

Forklift Training - General

OSHA Standards

1910.178 (l)

1915.120 (a)

1917.1 (a)(2)(xiv)

1918.1 (b)(10)

1926.602 (d)



Training

Powered industrial trucks

§1910.178(1)(1) *Operator training.* (1)(1) *Safe operation.* (i) The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, ...

... the employer shall ensure that each operator has successfully completed the training required by this paragraph (1), except as permitted by paragraph **(1)(5)**.



Forklift driver certification

- The employer shall certify that each operator has been trained and evaluated as required by the standard.
- Certification shall include:
 - Name of operator
 - Date of training
 - Date of evaluation
 - Identity of person(s) performing the training or evaluation



Forklift training content

- Operating instructions, warnings and precautions for the types of trucks the driver will use
- Truck controls and instrumentation
- Engine or motor operation
- Steering and maneuvering
- Visibility (including restrictions due to loading)
- Fork and attachment operation
- Vehicle capacity
- Vehicle inspections, maintenance, refueling and charging of batteries
- Surface conditions where vehicle will be operated
- Composition of loads to be carried
- Pedestrian traffic
- Environmental considerations that could result in buildup of hazardous fumes or exhaust



Scope 1910.178(a), based on ANSI B56.1 - 1969...

- Covers fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines.
 - It does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, farm vehicles, nor vehicles intended primarily for earth moving or over-the-road hauling.
- This scope covers general industry, construction and shipyards.



Reasons for New Standard

- PITs cause approximately 100 fatalities and 36,340 serious injuries in general industry and construction annually.
- OSHA estimates that 20 - 25% of the accidents are, at least in part, caused by inadequate training
- Updated consensus standards have been published.
- OSHA has been petitioned to improve the requirements for industrial truck training.
- Advisory Committee on Construction Safety and Health has recommended improving the standard.
- Resolutions were introduced in the Senate and House urging OSHA to revise its outdated standard.



Background

- The previous OSHA standards, while requiring operator training, did not define the type of training or authorization required.
- March 15, 1988 - Industrial Truck Association (ITA) petitioned OSHA for specific training requirements.
- American National Standards Institute (ANSI), 4 times, including current lift truck technology in cooperation with ASME, has revised its standard and specific training topics.



Background (continued)

- March 14, 1995: OSHA published a proposed ruling adding specific training requirements.
- January 30, 1996, OSHA proposed a revision of the construction standards, mandating the development of an operator training program based on the prior knowledge and skills of the trainee and requiring a periodic evaluation.

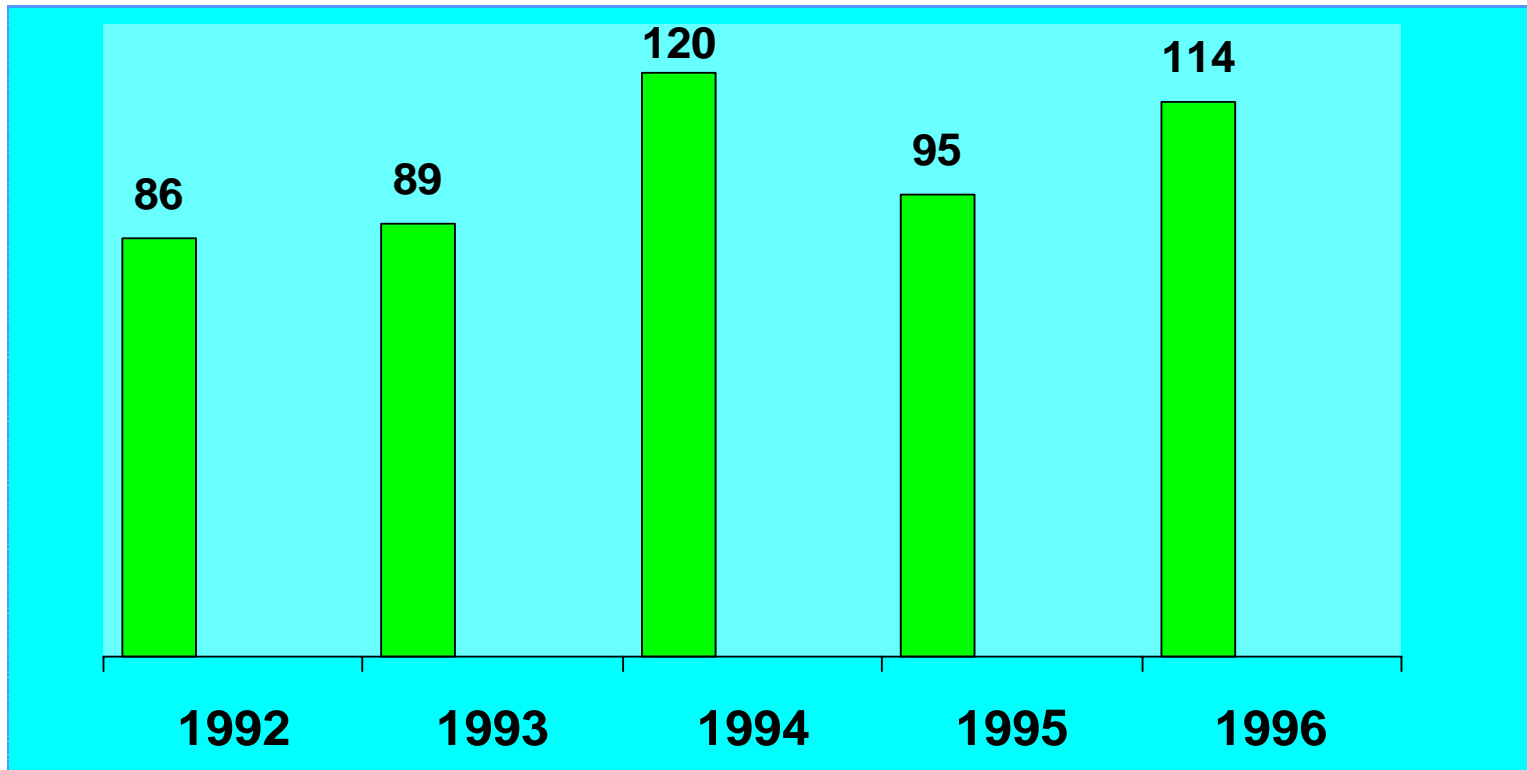


Final Rule

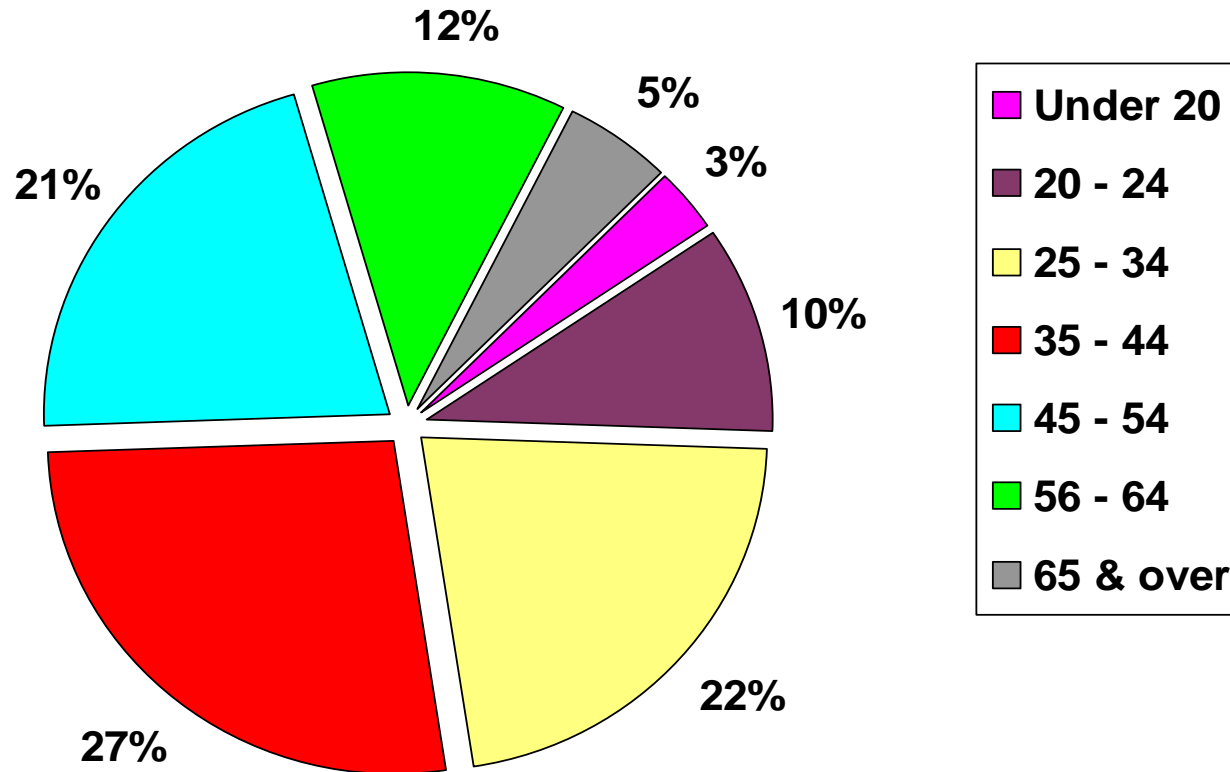
- Final rule for Powered Industrial Truck Operator Training published on December 1, 1998.
- Effective date March 1, 1999.
- It applies to all industries except agricultural operations.
- OSHA estimates that the new rule will prevent 11 deaths and 9,422 injuries per year.



