ADVANCED EXCAVATING SPECIALISTS, LLC (AES)
FIVE RIVERS CONSTRUCTION (FRC)

Forklifts and Power Industrial Trucks (PIT)

PURPOSE

The purpose of the Forklift and Powered Industrial Trucks program is to ensure that all authorized personnel are familiarized with the general principles, operation, brands, capacities, and capabilities of Forklifts and or Power Industrial Trucks they are authorized to operate.

PROCEDURE

An effective Forklift and Powered Industrial Trucks (PIT) training will be provided to Supervisory and authorized personnel prior to initial assignment and refresher training as necessary thereafter. Mandatory refresher training may be required due to unsafe operations, accidents, near miss, different vehicle types, and or change in conditions. The training program of authorized and supervisory personnel will address the following:

1. Only certified operators will be allowed to operate machinery.
2. Training Programs include formal instruction include lecture, discussions, and videos.
3. Daily operation inspections of equipment and surroundings to include trailer chocks, supports, and dock plates prior to loading and unloading.

This program will cover at least the 23 minimally required items:

1. Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate.
2. Differences between the truck and the automobile.
3. Truck controls and instrumentation; where they are located, what they do, and how they work.
4. Engine or motor operation.
5. Steering and maneuvering.
6. Visibility (including restrictions due to loading)
7. Fork and attachment adaptation, operation, and use limitations.
8. Vehicle capacity
9. Vehicle stability
10. Any vehicle inspection and maintenance that the operator will be required to perform.
11. Refueling and/or charging and recharging of batteries.
12. Operating limitations.
13. Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of vehicle(s) that the employee is being trained to operate.
14. Workplace-related topics.
15. Surface conditions where the vehicle will be operated.
16. Composition of loads to be carried and load stability.
17. Load manipulation, stacking, and unstacking.

18. Pedestrian traffic in areas where vehicles will be operated.
19. Narrow aisles and other restricted places where vehicles will be operated.
20. Hazardous (classified) locations where the vehicle will be operated.
21. Ramps and other sloped surfaces that could d affect the vehicles stability.
22. Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust.
23. Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation.

For other rules and regulations regarding Power Industrial Trucks and Forklifts, please refer to the Construction Safety Standard, Part W of Chapter 296-307-520 WAC, through Chapter 296-307-52047 WAC.

What is a "Power Industrial Truck"

Powered Industrial Truck means a fork truck, industrial tractor, platform lift truck, motorized hand truck, or other specialized industrial trucks, powered by electric motors or internal combustible engines. The definition does not include compressed gas-operated industrial trucks, tractor-mounted forklifts, or vehicles intended primarily for earth moving or over-the-road hauling.

What manufacture's requirements apply to Power Industrial Trucks?

1. All powered industrial trucks in use by an employer must meet the applicable requirements of design, construction and stability as defined by the American National Standards Institute B56.1-1969, Safety Standards for Powered Industrial Trucks, except for vehicles intended primarily for earth moving or over-the-road hauling. All new powered industrial trucks acquired and used by an employer on or after March 1, 2000, must meet the applicable requirements of design, construction and stability as defined in ASME B56.1-1993. The employer must ensure that all powered industrial trucks are inspected, maintained, and operated in accordance with this section and the manufacturer's recommendations and specifications.
2. Approved trucks must have a label indicating approval by the testing laboratory as meeting the specifications and requirements of ANSI B56.1-1969.
3. Modifications or additions must only be performed with the manufacturer's prior written approval. When modifications or additions are made, capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly.
4. If the truck is equipped with front-end attachments other than factory installed attachments, it must be marked to identify the attachments and show the approximate

weight of the truck and attachment combination at maximum elevation with the load centered from side to side.

5. The user must ensure that all nameplates and markings are in place and legible.

Classifications of Powered Industrial Trucks

1. **D Classification.** Trucks that are diesel engine powered that have minimum safeguards against inherent fire hazards.
2. **DS Classification.** Diesel powered trucks that, in addition to meeting all the requirements for the type D trucks, with additional safeguards to the exhaust, fuel, and electrical systems.
3. **DY Classification.** Diesel powered trucks that have all the safeguards of the DS trucks; in addition, any electrical equipment is completely enclosed. They are equipped with temperature limitation features.
4. **E Classification.** Electrically powered trucks with minimum acceptable safeguards against inherent fire hazards
5. **ES Classification.** Electrically powered trucks that, in addition to all of the requirements for the E trucks, are provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.
6. **EE Classification.** Electrically powered trucks that have, in addition to all of the requirements for the E and ES type trucks, have their electric motors and all other electrical equipment completely enclosed.
7. **EX Classification.** Electrically powered trucks that differ from E, ES, or EE type trucks in that the electrical fittings and equipment are so designed, constructed, and assembled to be used in atmospheres containing flammable vapors or dusts.
8. **G Classification.** Gasoline powered trucks that have minimum acceptable safeguards against inherent fire hazards.
9. **GS Classification.** Gasoline powered trucks with additional safeguards to the exhaust, fuel, and electrical systems.
10. **LP Classification.** Liquified petroleum gas-powered trucks that have minimum acceptable safeguards against inherent fire hazards.
11. **LPS Classification.** LP-gas powered trucks that in addition to meeting the requirements for LP trucks, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

The employer must consider the following before choosing a powered industrial truck.

