DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Parts 1910, 1915, 1917, and 1918

[Docket No. S–008]

Powered Industrial Truck Operator Training

AGENCY: Occupational Safety and Health Administration, Labor.

ACTION: Proposed rule.

SUMMARY: The Occupational Safety and Health Administration (OSHA) is proposing to revise the general industry safety standard for training powered industrial truck operators and to add equivalent training requirements for the maritime industries. The existing standard in part 1910 requires that only trained operators who are authorized to do so can operate powered industrial trucks and that methods of training be devised. The proposed training requirements would mandate the development of a training program that would base the amount, type, degree, and sufficiency of training on the knowledge of the trainee and the ability of the vehicle operator to acquire, retain, and use the knowledge and the skills and abilities that are necessary to safely operate the truck. A periodic evaluation of each operator's performance would be required. Refresher or remedial training also would be required, based primarily on unsafe operation, an accident or near miss, or deficiencies found in a periodic evaluation of the operator.

DATES: Written comments and requests for a hearing on this proposed rule must be postmarked by July 12, 1995.

ADDRESSES: Comments, information, and hearing requests should be sent in quadruplicate to: Docket Office, Docket No. S–008; Room N2624; U.S. Department of Labor, Occupational Safety and Health Administration; 200 Constitution Avenue NW; Washington, DC 20210 (202–219–7894).

FOR FURTHER INFORMATION CONTACT: Mr. Richard P. Liblong, Office of Information and Consumer Affairs, U.S. Department of Labor, Occupational Safety and Health Administration, Room N3641; 200 Constitution Avenue NW; Washington, DC 20210 (202–219–8148).

SUPPLEMENTARY INFORMATION:

I. Background

a. The General Industry Standard

On May 29, 1971 (36 FR 10466), OSHA adopted some of the existing Federal standards and national consensus standards as OSHA standards under the procedures described in section 6(a) of the Occupational Safety and Health Act (OSH Act) (29 U.S.C. 655, et.al.). Section 6(a) permitted OSHA to adopt, without rulemaking, within 2 years of the effective date of the Act, any established Federal standard or national consensus standard.

One of the consensus standards that was adopted under the 6(a) procedure was the American National Standards Institute (ANSI) B56.1–1969 Safety Standard for Powered Industrial Trucks. Among the provisions adopted from that standard was the operator training requirement codified at 29 CFR 1910.178(l), which states:

> Only trained and authorized operators shall be permitted to operate a powered industrial truck. Methods of training shall be devised to train operators in the safe operation of powered industrial trucks.

In that consensus standard, a powered industrial truck is defined as a mobile, power-driven vehicle used to carry, push, pull, lift, stack, or tier material. One truck may be known by several different names. Included are vehicles that are commonly referred to as high lift trucks, counterbalanced trucks, cantilever trucks, rider trucks, forklift trucks; high lift trucks, high lift platform trucks; low lift trucks, low lift platform trucks; motorized hand trucks, pallet trucks; narrow aisle rider trucks, straddle trucks; reach rider trucks; single side loader rider trucks; high lift order picker rider trucks; motorized hand/rider trucks; or counterbalanced front/side loader lift trucks. Excluded from the scope of the OSHA standard are vehicles used for earth moving or over-the-road haulage.

b. The Maritime Safety Standards

In 1958, Congress amended the Longshoremen's and Harbor Workers' Compensation Act (LHWCA) (44 Stat. 1424; 33 U.S.C. 901 et seq.) to provide maritime employees with a safe work environment. The amendments (Pub. L. 85–742, 72 Stat. 835) required employers covered by the LHWCA to ''furnish, maintain and use'' equipment and to establish safe working conditions in accordance with regulations promulgated by the Secretary of Labor. Two years later, the Labor Standards Bureau (LSB) issued the first set of safety and health regulations for longshoring activities as 29 CFR part 9 (25 FR 1565, February 20, 1960). These regulations only covered longshoring activities taking place aboard vessels.

Passage of the OSH Act (84 Stat. 1590; 29 U.S.C. 650 et seq.) authorized the Secretary of Labor to adopt established Federal standards issued under other statutes, including the LHWCA, as occupational safety and health standards under the OSH Act. Accordingly, the Secretary adopted the existing shipyard employment and longshoring regulations and recodified these rules as 29 CFR parts 1915 and 1918 (39 FR 22074, June 19, 1974). Since the OSH Act comprehensively covered all private employment, the longshoring standards also applied to shoreside cargo-handling operations. (See 29 CFR 1910.16.) The requirements for the use of mechanically powered vehicles used aboard vessels were codified at § 1918.73. These provisions did not include a requirement for the training of vehicle operators.

In addition, in accordance with established policy codified at 29 CFR 1910.5(c)(2), OSHA has applied its general industry regulations to shoreside activities not covered by its older longshoring rules. Citations also have been issued under section 5(a)(1) (the General Duty Clause) of the OSH Act (84 Stat. 1593; 29 U.S.C. 654), since some serious hazards are not addressed by the requirements of part 1910, 1915, or 1918.

On July 5, 1983 (48 FR 30886), OSHA published its final standard for Marine Terminals. These rules were intended to address the shoreside segment of marine cargo handling. Section 1917.27 Personnel required that:

> (a) *Qualifications of machinery operators.*
>
> (1) Only those employees determined by the employer to be competent by reason of training or experience, and who understand the signs, notices and operating instructions and are familiar with the signal code in use shall be permitted to operate a crane, winch or other power operated cargo handling apparatus, or any power operated vehicle, or give signals to the operator of any hoisting apparatus.
>
> Exception: Employees being trained and supervised by a designated person may operate such machinery and give signals to operators during training.
>
> (2) No employee known to have defective uncorrected eyesight or hearing, or to be suffering from heart disease, epilepsy, or other ailments which may suddenly incapacitate him shall be permitted to operate a crane, winch or other power-operated cargo handling apparatus or a power-operated vehicle.

The Marine Terminal Standards also had requirements for powered industrial

trucks at § 1917.43 Powered industrial trucks. However, these requirements were for the operation, maintenance and outfitting of those vehicles and did not expand upon the training requirements found at § 1917.27.

On June 2, 1994, OSHA published in the **Federal Register** (59 FR 28594) a Notice of Proposed Rulemaking (NPRM) for the revision of the longshoring and marine terminals standards.

That NPRM did not propose to amend significantly the aforementioned training requirements of § 1917.27 or to incorporate a training requirement for longshoring (on-board vessel) operations.

c. Updated Consensus Standard

Since promulgation of the OSHA standards, the consensus standard (ANSI B56.1) has undergone four complete revisions (dated 1975, 1983, 1988 and 1993). The current consensus standard (Ex. 3–1) states:

4.18 Operator qualifications.

Only trained and authorized persons shall be permitted to operate a powered industrial truck. Operators of powered industrial trucks shall be qualified as to visual, auditory, physical, and mental ability to operate the equipment safely according to 4.19 and all other applicable parts of Section 4.

4.19 Operator training.

4.19.1 Personnel who have not been trained to operate powered industrial trucks may operate a truck for the purposes of training only, and only under the direct supervision of the trainer. This training should be conducted in an area away from other trucks, obstacles, and pedestrians.

4.19.2 The operator training program should include the user's policies for the site where the trainee will operate the truck, the operating conditions for that location, and the specific truck the trainee will operate. The training program shall be presented to all new operators regardless of previous experience.

4.19.3 The training program shall inform the trainee that:

(a) The primary responsibility of the operator is to use the powered industrial truck safely following the instructions given in the training program.

(b) Unsafe or improper operation of a powered industrial truck can result in: death or serious injury to the operator or others; damage to the powered industrial truck or other property.

4.19.4 The training program shall emphasize safe and proper operation to avoid injury to the operator and others and prevent property damage, and shall cover the following areas:

(a) Fundamentals of the powered industrial truck(s) the trainee will operate, including:

(1) characteristics of the powered industrial truck(s), including variations between trucks in the workplace;

(2) similarities to and differences from automobiles:

(3) significance of nameplate data, including rated capacity, warnings, and instructions affixed to the truck;

(4) operating instructions and warnings in the operating manual for the truck, and instructions for inspection and maintenance to be performed by the operator;

(5) type of motive power and its characteristics;

(6) method of steering;

(7) braking method and characteristics, with and without load;

(8) visibility, with and without load, forward and reverse;

(9) load handling capacity, weight and load center.

(10) stability characteristics with and without load, with and without attachments;

(11) controls-location, function, method of operation, identification of symbols;

(12) load handling capabilities; forks, attachments;

(13) fueling and battery charging;

(14) guards and protective devices for the specific type of truck;

(15) other characteristics of the specific industrial truck.

(b) Operating environment and its effect on truck operation, including:

(1) floor or ground conditions including temporary conditions;

(2) ramps and inclines, with and without load;

(3) trailers, railcars, and dockboards (including the use of wheel chocks, jacks, and other securing devices;

(4) fueling and battery charging facilities;

(5) the use of ''classified'' trucks in areas classified as hazardous due to risk of fire or explosion, as defined in ANSI/NFPA 505;

(6) narrow aisles, doorways, overhead wires and piping, and other areas of limited clearance;

(7) areas where the truck may be operated near other powered industrial trucks, other vehicles, or pedestrians;

(8) use and capacity of elevators;

(9) operation near edge of dock or edge of improved surface;

(10) other special operating conditions and hazards which may be encountered.

(c) Operation of the powered industrial truck, including:

(1) proper preshift inspection and approved method for removing from service a truck which is in need of repair;

(2) load handling techniques, lifting, lowering, picking up, placing, tilting;

(3) traveling, with and without loads; turning corners;

(4) parking and shutdown procedures;

(5) other special operating conditions for the specific application.

(d) Operating safety rules and practices, including:

(1) provisions of this Standard in Sections 5.1 to 5.4 address operating safety rules and practices;

(2) provisions of this Standard in Section 5.5 address care of the truck;

(3) other rules, regulations, or practices specified by the employer at the location where the powered industrial truck will be used.

(e) Operational training practice, including;

(1) if feasible, practice in the operation of powered industrial trucks shall be conducted in an area separate from other workplace activities and personnel;

(2) training practice shall be conducted under the supervision of the trainer;

(3) training practice shall include the actual operation or simulated performance of all operating tasks such as load handling, maneuvering, traveling, stopping, starting, and other activities under the conditions which will be encountered in the use of the truck.

4.19.5 Testing, Retraining, and Enforcement.

(a) During training, performance and oral and/or written tests shall be given by the employer to measure the skill and knowledge of the operator in meeting the requirements of the Standard. Employers shall establish a pass/fail requirement for such tests. Employers may delegate such testing to others but shall remain responsible for the testing. Appropriate records shall be kept.

(b) Operators shall be retrained when new equipment is introduced, existing equipment is modified, operating conditions change, or an operator's performance is unsatisfactory.

