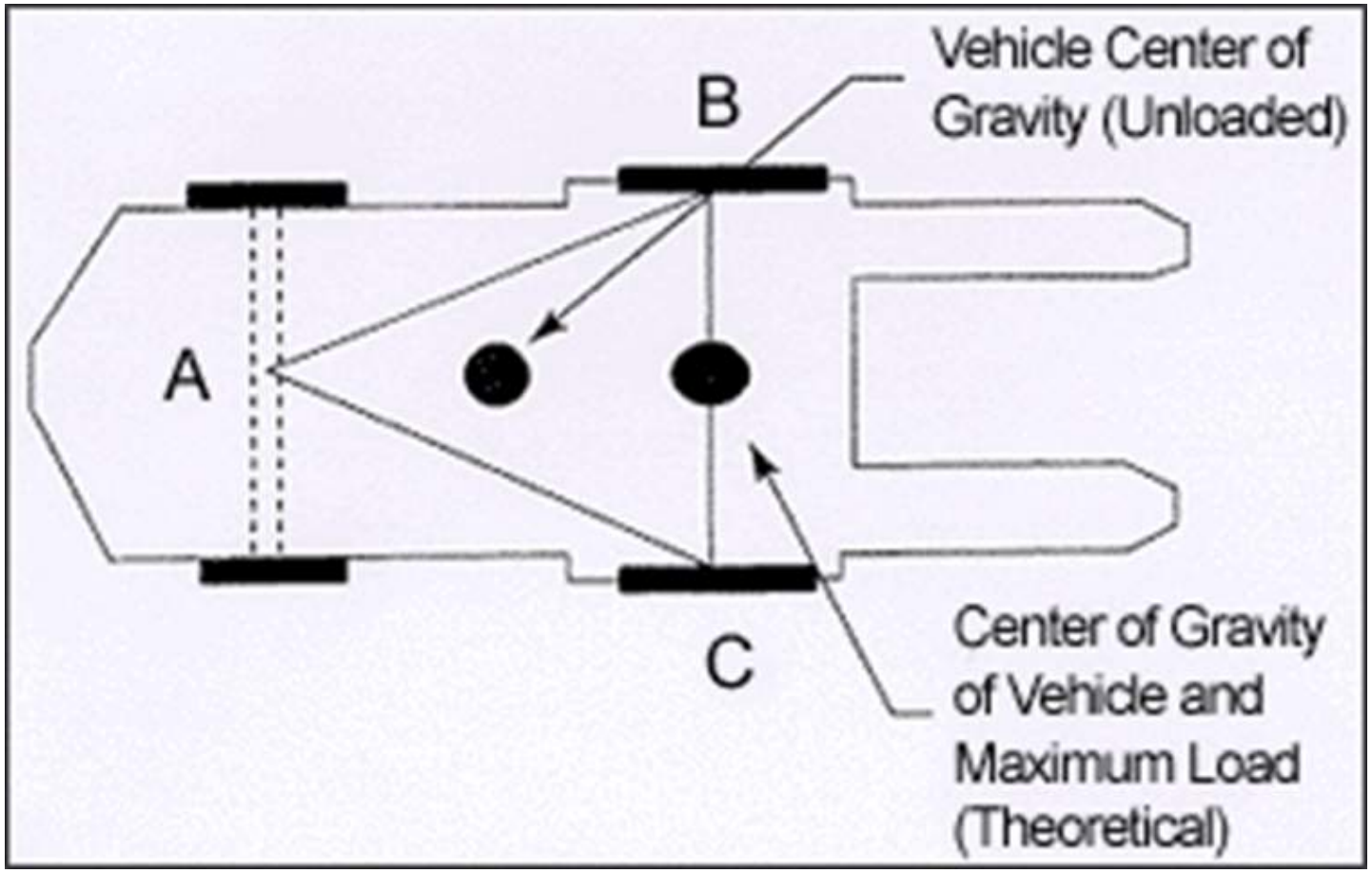


Page 35 (Module 1.1, page 9)

Stability

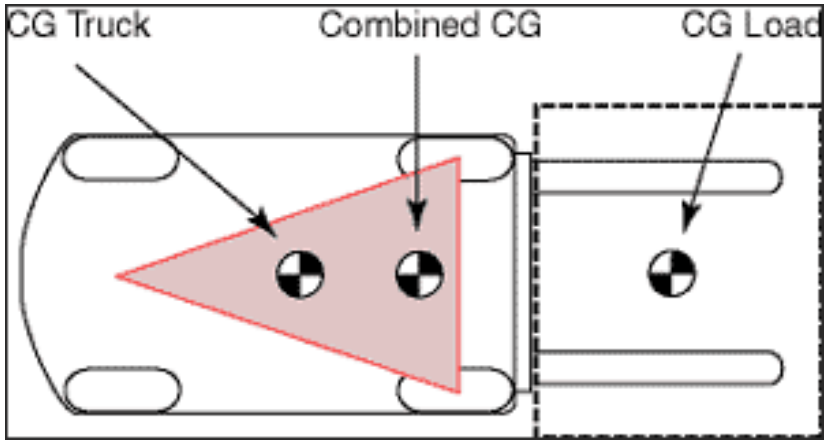


Stability Triangle

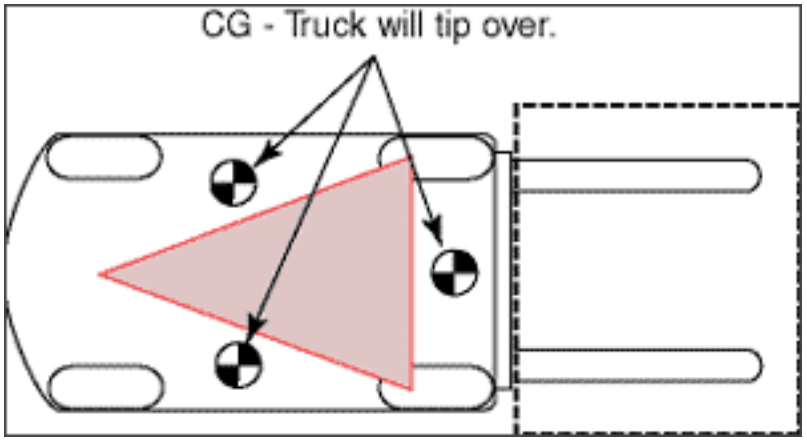


Page 35 (Module 1.1, page 9)

Stability Triangle



The forklift will not tip over as long as the Combined Center of Gravity of the truck and load system remains within the Stability Triangle.

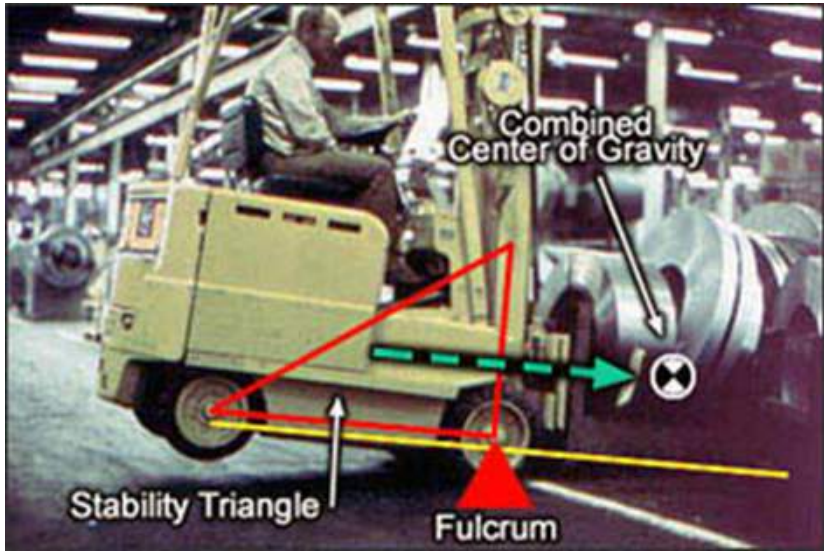


If the CG shifts outside the boundaries of the stability triangle, the truck will tip over.

Page 35 (Module 1.1, page 9)

Longitudinal Stability

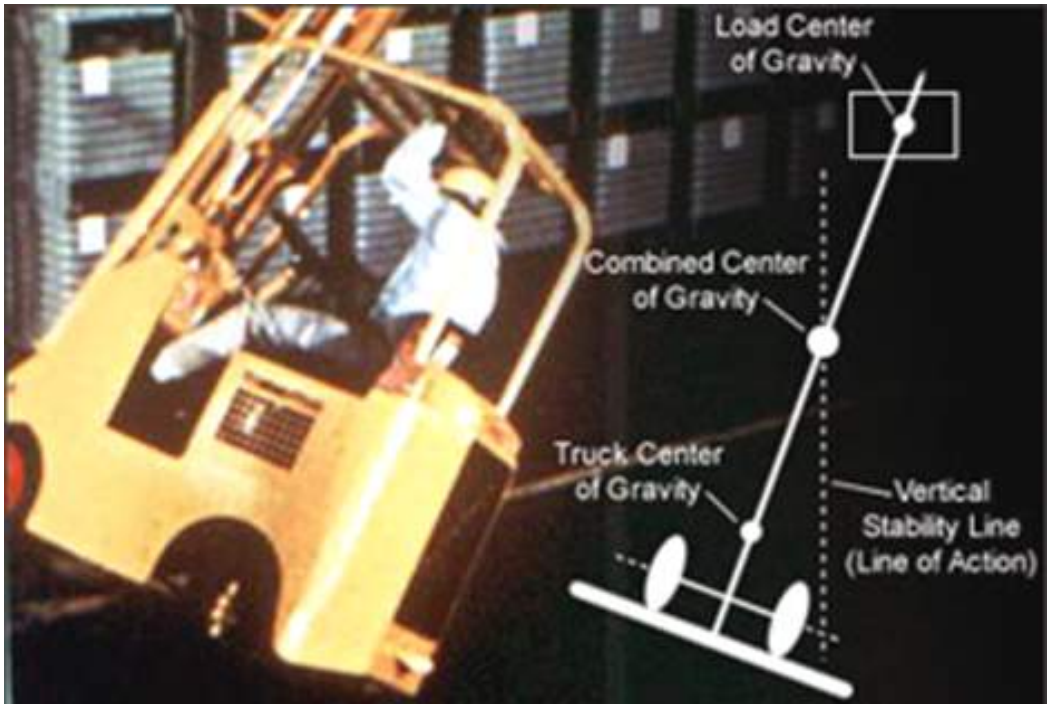
- Fulcrum: The axis of rotation
- Moment: The objects weight times the distance from a fixed point.
- If the load's moment is greater than the vehicle moment, the truck will tip over.



Page 36 (Module 1.1, page 10)

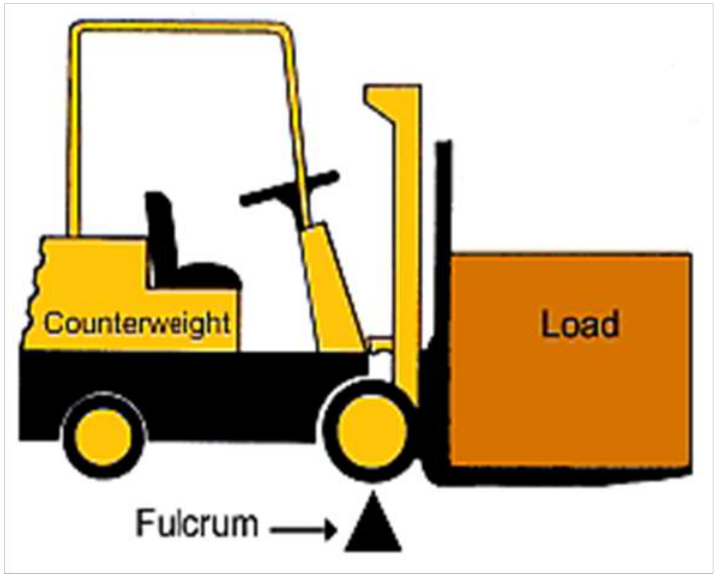
Lateral Stability

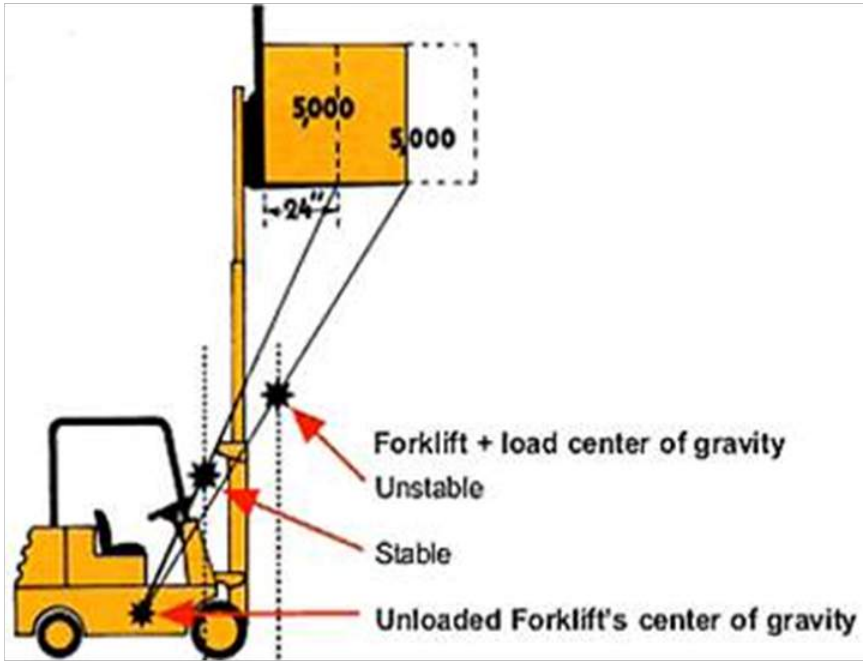
- Line of Action: Vertical line passing through the combined vehicle and load center of gravity relative to the stability triangle
- When the line of action is inside the Stability Triangle, it will not tip over.
- If the line of action is outside the Stability Triangle, it will tip over.



Page 36 (Module 1.1, page 10)

How loads affect forklifts





A forklift balances a load with a counterweight at the back. The front wheels act as a fulcrum or balance point. The center of gravity moves upward when the forks are raised.

Page 37 (Module 1.1, page 11)

Stability

- Basic principles: https://www.youtube.com/watch?v=95kb-PcPYsM
- Model: https://www.youtube.com/watch?v=ABPUW23uWW8
- Summary: https://www.youtube.com/watch?v=7jt_4PAEh5k

Forklift Capacity

Forklifts must have a label or nameplate containing:

- Model and serial number of forklift
- Weight
- Compliance with ANSI/ITSDF B56.1 (formerly ASME B56.1)
- Conformance with UL or FM requirements
- Rated capacity

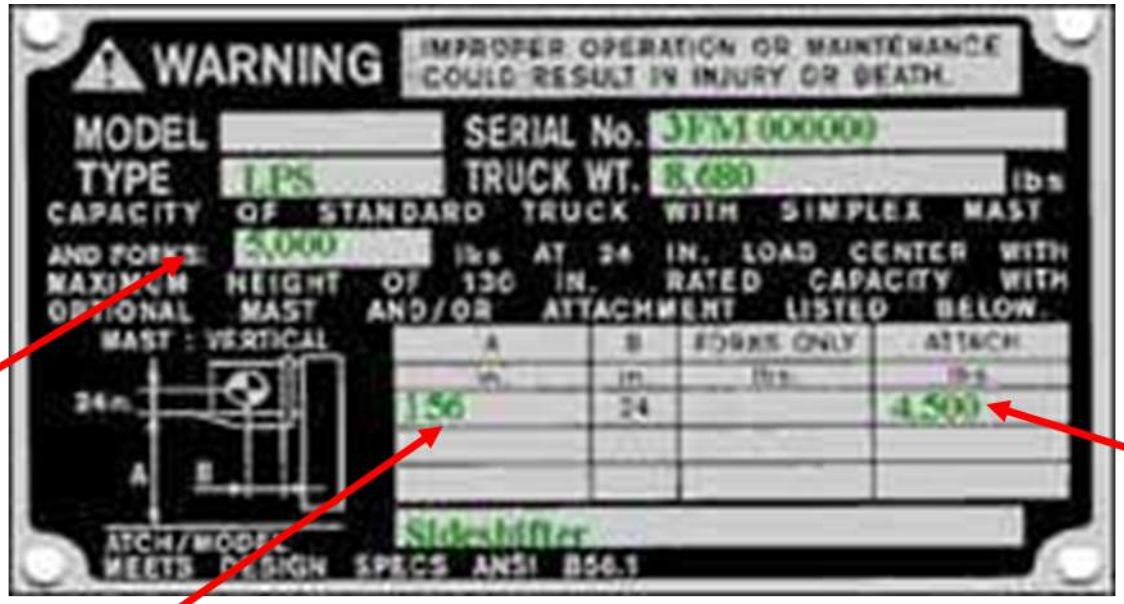
Forklift Nameplate

The nameplate will list the type of forklift and the capacity

OSHA

This forklift is a propane (LP) powered forklift, weighing 8680 lbs. with a lifting capacity of up to 4500 lbs.

Attachments Reduce Capacity



OSHA

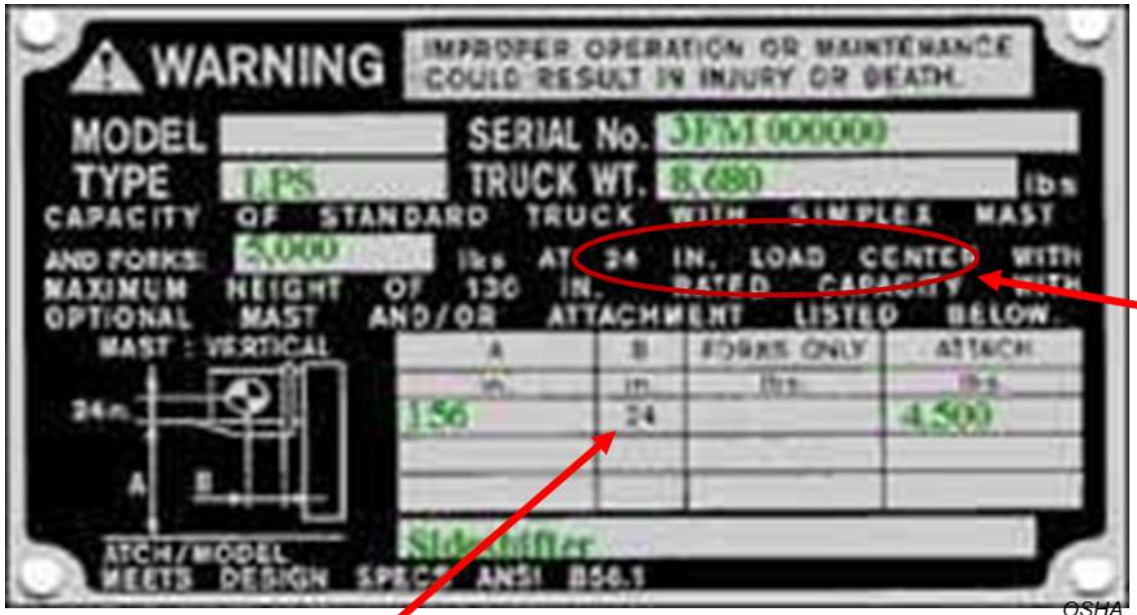
Load Capacity without attachments

Load Capacity with attachment

Maximum height with attachment

Load Center

Rated load applies to the load center indicated on the data plate:



Load Center without attachments

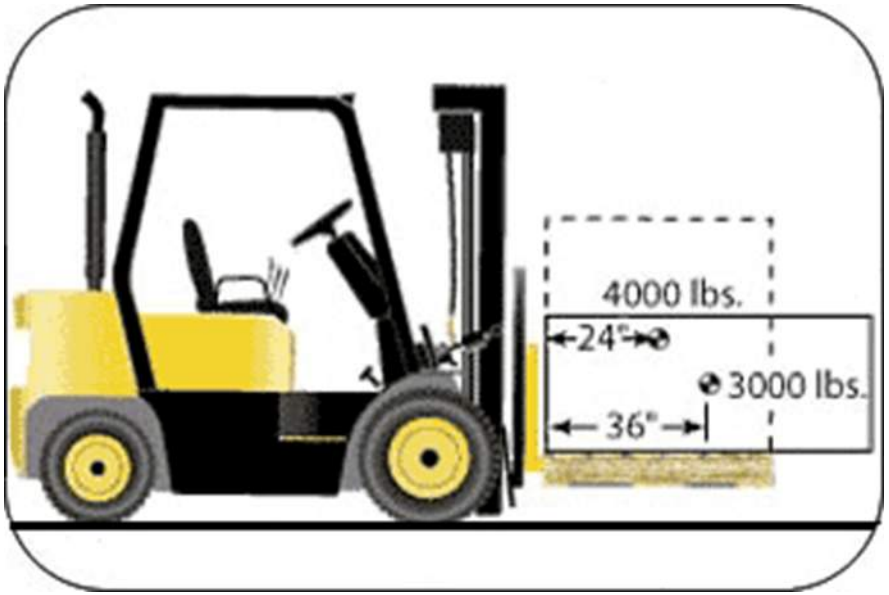
Load Center with attachment

Page 38 (Module 1.1, page 12)

Load Center

Consider the following:

- Weight
- Size
- Position
- Safe Load Capacity

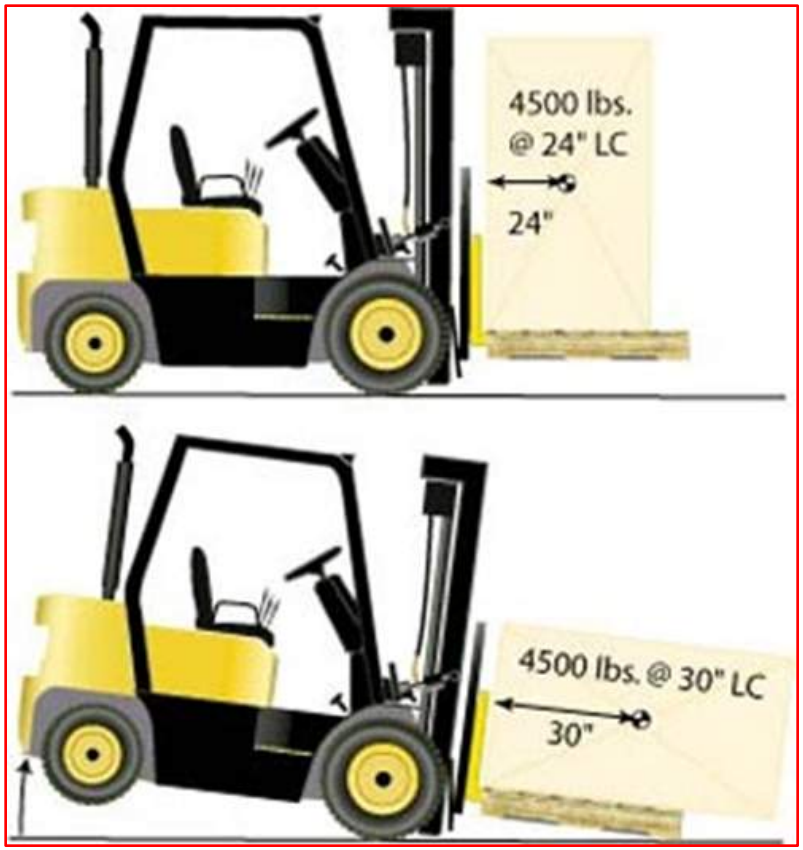


Page 39 (Module 1.1, page 13)

Load Center

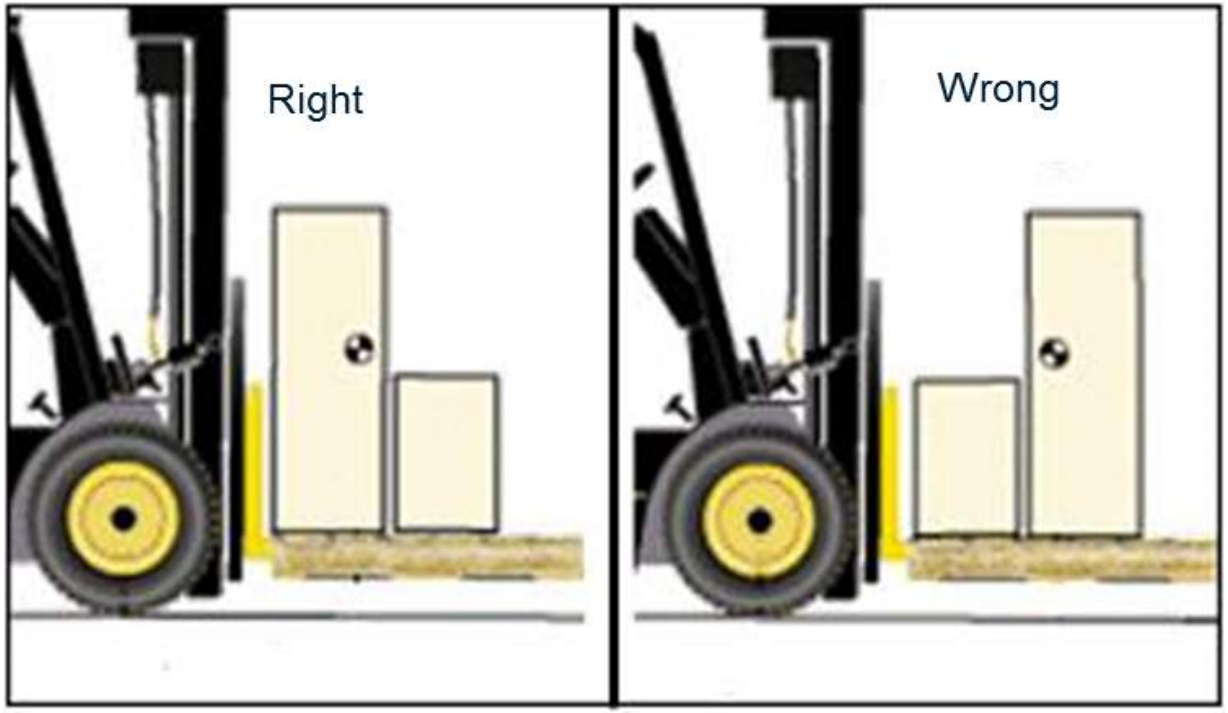
Weight, size and position affect stability:

- Capacity is reduced by 1000 pounds for every 12 inch increase in load center



Page 39 (Module 1.1, page 13)

Consider Load Center When Moving Loads



Put heaviest weight near mast.

Page 39 (Module 1.1, page 13)

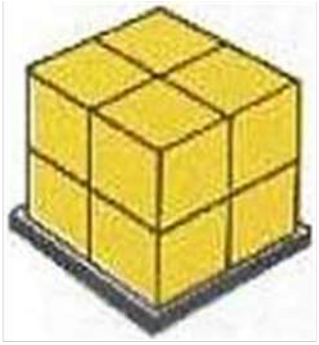
Determining Load Capacity

- Use distances on nameplate
- Rule of thumb:
  - 1000 pound reduction in load for every 12 inches off load center
- Operators Manual
- Field calculations

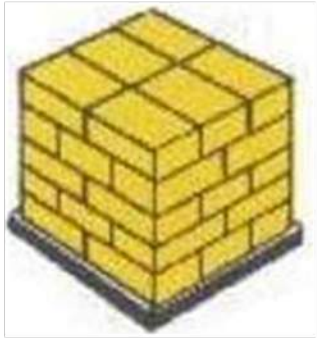
Page 40 (Module 1.1, page 14)

Stacking Loads on Pallets

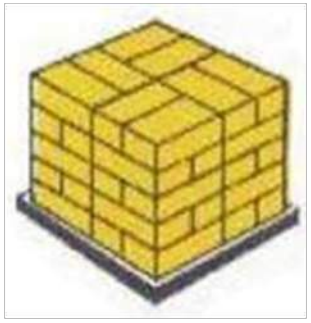
Loose or off center loads are subject to falling. This can change the center of gravity and cause tip over. These illustrations show the correct way to load pallets:



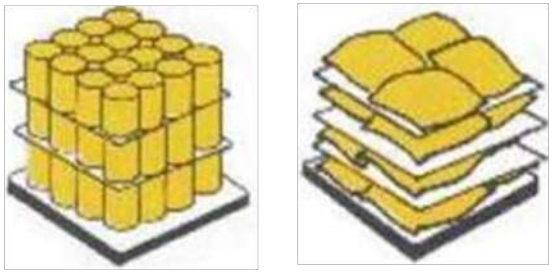
BLOCK
The most common. The upper level may be unstable if not encircled with wire or strapping.



BRICK
Containers are interlocked by turning each level 90 degrees.



PINWHEEL
Used where brick pattern is unstable.