Before choosing the industrial truck to use, the user must determine whether the atmosphere or location is hazardous or nonhazardous. The type of industrial truck must be chosen according to the requirements of WAC **296-307-52011**.

Forklifts and Power Industrial Trucks (PIT)

Requirements for determining which trucks to use in specific hazardous environments.

The following are the minimum truck types required in specific hazardous environments. The employer may choose to use industrial trucks having greater safeguards. Tables W-1 and W-2 give specific vehicle usage information by group and class.

TABLE W-1: SUMMARY TABLE ON USE OF INDUSTRIAL TRUCKS IN VARIOUS LOCATIONS

CLASSES (Description of classes)	GROUPS (Examples of locations or atmosphere in classes and groups)				DIVISIONS (Nature of hazardous conditions)	
UNCLASSIFIED	No group designations in Unclassified				No divisions in Unclassified	
Locations not possessing atmospheres as described in other columns.	Piers and wharves inside and outside general storage, general industrial or commercial properties					
CLASS I LOCATIONS	A	B	C	D	1	2
Locations in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitible mixtures.	Acetylene	Hydrogen	Ethyl ether	Gasoline Naphtha Alcohols Acetone Lacquer solvent Benzene	Conditions exists continuously, intermittently, or periodically under normal operating conditions.	Condition may occur due to accidentally, for example, due to a puncture of a storage drum.
CLASS II LOCATIONS	E	F	G		1	2
Locations which are hazardous because of the presence of combustible dust.	Metal dust	Carbon black Coal dust Coke dust	Grain dust Flour dust Starch dust Organic dust		Explosive mixture may be present under normal operating conditions, or where failure of equipment may cause the condition to exist simultaneously with arcing or sparking of electrical equipment, or where dusts of an electrically conducting nature may be present.	Explosive mixture not normally present, but where deposits of dust may cause heat rise in electrical equipment, or where such deposits may be ignited by arcs or sparks from electrical equipment.
CLASS III LOCATIONS	Class III has no groups				1	2
Locations where easily ignitible fibers or flyings are present but not likely to be in suspension in quantities sufficient to produce ignitible mixtures.	Baled waste, cocoa fiber, cotton, excelsior, hemp, istle, jute, kapok, oakum, sisal, Spanish moss, synthetic fibers, tow.				Locations in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.	Locations in which easily ignitible fibers are stored or handled (except in the process of manufacture).

TABLE W-2: AUTHORIZED USES OF TRUCKS BY TYPES IN GROUPS OF CLASSES AND DIVISIONS

	UNCLASSIFIED	CLASS I								CLASS II						CLASS III	
		DIV I				DIV II				DIV I			DIV II			DIV I	DIV II
Groups in classes	None	A	B	C	D	A	B	C	D	E	F	G	E	F	G	None	None
Type of truck authorized:																	
Diesel:																	
Type D. . . .	D**. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Type DS. . . .	. . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	DS. . .	. . .	. . .	. . .	. . .	. . .	DS. . .	. . .	DS
Type DY. . . .	. . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	DY. . .	. . .	. . .	. . .	. . .	. . .	DY. . .	DY. . .	DY
Electric:																	
Type E. . . .	E**. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	E
Type ES. . . .	. . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	ES. . .	. . .	. . .	. . .	. . .	. . .	ES. . .	. . .	ES
Type EE. . . .	. . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	EE. . .	. . .	. . .	. . .	. . .	. . .	EE. . .	EE. . .	EE
Type EX. . . .	. . . . .	. . .	. . .	. . .	EX. . .	. . .	. . .	. . .	EX. . .	. . .	EX. . .	EX. . .	. . .	. . .	EX. . .	EX. . .	EX
Gasoline:																	
Type G. . . .	G**. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	
Type GS. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	GS. . .	. . .	. . .	. . .	. . .	. . .	GS . . .	. . .	GS
LP-Gas:																	
Type LP. . . .	LP**. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	
Type LPS. . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	LPS. . .	. . .	. . .	. . .	. . .	. . .	LPS. . .	. . .	LPS

Trucks conforming to these types may also be used.