Forklift Fatalities, 1992-1996



Forklift Fatalities by Age Group 1992 -1996



Source: Bureau of Labor Statistics



Industries Where Powered Industrial Truck Accidents Occurred

Industry	# Accidents Investigated by OSHA
Mining	4
Construction	25
Manufacturing	95
Transportation, Communication, Utilities	22
Wholesale Trades	25
Retail Trades	18
Service	7
Public Administration	4
Total	200

Source: OSHA Fatality/Catastrophe Reports, compiled by OSHA Office of Electrical/Electronic and Mechanical Engineering Safety Standards.



Why Forklift Training Is Necessary

- 100 fatalities each year
- 20,000 lost workday injuries annually
- Common injuries
 - Hitting a pedestrian
 - Tipping over
 - Falling from raised forks
 - Falling from a ladder struck with a forklift
 - Falling material
- Training reduces injuries



Fatalities/Injuries Potentially Averted Annually by New Standard

Sector	# Fatalities	Estimated # Fatalities Averted	# Injuries	Estimated # Injuries Averted
Agriculture	0	0	47	5
Mining	1	0	0	0
Construction	16	2	2,380	237
Manufacturing	35	4	44,976	4,481
Transportation	16	2	10,698	1,066
Longshoring & Marine Terminals	3	0	275	27
Wholesale & Retail Trade	23	2	31,649	3,153
Finance, Insurance & Real Estate	0	0	79	8
Services	7	1	4,466	445
All Covered Industries	101	11	94,570	9,422

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis, 1997



New Std. Overview

- Operators must be trained and evaluated
- Only drive the types of trucks on which you have been trained



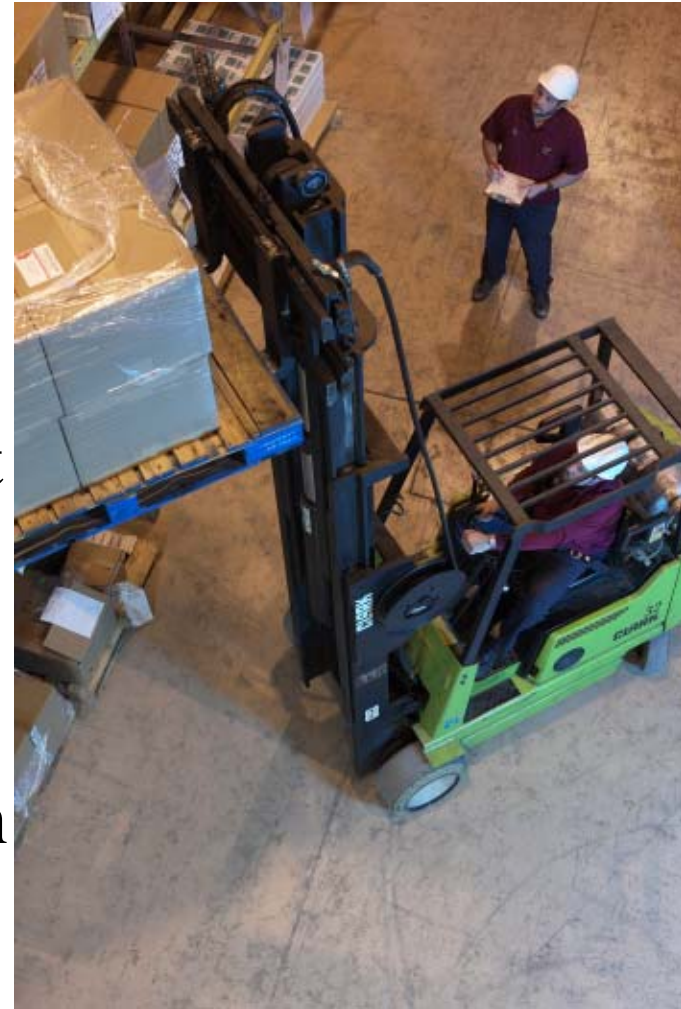
Effective Powered Industrial Truck Operator Training Program

- Four major areas of concern must be addressed:
 - The general hazards that apply to the operation of all or most powered industrial trucks;
 - The hazards associated with the operation of particular types of trucks;
 - The hazards of workplaces generally; and,
 - The hazards of the particular workplace where the vehicle operates.



Basic Forklift rules

- Don't stand or pass under raised forks
- Only handle stable loads within truck's rated capacity
- Use a safety platform to lift people
- Only use approved trucks in hazardous locations
- Don't drive up to anyone in front of a fixed object



Basic Forklift rules

- Slow down, sound horn at intersections
- Maintain safe following distances, clearance
- No stunt driving, horseplay
- Look in direction of travel



Basic Forklift rules

- Secure truck trailers before entering
- Lower forks, neutralize controls, shut off engine, and set brakes when truck is unattended
- Only use approved trucks in hazardous locations
- Don't drive up to anyone in front of a fixed object



Basic Forklift rules

- Allow no riders
- Keep arms, legs in truck
- Keep the load close to the ground
- Obey speed limits



ASSE & Safe Driving Speeds

- Enforce forklift speed
- A 5,000-pound forklift at 10 mph with a 4,000 pound load has a potential destructive force of 135,000 pounds of energy
- A forklift truck at 10 mph = 40 feet to stop.
- Maximum speed with no pedestrians present is 8 mph
- **MAXIMUM** 3 mph in areas where pedestrians are present.



Trainees may operate

- Under direct supervision of a person who has the knowledge, training, and experience to train operators and evaluate their competence; and,
- Where such operation does not endanger the trainee or other employees.



Training Program Implementation (continued)

- Training shall consist of a combination 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
 - conducted by a person with the knowledge, training and experience to train powered industrial truck operators and evaluate their competence



