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# Powered Industrial Trucks

- ***29 CFR 1910.178***

**Presented by:** ETTA, OSH Division, (919) 807-2875

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# Objectives

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1910.178

In this course, we will discuss the following:

- Minimum OSHA general requirements for powered industrial trucks (PITS)
- Safe operation of equipment
- Operator training and evaluation
- Hazard identification
- Abatement methods and procedures



# General Requirements

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1910.178(a)(1)

- This standard covers safety requirements relating to fire protection, design, maintenance, and use of:
    - Fork trucks
    - Tractors
    - Platform lift trucks
    - Motorized hand trucks
    - Other specialized industrial trucks
- ....powered by *electric motors or internal combustion engines.*
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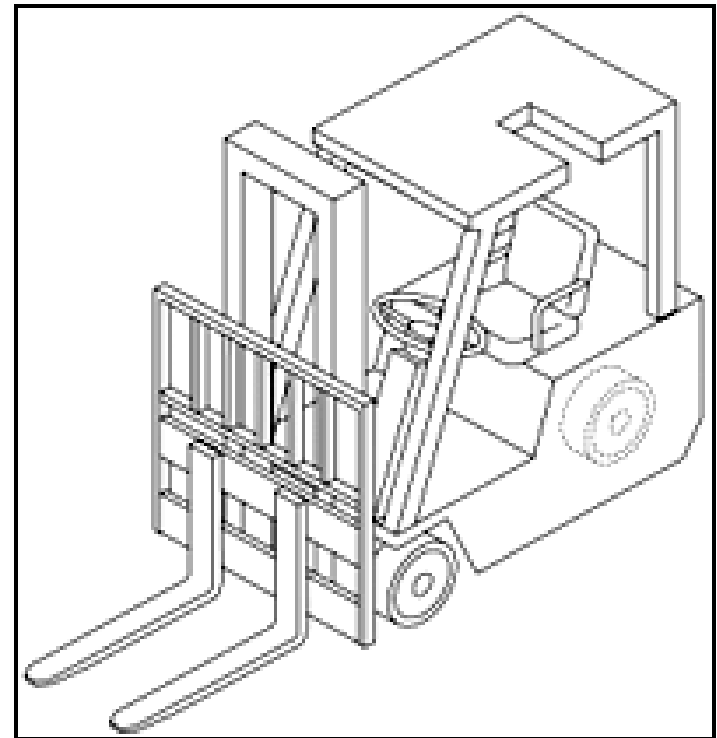
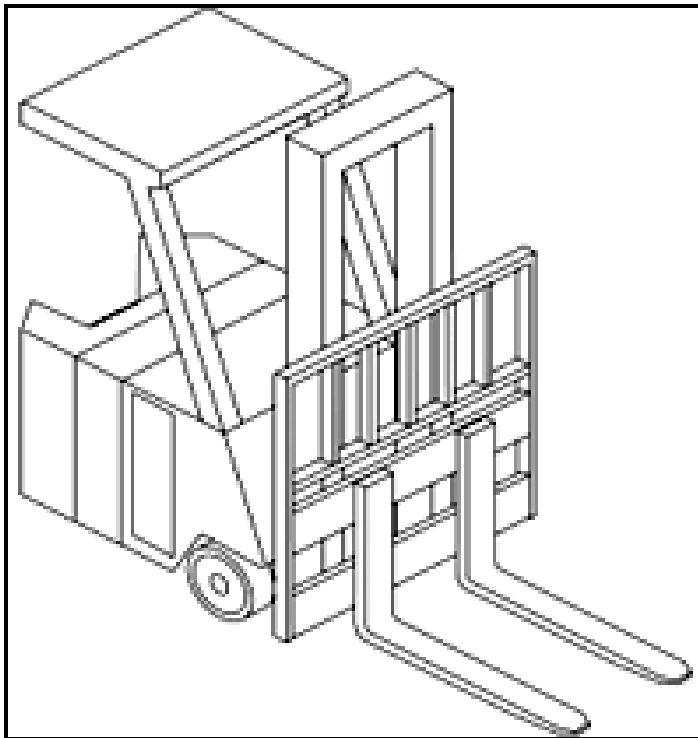


# General Requirements

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1910.178(a)(1)

- **Class I - Electric Motor Rider Trucks**

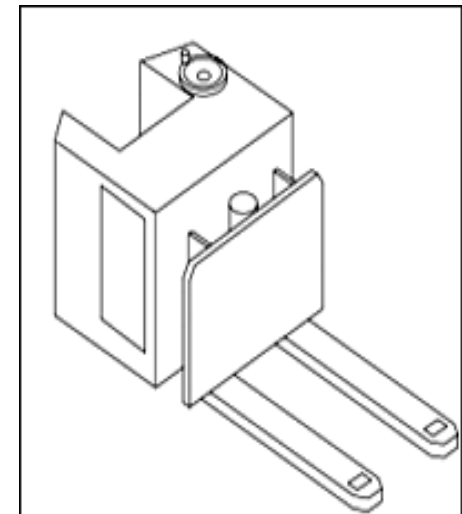
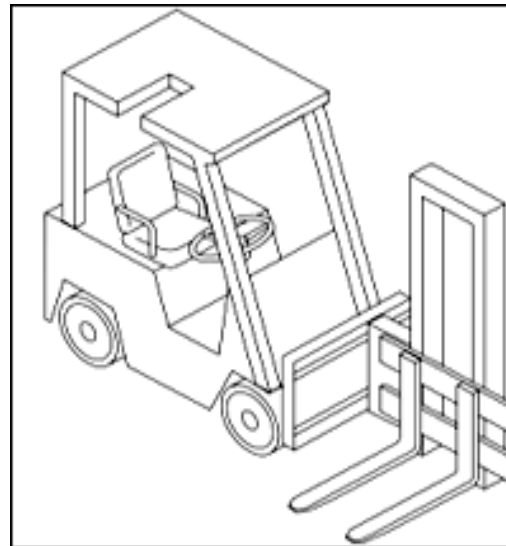
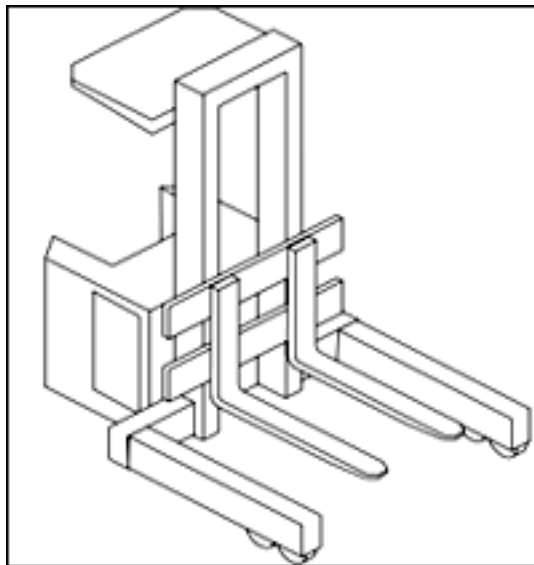