1. Powered industrial trucks are prohibited in atmospheres with a hazardous concentration of:
    a. Acetaldehyde.
    b. Acetylene.
    c. Butadiene.
    d. Cyclopropane.
    e. Diethyl ether.
    f. Ethylene.
    g. Ethylene oxide.
    h. Hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas).
    i. Isoprene.
    j. Propylene oxide.
    k. Unsymmetrical dimethyl hydrazine (UDMH).
        i. Only approved EX trucks, or other trucks approved by the manufacturer, may be used in atmospheres containing hazardous concentrations of metal dust, including:
            1. Aluminum, magnesium, and their commercial alloys.
            2. Other dusts of similarly hazardous characteristics.
            3. In atmospheres containing:
                a. Carbon black.
                b. Coal.
                c. Coke dust.
            4. In atmospheres where dust of magnesium, aluminum or aluminum bronze may be present, fuses, switches, motor controllers, and circuit breakers of trucks must have enclosures specifically approved for such locations.
2. Only approved EX trucks, or other trucks approved by the manufacturer, may be used in atmospheres containing:
    a. Acetone.
    b. Acrylonitrile.
    c. Alcohol.
    d. Ammonia.
    e. Benzine.
    f. Benzol.
    g. Butane.
    h. Ethylene dichloride.

i. Gasoline.
j. Hexane.
k. Lacquer solvent vapors.
l. Naphtha.
m. Natural gas.
n. Propane.
o. Propylene.
p. Styrene.
q. Vinyl acetate.
r. Vinyl chloride.
s. Xylenes; in quantities sufficient to produce explosive or ignitable mixtures.

3. Only approved DY, EE, or EX trucks, or other trucks approved by the manufacturer, may be used in locations where volatile flammable liquids or flammable gases are handled, processed, or used, if the hazardous liquids, vapors or gases are normally confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown, or in case of abnormal equipment operation.
   Only approved DY, EE, or EX trucks, or other trucks approved by the manufacturer, may also be used in locations in which hazardous concentrations of gases or vapors are normally prevented by mechanical ventilation but that might become hazardous through failure or abnormal operation of the ventilating equipment.
4. Only approved DS, ES, GS, or LPS trucks, or other trucks approved by the manufacturer, may be used in locations used for the storage of hazardous liquids in sealed containers or liquefied or compressed gases in containers. This classification includes locations where volatile flammable liquids or flammable gases or vapors are used but are hazardous only in case of an accident or an unusual operation condition.
   The quantity of hazardous material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the business's history of explosions or fires are all factors that should be considered in determining which truck has sufficient safeguards for the location.
   a. Only approved EX trucks, or other trucks approved by the manufacturer, may be used in atmospheres in which combustible dust is or may be suspended in quantities sufficient to produce explosive or ignitable mixtures, or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced.
   b. The EX classification, or other trucks approved by the manufacturer as having equal or greater safeguards, usually includes the working areas of:
      i. Grain handling and storage plants.
      ii. Rooms containing grinders or pulverizers.

iii. Cleaners.
iv. Graders.
v. Scalpers.
vi. Open conveyors or spouts.
vii. Open bins or hoppers.
viii. Mixers or blenders.
ix. Automatic or hopper scales.
x. Packing machinery.
xi. Elevator heads and boots.
xii. Stock distributors.
xiii. Dust and stock collectors (except all-metal collectors vented to the outside), and all similar dust producing machinery and equipment in:
    1. Grain processing plants.
    2. Starch plants.
    3. Sugar pulverizing plants.
    4. Malting plants.
    5. Hay grinding plants, and other similar locations.
    6. Areas where combustible dust may, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

5. Only approved DY, EE, or EX trucks, or other trucks approved by the manufacturer, may be used in atmospheres in which deposits or accumulations of combustible dust may be ignited by arcs or sparks from the truck, if combustible dust will not normally be suspended or thrown into suspension by the normal operation of equipment or apparatus in quantities sufficient to produce explosive or ignitable mixtures.
6. Only approved DY, EE, or EX trucks, or other trucks approved by the manufacturer, may be used in locations with easily ignitable fibers or flying's if the fibers or flying's are not likely to be suspended in quantities sufficient to produce ignitable mixtures.
7. Only approved DS, DY, ES, EE, EX, GS, or LPS trucks, or other trucks approved by the manufacturer, may be used in locations, including outside storage, where easily ignitable fibers are stored or handled, but are not processed or manufactured. E trucks that have been previously used in these locations may continue to be used.
8. If storage warehouses and outside storage locations are hazardous, the specified approved truck, or other truck approved by the manufacturer, must be used. If not classified as hazardous, any approved D, E, G, or LP truck, or other truck approved by the manufacturer, may be used, or trucks meeting the requirements for these types may be used.