Truck-related topics

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



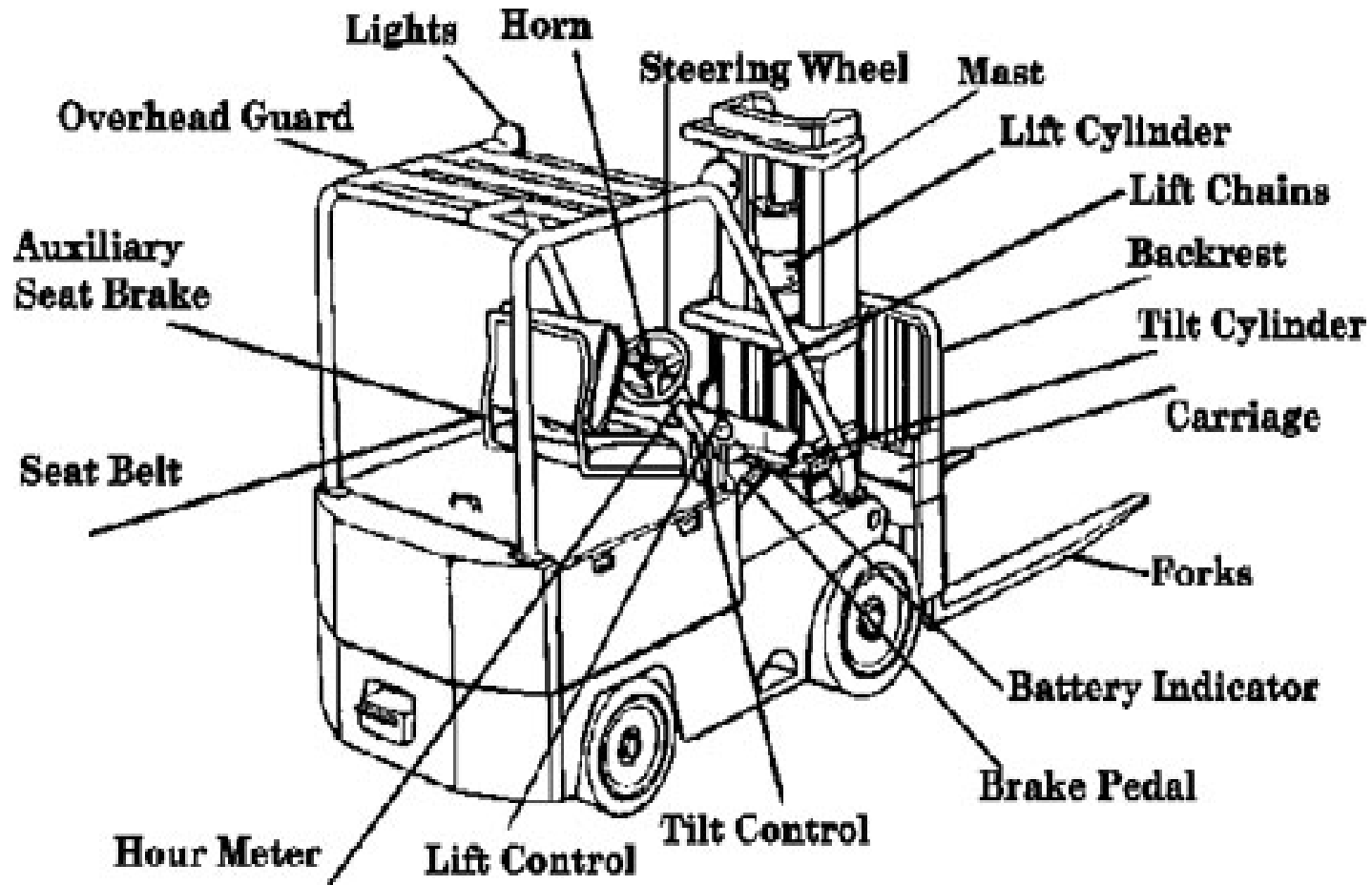
Truck-related topics



- 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.



Components of a Forklift Truck*



*One of the most common types of powered industrial trucks



Controls and instrumentation

- Unintentional, mistaken operation can cause serious accidents
- Different on varying types of vehicles

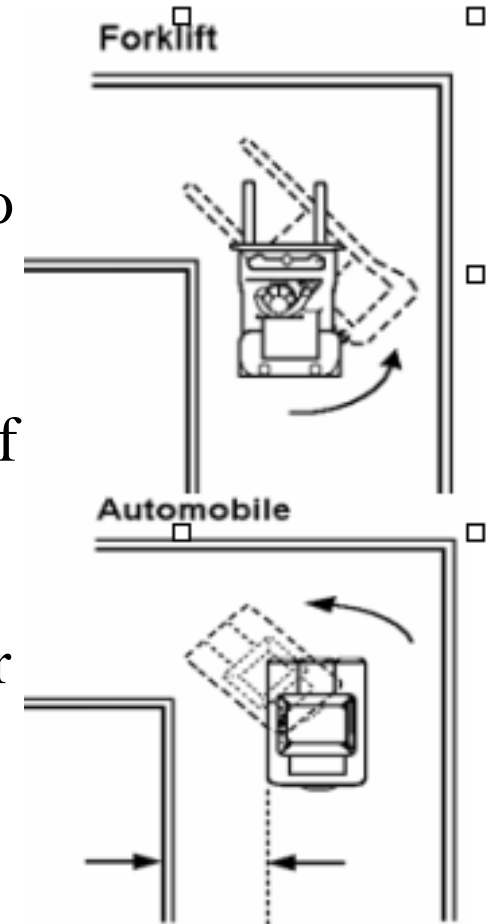


Forklift vs. Automobile Characteristics

- The rear of a forklift swings in the opposite direction of the turn.
Turning left, the rear of the forklift swings out to the right.
- The impact of a forklift against an object is much more significant than the corresponding impact of a car.

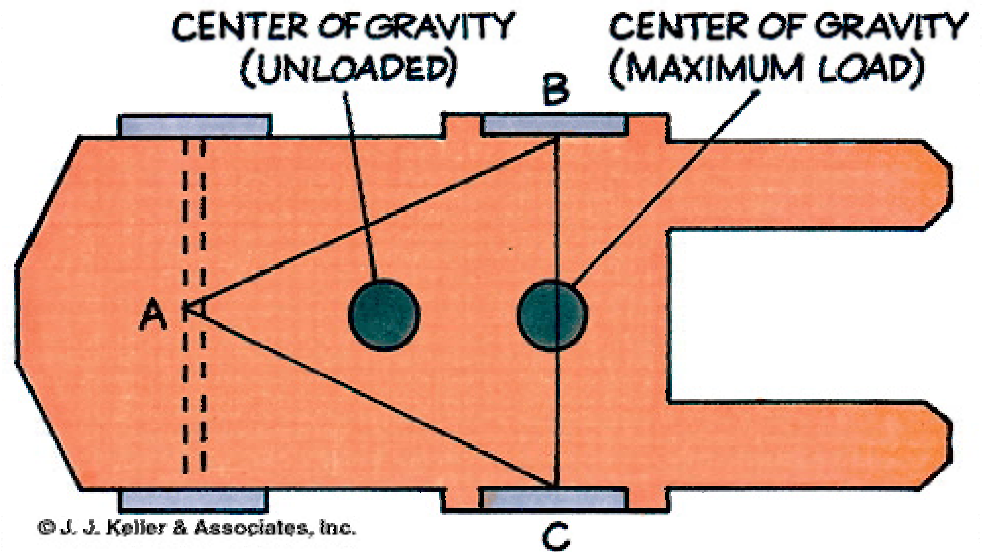
Because of its greater mass, a forklift hitting an object at 5 mph can cause similar damage to a car hitting the same object at 30 mph.

- Forklifts are often driven backward, especially when unloading cargo and driving a load that obstructs the view when moving forward.



Forklifts vs. automobiles

- Rear-wheel steering
- Different centers of gravity
 - Continually shifting
- Different controls
- Heavy loads



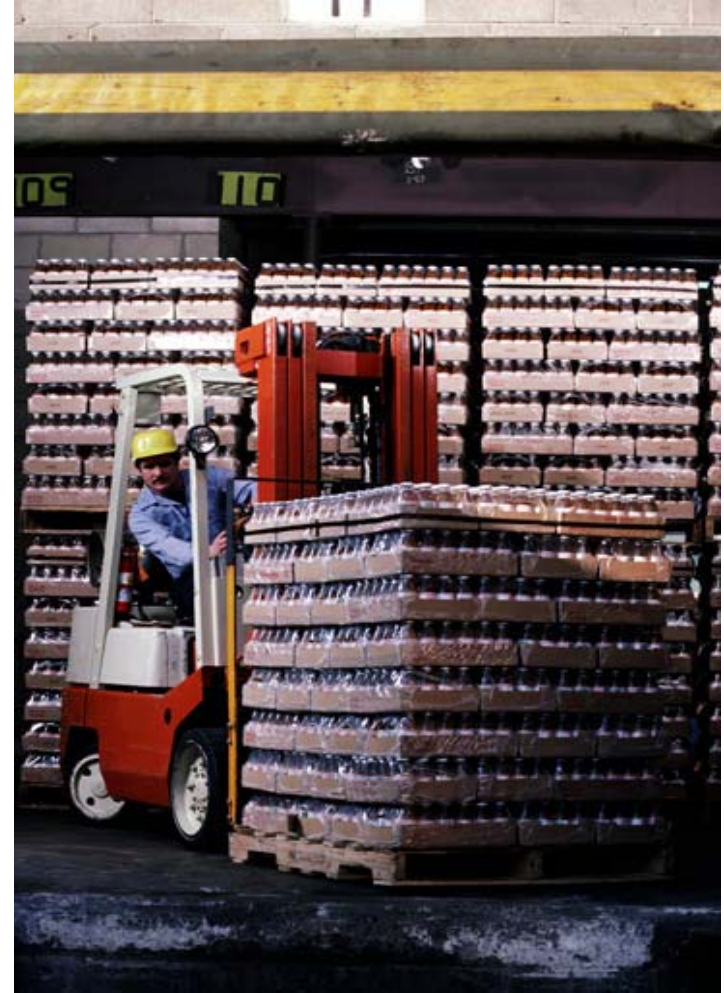
Engine and motor operation

- Gasoline, LP gas, propane, or battery



Operator visibility

- Loads can restrict vision
- Look in the direction of travel
- Check blind spots



While in the Operator Seat

- Make nonmoving checks—gauges, lights, horn, backup alarm, warning light, tilt and lift mechanism, and parking brake
- Make moving checks—seat belt, running brakes, and steering
- Look for oil or water leaks on the floor