(c) The user shall be responsible for enforcing the safe use of the powered industrial truck according to the provisions of this Standard.

Note: Information on operator training is available from such sources as powered industrial truck manufacturers, government agencies dealing with employee safety, trade organizations of users of powered industrial trucks, public and private organizations, and safety consultants.

(For an explanation of why OSHA decided to propose a somewhat different standard, see section entitled Summary and Explanation of the Proposed Standard, below.)

Since 1971, the consensus committee has adopted other volumes for additional types of vehicles that fall within the broad definition of a powered industrial truck. Specifically, requirements have been adopted for guided industrial vehicles, rough terrain forklift trucks, industrial crane trucks, personnel and burden carriers, operator controlled industrial tow tractors, and manually propelled high lift industrial trucks. This rulemaking would adopt training requirements for all types of powered industrial trucks regardless of their usage and the industry in which they are operating.

d. Petitions and Requests

On March 15, 1988, the Industrial Truck Association (ITA) petitioned OSHA to revise its standard requiring the training of powered industrial truck operators (Ex. 3–2). The petition contained suggested language for a proposed requirement along with a model operator training program by which compliance with the recommended requirement could be met. OSHA responded to the petition on April 8, 1988, stating that work on the

revision of the OSHA powered industrial truck operator training requirement would begin as soon as other priority projects were completed.

In addition to the petition, other interested persons have frequently asked questions about training operators of powered industrial trucks, such as:

- What constitutes the necessary and sufficient training of forklift operators?
- How can one ensure that all forklift operators have been trained?
- What testing, if any, should be conducted as part of the training?
- Should the prior experience of a newly hired employee be considered as fulfilling part or all of the training requirement or totally fulfilling the employer's obligation to train that employee?

Some interested persons have suggested that OSHA develop a standardized training course or at least review and comment on or endorse various training courses, programs, agenda, or outlines. Others have suggested that OSHA license or certify all powered industrial truck operators to attest to their ability to properly operate powered industrial trucks. These concerns also were considered in the development of the proposed rulemaking. OSHA is proposing to amend the current powered industrial truck operator training requirements for general industry and to adopt the same requirement for the maritime industries.

e. Reasons for the Proposal

As discussed in the benefits discussed below and in the Regulatory Impact Analysis, powered industrial truck accidents cause approximately 85 fatalities and 34,900 serious injuries each year. It is estimated that approximately 20 to 25 percent are at least in part caused by inadequate training.

As just discussed, the ITA and others have requested that OSHA improve its training requirement for powered industrial truck operators. ANSI has substantially upgraded its recommended training requirements. OSHA preliminarily concludes that upgrading the training requirements for powered industrial truck operators will substantially reduce a significant risk of death and injury from untrained operators driving powered industrial trucks.

II. The Powered Industrial Truck

The term powered industrial truck is defined in the American Society of Mechanical Engineers, ASME B56.1 (formerly the ANSI B56.1 standard) as a ''mobile, power propelled truck used to carry, push, pull, lift, stack, or tier material.''

There are presently approximately 822,830 powered industrial trucks in use in American industry. This number was generated using the available information on truck shipments of powered industrial trucks and the percentage of market that ITA members control. This information was provided OSHA by the Industrial Truck Association.

The Industrial Truck Association stated in conversations with OSHA representatives that it considers the average useful life of a powered industrial truck to be 8 years. The 8-year life cycle has been used throughout the preparation of this proposed rule and in the formulation of the Preliminary Regulatory Impact Analysis. The vehicle manufacturers also estimate that there are, on average, 1.5 operators for each industrial truck. A search of the available literature indicates that this number has not been disputed. OSHA believes that this number is a fair assessment of the number of powered industrial operators since many employers (particularly small employers) have one operator per truck and the vehicle is used only during one shift per day whereas other vehicles are used by multiple operators during multiple shifts.

Powered industrial trucks are classified by the manufacturers according to their individual characters.

There are seven classes of powered industrial trucks:

Class 1—Electric Motor, Sit-down Rider, Counter-Balanced Trucks (Solid and Pneumatic Tires).

Class 2—Electric Motor Narrow Aisle Trucks (Solid Tire).

Class 3—Electric Motor Hand Trucks or Hand/Rider Trucks (Solid Tires).

Class 4—Internal Combustion Engine Trucks (Solid Tires).

Class 5—Internal Combustion Engine Trucks (Pneumatic Tires).

Class 6—Electric and Internal Combustion Engine Tractors (Solid and Pneumatic Tires).

Class 7—Rough Terrain Fork Lift Trucks (Pneumatic Tires).

Each of these different types of powered industrial trucks has its own unique characteristics, and inherent hazards. To maximize the effectiveness of the training, it must be somewhat unique for each type vehicle. For example, an operator of a high lift rider truck must have an understanding of the basics of the vehicle's stability (including those factors which affect that stability), the need to not overload the vehicle, and the need to operate the vehicle according to established rules (such as not using the vehicle to elevate employees who are standing on its forks). On the other hand, order picker trucks elevate the operator along with a platform that is used to hold material destined for storage or retrieval from storage in high stacking racks or bins. The platforms on these trucks are not completely enclosed by railings, toe boards, or other similar fall protection devices to prevent an operator from falling off an elevated platform. To be protected, the operator must wear a body harness or belt with a lanyard affixed to the mast of the vehicle or the overhead guard. Therefore, training for employees who use order picker trucks must emphasize that the use of the body belt or harness and lanyard is essential whenever the operator is aloft.

Powered industrial trucks may be powered by gasoline, propane, diesel or liquified petroleum gas engines or by electric motors. Each of the basic powerplants (except propane) and their associated components (such as mufflers on internal combustion engines and switches and wiring on electric trucks) may be upgraded and the entire truck may be approved by a nationally recognized testing laboratory for operation in certain classified hazardous areas. These classified hazardous areas are those parts of a plant, factory or other workplace where there exists or may exist concentrations of flammable gases or vapors, combustible dust, or easily ignitible flyings or fibers so that the risk of fire or explosion is increased. The current OSHA general industry standard for powered industrial trucks contains basic descriptions of the types of approved powered industrial trucks and the various classes, divisions, and groups of classified hazardous areas and some of the materials whose presence would cause classification of those areas. However, the number of substances whose presence causes the hazards of fire and/or explosion have increased greatly since promulgation of the OSHA standards. (For additional information on the properties and classifications of materials, see the National Fire Protection Association (NFPA) 505–1992 Fire Safety Standard for Powered Industrial Trucks Including Type Designation, Areas of Use, Maintenance, and Operation.) (Ex. 3–3).

In addition to the general requirements for truck operation, such as vehicle stability and load carrying capability, training must be provided for unusual situations, such as training operators to handle asymmetrical loads when their work includes this activity. The only way that unusual loads may be moved safely with some powered

industrial trucks is for the operator to understand and apply the principles of moments and stability of the vehicle. (These principles are explained in more detail in the part of this preamble entitled ''Powered Industrial Truck Hazards.'') With many powered industrial trucks, the capacity is given as some weight at some load center [usually 24″ (61 cm)]. If the operator does not understand that the load center is the distance from the vertical face of the forks to the center of gravity of the load and that loads are usually symmetrical, then the operator may pick up a load incorrectly. If the operator understands that the capacity of the vehicle decreases as the load center increases, then some asymmetrical or off-center loads may be safely picked up and moved using a high lift truck. Other type trucks, such as low lift platform trucks, can handle asymmetrical or off-center loads with minimum danger to an employee because the load is not raised far above the ground. However, because these type trucks are unable to raise loads far above the ground, they are of little or no use when working in a workplace that has high stacking racks or bins where powered industrial trucks must be able to deposit and retrieve loads from considerable distances above the ground or floor.

Powered industrial trucks also are used to move large items or many smaller items about the workplace without the restrictions that generally exist with other mechanical material handling equipment. Other material handling equipment, like overhead cranes or conveyors, are restricted to moving material along a particular, predetermined pathway. A powered industrial truck, on the other hand, may operate along any aisleway or passageway provided it is wide enough to accommodate the vehicle and can support the vehicle and its load. Once one of these trucks has left an area, there is no remaining obstruction to the flow of employee or vehicular traffic, as would normally occur when fixed equipment is used.

Powered industrial trucks may be operated in and among employees with little or no inconvenience to the employees. Although it may be convenient to operate a powered industrial truck around employees, this can be dangerous, particularly when the employees may be hidden from view (for example, when they are working behind stored material.)

These trucks may operate on almost any type surface, from smooth and level floors to rocky, uneven ground, provided they were manufactured to operate on that type floor or ground and the surface does not have an excessive slope. Different type trucks are designed and manufactured to operate in various work environments. Not only may powered industrial trucks be used for moving material about the workplace, high lift trucks are used to raise loads up to 30 or 40 feet above the floor and deposit the material on a rack, mezzanine or other elevated location and then retrieve and lower the material. Many trucks were designed specifically to operate in restricted areas such as narrow aisles and passageways.

Because powered industrial trucks are intended to accomplish specific tasks in a particular manner, their use is restricted. For example, a powered industrial truck that was designed to operate in a restricted space (such as in a narrow aisle or passageway) must be manufactured with a narrow track (the distance between the two wheels on the same axle or at the same end of the vehicle). In many cases, the maximum width of a truck must be significantly less than the minimum width of the area in which it is operated since the vehicle will normally have to make turns so that loads may be deposited in and retrieved from racks or bins which are adjacent to the aisle or passageway. Narrow aisle trucks cannot be safely operated on a floor or the ground that is not smooth.

Another design criterion, the maximum lateral dimension of the vehicle, usually dictates where the various components of the vehicle, such as the engine or motor, the transmission and the seat for the operator, will be placed. The placement of these components may be higher or lower than their most desirable locations. The placement of the various components at a higher point of the vehicle than is desirable, which is the usual case, raises the center of gravity of the entire vehicle, thereby making the vehicle less stable. The greater the distance that the center of gravity of the vehicle and its load is above the ground, the less stable the vehicle (if all other factors remain constant). A more stable design of a powered industrial truck would require a wider track. This would allow installing the engine, transmission, and other components at a lower level of the truck, thereby lowering the center of gravity of the vehicle.

Because the powered industrial truck is a motor vehicle, its operation is similar to the automobile and some of its hazards are the same as those experienced during operation of the automobile. Like the automobile, the internal combustion engine powered industrial truck will move when the gas pedal depressed, and stop when the brake is applied. Some internal combustion engine and electric powered industrial trucks have both the accelerator and brake functions combined in one pedal or other controller providing restriction to movement of the vehicle when no pressure is applied to the pedal (or when the controller is in the neutral position). As pressure is applied to the pedal or other controller, the brake is gradually released, until at a given point of controller travel, the brake is completely disengaged. At this point, the vehicle can coast without restriction from the brake. Finally, as the pedal or other controller is actuated further, the motor or engine is engaged and the vehicle moves under the power supplied by the engine or motor. The vehicle then moves progressively faster as the pedal or controller is further actuated. Clearly good training is needed when design characteristics may reduce stability, limit vision or cause non-uniform methods of control.