Using Converted Trucks

When powered industrial trucks that were originally approved to use gasoline are converted to use LP-gas according to WAC **296-307-52047**(12), they may be used in locations where G, GS or LP, and LPS trucks are specified.

Overhead Safety Guards

1. High-lift rider trucks must be fitted with an overhead guard manufactured according to WAC **296-307-52005**(1), unless operating conditions do not permit.
2. An overhead guard must be used as protection against falling objects.

Load Backrest

1. A load backrest extension must be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.
2. f the type of load presents a hazard, the user must equip fork trucks with a vertical load backrest extension manufactured according to WAC **296-307-52005**(1).

Requirements that apply to fuel handling and storage

1. The employer must ensure that liquid fuels such as gasoline and diesel fuel are stored and handled according to NFPA Flammable and Combustible Liquids Code (NFPA No. 30-1996).
2. The employer must ensure that LP-gas fuel is stored and handled according to NFPA Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58-1998).

Lighting for operating areas.

1. Adequate lighting should be provided in operating areas. (See ANSI Practice for Industrial Lighting, ANSI/IES RP-7-1990.)
2. Where general lighting is inadequate, directional lighting must be provided on the truck.

Carbon monoxide gas levels.

Concentration levels of carbon monoxide gas created by truck operations must not exceed the levels specified in WAC 296-62-075, Part L (general occupation health standards).

Note: Questions concerning the degree of concentration and methods of sampling should be referred to a qualified industrial hygienist.

Dock boards (bridge plates)

1. Portable and powered dock boards must be strong enough to support the load carried on them.

2. Portable dock boards must be secured in position, either by anchors or anti-slipping devices.
3. Powered dock boards must meet the design and construction requirements of Commercial Standard CS202-56 (1956) "Industrial Lifts and Hinged Loading Ramps" published by the U.S. Department of Commerce.
4. Dock board or bridge plates must be driven over carefully and slowly, and their rated capacity never exceeded.
5. Portable dock boards must have handholds for safe handling.
6. Railroad cars must be kept stationary while dock boards or bridge plates are in position.

Loading trucks, trailers, and railroad cars with powered industrial trucks.

1. Wheel stops or other positive protection must be provided to prevent railroad cars from moving during loading or unloading.
2. Fixed jacks may be necessary to support a semi-trailer and prevent up-ending during loading or unloading if the trailer is not coupled to a tractor.
3. Many truck-trailers are equipped with a rear-end protection device to prevent cars from wedging underneath during a collision. These protection devices must be used with equipment that secures the truck-trailer to the loading dock. Wheel chocks are not required under the following conditions:
    a. Trucks or trailers are secured to the loading dock with a mechanical system that prevents movement away from the dock during loading, unloading, and boarding.
    b. All the mechanical equipment is installed, maintained, and used as recommended by the manufacturer.
    c. Any damaged mechanical equipment is removed from service immediately and is not used to secure trucks and trailers.
4. The flooring of trucks, trailers, and railroad cars must be checked for breaks and weakness before use.

Operator training requirements for powered industrial trucks.

1. **Safe Operation.**
    a. The employer must ensure that each powered industrial truck operator is trained in the safe operation of a powered industrial truck and is competent to operate a powered industrial truck safely.
    b. Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer must ensure that each operator has successfully completed the training required by this section.
2. **Training program implementation.**

a. Trainees may operate a powered industrial truck only under the direct supervision of persons who have the knowledge, training, and experience to train operators and where such operation does not endanger the trainee or other employees.

Note: The employer, or any other qualified person of the employer's choosing, may give required training and evaluation.

b. Training must consist of formal instruction and/or practical training, conveyed in a manner that the trainee understands.

Note: Formal instruction may include lectures, discussion, interactive computer learning, video tape and/or written material. Practical training may include demonstrations performed by the trainer and practical exercises performed by the trainee.

3. **Training program content.** Powered industrial truck operators must receive initial training in the topics that follow, except in topics that the employer can demonstrate are not applicable to safe operation of the truck in the employer's workplace.
    a. Truck-related topics:
        i. Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate.
        ii. Differences between the truck and the automobile.
        iii. Truck controls and instrumentation: Where they are located, what they do, and how they work.
        iv. Engine or motor operation.
        v. Steering and maneuvering.
        vi. Visibility (including restrictions due to loading).
        vii. Fork and attachment adaptation, operation, and use limitations.
        viii. Vehicle capacity.
        ix. Vehicle stability.
        x. Any vehicle inspection and maintenance that the operator will be required to perform.
        xi. Refueling and/or charging and recharging of batteries.
        xii. Operating limitations.
        xiii. Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of vehicles that the employee is being trained to operate.
    b. Workplace-related topics:
        i. Surface conditions where the vehicle will be operated.
        ii. Composition of loads to be carried and load stability.

iii. Load manipulation, stacking, and unstacking.
iv. Pedestrian traffic in areas where the vehicle will be operated.
v. Narrow aisles and other restricted places where the vehicle will be operated.
vi. Hazardous (classified) locations where the vehicle will be operated.
vii. Ramps and other sloped surfaces that could affect the vehicle's stability.
viii. Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust.
ix. Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation.