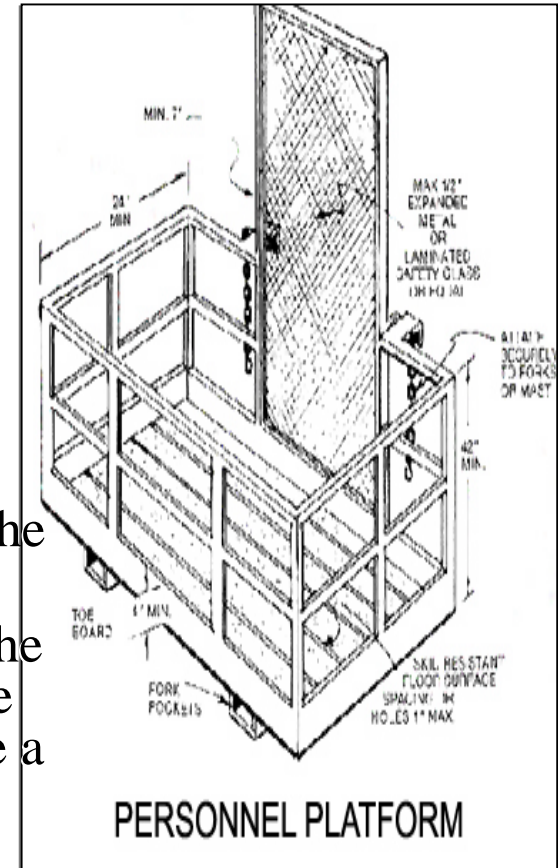
Forks

- Additions/modifications may affect stability, safe operation
- Attachments can restrict/limit operation
- Must be approved by manufacturer if alters vehicle capacity, stability or operation



Attachments

- Attachments act like extensions to the length or width of the forklift and, therefore, require additional operating clearances for turning and passing through aisles.
- Adding an attachment is like permanently carrying a load. If the attachment weighs 1,000 pounds (lb), your forklift's capacity is automatically reduced by 1,000 lb.
- Attachments typically move the load farther away from the forklift, which increases your load center.
If the attachment moves the load 8 in. away, it will reduce the capacity by approximately 800 lb (100 lb per in.) because loads that normally have a load center of 24 in. now have a 32-in. load center.



Loading and Unloading

- Never attempt to lift or carry a load beyond the rated capacity on the nameplate.
- Check the weight of the load. Placing a weight on the back of a forklift to increase load capacity is extremely dangerous.
- Locate the load's center of gravity.
- Inspect the load for stability, projections, and damaged pallets before lifting.
- Never drill a hole in the forks to use as a way of towing something or as a place to put a chain hook when hoisting. Many forklifts are equipped with a tow bar in the back for towing..

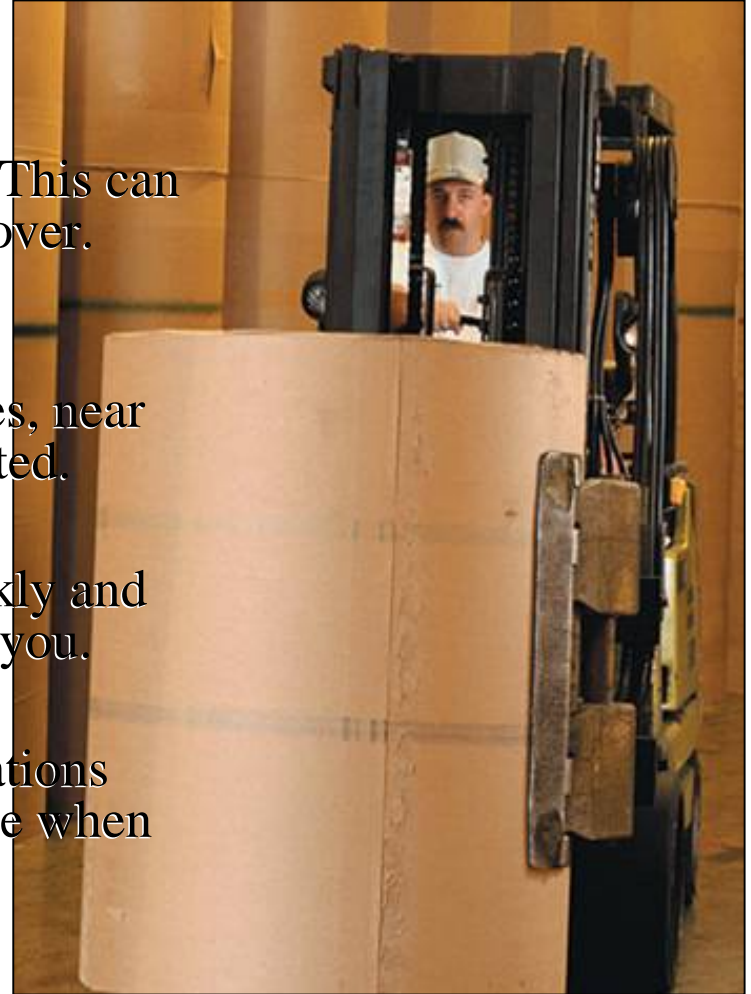


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Traveling

- The cage is there to protect your body.
- Never travel while raising or lowering a load. This can cause an unstable situation and a possible tip-over. When traveling, keep the load low.
- Sound the horn at corners, when crossing aisles, near doorways, and anywhere your view is obstructed.
- A safe speed is a speed at which you can quickly and easily stop if a pedestrian steps out in front of you.
- Watch for your clearance for overhead installations when lifting your load, and check the clearance when turning because the rear end swings wide.



Traveling (cont.)

- Avoid loose objects or holes
- Never carry passengers
- Pedestrians always have the right-of-way
- Keep a safe distance from the edge of ramps or docks
- Never eat or drink
- No horseplay



Operating Hazards—Load Carrying

- Load-carrying hazards include:
 - Working around loading docks
 - Loads that block the forward vision
 - Stacking and unstacking on racks



Ramps

- Turning on a ramp presents opportunities to tip over.
- Keeping the load upgrade will keep the combined center of gravity in the center of the stability triangle.
- Drive slowly, especially on downgrades of ramps where the combined weight of the load and gravity will decrease the effectiveness of the brakes.



Docks

- Check the dock plate for cracks or signs of wear, and be sure it is properly secured.
- Check the trailer floor for holes that the tire of a forklift could fall into, causing a tip-over.
- Chock the trailer wheels to prevent trailer creep.
- • Support the nose of the trailer.



Parking

- Do not park in a way that will block exits or access to emergency equipment.
- Lower the forks to the ground to prevent someone from getting their body under forks.
- Set the gear in neutral.
- Set the parking brake.
- Turn off the key, take it with you.



Workplace-specific information

- Traffic routes, pedestrians
- Unique hazards of the facility
- Surface conditions, ramps, slopes
- Composition of loads



Workplace-related topics



- Pedestrian traffic
- Surface conditions, ramps, slopes
- Composition of loads
- Narrow aisles
- Hazardous Locations
- Ventilation



Aisle Space

§1910.176(a); (e)

- *Aisles and Passageways*
- Where mechanical handling equipment is used, sufficient safe clearances have to be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways must be kept clear and in good repair, with no obstruction across or in aisles that could create a hazard.
- All permanent aisles and passageways must be appropriately marked.
- *Clearance Limits*
- Clearance signs to warn of clearance limits must be provided.



Vehicle capacity

- Only handle loads within truck's rated capacity
- Capacity is found on nameplate



Conduct a Preoperational Inspection

- Follow procedures, schedules
- Pre-operation safety checks
- Damage, defects, unusual conditions
- Remove unsafe trucks from service



Inspection Walk-around

- Check that the forklift is properly disengaged—forks down, key off, neutral gear, parking brake on
- Check left and right side—tires, lug nuts, axle, overhead guard, and no debris behind the mast
- Check front—forks, hoses, fork pins, backrest, mast, and chains
- Check rear—counterbalance and radiator



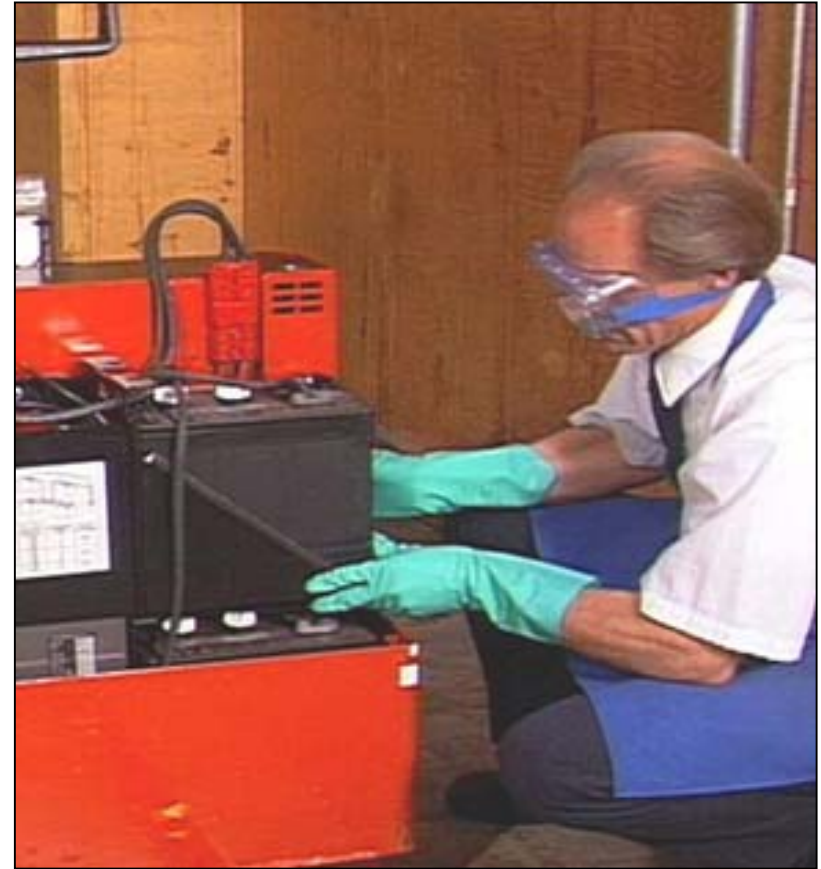
Inspection Walk-around (cont.)

