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THE SOUTH CAROLINA DEPARTMENT of ADMINISTRATION
Division of General Services

Powered Industrial Trucks

Operator Training

DGS Safety
July 2015

Ref: **29 CFR1910.178**

Policy On Powered Industrial Trucks (Forklifts)
Powered Industrial Truck (Forklift) Program

Disclaimer

This presentation is intended to provide instruction *prior* to you, the employee, undergoing on-the-job supervised training on the type(s) of powered industrial truck(s) used at your facility. After instruction and supervised OJT for an adequate time to gain familiarization and experience, you will be evaluated before being certified as qualified to operate a powered industrial truck without supervision.

A Powered Industrial Truck:

Is a mobile, power-propelled truck used to carry, push, pull, lift, stack or tier materials.

- Excluded are vehicles used for earth moving and over-the-road hauling.
- Commonly known as forklifts, pallet trucks, rider trucks, fork-trucks, or lift-trucks.

A Powered Industrial Truck

Can be powered by:

- Electric Motors
  - Easy to Maintain
  - Great for Warehouse Use (No Dangerous Fumes)
- Internal Combustion Engines
  - Fueled by Gas, Diesel or Liquid Petroleum Gas (LPG)
  - Stronger & Faster than Electric Forklifts
  - Not to be Used in Enclosed Areas (Fumes) Without Monitoring & Ventilation

Reasons for Forklift Training

- Powered industrial truck accidents annually cause approximately
  - 85 fatalities
  - 34,900 serious injuries
  - 61,800 non-serious injuries

- 25% (estimated) caused by inadequate training

Operating a forklift without training is dangerous and can even be fatal to you or other employees working in the area

You Tube Video (3:49)

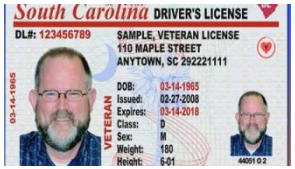
http://www.toolsofthetrade.net/jobsite-equipment/top-10-forklift-accidents.aspx

(requires internet connection)

Powered Industrial Truck

Operator Qualifications

- Valid South Carolina Driver's License
- Good Driving Record
- Physically Capable. Examples:



  - No adverse hearing loss that cannot be corrected with hearing aids.
  - No physical impairments that would impair safe operation of a PIT such as not being able to look over shoulder when traveling in reverse
  - Able to lift 50 pounds for material handling
  - No neurological disorders that affect balance or consciousness.
  - Not taking any medication that affects perception, vision, or physical abilities.

Trainees may only operate a powered industrial truck:

- Under direct supervision of a designated knowledgeable and experienced operator
- Where such operation does not endanger the trainee or other employees

Powered Industrial Truck Trainers / Evaluators

Surplus Property:

- **Pete McGhee**
- **Troy Cates**

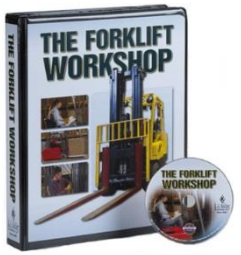
Custodial:

- **Thomas Eichelberger**

Forklift Training Program

Training shall consist of :

- **Formal instruction** (e.g., lecture, discussion, interactive computer learning, written material)
- **Practical training** (demonstrations and exercises performed by the trainee) *and*
- **Evaluation** of the operator's performance in the workplace



Forklift Training Program

The OSHA Forklift Standard Requires Training to Discuss the Following **Truck-Related Topics**:

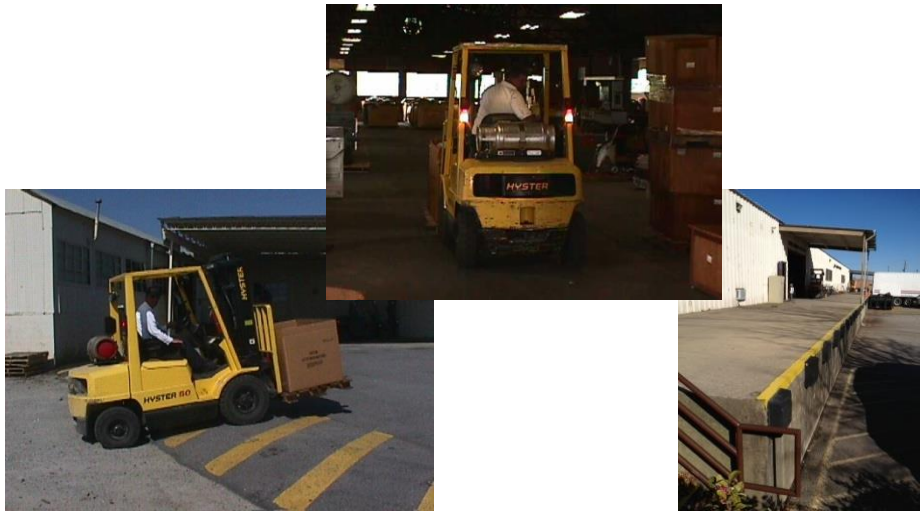
- Operating instructions, warnings and precautions
- Differences from automobile
- Controls and instrumentation
- Engine or motor operation
- Steering and maneuvering
- Visibility

- Fork and attachment adaptation, operation, use
- Vehicle capacity and stability
- Vehicle inspection and maintenance that the operator will be required to perform
- Refueling/Charging/ Recharging batteries
- Operating limitations
- Other instructions, etc.

Forklift Training Program

The OSHA Forklift Standard Requires Training to Discuss the Following **Work Environment-Related Topics**:

- Surface conditions
- Load
  - Composition
  - Stability
  - Manipulation
  - Stacking / Unstacking
- Pedestrian traffic
- Narrow Aisles
- Hazardous Locations
  - Ramps / Slopes
  - Poor Ventilation (CO Buildup)



Refresher Training

- Ensures Continued **Knowledge** and **Skills**
  Needed to Drive the Powered Industrial Truck *Safely*

- **Required when**:
  - Unsafe Operation
  - Accident or Near-Miss
  - Evaluation Indicates Need
  - New/Different Type of Equipment
  - Workplace Condition Changes
  - DGS Policy: Every 3 years

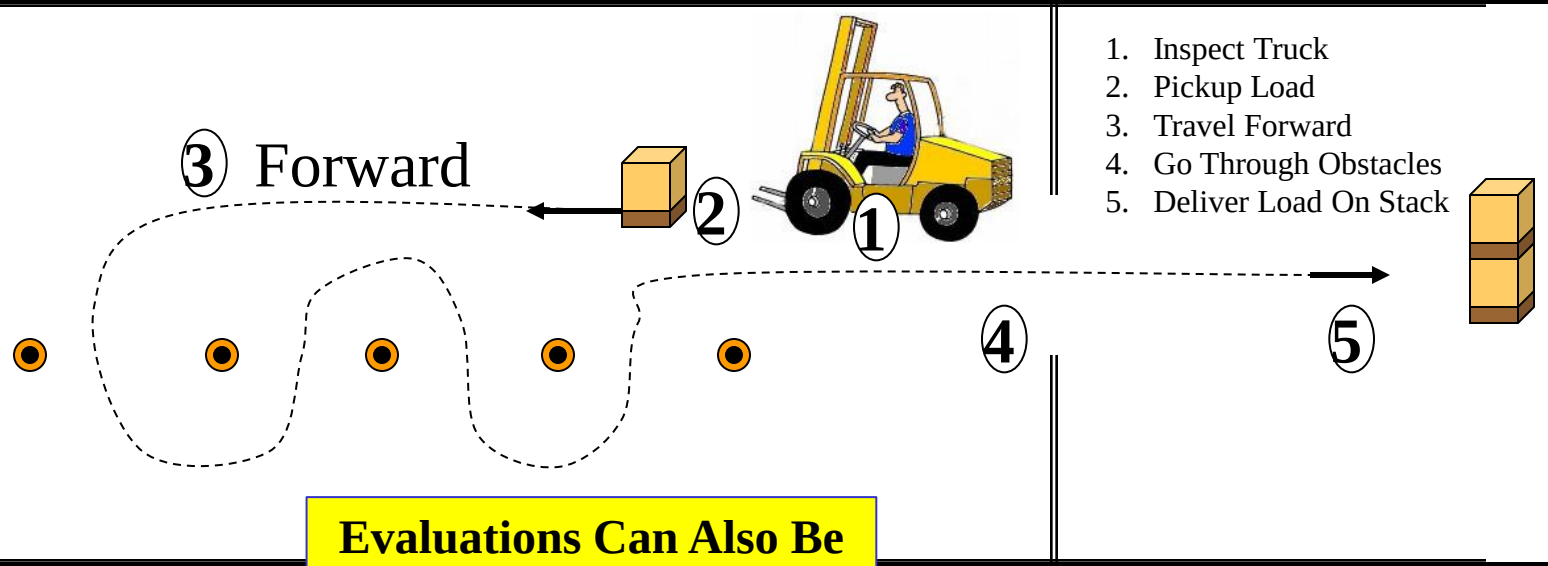
Operator Evaluation

Each Powered Industrial Truck Operator's Performance Must Be Evaluated:

- After initial training,
- After refresher training, and
- At least once every three years

Evaluation - Example

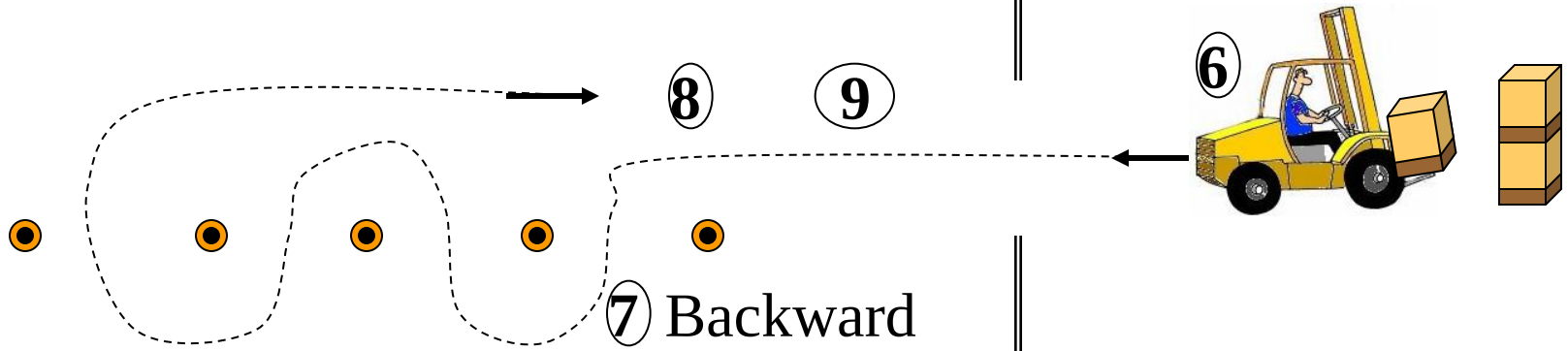
Evaluation - Example



1. Inspect Truck
2. Pickup Load
3. Travel Forward
4. Go Through Obstacles
5. Deliver Load On Stack

Evaluations Can Also Be Made While Watching Normal Operations

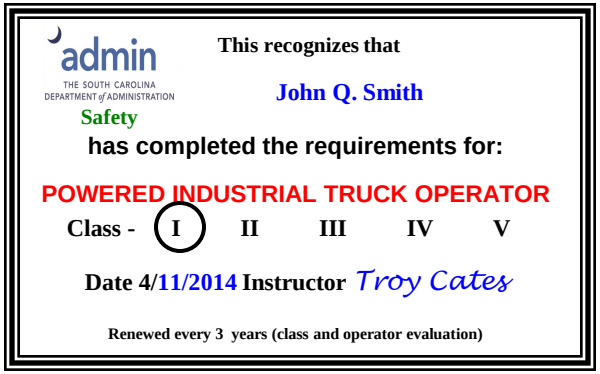
6-9: Same as 2-5 Except Go Backward



Certification

The employer shall certify that each operator has been trained and evaluated as required by the OSHA standard to operate specified type(s) of powered industrial truck(s).