# General Requirements

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1910.178(a)(1)

- **Class II - Electric Motor Narrow Aisle Trucks**

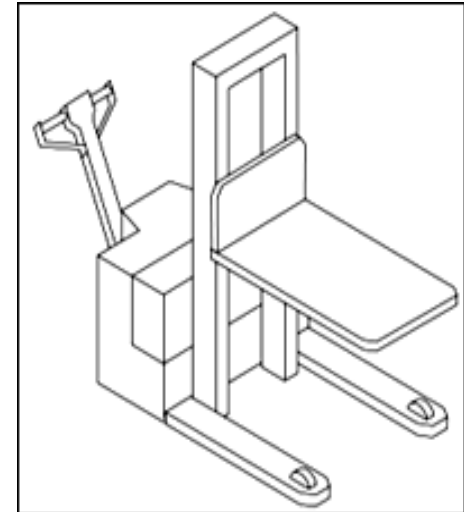
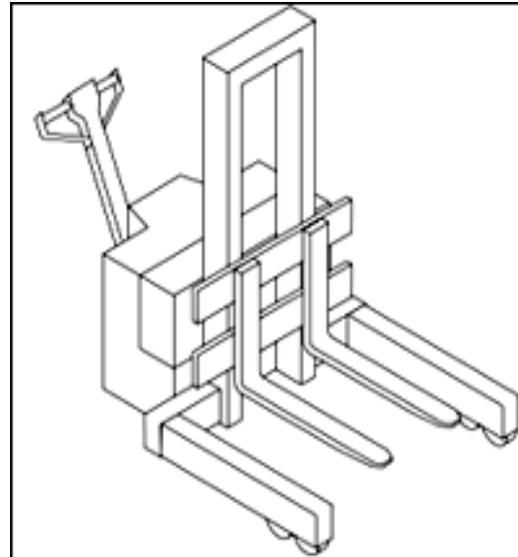
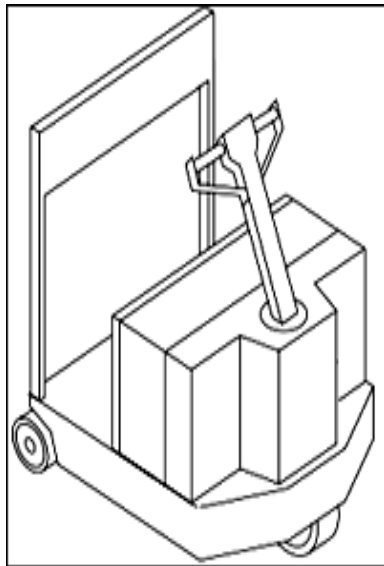


# General Requirements

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1910.178(a)(1)

- **Class III - Electric Motor Hand Trucks or Hand/Rider Trucks**

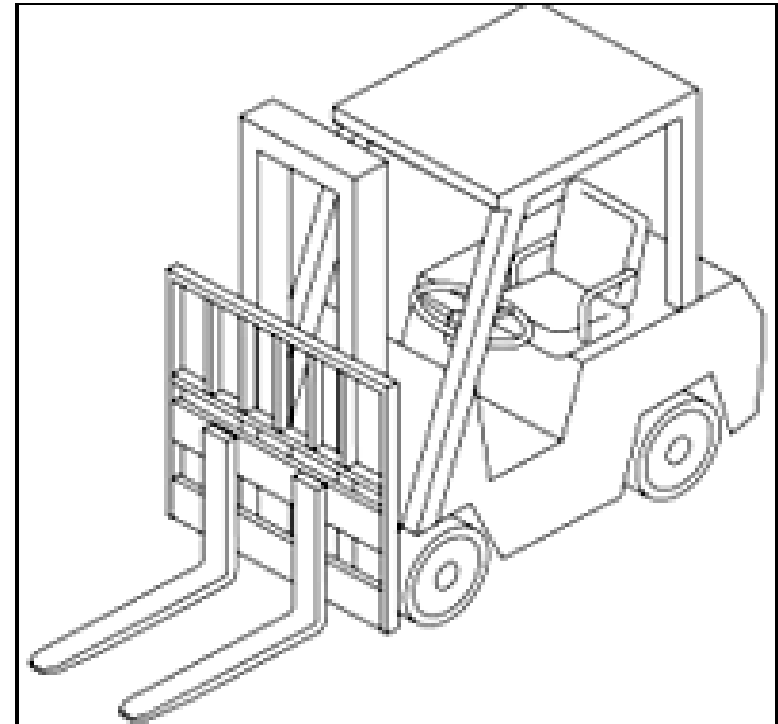


# General Requirements

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1910.178(a)(1)