- Propane-powered forklift
 - Check all oil and fluid levels
 - Check fan belt, fan, and radiator
 - Check tank, hose attachments, and tank clamp
- Electric-powered forklift
 - Check the battery condition



Battery Charging

- Charge batteries only in protected areas with ventilation Inspect battery connectors for damage
- Immediately clean up electrolyte spills
- Battery electrolyte is highly corrosive—wear PPE



Charging of batteries

- Exposes workers to hazardous chemicals, electrical hazards
- No smoking, flames, sparks, arcs
- Keep tools, metallic objects away from uncovered batteries



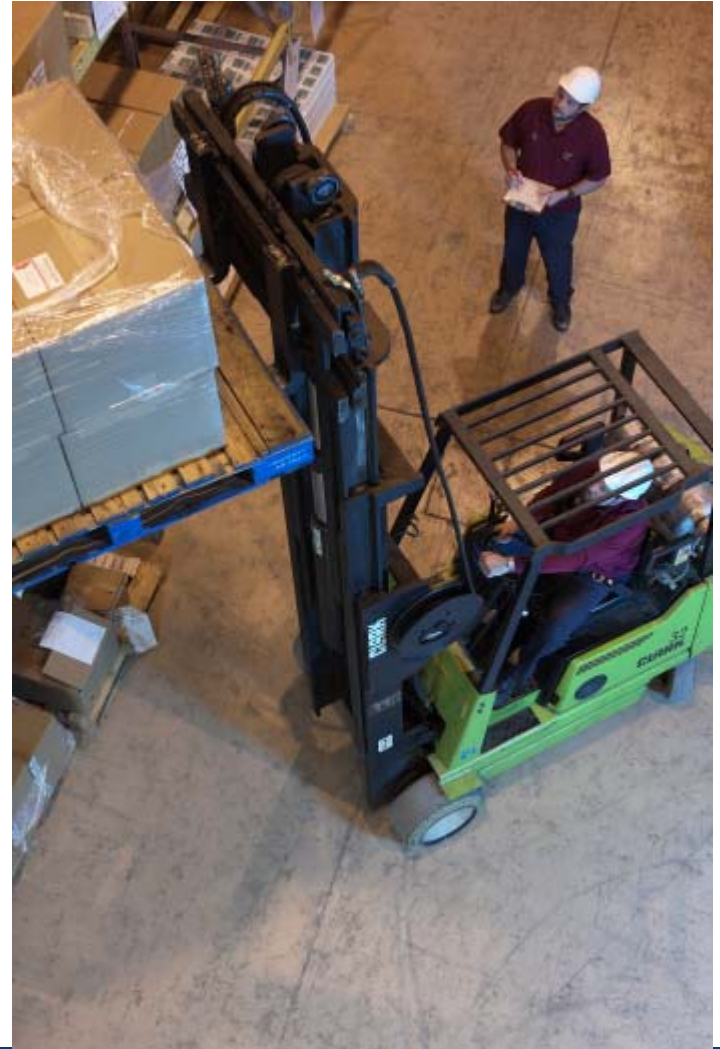
Propane Refueling

- Do not smoke around propane. It is a highly combustible gas that can cause a fire or even explode if not handled correctly.
- Report propane leaks immediately.
- Leaks can be detected by:
 - – the distinct odor
 - – a hissing sound
 - – frost on the fittings
- Minimum personal protective equipment (PPE) requirements for propane refueling are gloves and safety glasses. Additional PPE might be goggles or a face shield.



Vehicle stability

- Center of gravity shifts as load is raised
- Truck is less stable with raised load



Tip-Over Safety Procedure

- Forklift tip-over can cause serious injury and even death to the operator or pedestrians.
- Seat belts must always be worn. Many fatalities have occurred when an operator without a seat belt was thrown clear of the forklift and struck his or her head on a solid object.
- If the forklift begins to tip over, do not jump. You should be wearing the seat belt so that it would be hard to jump if you had the seat belt secured.
- Many operators who thought they could jump clear of a tip-over have been crushed by the overhead guard or the mast of the forklift.
- Hold firmly to the steering wheel.
- Brace your feet.
- Lean away from the fall.



Operating Hazards— Environmental Conditions

- Environmental hazards include:
- Operating non-electric forklifts in poorly ventilated areas where carbon monoxide or carbon dioxide can build up
- Ascending and descending ramps
- Crossing railroad tracks
- Operating and braking on slippery floors
- Operating on dirt or gravel
- Poor lighting



Retraining/re-evaluation

- Triggered by certain events
 - Unsafe operation
 - Accident or near-miss
 - Evaluation indicates need
 - Different type of equipment introduced
 - Workplace condition changes
- Evaluate at least every 3 years



Refresher Training and Evaluation (continued)

- An evaluation of each powered industrial truck operator's performance must be conducted:
 - After initial training,
 - After refresher training, and
 - At least once every three years



Key Points to Remember

- Facility hazards include pedestrians, environmental conditions, and loading/unloading
- Position loads close to the vertical backrest
- Always conduct and document a preoperational inspection
- Follow the safe operating rules of the road
- Always refuel/recharge in ventilated areas and wear proper PPE



Appendix A - Stability of Powered Industrial Trucks

- Appendix A provides non-mandatory guidance to assist employers in implementing the standard.
- This appendix does not add to, alter, or reduce the requirements of this section.

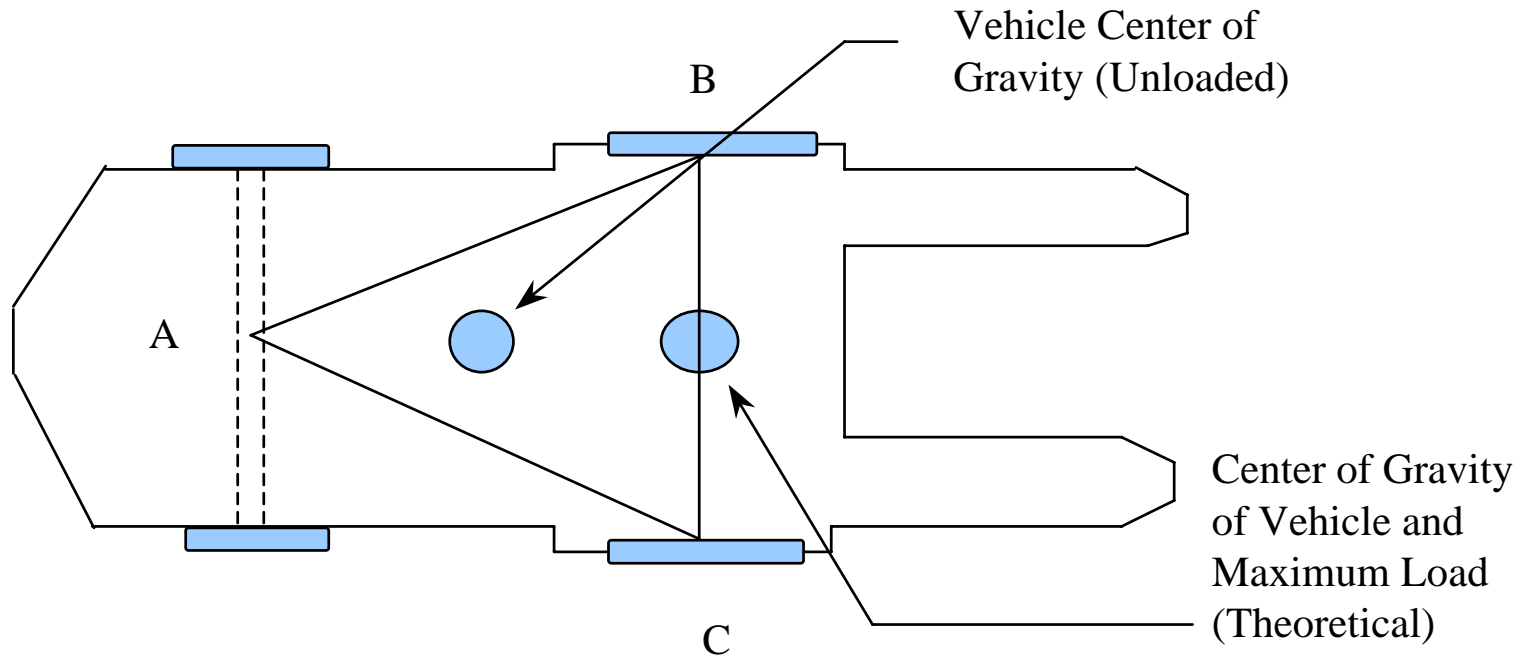


Appendix A - Stability of Powered Industrial Trucks

- Definitions
- General
- Basic Principles
- Stability Triangle
- Longitudinal Stability
- Lateral Stability
- Dynamic Stability