Certification shall include:



- Name of operator
- Date of training
- Date of evaluation
- Identity of person(s) performing the training &/or evaluation

Forklift Classification

Class I - Electric Motor Rider Trucks

Solid Tire

Pneumatic Tire

Class II – Electric Motor Narrow Aisle Trucks

Class III - Electric Motor Walkies

Low-Lift Pallet

High-Lift Reach Pallet

Counterbalanced High-Lift Pallet

Class IV – Internal Combustion Engine (Solid Tire)

Class V – Internal Combustion Engine (Pneumatic Tire)

Class VI – Electric and Internal Combustion Engine Tractors

Class VII - Rough Terrain

Avoiding Duplicative Training

An operator who has previously received training for one type of truck and working conditions only needs additional training pertinent to a different type of truck and an operator evaluation in order to hold multiple certifications

ORDER PICKER

PALLET JACK

SIT DOWN RIDER

REACH TRUCK

ROUGH TERRAIN

STACKER

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Surplus Property
Forklift Operations

Hyster 50
Propane-Powered Forklift
4,000 LB. Capacity

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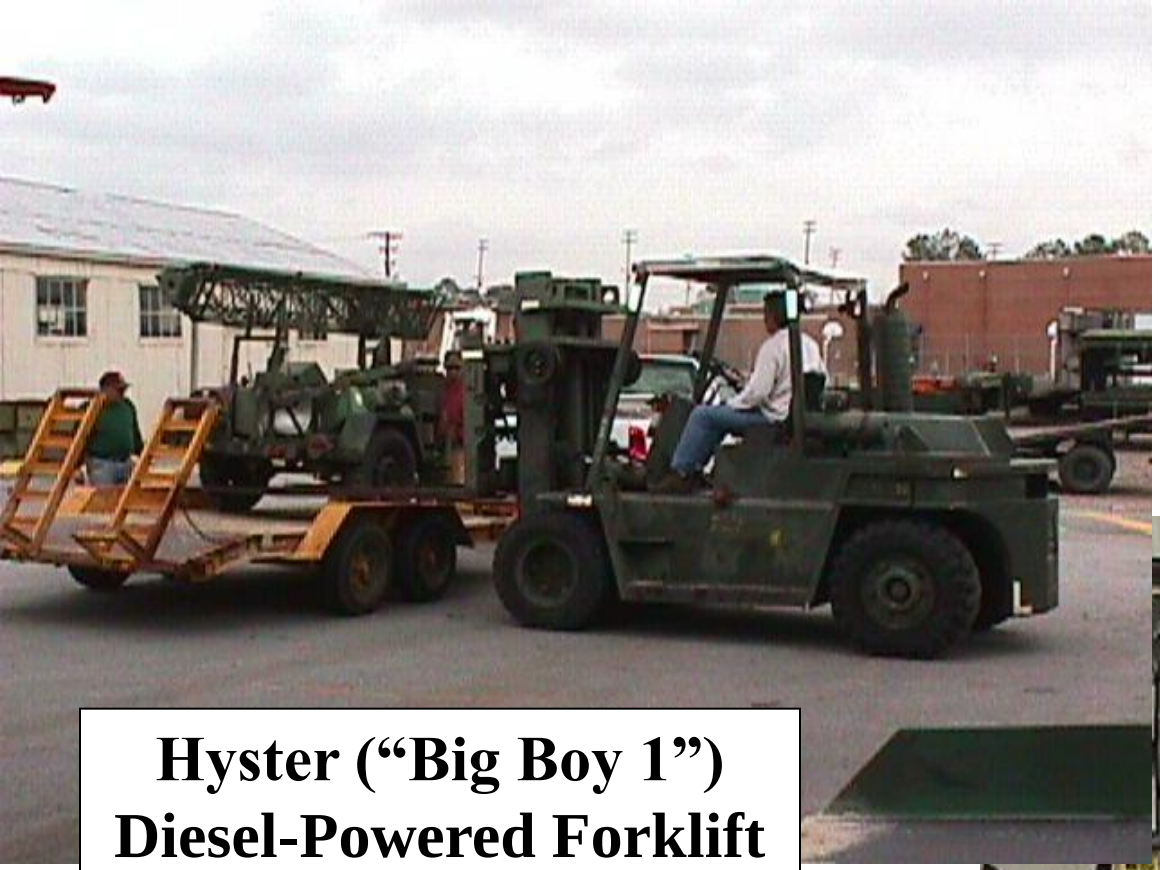
Surplus Property



Hyster ("Big Boy 1")
Diesel-Powered Forklift
10,000 LB. Capacity

CAT M40
Electric-Powered Forklift
4,000 LB. Capacity

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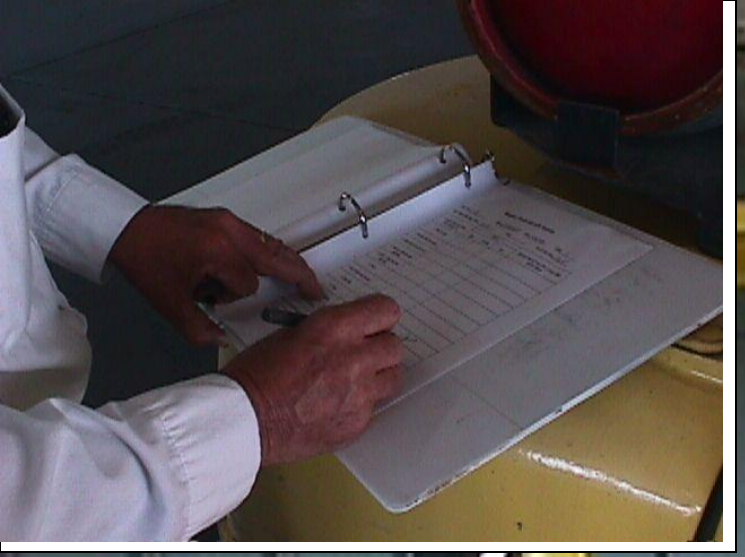
Surplus Property

Hand Pallet Trucks (Hydraulic) 5,000 LB. Capacity



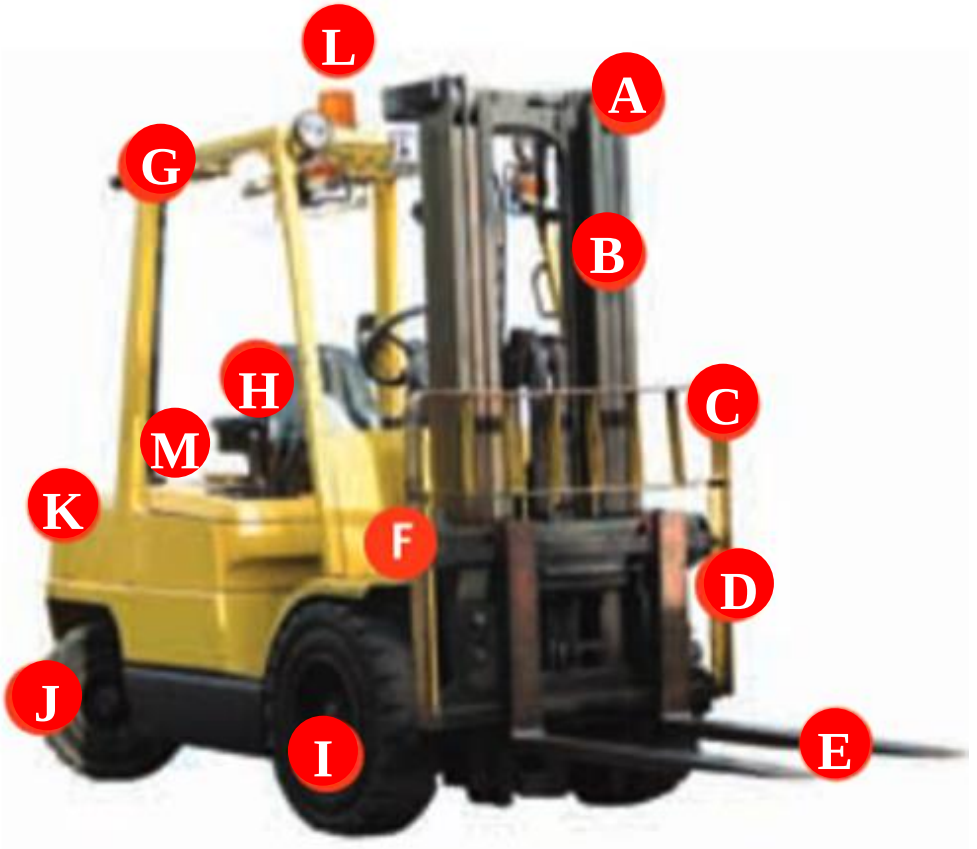
INSPECTION

PRIOR TO EACH SHIFT

Components of a Forklift Truck

Know Where Forklift Components Are Located
& How to Operate Them

A – Mast
B – Lift Cylinder
C – Load Backrest
D – Fork Carriage
E – Forks
F – Tilt Cylinder
G – Overhead Cage
H – Driver Seat with Seat Bel
I – Drive Wheels & Axle
J – Steering Wheels & Axle
K – Counter Balance
L – Warning Light
M – Fuel Tank



Engine Off Checks

Before starting your vehicle, conduct a pre-operation inspection

- Fluid Levels
- Leaks, Cracks Or Any Other Visible Defects
- Tires
- Forks
- Load Backrest Extension
- Safety Decals, Nameplate And Data Plate
- Operator Compartment
- Grease And Debris
- Working Seat Belt And Other Safety Devices

Engine Off Checks

Additional Items Should Be Checked Depending On The Forklift Type

- **Electric Forklifts**
  - Cables And Connectors For Frayed Or Exposed Wires
  - Battery Restraints
  - Electrolyte Levels
  - Hood Latch

- **Liquid Propane Forklifts**
  - Properly mounted tank
  - Pressure relief valve pointing up
  - Hose and connectors
  - Tank restraint brackets
  - Tank for dents and cracks
  - Tank fits within profile of truck
  - Leaks

- **Internal Combustion Forklifts**
  - Engine oil
  - Brake reservoir
  - Engine coolant
  - Air filter
  - Belts and hoses
  - Radiator
  - Hood latch

Types & Use of Tires

- Pneumatic Tires
  - Rubber Filled with Air for Cushioning & Deep Tread for Rough Terrain

- Solid Rubber Tires
  - Good for Indoor Use
- Polyurethane Tires
  - Used Indoors on Electric Forklifts