IRREGULAR STACKING PATTERNS
Wood strips, plywood or heavy cardboard between layers can help stabilize castings, bags, and other irregular shapes.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

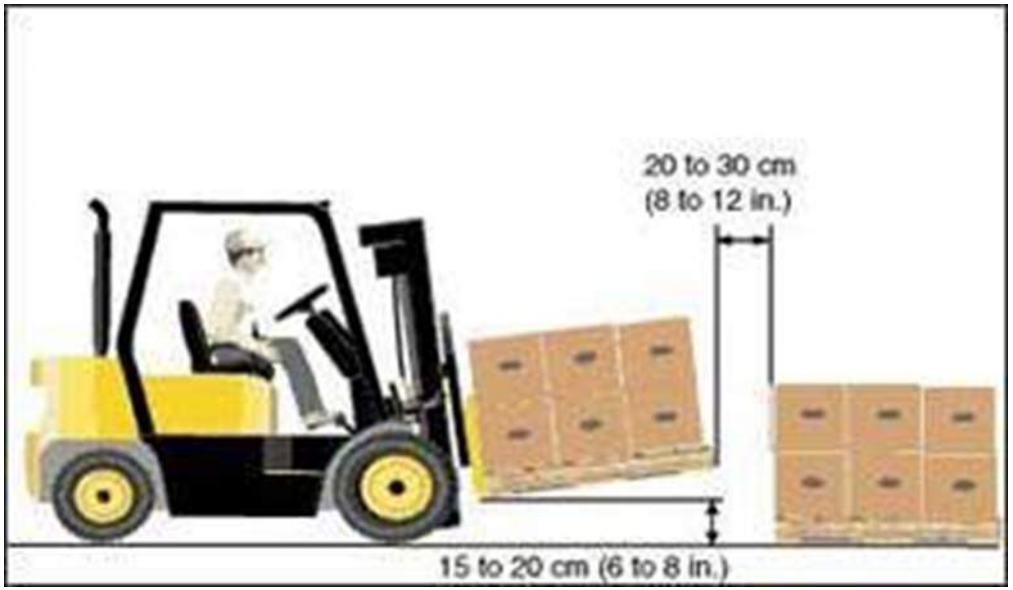
Don’t Use Damaged Pallets

Page 41 (Module 1.1, page 15)

Moving Loads

Use extra care when handling loads that approach the forklifts maximum rated capacity.

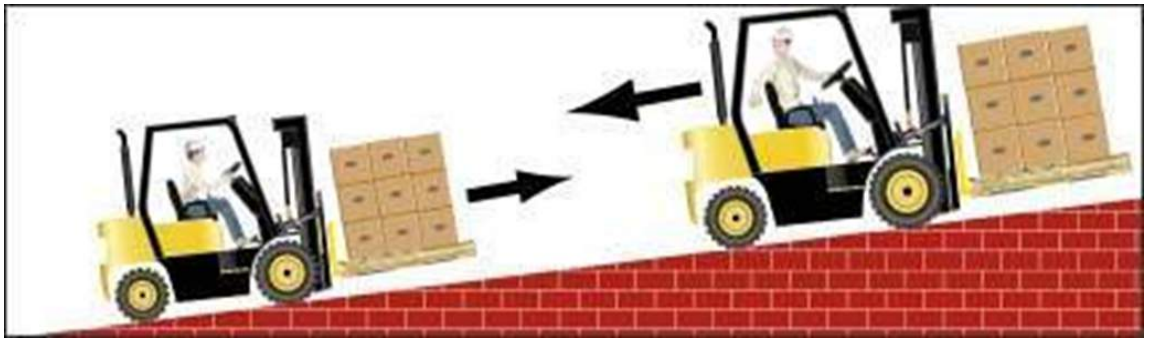
- Carry load at lowest possible position
- Travel with mast tilted back
- Tilt mast forward cautiously when unloading
- Never travel with load elevated



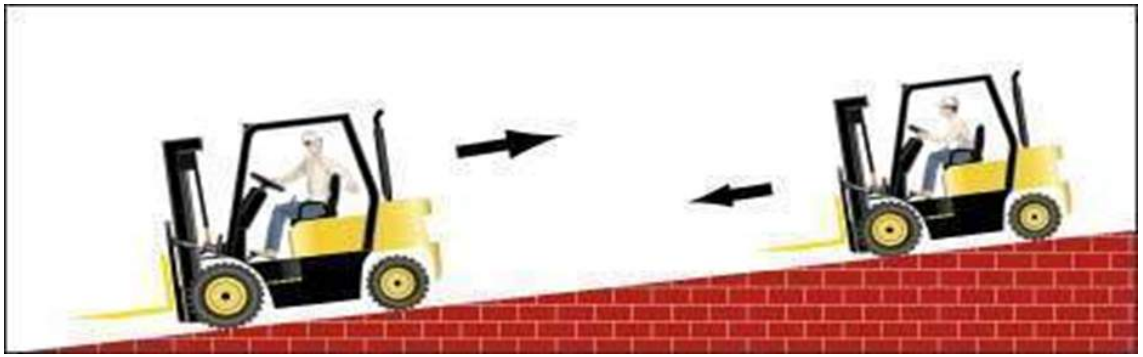
Page 42 (Module 1.1, page 16)

Moving on an Incline

Traveling with a load: Point forks uphill



Traveling without a load: Point forks downhill

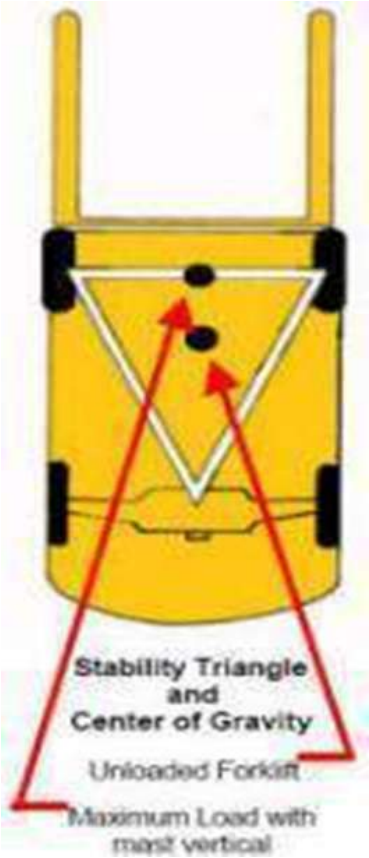


Page 42 (Module 1.1, page 16)

Motion

Sudden starts, stops or sharp turns may shift the center of gravity outside the stability triangle, resulting in tipover.

- Do not accelerate or decelerate rapidly
- Consider forces that result when a vehicle and load are in motion.



Page 42 (Module 1.1, page 17)

Surface Conditions

Operating a forklift on slippery conditions can result in skidding. Skidding can lead to tipover.

- If possible, avoid moving forklift on hazardous surfaces
- Spread absorbent on slick surfaces
- Cross slowly, cautiously
- Cross uneven areas at an angle
- Post warning signs
- Slow down, maintain control
- Clean up before proceeding

Page 43 (Module 1.1, page 17)

Obstructions/Uneven Surfaces

Obstructions can cause the forklift to skid or bounce, leading to tipover.

- Walk route before driving if possible.
- Remove obstructions
- Cross speed bumps or railroad tracks slowly, at 45 degree angle.
- Maintain a spotter
- Keep at least on drive wheel on ground at all times
- Use a spotter

Page 43 (Module 1.1, page 17)

Work Platforms

Never lift personnel with a forklift without an approved platform with railings.

U.S. Army

Source: Pelsue Co.

Dangerous!!

Safe

Order Picker Fall Protection

In warehouses "order picker" forklifts, the vehicle must have either:

- Standard guardrails on all open sides

or

- A safety harness and lanyard

OSHA

CDC

Page 44 (Module 1.1, page 18)

Order Pickers

Risks include tipover if overloaded (in addition to falls).

- Check pallet weight before selecting item
- Place heavy loads on bottom
- Do not exceed rated capacity
- Never lift heaviest load to maximum lift/stacking height

Page 45 (Module 1.1, page 19)

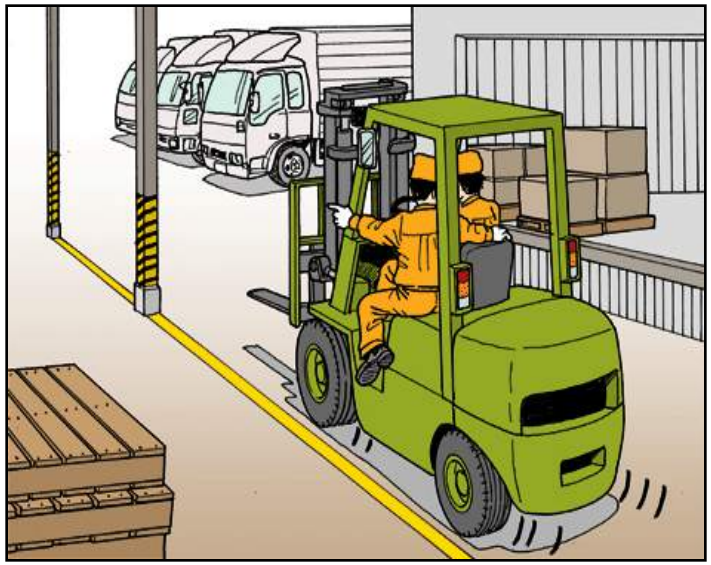
Passengers

Forklifts are not designed to carry passengers

- A forklift has one seat.
- The seat is for the operator.

Page 45 (Module 1.1, page 19)

The risk to a rider on a forklift



Source: JICOSH

A seasoned forklift operator sat next to the operator's seat while showing a new operator how to operate the forklift.

The new operator accidentally performed the wrong maneuver, causing the forklift to run into one of the pillars at the site. The worker who had been training him was crushed between the support pillar and the forklift.

Source: JICOSH

Page 45 (Module 1.1, page 19)

Floor Loading Limits

Floors are rated for weight, if exceeded, the floor could collapse

- Determine floor load limits and post
- Inspect floor
  - Holes,
  - Weakened flooring
  - Loose objects
  - Protruding nails, boards
- No forklifts if floor can't support weight

Page 46 (Module 1.1, page 20)

Loading Docks

Leading cause of forklift fatalities is from forklifts falling off loading docks.

- Set brakes
- Use chocks, stops, or other protection
- Fixed jacks
- Positive protection
- Dock safety program

Source: RiteHite Doors

Page 46 (Module 1.1, page 20)

Dockboards, Bridgeplates

- Strong enough for imposed load
- Secured in position
- Powered dockboards must meet CS 202-56 (1061) or later
- Handholds for safe handling of portable dockboards
- Positive protection

Page 46 (Module 1.1, page 20)

Visibility

Mast reduces forward visibility, especially when carrying a load

Forklift Blind Spot

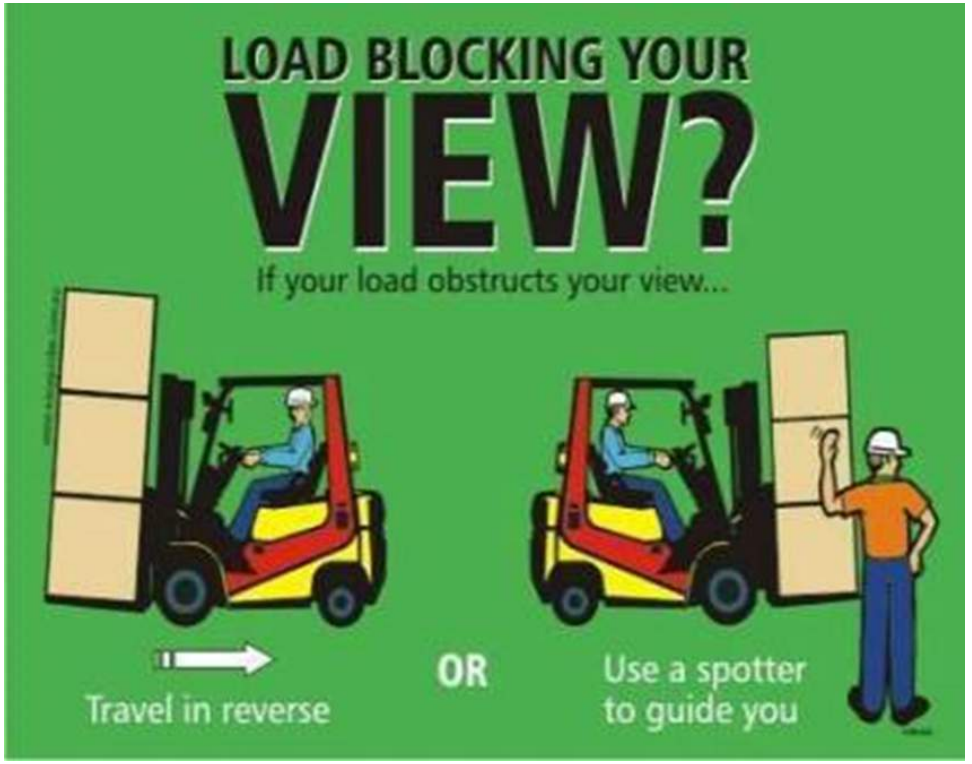
Blind spot

Page 49 (Module 1.1, page 23)

https://fortress.wa.gov/lni/shrl/VideoDetails.aspx?VideoID=1013

Pedestrian Safety: Operator Responsibilities

- Yield to pedestrians
- Slow down, sound horn
- Use spotter
- Look in direction of travel
- Signal to pedestrians to stand clear
- 10 foot clearance from co-workers



Page 50 (Module 1.1, page 24)

Pedestrian Safety: Pedestrian Responsibilities

- Make eye contact with operator and wait until operator indicates it is safe to pass
- Train pedestrians that forklifts cannot stop suddenly
- Stay clear of forklifts in operation
- Use pedestrian walkways
- Never pass under an elevated load

Page 51 (Module 1.1, page 25)

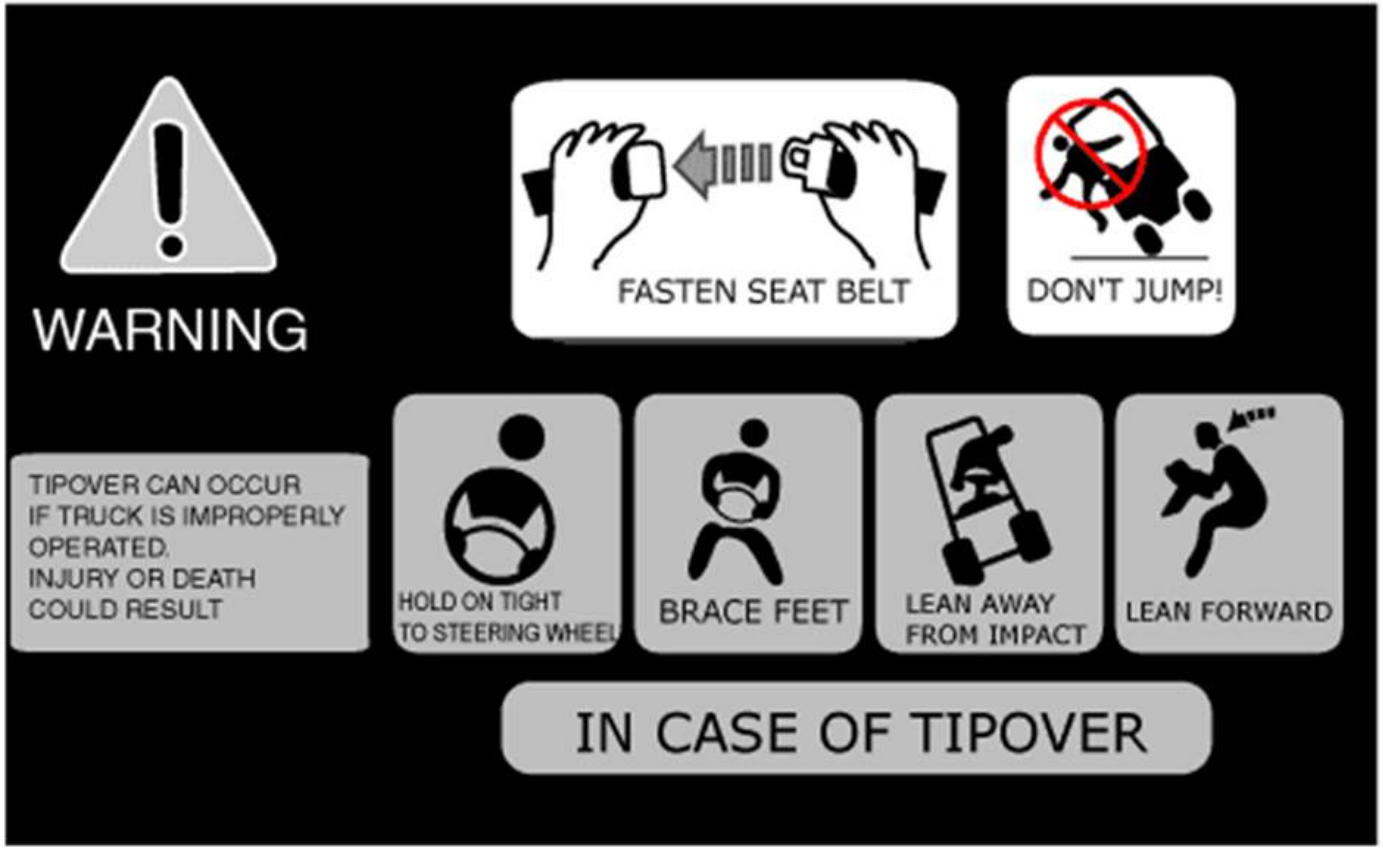
Seatbelts

- Required on all forklifts manufactured since 1992
- Retrofitted on older models
- Forklift Operators must use seatbelts when the forklift has them

Page 52 (Module 1.1, page 26)

In Case of Tipover:

Stay in the cage



https://www.youtube.com/watch?v=QLdCuogAupI

Page 52 (Module 1.1, page 26)

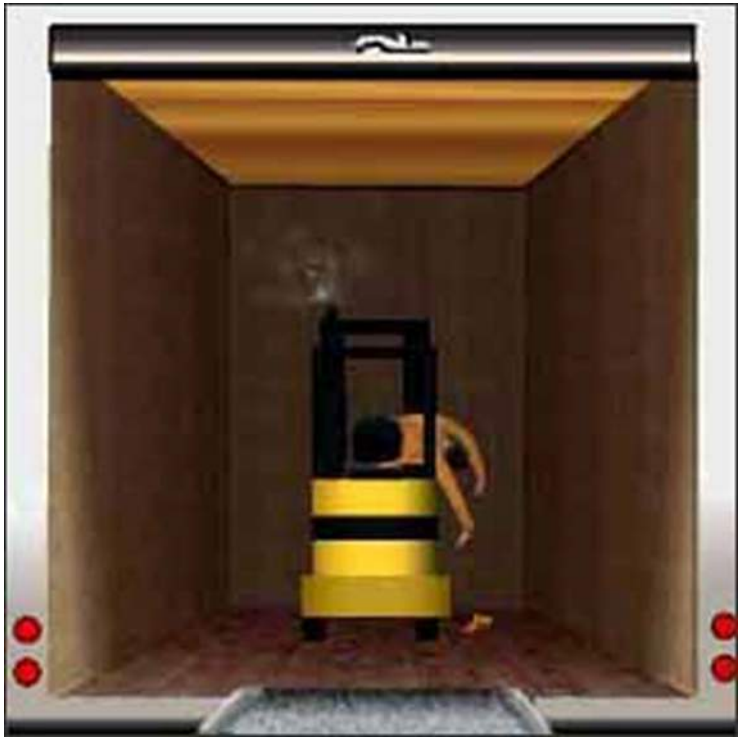
Carbon Monoxide

At low concentrations:

- Fatigue in healthy people
- Chest pain in people with heart disease

At higher concentrations:

- Impaired vision and coordination
- Headaches
- Dizziness; confusion; nausea, flu-like symptoms that clear up after leaving area of high concentration
- Loss of consciousness
- Fatal at very high concentrations



Page 54 (Module 1.1, page 28)

Carbon Monoxide Controls

- Conduct surveys
- Train workers
- Install sensors
- Use battery powered forklifts in tight spaces
  - Elevators
  - Railcars
  - Truck Trailers
- Avoid racing or idling engine

Source:Worksafe BC

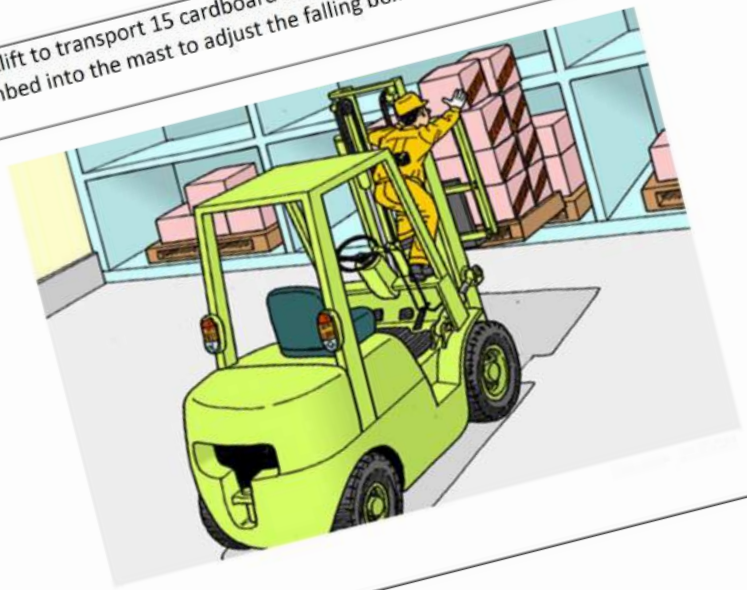
Page 54 (Module 1.1, page 28)

Activity:

PACIFIC NORTHWEST OSHA EDUCATION CENTER

Exercise: In groups, review the following scenarios. What accident can you forsee, and how could the accident be prevented:

1. While using a forklift to transport 15 cardboard boxes at once, some of the boxes started to slip. The operator climbed into the mast to adjust the falling boxes.



What happened next?

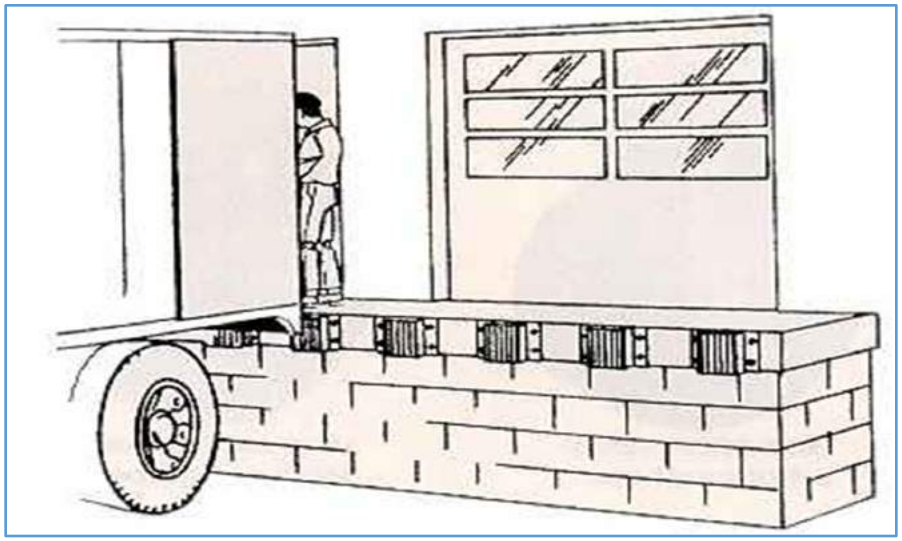
Page 60 (Module 1.1, page 34)

Loading Dock Safety

Hazards at loading docks

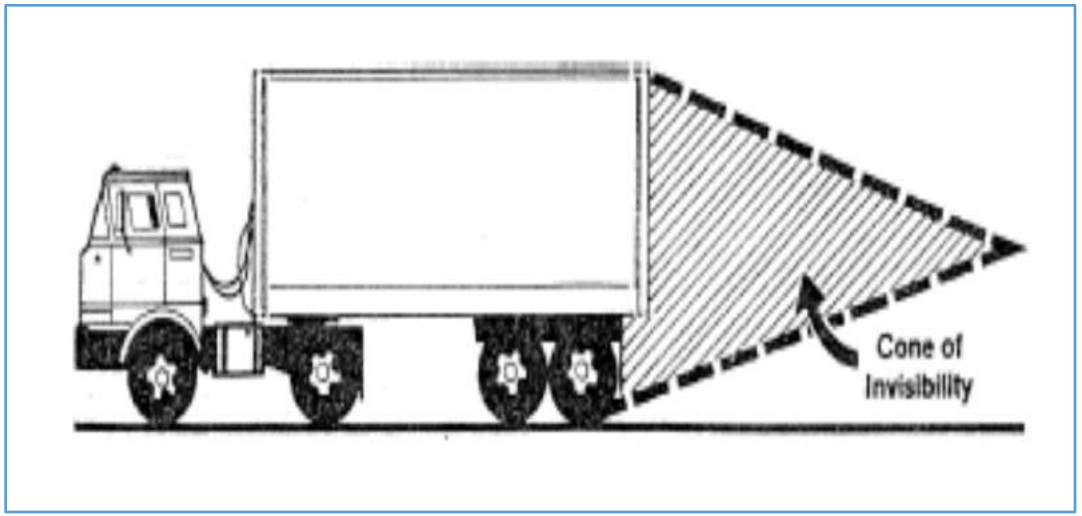
- Driving forklifts near dock edge
- Standing at edge of loading dock near moving trailers
- Guiding a backing truck or trailer
- Truck pulls away from dock with forklift inside

Source: RiteHite Doors



Page 75 (Module 1.2, page 1)

An employee standing at the edge of the dock is in the blind spot of the truck driver



Employees have been crushed when trying to see outside or communicate with the truck driver.

Dock Plates/ Levelers

Cover gap between loading dock and back of truck

- Heavy enough to withstand weight of forklift and load
- Ergonomic hazard (manual dock plates)
- Crushing hazard when moving or unjamming

Pullaway

"Live loads"
are hazardous, when tractor is attached to trailer and driver has access to vehicle.

Drivers have pulled away with forklift operators still inside trailer, resulting in death or serious injury.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Pullaway: Hazard Controls

- Close dock doors when trucks are moving in and out of dock
- Use spotters (safely)
- Require truck driver to verify no forklifts/ personnel in trailer before moving
- Chocks
- Use of trailer restraint system

Page 77 (Module 1.2, page 3)

Dock Locks

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Use of Dock Locks

Inside
Dock

Outside
Dock

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Wheel Chocks

- 1/5 height of wheel
- Place at a front or back rear tire
- Clear responsibility for placing chocks
  - Truck driver?
  - Forklift operator?
  - Dock worker?

Will a wheel chock prevent driver pullaway?

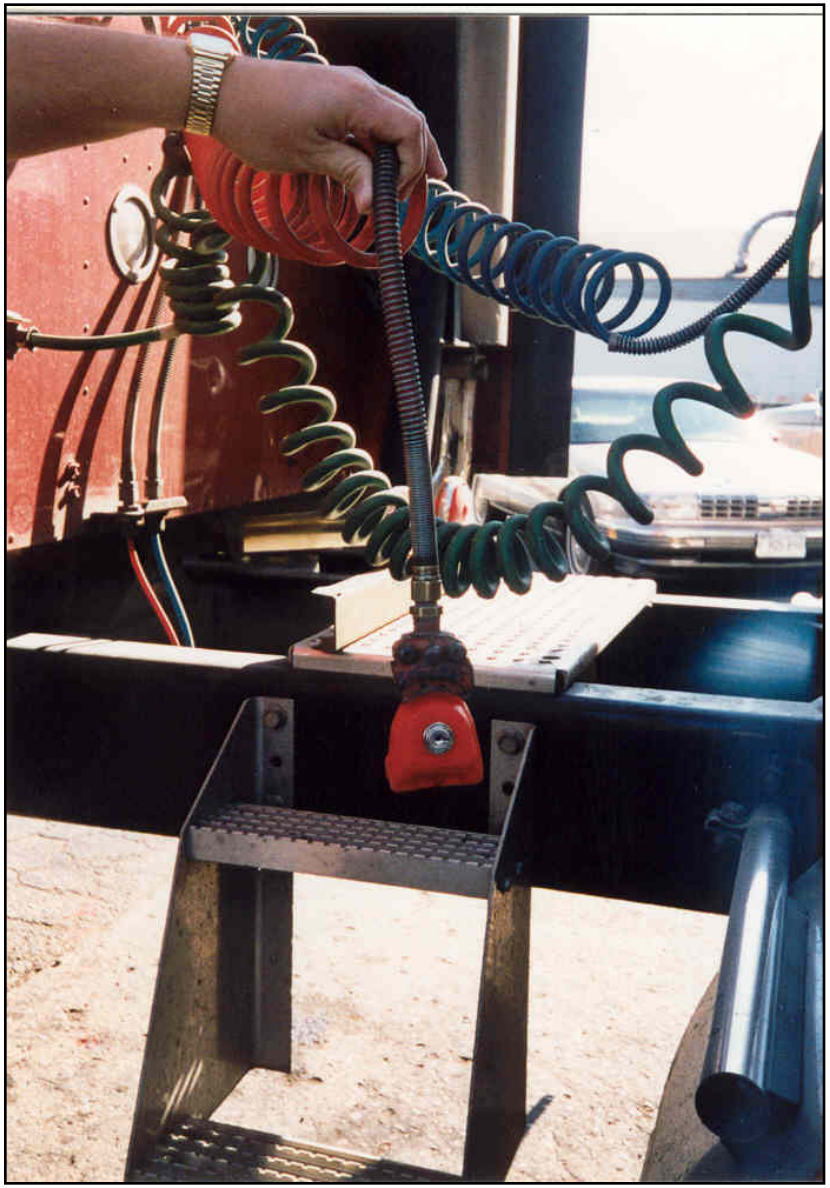
Page 79 (Module 1.2, page 5)

Wheel Restraints

Page 78 (Module 1.2, page 4)

Trailer “Deadlining” (lockout) device

- Lock is applied to emergency brake, and must be removed before airline can be connected
- Dock supervisor or forklift operator keeps key until load is complete and area is clear



Page 79 (Module 1.2, page 5)

Safe Forklift Operations

The operator is responsible for maintaining control of the forklift at all times.