Powered industrial trucks also may come equipped with, or can be modified to accept, attachments that allow movement of odd shaped materials or permit the truck to carry out tasks that may not have been envisioned when the truck was designed and manufactured. Many of these attachments may be added to or installed on the vehicle by the dealer or by the employer. For example, there are powered industrial truck attachments for grasping barrels or drums of material. Some of these attachments will not only grasp a barrel or drum but allow the vehicle operator to rotate the barrel or drum to empty the vessel or lay it on its side. Another attachment that looks like a long spike may be positioned within rolled material, such as carpeting. This attachment allows the movement of material without causing damage to the material being handled. All of these attachments may adversely effect the ability of a powered industrial truck to perform its primary function or may cause the vehicle to be used safely only under limited operating conditions, such as under reduced speed or load-carrying capacity. OSHA recognizes that certain attachments may limit the safe use of the vehicle. To ensure that modifications or additions do not adversely affect the safe use of the vehicle, OSHA requires at § 1910.178(b)(4) that:

(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without the manufacturer's prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

When the use of specialized attachments restricts the use of the powered industrial truck or when the truck is used to lift people, it is essential that operator training must include instruction on the safe use of the vehicle so that the operator knows and understands the restrictions or limitations that are imposed upon the operation of the vehicle by the utilization of those attachments.

Another type of attachment that alters the basic use of the vehicle and presents unique hazards is an overhead hoist attachment. It is made up of a rail (like an I-beam) that is attached to the truck and supports an overhead hoist. It is very easy for an operator to pick up a load with an overhead hoist attachment while the load is close to the vehicle and, without realizing it, exceed the moment of the vehicle by moving the load further from the body of the vehicle. In order to operate this type attachment successfully, the operator must have specific training in the use of this attachment, including training in calculating the maximum load at different points in front of the vehicle and instruction in the causes of longitudinal vehicle tipover and its prevention.

In an attempt to improve the load carrying capability of the vehicle, some people add extra counterweights to powered industrial trucks. Although this will increase the ability of the vehicle to resist longitudinal tipover when the vehicle is overloaded, additional weight imposes extra stresses on the vehicle and its components. The added stresses also can cause changes in the driving characteristics of the vehicle and premature failure of the truck and its components, sometimes with catastrophic effects. Training is needed so that operators avoid creating those hazards.

III. Powered Industrial Truck Hazards

Powered industrial trucks are used in all industries. Their principle utility lies in the fact that either a large number of objects confined in a large box, crate or other container or large objects may be moved about the workplace with relative ease. Since powered industrial truck movement is controlled by the operator and is not restricted by the frame of the machine or other impediments, virtually unrestricted movement of the vehicle about the workplace is possible.

The hazards that are commonly associated with powered industrial trucks may not exist or be as pronounced for every type, make or model vehicle. For example, the hazard of tipping over the vehicle due to unstable operation does not exist (except in the most extraordinary circumstance) with the low lift platform truck, the motorized hand truck or the motorized hand/rider truck because each of these trucks does not allow the raising of the load to a point that will cause the vehicle to become unstable. On the other hand, the counterbalanced rider truck and the order picker truck allow the load to be raised very high, causing the vehicle to become less stable as the load is raised.

Each type truck has different hazards associated with its operation. For example, the chance of a falling load accident occurring when the truck is a sitdown, counterbalanced rider truck is much greater than when the vehicle is a motorized hand truck because the height that the load can be raised on the sitdown rider truck is much greater than the hand truck.

Correspondingly, the method or means to prevent the accident or to protect the employee from injury may be different with different type trucks. When a rider truck is involved in a tipover accident, the operator has the opportunity to remain in the operator's position on the vehicle during the tipover, thereby minimizing the potential for injury. In most cases, the operator of a rider truck is injured in a tipover accident when he or she attempts to jump clear of the vehicle when it begins to tip over. Because the natural tendency of the operator is to jump downward, he or she lands on the floor or ground and is then crushed by the overhead guard of the vehicle. Consequently, the operator should be trained to stay with the vehicle during a lateral tipover. On the other hand, when an order picker tips over with the platform in a raised position, generally the operator should attempt to jump clear of the vehicle, and should be trained accordingly.

Because the powered industrial truck is a motor vehicle, its operation is similar to the automobile and some of its hazards are the same as those experienced during operation of the automobile. Both the automobile and the powered industrial truck are subject to some of the same hazards such as contacting both fixed and movable objects (including employees) and tipping over.

Additionally, there are hazards associated with operating the vehicle at an excessive rate of speed and the hazard of skidding on a wet or otherwise slippery ground or floor. Driving a powered industrial truck at an excessive rate of speed may result in the loss of control of the vehicle, causing the vehicle to skid, tipover, or fall off a loading dock or other elevated walking or working surface. Failure to maintain control of the vehicle also may cause the vehicle to strike an employee or some stored material, causing the material to topple and possibly injure another employee. In these cases, training which reinforces driver training is necessary so that the operator will react properly to minimize the hazard to him or herself and to other employees.

Although there are many similarities between the automobile and the powered industrial truck, there are also many differences. Here greater training is required so that operators are aware of the differences. Some of the characteristics of a powered industrial truck that have a pronounced effect upon its operation and safety that are outside their auto driving experience are its ability to change its dynamic stability, to raise, lower and tilt loads, and to steer with the rear wheels while powered by the front wheels. The capability to move loads upwards, downwards, forwards and backwards causes a shift of the center of gravity of the vehicle and can adversely affect the overall stability. When a load is raised or moved away from the vehicle, the vehicle's longitudinal stability is decreased. When the load is lowered or moved closer to the vehicle, its longitudinal stability is increased.

To mitigate the hazards of stability caused by the movement of the material being handled, OSHA has seven provisions that address proper operation of a powered industrial truck. These provisions are § 1910.178 (n)(15), (o)(1), (o)(2), (o)(3), (o)(4), (o)(5), and (o)(6). These provisions specify:

(15) While negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.

(O) *Loading.* (1) Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.

(2) Only loads within the rated capacity of the truck shall be handled.

(3) The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted.

(4) Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.

(5) A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.

(6) Extreme care shall be used 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. An elevated load shall not be tilted forward except when the

load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

Knowledge of, and adherence to these principles, as well as the other requirements of the OSHA standard, are essential for safe load handling and vehicle operation. Training is needed in these requirements.

Each powered industrial truck has a different ''feel'' that makes its operation slightly different from the operation of other trucks. The workplaces where these trucks are being used also present particular hazards. For these reasons, a uniform or consistent set of hazards for all industrial trucks and their operation cannot be delineated. The hazards addressed in this section relating to the use of powered industrial trucks have been generalized rather than being make or model specific. For this reason, development of a single ''generic'' training program which fits all powered industrial trucks and their operation is impractical. In developing an effective training program, there are three major areas of concern regarding the hazards of the operation of powered industrial trucks. The three major groups of hazards of powered industrial trucks and their operation are hazards associated with the particular make and model truck, hazards of the workplace, and general hazards that apply to the operation of all or most powered industrial trucks.

There are other hazards caused by improper operation of a powered industrial truck. Among these hazards are: Falling loads caused by overloading or improperly loading powered industrial trucks (including carrying unbalanced or unstable loads); the vehicle falling from platforms, curbs, trailers or other surfaces on which the vehicle is operating; driving the vehicle while the operator has obstructed view in the direction of travel or the operator not paying full attention to the operation of the powered industrial truck; and the vehicle being operated at an excessive rate of speed. OSHA has identified several accidents that have occurred when an employee other than the operator is ''given a ride'' on a powered industrial truck. Most trucks were designed and are intended to allow only the operator to ride on the vehicle. The carrying of other persons may result in an accident when that other person either falls from the vehicle or contacts some obstruction when the vehicle is driven in proximity to that obstruction. Finally, powered industrial truck accidents have occurred because the vehicle was not maintained (most commonly, employees being overcome by excessive carbon monoxide exposure) or when the powered industrial truck was not being maintained properly.

Each of these hazards may be more or less consequential based upon the method of operation of the powered industrial truck, the loads being carried, and the workplace where the vehicle is being operated. Truck operators must be trained to recognize unsafe conditions and how to react to them when they occur.

Several features of a powered industrial truck contribute either directly or indirectly to the existence or severity of the hazards of the vehicle. Some of the factors, that would either create or enhance the hazards of the particular truck, are the placement of the critical components of the vehicle, the age of the vehicle, and the manner in which the vehicle is operated and maintained.

There are other hazards related to the use of powered industrial trucks that are caused or enhanced by the characteristics of the workplace. Those hazards include the following: operating powered industrial trucks on rough, uneven or unlevel surfaces; operating powered industrial trucks with unusual loads; operations in hazardous (classified) areas; operation in areas where there are narrow aisles; where there is pedestrian traffic; or where employees are working in or adjacent to the path of travel of the powered industrial truck.

The operation of a powered industrial truck presents hazards not only to the operator, but also endangers other employees working with or around the vehicle. As explained in the section entitled ''Accident, injury and other data'', below, employees other than operators have been injured or killed in accidents involving powered industrial trucks. Proper training can reduce accidents resulting from the above causes.

IV. Accident, Injury and Other Data

This section of the preamble contains a discussion of the reports, studies and other sources of data and information that were analyzed to determine the magnitude and extent of the problems that powered industrial truck operator training can mitigate.

A. The Bureau of Labor Statistics (BLS) maintains a database entitled, Census of Fatal Occupational Injuries (CFOI). The CFOI is a compilation of information on fatal work injuries that occurred in the 50 States and the District of Columbia. The CFOI uses death certificates, workers compensation reports and other Federal and State records to gather pertinent information. Work relationships are verified by using at least two source documents.

The program collects information on the workers and the circumstances surrounding each fatality. The data are compiled on an annual basis.

In April, 1994, BLS published a booklet entitled, Fatal Workplace Injuries in 1992: A Collection of Data and Analysis (Ex. 3–4). In this booklet, there was an article written by Gary A. Helmer entitled, Fatalities Involving Forklifts and Other Powered Industrial Carriers, 1991–1992. This report contains information contained in the CFOI on 170 fatal powered industrial truck accidents. Table 1 lists the classifications of those powered industrial truck accidents.

TABLE 1.—CLASSIFICATION OF FORKLIFT FATALITIES, CFOI, 1991–1992

How accident occurred	No.	Percent
Forklift overturned	41	24
Forklift struck something, or ran off dock	13	8
Worker pinned between objects	19	11
Worker struck by material	29	17
Worker struck by forklift	24	14
Worker fell from forklift	24	14
Worker died during forklift repair	10	6
Other accident	10	6
Total	170	100

Source: Bureau of Labor Statistics, *Fatal Workplace Injuries in 1992, A Collection of Data and Analysis,* Report 870, April 1994.