Engine Off Check - Tires

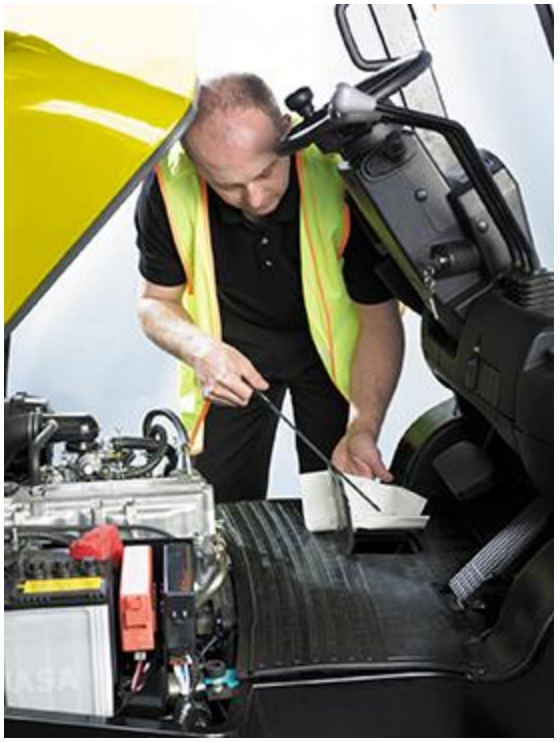
Look For:

- Tire Damage
  - Cuts & Gouges
  - Remaining Tread
- Proper Inflation

Engine Off Check - Fluids

Look For:

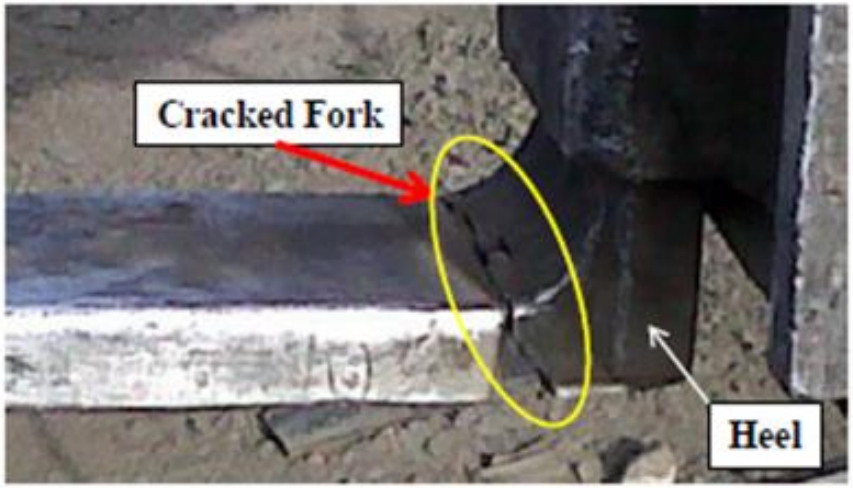
- Fluid Levels
  - Oil
  - Water/Radiator Coolant
  - Hydraulic Fluid
  - Transmission
  - Brakes
- Check For Leaks



Engine Off Check - Forks

Look For:

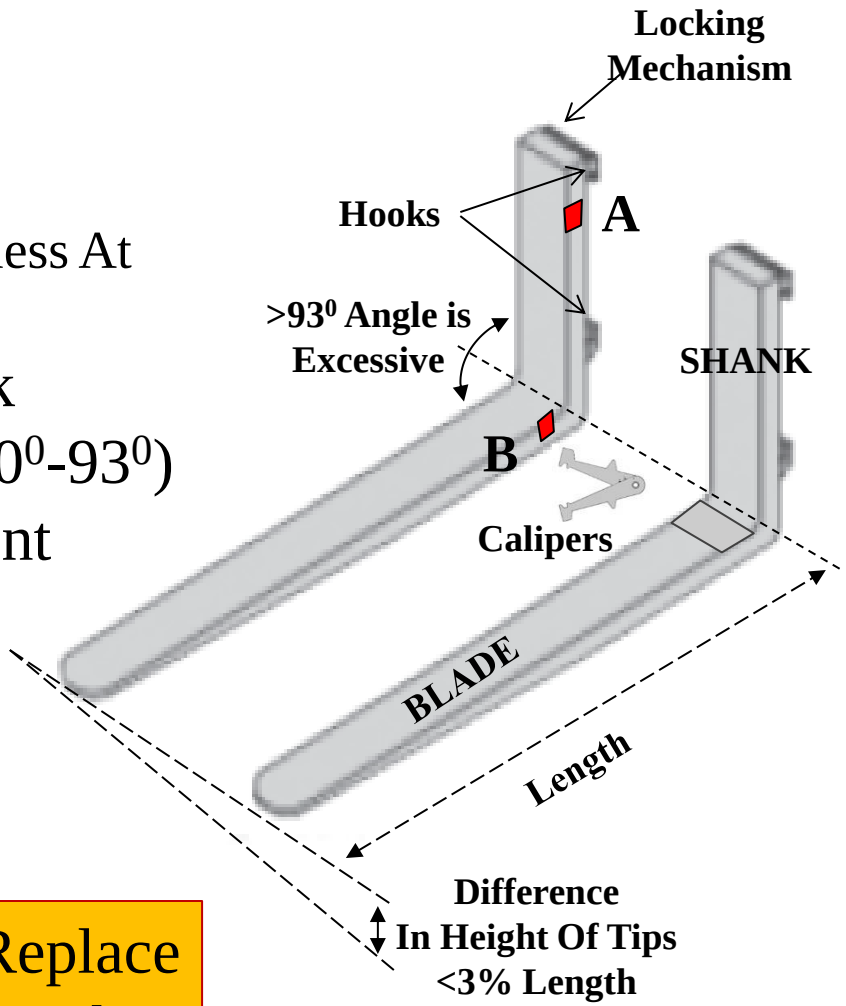
- Damage
- Surface Cracks Especially Heel and Welds
- Top Clip Retaining Pin For Forks
- Positioning Lock & Retention Devices In Place & Working
- Fork Identification Marking (Backside of Shank) Legible



Engine Off Check – Forks (cont.)

Look For:

- Wear on Fork Blade, Shank & Hooks
  - Caliper Measurement Of Thickness At (B) Not Less Than 90% of (A)
- Straightness of Blade & Shank
- Fork Angle (Shank to Blade 90^0-93^0)
- Tip Height & Length Alignment



Repair Or Replace Defective Forks

Engine Off Check

Look For:

- Overhead Guard
- Fire Extinguisher (2A:10B:C)
- Load Backrest Securely Attached

- Mast
  - Chains
  - Cables & Stops
  - Hydraulic Hoses

Do Not Place
Hands Inside Mast

Engine Off Check

Check

- Engine Oil Level
- Hydraulic Fluid Level
- Transmission Fluid Level
- Brake Fluid Level
- Engine Belts
- Air Filter
- Radiator Coolant Level
- Fuel Sedimentor (Diesel)

Check LPG Tank (for Rust Corrosion & Damage)

Check Battery (Water/Electrolyte Level & Charge)

DGS Employees Not Allowed To Add Acid

Forklift Safety - Mounting

<u>Mounting</u>

- Wear Safety Footwear For Material Handling
  - Toe Crush Protection & Slip-Resistant Soles
  - Check Soles For Grease Before Mounting

- Get A Good Grip On Forklift Handhold
  - Hands Clean And Dry
  - Do Not Grab Steering Wheel
- Pull Yourself Into The Cab
- Watch Hitting Overhead Cage

<u>Dismounting</u>

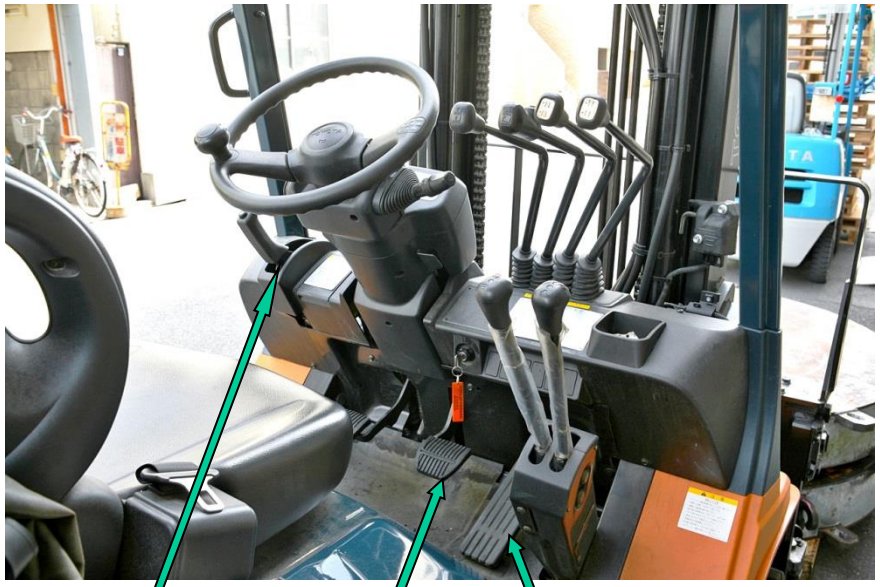
- Opposite of Mounting
- Do Not Jump Down

Engine On Checks

- Drive Control:
  - Forward
  - Reverse
    - Back-up Alarm
  - Steering Left / Right
- Brakes (Normal & Parking)
- Tilt Control: Forward And Back
- Hoist And Lowering Control
- Horn
- Lights
- Gauges (Ammeter, Oil Pressure, Fuel Level, Temperature, Hour Meter)
- Attachment Control (If Equipped)

NOTE: Unusual noises or vibrations

Engine On Checks - Controls



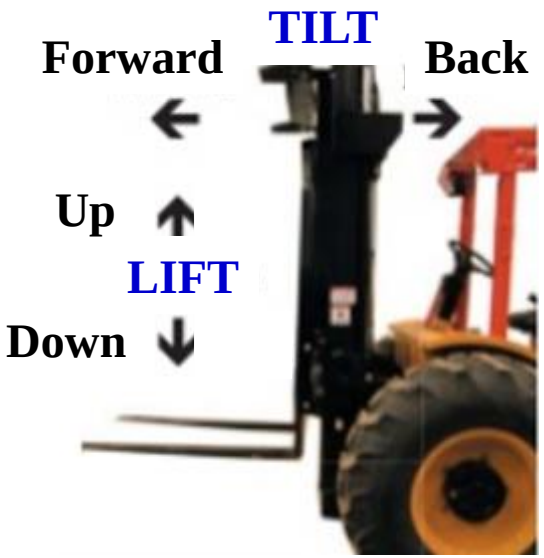
1. Ignition Switch
2. High Transmission Temperature Light (Red)
3. Low Transmission Oil Pressure Light (Red)
4. Low Engine Oil Pressure Light (Red)
5. Parking Brake Light (Red)
6. Engine Preheat Light (Red)
7. Engine Water Temperature Gauge
8. Hour meter Gauge
9. Voltmeter Gauge
10. Fuel Gauge
11. Four Wheel Drive Switch
12. Front and Rear Work Lights
13. Warning Lights Switch
14. Turn Signal Switch
15. 12 V Power Source

Fork Operation

Forks / Mast Levers

1 - Lift	3 - Sideways
2 - Tilt	4 - Spread

Engine On Checks - Mast & Lifting Mechanism



- Outer Piece Connected To The Chassis
- Pulley Extends The Mast
- Inner Part Moves Up & Down
  - Chain From The Fixed Part Goes Up & Over The Wheels On The Extending Part Then Down To The Forks
- Can Be Tilted Forward & Backward
- Used To Move The Center Of Gravity Of The Load Closer To The Truck

Engine On Checks

- Drive Forward
- Steer Left / Right
- Stop
- Backup

Pre-Operational Inspection Completed

- Complete Inspection Log
- Keep Log On Forklift (Or Main Office)

Forklift Safety - Maintenance

Remove From Service / Do Not Operate Truck With:

- Any Unsafe Operating Condition
  - A Fuel Leak

Scheduled Maintenance Is
Critical To Safe Operation

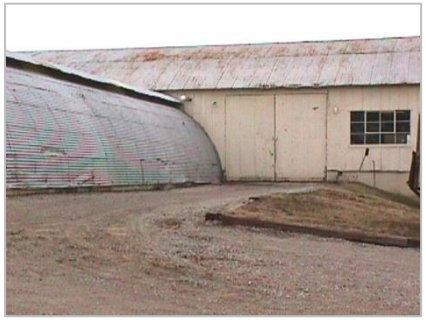
All Repairs Shall Be Made
ONLY By Authorized Personnel

While Driving, Be Aware Of These Potential Hazards:

- Mechanical Breakdown
- Leakage
- Overheating
- Fire

Forklift Safety - Speed

- Normal Walk (5 mph)
- Depends On:
  - Size of the Load
  - Workplace Layout
    - Turns, Aisles, Grades
  - Travel Surface
  - Pedestrian & Vehicle Traffic



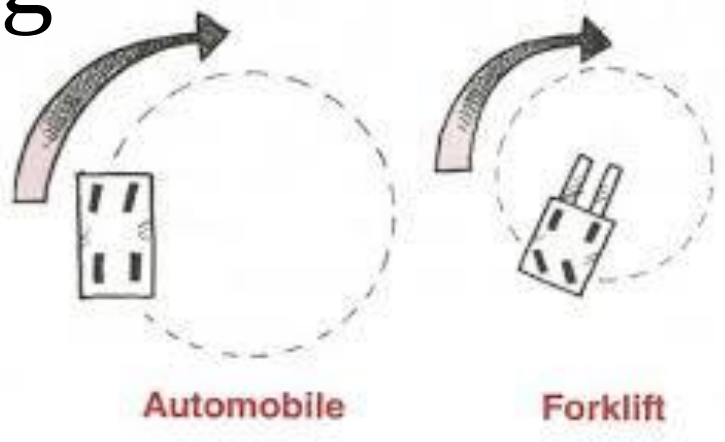
<u>Speed Bumps</u>:

- Cross Diagonally
- Raise Load

<u>On Wet Floors / Gravel</u>:

- Traction is Poor
- Go / Turn / Stop Slowly

Forklift Safety - Steering



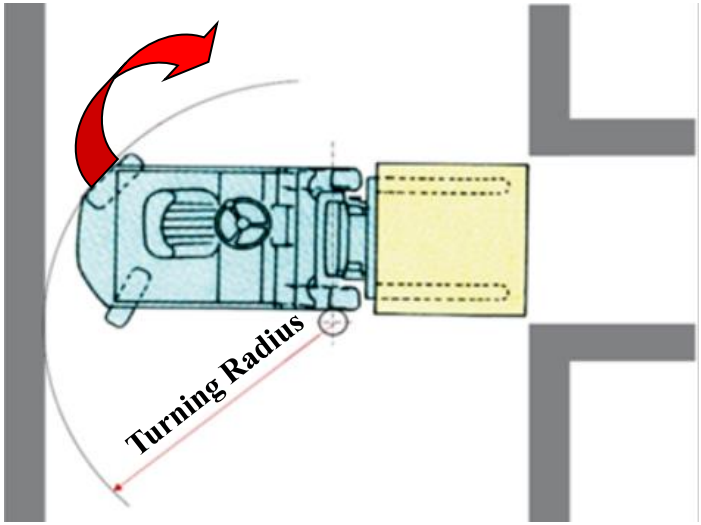
Different From A Car

- Steer From The **Rear Wheels**;
  Pivots on Front Wheels
  - Greater Maneuverability
  - Rear End Swings Sideways 3 Times Faster Than Front
    - Ensure Rear End Swings Clear of Materials, Racks & Pedestrians When Turning Corner / Maneuvering

- Steering Will NOT Self-Center After Making A Turn

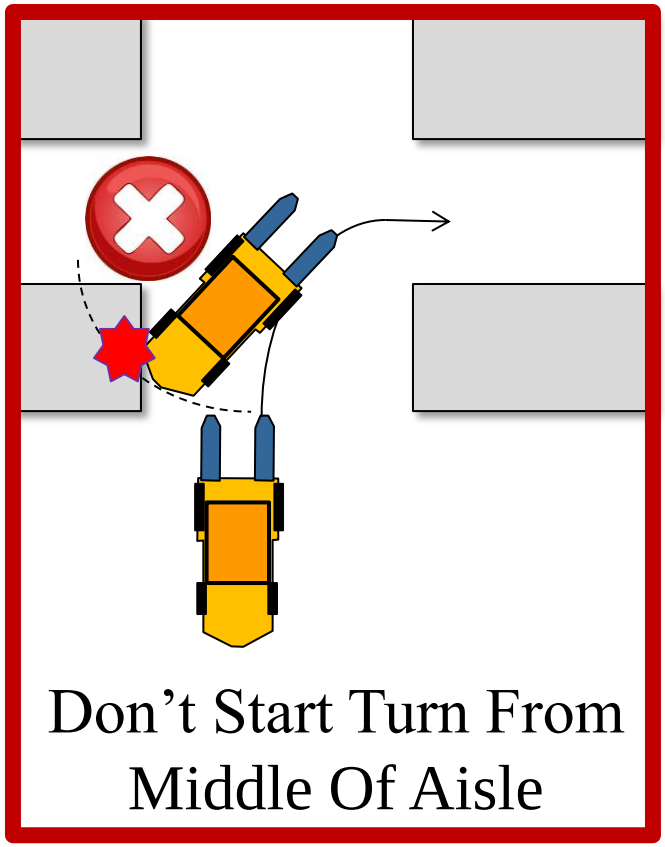
Keep Hand On Steering Wheel

Go Slow When Turning

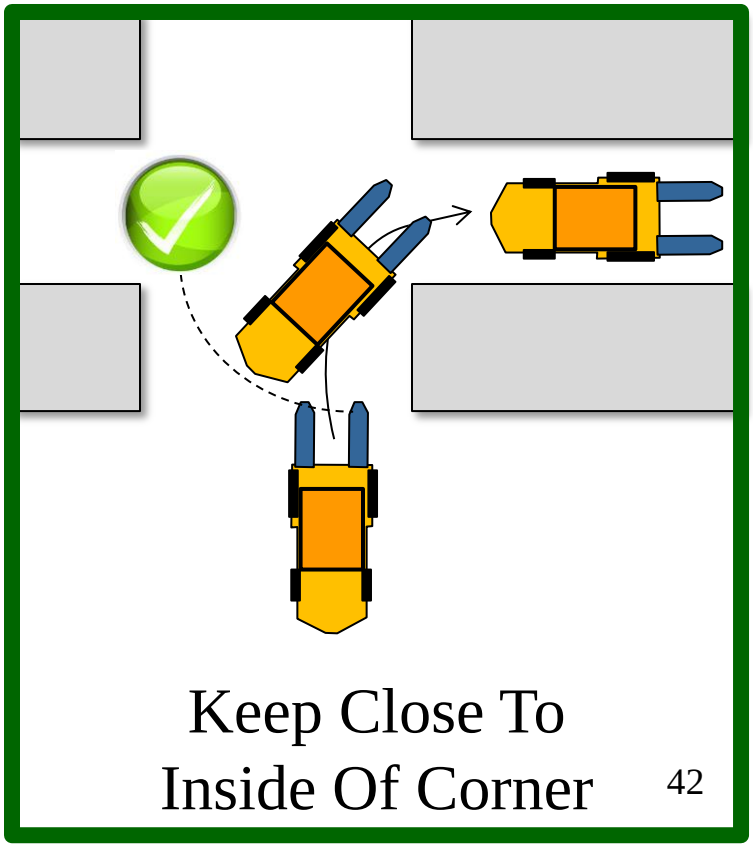


Forklift Safety Steering

REAR SWING



Don’t Start Turn From Middle Of Aisle



Keep Close To Inside Of Corner

Forklift Safety – Restrictions

WARNING

Do Not Stand On Or Under Forks

Do Not Drive Up To Anyone Standing In Front Of Fixed Object

Forklift Safety

Racing
Stunt Driving
& Horseplay

PROHIBITED

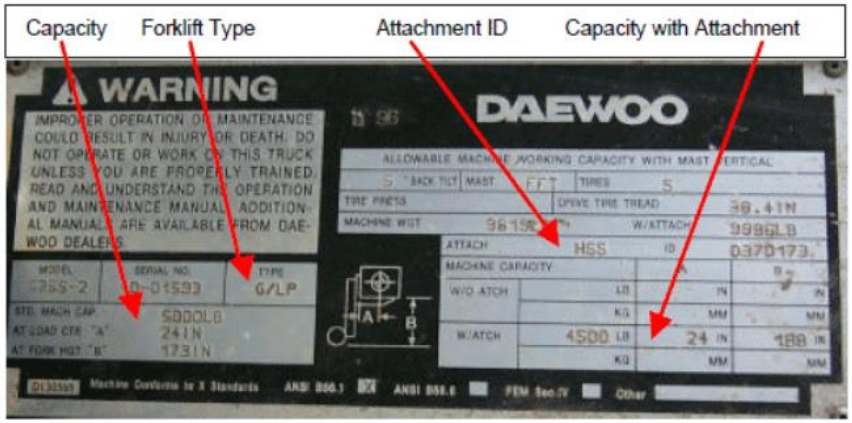
Forklift Safety – Blind Spots

- Use The Horn When Approaching
  - An Aisle Way Intersection
  - A Doorway
- Can't See Around Load
  - Go In Reverse
  - Use A Spotter
- Keep Safe Distance
  - From Other Trucks
  - From Pedestrians
  - To Stop Safely

Forklift Safety
Maximum Load Capacity

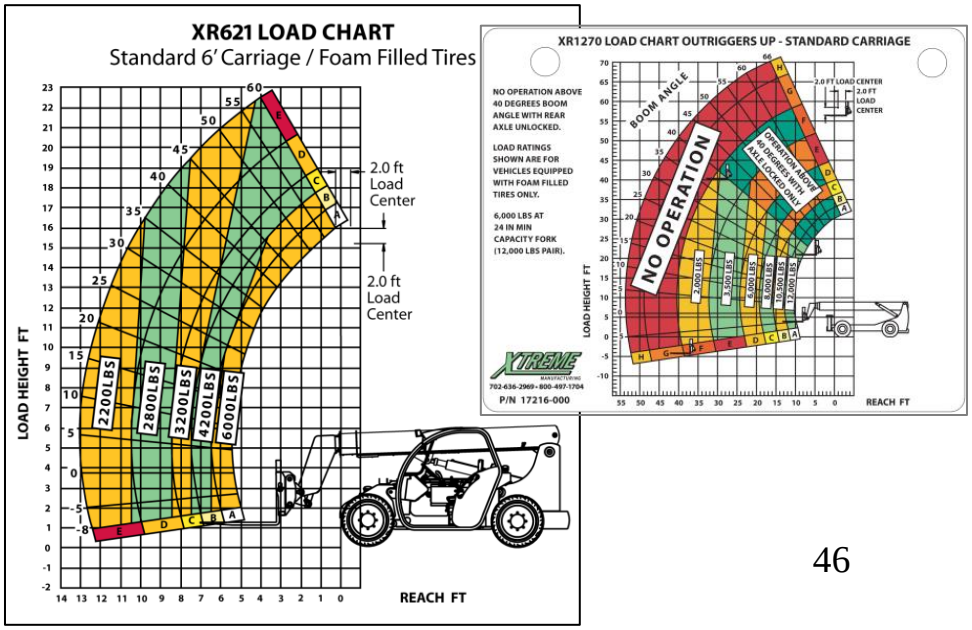
Depends On:

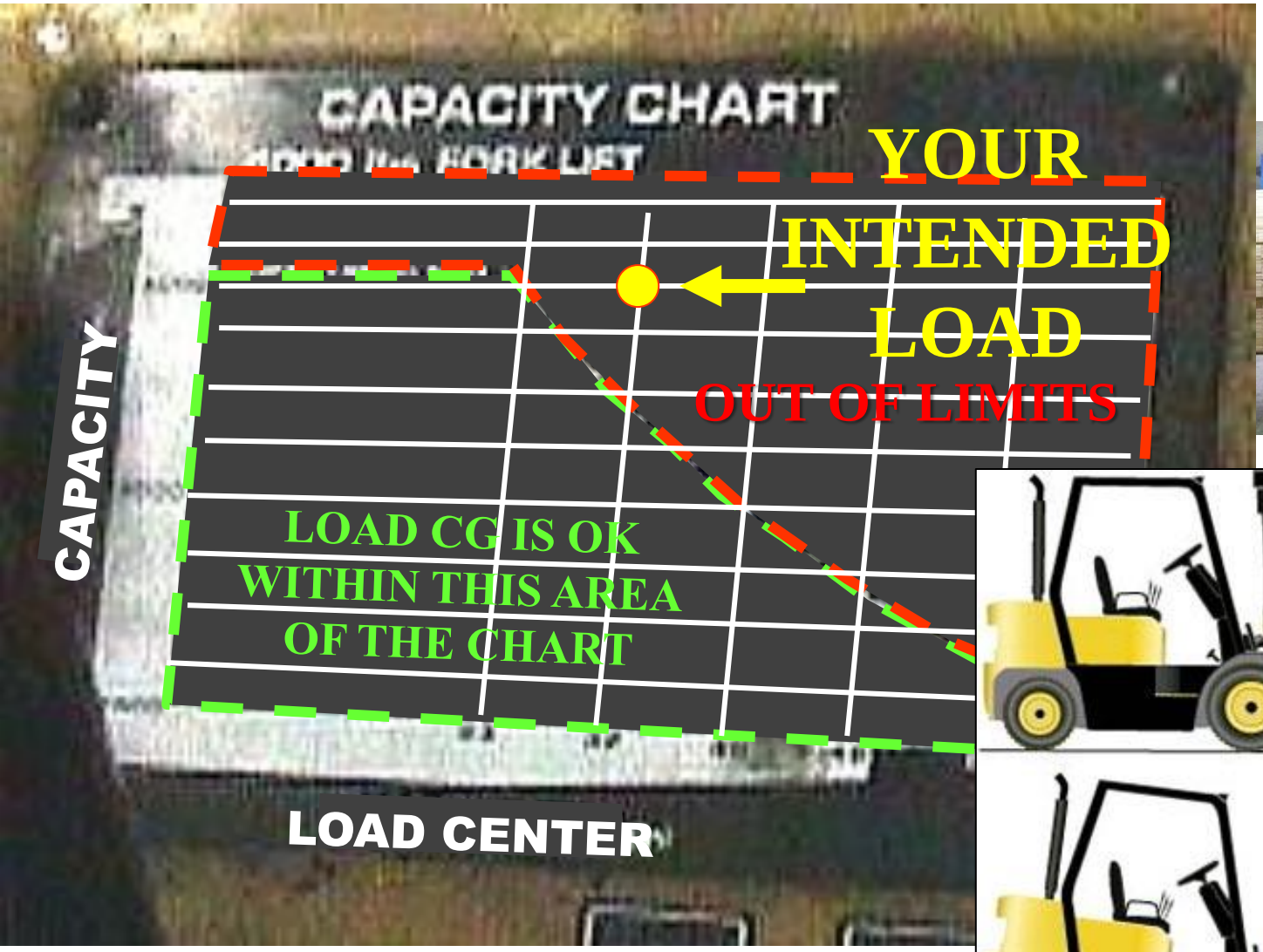
- **Truck Lifting Capability**
- **Load Center**
  - **Lift Height**
  - **Forward / Rear**
  - **Side to Side**

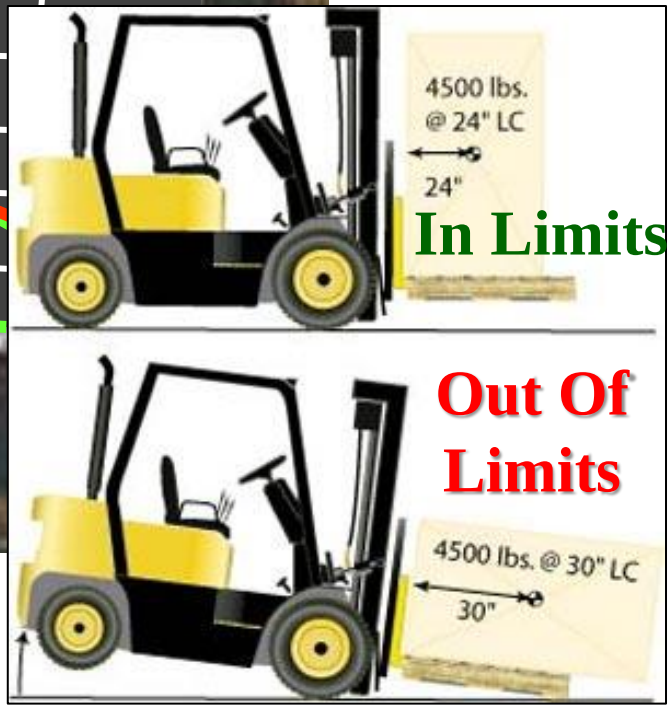


Limits / Computation Found In:

- **Truck Data Plate**
- **Charts in Operator Manual**







Do Not Exceed Weight Limits

Load Center is Too Heavy / Too Far Forward For A Safe Carry

Forklift Safety - Attachments

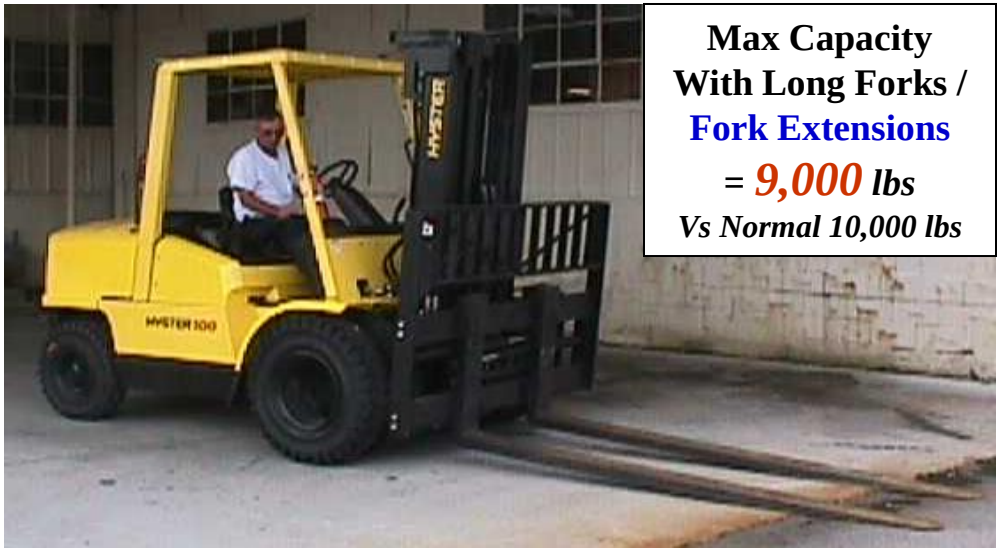
Lifting Hook

Boom

Barrel

Attachments *Change* Load Capacity

Forklifts Will Not Be Altered & Attachments Not Used Unless APPROVED By The Manufacturer

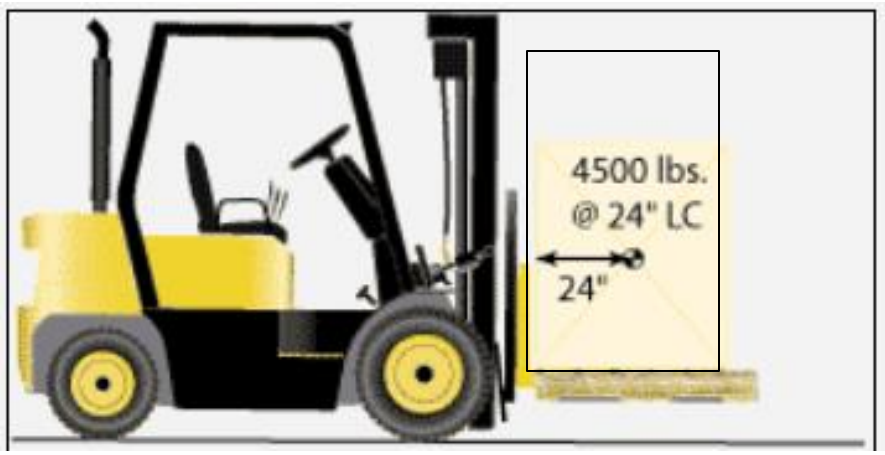


Max Capacity With Long Forks / Fork Extensions = *9,000* lbs
Vs Normal 10,000 lbs

Personnel Lift Platform
(Requires Fall Protection)

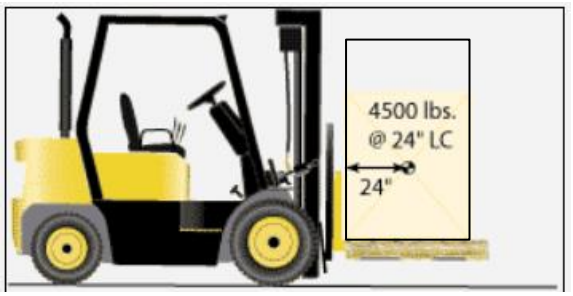
Forklift Safety – Load Composition

- Load Weight, Weight Distribution, Size, Shape, And Position Are Key Factors Affecting The Stability Of The Forklift
- Forklifts Are Designed To Carry A Capacity Load At A Standard Load Center, Commonly 24 Inches
- The Forklift's Capacity Was Determined As If The Load Were A Cube Whose Weight Is Evenly Distributed Resting On A Standard Pallet (48" X 48")



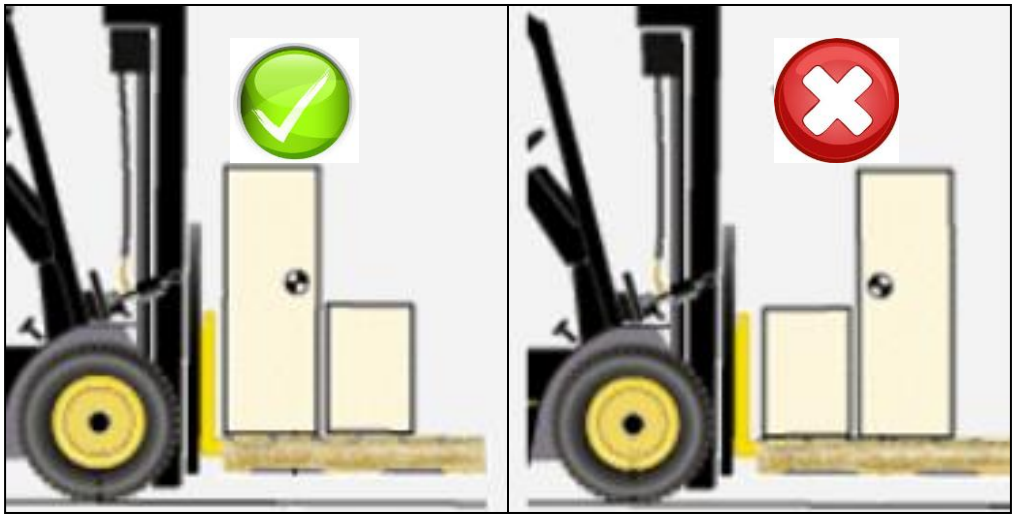
Forklift Safety – Load Composition

- Most Loads Are Not Perfectly Shaped Cubes Having Their Center Of Gravity Exactly In The Middle
  - Most Loads Differ From This Theoretical Load
- The Capacity May Be Reduced When The Load
  - Is Irregularly Shaped
  - Has Unbalanced Weight Distribution
  - Is Not Centered On The Forks
- The Same Load Laid Lengthways Moves the CG Which Can
  - Exceed The Rated Lift Capacity
  - Cause Loss of Steering Control