Page 95 (Module 1.3, page 1)

Mounting the Forklift

- Keep hands clean and dry
- Grab handhold, not steering wheel
- Check shoes for grease
- Place feet firmly on step and pull body into cab

Page 95 (Module 1.3, page 1)

Starting the Forklift

- Pre-shift inspection
- Turn key
- Check gauges
- No warning lights? Gauge indicators in safe zone?
- Exhaust noise and color normal?
- No excessive vibration?
- Controls, breaks, lift mechanism good?
- Fasten seat belt
- Pathway clear?
- Proceed

If there are problems, do not operate the forklift

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Stopping the Forklift

- Park in authorized area
  - Do not block aisles or exits
- Lower forks
- Slowly apply brake, stop
- Neutralize controls
- Set parking brake
- Turn off ignition
- If on incline, block wheels
- Dismount carefully
  - Grab handhold
  - Lower body, don't jump
  - Watch foot placement

Page 96 (Module 1.3, page 2)

Operating Speeds

- Operate at speeds that:
  - Avoid tipovers
  - Avoid collisions
  - Avoid falling loads
- *Should* post speed limits:
  - 5 mph or less
  - “Fast walk”

Page 96 (Module 1.3, page 2)

Changing directions

- Move at walking speed of 2.5 mph
- For greater safety, come to a complete stop first
- Use horn/warning light to warn pedestrians if needed

Page 98 (Module 1.3, page 4)

Rear Wheel Swing

- Rear of truck turns in opposite direction of turn
- Anticipate rear wheel swing
- Start turn as close to inside corner as possible
- Do not turn from a central position in a narrow aisle
- Slow forklift to walking speed before making turn

Page 98 (Module 1.3, page 4)

Turning on Grades

Forklifts are less stable on grades. Do not turn on grades unless it is unavoidable.

If a turn has to be made:

- Reduce speed
- Turn steer wheel in smooth, sweeping motion

- If grade >10%, travel with load upgrade.
- Avoid running over loose objects.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Driving: Difference Between Forklifts and Cars

Things that are the same:

- Reduce speed before turning, on a grade, and when near obstacles

Things that are different:

- Forklifts can tip over
- Rear wheel swing
- Reduced operator visibility

So…

- Steer smoothly, reduce speed, slow down, avoid erratic movements, slow down, don't turn on a grade, slow down, don't drive over obstructions, slow down

This…..

…..doesn't operate like these.

Page 99 (Module 1.3, page 5)

Parking

When unattended:

- Park in authorized area
- Park on hard, level surface
- Tilt mast forward
- Lower load
- Forks away from pedestrians
- Neutralize controls
- Stop engine
- Remove the key
- Block wheels on inclines

A Forklift is "unattended" when

- *Not in view of operator, or*
- *Operator is >25 feet away (even if forklift is in view)*

Page 100 (Module 1.3, page 6)

Traveling in Reverse

- Look in direction of travel (turn and look behind)
- Keep a clear view
- Ascend and descend grades slowly
- Keep load upgrade when grade is >10%
- Travel with load and mast tilted back, raised just high enough to clear ground surface
- Travel with load trailing if it blocks view and no spotter

Page 100 (Module 1.3, page 6)

Safe Operations & Practices

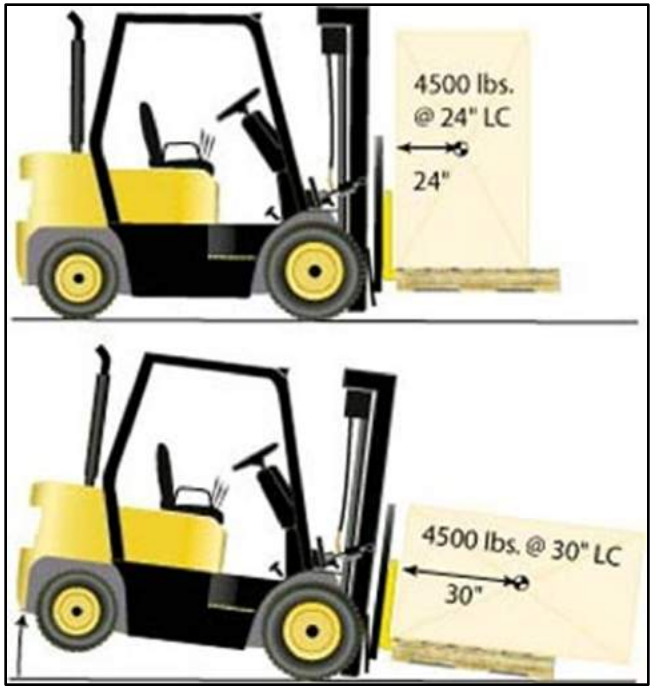
- Use appropriate equipment for the purpose intended
- Appropriate rated capacity, balance loads
- Separate forklifts and people
- Never drive up to anyone who could get “caught between”
- No passengers
- All body parts inside forklift
- Watch for obstructions
- Slow on slippery surfaces
- Safe distances from edges, platforms
- Keep exits clear
- Lower forks when traveling
- No people on or under forks

Don’t travel with a raised load!

Page 101 (Module 1.3, page 7)

Safe Handling of Loads

- Consider rated capacity, load distribution
  - Typically rated at 24 inches
- Properly secure uneven, oddly shaped loads
  - Banding
  - Shrink wrap
- Secure damaged loads
- Special handling for hazardous materials



Page 102 (Module 1.3, page 8)

Approaching Loads

- Approach slowly and carefully
- Stop in front of load, 8-12 inches short of load
- Square forklift in front of load
- Adjust fork height
- Lock parking brake
- Set direction control to neutral
- Do not raise or lower loads unless forklift is stopped and brake is set

Page 102 (Module 1.3, page 8)

Mast & Fork Position

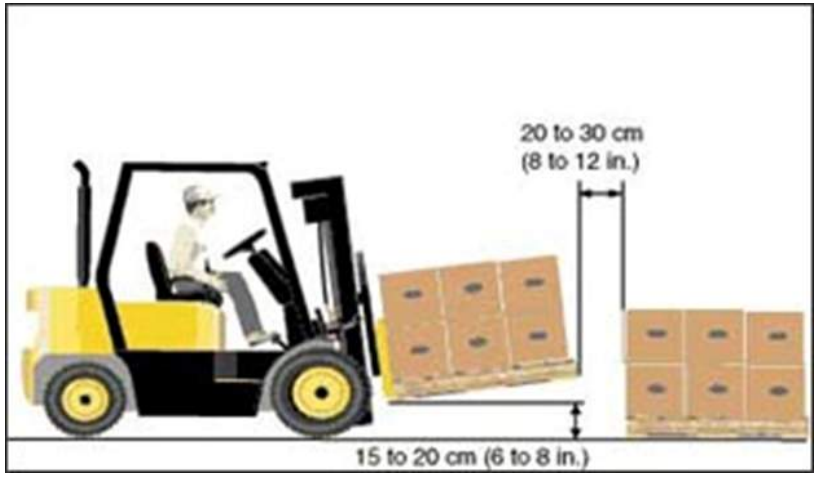
- Mast positioned with forks slightly upwards when traveling
- When approaching load:
  - Tilt mast forward to vertical position
  - Level forks
  - Move direction control forward, move slowly
  - Slide forks under pallet until fully under load
  - Center weight under forks

Do not pick up off-center loads

Page 103 (Module 1.3, page 9)

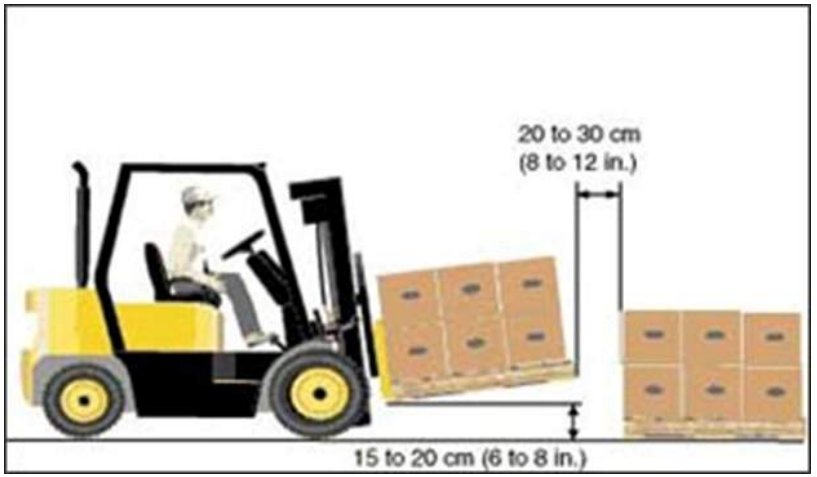
Lifting a load

- Carefully raise load about 4 inches
- When load is clear, tilt mast back slightly
- Make sure there are no overhead obstructions
- Slowly return lift control lever to neutral position
- Ensure load is secure before traveling



Lowering a load

- Mast tilted backward when traveling
- Slowly move forklift 8-12 inches from stack
- Stop forklift
- Lower load 6-8 inches from stacking surface
- Carefully lower fully, and move forks back
- Make sure forks are clear of the pallet before moving forklift



Page 103 (Module 1.3, page 9)

Operating on Loading Docks

- Trucks, trailers: Brakes set and wheels chocked
- Railroad cars: Stops to prevent movement
- Dock locks indicate safe to enter trailer
- Dockboards secured in position
- Forklifts avoid traveling near edge of dock
- Carbon monoxide levels monitored and controlled

Page 104 (Module 1.3, page 10)

Forklift Operators

- Must be 18 or older to work on hazardous machinery
- This includes forklifts

Page 104 (Module 1.3, page 10)

Forklift Inspections and Maintenance

- Pre-shift inspections
- Defective forklifts must be removed from service and not driven until repaired
- Maintained per manufacturer

MSHA

Page 111 (Module 1.4, page 1)

Pre-Shift Inspections

Check:

- Fluid levels
- Hydraulic hoses and mast chains
- Tire pressure/ condition
- Forks
- Load backrest extension
- Nameplate and labels
- Operator manual on forklift
- Operator compartment
- Safety devices/seatbelts

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Pre-Shift Inspections-Electric forklifts

Check:

- Cables, connectors, frayed or exposed wires
- Battery restraints
- Electrolyte level (wear PPE)
- Hood latch

Page 111 (Module 1.4, page 1)

Pre-Shift Inspections-Gasoline forklifts

Check:

- Engine oil
- Brake reservoir
- Engine coolant
- Air filter
- Belts and hoses
- Radiator
- Leaks
- Hood latch

Page 112 (Module 1.4, page 2)

Pre-Shift Inspections-Propane forklifts

Check:

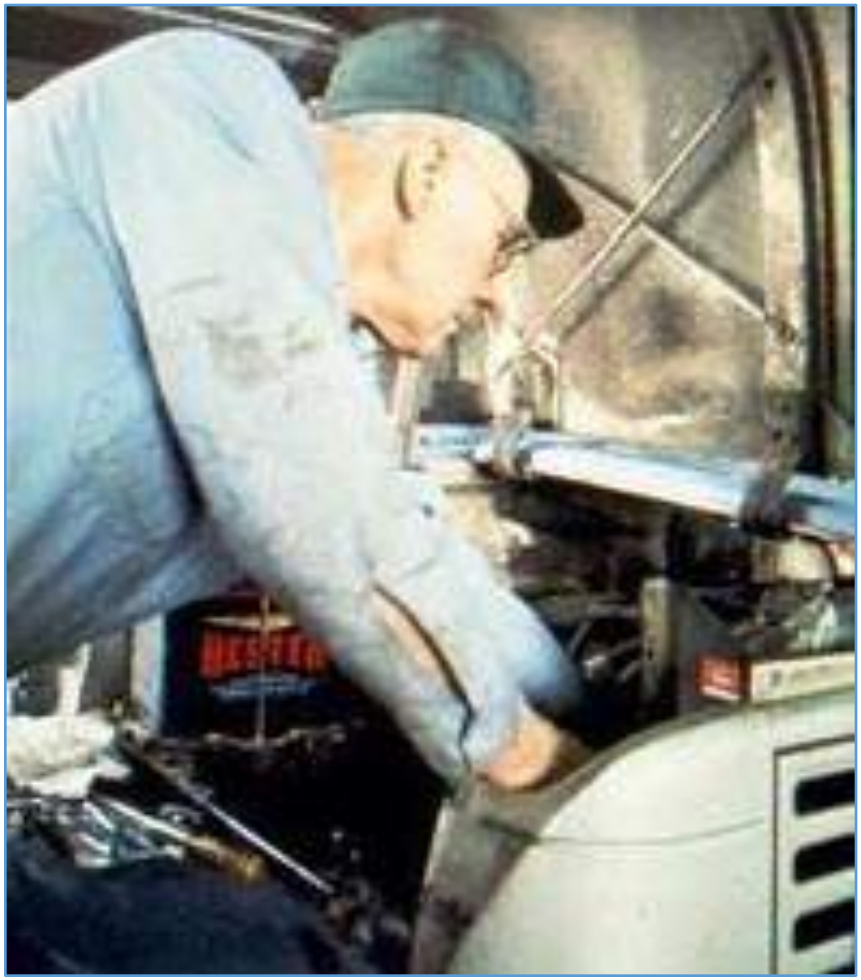
- Properly mounted tank (wear PPE)
- Pressure relieve valve pointing up
- Hose, connectors
- Task restraint brackets
- Tank condition
- Tank fit
- Leaks

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Forklift Maintenance

- By trained personnel
- Per manufacturer's specifications
- When forklift does not pass pre-shift inspection
- When defects noticed during operation
- Modifications must be approved by manufacturer in writing
  - See letters of interpretation



Page 123 (Module 1.4, page 13)

Maintenance

Include maintenance personnel in the warehouse safety program

Washington State Department of Labor & Industries
Division of Occupational Safety and Health

DOSH Fatality Bulletin

Learning from workplace tragedy

Employee Killed Maintaining Hydraulics on Forklift

What happened?

On March 14, 2008, a 35-year-old equipment mechanic was assigned to repair a leaking hydraulic hose on a powered industrial truck (forklift). The employee was killed when pressure was released on a hydraulic feed line, allowing the truck's hoisting mechanism to lower, trapping and suffocating the employee.

Page 126 (Module 1.4, page 16)

Fueling Gasoline or diesel

- Park forklift
- Transmission in neutral
- Lower forks to ground
- Engage parking brake
- Shut off engine
- Open filler cap
- Fill tank slowly
- Close filler gap
- No smoking

Page 141 (Module 1.4, page 31)

Fueling Liquid Petroleum Gas

- LPG vapor accumulates at ground level.
- Can ignite if exposed to heat source.
- Very flammable
- Cold in atmosphere (frostbite)

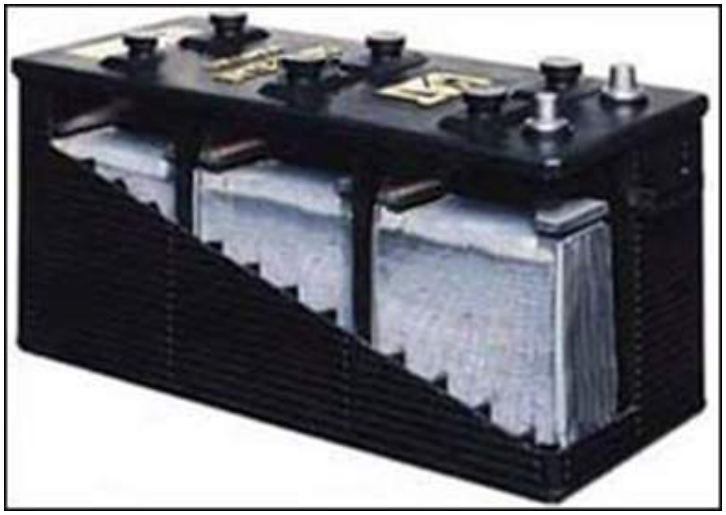
- No smoking
- Use PPE
- Only trained personnel should replace LPG containers

Page 141 (Module 1.4, page 31)

Electric Forklifts: Batteries

Rechargeable industrial batteries have:

- Cells: with positive & negative plates
- Separators between plates
- Battery tray: steel container holding cells
- Electrolyte: Sulfuric acid in cells
- Element: positive and negative terminals at top of each cell



Hazards include:

- Corrosive sulfuric acid
- Electric shock
- Burns
- Explosion

Page 142 (Module 1.4, page 32)

Safety Practices when Working Near Batteries

- Do not connect positive and negative terminals with body or other conductors
- No metal jewelry
- No metal/conductive articles on top of batteries
- Shut off charger when conducting/disconnecting battery
- Non sparking/non conductive tools
- Vent plugs at all times
- Battery cables/connectors insulated (check condition)
- Use lockout/tagout when working on battery in a forklift

Page 142 (Module 1.4, page 32)

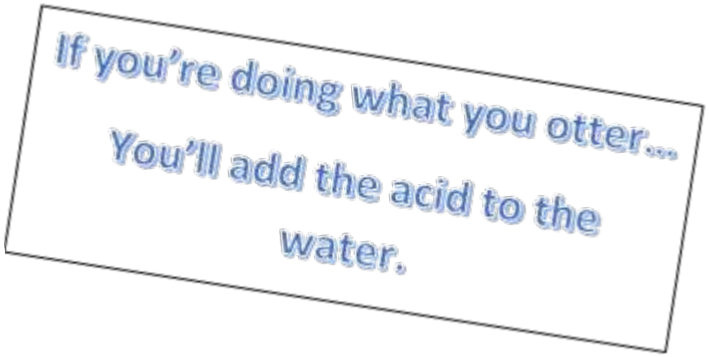
Battery Charging Areas

- Spill kit for electrolyte
- PPE available
- Eyewash
- Fire protection
- Fire extinguisher
- Ventilation (H_2 offgass)
- No smoking signs
- No open flames, sparks, arcs
- Protect from forklifts
- Battery movement:
  - Conveyor
  - Overhead hoist
  - Other equipment

Page 142 (Module 1.4, page 32)

Battery Charging

- Only in designated area
- PPE:
  - Face shield
  - Safety glasses/goggles
  - Acid proof gloves, shoes, apron, clothes
- Check electrolyte level before charging
- Check water (don't refill before charging)
- Unplug/turn off charger before moving battery
- Do not overcharge



Page 143 (Module 1.4, page 33)

Sulfuric Acid

- Splash to eyes:
  - Flush 15 minutes
  - Get medical attention
- Splash to skin:
  - Remove clothing
  - Flush 15 minutes
  - Get medical attention
- Spills
  - Neutralize
  - Absorb
  - Contain
  - Dispose
  - Clean up

Page 145 (Module 1.4, page 35)

Operator Training and Certification

Training content:

- Forklifts used at the worksite
- Hazards
- Safety requirements/OSHA standard

Training format:

- Formal instruction
- Practical demonstration/exercises
- Evaluation of skills

Skill evaluation must be repeated at least every three years

Page 149 (Module 1.5, page 1)

Trainer Qualifications

- Knowledge
- Training
- Experience
  - Must actually operate forklifts

Training Documentation

- Operator name
- Training date
- Evaluation date
- Name of trainer/evaluator

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Training Content

General

- Operating instructions, warnings, precautions
- Differences between forklift and automobile
- Controls and instrumentation
- Engine/motor operations
- Steering/maneuvering
- Visibility
- Fork and attachment operation, use limitations
- Forklift capacity
- Forklift stability
- Inspection/maintenance procedures
- Refueling/Charging
- Operating limitations

Training Content

Site specific

- Employer's Powered Industrial Truck Program
- Forklifts used at the employee's facility
- Review of forklift employee will operate
- Employer's fueling/recharging procedures
- Surface conditions at employer's facility
- Composition of loads at facility
- Pedestrian traffic at the facility
- Ramps, slopes at the facility
- Where carbon monoxide is detected at the facility
- Other unique conditions
- How to report an unsafe condition
- How corrective actions are made

Page 152 (Module 1.5, page 4)

Forklift Operation by Trainee

Only

- Under direct supervision of trainer
- When no danger to other trainees or employees

Page 163 (Module 1.5, page 15)

Refresher Training/Evaluation

Skills evaluation (NOT classroom review)

- AT LEAST once every three years, or:
  - Operator observed to operate forklift in an unsafe manner
  - Operator is involved in an accident or near miss accident
  - Operator evaluation that he/she isn't operating the forklift safely
  - Operator is assigned to drive a different type of forklift
  - Conditions change in the workplace

Page 163 (Module 1.5, page 15)

Module 2

Material Handling and Ergonomics

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Ergonomics is…

- The science and practice of designing jobs or workplaces to match the capabilities and limitations of the human body,

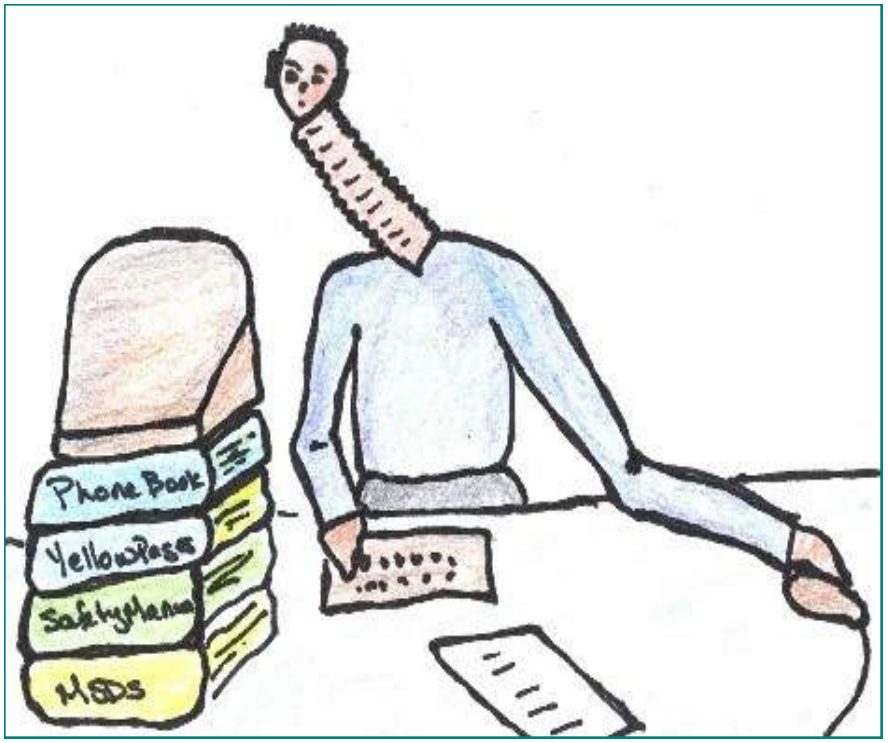
or

- Fitting the job to the worker

Page 180 (Module 2, page 2)

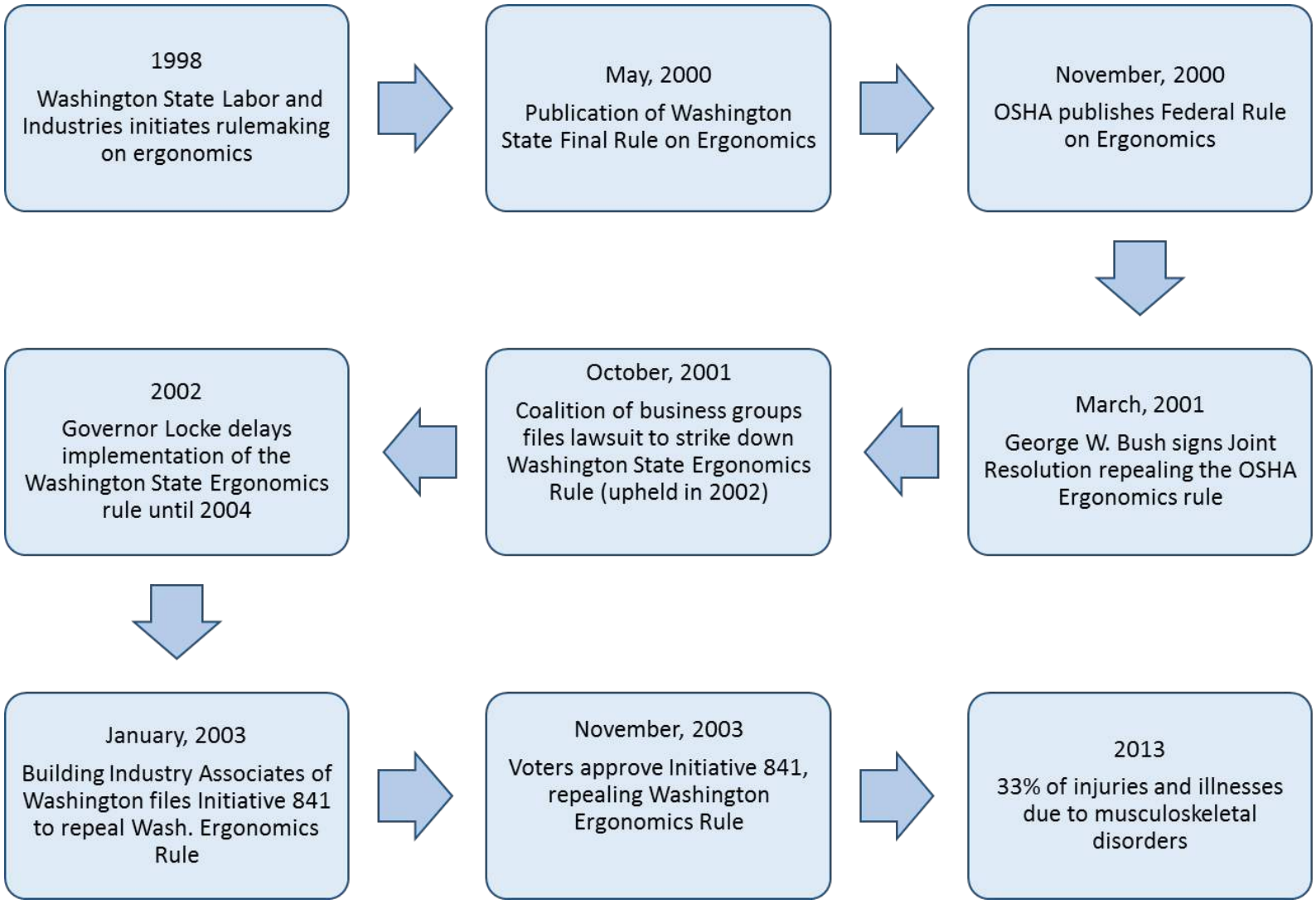
If an Engineer Designed an Office Worker…

- Long articulating neck to best observe computer screen
- Lightweight head to reduce pressure on articulating neck
- One long arm to reach mouse
- One short arm for keyboard
- Flat thighs to fit under desk



How would an engineer design a warehouse worker…?

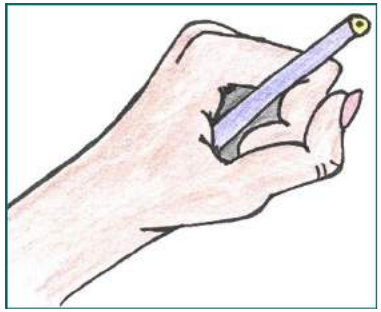
History of the Ergonomics Rule



Page 179 (Module 2, page 1)

Benefits of ergonomics

- Reduces worker injuries (and cost)
- Reduces fatigue and discomfort
- Improves work efficiency
- Improves quality of work



Try this:

- Hold a pencil in one hand tightly, with your hand in the neutral position.
- Next, flex your hand, holding the pencil tightly.

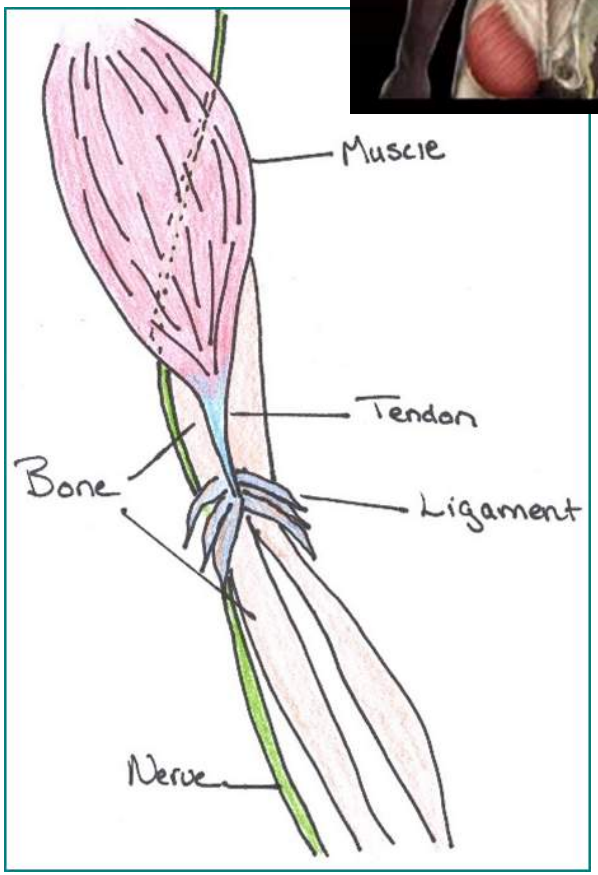
Which position gives you the stronger grip?