B. Measuring the Effectiveness of an Industrial Lift Truck Safety Training Program.

In 1984, H. Harvey Cohen and Roger C. Jensen, working under contract with the National Institute for Occupational Safety and Health (NIOSH), published an article in the Journal of Safety Research (Fall 1984, Vol. 15, No. 3, pps. 125–135) entitled, Measuring the Effectiveness of an Industrial Lift Truck Safety Training Program (Ex. 3–5). The article contained an analysis of two studies that were undertaken to measure objectively the effects of safety training of powered industrial truck operators.

This article detailed the results of an experiment that was conducted to evaluate the value of training powered industrial truck operators using a behavioral (work) sampling procedure to obtain objective data about work practices that correlate with injury risk. There were two separate studies conducted in this experiment, one at each of two similar warehouses. The

studies that comprised the experiment were conducted to assess the value of training and the influence of post training actions on the safety performance of workers.

There were 14 criteria used in measuring the performance of the trainees. Each of the criterion was selected because it was (a) measurable, (b) frequently observable, (c) capable of being reliably observed, (d) related to accident occurrence, and (e) amenable to corrective action through training. The fourteen criteria observed were: Warns other operators, yields to trucks, warns co-workers, yields to co-workers, sounds horn at blind intersection, slows down at blind intersection, looks at blind intersection, looks in direction of travel, maintains moderate speed, avoids quick starts/changes of direction, keeps all body parts within truck, maintains forks in proper position, maintains balanced load, and drives properly in reverse. Each observation of the operation of the powered industrial trucks resulted in all criteria being evaluated (either correctly performed, incorrectly performed, or not observed). An error rate for each criterion was calculated by dividing the number of incorrect behaviors observed by the total behaviors observed.

Each of the groups of employees were subdivided into smaller groups. These groups were then given training at different times during the study and, in some cases, additional feedback following the training.

The first study was conducted in four phases. The pretraining phase was conducted with none of the operators having received special training. During the second phase, the control group remained untrained, the treatment group received training, and the treatment-plus-feedback group received training and also received performance feedback. In the third phase, the control group received training so that all three groups had received training but only the training-plus-feedback group received performance feedback. The retention phase started three months after the end of the third phase of the study and the performance of all operators was evaluated without regard to their previous categorization.

The error rates of the various groups during the different phases of the study are given in Table 2.

TABLE 2.—SUMMARY OF MEAN ERROR RATES [1]

[Warehouse 1]

Group	Pre-training	Post-training 1	Post-training 2	Retention
Control	.34	.32	.23	
Training	.33	.27	.26	
Training + Feedback	.35	.27	.25	
All operators	.34	.27	.25	.19

[1] The mean error rate is defined in the study as the number of incorrect behaviors observed divided by the total behaviors observed.

NOTE: The mean error rate for all operators began at .34, that is, in 34 percent of the observed criteria, the tasks observed and evaluated were performed improperly.

Source: Measuring the Effectiveness of Industrial Lift Truck Safety Training Program, Journal of Safety Research, Vol. 15, No. 3, Fall 1984, pp. 125–135.

Following the initial training (post-training 1), all three groups showed a decrease in their mean error rates with the training-plus-feedback group showing the largest decrease (from .35 to .27, a 23 percent decrease) followed by the training-only (from .33 to .27, an 18 percent decrease) and the control group (from .34 to .32, a 6 percent decrease). The reduction in the error rate of the control group from the pre-training to the post-training 1 phase of the study was attributed to a peer modeling influence, i.e., the control group operators were copying the behavior of their previously trained counterparts. Toward the end of the post-training 1 phase, the error rates of the three groups converged, suggesting that the effects of the training program had begun to wear off. Observers also noted that some behaviors were being compromised when employees of different knowledge levels were required to interact, particularly in conflict avoidance situations such as signaling and yielding at blind intersections.

During the post-training 2 phase of the study, all groups improved in performance, particularly the original control group. This group's performance improved by 28 percent (from a mean error rate of .32 to .23). Additional evidence of the effect of peer modeling may be deduced from the fact that the performance of the other two groups (the training and the training and feedback groups) continued to improve although there was no additional instruction given to those groups.

The retention phase of the study was conducted three months following the completion of the post-training 2 phase of the study. It was intended to determine the longer term effects of the training. The results of this phase of the study indicate an additional improvement in the performance of the operators with the mean error rate decreasing from .25 to .19, a 24 percent improvement in their performance. The total performance gain achieved during this study was a 44 percent improvement from the pre-training (baseline) phase through the retention phase (from a mean error rate of .34 to a final error rate of .19). The data indicate that there were significantly fewer errors at each successive phase of the study.

The second study was conducted in order to verify and extend the findings of the first study. Consequently, a modified experimental design was used to eliminate the mitigating influence of the untrained control group. In the second study, all operators were trained at the same time and all received performance feedback. Comparisons were made only before and after training. The study was divided into three phases: Pre-training, post-training and retention. The retention phase of the study was again conducted three months after the conclusion of the prior phase. The mean error rates during the three phases of the study are given in Table 3.

TABLE 3.—SUMMARY OF MEAN ERROR RATES STUDY 2

Pre-training	Post-training	Retention
.23	.09	.07

Source: Measuring the Effectiveness of Industrial Lift Truck Safety Training Program, Journal of Safety Research, Vol. 15, No. 3, Fall 1984, pp. 125–135.

Following the training of the vehicle operators, there was a 61 percent

improvement in performance scores (from an error rate of .23 to .09). Observation in the retention phase of this study showed an additional reduction of 22 percent in mean error rates (from .09 to .07 mean error rate). This corresponds closely to the 24 percent gain experienced in Study 1. The overall improvement in mean error rates between the pre-training error rate (.23) to that achieved during the retention phase (.07) was a reduction of 70 percent.

C. In 1987, Nancy Stout-Wiegand of the National Institute for Occupational Safety and Health (NIOSH) published an article in the Journal of Safety Research (Winter 1987, Vol 18, No. 4, pp. 179–190) entitled, Characteristics of Work-Related Injuries Involving Forklift Trucks (Ex. 3–6). This article analyzed powered industrial truck injuries reported in two occupational injury databases—the National Electronic Injury Surveillance System (NEISS) and the Bureau of Labor Statistics' Supplementary Data System (SDS).

The NEISS database is composed of records from a national sample of 200 hospital emergency rooms and burn centers handling all types of injuries. The NEISS database was originally established by the Consumer Product Safety Commission, therefore, the original intent was to gather data about accidents involving commercial products rather than industrial injuries. The hospital emergency rooms were not necessarily those located in industrial areas that would predominantly treat industrial injuries and illnesses. The data from this sample are weighted to represent the nation in numbers and characteristics of traumatic injuries treated in emergency rooms and burn centers. A subset of this database—the work related injuries—is maintained by NIOSH. Since the NEISS database records only injuries treated in emergency rooms and burn centers, traumatic work injuries treated by private practitioners or by industry or private clinics are not included in the NEISS database. Moreover, chronic injuries, such as injuries due to overexertion, are not as likely to be treated in emergency room as are acute traumatic injuries, and, therefore are probably underrepresented in the NEISS database. Other probable sources of error in the calculation of accident rates include misclassification of the sources of injury or the agent of injury. For example, if an employee fell while elevated on the forks of a powered industrial truck, the accident could be misclassified as a fall from elevation rather than a fall from a forklift. Similarly, if an employee were struck in the head by part of a load which fell from a powered industrial truck, the accident could be classified as employee struck by falling object. In either case, the accident would have involved a powered industrial truck, but in neither case would the accident have been classified as one in which a powered industrial truck was involved.

The Supplementary Data System (SDS) database is composed of workers' compensation claims for injuries involving lost workdays. There were 30 states that provided information to the SDS system. The SDS system reports the occupations of injured workers and states where the claim was filed. SDS includes only compensable injuries. The definition of a compensable injury varies from state to state, with some injuries being compensable, for example, if they result in one day or more away from work. In other states, the time away from work may be up to 7 days before the injury becomes compensable.

The SDS and NEISS data do not necessarily represent the same injuries because injuries treated in emergency rooms do not always result in lost workdays. At the same time, compensable injuries included in SDS may not have been treated in emergency rooms and thus would not be represented in NEISS. However, both of these databases represent the more serious injuries involving powered industrial trucks, that is, those requiring treatment in emergency rooms and those which result in compensable injuries.

In 1983, the SDS system identified 13,417 workers' compensation claims for lost-workday injuries involving powered industrial trucks that occurred in 30 states. Assuming that these 30 states represent an average of the whole population, then the number of accidents which occurred nationally would be five-thirds of the 13,417 accidents, or approximately 22,400 compensation claims for lost-workday injuries involving powered industrial trucks filed nationally. This number is comparable to the estimated 24,000 forklift-related injuries that were treated in U.S. emergency rooms in 1983 as reported by NIOSH from information gathered by the NEISS system. In 1985, the NEISS system figures were used to determine that about 34,000 powered industrial truck related accidents were treated in emergency rooms. This is an increase of about 39% over a three-year period of time.

This report also contained a tabulation of the occupations of the injured workers. The breakdown of the occupations of those employees and the corresponding percentage of the accidents is listed in Table 4.

TABLE 4.—PERCENTAGE DISTRIBUTION OF POWERED INDUSTRIAL TRUCK INJURIES BY OCCUPATION OF INJURED EMPLOYEE

Occupation	Percent
Professional, technical and kindred workers	0.3
Managers and administrators (except farm)	2.0
Sales workers	0.8
Clerical and kindred workers	5.0
Craftsmen and kindred workers	(15.5)
Mechanics	6.5
Foremen	3.0
Other craftsmen and kindred workers	6.0
Operatives (except transportation)	(17.5)
Assemblers	1.4
Packers/wrappers	1.1
Welders	0.9
Miscellaneous/unspecified operatives	9.2
Other operatives	4.9
Transportation equipment operatives	(20.8)
Powered industrial truck operators	12.3
Truck drivers	5.5
Motormen	1.7
Deliverymen	1.2
Other transportation equipment operators	0.1
Laborers (except farm)	(37.3)
Warehousemen	10.4
Freight and material handlers	7.3
Stock handlers	4.4
Construction laborers	2.2
Miscellaneous/unspecified laborers	8.0
Other laborers	1.6
Farmers (managers and laborers)	1.5
Service workers	1.8
Occupations unspecified	1.1

Source: *Characteristics of Work-Related Injuries Involving Forklift Trucks*, Journal of Safety Research, Vol. 18 No. 4, Winter 1987, pp. 179–190.