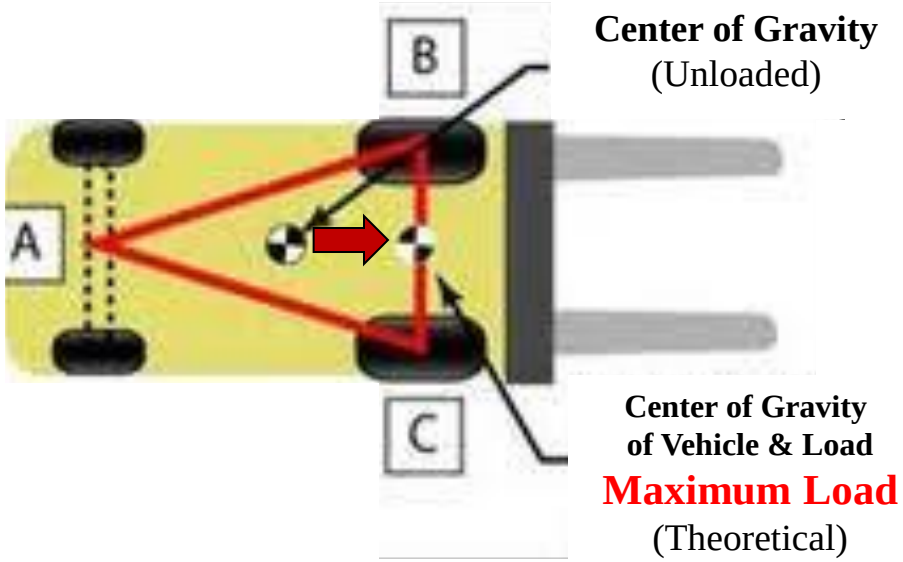
Forklift Safety – Load Composition

- Always Minimize The Distance From The Front Wheels To The Load Center
  - Load The Heaviest Part Toward The Mast
  - To Shorten The Load Center Distance



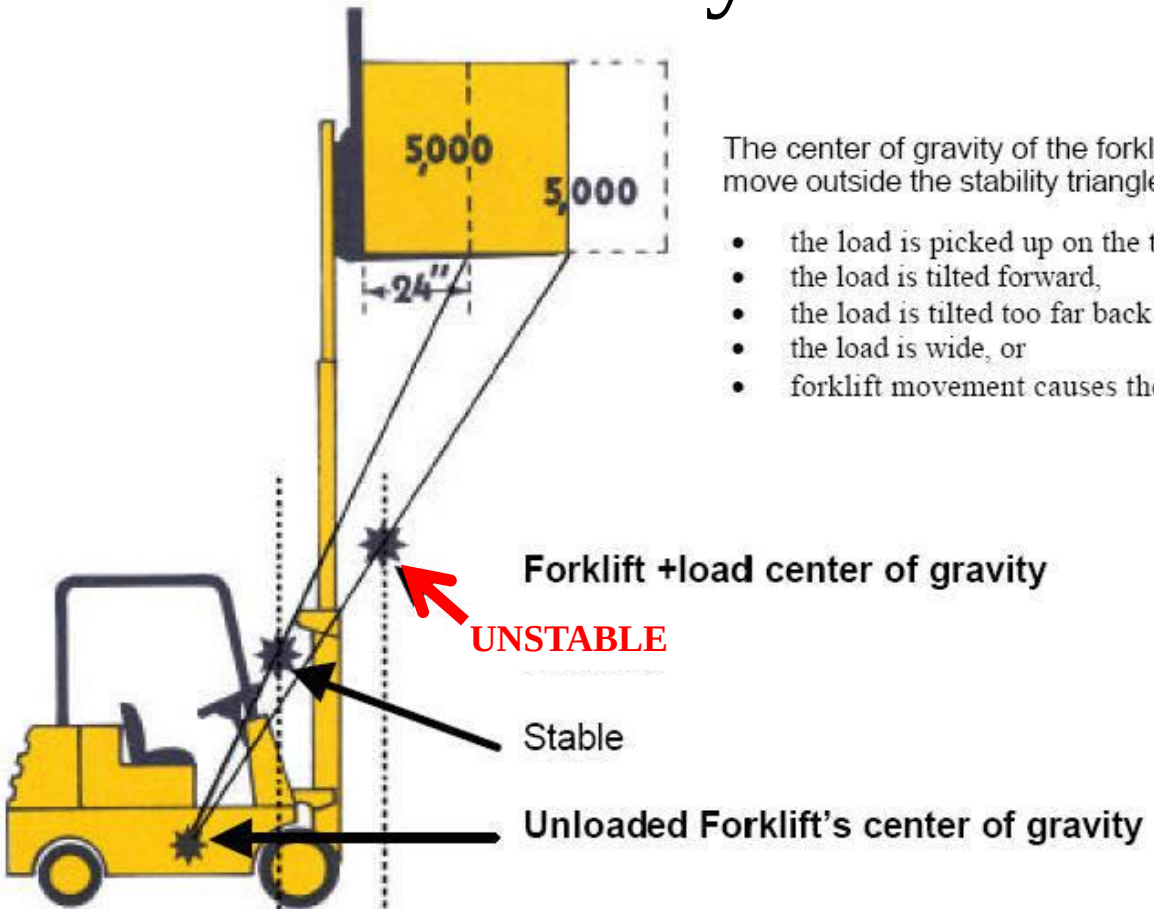
- If The Stated Load Center Is Exceeded (see Data Plate), Compensate By
  - Redistributing The Load
  - Reducing The Weight Of The Load

Forklift Safety - Stability Pyramid



When the Vehicle is Loaded, the Combined Center of Gravity (CG) for the Truck and its Load Shifts, i.e., Forward Closer To Line B-C (the Front Axle)

Forklift Safety - Stability Pyramid



The center of gravity of the forklift-load combination can move outside the stability triangle if:

- the load is picked up on the tip of the forks,
- the load is tilted forward,
- the load is tilted too far back when raised
- the load is wide, or
- forklift movement causes the center of gravity to shift

Having a Load Too Heavy, Too Much to the Side of the Forks Too High and/or Rapid Movement, i.e., the CG Can Go Outside of the Stability Pyramid and ***the Truck Can Tip Over***.

Forklift Safety - Stability Pyramid

You Can Lose Your Load or Tip Over if:

- Accelerate Too Quickly
- Turn Too Fast
- Stop Abruptly
- Steep Slopes
- Uneven Terrain

Forklift Safety - Load Pickup

- Approach Slowly and Square Up On The Load
- Stop 8” - 12” In Front Of The Load
- Position The Forks Level & At The Correct Height
- Set The Direction Control To Neutral
- Move Forward To Slide The Forks Into The Pallet & Fully (At Least 2/3) Under The Load
- Ensure There Is Adequate Overhead Clearance
- Tilt the Mast Slightly Back To Secure The Load
- Pick Up The Load Carefully (About 4”)
  - Ensure The Load Does Not Catch On Any Obstructions
- Return The Lift Control To Neutral
- Honk Horn And Look To The Rear Prior To Backing

Forklift Safety – Lowering Load

- Slowly Back Away To Clear The Storage Rack Or Stack
- Lower The Load to 4” – 6” Above The Floor
- You Are Ready To Travel

Forklift Safety – Load Travel

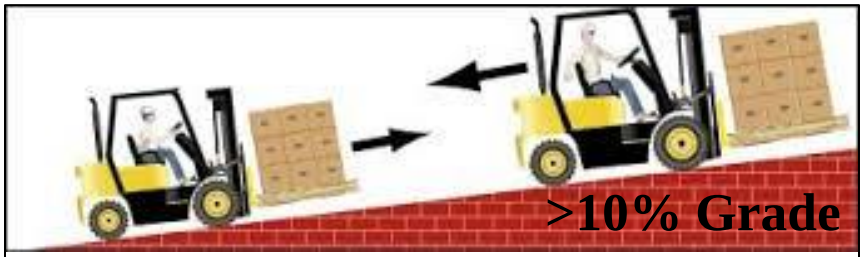
- Never Travel With The Load Elevated
  - Increases The Load Center Distance Shifts The CG Upward And Forward
  - Makes The Forklift And The Load Less Stable

- Keep The Center Of Gravity Of The Load As Low To The Ground And As Close To The Front Wheels As Possible
  - Carry The Load At The Lowest Position Possible, 4” To 6” Above The Ground
  - Tilt The Mast Back And Position The Heaviest Part Of The Load Against The Carriage
  - Travel With The Mast Tilted Back To Stabilize The Load

Forklift Safety – Stacking

- Approach Slowly and Square Up On The Load
- Stop 8” - 12” In Front Of The Load
- Position The Forks At The Correct Height
- Set The Direction Control To Neutral
- Set The Brakes
- Ensure There Is Adequate Overhead Clearance (Lights, Pipes, Sprinklers, etc.)
- Raise The Load High Enough (4”) To Clear The Top Of The Stack
- Use the Inching Pedal, Creep The Load To The Stack
- Cautiously Tilt the Mast Slightly Forward To Deposit The Load
- Level the Mast and Slightly Lower the Forks
- Honk Horn And Look To The Rear Prior To Backing

Forklift Safety - Slopes / Ramps



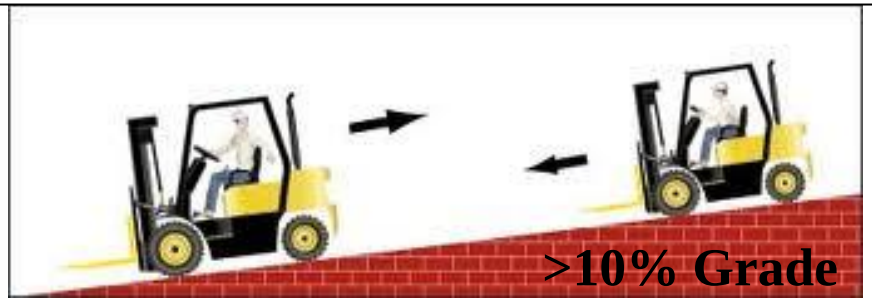
Keep Load Uphill:

- Go Forward Uphill
- Go In Reverse Downhill

Facilities Management: Ramp
Between Upper & Lower Parking Lots

Never Turn While On A Slope

Load Tilted Back &
Raised Only To Clear Surface



With <u>No Load, Keep Forks Downhill</u>:

- Back Uphill
- Go Forward Downhill

Surplus Property
State Warehouse

Loading Dock Ramp

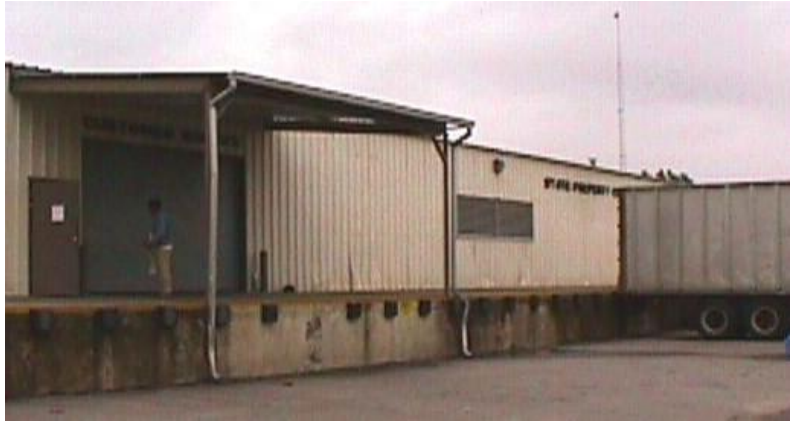
- **Two 90 degree turns**
- **Blind Corner**
- **Go Slow & Blow Horn**

INSIDE RAMPS

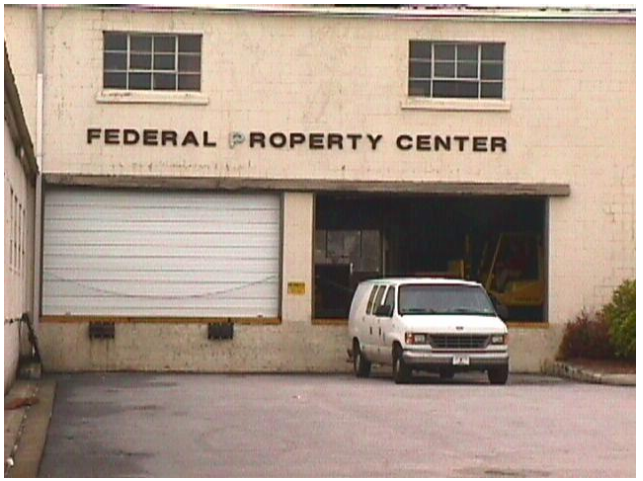
SURPLUS PROPERTY FEDERAL WAREHOUSE

Forklift Safety - Loading Docks

SURPLUS PROPERTY
STATE WAREHOUSE



Forklift Safety - Loading Docks



SURPLUS PROPERTY
FEDERAL
WAREHOUSE

Forklift Safety - Loading Docks / Trailers

Inspect Trailer Bed for Weakness

Brakes Set,

Wheels Chocked,

Jack Stands (When No Tractor)

& Use
Dock Plate

or Else -->

Your Forklift Is Tipping…

Now What?

Always Buckle Up Before Operating & Stay Buckled

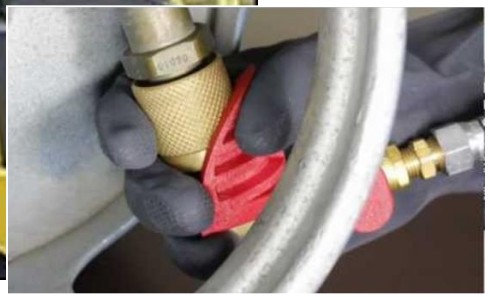
Forklift Safety - Refueling

- Park In The Designated Refueling Area
- Transmission – Neutral
- Lower The Forks To The Ground
- Parking Brake – On
- Engine - Off

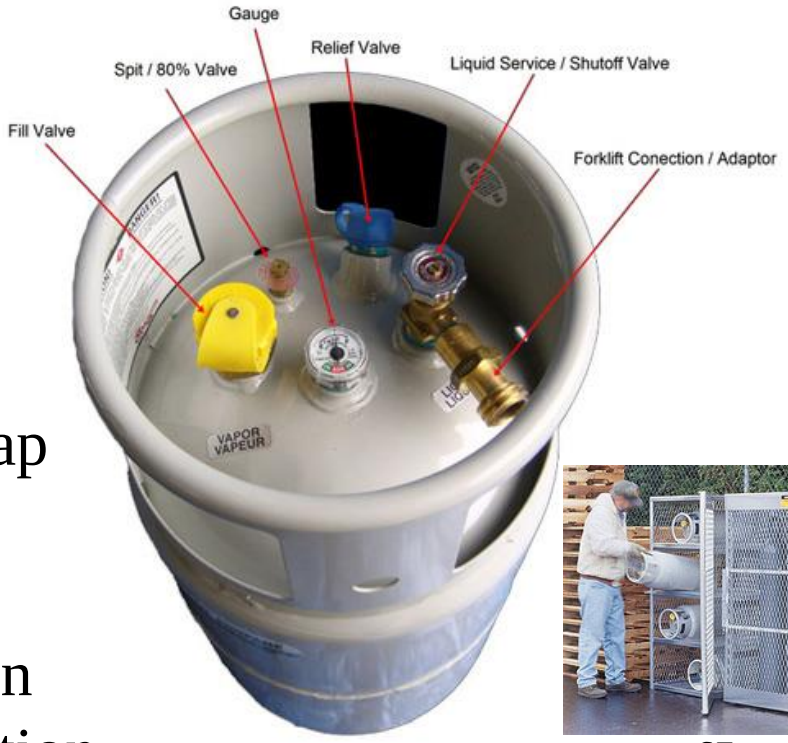
All Refueling:

- Must Be Done Outside
- Away From Ignition Sources
- Cleanup Spills Before Restarting

Forklift Safety – Replace LPG Tank



- Shut Off Fuel Service Valve
- Disconnect Tank From Fuel Hose
- Release Tank Retaining Strap
- Remove Empty LPG Tank



- Install Full LPG Tank
- Secure Tank With Retaining Strap
- Reconnect Fuel Hose To Tank
- Open the Fuel Service Valve
- Place Empty Tank In Storage Bin
- Start Forklift & Continue Operation

Forklift Safety – Replace LPG Tank

If Fuel Hose Leaks

- Shut Off Fuel Service Valve Immediately
- Place Forklift “Out Of Service” Until Repaired

If Tank Ruptures / Forklift Catches Fire

- Evacuate At Least 50 Feet
- Call 9-1-1

Forklift Safety – Job Done

When a Forklift is left Unattended / Job Done

- Park in designated area
- Set Brakes
- Level and Lower Forks
- Neutralize Controls
- Turn Off Forklift
- Block Wheels If Parked On Incline

NOW! On The Job Training

Surplus Property:

- **Pete McGhee**
- **Troy Cates**

Custodial:

- **Thomas Eichelberger**

QUESTIONS?

Ask Your Trainer

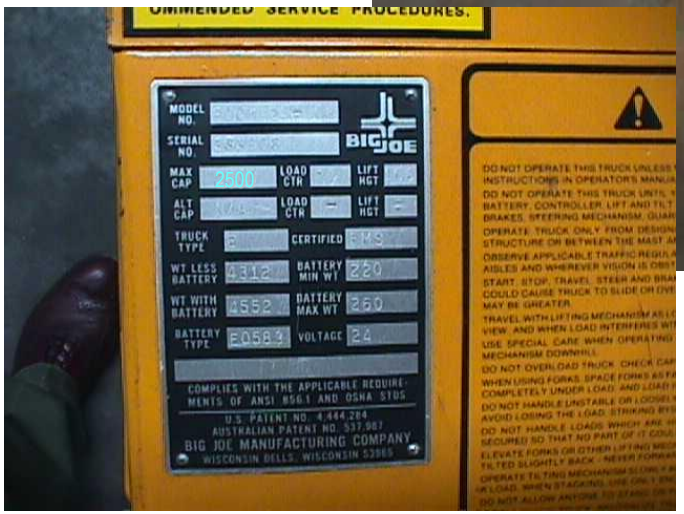
or

Call Safety

End Instruction

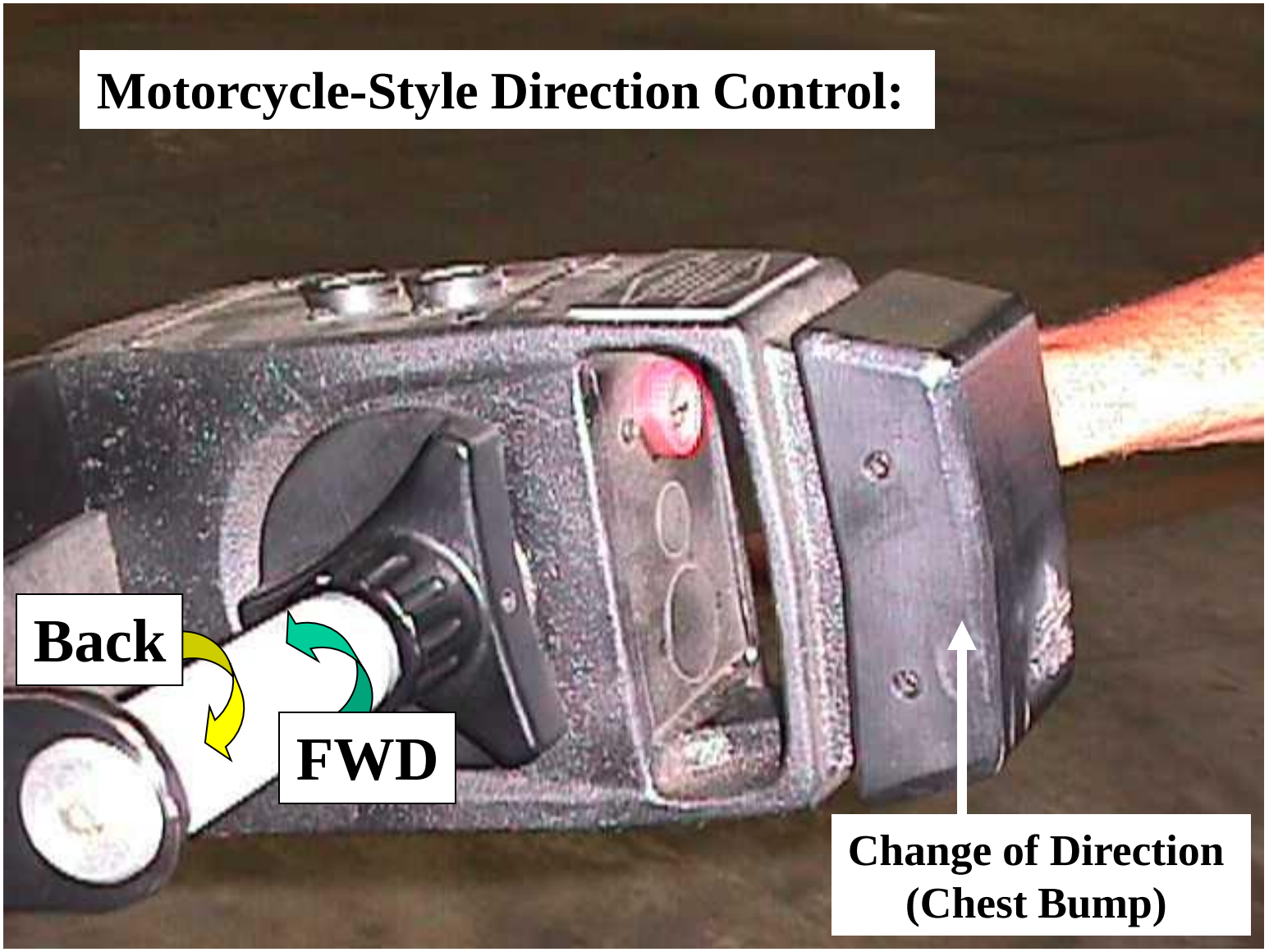
The Following Slides Are Additional Information On A Walkie Forklift