Page 180 (Module 2, page 2)

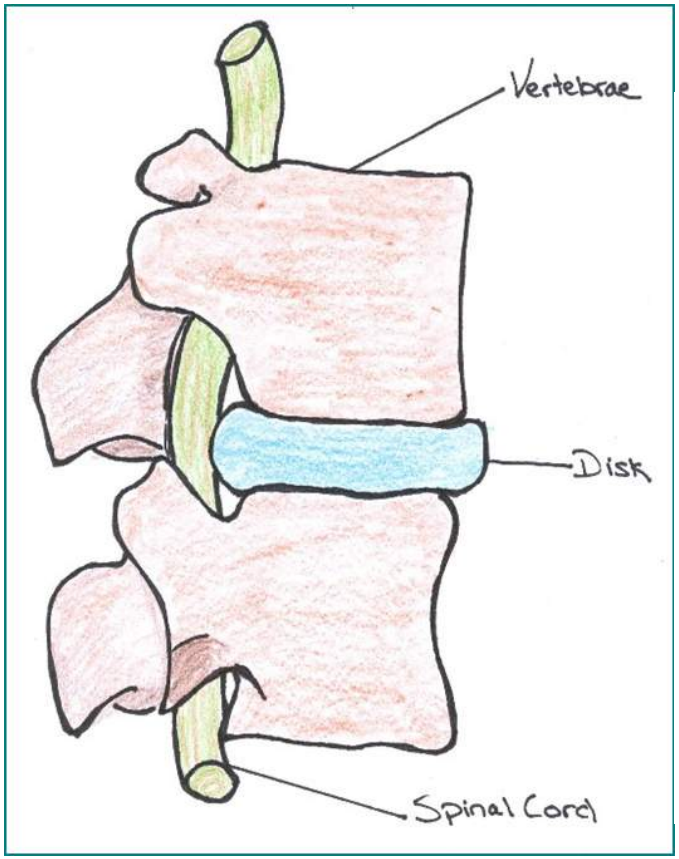
Anatomy and Physiology

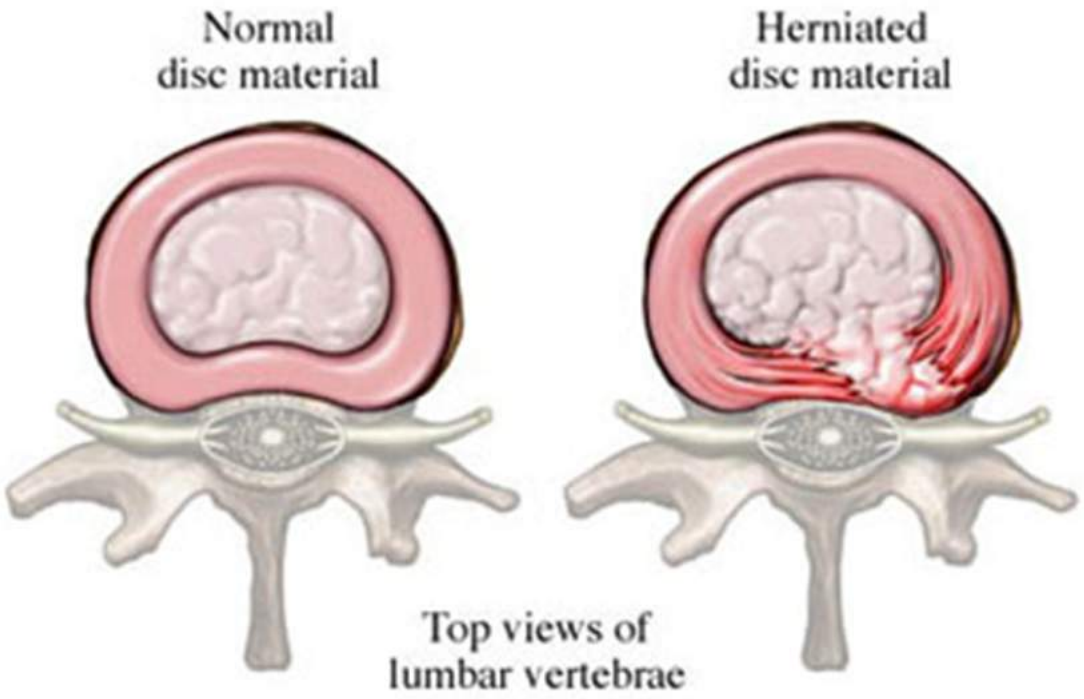
Musculoskeletal system:

- Bones: Framework of body
- Muscles: Movement and support
- Ligaments: Connect bones to bones
- Tendons: Connect muscles to bones



Anatomy and Physiology of the Spine

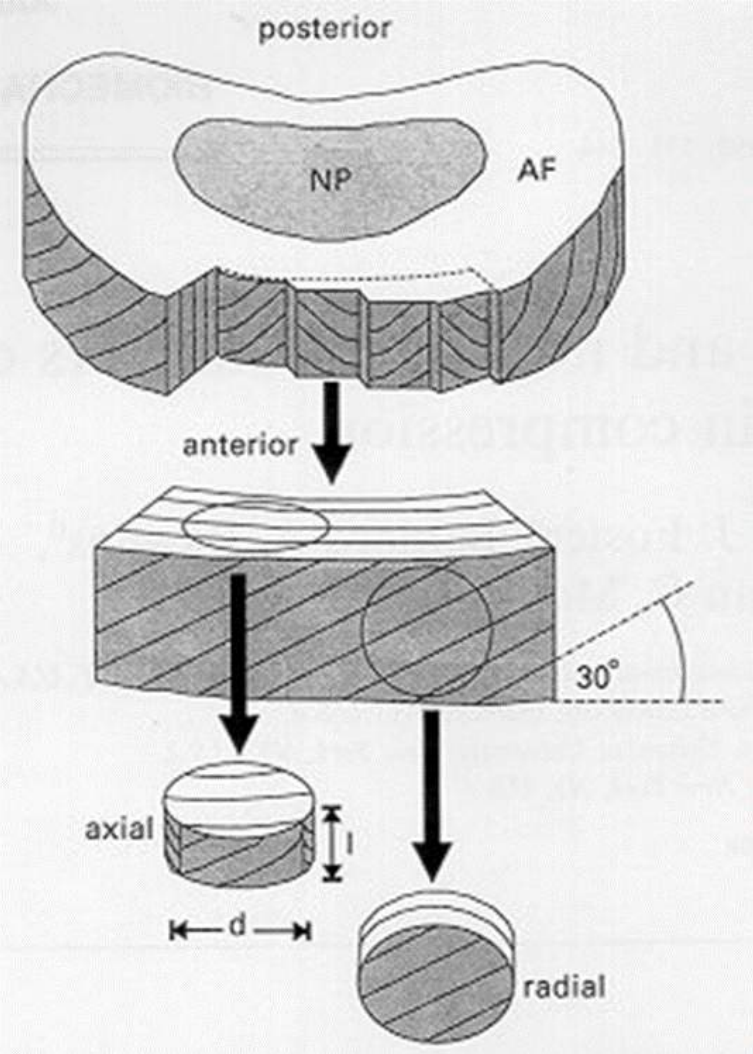




Page 181 (Module 2, page 3)

Discs

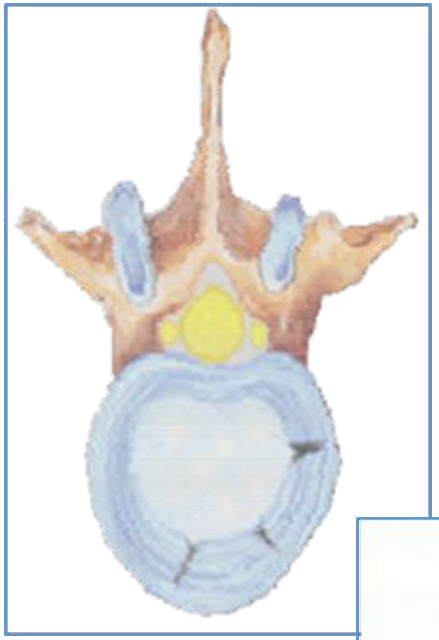
- Nucleus:
  - Jelly like substance in center of disc
  - Shock absorber
  - Can “dry out”
- Annulus:
  - Surround and protect nucleus
  - Tough, fibrous sheets of collagen
  - Criss-crossed like a radial tire
  - Strongest part of disk and connects vertebrae

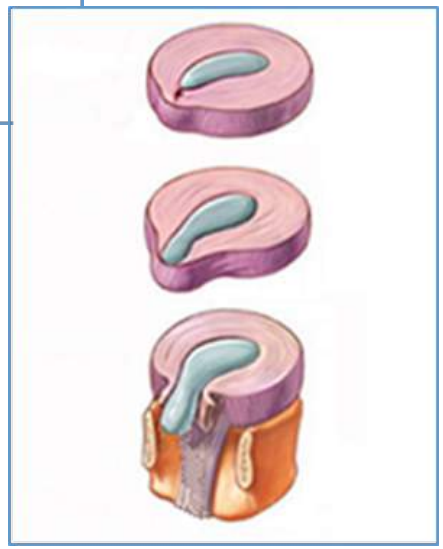


Page 181 (Module 2, page 3)

Stages of Disc Damage

- Bulging disc: Cracks in annulus wall allow jelly of nucleus to squeeze out and bulge
- Herniated disc: Cracks enlarge and allow more jelly to squeeze into bulge. Bulge can extend until it presses nerve, causing pain
- Ruptured disc: Nucleus jelly squeezes out of the disc, pressing against nerve and causing pain

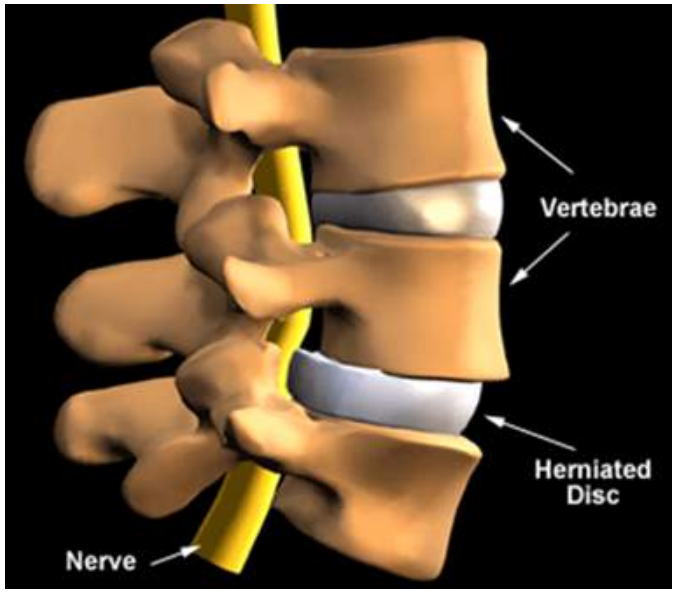


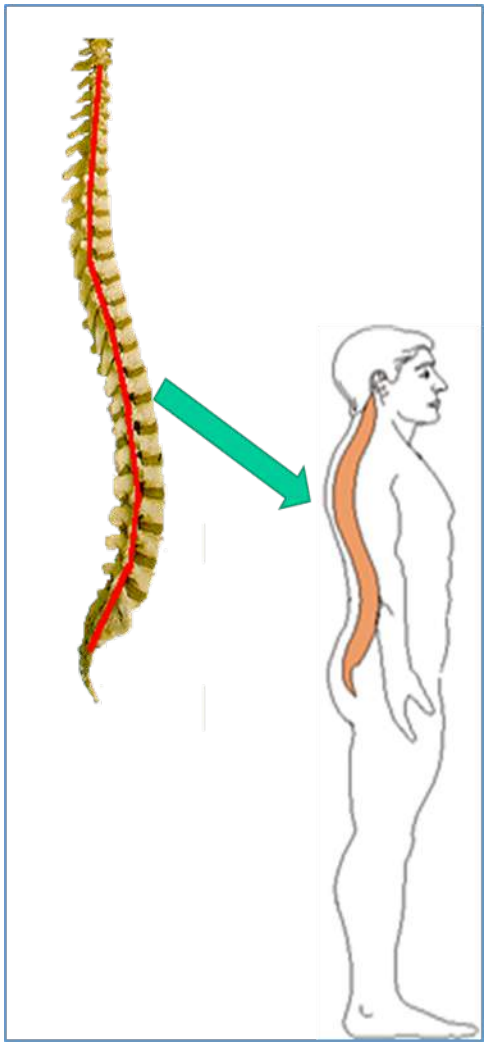


Page 181 (Module 2, page 3)

Spine Neutral Posture

- "S" curve
- Pressure evenly distributed on all discs
- Reduces risk of injury

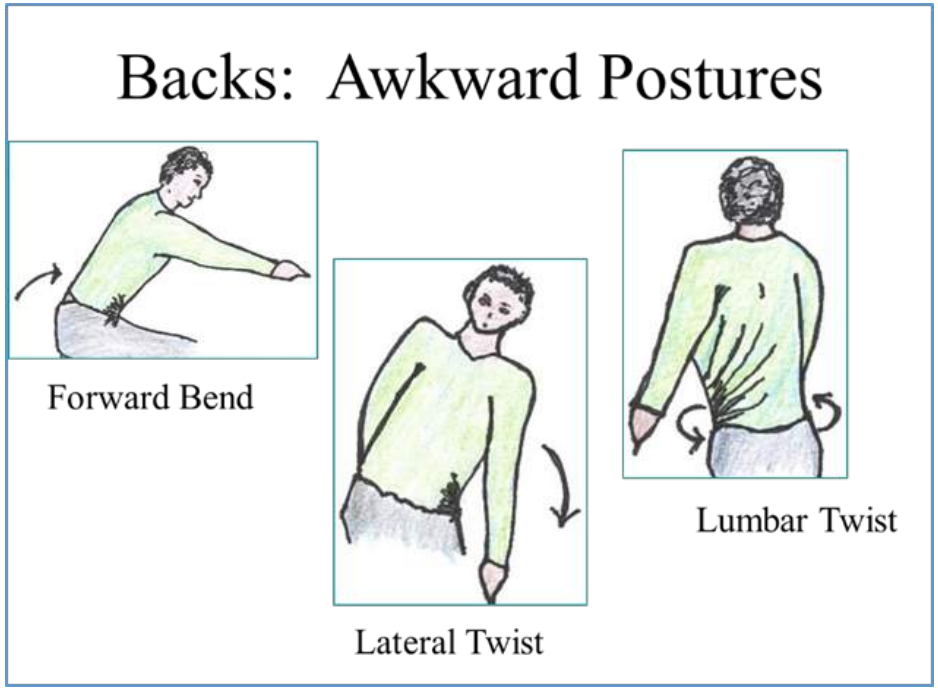


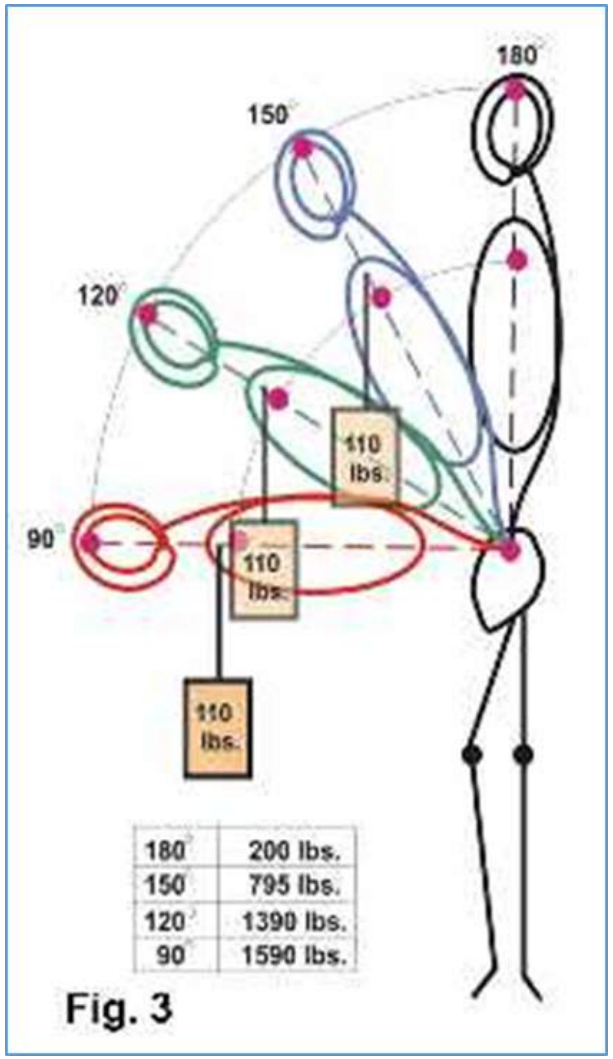


Page 182 (Module 2, page 4)

Spine Awkward Postures

- "Not neutral"
- Greater stress on body
- Increases risk of injury





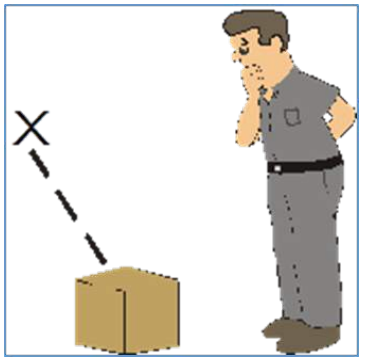
Page 183 (Module 2, page 5)

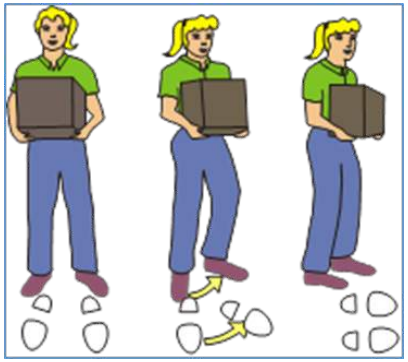
Proper Lifting Technique

- Does the workspace allow a proper lift technique to be used?

If yes…

- Maintain firm footing
- Place feet shoulder width apart
- Straddle object
- Bend at knees not at waist
- Get a good grip
- Lift with legs, keeping spine in an “S” curve
- Pivot, don’t twist





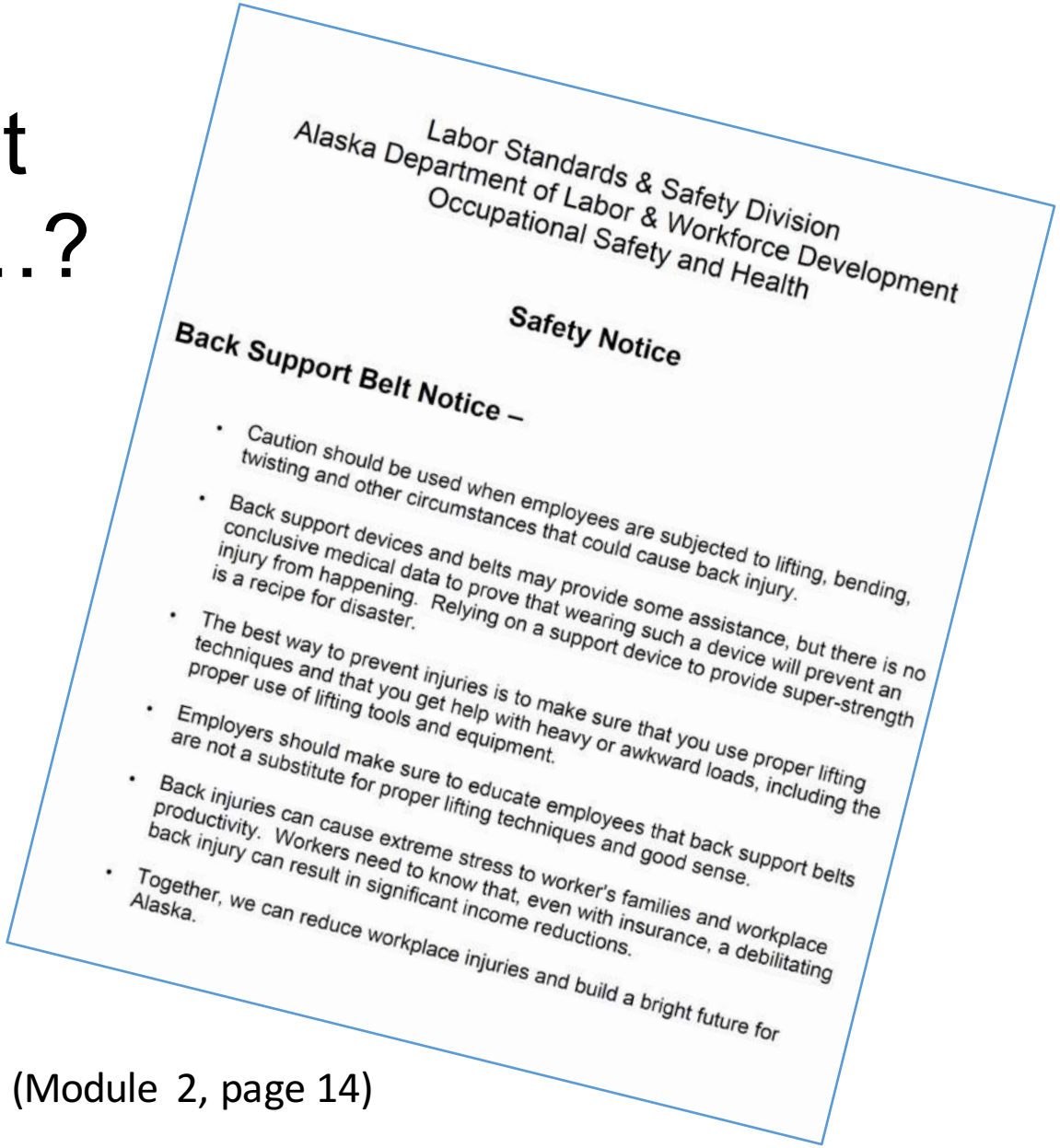
Page 183 (Module 2, page 5)

The fulcrum effect:

A 10 pound weight held at arm's length is equivalent to a 100 pound weight held close to the body

Page 184 (Module 2, page 6)

What About Backbelts…?



Labor Standards & Safety Division
Alaska Department of Labor & Workforce Development
Occupational Safety and Health

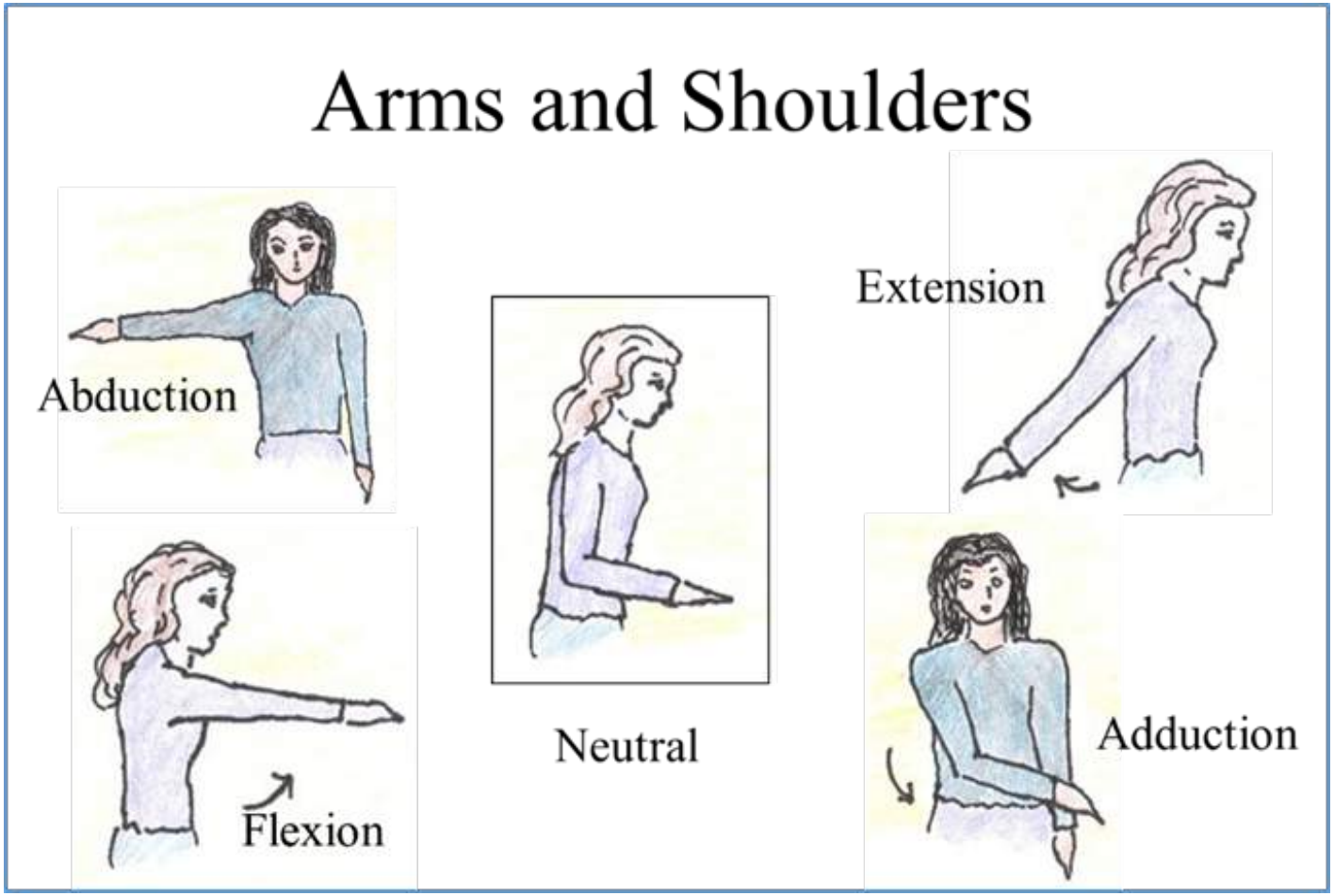
Safety Notice

Back Support Belt Notice –

- Caution should be used when employees are subjected to lifting, bending, twisting and other circumstances that could cause back injury.
- Back support devices and belts may provide some assistance, but there is no conclusive medical data to prove that wearing such a device will prevent an injury from happening. Relying on a support device to provide super-strength is a recipe for disaster.
- The best way to prevent injuries is to make sure that you use proper lifting techniques and that you get help with heavy or awkward loads, including the proper use of lifting tools and equipment.
- Employers should make sure to educate employees that back support belts are not a substitute for proper lifting techniques and good sense.
- Back injuries can cause extreme stress to worker's families and workplace productivity. Workers need to know that, even with insurance, a debilitating back injury can result in significant income reductions.
- Together, we can reduce workplace injuries and build a bright future for Alaska.