Stability Triangle - Figure 1

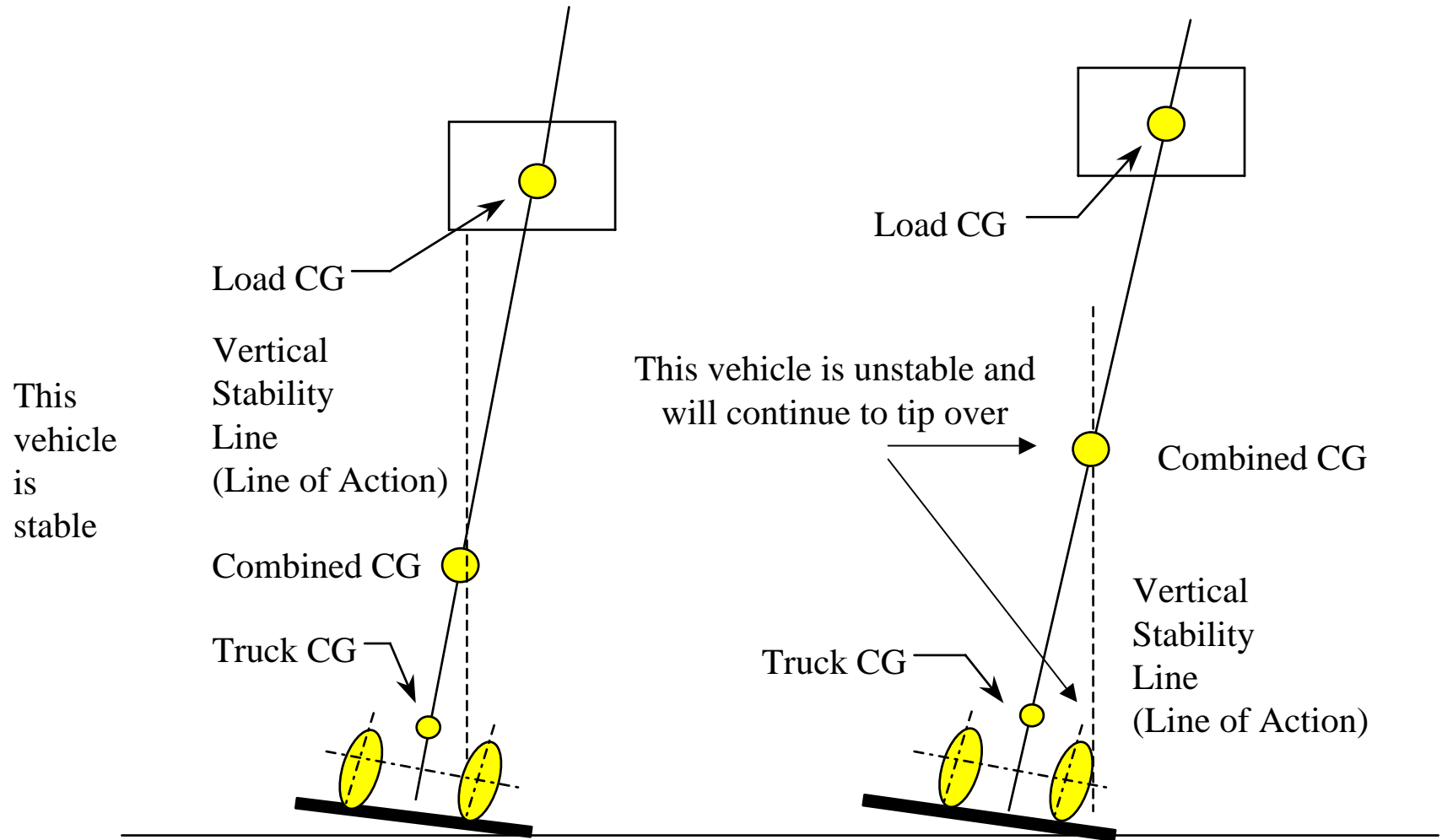


Notes:

1. When the vehicle is loaded, the combined center of gravity (CG) shifts toward line B-C. Theoretically the maximum load will result in the CG at the line B-C. In actual practice, the combined CG should never be at line B-C.
2. The addition of additional counterweight will cause the truck CG to shift toward point A and result in a truck that is less stable laterally.

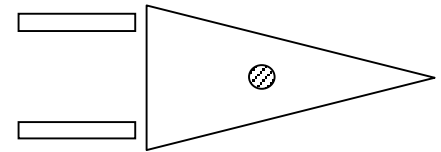


Stability Triangle - Figure 2

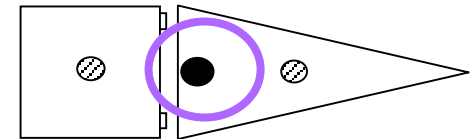


Stability Triangle

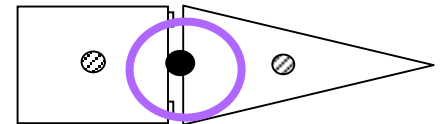
- The top image shows the center of gravity for a forklift without a load, right in the middle of the stability triangle. A common sit-down counterbalance forklift truck has a three-point suspension with the weight supported at each front tire and the center of the rear axle.



- The middle image shows the center of gravity of a forklift carrying its maximum rated load.

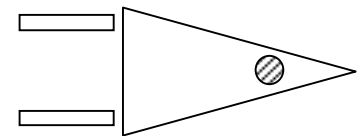
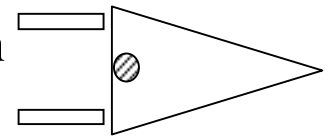
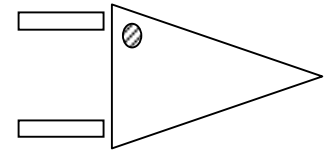


- The bottom image shows the center of gravity of a fully loaded forklift with the load center more than 24 inches (in.) away from the vertical face of the forks. The forklift with its load will likely tip forward.



Combined Actions

- Turning a corner; having an unbalanced load; a tire going into a pothole; driving on a sloped surface
- The forklift has a capacity load; the mast is tilted forward; stopping abruptly; quickly accelerating in reverse; driving down a ramp
- The mast is tilted back; stopping abruptly when going in reverse, quickly accelerating forward; driving up a ramp
- A forklift cornering while driving up a ramp would cause the center of gravity to be back and to the side, resulting in a tip-over.



Types of Powered Industrial Trucks

There are many different types of powered industrial trucks covered by the OSHA standard.

- Commonly used types include:
 - High lift trucks, counterbalanced trucks, cantilever trucks, rider trucks, forklift trucks, high lift trucks, high lift platform trucks, low lift trucks, motorized hand trucks, pallet trucks, straddle trucks, reach rider trucks, high lift order picker trucks, motorized hand/rider trucks, and counterbalanced front/side loader lift trucks.
- A single type of truck can only be described by calling it by all of its characteristics, (e.g., a high lift, counterbalanced, sit down rider truck).



Unique Characteristics of Powered Industrial Trucks

- Each type of powered industrial truck has its own unique characteristics and some inherent hazards.
- To be effective, training must address the unique characteristics of the type of vehicle the employee is being trained to operate.