D. Industrial Forklift Truck Fatalities—A Summary.

The Office of Data Analysis (ODA) of OSHA's Directorate of Policy conducted an examination of 53 investigative case files involving powered industrial truck fatalities that occurred between 1980 and 1986 (Ex. 3–7). The results of their analysis is summarized below.

TABLE 5.—OFFICE OF DATA ANALYSIS TYPE ACCIDENTS—53 POWERED INDUSTRIAL TRUCK FATALITIES

Type accident	No.	Percent
Crushed by tipping vehicle	22	42
Crushed between vehicle and a surface	13	25

TABLE 5.—OFFICE OF DATA ANALYSIS TYPE ACCIDENTS—53 POWERED INDUSTRIAL TRUCK FATALITIES—Continued

Type accident	No.	Percent
Crushed between two vehicles	6	11
Struck or run over by vehicle	5	10
Struck by falling material	4	8
Fall from platform on forks	2	4
Accidental activation of controls	1	2

Source: *Industrial Forklift Truck Fatalities—A Summary*, Report from Office of Data Analysis, Directorate of Policy, OSHA, dated June 1990.

The single largest cause of the accidents was vehicle tipovers. These tipovers were attributed to the following: (1) The vehicle being out of control (speeding, elevated loads, mechanical problems, etc.; 7 instances—13 percent); (2) the vehicle being run off/over the edge of the surface (4 instances—8 percent); (3) attempting to make too sharp a turn (excessive speed, unbalanced load, etc.; 4 instances—8 percent); (4) employee jumped from overturning vehicle being pulled by another vehicle (2 instances—4 percent); vehicle skidded or slipped on slippery surface (2 instances—4 percent); (5) wheels on one side of vehicle ran over raised surface or object (2 instances—4 percent); and (6) vehicle tipped over when struck by another vehicle (1 instance—2 percent).

The second highest number of fatalities reported in the ODA study was caused by an employee being crushed between a vehicle and a surface. The accidents were attributed to: (1) The operator getting off the vehicle while it was running (7 instances—13 percent); (2) worker on platform being crushed between platform and overhead surface (2 instances—4 percent); (3) employees leg being caught when vehicle sideswiped metal surface (1 instance—2 percent); (4) employee attempting to prevent vehicle tipover by holding up overhead guard (1 instance—2 percent); (5) employee changing tire and vehicle fell from jack (1 instance—2 percent) and (6) empty 55 gallon drum used for support vehicle during maintenance collapsed (1 instance—2 percent).

The six accidents that were attributed to employees being crushed between two vehicles were caused by contact between two moving powered industrial trucks (4 cases) and between a powered industrial truck and a stationary vehicle in the other two instances.

Of the five accidents which were identified as an employee being struck or run over by vehicle, four were accidents where employees other than the vehicle operator were struck by the vehicle. The remaining one was an operator trying unsuccessfully to board a free rolling vehicle.

E. The OSHA Fatality/Catastrophe Reports. OSHA records a summary of the results of investigations of all accidents resulting in fatalities, catastrophes, amputations and hospitalizations of two or more days, and those accidents that have received significant publicity or property damage. These summaries are recorded on an OSHA Form 170 and include an abstract describing the activities taking place at the time of the accident and the causes of the accident. These reports are stored in a computerized database system.

OSHA queried the computer for all reports that contained the keyword ''industrial truck''. There were 4268 total reports in the system that resulted in 3038 fatalities, 3244 serious injuries, and 1413 non-serious injuries (many of the accidents resulted in multiple fatalities and/or injuries). The use of the keyword ''industrial truck'' produced a printout of 208 accidents (Ex. 3–8). These 208 accidents resulted in 147 fatalities, 115 serious injuries and 34 non-serious injuries.

By adding the number of fatalities, serious injuries and non-serious injuries and dividing by the number of accidents, it was determined that 1.4 injuries of some nature occurred per accident. OSHA also determined the percent of each of the three classes of accidents that involved powered industrial trucks. Those percentages are 4.8 percent of the fatalities, 3.5 percent of the serious injuries and 2.4 percent of the non-serious injuries were attributable to an accident that involved a powered industrial truck.

OSHA looked at the OSHA 170s to determine the causes of the accidents that were attributable to the use of powered industrial trucks in general industry. Table 6 presents a compilation of the causes of those accidents.

TABLE 6.—CAUSES OF ACCIDENTS [1]—OSHA INVESTIGATION SUMMARIES (OSHA 170S)

Cause	No. of reports
No training [2]	19
Improper equipment	10
Overturn	53
Unstable load	45
Overload, improper use	15

TABLE 6.—CAUSES OF ACCIDENTS [1]—OSHA INVESTIGATION SUMMARIES (OSHA 170S)—Continued

Cause	No. of reports
Obstructed view	10
Carrying excess passenger	8
Operator inattention	59
Falling from platform or curb	9
Falling from trailer	6
Elevated employee	26
Operator struck by load	37
Other employee struck by load	8
Accident during maintenance	14
Vehicle left in gear	6
Speeding	5
Not powered industrial truck accident	9

[1] The causes of the accidents were determined by the narrative in the accident report. In most cases, the narrative emphasized the cause of the accident, however, in a few cases, reasonable and appropriate assumptions were made. In some cases, multiple accident causes were described in the narrative portion of the report, or were assumed to have caused the accident. (See Ex. 3–8.)

[2] Of the 19 instances when the report contained the indication that a lack of training was one of the causal factors of the accident, there were 6 serious violations issued, 2 other (nonserious) violations and 11 instances where no citation was issued.

Source: Office of Electrical, Electronic and Mechanical Engineering Safety Standards, Directorate of Safety Standards Programs, OSHA.

Using the OSHA Form 170 data, OSHA also compiled a listing of the industries in which accidents occurred. Table 7 presents a tabulation of the SIC codes, the description of the industry, and the number of times that accidents were identified as having occurred in those industries. For a complete listing of the individual industries, see Ex. 3–9.

TABLE 7.—INDUSTRIES WHERE ACCIDENTS OCCURRED—OSHA INVESTIGATIVE SUMMARY (OSHA FORM 170) REPORTS

SICP division	Description	Times cited
B	Mining	4
C	Construction	25
D	Manufacturing	95
E	Transportation, communication and utilities.	22
F	Wholesale trades	25
G	Retail trades	18
I	Services	7
J	Public administration	4

NOTE: The breakdown of accidents does not include agricultural accidents since establishments of 10 or less employees in this industry are exempt from OSHA jurisdiction.

Source: Office of Electrical, Electronic and Mechanical Engineering Safety Standards, Directorate of Safety Standards Programs, OSHA.

F. *The OSHA Emergency Communications System Reports.*

OSHA has another internal system for collecting information about serious accidents. This is a telephone system which requires that serious and/or significant accidents be telephoned into the National Office.

The telephone call system is part of the OSHA emergency communications system. Regional Administrators are required to file a first report of fatalities, catastrophes and other important events (such as those that receive significant publicity) to the National Office. The information contained in these reports is disseminated to the responsible officials in OSHA and to the directorates of the Agency. These reports are broken down within the various offices and distributed to the appropriate personnel. There are approximately 1200 reports received by the National Office yearly. See Ex. 3–10.

None of the reports are screened before the OSHA National Office receives them to eliminate those from a certain industry, occupation or because of other factors. Although these reports may not be considered statistically significant by themselves in attempting to determine the number of accidents that have occurred, the lack of prior screening indicates that they represent a reasonable sampling of the most serious type accidents and that the causes of the accidents closely parallel the distribution of the causes of all accidents.

OSHA has examined the First Report of Serious Injury reports and identified 247 that involved powered industrial trucks. These accidents occurred between 1980 and the present. OSHA looked at the number of accidents reported through its telephonic system and determined the percentage of those accidents that involved powered industrial trucks. Table 8 contains a listing of the number of First Reports of Serious Accident reports which were received from 1980 to present, the number of those accidents which involved powered industrial trucks, and the corresponding percentage.

TABLE 8.—YEARLY SUMMARY OF FIRST REPORT OF SERIOUS ACCIDENTS

Year	Total reports	Pit accidents	Percent
1980	200	2	1
1981	125	2	1.6
1982	113	0	0
1983	115	3	2.6
1984	181	1	.6
1985	456	15	3.3
1986	1,147	44	3.8
1987	1,236	38	3.1
1988	1,330	47	3.5
1989	1,150	44	3.8
1990	1,105	41	3.7
1991	[1] 215	10	4.7
Totals [2]	6,424	247	3.6

[1] These are the number of total reports received between the first of the year until March 31.

[2] The total number of reports, the number of accidents involving powered industrial trucks and the percentage were calculated using the figures from 1985–1990. The number of accidents reported during the years 1980–1984 and those reported during 1991 were too few to be representative.

Source: Office of Electrical, Electronic and Mechanical Engineering Safety Standards, Directorate of Safety Standards Programs, OSHA.

Each of these reports were examined to determine the causes of the accidents. In some instances, multiple causes were identified. Table 9 lists the causes of the accidents and the number of accidents which were attributable to that cause.

TABLE 9.—CAUSES OF ACCIDENTS (POWERED INDUSTRIAL TRUCKS) FIRST REPORTS OF SERIOUS ACCIDENT

Cause of the accident	No. Accidents
Tipover	58
Struck by powered industrial truck	43
Struck by falling load	33
Elevated employee on truck	28
Ran off loading dock or other surface	16
Improper maintenance procedures	14
Lost control of truck	10
Truck struck material	10
Employees overcome by carbon monoxide or propane fuel	10
Faulty powered industrial truck	7
Unloading unchocked trailer	7
Employee fell from vehicle	7
Improper use of vehicle	6
Electrocutions	2

TABLE 9.—CAUSES OF ACCIDENTS (POWERED INDUSTRIAL TRUCKS) FIRST REPORTS OF SERIOUS ACCIDENT—Continued

Source: Office of Electrical, Electronic and Mechanical Engineering Safety Standards, Directorate of Safety Standards Programs, OSHA.

G. The OSHA General Duty Clause Citation Analysis.

The Office of Mechanical Engineering Safety Standards of OSHA, conducted an analysis of the citations which were issued between 1979 and 1984 for violations of the general duty clause (section 5(a)(1)) of the Occupational Safety and Health Act. During that period, there were a total of 3637 inspections in which at least one 5(a)(1) citation was issued. See Ex. 3–11.

Sixty-five general duty clause citations involved powered industrial truck operations. Each was examined to determine the nature of the violation. Table 10 lists the violation that was alleged to have occurred.

TABLE 10.—SUMMARY OF GENERAL DUTY CLAUSE (5(A)(1)) CITATIONS

Violation	No. instances
Employee elevated on forks	44
Improper operation of vehicle	13
Improper maintenance on vehicle	5
No vehicle operator training	2

TABLE 10.—SUMMARY OF GENERAL DUTY CLAUSE (5(A)(1)) CITATIONS—Continued

Violation	No. instances
Order picker without fall protection	1

Source: Office of Electrical, Electronic and Mechanical Engineering Safety Standards, Directorate of Safety Standards Programs, OSHA.