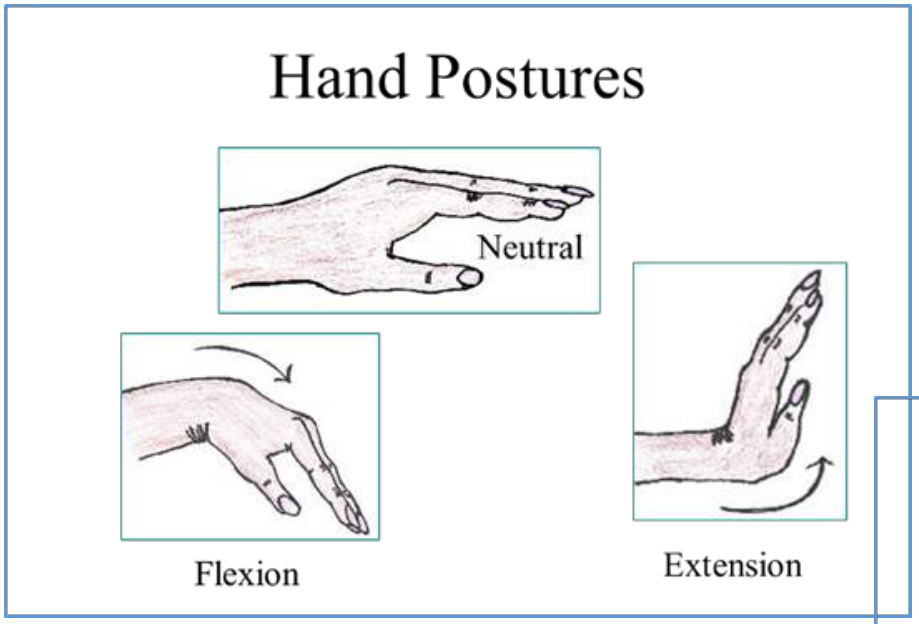
Page 192 (Module 2, page 14)

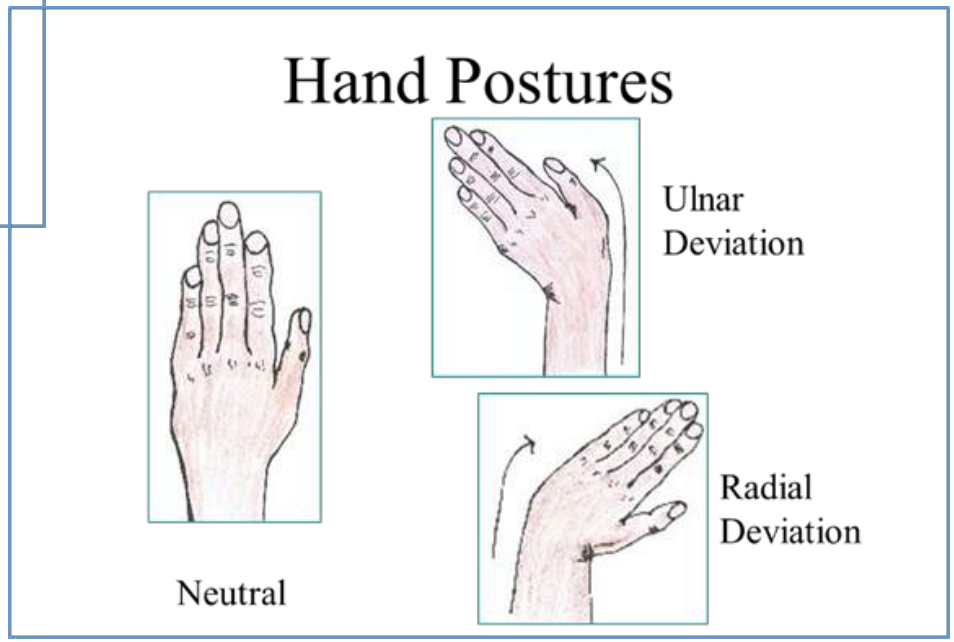
Upper Body Ergonomics



Page 186 (Module 2, page 8)

Upper Body Ergonomics





Page 186 (Module 2, page 8)

Hazard Analysis: Order Picking

- Critical warehouse function
- Accounts for a large number of musculoskeletal disorders

Page 193 (Module 2, page 15)

Traditional Order Pick System

- Pallets of product are removed from dock and placed in racks
- Product is moved from racks and placed on pallets
- After pallet is assembled, it is moved by forklift or pallet jack to dock

Page 193 (Module 2, page 15)

Traditional Order Pick System

Advantages:

- Reduced floor space
- Minimizes product handling
- Product moved by mechanical means
- Can fill large orders

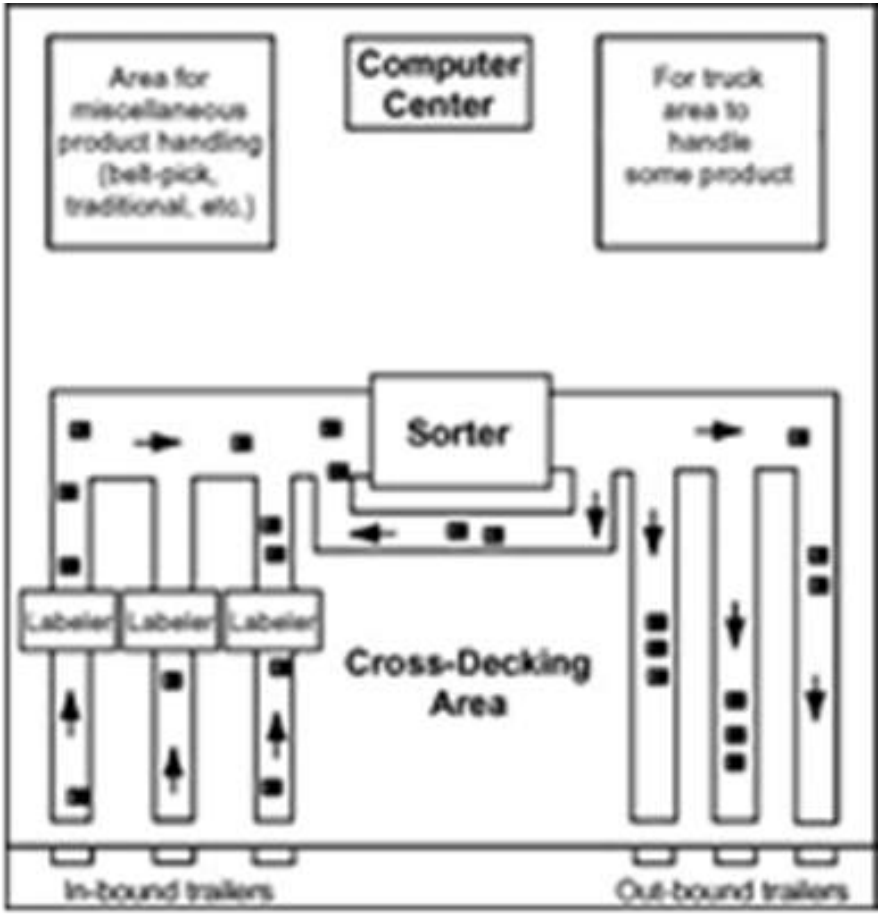
Disadvantages:

- Awkward bends
- Heavy lifting
- Reaching
- Twisting

Page 193 (Module 2, page 15)

Flow Through System

- Product received, broken down, placed on a conveyor
- Conveyor moves product to sorting area
- Product moved to outbound truck



Page 193 (Module 2, page 15)

Flow Through System

Advantages:

- Reduced pallet handling

Disadvantages:

- Lot's of floor space
- High level of coordination

Page 193 (Module 2, page 15)

Conveyor Hazards

Page 194 (Module 2, page 16)

Belt Picking System

- Pallets of product taken from dock and placed on belts or racks
- Order pickers remove product from racks and place on conveyor belt
- Product from conveyor belt placed on pallet
- Assembled pallets shrink wrapped and loaded on truck

Page 194 (Module 2, page 16)

Belt Picking System

Advantages:

- Can use hoists or lift assists
- Receiving conveyor can be adjusted to minimize bending/elevated reaches
- Final palletizing station can be designed to minimize risk

Disadvantages:

- Product handled twice
- Higher frequency of lifting
- Work is not varied, uses same muscle groups without opportunity to rest

Page 194 (Module 2, page 16)

Cross Docking System

- Pallets received at dock
- Broken down into customer specific loads while still on dock
- Items placed on outbound docks
- No product is placed on racks

Page 195 (Module 2, page 17)

Cross Docking System

Advantages:

- Ship larger quantities of product
- Minimizes lifting of single units
- Larger quantities moved by forklift or pallet jack
- If pallets need to be broken down to smaller units, there is more space.
- Easier access for forklifts
- Better employee access to product

Disadvantages:

- Not practical for less than full pallet orders
- Diversity of product requires more floor space
- High level of coordination

Page 195 (Module 2, page 17)

Material Handling Hazards

- Work layout or environment
- Work demands
- Proper tools not available
- Job design

Page 196 (Module 2, page 18)

Placing Boxes on Pallets

Hazards

- Repeated bending at waist
- Heaviest items on bottom layer for stability so lifting heaviest items requires most hazardous body postures

Solutions

- Raise height of bottom level
- Use height adjustable picking equipment
  - Stack empty pallets under load
  - Use palletizer to raise load
- Educate employees on hazards of bending while moving heavy items
- Use powered equipment rather than manual work

Page 196 (Module 2, page 18)

Maintenance

Hazards

- Flat spots on forklift wheels
- Steering stiffness, controls not smooth
- Vibration, jarring from uneven floor surface

Solutions

- Proper maintenance of equipment
- Train employees to recognize signs of deterioration and report early
- Keep floors well maintained

Storage

Location of stored items can contribute to ergonomic hazards

- Racks
- Pick pins
- Slots

Page 198 (Module 2, page 20)

Low Location Hazards

Hazards

- Forward torso bending and reaching

Solutions

- Elevate pallets within slot bin
- Place empty pallets under load
- Raise bottom level of racking, so bending not required
- Lifting device (forklift with vacuum hoist)

Page 198 (Module 2, page 20)

High Location Hazards

Hazards

- Reach above shoulders

Solutions

- Use elevated locations for overstock storage areas, move to lower levels when needed
- Pick Sticks

Page 200 (Module 2, page 22)

Multi Slot Hazards

Hazards

- Increased bending and reaching
- Extra movement to move items over slot lips

Solutions

- Full slots for heavy or bulky products
- Gravity feed flow racks

Page 201 (Module 2, page 16)

Reaching Hazards

Hazards

- After product is removed from the front of the pallet, reaching is required to reach the back of the pallet

Solutions

- Rotate product & turn pallets with forklift
- Turntables
- Roller and channel devices
- Wider slots for heavier product, so workers can walk into the slot

Page 202 (Module 2, page 24)

Narrow Aisle Width

Hazards

- Employee must stop farther from pick slot, and have to carry product to pallet

Solutions

- Increase aisle width for fast moving product
- Arrange schedules so that multiple employees don't need to access the same slots at the same time

Page 202 (Module 2, page 24)

Packaging

Hazards

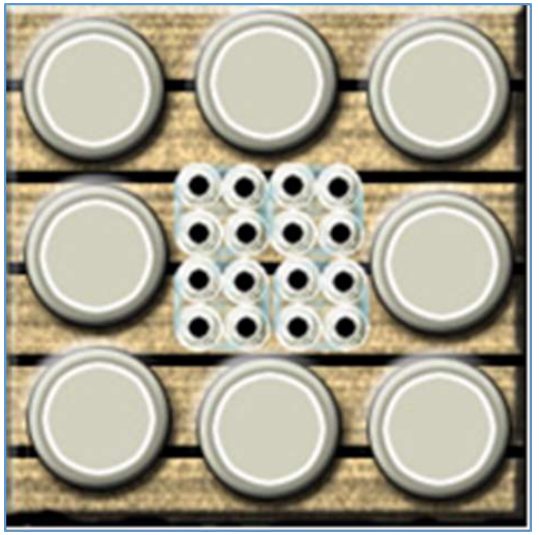
- Lifting heavy containers

Solutions

- Get lighter containers from suppliers
- Improve access to heaviest items
- Redesign work to allow neutral postures
- Handholds/cutouts on heavy products
- Make sure containers don't break
- Load heavier products outside, lighter products inside

Domino Cuts Sugar Packages

Domino Sugar reduced its bundled packages of sugar from 60 pounds to 40 pounds, below OSHA's suggested limit of 50 pounds. This change will make the bundles easier to handle and reduce the total weight of each by 33 percent. All three of its manufacturing locations have adjusted their packaging equipment to accommodate the weight modification. The first shipments of 40-pound bundles began in June.

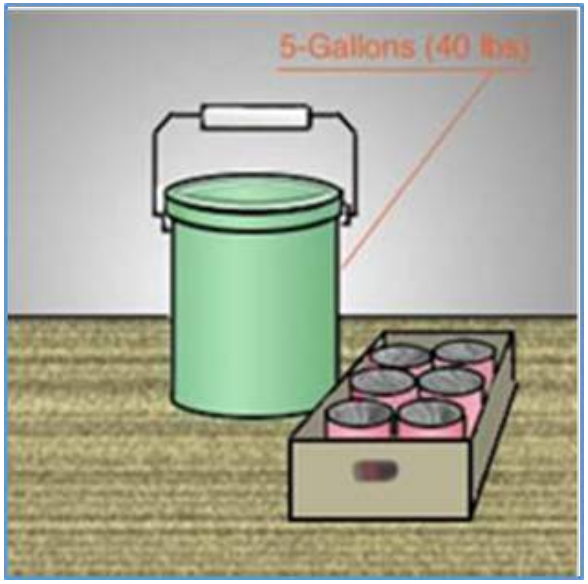


Page 203 (Module 2, page 25)

Poor Handholds

Hazards

- No handles or cutouts
  - Awkward postures
  - Greater force to lift



Solutions

- Work with suppliers to use stable boxes with hand hold cut outs or handles.

Page 204 (Module 2, page 26)

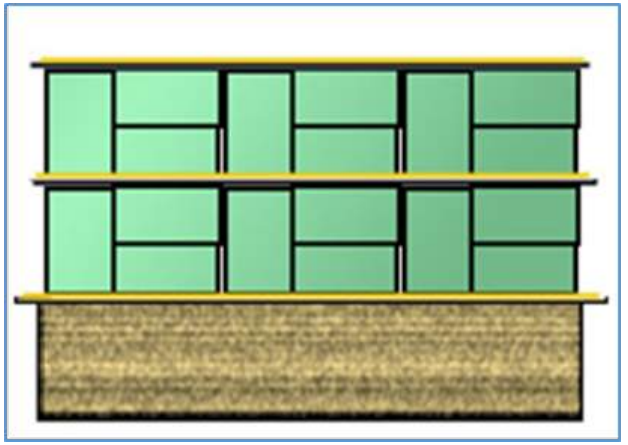
Plastic Wrapping

Hazards

- Plastic sticks, adding resistance
  - Stress to body
  - Greater force to move

Solutions

- Put slip sheets between layers
- Treat cases as heavy loads
- Additional head room and space in stacks
- Wrap sides and tops of cases, leaving cardboard bottom exposed



PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Wooden Pallets

Hazards

- Heavy, 30 to 70 pounds
- Splinters

Solutions

- Lighter weight pallets
- Plastic pallets
- Pallet dispenser

Page 205 (Module 2, page 27)

Wrapping pallets

Hazards

- Awkward bending
- Cuts

Solutions

- Automated plastic wrapping
- Light weight rolls for manual wrapping
- Use handle on rolls

Page 205 (Module 2, page 27)

Opening boxes

Hazards

- Pinch grip for knife cutter

Solutions

- “in line” knives with ergonomic handle
- Ergonomic razor knives

Page 206 (Module 2, page 28)

Depalletizing

Hazards

- Awkward postures
- Awkward lifts

Solutions

- Evaluate each racking system to determine least stressful method of depalletizing.
- Identify which technique should be used for each slot. Train employees and provide signage.
- Use turntables.

Page 207 (Module 2, page 29)

Shortcuts

Hazards

- Reach across pallet, rather than walk around it.
- Increased body stressors

Solutions

- Factor proper work practices into pick times. Time limits should not encourage shortcuts.
- Train employees on importance of proper ergonomic techniques.

Page 208 (Module 2, page 30)

Unexpected Exertions

Causes

- Box weighs more than expected
- Box falls apart
- Boxes stick together
- Poor footing
- Quick motions while holding load

Solutions

- Tag slots with case weights
- Use cases appropriate for contents and environment
- Clean areas to avoid slipping
- Slip resistant footwear

Page 209 (Module 2, page 31)

Stickers

Hazards

- Holding sticker sheet while lifting product: Reduced hand contact
- Uneven force by hands

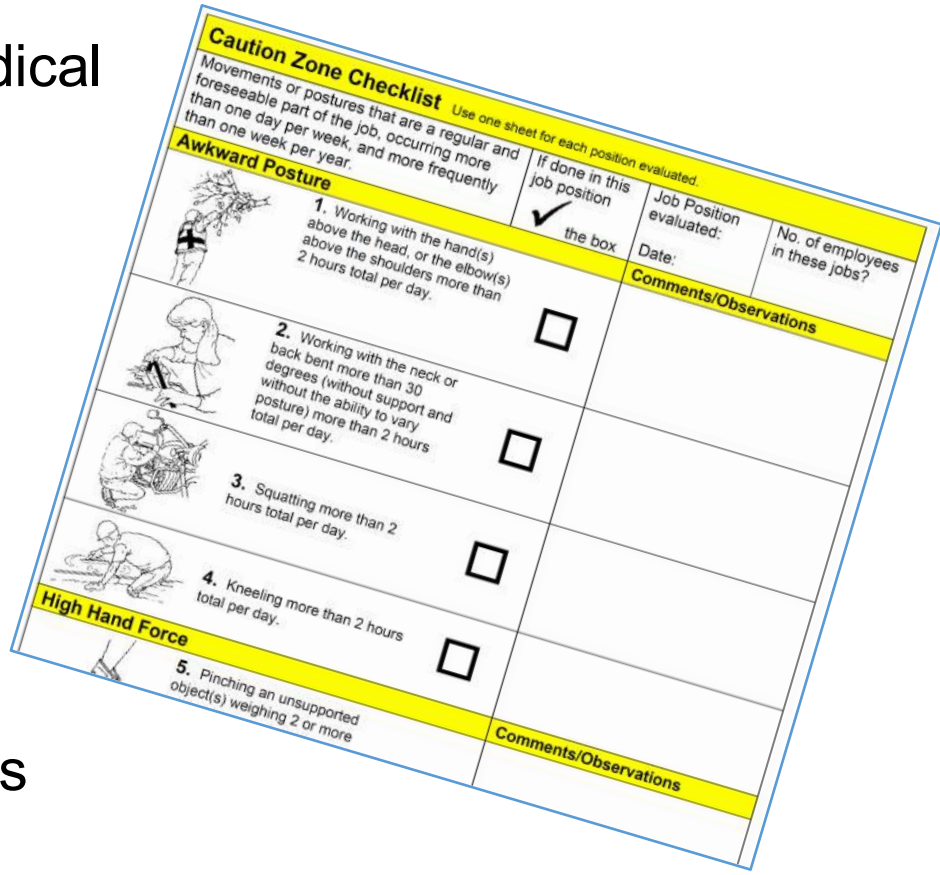
Solutions

- Sticker dispenser worn at waist
- Keep clipboard on pallet jack/forklift to hold sticker sheets

Page 209 (Module 2, page 31)

Ergonomic Programs

- Medical Management
  - Injury tracking
  - Work with occupational medical clinic
  - Return to work program
  - Early injury reporting and treatment
- Employee training
- Evaluate risk factors and make corrective actions
  - NIOSH lifting equation
  - ACGIH Lifting TLV
  - Washington State Checklists
    - Caution Zone Jobs
    - Hazard Jobs



Caution Zone Checklist Use one sheet for each position evaluated.

Movements or postures that are a regular and foreseeable part of the job, occurring more than one day per week, and more frequently than one week per year.

If done in this job position ✓ the box

Job Position evaluated:

Date:

No. of employees in these jobs?

Awkward Posture

1. Working with the hand(s) above the head, or the elbow(s) above the shoulders more than 2 hours total per day. ☐

2. Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day. ☐

3. Squatting more than 2 hours total per day. ☐

4. Kneeling more than 2 hours total per day. ☐

Comments/Observations

High Hand Force

5. Pinching an unsupported object(s) weighing 2 or more

Comments/Observations

Page 210 (Module 2, page 32)

Module 3

Hazard Communication

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

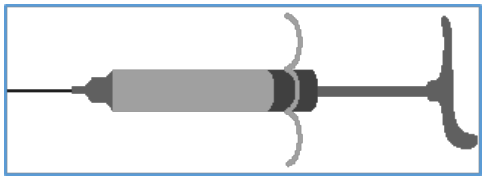
Hazard Communication

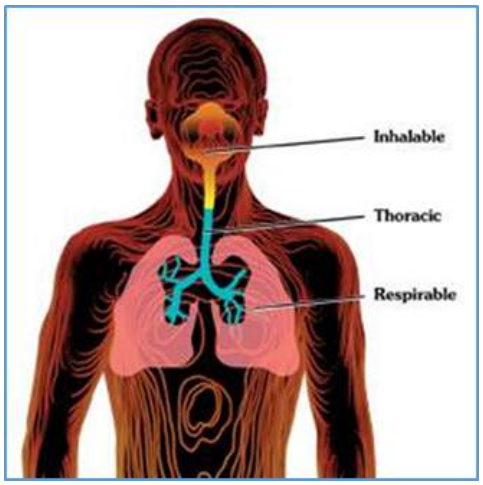
- Worker “Right to know” law, or “right to understand”
- Global Harmonization (GHS), 2012
- Applies to:
  - General Industry
  - Shipyard
  - Marine Terminals
  - Longshoring
  - Construction
  - Chemical manufacturers
  - Importers
  - Washington state: All workplaces where workers are exposed to chemical hazards

Page 237 (Module 3, page 1)

Routes of Exposure

- Inhalation
- Ingestion
- Absorption (skin)
- Injection

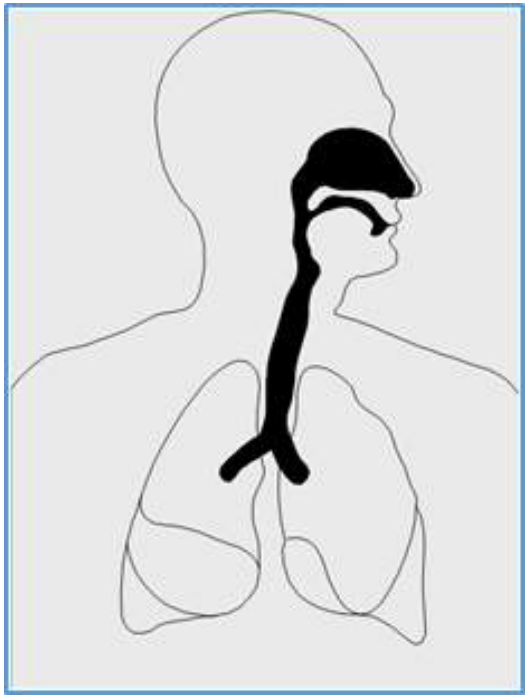




Page 237 (Module 3, page 1)

Particulate Matter and Aerosols

- **Dusts**: Grinding, crushing, rapid impact, detonation
- **Fumes**: When volatized solid condenses in cool air
- **Smoke**: When combustible or flammable material burns
- **Fibers**: Particles with a length several times diameter
- **Mists:** Suspended liquid droplets



PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Gasses

- **Gasses**: Formless, occupies entire space or enclosure
- **Vapors**: Volatile form of solids or liquids at room temperature and pressure

Page 238 (Module 3, page 2)

Elements of the Hazard Communication Standard

Employers must:

- Maintain list of chemicals, or inventory
- Safety Data Sheets (SDSs) for each chemical on inventory
- Chemical labels
- Train employees
- Written Hazard Communication Program

Hazard Communication in Warehouses

- All parts of standard apply if employees are exposed to chemicals
- If handling only sealed containers:
  - Ensure labels on incoming chemicals
  - Maintain SDSs
  - Train employees to extent necessary to protect them in the event of a spill or leak
- Include SDSs in chemical shipments

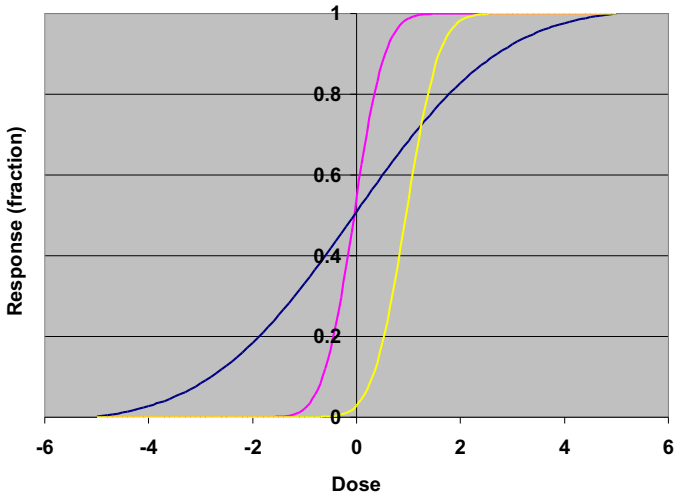
PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

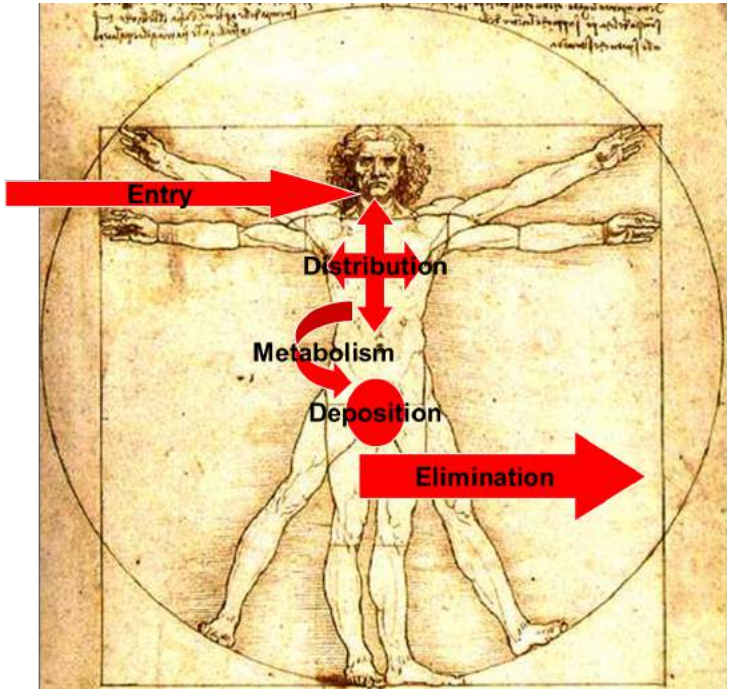
OSHA Training Institute Education Centers
University of Washington

Chemical Hazards: Toxicology

"All substances are poisons; there is not one which is not a poison. The right dose differentiates a poison and a remedy."

Paracelsus (1493-1541)





Page 238 (Module 3, page 2)

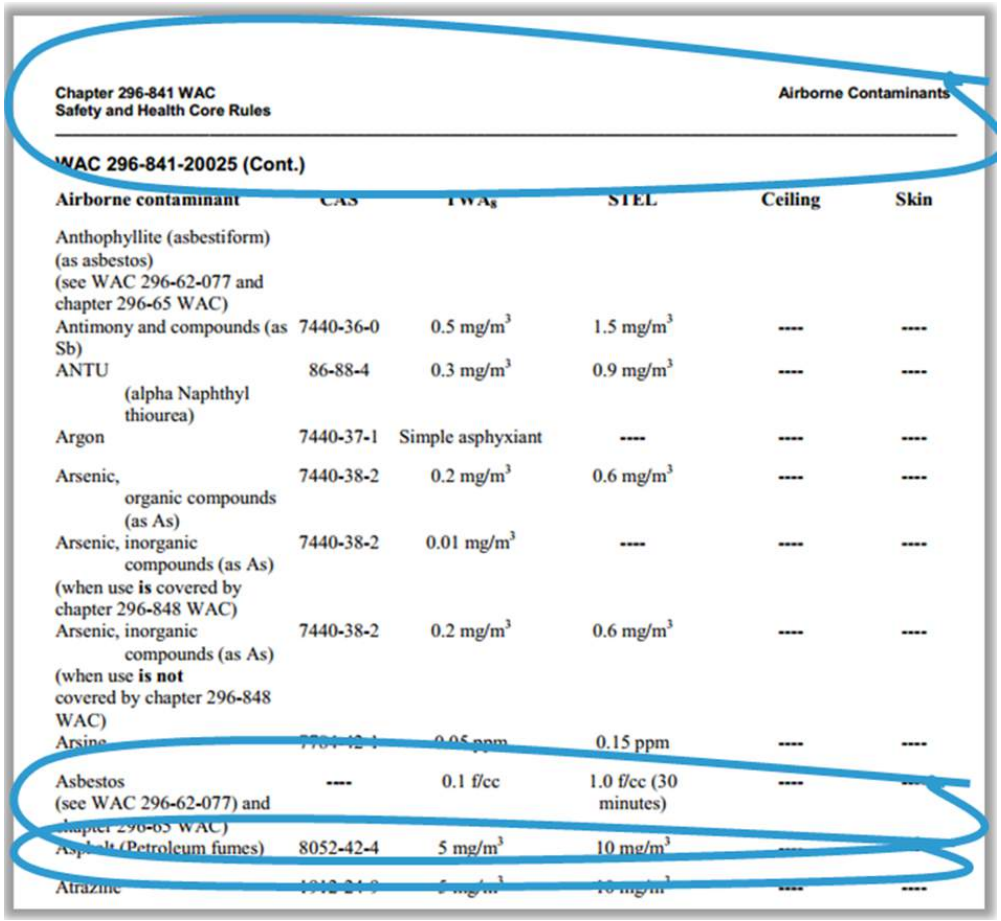
Chemical Hazards

- **Acute**: Short term health effects
- **Chronic**: Long term, or multiple exposures
- **Target organs**: Specific body parts affected

Page 244 (Module 3, page 8)

Exposure Limits

- OSHA Permissible Exposure Limits (PELs)
  - Washington DOSH PELs
  - Or-OSHA PELs
- ACGIH Threshold Limit Values (TLVs)
- Immediately Dangerous to Life and Health (IDLH)



Chapter 296-841 WAC
Safety and Health Core Rules

Airborne Contaminants

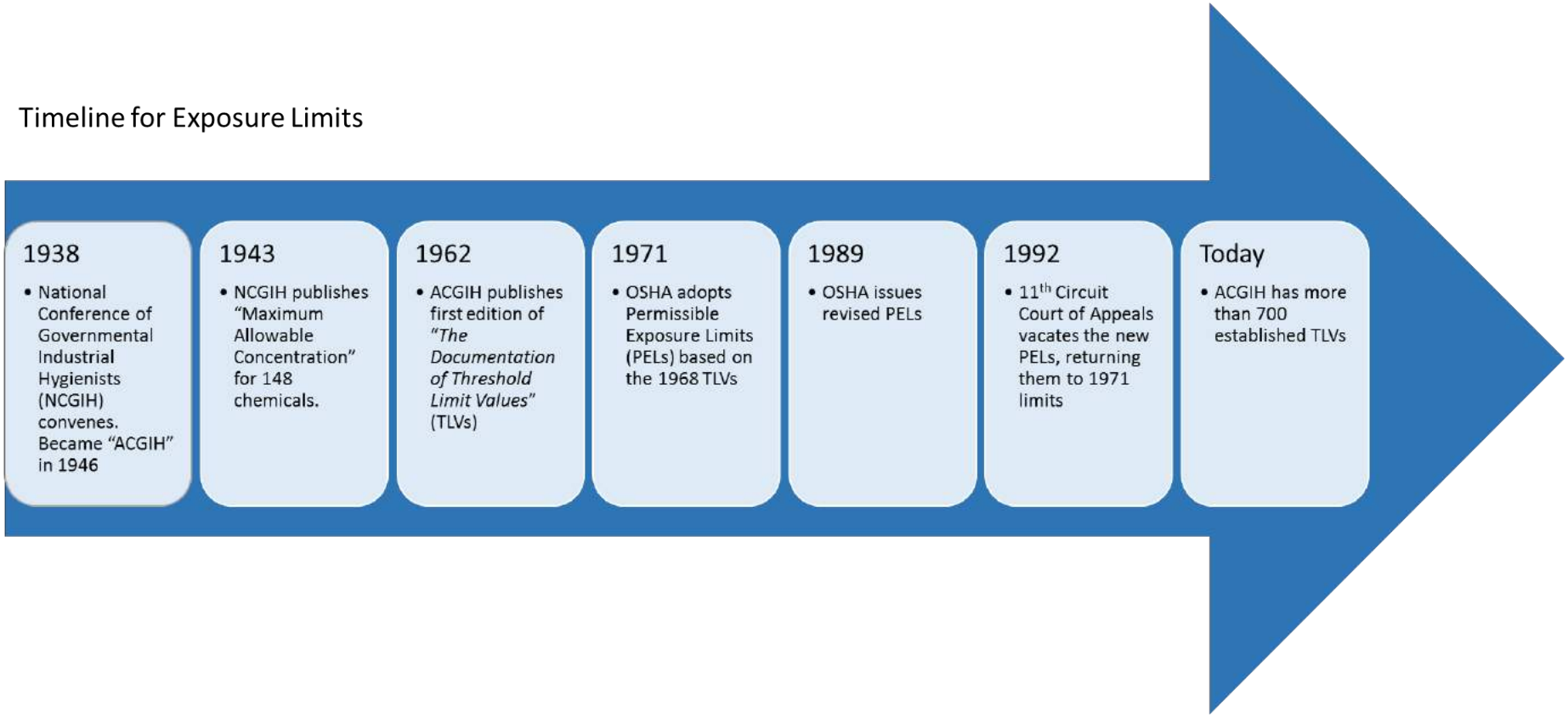
WAC 296-841-20025 (Cont.)