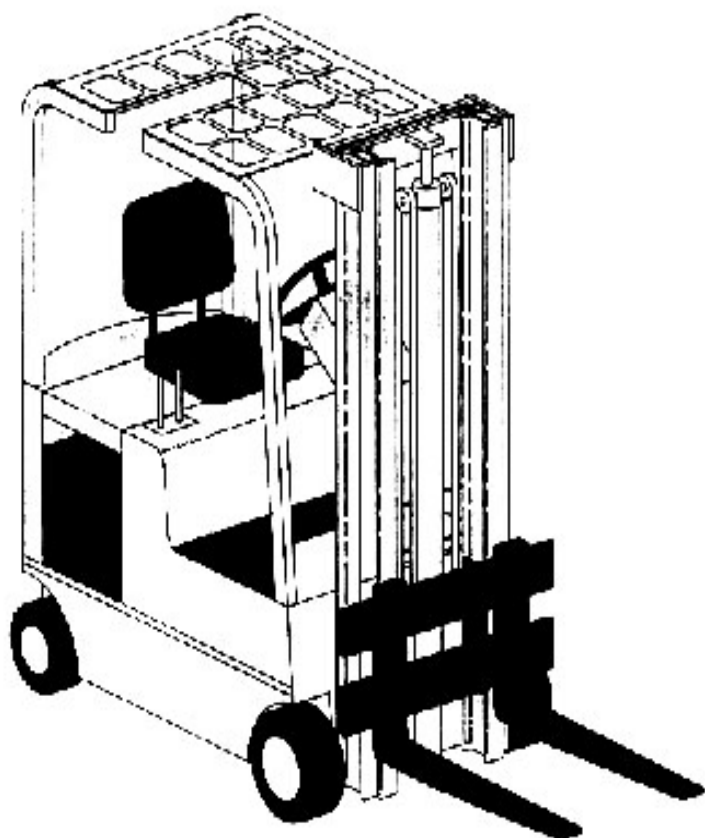


Class I - Electric Motor Rider Trucks

- Counterbalanced rider type, stand up
- Three wheel electric trucks, sit-down
- Counterbalanced rider type, cushion tires, sit-down (high and low platform)
- Counterbalanced rider, pneumatic tire, sit-down (high and low platform)



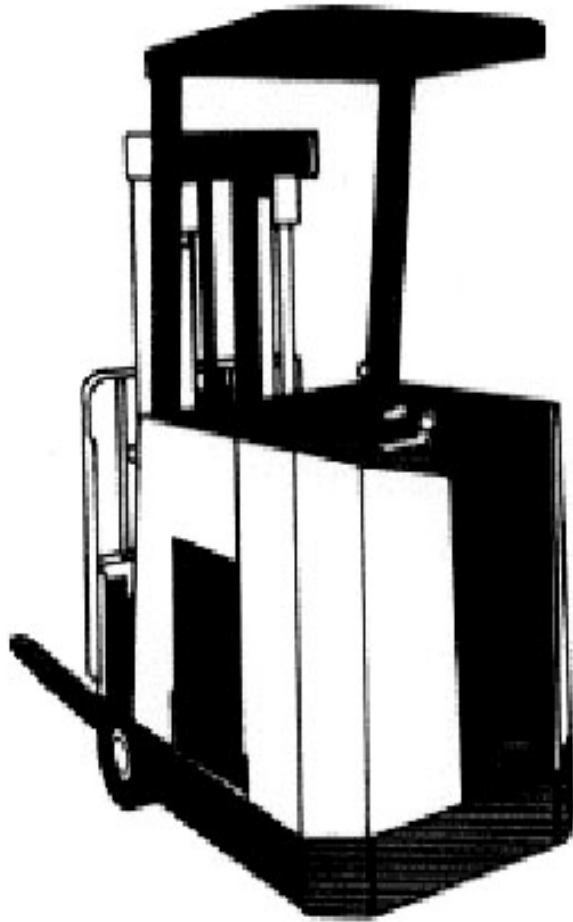
Class I - Electric Motor Rider Trucks



Sit Down Rider - Electric



Class I - Electric Motor Rider Forks



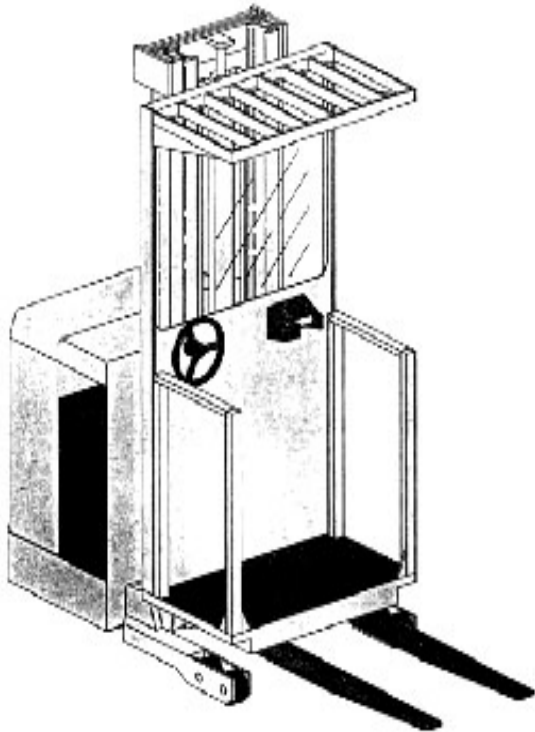
- Counterbalanced Rider Type, Stand-Up

Class II - Electric Motor Narrow Aisle Trucks

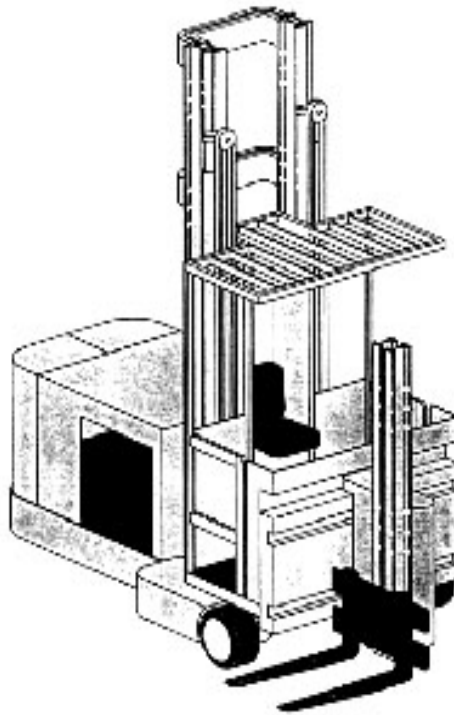
- High lift straddle
- Order picker
- Reach type outrigger
- Side loaders, turret trucks, swing mast and convertible turret/stock pickers
- Low lift pallet and platform (rider)



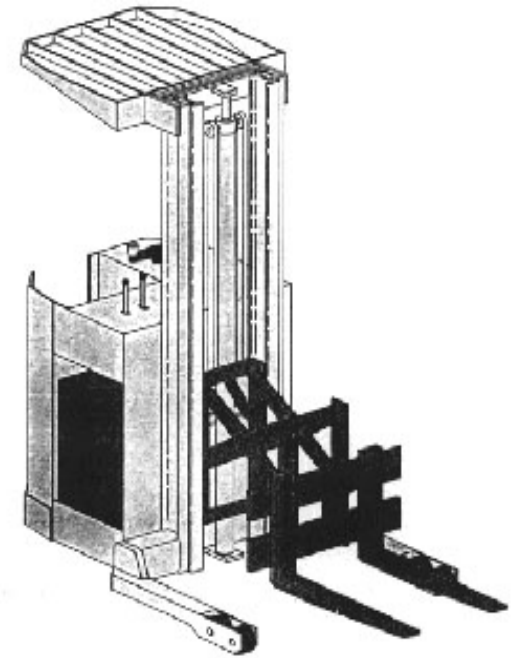
Class II - Electric Motor Narrow Aisle Trucks



Order Picker



Turret Truck



**Reach Type
Outrigger**



Class II - Narrow Aisle Trucks



Rider Reach Truck



Order Picker

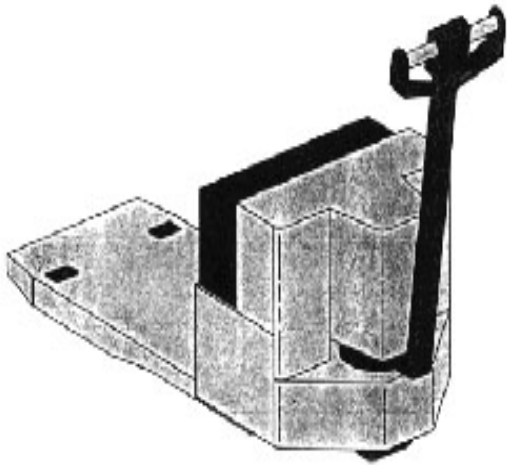


Class III - Electric Motor Hand or Hand/Rider Trucks

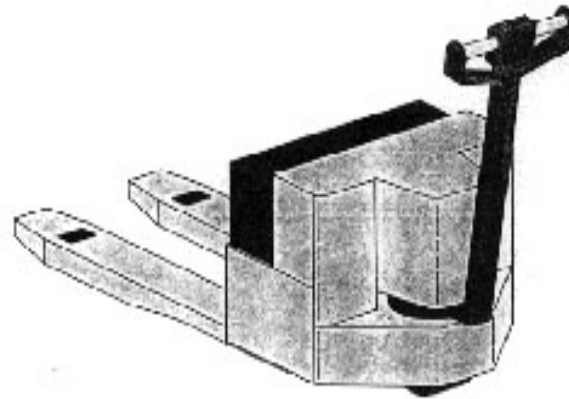
- Low lift platform
- Low lift walkie pallet
- Reach type outrigger
- High lift straddle
- High lift counterbalanced
- Low lift walkie/rider pallet