Big Joe (Walkie)



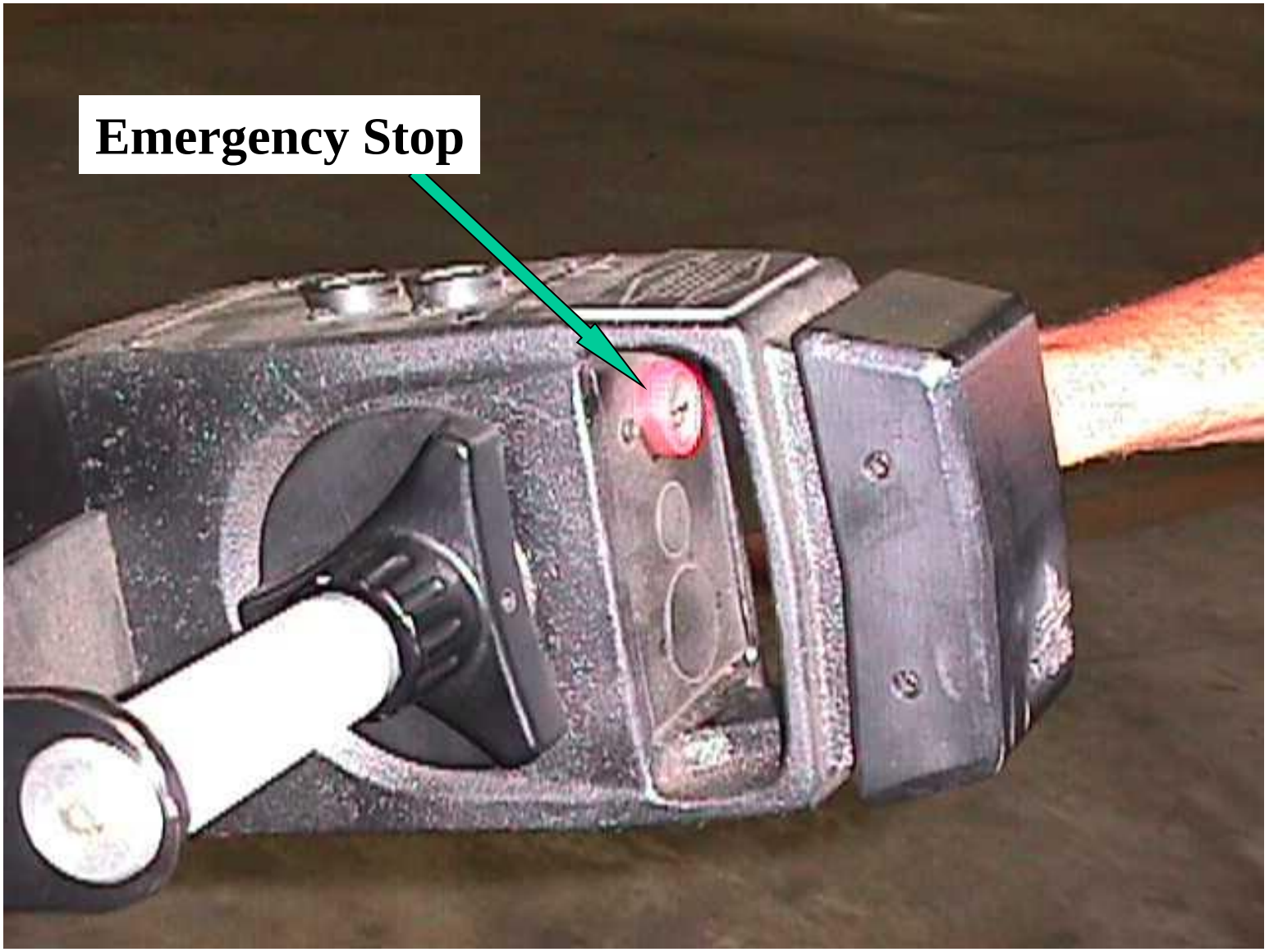
Max Capacity – 2,500 lbs

Big Joe - Controls

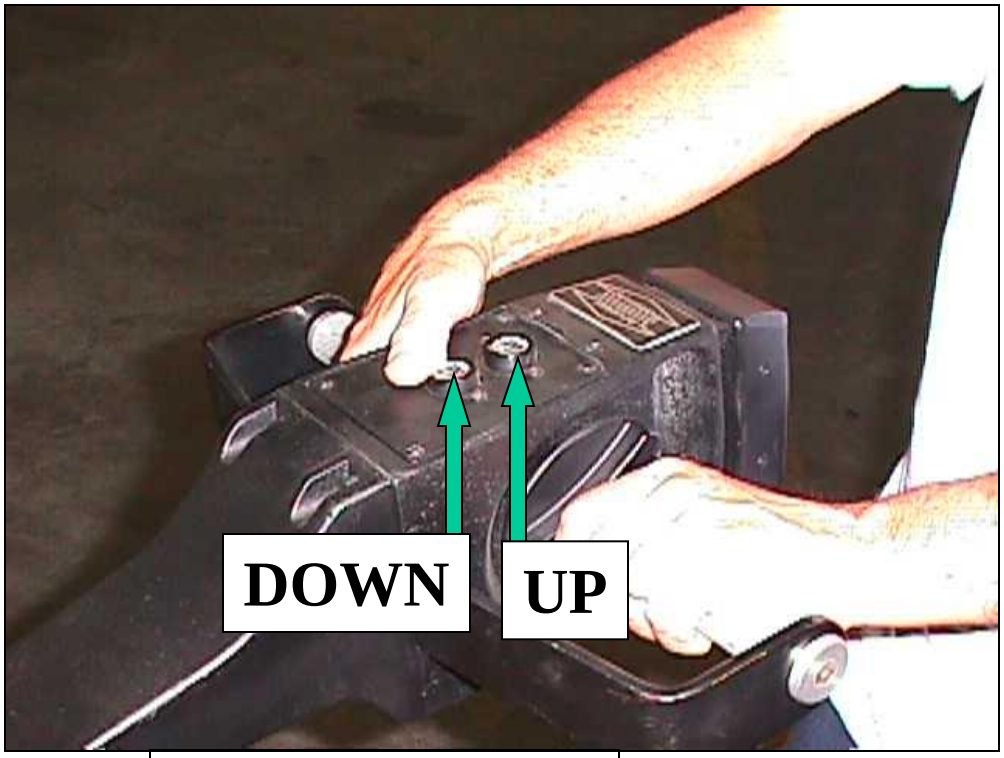


Big Joe - Controls

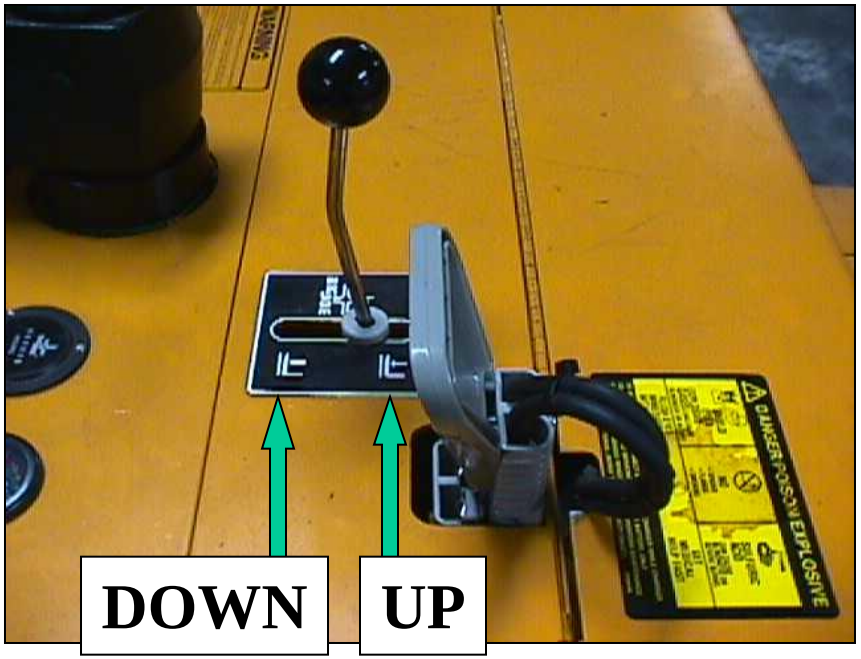
Big Joe - Controls



Big Joe – Fork Controls



Control Handle



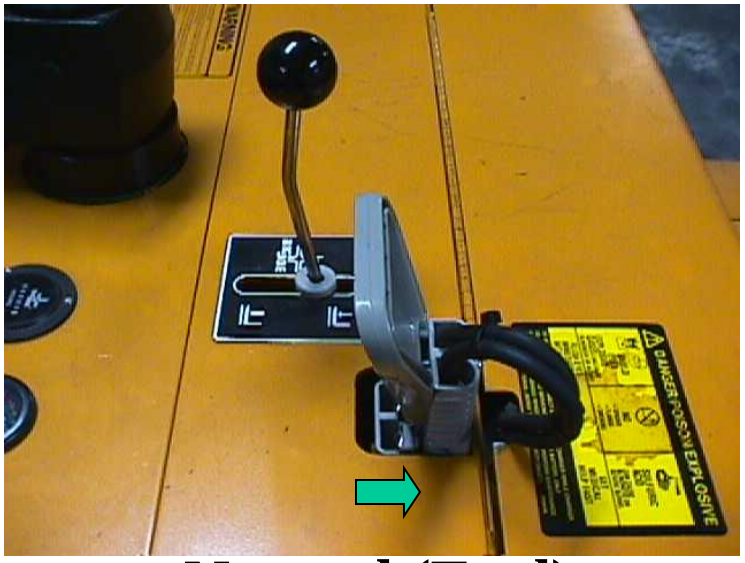
Alternate Control

Big Joe – Re-Charging

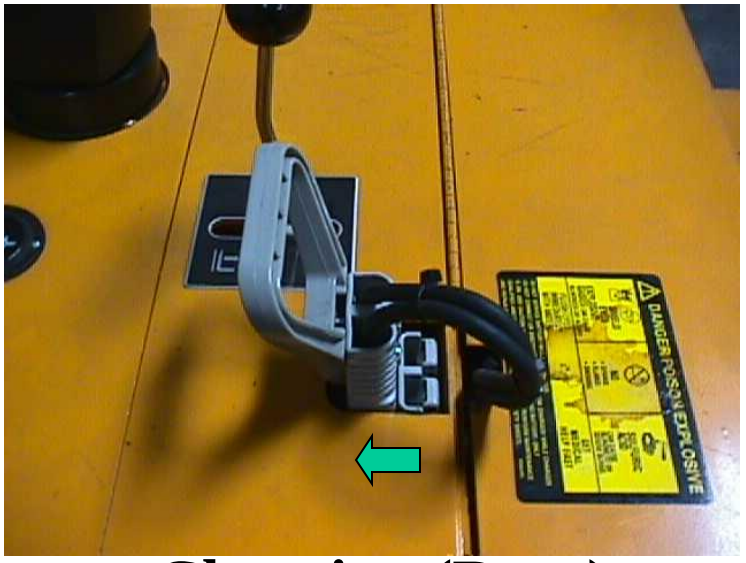
Hour Meter

Battery Level

Big Joe – Re-Charging



Normal (Fwd)



Charging (Rear)

Charging Port

Batteries