Airborne contaminant	CAS	TWA$_8$	STEL	Ceiling	Skin
Anthophyllite (asbestiform) (as asbestos) (see WAC 296-62-077 and chapter 296-65 WAC)					
Antimony and compounds (as Sb)	7440-36-0	0.5 mg/m^3	1.5 mg/m^3	----	----
ANTU (alpha Naphthyl thiourea)	86-88-4	0.3 mg/m^3	0.9 mg/m^3	----	----
Argon	7440-37-1	Simple asphyxiant	----	----	----
Arsenic, organic compounds (as As)	7440-38-2	0.2 mg/m^3	0.6 mg/m^3	----	----
Arsenic, inorganic compounds (as As) (when use **is** covered by chapter 296-848 WAC)	7440-38-2	0.01 mg/m^3	----	----	----
Arsenic, inorganic compounds (as As) (when use **is not** covered by chapter 296-848 WAC)	7440-38-2	0.2 mg/m^3	0.6 mg/m^3	----	----
Arsine	7784-42-1	0.05 ppm	0.15 ppm	----	----
Asbestos (see WAC 296-62-077) and chapter 296-65 WAC)	----	0.1 f/cc	1.0 f/cc (30 minutes)	----	----
Asphalt (Petroleum fumes)	8052-42-4	5 mg/m^3	10 mg/m^3	----	----
Atrazine	1912-24-9	5 mg/m^3	10 mg/m^3	----	----

Page 245 (Module 3, page 9)

Permissible Exposure Limits (PELs)

Timeline for Exposure Limits



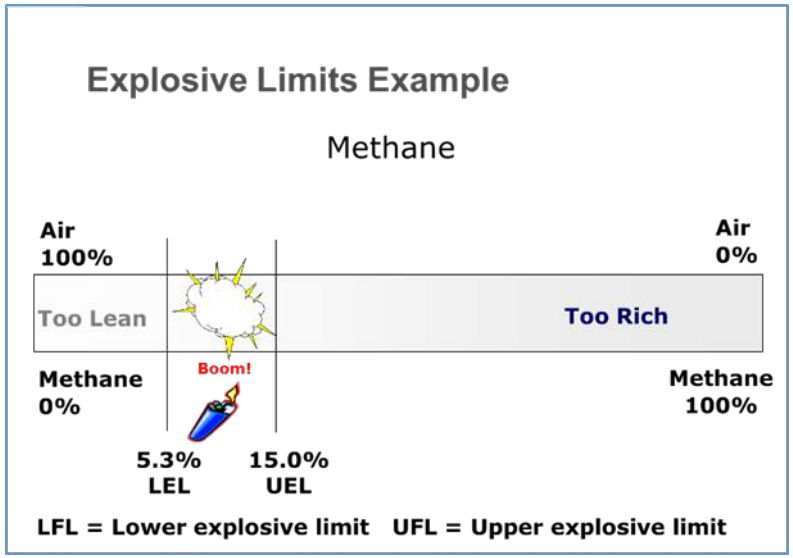
Chemical Hazards

- **Carcinogens**: cause cancer
- **Teratogens:** harm developing fetus
- **Mutagens:** damage DNA
- **Sensitizers:** greater reactions with repeated exposure
- **Corrosives:** cause chemical "burns"

Page 246 (Module 3, page 10)

Chemical Hazards

- **Flammable**: vapors can ignite
- **Combustible:** can burn
- **Oxidizer:** can produce oxygen that contributes to combustion of another material
- **Asphyxiant:** displaces oxygen
- **Metals:** can ignite, can be toxic, or can be essential



Page 247 (Module 3, page 11)

Chemical Hazards

Compressed gasses: gasses stored in cylinders under pressure.

- May be:
  - Flammable or combustible
  - Toxic
  - Asphyxiant
- Always a:
  - Physical hazard

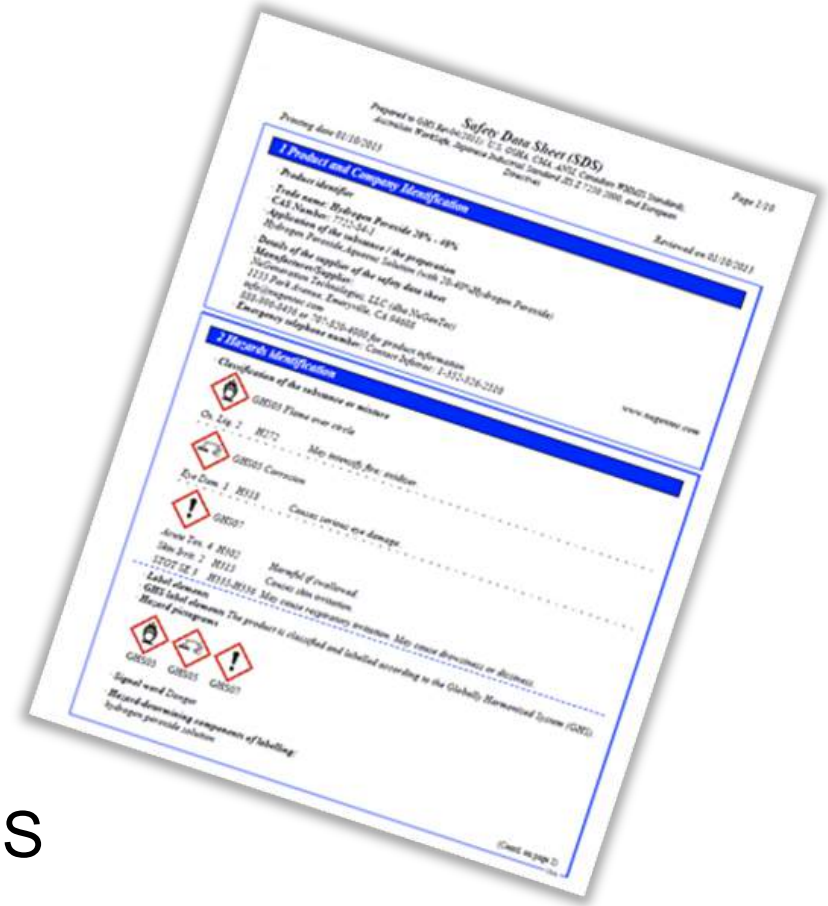
https://www.youtube.com/watch?v=ejEJGNLTo84

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Safety Data Sheets (SDS)

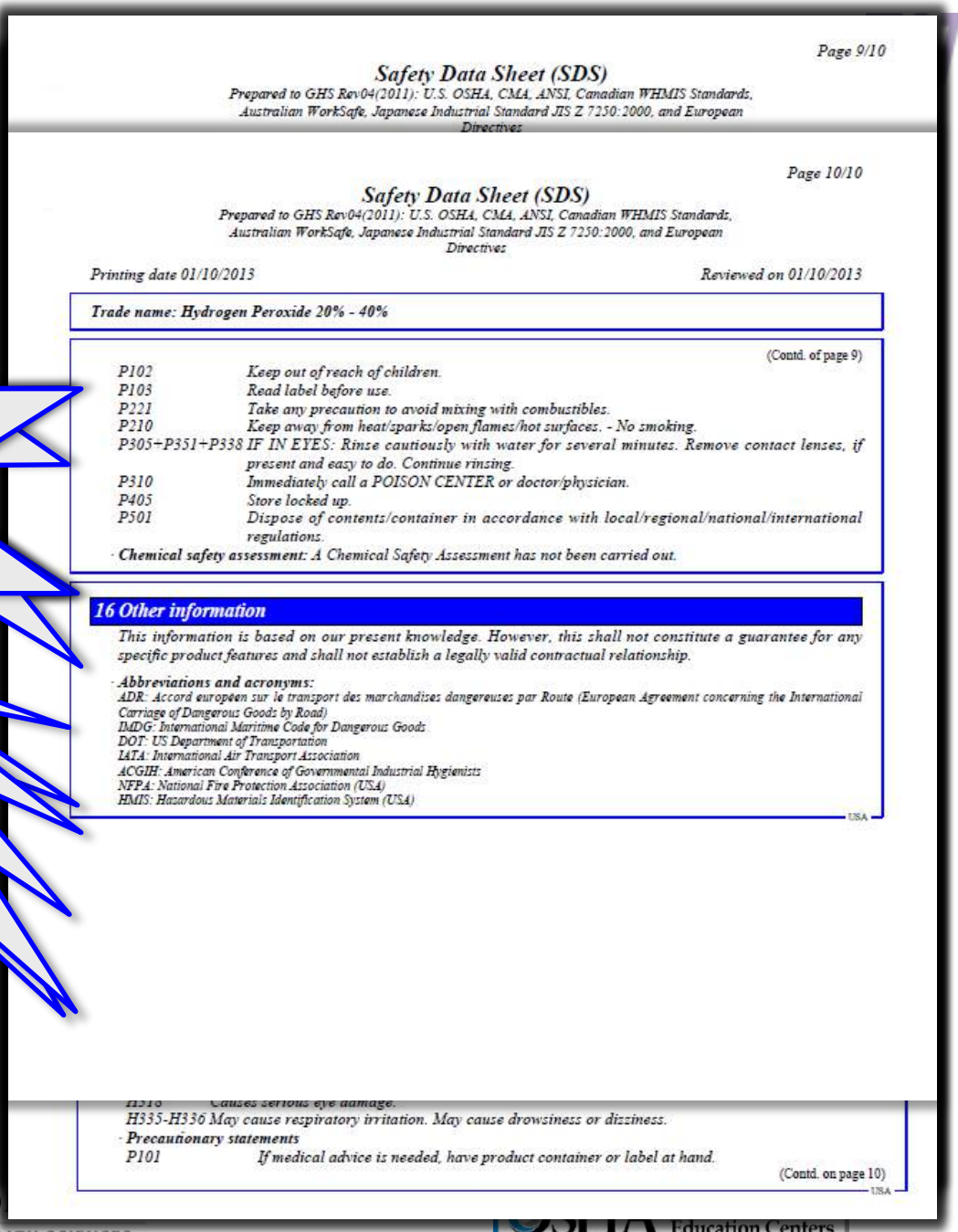
- Prepared by manufacturer
  - Each SDS is unique to each manufacturer and product
- Made available to employees
  - SDS for every chemical on inventory
- Required if product can create exposure
  - i.e., grinding wheel
- Universal format since 2012 GHS implementation
  - 16 sections



Page 250 (Module 3, page 14)

Let's tour the 16 sections of the SDS

Section 16: Other information, including date of preparation or last revision.



Page 9/10

Safety Data Sheet (SDS)
Prepared to GHS Rev04(2011): U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

Page 10/10

Safety Data Sheet (SDS)
Prepared to GHS Rev04(2011): U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

Printing date 01/10/2013 *Reviewed on 01/10/2013*

Trade name: Hydrogen Peroxide 20% - 40%

(Contd. of page 9)

P102 Keep out of reach of children.
P103 Read label before use.
P221 Take any precaution to avoid mixing with combustibles.
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/physician.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

USA

H318 Causes serious eye damage.
H335-H336 May cause respiratory irritation. May cause drowsiness or dizziness.

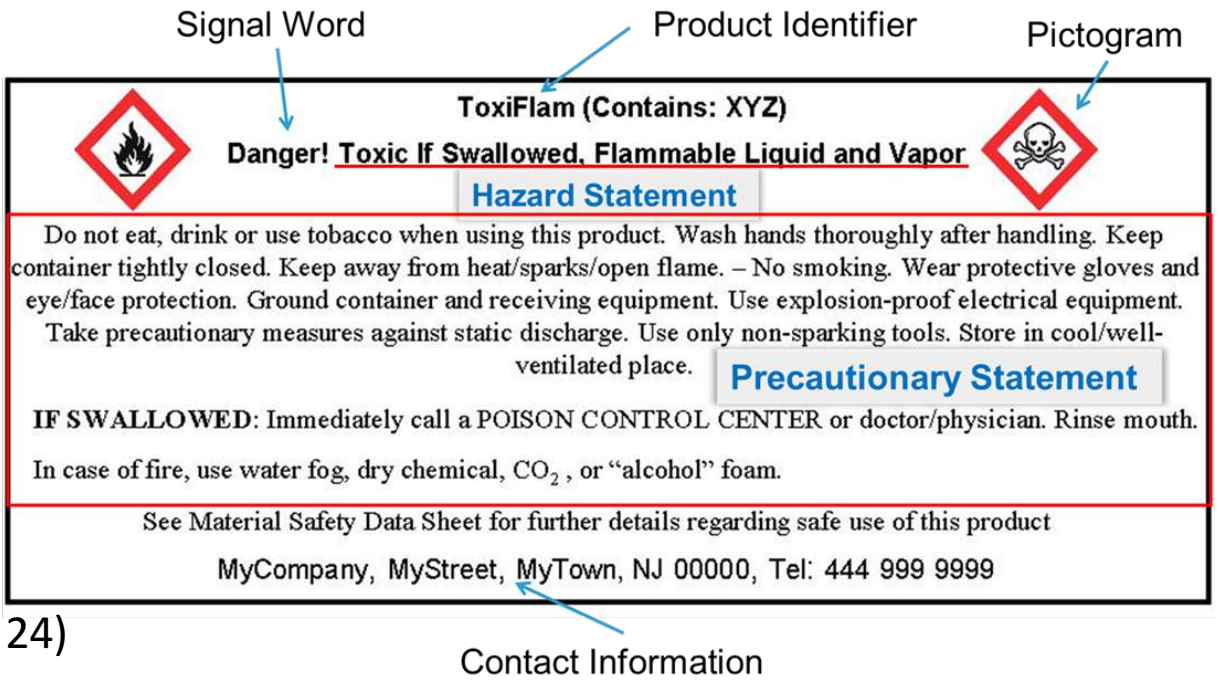
· **Precautionary statements**
P101 If medical advice is needed, have product container or label at hand.

(Contd. on page 10)

USA

Labels

- Name/product identifier
- Signal word: “Danger” or “warning”
- Hazard statement
- Pictograms
- Precautionary statement
- Contact info



Page 260 (Module 3, page 24)

Secondary Labels

Secondary containers must be labeled with:

- Product name or identifier
- Hazard Information

Unless used immediately and is never unattended

Page 260 (Module 3, page 24)

Pictograms: **Acute Toxicity**

Fatal or Toxic

Extremely poisonous and dangerous, and will produce health effects soon after swallowing, inhaling, or getting on skin.

Examples:

- Sulfuric acid
- Ammonia

Page 269 (Module 3, page 33)

Pictograms: **Toxic**

The product is harmful, acutely toxic, a respiratory irritant, a skin sensitizer, or can make someone sick if inhaled or contacted with skin.

Example:

- Butane

Page 269 (Module 3, page 33)

Pictograms: **Chronic Health Hazard**

The product produces chronic health effects. This includes carcinogens, mutagens, reproductive toxicity, sensitizers, target organ toxicity

Example:

- Benzene
- Diisocyanates

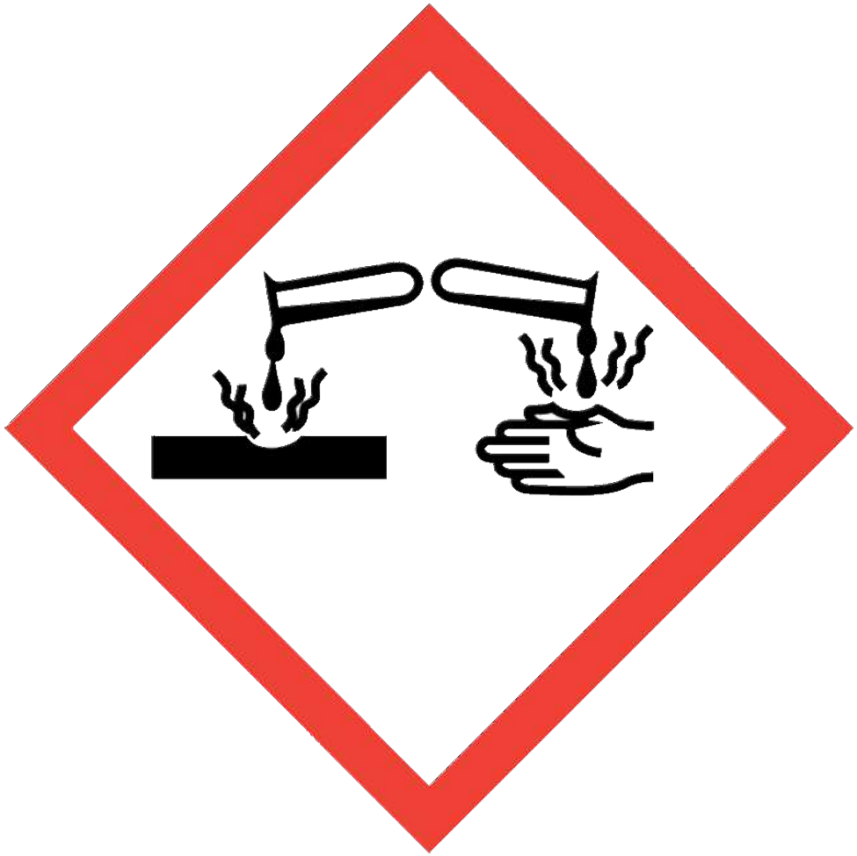
Page 269 (Module 3, page 33)

Pictograms: **Corrosive**

The product produces destruction of skin, including deeper tissues. Can cause skin burns, eye damage, and destroy metals.

Example:

- Lye
- Sodium Hydroxide

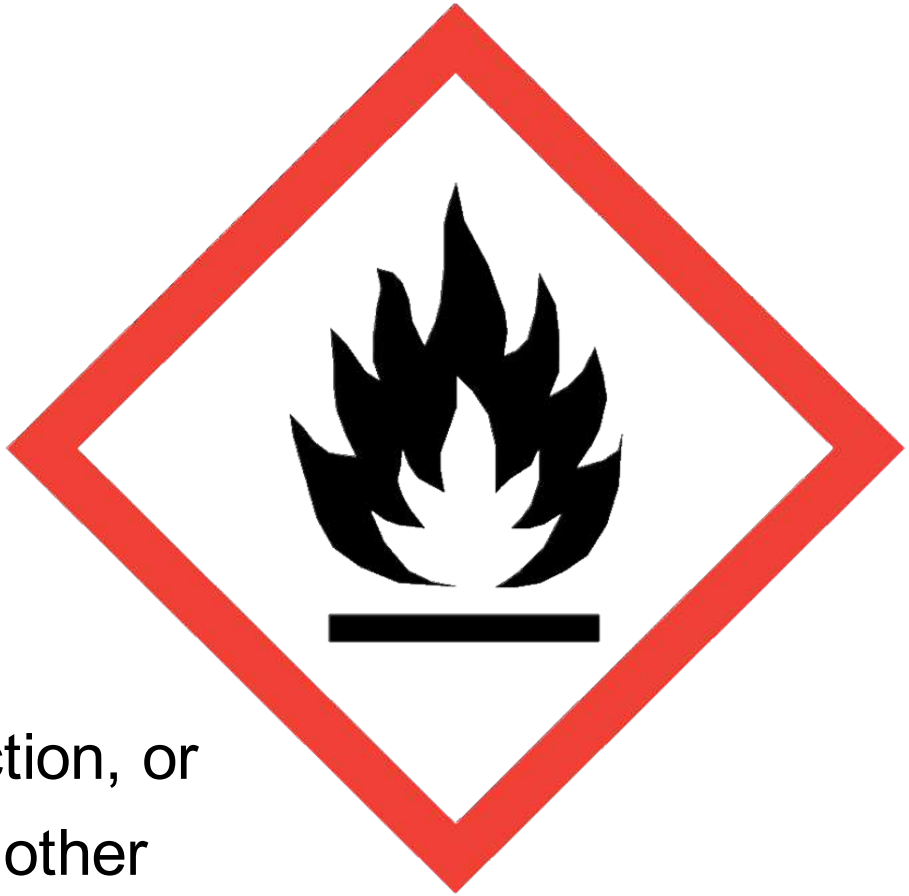


Page 269 (Module 3, page 33)

Pictograms: **Flammable**

Products that are:

- Flammable
- Self reactive
- Pyrophoric
- Self heating
- Emits a flammable gas
- Organic peroxide
- Sensitive to impact or friction, or
- Reacts dangerously with other chemicals



Page 269 (Module 3, page 33)

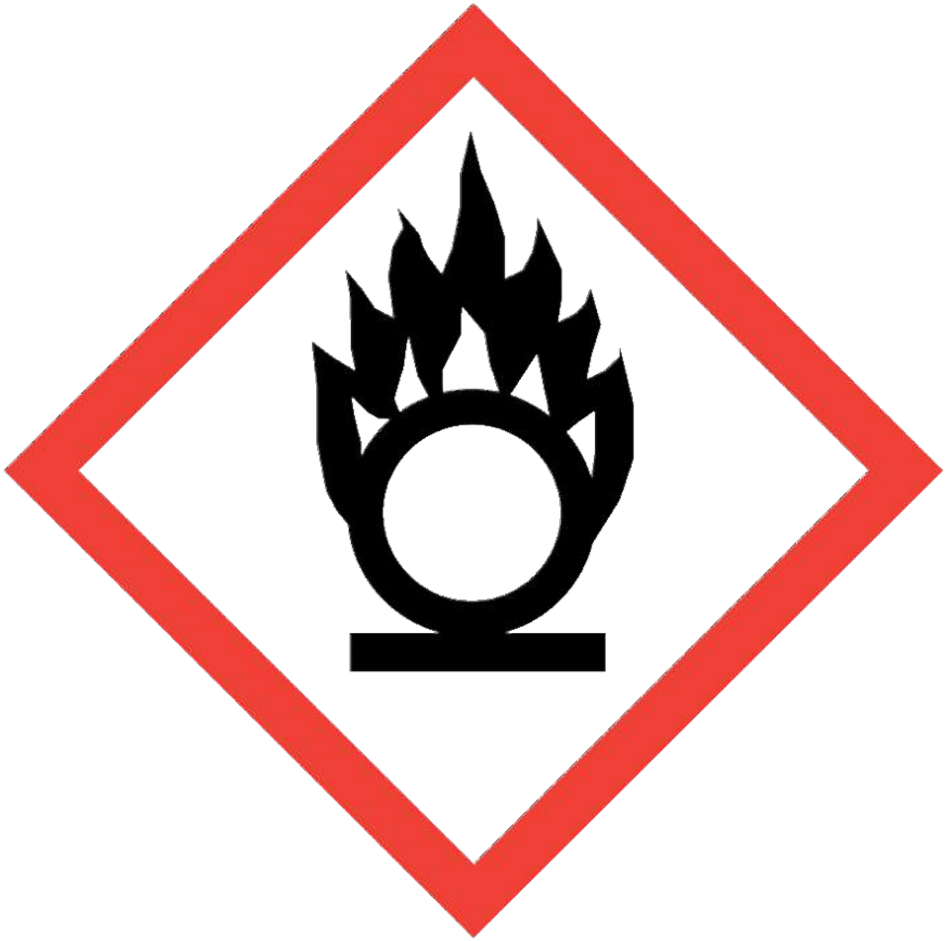
Pictograms: **Explosive**

Products that are explosive or self reactive, can explode when heated, or is an organic peroxide

Page 270 (Module 3, page 34)

Pictograms: **Oxidizer**

Products that are not flammable by themselves, but can react with other chemicals to produce oxygen, ozone, or hydrogen peroxide, which can cause fires



Page 270 (Module 3, page 34)

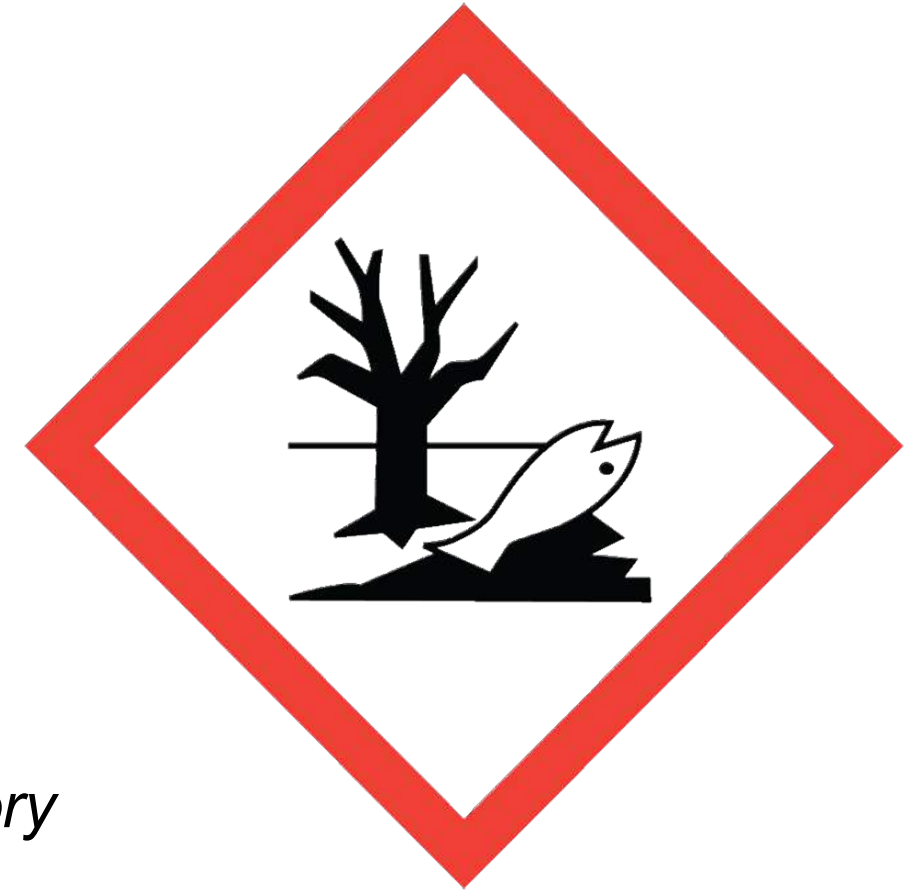
Pictograms: **Gas Under Pressure**

Products that are compressed, liquefied, or dissolved gas under pressure at 29 pounds per square inch or more.

Page 270 (Module 3, page 34)

Pictograms: **Aquatic Toxicity**

An environmental hazard. Toxic to fish or other organisms that live in water.



OSHA non-mandatory

Page 270 (Module 3, page 34)

Signal Words

There are **two** signal words in GHS:

- **Danger**: An immediate hazard to the worker
- **Warning**: A lesser although still potentially harmful hazard

Precautionary Statements

Brief Statements to prevent adverse effects.

Keep container tightly closed.
Keep away from heat/sparks/open flame-No smoking.
Use only outdoors or in a well-ventilated area.
Do not breath fume/gas/mist/vapours/spray.
Wear protective gloves and eye/face protection [as specified….]
Ground/bond container and receiving equipment.

IN CASE OF FIRE use [as specified] for extinction

FIRST AID
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
Call a Poison Center or doctor/physician if you feel unwell.

Store in a cool, well-ventilated place.