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

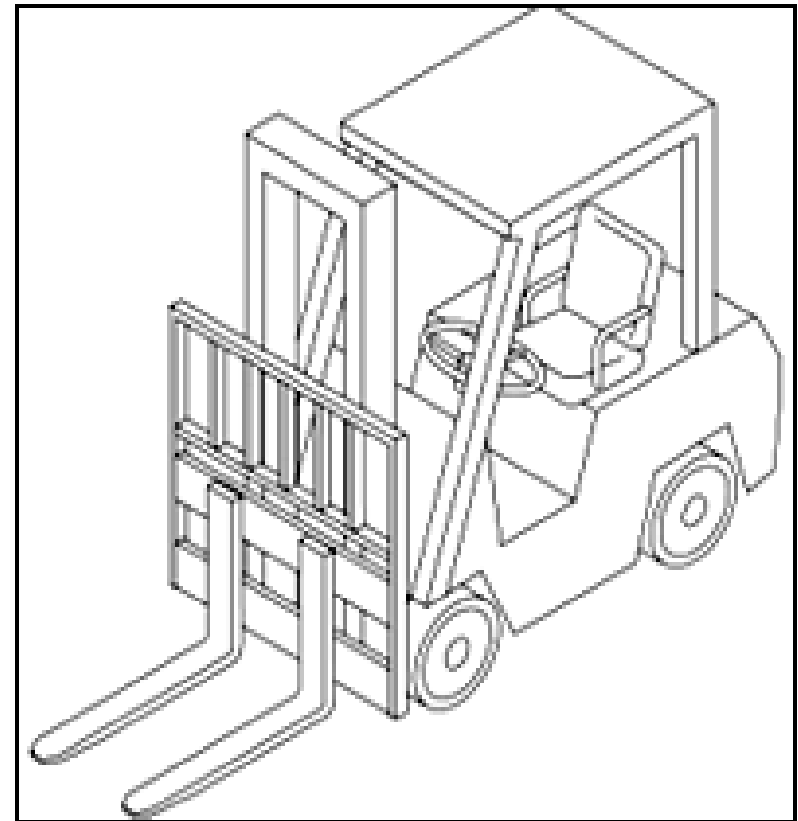


# General Requirements

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1910.178(a)(1)

- **Class V - Internal Combustion Engine Trucks (Pneumatic Tires)**



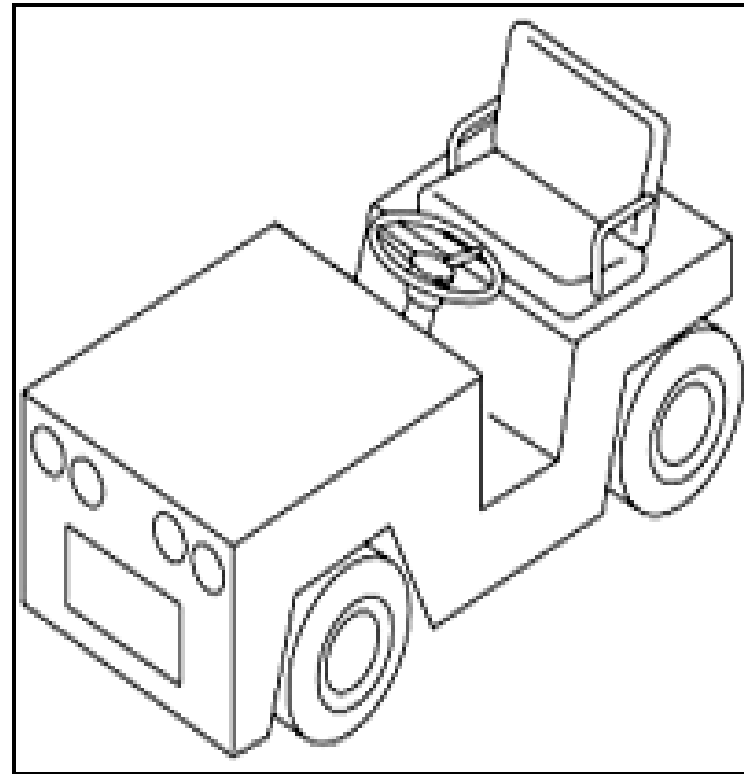


# General Requirements

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1910.178(a)(1)

- **Class VI - Electric and Internal Combustion Engine Tractors**

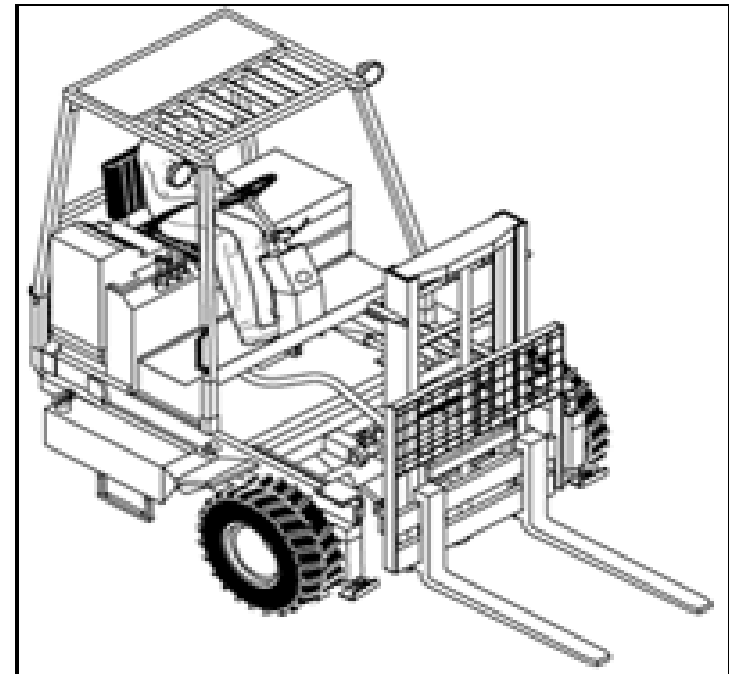
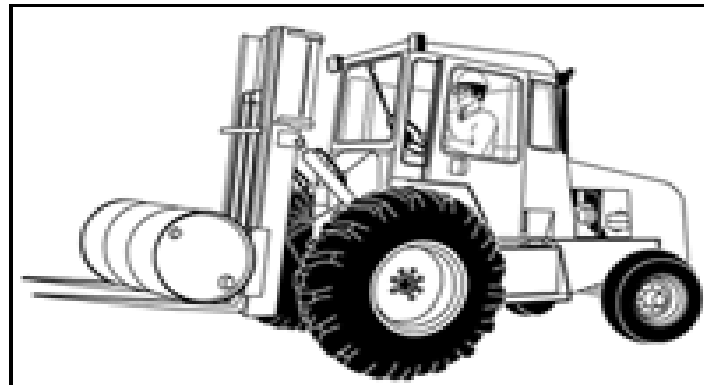
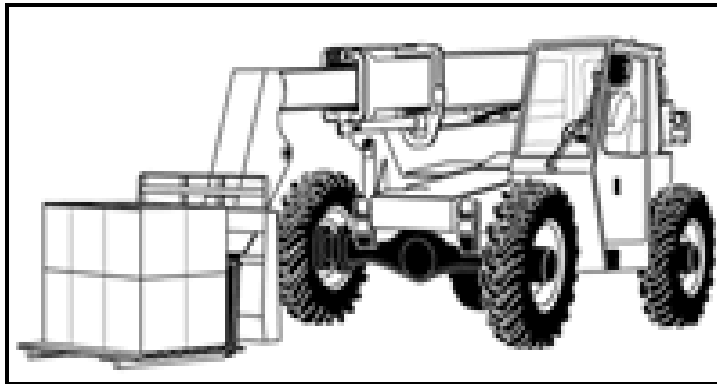


# General Requirements

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1910.178(a)(1)

- **Class VII - Rough Terrain Forklift Trucks**



# General Requirements

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1910.178(a)(1)

- Does not apply to:
  - Compressed air or nonflammable compressed gas-operated industrial trucks
  - Farm vehicles
  - Vehicles intended primarily for earth moving or over-the-road hauling.