4. **Retraining.**
    a. Retraining in relevant topics must be provided to the operator when:
        i. The operator has been observed to operate the vehicle in an unsafe manner.
        ii. The operator has been involved in an accident or near-miss incident.
        iii. The operator has received an evaluation that reveals that the operator is not operating the truck safely.
        iv. The operator is assigned to drive a different type of truck.
        v. The condition in the workplace changes in a manner that could affect safe operation of the truck.
        vi. Retraining must be provided to an operator if three years has elapsed since he or she last received training.
5. **Avoidance of duplicative training.** If an operator has previously received training in a topic specified in subsection (3) of this section, and such training is appropriate to the truck and working conditions encountered, additional training in that topic is not required if the operator can provide proof of such training within three years, and the employer can verify operator competency.
6. **Recordkeeping.** Employers must keep records showing that each operator has been trained or received retraining as required by this section. These records must include the name of the operator, the date of the training or retraining, and the name of the person(s) giving the training or retraining.
7. **Implementation dates.** The employer must ensure that operators of powered industrial trucks are trained, as appropriate, by the effective date of this section. Employees hired on or after the effective date of this section must be trained and found competent prior to being assigned to operate a powered industrial truck.

8. **Nonmandatory guidance.** To assist employers in implementing operator training requirements, a nonmandatory appendix has been added as WAC **296-307-52030**. This appendix does not add to, alter, or reduce the requirements of this section.

Additional (nonmandatory) information that may assist with powered industrial truck operator training.

1. **Definitions.** The following definitions may help to explain the principle of stability:

   Center of gravity. The point on an object at which all of the object's weight is concentrated. For symmetrical loads, the center of gravity is at the middle of the load.

   Counterweight. The weight that is built into the truck's basic structure and is used to offset the load's weight and to maximize the vehicle's resistance to tipping over.

   Fulcrum. The truck's axis of rotation when it tips over.

   Grade. The slope of a surface, which is usually measured as the number of feet of rise or fall over a hundred foot horizontal distance (the slope is expressed as a percent).

   Lateral stability. A truck's resistance to overturning sideways.

   Line of action. An imaginary vertical line through an object's center of gravity.

   Load center. The horizontal distance from the load's edge (or the fork's or other attachment's vertical face) to the line of action through the load's center of gravity.

   Longitudinal stability. The truck's resistance to overturning forward or rearward.

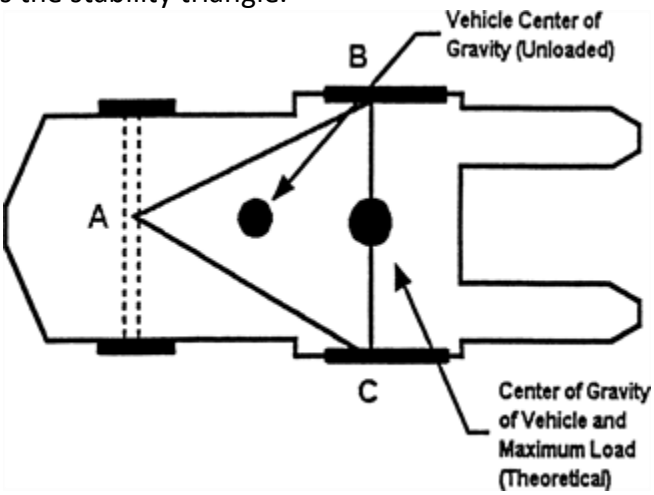
   Moment. The product of the object's weight times the distance from a fixed point (usually the fulcrum). In the case of a powered industrial truck, the distance is measured from the point at which the truck will tip over to the object's line of action. The distance is always measured perpendicular to the line of action.

   Track. The distance between the wheels on the same axle of the truck.

   Wheelbase. The distance between the centerline of the vehicle's front and rear wheels.
2. **General.**
   a. Determining the stability of a powered industrial truck is simple once a few basic principles are understood. There are many factors that contribute to a vehicle's stability: The vehicle's wheelbase, track, and height; the load's weight distribution; and the vehicle's counterweight location (if the vehicle is so equipped).

b. The "stability triangle," used in most stability discussions, demonstrates stability simply (see Figures 1 and 2).