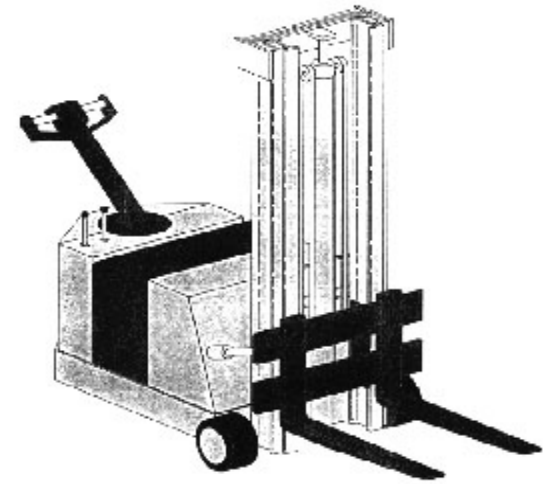
Class III - Electric Motor Hand or Hand/Rider Trucks



Low Lift Platform



**Low Lift
Walkie Pallet**



**High Lift
Counterbalanced**



Class III - Hand & Hand/Rider Trucks



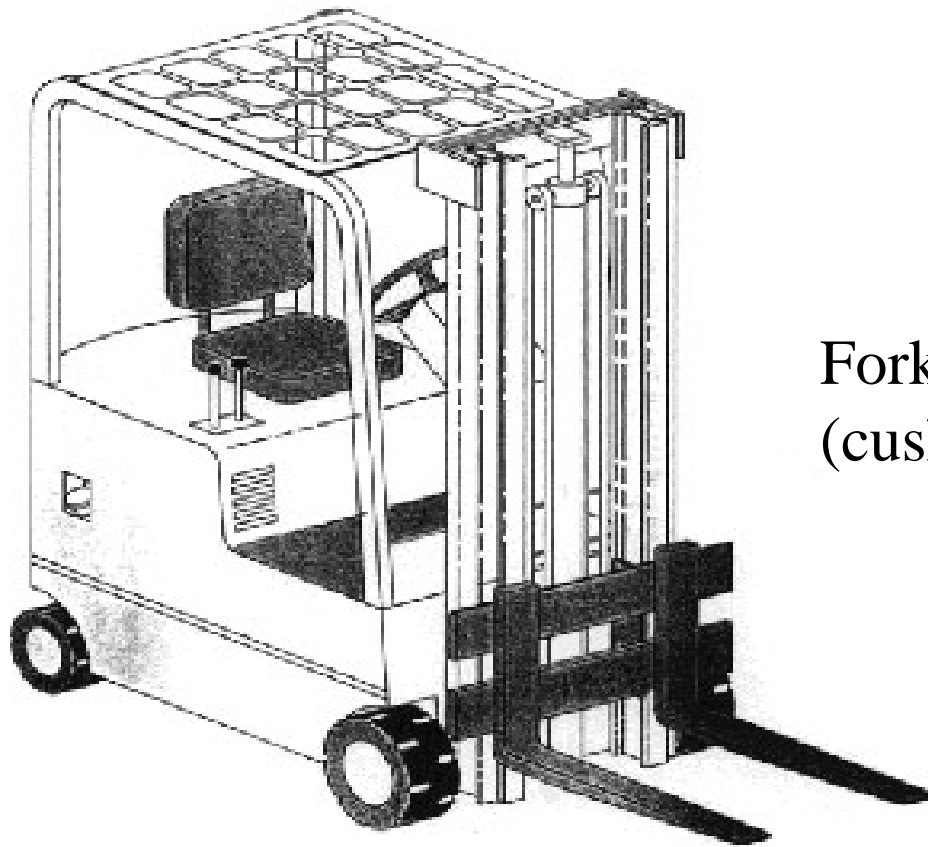
**Walkie Powered
Pallet Truck**



**Walkie/Rider
Powered Pallet Truck**



Class IV - Internal Combustion Engine Trucks - Cushion (Solid) Tires



Fork, counterbalanced
(cushion/solid tires)



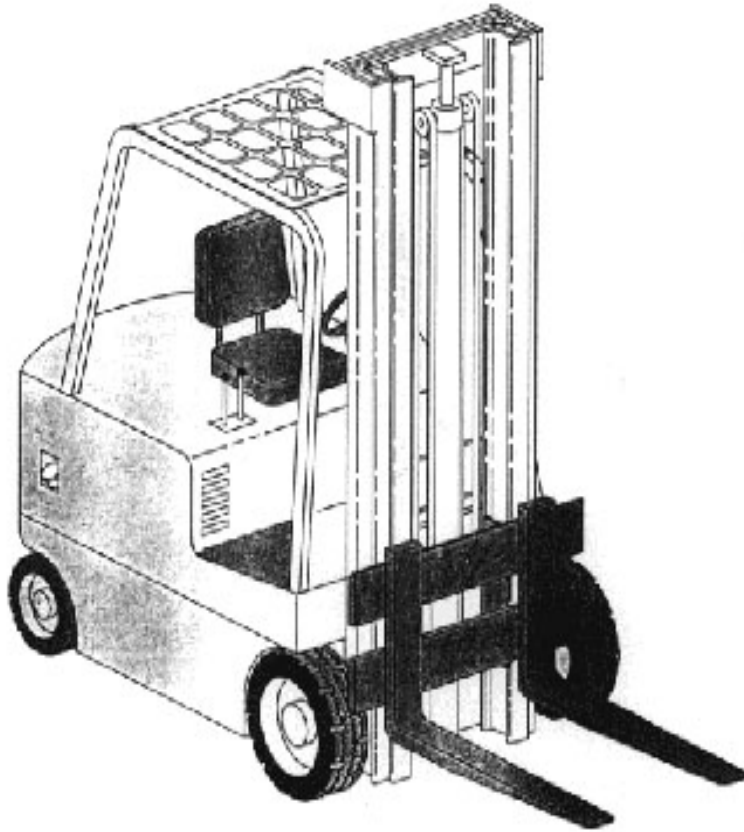
Class IV - Internal Combustion Engine Trucks - Cushion (Solid) Tires



**Sit Down Rider Fork
- LPG**



Class V - Internal Combustion Engine Trucks - Pneumatic Tires



Fork, counterbalanced
(pneumatic tires)



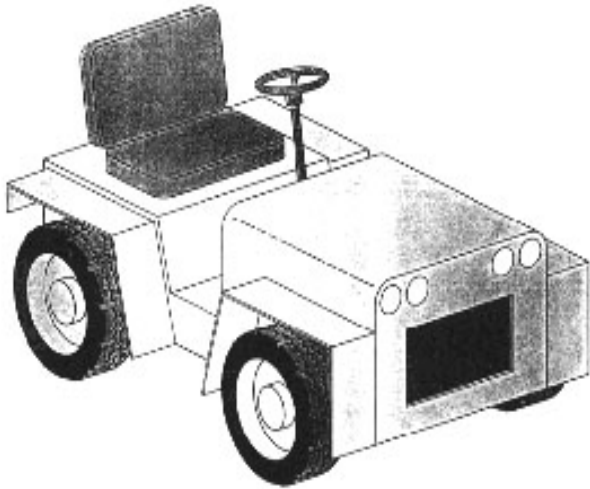
Class V - Internal Combustion Engine Trucks (Pneumatic Tires)



**Sit Down Rider - Gas-
Pneumatic Tires**



Class VI - Electric & Internal Combustion Engine Tractors



Sit-down rider

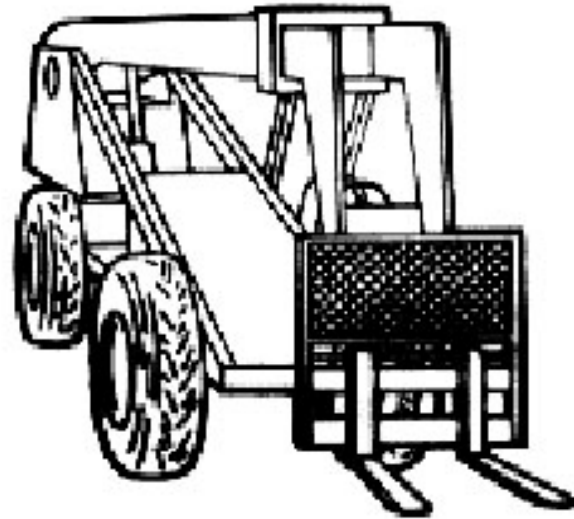


Class VII - Rough Terrain Forklift Trucks

- Straight-mast forklift



- Extended-reach forklift



All rough terrain forklift trucks



Rough Terrain Straight Mast Forklifts



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