Standardized statements from Annex 3 of the Globally Harmonized System of Classification and Labeling of Chemicals linked to hazard categories

Page 271 (Module 3, page 35)

Distributors Must:

Make sure labels on chemicals shipped

- Meet GHS requirements
- Also meet DOT label requirements
- Make sure they don't conflict

Make sure customers have SDSs

- Include in or before first shipment
- Whenever updated
- Follow up with supplier if they don't provide SDS

Page 271 (Module 3, page 35)

Employee Training Content:

- Requirements of the Hazard Communication Standard
- Employer's Hazard Communication Program
  - List or inventory of workplace chemicals
  - How to access Safety Data Sheets
  - Labeling system
  - How to access
- How to detect chemicals in the workplace (i.e., CO from forklifts)
- Hazards of workplace chemicals
- How to protect themselves from hazards

Employee Training:

- In a manner and language employee's understand
- At initial assignment and when new chemicals are introduced
- Records must include:
  - Date of Training
  - Roster, signatures of attendees
  - Subjects covered
  - Names and qualifications of instructors
  - Copies of handouts and quiz results
  - List of videos or other training aids used

Page 276 (Module 3, page 40)

Module 4

Emergency Action Plans and Fire Prevention Plans

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Fires in Warehouses:

- 1,212 fires in warehouse properties per year
- $155 million in direct property damage, deaths and injuries

Source: NFPA

OSHA requires proper exits, fire extinguishers, and employee training to prevent injuries and fatalities

Page 281 (Module 4, page 1)

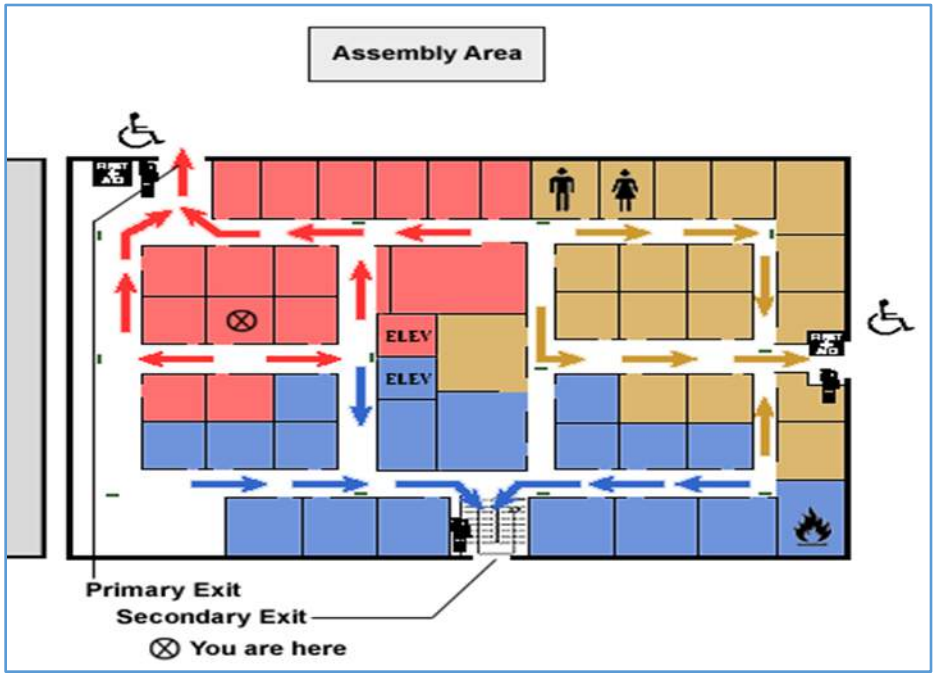
Module 4:

- Exit routes
- Emergency action plans
- Fire prevention plans
- Portable fire extinguisher and their intended use

Exit Routes

A continuous, unobstructed path of travel to a place of safety

- **Exit access:** Portion of exit route that leads to the exit
- **Exit:** Protected path of travel to exit discharge
- **Exit discharge:** Leads directly out
- **Refuge area:** for shelter in place



Page 281 (Module 4, page 1)

Exit Route - Basic Requirements

- Permanent and arranged for quick escape
- Fire-resistant materials
- Only openings necessary to allow access from exit to exit discharge
- Openings must be protected by an approved self-closing fire door

Page 281 (Module 4, page 1)

Exit Discharge

- Must lead directly outside,
  - or to a street, walkway, refuge area, or public way
- Large enough to accommodate all building occupants likely to use the exit route
- Stairs that continue beyond the level of exit discharge must be interrupted to clearly indicate the direction of travel to the exit discharge

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Exit Doors

- Must be able to open from the inside <u>at all times</u>
- Panic bars permitted
- Must be free of any device or alarm that could restrict emergency use if the device or alarm fails

Page 282 (Module 4, page 2)

Exit Door: Hinges

- Doors that connect room to exit must be marked
- Side hinged
- Swing in direction of travel if:
  - > 50 people, or
  - In a high hazard area

Page 282 (Module 4, page 2)

Exit Route Capacity and Dimensions

- Support maximum occupant load
- Capacity cannot decrease in direction of travel
- Dimensions:
  - Ceiling: 7 ½ feet, no projections to less than 6 feet 8 inches
  - At least 28 inches wide at all points
  - At least equal to width of exit and exit discharge

Page 282 (Module 4, page 2)

Minimize Danger to Employees

- Free of explosive/flammable materials
- No travel towards high hazard areas
- Suitable lighting
- No exit routes through bathrooms, rooms that can be locked, or dead ends
- Emergency safeguards in good working order
  - Sprinkler systems
  - Fire doors
  - Alarm systems

Page 283 (Module 4, page 3)

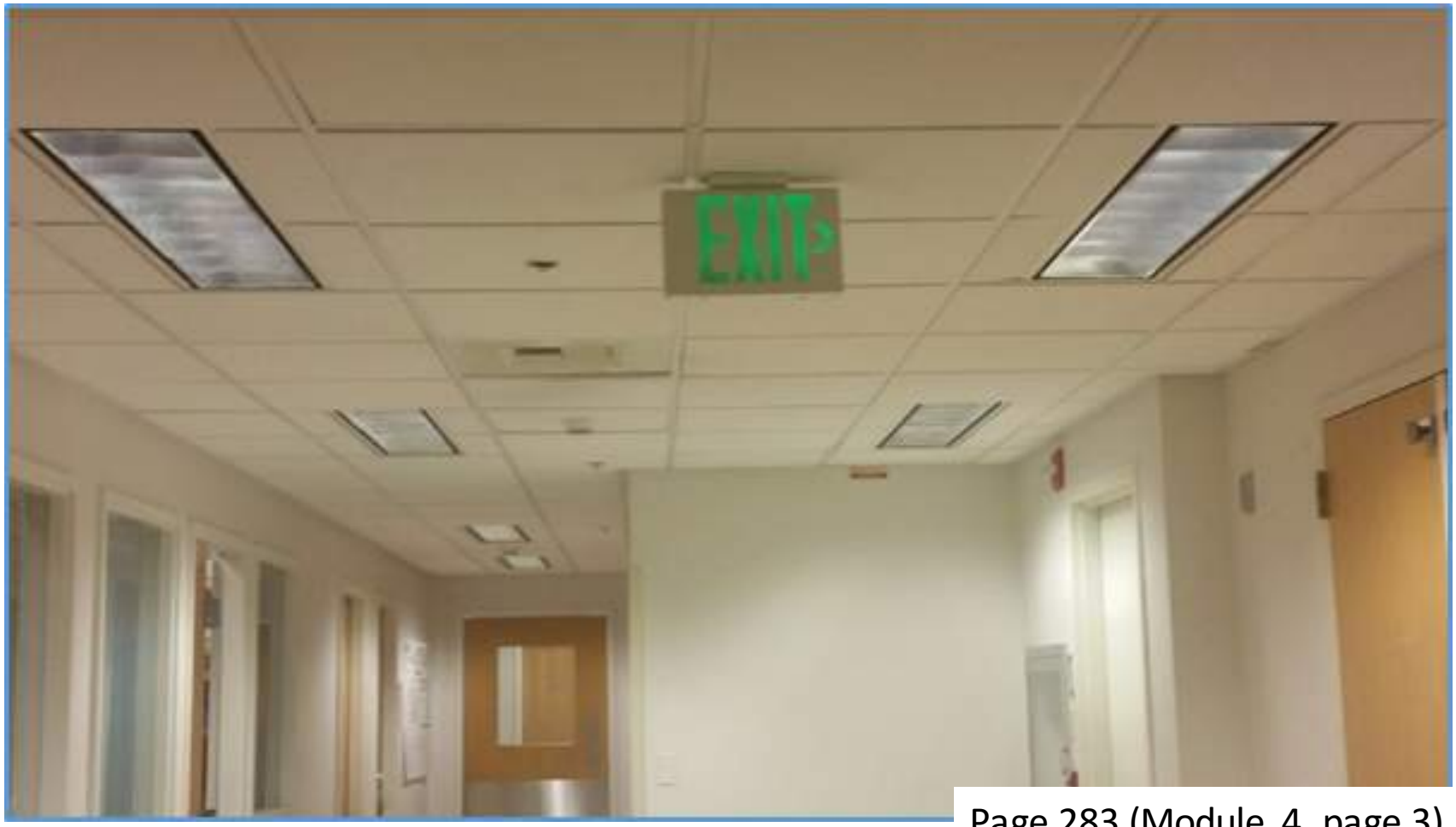
Exit Marking

- EXIT sign
- Clearly visible
- Signs, decorations must not obscure visibility
- Line of site must be clearly visible at all times

Page 283 (Module 4, page 3)

Exit Marking

- If direction is not clear, signs must indicate direction of travel



Page 283 (Module 4, page 3)

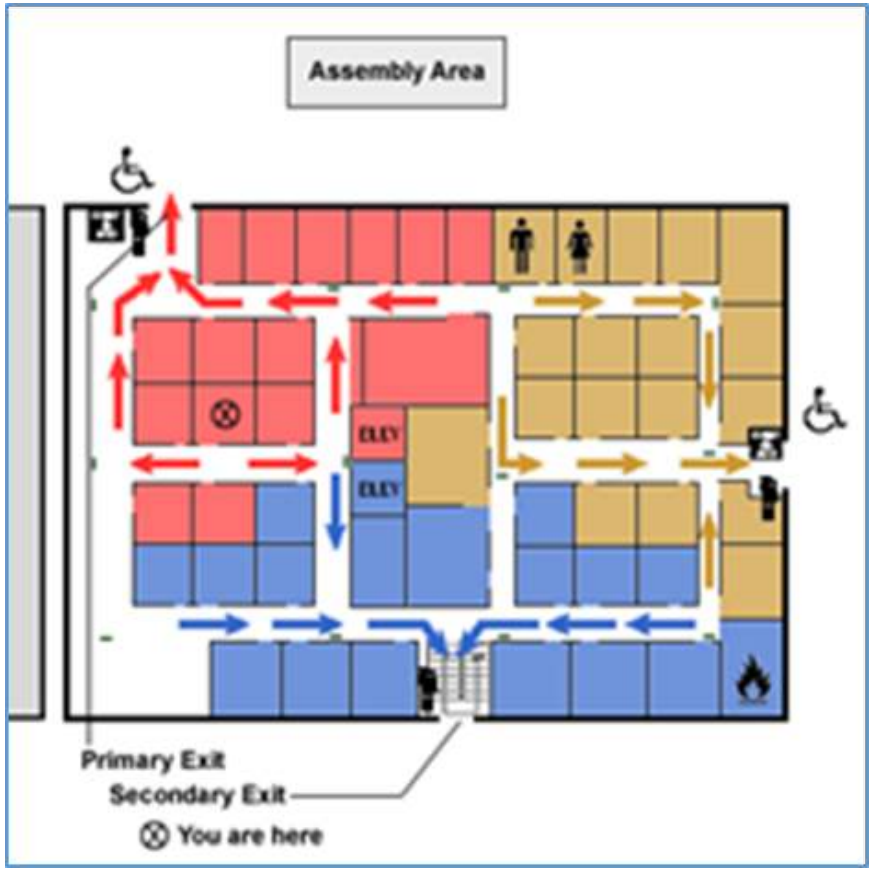
Exit Marking

- If it looks like an exit,
- …but is not an exit,
- It must be:
  - Marked as “Not an Exit”, or
  - Marked for its actual use

Page 283 (Module 4, page 3)

Maintenance During Construction and Alterations

- New buildings may not be occupied until exits are ready for use
- Building undergoing maintenance or repairs may not be occupied unless exit routes and fire protection is maintained



Page 286 (Module 4, page 6)

Emergency Action Plan

- Written document
- Procedures to report emergencies
- Alarm system
- Evacuation procedures and routes
- Exit diagrams
- Procedures to shelter in place
- Procedures for employees who remain after alarm

http://www.osha.gov/SLTC/etools/evacuation/floorplan_demo.html

- How to account for everyone after evacuation
- Duties: rescue & medical
- How to inform employees of plan
- Contact info for key personnel

https://www.osha.gov/SLTC/etools/evacuation/

Page 286 (Module 4, page 6)

Evacuation Wardens or Sweeps

- Sweep is last to leave: Checks offices, restrooms, other areas
- Makes sure doors are closed
- If people can't evacuate, sweep reports locations at assembly point
- Wardens may be assigned to assist others or account for personnel; may help people with disabilities or injuries
- Sweeps and Wardens must be trained, physically and emotionally capable of duties, and must agree to these duties
- Suggest one warden for every 20 employees

Page 287 (Module 4, page 7)

Critical Operations and Employees who Remain Behind

- Some employees may need to delay evacuation to:
  - Use fire extinguishers
  - Shut down gas/electrical systems
  - Operate specialized equipment
  - Prevent release of hazardous materials
- *Carefully* consider the risk/benefit
- Describe procedures in Emergency Evacuation Plan

Page 287 (Module 4, page 7)

Emergency Action Plan Training

- Types of potential emergencies
- Reporting
- Alarms
- Shutdown procedures
- Special hazards
- Fire hazards
- Roles & responsibilities
- Chain of command
- Notification & communication procedures
- Emergency response procedures

Page 287 (Module 4, page 7)

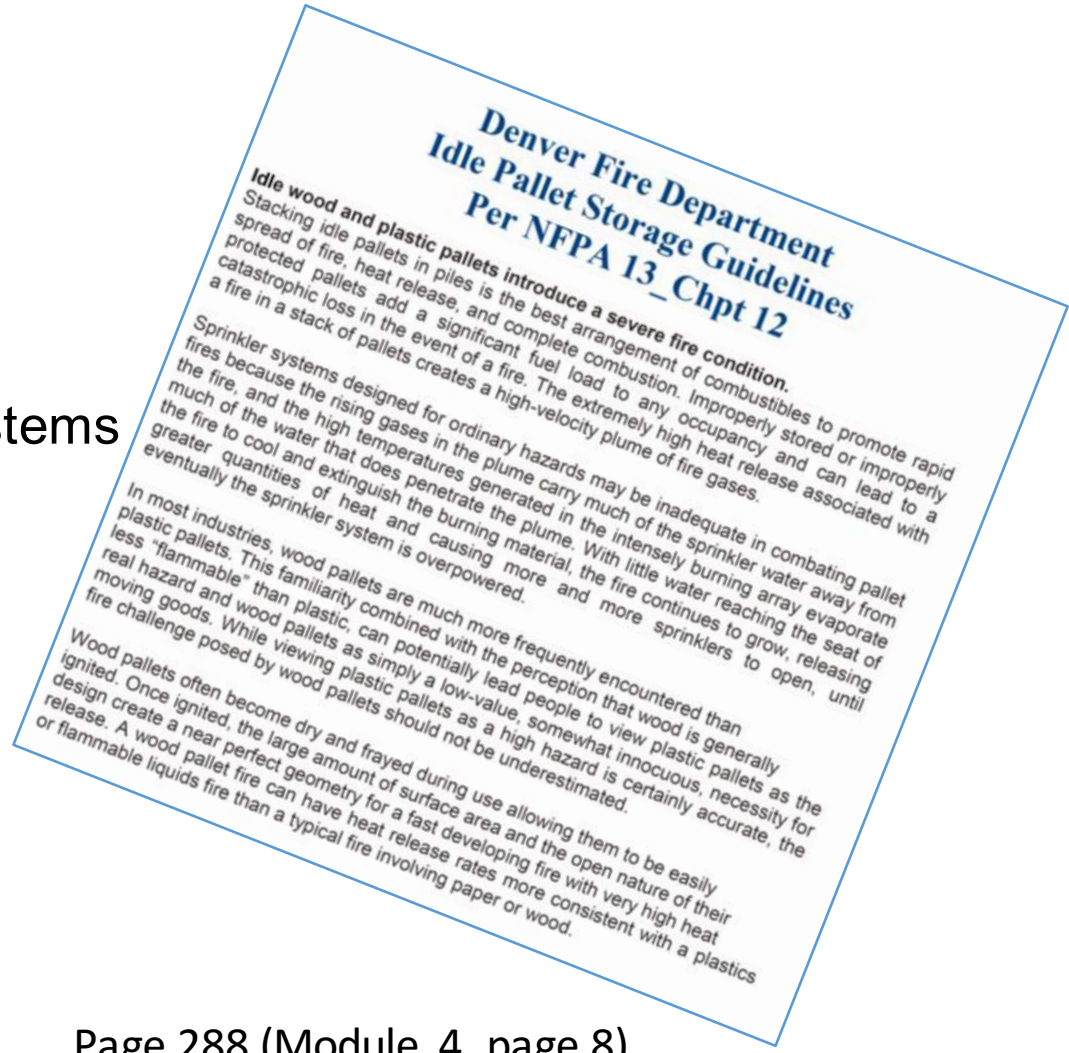
Fire Prevention Plan

- List of fire hazards and controls
- Control of accumulation of flammable & combustible waste
- Maintenance of safeguards on heat producing equipment
- Responsibilities for maintenance personnel and contact info
- Responsibilities for control of fuel source hazards and contact info

Page 288 (Module 4, page 8)

Fire Prevention Plan

- Identify fire sources
- Control methods for each ignition source
  - Detection devices
  - Portable fire extinguishers
  - Fixed fire extinguishing systems
- Review local codes
- Insurance provider requirements
- Plan with emergency responders
- Review annually
- Train employees



Denver Fire Department
Idle Pallet Storage Guidelines
Per NFPA 13_Chpt 12

Idle wood and plastic pallets introduce a severe fire condition.
Stacking idle pallets in piles is the best arrangement of combustibles to promote rapid spread of fire, heat release, and complete combustion. Improperly stored or improperly protected pallets add a significant fuel load to any occupancy and can lead to a catastrophic loss in the event of a fire. The extremely high heat release associated with a fire in a stack of pallets creates a high-velocity plume of fire gases.

Sprinkler systems designed for ordinary hazards may be inadequate in combating pallet fires because the rising gases in the plume carry much of the sprinkler water away from the fire, and the high temperatures generated in the intensely burning array evaporate much of the water that does penetrate the plume. With little water reaching the seat of the fire to cool and extinguish the burning material, the fire continues to grow, releasing greater quantities of heat and causing more and more sprinklers to open, until eventually the sprinkler system is overpowered.

In most industries, wood pallets are much more frequently encountered than plastic pallets. This familiarity combined with the perception that wood is generally less "flammable" than plastic, can potentially lead people to view plastic pallets as the real hazard and wood pallets as simply a low-value, somewhat innocuous, necessity for moving goods. While viewing plastic pallets as a high hazard is certainly accurate, the fire challenge posed by wood pallets should not be underestimated.

Wood pallets often become dry and frayed during use allowing them to be easily ignited. Once ignited, the large amount of surface area and the open nature of their design create a near perfect geometry for a fast developing fire with very high heat release. A wood pallet fire can have heat release rates more consistent with a plastics or flammable liquids fire than a typical fire involving paper or wood.

Page 288 (Module 4, page 8)

Fire Prevention

- Pallet fire:

  https://www.youtube.com/watch?v=sIkxnANOW2s

  https://www.youtube.com/watch?v=R65ShnaCRuI&t=36s

  https://www.youtube.com/watch?v=hNNg_E428N0&t=27s (go to 1:58)

- Why sprinklers are a good thing

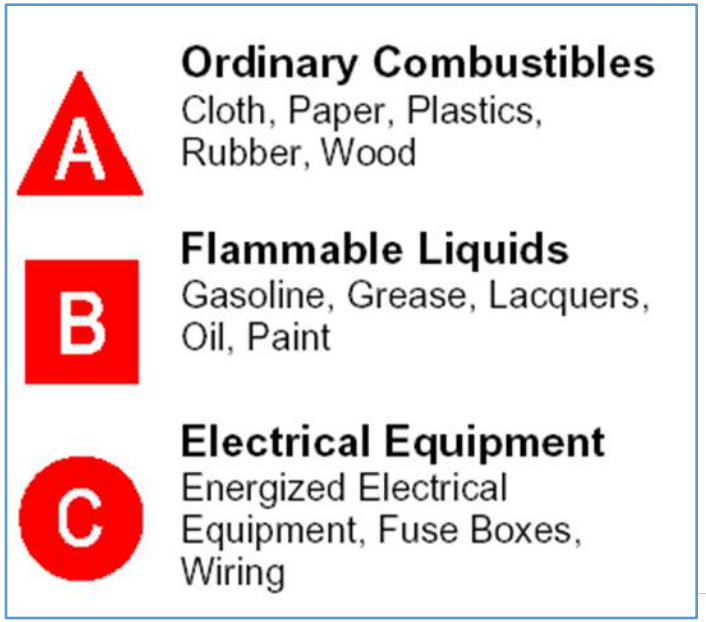
  https://www.youtube.com/watch?v=iZu2Fs1sOJQ

Portable Fire Extinguishers

- Fire extinguishers must be:
  - Available
  - Accessible
  - Maintained
- Use a fire extinguisher if:
  - Properly trained
  - Have proper extinguisher for fire
  - The fire won't block exit
  - The fire extinguisher works

Page 298 (Module 4, page 18)

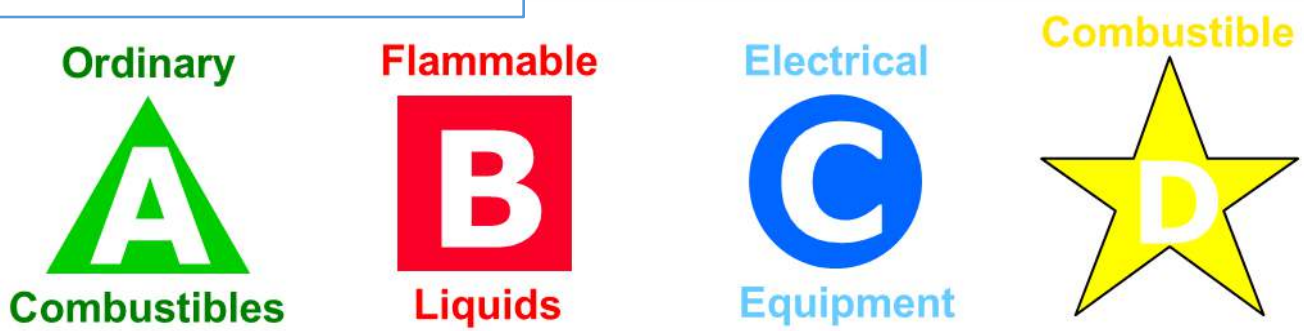
Portable Fire Extinguishers



- A = Ash
- B = Barrel
- C = Circuits

Also:

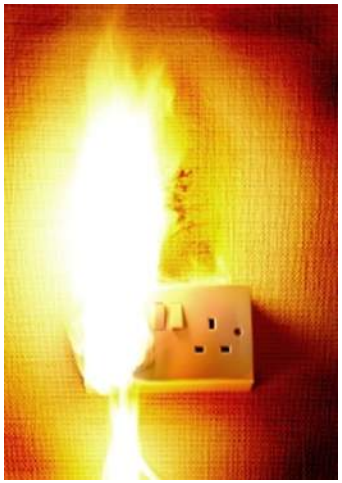
- *D = Combustible metals*
- *K = Kitchen (oils and grease)*



Page 298 (Module 4, page 18)

Fire Extinguisher Ratings

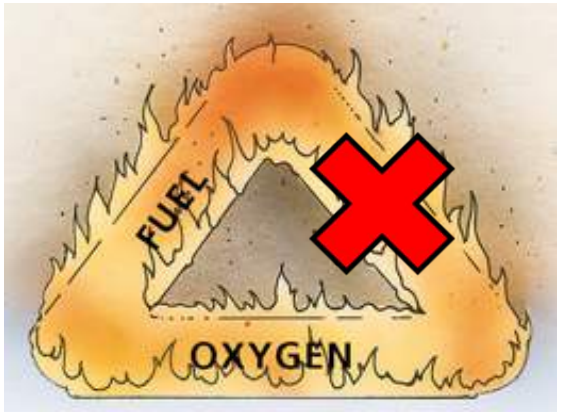
- Numerical ratings: How large a fire an experienced person can put out.
  - For example, a 4-A rated extinguisher could extinguish a 10 square foot fire
- Rule of thumb:
  - Wastepaper basket size



Page 298 (Module 4, page 18)

Air-pressurized water (APW)

- Class A fires
- Large silver container
- Cools surface of the fuel to remove the “heat” element of the fire triangle



Source: nps.gov

Page 299 (Module 4, page 19)

Carbon Dioxide

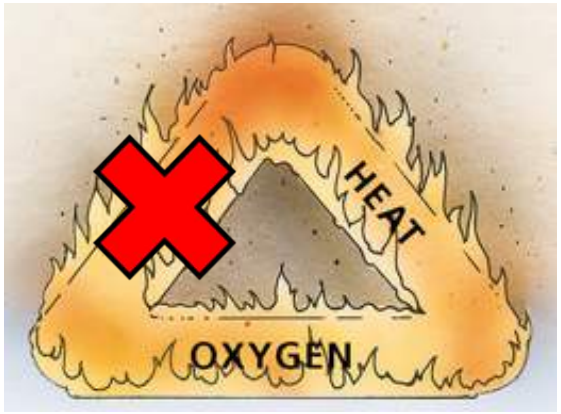
- Class B & C fires
- Large horn and no pressure gauge
- Displaces oxygen

Source: nps.gov

Page 299 (Module 4, page 19)

Dry Chemical

- Class A, B & C or B & C fires
- Coats fuel with thin layer of retardant powder
- Separates fuel from oxygen



Source: nps.gov

Page 300 (Module 4, page 20)

Types of Fire Extinguishers

https://www.youtube.com/watch?v=EUVzpiiL3Ng

Maintenance

- Monthly inspections
- Annual maintenance check
- Hydrostatic testing

Page 300 (Module 4, page 20)

Employee Training

- Annually on:
  - Principles of fire extinguisher use
  - Hazards of incipient (beginning) stage fires

https://www.youtube.com/watch?v=IIwResK9VBc

https://www.youtube.com/watch?v=TKZgafg06Xc

Page 301 (Module 4, page 21)

Use the “P.A.S.S.” system

Pull the pin

Aim at the base of the fire from about 8 feet away

Squeeze the handle

Sweep from side to side at the base of the fire until it is out

“P.A.S.S.”

https://www.youtube.com/watch?v=LlyWkGmXewo

https://www.youtube.com/watch?v=KgC3plR8daw

Module 5

Wall and Floor Openings

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Walking and Working Surfaces

Updated OSHA Standard: 2017

- Slips, trips, falls are a majority of injury incidents in general industry
- Falls to a lower level a leading cause of occupational fatality

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Definitions 29 CFR 1910.21

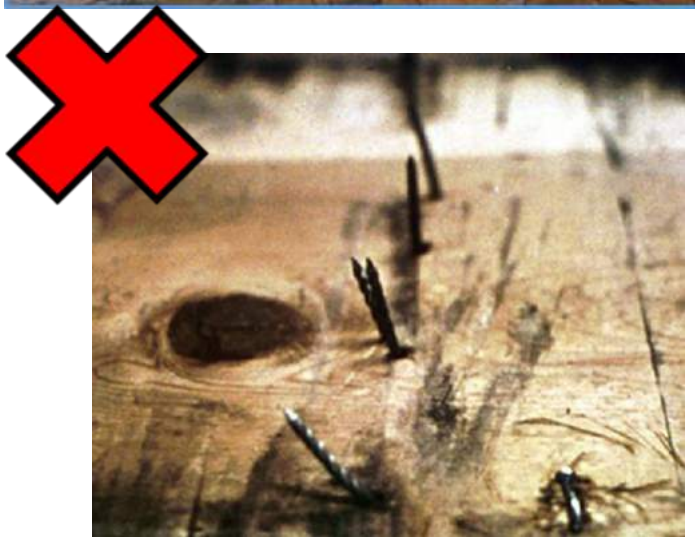
Guardrail system	A barrier erected along an unprotected or exposed side, edge, or other area of a walking-working surface to prevent employees from falling to a lower level.
Handrail	A rail used to provide employees with a handhold for support.
Hole	A gap or open space in a floor, roof, horizontal working surface or similar surface that is at least 2 inches in its least dimension.
Opening	A gap or open space in a wall, partition, vertical walking working surface that is at least 30 inches high and at least 18 inches wide, through which an employee can fall to a lower level.

Definitions 29 CFR 1910.21

Platform	A walking-working surface that is elevated above the surrounding area.
Runway	An elevated walking-working surface, such as a catwalk, a foot walk along shafting, or an elevated walkway between buildings.
Unprotected sides and edges	Any side or edge of a walking-working surface (except at entrances and other points of access) where there is no wall, guardrail system, or stair rail system to protect an employee from falling to a lower level.
Walking-working surface	Any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area or workplace location.