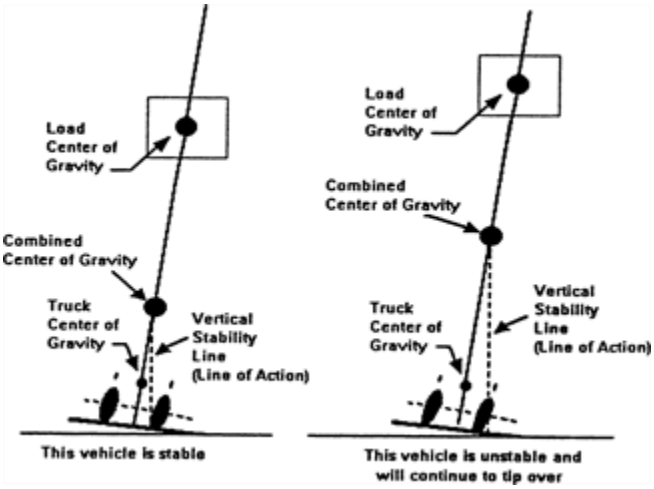
3. **Basic principles.**
   a. Whether an object is stable depends on the object's "moment" (see definitions, this section) at one end of a system being greater than, equal to, or smaller than the object's moment at the system's other end. This principle can be seen in the way a seesaw or teeter-totter works: That is, if the product of the load and distance from the fulcrum (moment) is equal to the moment at the device's other end, the device is balanced and it will not move. However, if there is a greater moment at one end of the device, the device will try to move downward at the end with the greater moment.
   b. The longitudinal stability of a counterbalanced powered industrial truck depends on the vehicle's moment and the load's moment. In other words, if the mathematic product of the load-moment (the distance from the front wheels, the approximate point at which the vehicle would tip forward) to the load's center of gravity times the load's weight is less than the vehicle's moment, the system is balanced and will not tip forward. However, if the load's moment is greater than the vehicle's moment, the greater load-moment will force the truck to tip forward.
4. **The stability triangle.**
   a. Almost all counterbalanced powered industrial trucks have a three-point suspension system, that is, the vehicle is supported at three points. This is true even if the vehicle has four wheels. The truck's steer axle is attached to the truck by a pivot pin in the axle's center. When the points are connected with imaginary lines, this three-point support forms a triangle called the stability triangle. Figure 1 depicts the stability triangle.



Notes: 1. When the vehicle is loaded, the combined center of gravity shifts toward line B-C. Theoretically, the maximum load will result in the center of gravity at line B-C. In actual practice, the combined center of gravity should never be at line B-C.

2. The addition of additional counterweight will cause the truck center of gravity to shift toward point A and result in a truck that is less stable laterally.

b. When the vehicle's line of action, or load center, falls within the stability triangle, the vehicle is stable and will not tip over. However, when the vehicle's line of action or the vehicle/load combination falls outside the stability triangle, the vehicle is unstable and may tip over.



5. **Longitudinal stability.**
   a. The axis of rotation when a truck tips forward is the front wheels' points of contact with the pavement. When a powered industrial truck tips forward, the truck will rotate about this line. When a truck is stable, the vehicle-moment must exceed the load-moment. As long as the vehicle-moment is equal to or exceeds the load-moment, the vehicle will not tip over. On the other hand, if the load-moment slightly exceeds the vehicle-moment, the truck will begin to tip forward, thereby causing the rear to lose contact with the floor or ground and resulting in loss of steering control. If the load-moment greatly exceeds the vehicle-moment, the truck will tip forward.
   b. To determine the maximum safe load-moment, the truck manufacturer normally rates the truck at a maximum load at a given distance from the front face of the forks. The specified distance from the front face of the forks to the line of action of the load is commonly called the load center. Because larger trucks normally handle loads that are physically larger, these vehicles have greater load centers. Trucks with a capacity of 30,000 pounds or less are normally rated at a given load weight at a 24-inch load center. Trucks with a capacity greater than 30,000 pounds are normally rated at a given load weight at a 36- or 48-inch load center. To safely operate the vehicle, the operator should always check the data plate to determine the maximum allowable weight at the rated load center.
   c. Although the true load-moment distance is measured from the front wheels, this distance is greater than the distance from the front face of the forks. Calculating

the maximum allowable load-moment using the load-center distance always provides a lower load-moment than the truck was designed to handle. When handling unusual loads, such as those that are larger than 48 inches long (the center of gravity is greater than 24 inches) or that have an offset center of gravity, etc., a maximum allowable load-moment should be calculated and used to determine whether a load can be safely handled. For example, if an operator is operating a 3,000-pound capacity truck (with a 24-inch load center), the maximum allowable load-moment is 72,000 inch-pounds (3,000 times 24). If a load is 60 inches long (30-inch load center), then the maximum that this load can weigh is 2,400 pounds (72,000 divided by 30).