# General Requirements

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1910.178(a)(1)

- Does not apply to vehicles intended or designed primarily for earth moving
  - OSHA letter of interpretation dated 03/07/2000



# General Requirements

1910.178(a)(2)-(3)

- All new PITs acquired and used by an employer shall meet the design requirements of:
  - American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1– 1969”, which is incorporated by reference as specified in § 1910.6
- Approved trucks shall bear a label or some other identifying mark indicating approval by the testing laboratory.



# General Requirements

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1910.178(a)(4)

- Modifications and additions which affect capacity and safe operation must have prior written approval from manufacturer.



# General Requirements

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1910.178(a)(5)

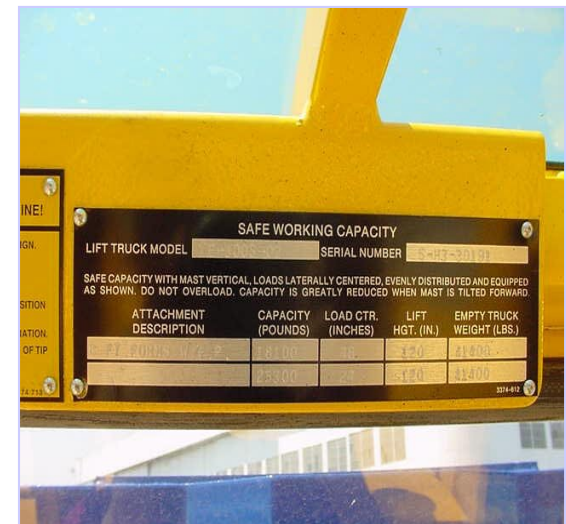
- Truck equipped with front-end attachments other than factory installed:
  - Marked to identify the attachments
  - Show approximate weight of truck and attachment



# General Requirements

1910.178(a)(6)-(7)

- All nameplates and markings must be in place and maintained in a legible condition.
- The term, approved truck or approved industrial truck means:
  - A truck that is listed or approved for fire safety purposes for the intended use by a national recognized testing laboratory.







# Designations

1910.178(b)(1)-(12)

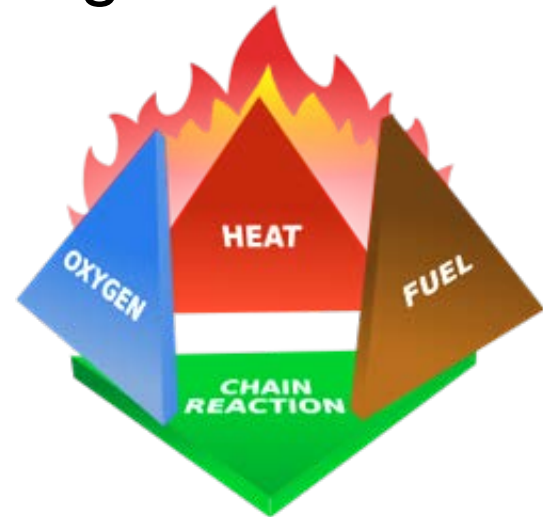
- The atmosphere or location shall have been classified as to whether it is hazardous or nonhazardous prior to the consideration of industrial trucks being used.

<b>D, DS, DY</b>	<b>Diesel</b>
<b>E, ES, EE, EX</b>	<b>Electric</b>
<b>G, GS</b>	<b>Gasoline</b>
<b>LP, LPS</b>	<b>Liquefied petroleum gas</b>

# Designated Locations

1910.178(c)

- Refer to Table N-1 in 1910.178 for the use of industrial trucks in various locations.
- Power-operated industrial trucks shall not be used in atmospheres containing hazardous concentrations:
  - Gases or vapors
  - Dusts



# Converted Industrial Trucks

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1910.178(d)

- Industrial trucks approved for the use of gasoline may be converted to liquefied petroleum gas and it may be used in those locations where G, GS or LP, and LPS designated trucks have been specified.



# Safety Guards

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1910.178(e)(1)

- High lift rider trucks must be fitted with an overhead guard.
  - Overhead guard required unless operating conditions do not permit.



# Safety Guards

1910.178(e)(2)

- If the type of load presents a hazard, then the user must equip fork truck with a vertical backrest extension manufactured in accordance with the standard.



# Fuel Handling and Storage

1910.178(f)(1)

- Storage and handling of liquid fuels must be in accordance with NFPA Flammable and Combustible Liquids Code [NFPA No. 30-1969].
  - Incorporated by reference as specified in §1910.6.



# Fuel Handling and Storage

1910.178(f)(2)

- Storage and handling of liquefied petroleum gas fuel must be in accordance with NFPA Storage and Handling of Liquefied Petroleum Gases [NFPA No. 58-1969].
  - Incorporated by reference as specified in §1910.6



# Changing/Charging Storage

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1910.178(g)(1)

- Battery charging installations must be located in areas designated for that purpose.

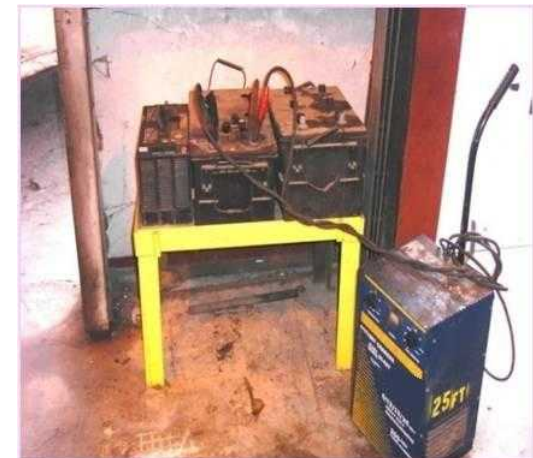




# Changing/Charging Storage

1910.178(g)(2)

- Facilities must be provided for flushing and neutralizing spilled electrolyte.
- Facilities must be provided for protecting charging apparatus from damage by trucks.