V. Basis for Agency Action

OSHA believes that, as the above discussion indicates, that there is a sufficient body of data and information on which to base a revision of the existing standard for powered industrial truck operator training and the promulgation of the same requirement for powered industrial truck operator training in the construction, maritime and agriculture industries. These requirements would reduce the number of fatalities and injuries resulting from accidents involving powered industrial trucks operated by untrained or insufficiently trained employees.

According to OSHA's data and information, powered industrial truck accidents account for approximately 4.8 percent of the fatalities, 3.5 percent of the serious injuries and 2.4 percent of the non-serious injuries that occur in general industry each year. These accidents resulted in an average of 107 fatalities, 33,800 serious injuries, and 61,800 non-serious injuries per year from 1981 through 1990.

In analyzing its accident data, OSHA has derived two separate estimates of the number of fatalities and serious injuries that occur to employees due to powered industrial truck accidents. Because the two set of numbers are in the same range, the Agency has presented both. It should be noted that the number of fatalities is virtually identical using either method of derivation. However, slightly different definitions are used for estimating injuries. The other set of estimates are presented in the Preliminary Regulatory Impact Analysis, below.

There are approximately 68,400 accidents involving powered industrial trucks in general industry per year. This figure was arrived at by totaling the fatalities, serious, and non-serious injuries and dividing this result by 1.4 (the number of injuries per accident determined from the OSHA Fatality/Catastrophe Reports). According to the Industrial Truck Association (ITA), there are currently approximately 855,900 powered industrial trucks in the United States, therefore approximately 8 percent of the powered industrial trucks will be involved in an accident this year (this assumes a truck is involved in only one accident this year). Since the ITA has stated that the useful life of a powered industrial truck is 8 years, that means that at some point during its useful life, almost two-thirds of the powered industrial trucks will be involved in some type accident (again, assuming there is only one accident per truck).

OSHA also looked at the type accidents that were described in the section of this preamble entitled ''Accident, injury and other data.'' The three reports that contained that information were the ''Industrial Forklift Truck Fatalities—A Summary'' (ODA Study); ''The OSHA Fatality/Catastrophe Reports'' (Fat/Cat Study); and the ''OSHA Emergency Communications System Reports, First Reports.'' The number of different types of accidents are given in Table 12, below. Since the Industrial Forklift Truck Fatalities report was the only one that used a single causation methodology for categorizing the accidents, this is the only study for which percentages of the accidents were calculated. These percentages appear in parentheses following the numbers.

TABLE 11.—CAUSES OF POWERED INDUSTRIAL TRUCK ACCIDENTS

Cause	Study		
	ODA study	Fat/cats	First reports
Tipovers	22 (42%)	53	58
Struck by vehicle	24 (46%)	.....	43
Struck by falling material	4 (8%)	90	[1] 43
Elevated employees	2 (4%)	26	28
Control activation	1 (2%)	[2] 6	.....
Improper equipment or usage	.....	10	[3] 13
Vehicle overloaded	.....	15	.....
Obstructed view	.....	10	.....
Maintenance acc	.....	14	14
Speeding	.....	5	.....
Fell from platform	.....	.....	[4] 23
Lost control	.....	.....	10
Overcome by CO	.....	.....	10
Employee fell from vehicle	.....	.....	7
Electrocution	.....	.....	2

[1] This number represents the accidents due to material that was in the powered industrial truck (a portion of the load) falling on an employee-33 cases, and stacked material falling on an employee when struck by a powered industrial truck-10 cases.

[2] This number represents the accidents due to the operator leaving the vehicle in gear, dismounting the vehicle and being struck when the vehicle moved.

[3] This number represents the number of accidents when either the vehicle was used improperly (6 instances) or the vehicle was defective (7 instances).

[4] This number represents the number of accidents when the operator drove the vehicle off an elevated dock (16 instances) or fell against the face of the dock when an unchocked trailer rolled away from the dock when being loaded or unloaded.

Sources: ''The Forklift Truck Fatalities—A Summary Report'' (ODA Study); ''The OSHA Fatality/Catastrophe Reports'' (Fat/Cats); and ''The OSHA Emergency Communications System Reports (First Reports)''.

In 9 percent of the accident investigations in which an OSHA 170 was prepared (19 of 208), lack of training was identified as a causal factor. In more than half of these accident investigations (11 of 19), lack of training was not cited by OSHA compliance officers. However, OSHA's standard specifies that only trained and authorized operators are allowed to operate powered industrial trucks. Absence of a citation when lack of training was identified as a causal factor in the accident can only be attributed to the fact that many compliance officers believe that the powered industrial truck training requirement (29 CFR 1910.178(l)) is vague and unenforceable in its present form.

In addition, most of the accidents where lack of training was not mentioned, clearly could have been avoided through better training. When OSHA completes this rulemaking, in light of the large number of industrial truck accidents, based on priorities and resources, it will consider whether to revise the entire powered industrial truck standard. Persons also may wish to comment on whether OSHA should revise the entire standard in the future.

VI. The Need for Training

Training is generally defined as making a person proficient through the use of specialized instruction and practice. Training is the means by which an employer ensures that employees have the knowledge, skills, and abilities that are necessary for the employees to do their jobs correctly.

Once an employee acquires the basic knowledge, skills, and abilities, refresher or remedial training may be used to reinforce or improve those attributes, to provide new material, to provide material that was previously discussed in a new manner, or to simply maintain an awareness of the material that had previously been taught. Refresher or remedial training is normally conducted on a predetermined periodic basis, that is, on a monthly, semi-annual, or annual basis.

Training may be as simple and informal as a supervisor pointing out either an error in the manner in which an employee is doing a job (making an on-the-spot correction) or showing an employee how to do a particular task (demonstrating the proper method to do the job). On the other end of the spectrum is the detailed, structured instruction that uses the classical methods of training (lectures, conferences, formal demonstrations, practical exercises, examinations, etc.). Formal training is usually used to impart a greater amount of, more complicated, or more detailed information to a trainee.

For the most part, employees do not start out with the innate knowledge, skills, and abilities to perform many of the complicated or difficult practices and procedures that occur commonly in the workplace. For example, many states require potential car drivers to pass either driver training and/or driver education programs to qualify for a drivers license. Even with this training, young drivers are involved in a disproportionate number of accidents. It is only after the drivers have more experience that the number of accidents decreases. Although many employees who are selected or assigned to drive powered industrial trucks are licensed to drive automobiles, there are enough dissimilarities between these two types of vehicles and their operation to require additional knowledge, skills, and abilities to operate a powered industrial trucks safely. Operational characteristics of powered industrial trucks, such as using vehicles equipped with rear-wheel steering and front-wheel drive and the hoisting—moving—lowering of loads, require operator training and practice to master the different driving skills that must be used when an employee operates powered industrial trucks.

Many of these accidents either can be prevented, or the seriousness of the injury to the employee can be mitigated by training employees. Effective training and supervision also can prevent the occurrence of unsafe acts such as speeding, failing to look in the direction of travel, and failing to slow down or stop and sound the vehicle's horn at blind intersections and other areas where pedestrian traffic may not be observable. Another example in which training can prevent or lessen the severity of an accident of this kind is directly related to the stability of powered industrial trucks when traveling with an elevated load. Effective operator training should include the admonition that the vehicle can only be moved when the load is at its lowest point. Even if this admonition is ignored and the vehicle tips over, the injury to the operator is usually minimal if the he or she stays with the vehicle. As previously discussed, the usual injury in a powered industrial truck tipover occurs when the operator attempts to jump off the vehicle when it is tipping over. Since the normal tendency is for a person to jump downward, the operator lands on the floor or ground in the path of the overhead guard and the usual injury is a crushing injury of the head, neck or back when the overhead guard contacts the employee. Training an employee to stay with the vehicle will reduce the severity of some of these injuries.

In 1990, the Office of Technology Assessment of the U.S. Congress published a book at the request of the Senate Labor and Human Resources Committee, the House Education and Labor Committee, and the Senate Finance Committee. This book is entitled, Worker Training: Competing in the New International Economy, OTA–ITE–457 (Washington, DC: U.S. Government Printing Office, September 1990; Ex. 3–12) Although this book addresses the need for training so that American industry can remain competitive in the world marketplace, there were many salient facts presented, both about the state of training in the workplace and the need for additional training.

To be effective, training must impart appropriate skills, must not include irrelevant information and must accommodate varying employee backgrounds and learning styles. Training is most effective when it is quickly reinforced on the job. Poor timing of training, lack of reinforcement at work, and other factors prevent effective transfer of knowledge to the job.

The book also pointed out that small business access to new employees with good skills is limited. Employees hired by companies reflect the labor pool available and is dependent upon the size of the company. Small companies must draw their employees from the locally available talent pool whereas larger companies can attract prospective employees from a much larger geographical area. In order to make up for the limitations of the limited talent pool, small employers usually must provide additional training and education to achieve comparable employee performance.

The OTA book pointed out that inadequate training costs firms and employers not only in health and safety risks, but also downtime, defective parts and equipment, wasted material, late deliveries, inferior quality products and poor customer service. To maximize its effectiveness, training must be focused on workplace problems because simply providing more generalized, non-directed training will not promote industrial competitiveness. If the work is not organized to tap employee skills, the training investment will be wasted.

Finally, the book emphasized that employers historically have not trained their workers for several reasons. First, high labor turnover has mistakenly led employers to believe that skilled workers will leave so their companies will not recoup their training investment. Second, many employers believe that an increase in productivity will not offset the cost of training employees. As the book points out, that is not the case.

The studies conducted by Cohen and Jensen, discussed under *Accident, injury and other data* earlier in this preamble, found a reduction in operator error rate of up to 70 percent. Although a 70 percent error rate reduction can not be directly equated to a corresponding reduction in the number of accidents that this or any other group of operators will experience, improper or unsafe operation of a powered industrial truck is the major cause of the accidents and their resultant fatalities and injuries. Therefore, a reduction in the unsafe operation of a powered industrial truck will reduce the number of accidents, and the resultant fatalities and injuries.

Many standards promulgated by OSHA explicitly require the employer to train employees in the safety and health aspects of their jobs. These requirements reflect OSHA's belief that training is an essential part of an effective employer's program for protecting workers from accidents and illnesses. (See Ex. 3–13

for a complete list of the OSHA standards that require training.)

Although not all powered industrial truck accident reports spell out the lack of training as a causal factor of the accidents, each accident can, in part, be attributed to either being caused or worsened by the actions or inactions of the operator. For example, when a powered industrial truck tips over, the accident is caused by one or more of several factors, including speeding, traveling with the load in an elevated position, or improperly negotiating a turn. Training can minimize the times that these events occur.