6. **Lateral stability.**
    a. The vehicle's lateral stability is determined by the line of action's position (a vertical line that passes through the combined vehicle's and load's center of gravity) relative to the stability triangle. When the vehicle is not loaded, the truck's center of gravity location is the only factor to be considered in determining the truck's stability. If the line of action of the combined vehicle's and load's center of gravity falls within the stability triangle, the truck is stable and will not tip over. However, if the line of action falls outside the stability triangle, the truck is not stable and may tip over. Refer to Figure 3.
    b. Factors that affect the vehicle's lateral stability include the load's placement on the truck, the height of the load above the surface on which the vehicle is operating, and the vehicle's degree of lean.
7. **Dynamic stability.**
    a. Up to this point, the stability of a powered industrial truck has been discussed without considering the dynamic forces that result when the vehicle and load are put into motion. The weight's transfer and the resultant shift in the center of gravity due to the dynamic forces created when the machine is moving, braking, cornering, lifting, tilting, and lowering loads, etc., are important stability considerations.
    b. When determining whether a load can be safely handled, the operator should exercise extra caution when handling loads that cause the vehicle to approach its maximum design characteristics. For example, if an operator must handle a maximum load, the load should be carried at the lowest position possible, the truck should be accelerated slowly and evenly, and the forks should be tilted forward cautiously. However, no precise rules can be formulated to cover all of these eventualities.

Operating Power Industrial Trucks

1. No operator may drive a truck up to anyone standing in front of a fixed object.
2. No one may stand or pass under the elevated portion of any truck, whether loaded or empty.

3. Employers must not allow people to ride on powered industrial trucks unless a safe place to ride is provided.
4. Employers must prohibit employees from placing any body parts between the uprights of the mast or outside the running lines of the truck.
5. When an operator leaves a powered industrial truck unattended:
    a. The load must be fully lowered.
    b. The controls must be neutralized.
    c. The power must be shut off; and
    d. The brakes must be set.
    e. If the truck is parked on an incline, the wheels must be blocked.

A powered industrial truck is "unattended" when the operator is 25 feet or more away from the vehicle, which remains in view, or whenever the operator leaves the vehicle and it's not in view.

6. When a truck operator is dismounted, within 25 feet of the truck, and still in view, the load must be fully lowered, the controls must be neutralized, and the brakes must be set to prevent movement.
7. The operator must maintain a safe distance from the edge of ramps or platforms while operating on any elevated dock, or platform or freight car.
8. There must be enough headroom for trucks to operate under overhead installations, lights, pipes, sprinkler systems, or other overhead projections.
9. An active operator protection restraint device (such as a seatbelt or lap-bar) or system must be used, when provided.

Use of trucks to open or close freight car doors.

Trucks may only be used for opening or closing freight car doors with an approved device that meets the following requirements:

1. The door opening or closing device requires that the force applied by the device to the door is parallel to the door travel.
2. The truck operator is trained in the use of the door opening or closing device and keeps the operation in full view while opening and closing.
3. The area is clear of people while the door is moved with a device.

Lifting employees on the fork of trucks

Employees may be lifted on the lifting carriage or forks of a powered industrial truck under the following conditions:

1. The truck is equipped with vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks.
2. A safety platform is firmly secured to the lifting carriage and/or forks.
3. Employees on the platform have a mechanism to shut off power to the truck.

4. Employees on the platform are protected from falling objects according to the operating conditions.

Using platforms for hoisting

A platform built specifically for hoisting people may be used to lift employees when:

1. The platform is securely attached to the forks and has standard guardrails and toe boards installed on all sides.
2. The hydraulic system is designed so that the lift mechanism will not drop faster than 135 feet per minute in the event of a failure in any part of the system. Forklifts used for elevating work platforms are identified as meeting this requirement.
3. A safety strap is installed, or the control lever is locked to prevent the boom from tilting.
4. An operator attends to the lift equipment while employees are on the platform.
5. The operator is in the normal operating position while raising or lowering the platform.
6. The vehicle remains stationary while employees are on the platform.

Exception: Inching or maneuvering at very slow speed is permissible.

7. The area between employees on the platform and the mast is adequately guarded to prevent contact with chains or other shear points.