Housekeeping

- Clean, orderly and sanitary
- Floor surfaces clean and dry
  - Platforms, mats, or other dry standing surfaces may be needed
- No protruding nails, splinters, holes or loose boards
- Free of leaks, spills, snow and ice
- Regular inspections
- Correct damage, corrosion, structural impacts



Page 308 (Module 5, page 2)

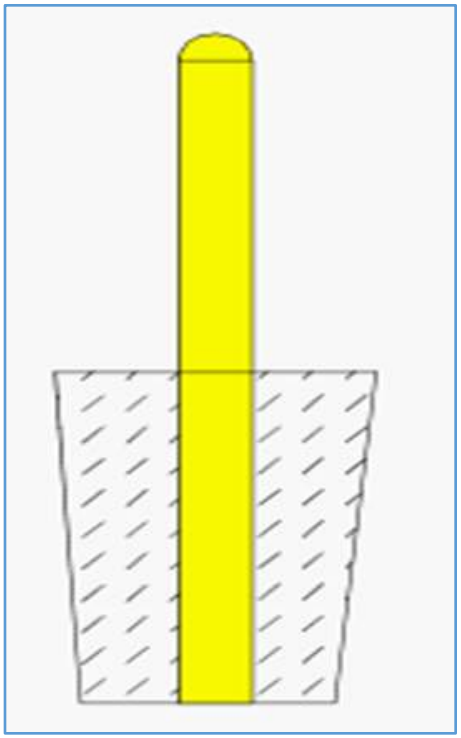
Aisles and Passageways

- Permanently mark aisles and passageways.
  - Non slip paint (epoxy)
  - Not tape
- Emergency access must be clear
- Insufficient aisle width can impede traffic, cause injuries
- Risk increases with poor housekeeping

Page 308 (Module 5, page 2)

Best Practices for Aisles and Passageways

- Barricades to protect walls, racking, materials from forklift damage
- Permanent bollards: heavy grade steel placed in concrete
- Steel mirrors or warning signs at blind corners and intersections
- Windows in doors
- Bolt racking to floor



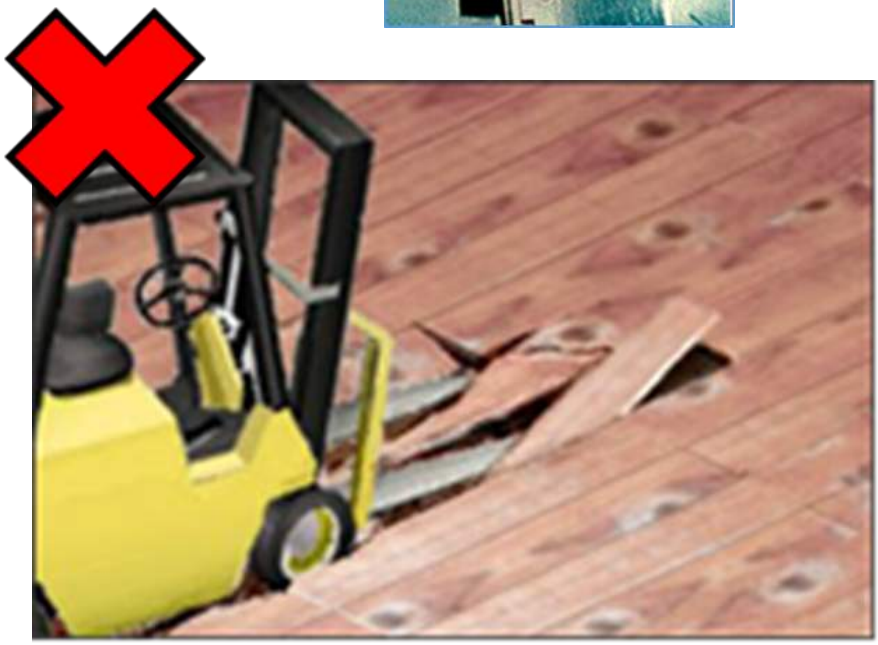
Bollard set in cement

Page 308 (Module 5, page 2)

Floor Loading

Employers are responsible for ensuring that floors can support intended loads

- Best practice: Post load ratings
  - From building owner?
  - 3rd party certification?
  - Perform testing and evaluation?
- Include mezzanine



Page 309 (Module 5, page 3)

Unprotected Sides and Edges

Any side or edge of a walking-working surface where there is no wall, guardrail system, or stair rail system to protect an employee falling to a lower level.

- Protection must be provided if an employee could fall four (4) feet or more
  - Guardrail systems
  - Safety net systems, or
  - Personal fall protection system

Page 312 (Module 5, page 6)

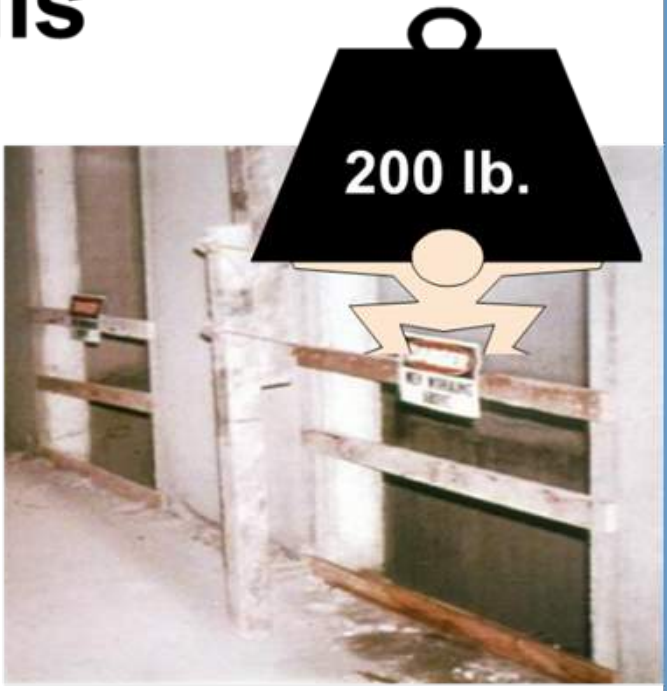
Guardrails

- Top edge of guardrail 42 ± 3 inches
- Midrails at midway between top edge of guardrail and walking/working surface
- Intermediate members 19 inches apart, maximum
- Toeboard

Page 312 (Module 5, page 6)

Guardrails

Completed structure must be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail

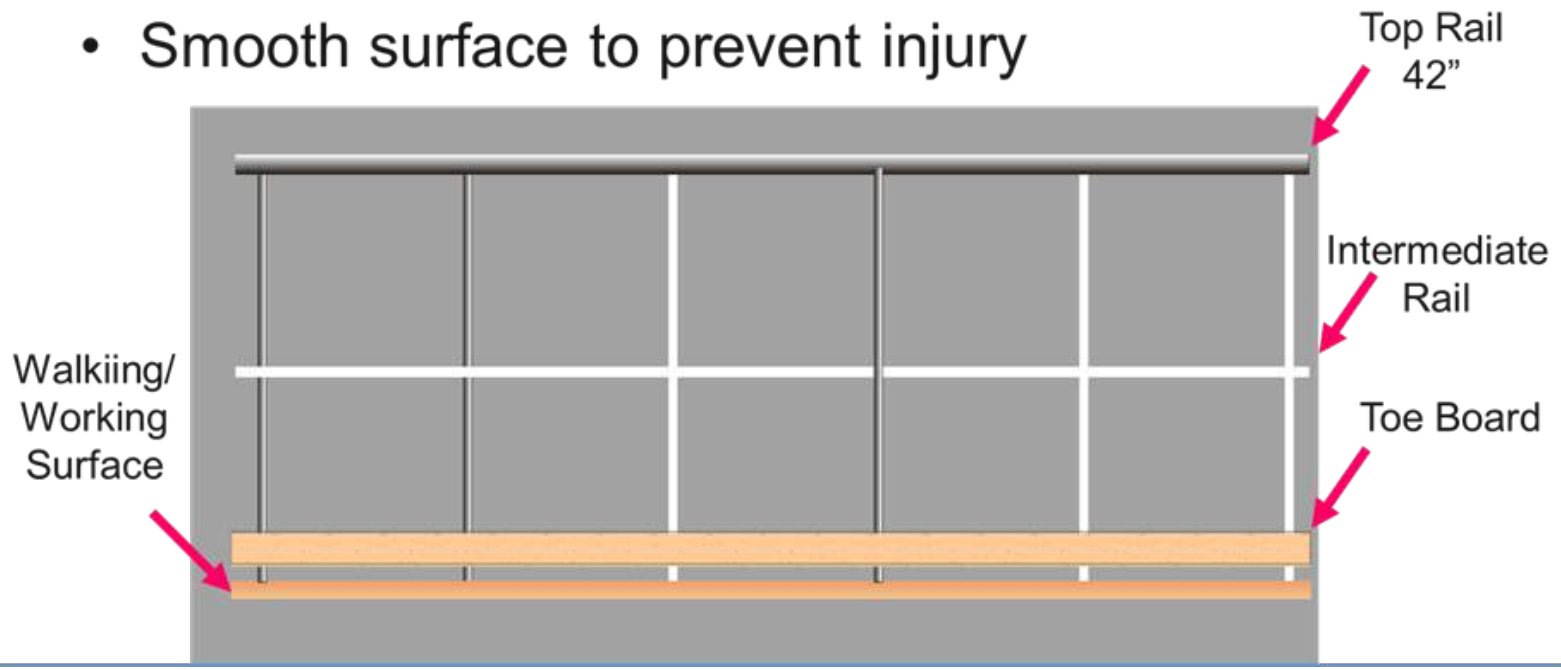


PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Standard railing

- Top rail at least 3 inches from any object
- Withstand at least 200 lbs of force
- Smooth surface to prevent injury



PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Toeboards

- Prevent falls and falling objects
- 3.5 inch height along exposed edge
- Solid, no openings more than 1 inch
- Withstand 50 pound force
- At vehicle service pits (i.e., forklifts)
  - 2.5 inch toeboard, *or*
  - Omitted if prevents access to pit

Page 313 (Module 5, page 7)

Holes

- If *more than 4 feet* from lower level, protect with:
  - Covers
  - Guardrails
  - Travel restraint systems, or
  - Personal fall arrest
- If *less than 4 feet* from lower level, prevent tripping with:
  - Covers, or
  - Guardrail systems

29 CFR 1910.28 (b) (3)

Page 315 (Module 5, page 9)

Runways

- Must be protected by guardrails on both sides (4 feet or more to a lower level)
- Guardrail can be absent from one side if:
  - Required for special purpose
  - Runway is at least 18 inches wide, and
  - Personal fall arrest or travel restraint system used

29 CFR 1910.28 (b) (5)

Page 315 (Module 5, page 9)

Docks

29 CFR 1910.28 (b)

(iii) When the employer can demonstrate that the use of fall protection systems is not feasible on the working side of a platform used at a loading rack, loading dock, or teeming platform, the work may be done without a fall protection system, provided:

(A) The work operation for which fall protection is infeasible is in process;
(B) Access to the platform is limited to authorized employees; and,
(C) The authorized employees are trained in accordance with §1910.30.

Best Practices at Docks

- Secure truck trailers before entering
- Drive forklifts slowly
- Train employees to
  - Keep clear of dock edges
  - Never back a forklift up to the edge
- Paint edge of dock yellow (visual warning)
- Prohibit jumping off dock

Page 316 (Module 5, page 10)

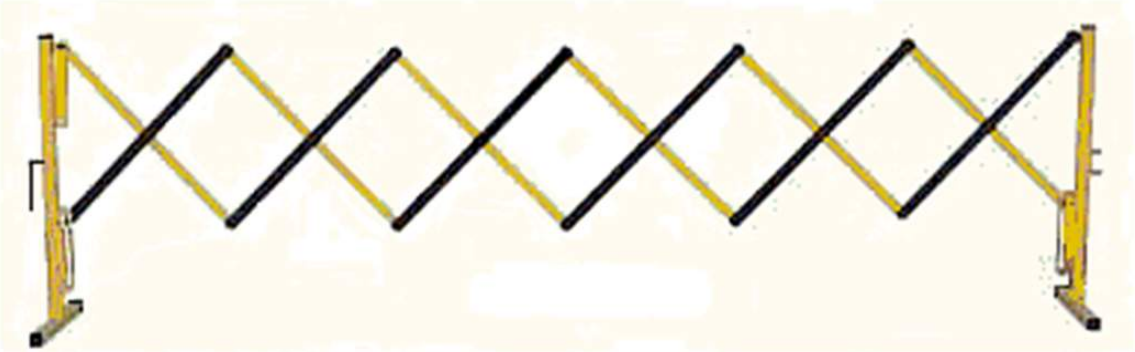
Best Practices at Docks

Removable railings

Roll up doors

Page 316 (Module 5, page 10)

Best Practices at Docks



Expandable gates

Safety gates

Page 317 (Module 5, page 11)

Best Practices at Docks

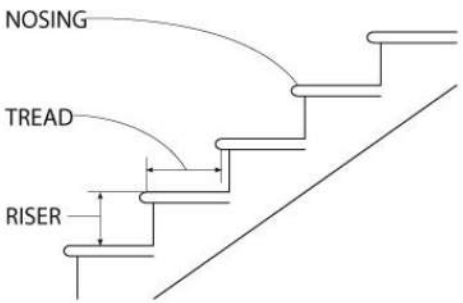
Full height folding gates

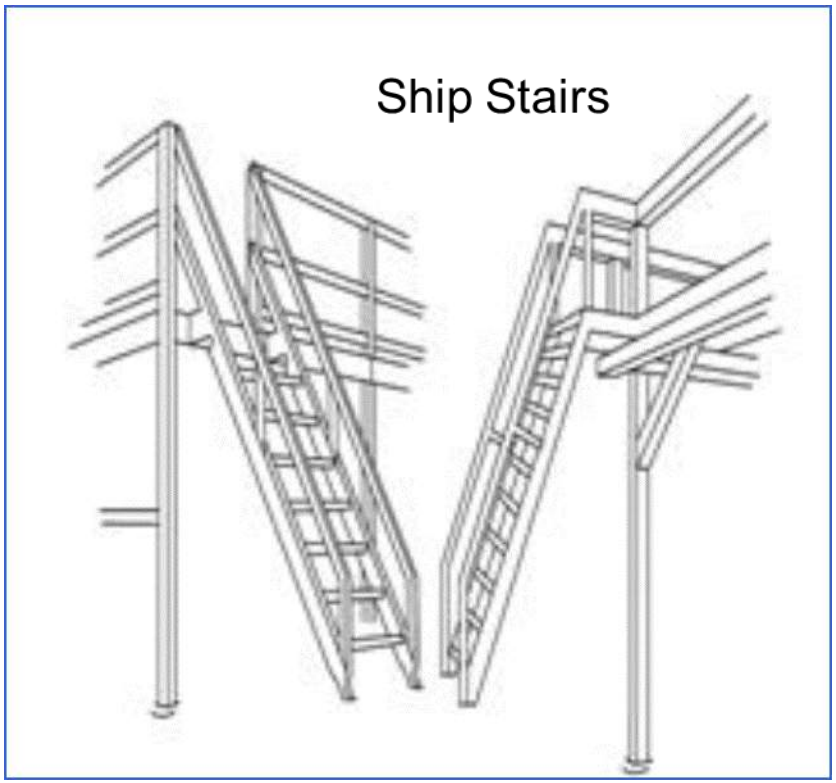
Other ideas?

Page 317 (Module 5, page 11)

Stairways

Use Standard Stairs





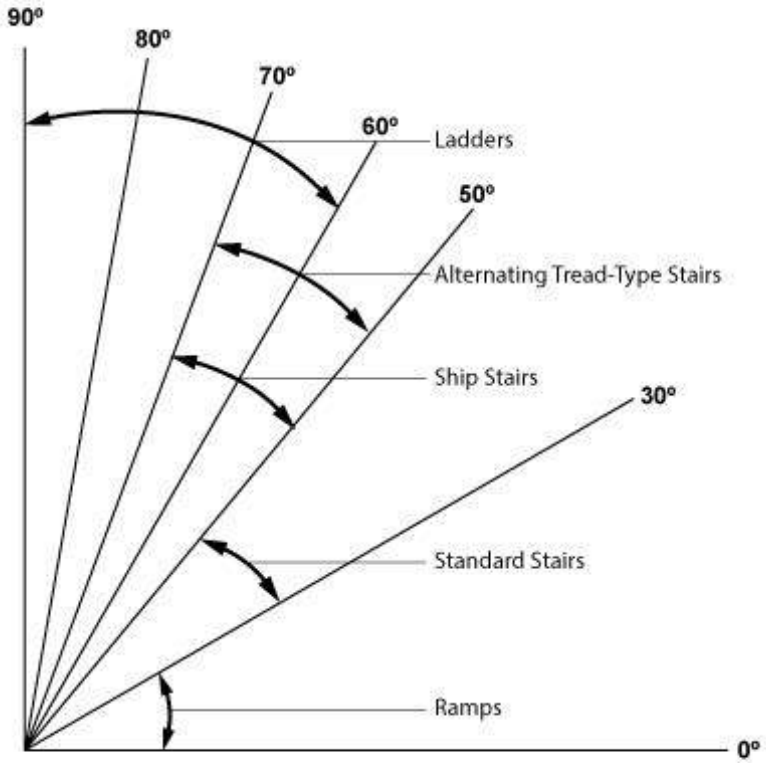
If Standard Stairs are not feasible, use ship, spiral, or alternating stairs

Page 318 (Module 5, page 12)

Stairways, Dimensions

Requirements	Standard Stairs	Ship Stairs	Spiral Stairs
Angle from horizontal, degrees	30-50	50-70	n/a
Maximum riser height, inches	9.5	12 (not less than 6.5)	9.5
Minimum tread depth, inches	9.5	4	7.5
Minimum width, inches	22	18	26

Page 319 (Module 5, page 13)



Angle	Type
≤ 30°	Ramps
30° – 50°	Standard Stairs
50° – 70°	Ship Stairs
50° – 70°	Alternating Tread-Type Stairs
60° – 90°	Ladders

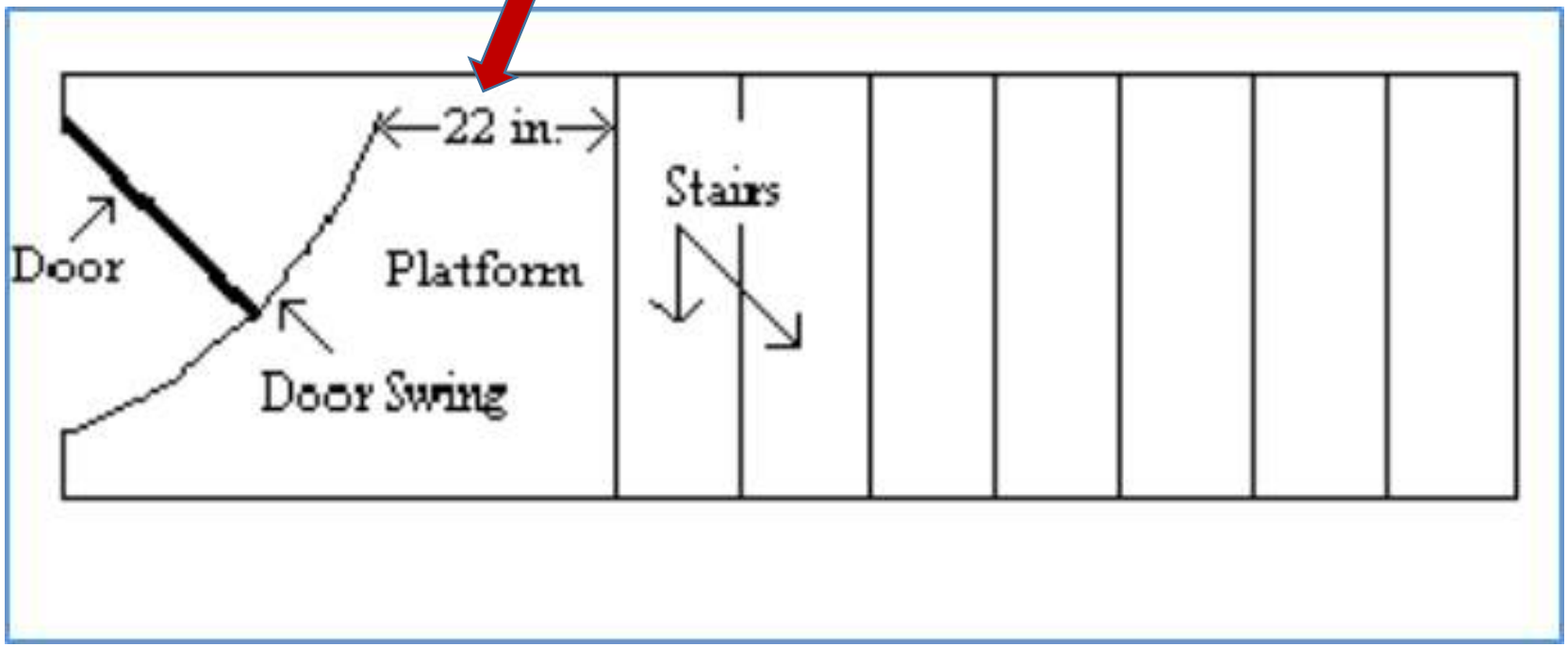
Stairways

- Must have handrails, stair rail systems, guardrails
- Vertical clearance (6’8” for standard stairs)
- Uniform riser heights & tread depth
- Landings at least 30 inches in depth
- Each stair must support
  - At least 5 times normal load
  - At least 1000 pounds

Page 319 (Module 5, page 13)

Door Opening to Stairways

20 inches if installed before 1/17/2017



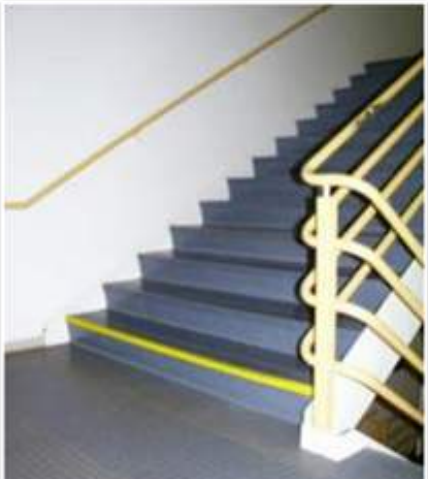
Page 319 (Module 5, page 13)

Best Practices for Workplace Design

Step edges are highlighted for better visibility to prevent a misstep and fall down the stairs.

Mark/highlight step edges and transition areas (changes in elevations). Use anti-skid paint.

Confusing the bottom step with the floor is a common occurrence when it's not marked. No missing the last step here.



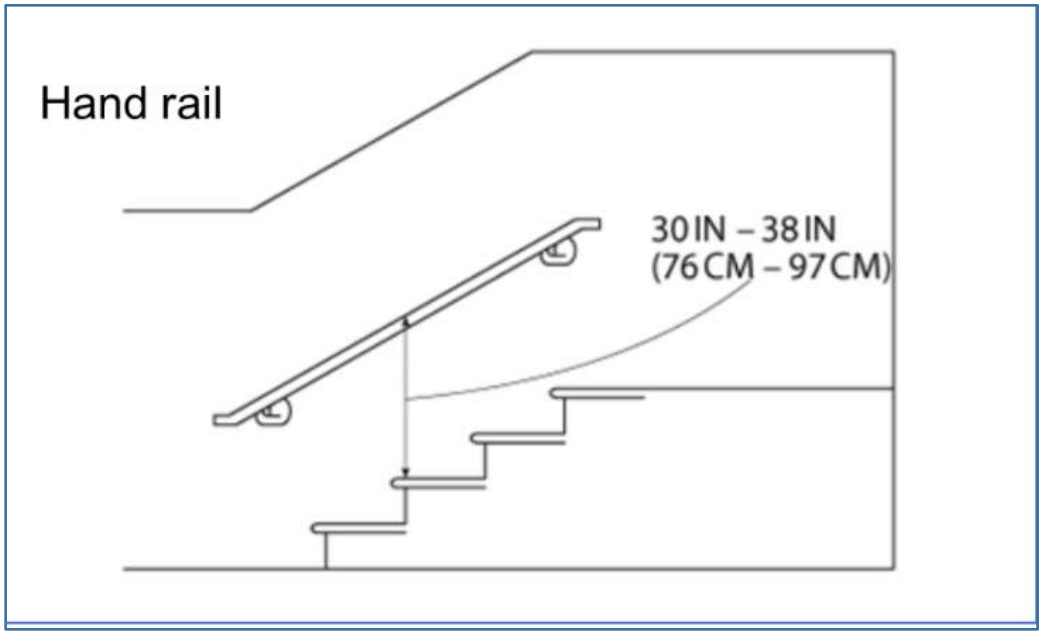
Make sure stairs have sufficient lighting and hand rails.

PACIFIC NORTHWEST OSHA EDUCATION CENTER
DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON · SCHOOL OF PUBLIC HEALTH

OSHA Training Institute Education Centers
University of Washington

Handrails and Stair Rail Systems

- **Handrails**: for employees to hold onto for support
- **Stair rails**: prevent falls off stairways
- **Combined**: do both

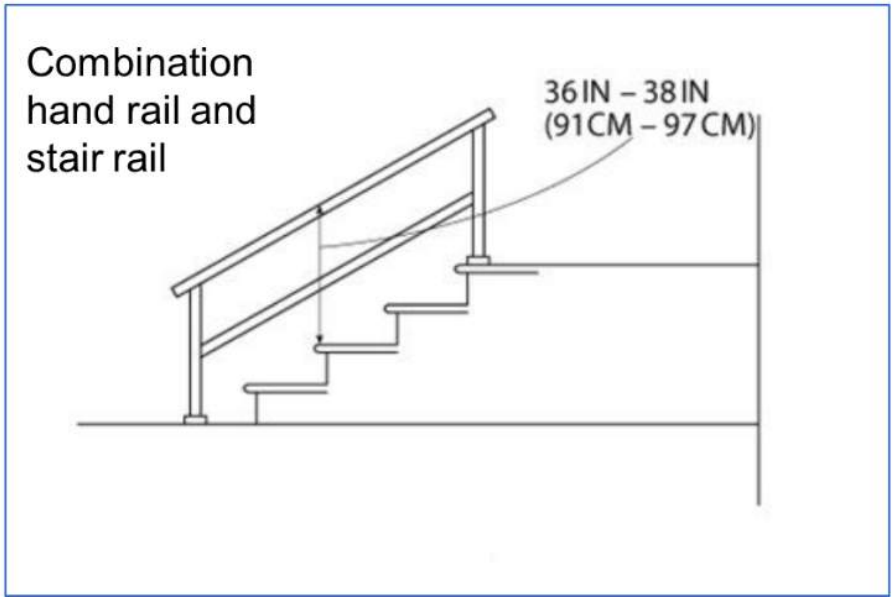


- *Handrail requirements:*
  - *30-38 inches high*
  - *2.5 inch hand clearance*

Page 321 (Module 5, page 15)

Stair Rail Systems: Height

- Installed before 1/17/17:
  - At least 30 inches
- Installed after 1/17/17:
  - At least 42 inches
- Combined stair rail/handrail systems:
  - 36-38 inches



Page 321 (Module 5, page 15)

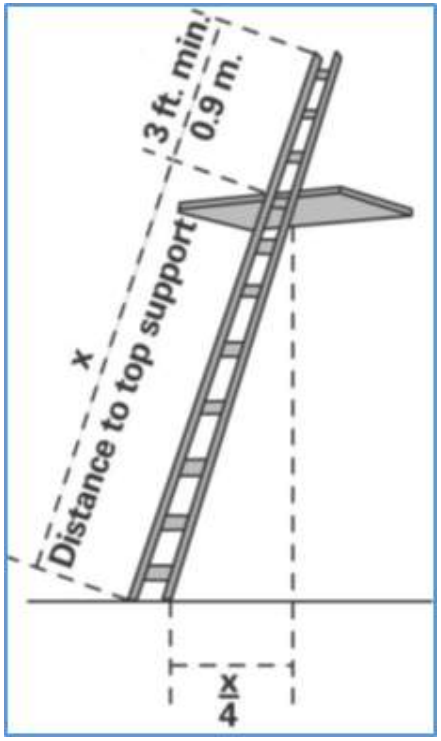
Portable Ladders

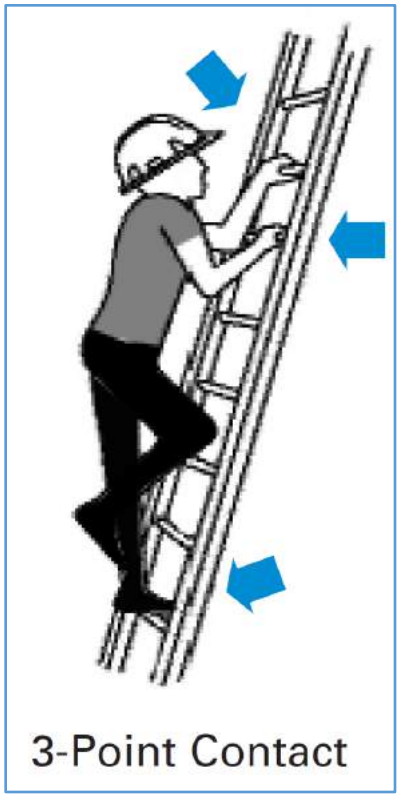
- Used for the purpose(s) for which they were designed
- Inspect at the beginning of each shift
- Red tag and remove if defective
- Free of puncture/laceration hazards
- Metal ladders must be protected from corrosion
- Wooden ladders can't be coated with a material that would obscure defects

Page 323 (Module 5, page 17)

Use of Portable Ladders

- Do not exceed maximum load
- Only one person at a time
- Face ladder
- Three points of contact
- Three feet above upper landing surface
- Do not move while someone is on it
- Do not use top step





Page 325 (Module 5, page 19)

Summary

- Explain the hazards of operating powered industrial truck in warehouse and storage facilities
- Explain the hazards associated with material handling in warehouse operations
- Identify the purpose of the Hazard Communication Standard and describe employer and employee responsibilities under HazCom
- Discuss exit routes and emergency action and fire prevention plans
- Describe hazards of wall and floor openings

Questions?