Proper training of an employee must take into account the fact that different operating conditions (including the type and size of the load, the type and condition of the surface on which the vehicle is being operated, and other factors) can adversely affect vehicle operation. Operator training must emphasize two points regarding any potential accident scenario. These two factors are: (1) The employee should not engage in activities that may cause an accident, and (2) the employee should minimize the potential for injury (either to himself or herself or to other employees) by taking appropriate actions.

OSHA is not proposing a program of licensing or certification of powered industrial truck operators either by itself or as an adjunct to operator training. OSHA does not have the resources to conduct such a program since there are close to 1.5 million employees who operate powered industrial trucks.

VII. Summary and Explanation of the Proposed Rule

OSHA is proposing to revise the training requirement for powered industrial truck operators, 29 CFR 1910.178(l), contained in the general industry standards, and to add equivalent training requirements for the maritime industries. This proposal is intended to enhance the safe operation of powered industrial trucks in the workplace.

On February 27, 1995, OSHA submitted to the Advisory Committee on Construction Safety and Health (AC) a draft of this document. The ACCOSH recommended to OSHA that the Agency not proceed with rulemaking for that industry until the Advisory Committee had sufficient time to completely study the document and provide further recommendations. Consequently, this rulemaking is limited to general industry and the maritime industries. The Agency intends to propose to adopt for the construction industry similar requirements for training the operators of powered industrial trucks after receiving and taking into account the recommendations of the ACCOSH.

In developing this proposal, OSHA looked at the training requirements of the existing national consensus standard for powered industrial trucks, ANSI B56.1–1993, as well as training requirements from other standards (both industry and government). The non-training related requirements of those standards are beyond the scope of this proposal.

OSHA has not included suggestive language contained at paragraph 4.19.2 of the consensus standard because other enforceable language in the proposed standard covers the issue. This paragraph states, ''The operator training program should include the user's policies for the site where the trainee will operate the truck, the operating conditions for that location, and the specific truck the trainee will operate. The training program shall be presented to all new operators regardless of previous experience.''

The Agency has not adopted the language contained in 4.19.3(a) of the consensus standard because the responsibility for providing a safe workplace (including the use of a powered industrial truck) is vested with the employer under the OSH Act. This paragraph specifies, ''The primary responsibility of the operator is to use the powered industrial truck safely following the instructions given in the training program.''

The consensus standard, at 4.19.4(e) and 4.19.5 specifies the type of training and the testing that should be conducted, whereas the OSHA standard leaves the methods of training up to the employer. As explained elsewhere in this preamble, the employer is responsible for selecting the methods that are employed to train the operators. In some circumstances, the employee may be able to gain valuable information from reading the operators manual for the vehicle. In other circumstances, the employee may not be able to read and comprehend the contents of the manual and may have to be shown how to operate the truck safely.

Many of the other OSHA standards and the consensus standards specify that some means be used to verify that training was conducted. Examples of such verification include: (1) Requiring documentation of the training, (2) the production and retention of lesson plans, (3) attendance rosters, and (4) the issuance of training certificates. When refresher or remedial training is specified, these other rules usually require that a set amount of training be conducted at a regular interval (for example, a certain number of hours of refresher training be conducted annually). OSHA is including evaluation by a designated person and certification that the employee has taken the training and can competently operate the truck. Course materials also must be kept. OSHA believes that this is the appropriate method of verification. As operators vary greatly in the experience and backgrounds and they will be required to operate different types of vehicles, different types and amounts of training are necessary and OSHA does not believe it can specify a rigid curriculum.

This proposed revision of the training requirement found in § 1910.178(l) for operators of powered industrial trucks and the imposition of the same requirement for operators of powered industrial trucks in other industries (construction and maritime) specifies that the employer develop a complete training program. This program consists of an evaluation of each potential truck operator and the training of the potential operator in those subject matters relating to the operation of the truck, the work environment in which the truck will be operated and the requirements of the OSHA standard. This training program also must include a periodic evaluation of the performance of the operator and refresher or remedial training as necessary. To maximize the effectiveness of the training, OSHA is proposing to allow the employer to avoid having to conduct training that is duplicative of other training the employee has previously received. Finally, the training provisions would require that the employer certify that the training and evaluations have been conducted.

At paragraph (1)(i), OSHA specifies that each potential operator of a powered industrial truck must be capable of performing the duties that are required of the job after training and appropriate accommodation. This would include being able to climb onto and off of a truck, to sit on the vehicle for extended periods of time, and to turn his or her body to be able to look in the direction of travel when driving in reverse. Elements of this evaluation may include the employee having the physical and mental abilities to perform the job. Information obtained during the initial employee evaluation can be used to, among other things, determine how best to train the employee. For example, if the employee cannot read and comprehend the operator's manuals for the type trucks that the employee will operate, then this information would have to taught by means other than

having the employee try to read the truck manuals. The initial evaluation can be useful for the avoidance of duplicative training.

Paragraph (1)(ii) provides that the employer shall assure that the employee has received required training, that the employee has been evaluated and that the potential operator can perform the job competently. The evaluation must be carried out after the training by a designated person so that the employer can assure that the potential operator can perform the duties required of an operator in a competent manner. The conduct of this evaluation during the training is known as a practical exercise or a performance test. OSHA believes that only through evaluation by a knowledgeable person after training can an employer know that the employee has been adequately trained and can safely perform the job.

The designated person may be the employer if qualified. A small business person who has employees may send the employees to an outside training organization. Alternately, the employer may take or have training so that the employer is qualified as a designated person.

At paragraph (2), OSHA is proposing to require that the employer implement a training program for all powered industrial truck operators. This program would ensure that only trained drivers who have successfully completed the training program would be allowed to operate these vehicles. An exception to the rule would allow trainees to operate powered industrial trucks provided the operation is under the direct supervision of a designated person and the operation is conducted where is minimum danger to the trainee or other employees.

OSHA is proposing at paragraph (2)(ii) that the training consist of a combination of classroom instruction and practical training. The Agency believes that only by the use of a combination of training methods will the employee be adequately trained. Although classroom training is invaluable for the teaching of the principles of vehicle operation, it is the hands-on training and the evaluation of the operation of the vehicle that finally proves the adequacy of the training and the ability of the employee to use that training to successfully operate a powered industrial truck.

At paragraph (2)(iii), OSHA is proposing to require that all training be conducted by a designated person. OSHA defines a designated person as one who has the requisite knowledge, training and experience to train powered industrial truck operators. As discussed elsewhere in this preamble, the employer may have the necessary prerequisites to qualify as a designated person or he or she may assign the training responsibility to another person (either a knowledgeable employee or an trainer from outside the company).

To ensure that the training contains the appropriate information for the operator, OSHA has provided a list of subjects at paragraph (3). Under this rule, it is the responsibility of the employer to select the particular items that are pertinent to the type trucks that the employee will be allowed to operate and the work environment in which the vehicle will be operated. For example, if the employee will be allowed to operate an order picker, it is essential that he or she understand the location and function of the controls, the location and operation of the powerplant, steering and maneuvering, visibility, inspection and maintenance and other general operating functions of the vehicle. Additionally, it is essential that the employee know and understand that he or she must be restrained from falling when the platform of the truck is in an elevated position and that the truck must never be driven when the platform is elevated. Under this proposed requirement, it is the responsibility of the employer to select those elements of the training that are necessary for the type vehicle to be used and the workplace in which that vehicle will be operated. The employer may leave out elements if the employer can demonstrate that they are not relevant to safe operation in the employer's workplace.

An additional component of the training program is a continuing evaluation of the operator. At paragraph (4), OSHA specifies that this evaluation be conducted on a periodic basis so that the employee retains and uses the knowledge, skills and abilities that are necessary for the safe operation of the vehicle. This evaluation need not be conducted continuously, however, the employer should conduct these evaluations at intervals that will ensure that the operators have not forgotten or chosen to disregard their training. This evaluation does not have to be formalized but must consist of a designated person observing the operation to ensure that the use of the powered industrial truck is being conducted safely. OSHA requires that this evaluation be carried out at least annually.

OSHA is requiring at paragraph (5) that the employer certify that the required training and evaluations have been conducted. To minimize the paperwork burden on the employer, OSHA is specifying that the certification consist of the name of the employee, the date of the training or evaluation and the signature of the person conducting the training or evaluation.

Under this paragraph, OSHA also specifies that all the current training materials used in the conduct of training or the name and address of the outside trainer, if one is used, be maintained.

At paragraph (6), OSHA is proposing to allow the employer to forgo that portion of the training that an employee has previously received. The intent of these provisions is to allow the employer to not have to train an employee in those phases of the operation of a powered industrial truck if the employee knows the necessary information and has been evaluated and has proven to be competent to perform those duties.

As previously discussed, there are three major areas of consideration that must be emphasized when conducting a powered industrial truck training program. These three areas are: (1) The characteristics, operation and limitations of the vehicles that the trainee will be authorized to operate, (2) the hazards due to the characteristics of the workplace in which these vehicles will operate, and (3) the general safety rules that apply to these vehicles and their operation.

This proposed rule has been drafted in performance language to allow reasonable flexibility to the employer for developing the training program and conducting the training. OSHA recognizes the inherent differences in the capabilities and limitations of employees, both to assimilate the training and then to utilize the knowledge that has been gained. Therefore, the proposed regulation does not limit the employer by specifying the manner in which the training must be conducted. Similarly, the specific content of the training course has not been stated because there are different topics which must be taught due to variances in the operation of the many makes and models of vehicles and because there are different hazards in each workplace. However, OSHA has proposed the various subject matters that should be covered unless the employer determines they are not relevant to the employer's vehicle and workplace. Although some areas of concern may not be pertinent to any one workplace and vehicle, other areas are pertinent to all vehicles and workplaces.

OSHA believes that a training program needs to be conducted before the employee begins to operate a vehicle. To this end, OSHA has required initial training of employees so that they

will acquire the knowledge and skills are necessary for the safe operation of the powered industrial truck before being allowed to operate the vehicle without close supervision.

OSHA has left the particulars of the type of training (lecture, conference, demonstration, practical exercise, test or examination, etc.) to the employer. The length of the training and other variables must be based on the employee's experience and other qualifications and the nature of the work environment. The training must be based upon the type of vehicles the employee will be allowed to operate, the conditions that exist in the workplace, the general safety rules from this OSHA standard, the ability of the trainer to teach, and the ability of the trainee to learn. The ability of the employee to assimilate the information presented in the training must be used as the primary criterion for the length, type and other details of the training. Since each employee is different in his or her ability to comprehend, assimilate and use the information received in the training, OSHA believes that one standardized training course will not suffice for all employees.

The employer may choose the training provider. This could include contracting with an outside professional training company to come into the company and train the powered industrial truck operators or the employer developing and conducting the training program. In either case, the employer can choose the method or methods by which the employees will be trained and when the training is conducted.