# Changing/Charging Storage 1910.178(g)(2)

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- Facilities must be provided for adequate ventilation for dispersal of fumes from gassing batteries.



# Changing/Charging Storage 1910.178(g)(4)-(5)

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- Conveyor, overhead hoist, or equivalent material handling equipment must be provided for handling batteries.
- Reinstalled batteries shall be properly secured.



# Changing/Charging Storage 1910.178(g)(6)-(7)

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- A carboy tilter or siphon must be provided for handling electrolyte.
- Acid must be poured into water; water must not be poured into acid.



# Changing/Charging Storage 1910.178(g)(8)

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- Trucks must be properly positioned and brake applied before attempting to change or charge batteries.



# Changing/Charging Storage 1910.178(g)(9)

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- When charging batteries, vent caps must be checked for proper functioning.
- The battery cover must be opened to dissipate heat.



# Changing/Charging Storage

1910.178(g)(10)-(11)

- Smoking must be prohibited in the charging area.
- Precautions must be taken to prevent open flames, sparks or electric arcs in charging area.



# Changing/Charging Storage

1910.178(g)(12)

- Tools and other metallic objects must be kept away from the top of uncovered batteries.



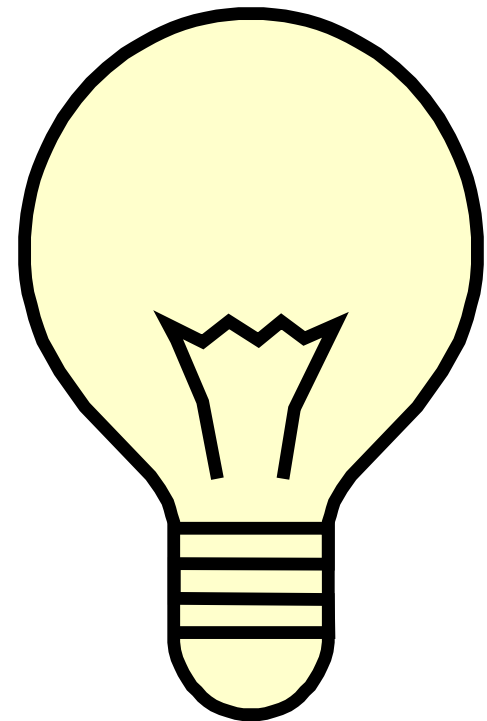




# Lighting for Operating Areas 1910.178(h)(2)

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- Where general lighting is less than 2 lumens per square foot, auxiliary directional lighting shall be provided on the truck.





# Noxious Gases and Fumes

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1910.178(i)

- Concentration levels of carbon monoxide gas created by powered industrial truck operations must not exceed the levels specified in 1910.1000.
  - Air contaminants/Carbon monoxide “CO”



# Trucks and Railroad Cars

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1910.178(k)(1)

- Brakes of highway trucks must be set and wheel chocks placed under rear wheels while boarded with powered industrial trucks.



# Trucks and Railroad Cars

1910.178(k)(2)

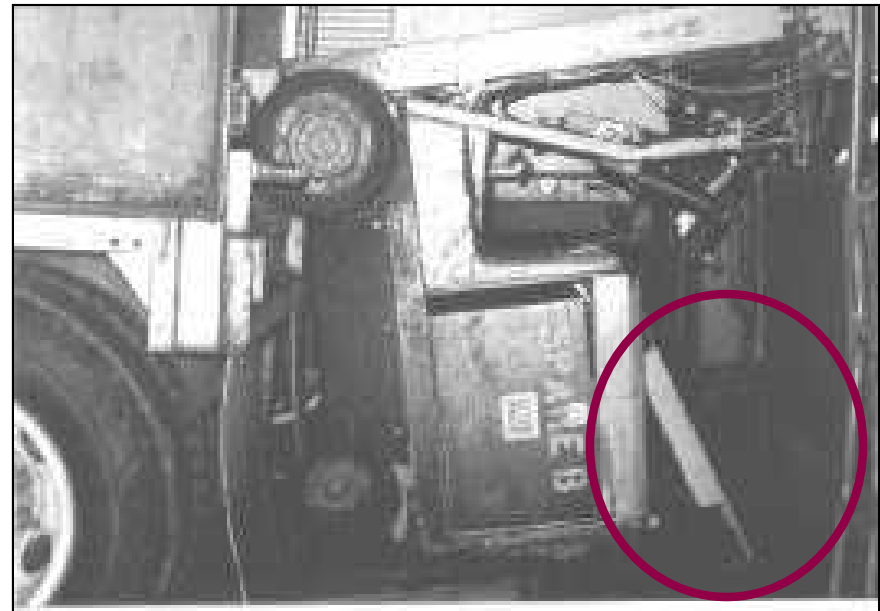
- Wheel stops or other positive protection must be provided to prevent railroad cars from moving during loading or unloading operations.



# Trucks and Railroad Cars

1910.178(k)(3)

- Fixed jacks may be necessary to support semi-trailer during loading or unloading when the trailer is not coupled to a tractor.



# Trucks and Railroad Cars

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1910.178(k)(4)

- Setting the hand brake would be positive protection to prevent railroad car movement.



# Operator Training

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1910.178(l)(1)(i)

- Employer shall ensure each powered industrial truck operator is competent to operate a powered industrial truck safely
  - As demonstrated by successful completion of training and evaluation.