Traveling in a power industrial truck

1. The operator must maintain a safe distance of approximately three truck lengths from the truck ahead. The truck must be always kept under control.
2. The operator must yield the right of way to ambulances, fire trucks, or other vehicles in emergency situations.
3. Passing other trucks traveling in the same direction at intersections, blind spots, or other dangerous locations is prohibited.
4. Railroad tracks must be crossed diagonally wherever possible. The operator must not park closer than 8 feet from the center of railroad tracks.
5. The operator must look in the direction of, and keep a clear view of, the path of travel.
6. Stunt driving and horseplay are prohibited.
7. The operator must approach elevators slowly, and then enter squarely after the elevator car is properly leveled. Once on the elevator, the operator must neutralize controls, shut off power, and set the brakes.
8. Motorized hand trucks must enter elevator or other confined areas with load end forward.
9. The operator must avoid running over loose objects on the roadway surface.
10. Access to fire aisles, stairways, and fire equipment must be kept clear.

Traveling speeds of Powered Industrial Trucks

1. The operator must observe all traffic regulations, including authorized plant speed limits.
2. The operator must slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load obstructs a forward view, the driver must travel with the load trailing.

Exception: If traveling with the load trailing creates new hazards, it is not required.

3. The operator must ascend and descend grades slowly.
    a. At grades over 10 percent, loaded trucks must be driven with the load upgrade.
    b. Unloaded trucks should be operated on all grades with the load carrier downgrade.
    c. On all grades the load and load carrier must be tilted back if applicable and raised only as far as necessary to clear the road surface.
4. Under all travel conditions, the truck must be operated at a speed that will permit it to be stopped safely.
5. The driver must slow down for wet and slippery floors.
6. While negotiating turns, the operator must slow to a safe speed and turn the wheel in a smooth, sweeping motion.

Loading Powered Industrial Trucks

1. All loads must be stable or safely arranged. Exercise caution when handling off-center loads that cannot be centered.
2. All loads must be within the rated capacity of the truck.
3. Take care securing, manipulating, positioning, and transporting loads when attachments are used. Trucks with attachments must be operated as partially loaded trucks when not handling a load.
4. Place the load carrier under the load as far as possible. Tilt the mast backward to stabilize the load.
5. Use extreme care when tilting the load forward or backward, particularly when high tiering. Avoid tilting the load forward with the load carrier elevated except to pick up a load, or when the load is in a deposit position over a rack or stack. When stacking or tiering, use only enough backward tilt to stabilize the load.

Servicing Powered Industrial Trucks

1. Powered industrial trucks that need repairs, are defective, or in any way unsafe must be taken out of service until restored to safe operating condition.
2. Stop the engine before filling fuel tanks. Avoid spilling fuel.
3. When oil or fuel spills, wash the spill away carefully or evaporate the spill completely and replace the fuel tank cap before restarting engine.
4. No truck may be operated with a leak in the fuel system.
5. Open flames are prohibited for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

Maintaining Powered Industrial Trucks

1. Powered industrial trucks must be removed from service when not in safe operating condition. All repairs must be made by an authorized employee.
2. No repairs may be made in Class I, II, and III locations.
3. When repairs to fuel and ignition systems of industrial trucks involve fire hazards, the repairs must be conducted only in designated locations.
4. Trucks in need of repairs to the electrical system must have the battery disconnected prior to repair.
5. Industrial truck parts must be replaced only by parts of equivalent safety.
6. Industrial trucks must not be altered so that the relative positions of parts are different from when they were manufactured. Industrial trucks must not have parts added or eliminated, except as provided in WAC **296-307-52005**. Fork trucks must not have additional counterweighting added unless approved by the truck manufacturer.

7. Industrial trucks must be examined at least daily before being placed in service. Industrial trucks must not be placed in service if the examination shows any unsafe condition.
   Where industrial trucks are used on a round-the-clock basis, they must be examined after each shift. Defects must be immediately reported and corrected.
8. Water mufflers must be filled daily or as frequently as necessary to prevent the water supply from dropping below 75 percent. Vehicles must not be operated if muffler screens or other parts are clogged. Any vehicle that emits hazardous sparks or flames from the exhaust system must immediately be removed from service until the emission of such sparks and flames has been eliminated.
9. When the temperature of any part of any truck exceeds its normal operating temperature, the vehicle must be removed from service until the cause for overheating has been eliminated.
10. Industrial trucks must be kept clean and free of excess accumulations of combustible materials, oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100°F) solvents must not be used. High flash point (at or above 100°F) solvents may be used. Take precautions regarding toxicity, ventilation, and fire hazard according to the agent or solvent used.
11. Industrial trucks originally approved to use gasoline fuel may be converted to use LP-gas fuel if the converted truck has the features specified for LP or LPS designated trucks. The converted equipment must be approved. The employer may find a description of the conversion system and the recommended method of installation in the "listed by report" of a nationally recognized testing laboratory.