# Operator Training

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1910.178(l)(2)

- Trainees may only operate the truck:
  - Under direct supervision of trainer
  - Where such operation does not endanger the trainee or other employees

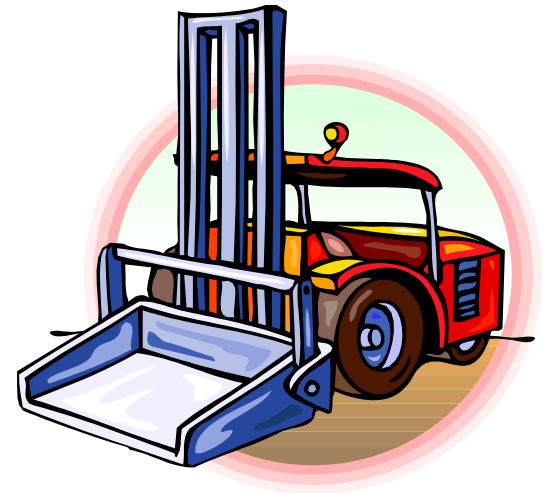




# Operator Training

1910.178(l)(2)(ii)-(iii)

- Training program must consist of a combination of:
  - Formal instruction
  - Lecture
  - Discussion
  - Interactive computer learning
  - Video, written material
  - Practical training exercises
  - Evaluation
- Operator training and evaluation
  - Shall be conducted by a person who have the knowledge, training, and experience



# Operator Training

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1910.178(l)(3)

- Training program content – initial training
  - Truck-related topics
  - Workplace-related topics
  - Requirements of 1910.178



# Operator Training

1910.178(l)(3)(i)

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



# Operator Training

1910.178(l)(3)(i)

- 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.



# Operator Training

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1910.178(l)(3)(ii)

- Workplace-related topics
  - Surface conditions
  - Composition and stability of loads
  - Load manipulation, stacking, unstacking
  - Pedestrian traffic
  - Narrow aisles and restricted areas



# Operator Training

1910.178(l)(3)(ii)

- Operating in hazardous (classified) locations
- Operating on ramps and sloped surfaces
- Potentially hazardous environmental conditions
- Operating in closed environments or other areas where poor ventilation or maintenance could cause carbon monoxide or diesel exhaust buildup



# Operator Training

1910.178(l)(4)(ii)

- Refresher training and evaluation
  - Operator observed operating vehicle in unsafe manner
  - Involved in accident or near-miss incident
  - Evaluation reveals not operating truck safely
  - Assigned to different type of truck
  - Conditions in workplace change



# Operator Training

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1910.178(l)(5)

- Avoidance of duplicative training
  - If an operator has previously received training in a topic specified in paragraph (l)(3) of this section, and such training is appropriate.





# Operator Training

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1910.178(l)(6)

- Employer must certify that each operator has been trained and evaluated
- Certification must include:
  - Name of operator
  - Date of training
  - Date of evaluation
  - Identity of trainer

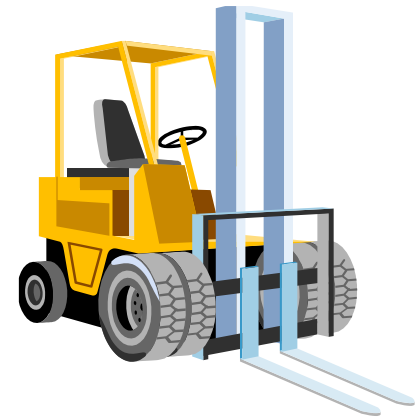


# Truck Operations

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1910.178(m)(1)-(4)

- Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.
- No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.



# Truck Operations

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1910.178(m)(1)-(4)

- Unauthorized personnel shall not be permitted to ride.
  - A safe place to ride shall be provided where riding of trucks is authorized.
- The employer shall prohibit arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.





# Truck Operations

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1910.178(m)(2)



# Truck Operations

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1910.178(m)(5)(i)

- When a powered industrial truck is left unattended:
  - Load engaging means shall be fully lowered.
  - Controls shall be neutralized.
  - Power shall be shut off and brakes set.
  - Wheels shall be blocked, if the truck is parked on an incline.



# Truck Operations

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1910.178(m)(5)(ii)

- Follow the above requirements if the operator leaves the vehicle:
  - Unattended, *or*
  - Operator is 25 feet or more away from the vehicle, *or*
  - Whenever it's not in his view



# Truck Operations

1910.178(m)(5)(iii)

- When the operator of an industrial truck is dismounted and within 25 feet of the truck **still in his view**, the load engaging means shall be:
  - Fully lowered
  - Controls neutralized
  - Brakes set to prevent movement
  - Wheels blocked if truck parked on incline



# Truck Operations

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1910.178(m)(6)

- A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car.
- Forklifts are not to be used to open or close freight doors.





# Truck Operations

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1910.178(m)(7)

- Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading.
  - Fixed jacks may be necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor.



# Truck Operations

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1910.178(m)(8)

- There shall be sufficient headroom.
  - Lights, pipes, sprinkler system, etc.





# Truck Operations

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1910.178(m)(9)-(10)

- An overhead guard must be used as protection against falling objects.
- Load backrest extension in use.



# Truck Operations

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1910.178(m)(14)

- Fire aisles, access to stairways, and fire equipment shall be kept clear.



# Traveling

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1910.178(n)(1)-(2)

- All traffic regulations shall be observed, including authorized plant speed limits.
- A safe distance shall be maintained.
  - Approximately three truck lengths
- Right of way
  - Ambulances, fire trucks, etc. ...



# Traveling

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1910.178(n)(3)-(4)

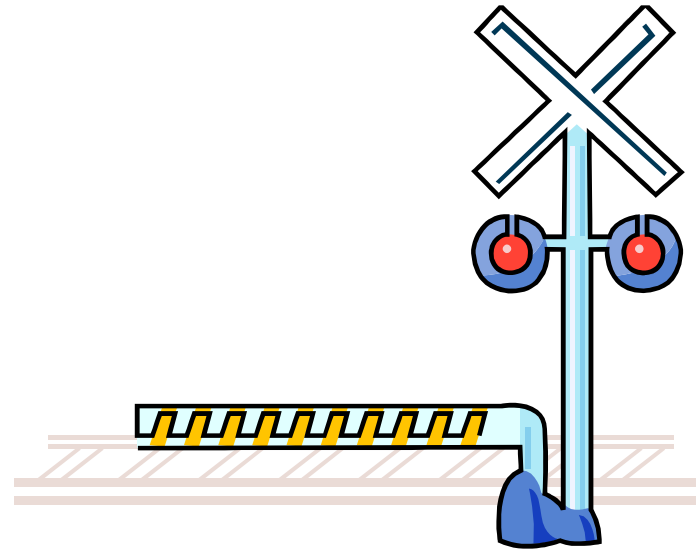
- Watch for intersections, blind spots or other dangerous locations.
- All drivers must slow down, sound horn at cross aisles and other locations where vision is obstructed.
  - If load obstructs forward view, then travel with load trailing.



# Traveling

1910.178(n)(5)-(6)

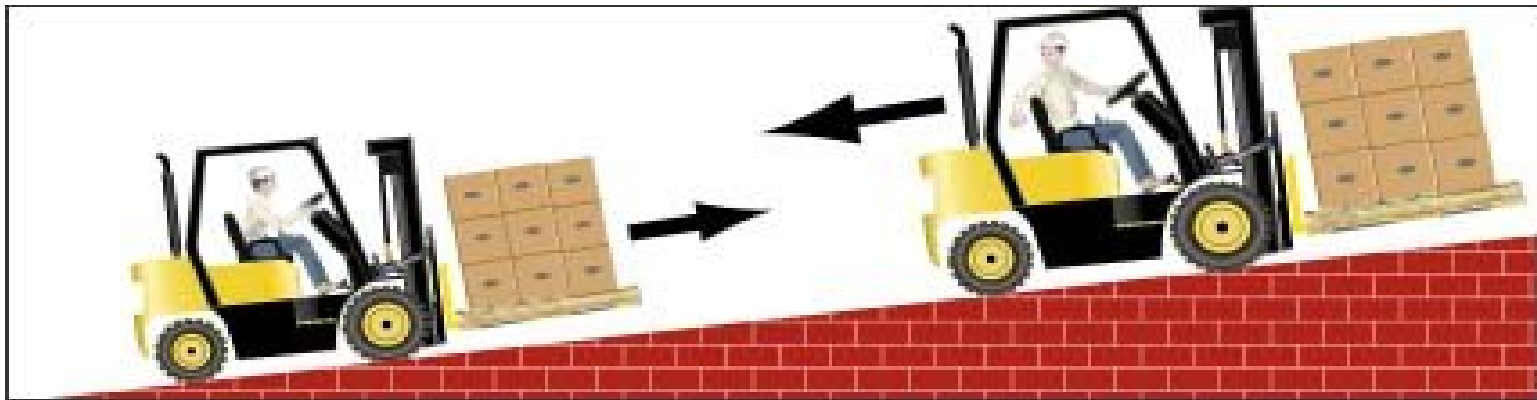
- Railroad tracks shall be crossed diagonally wherever possible.
- Operators shall keep a clear view of the path of travel.



# Traveling

1910.178(n)(7)

- When ascending or descending grades in excess of 10 percent, loaded trucks must be driven with the load upgrade.
- Never turn a forklift on a grade.





# Traveling

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1910.178(n)(11)

- Dockboards or bridgeplates must be properly secured before being driven over.
- Potential hazards
  - While entering and leaving truck trailers or railroad cars:
    - » Falling off loading dock
    - » Moving trucks or railroad cars during loading and unloading
    - » Slipping or inadequate dockboards



# Traveling

1910.178(n)(12)-(13)

- Elevators shall be approached slowly and squarely.
  - Once on the elevator:
    - » Controls shall be neutralized
    - » Power shut off
    - » Brakes set
- Motorized hand trucks must enter elevator or other confined areas with load end forward.



# Traveling

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1910.178(n)(14)-(15)

- Running over loose objects on roadway surfaces must be avoided.
- Watching your speed and how you should negotiate turns.



# Loading

1910.178(o)(1)

- Only stable or safely arranged loads shall be handled.
  - Exercise caution when handling off-center loads.



# Loading

1910.178(o)(2)

- Only loads within the rated capacity of the truck must be handled.



# Loading

1910.178(o)(3) and (5)

- Long or high (including multiple-tiered) loads which may affect capacity must be adjusted.
- On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.



# Loading

1910.178(o)(6)

- Use extreme care when tilting the load forward or backward, particularly when high tiering.
- Tilting forward with load engaging means elevated shall be prohibited except to pick up a load.



# Truck Operation

1910.178(p)(1)-(5)

- Operation of trucks
  - Repairs, defectives or unsafe conditions
  - Fuel tanks must not be filled while the engine is running
  - Clean up any spillage before starting truck
  - Do not operate if fuel is leaking from vehicle
  - No open flames



Fuel cap (note spilled gas on the outside of the truck.)



# Trucks Maintenance

1910.178(q)(1)-(3)

- Trucks not in safe operating condition must be removed from service.
- Repairs must be made by authorized personnel.
- Any repairs to the fuel and ignition systems shall be conducted only in locations designated for such repairs.



# Trucks Maintenance

1910.178(q)(4)-(6)

- Prior to repairs to electrical system, the battery shall be disconnected.
- Parts replaced shall be replaced only by the equivalent type of part from the manufacturer.
- Trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer.



# Trucks Maintenance

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1910.178(q)(7)

- Trucks must be examined before being placed in service.
- Must not be placed in service if any condition adversely affects safety of vehicle.
- Examination made at least daily.



# Trucks Maintenance

1910.178(q)(8)-(10)

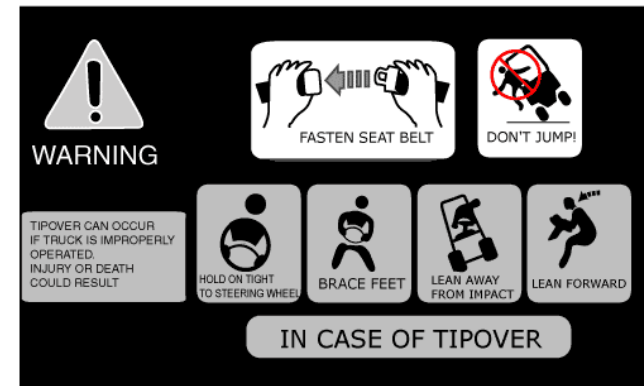
- Mufflers shall be inspected as required.
- Vehicle shall be removed from service when temperature of parts indicates overheating.
- Industrial trucks must be kept in a clean condition.
  - Free of lint, excess oil and grease



# Tipovers or Rollovers

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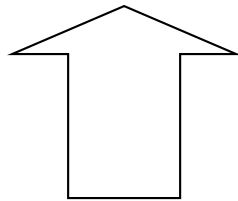
- There are two basic type of tipovers in a forklift:
  - A forward tip or longitudinal tip
  - A lateral or side tip
- The procedure to follow in the event of tipover varies depending on the type of tipover and the class of forklifts that you may use in your facility.



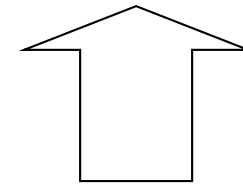
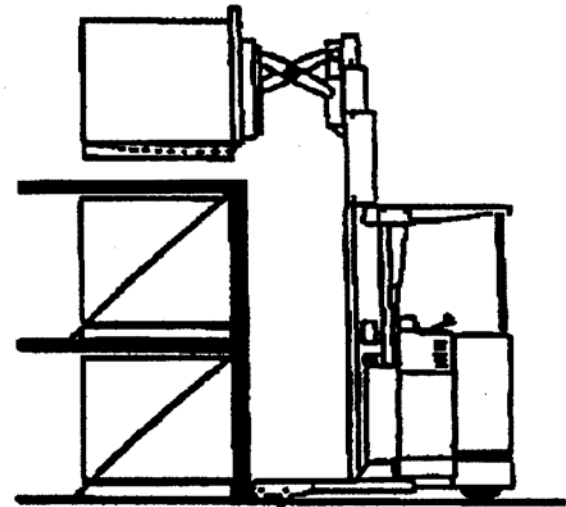
# Stability

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- Forward wheels are the **fulcrum**



**Fulcrum**



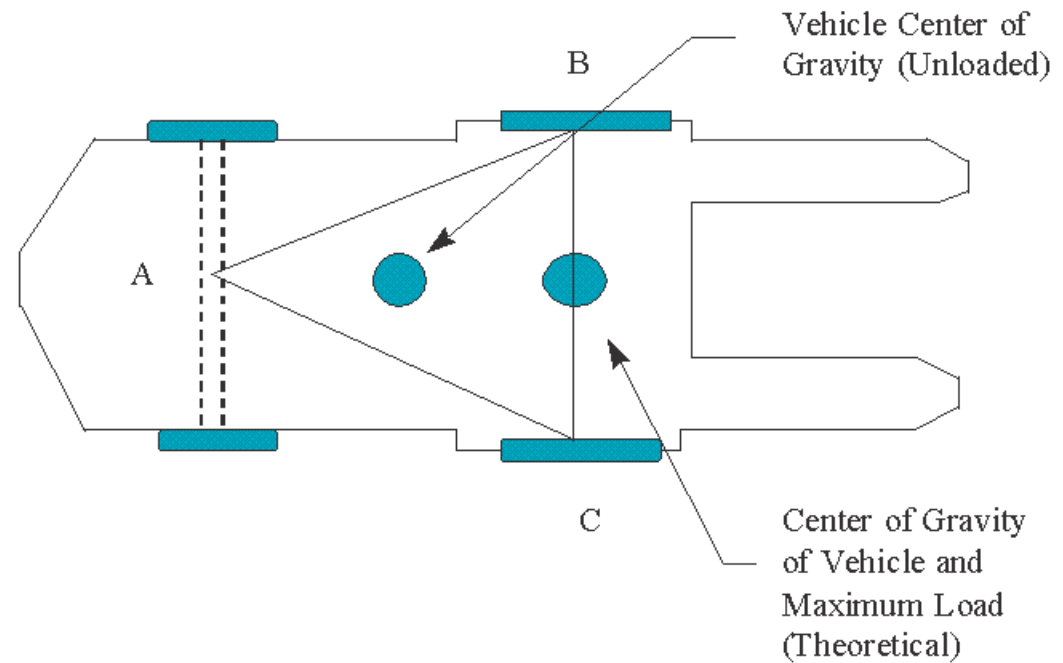
**Fulcrum**

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# Stability Triangle

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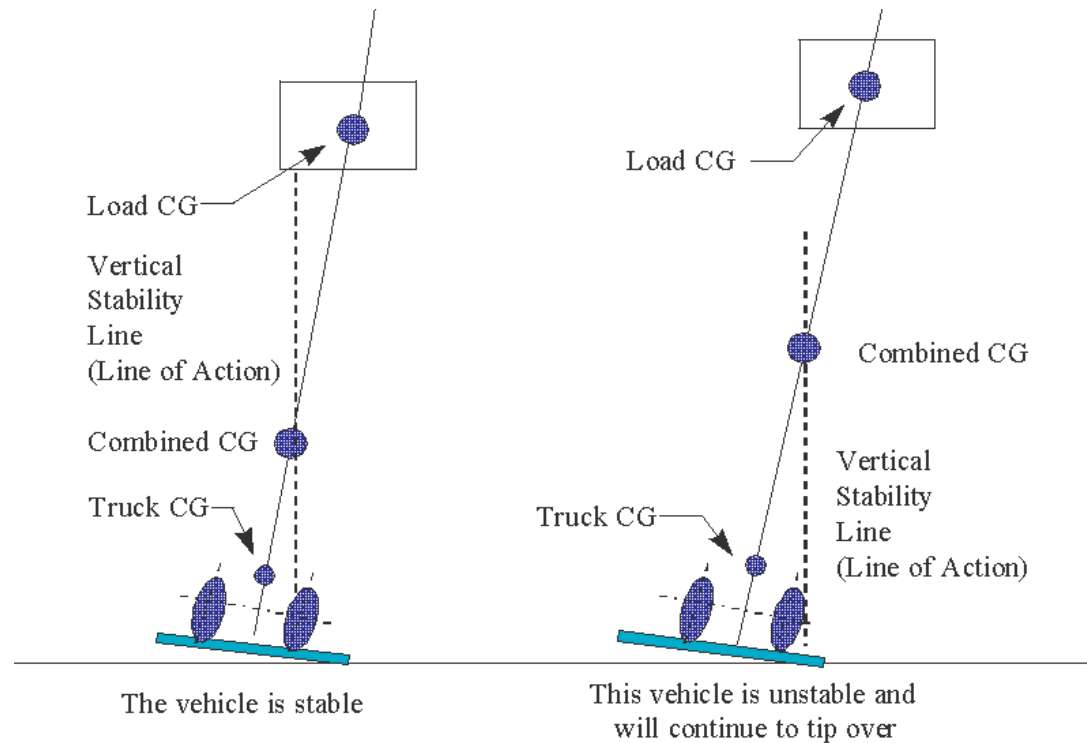
- Counterbalanced powered industrial trucks
  - Vehicle is supported at three points



# Stability Triangle

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- Counterbalanced powered industrial trucks
  - Vehicle is supported at three points







# Accident Investigation

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# Summary

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We covered the following requirements for the operation and maintenance of power industrial equipment:

- Minimum OSHA general requirements for powered industrial trucks
- Safe operation of equipment
- Operator training and evaluation
- Hazard identification
- Abatement methods and procedures



**Thank You For Attending!**

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**Final Questions?**

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