The standard requires not only appropriate training but evaluation of the operators competency by a designated person with the knowledge to make that evaluation. This is the method that will most accurately prove that the operator has been trained and that the training has been, and continues to be, effective. Through observation of the operation of the vehicle, these questions can be answered.

When a new employee claims prior experience in operating a powered industrial truck, the employer must ensure that the employee knows how to operate the vehicle safely. This can be ascertained by questioning the employee on various aspects of the operation of the truck and by requiring the operator to demonstrate his or her ability to operate the vehicle safely through the conduct of a practical exercise.

In making a determination of an employee's claim of sufficient prior experience, the employer must consider the type of equipment that this employee professes to have operated, how long ago this experience was gained, and the type work environment in which the employee worked. Written documentation of the earlier training is also necessary to determine that proper training has been given. In addition, the competency of the employee must be evaluated. Based on the resolution of these issues, the employer can determine whether the experience is recent and thorough enough, the documentation complete, and the competency sufficient to forgo some or much of the initial training. Some training on the specific factors of the new employees workplace is always going to be necessary. Again, the major criterion of evaluation of the employee is: Does the person know how to do the job and does the vehicle operator use those knowledge, skills and abilities to do the job safely?

OSHA also is proposing to add two non-mandatory appendices. These appendices are intended to provide guidance to employers in establishing a training program (Appendix A) and in understanding to basic principles of stability (Appendix B). In neither case is the information contained in these appendices intended to provide a exhaustive explanation of the techniques of conducting training or of understanding the principles of stability, but each appendix is intended to introduce the basic concepts so that the employer can utilize the material to provide basic training.

VIII. Statutory Considerations

A. Introduction

Section 2(b)(3) of the Occupational Safety and Health Act authorizes ''the Secretary of Labor to set mandatory *occupational safety and health standards* applicable to businesses affecting interstate commerce'', and section 5(a)(2) provides that ''[e]ach employer shall comply with *occupational safety and health standards* promulgated under this Act'' (emphasis added). Section 3(8) of the OSH Act (29 U.S.C. 652(8)) provides that ''the term 'occupational safety and health standard' means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.''

OSHA considers a standard to be ''reasonably necessary or appropriate'' within the meaning of section 3(8) if it meets the following criteria:

(1) The standard will substantially reduce a significant risk of material harm;

(2) Compliance is technologically feasible in the sense that the protective measures being required already exist, can be brought into existence with available technology, or can be created with technology that can reasonably be developed;

(3) Compliance is economically feasible in the sense that industry can absorb or pass on the costs without major dislocation or threat of instability; and

(4) The standard is cost effective in that it employs the least expensive protective measures capable of reducing or eliminating significant risk. Additionally, safety standards must better effectuate the Act's protective purpose than any applicable national consensus standard, must be compatible with prior agency action, must be responsive to significant comment in the record, and, to the extent allowed by statute, must be consistent with applicable Executive Orders. OSHA believes that application of these criteria results in standards that provide a high degree of worker protection without undue burden on employers.

OSHA has long interpreted section 3(8) of the OSH Act to require that, before it promulgates ''a health or safety standard, it must find that a place of employment is unsafe—in the sense that significant risks are present and can be eliminated or lessened by a change in practices [See *Industrial Union Dep't, AFL-CIO* v. *American Petroleum Inst.*, 448 U.S. 607, 642 (1980) (plurality) (Benzene).'' When, as frequently happens in safety rulemaking, OSHA promulgates standards that differ from existing national consensus standards, it must explain ''why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard [29 U.S.C. 655(b)(8)].'' Thus, national consensus standards provide the minimum level of effectiveness for standards which OSHA may adopt (29 U.S.C. 655(a)).

As a result, OSHA is precluded from regulating insignificant safety risks or from issuing safety standards that do not lessen risk in a significant way.

The OSH Act also limits OSHA's discretion to issue overly burdensome rules, as the agency also has long recognized that ''any standard that was not economically or technologically feasible would *a fortiori* not be 'reasonably necessary or appropriate' under the Act. See *Industrial Union Dep't* v. *Hodgson,* [499 F.2d 467, 478 (D.C. Cir. 1974)] ('Congress does not appear to have intended to protect

employees by putting their employers out of business.') [*American Textile Mfrs. Inst. Inc.*, 452 U.S. at 513 n. 31 (a standard is economically feasible even if it portends ''disaster for some marginal firms,'' but it is economically infeasible if it ''threaten[s] massive dislocation to, or imperil[s] the existence of,'' the industry)].''

By stating the test in terms of ''threat'' and ''peril,'' the Supreme Court made clear in *ATMI* that economic infeasibility begins short of industry-wide bankruptcy. OSHA itself has placed the line considerably below this level. (See for example, *ATMI*, 452 U.S. at 527 n. 50; 43 FR 27,360 (June 23, 1978). Proposed 200 µg/m3 PEL for cotton dust did not raise serious possibility of industry-wide bankruptcy, but impact on weaving sector would be severe, possibly requiring reconstruction of 90 percent of all weave rooms. OSHA concluded that the 200 µg/m3 level was not feasible for weaving and that 750 µg/m3 was all that could reasonably be required). See also 54 FR 29,245–246 (July 11, 1989); *American Iron & Steel Institute*, 939 F.2d at 1003. OSHA raised the engineering control level for lead in small nonferrous foundries to avoid the possibility of bankruptcy for about half of small foundries even though the industry as a whole could have survived the loss of small firms.) Although the cotton dust and lead rulemakings involved health standards, the economic feasibility ceiling established therein applies equally to safety standards. Indeed, because feasibility is a necessary element of a ''reasonably necessary or appropriate'' standard, this ceiling boundary is the same for health and safety rulemaking since it comes from section 3(8), which governs all permanent OSHA standards.

All OSHA standards must also be cost-effective in the sense that the protective measures being required must be the least expensive measures capable of achieving the desired end (*ATMI*, at 514 n. 32; *Building and Constr. Trades Dep't AFL-CIO* v. *Brock*, 838 F.2d 1258, 1269 (D.C. Cir. 1988)). OSHA gives additional consideration to financial impact in setting the period of time that should be allowed for compliance allowing as much as ten years for compliance phase-in. (See *United Steelworkers of Am.* v. *Marshall*, 647 F.2d 1189, 1278 (D.C. Cir. 1980), *cert. denied*, 453 U.S. 913 (1981).) Additionally, OSHA's enforcement policy takes account of financial hardship on an individualized basis. OSHA's Field Operations Manual provides that, based on an employer's economic situation, OSHA may extend the period within which a violation must be corrected after issuance of a citation (CPL. 2.45B, Chapter III, paragraph E6d(3)(a), Dec. 31, 1990).

To reach the necessary findings and conclusions that a safety standard substantially reduces a significant risk of harm, is both technologically and economically feasible, and is cost effective, OSHA must conduct rulemaking in accord with the requirements of section 6 of the OSH Act. The regulatory proceeding allows it to determine the qualitative and, if possible, the quantitative nature of the risk with and without regulation, the technological feasibility of compliance, the availability of capital to the industry and the extent to which that capital is required for other purposes, the industry's profit history, the industry's ability to absorb costs or pass them on to the consumer, the impact of higher costs on demand, and the impact on competition with substitutes and imports. (See *ATMI* at 2501–2503; *American Iron & Steel Institute* generally.)

Finally, general principles of administrative law require the Agency to justify significant departures from prior practice. (See *International Union, UAW* v. *Pendergrass*, 878 F.2d 389, 400 (D.C. 1989)). In the twenty years since enactment of the OSH Act, OSHA has promulgated numerous safety standards—standards that provide benchmarks for judging risks, benefits, and feasibility of compliance in subsequent rulemakings. (OSHA's Hazardous Waste Operations and Emergency Response Standard, for example, required use of existing technology and well accepted safety practices to eliminate at least 32 deaths and 18,700 lost workday injuries at a cost of about $153 million per year (54 FR 9311–9312; March 6, 1989). The Excavation standard also drew on existing technology and recognized safety practices to save 74 lives and over 800 lost workday injuries annually at a cost of about $306 million. (54 FR 45,954; Oct. 31, 1989). OSHA's Grain Handling Facilities standard relied primarily on simple housekeeping measures to save 18 lives and 394 injuries annually, at a total net cost of $5.9 to $33.4 million (52 FR 49,622; Dec. 31, 1991).)

B. The proposed amendment to the standard for the training of powered industrial truck operators and the promulgation of like requirements for the construction and maritime industries complies with the statutory criteria described above.

As explained in Section I, *Background*, Section II, *The Powered Industrial Truck*, Section III, *Powered Industrial Truck Hazards*, Section IV, *Accident, Injury and Other Data*, and Section V, *Basis for Agency Action*, earlier in this preamble, and in Section IX, *Summary of the Regulatory Impact and Regulatory Flexibility Analysis and Environmental Impact Assessment*, later in this preamble, OSHA has determined that the operation of powered industrial trucks by untrained or inadequately trained operators pose significant risks to employees. There have been on average 85 fatalities, 34,900 serious injuries and 61,800 non-serious injuries annually since 1981 due to unsafe powered industrial truck operation. OSHA estimates that compliance with the revised training requirement for powered industrial truck operator will reduce the risk of hazards to those operators and other employees by 25 percent (preventing 17 to 22 fatalities, 10,898 to 14,118 serious injuries and 15,450 non-serious injuries annually). This constitutes a substantial reduction of significant risk of material harm.

The Agency believes that compliance is technologically feasible because there exists a current rule for the training of powered industrial truck operators and the revised regulation specifies in more detail what is to be taught to those operators, and requires the employer to institute effective supervisory measures to ensure continued safe operation of those vehicles. In many companies, the training of vehicle operators and the subsequent supervisory measures required by the standard have already been implemented.

Additionally, OSHA believes that compliance is economically feasible, because, as documented by the Regulatory Impact Analysis, all regulated sectors can readily absorb or pass on compliance costs.

The standard's costs, benefits, and compliance requirements are reasonable, amounting to approximately 34.9 million in the first year and 19.4 million per year thereafter, preventing 17 to 22 fatalities, 10,898 to 14,118 serious injuries and 15,450 non-serious injuries per year. As explained above, using another definition, OSHA estimates that it will eliminate between 11,968 and 15,504 lost workday injuries in addition to the fatalities prevented. These percentages are consistent with those of other OSHA safety standards.

C. The requirement for the training of powered industrial truck operators is necessary to address the significant risks of material harm posed by the operation of those vehicles.

OSHA believes that Section I, *Background*, Section II, *The Powered Industrial Truck*, Section III, *Powered*

Industrial Truck Hazards, Section IV, *Accident, Injury and Other Data*, and Section V, *Basis for Agency Action*, earlier in this preamble have clearly and comprehensively set out the Agency's bases for concluding that the operation of powered industrial trucks by untrained or inadequately trained employees pose significant risks and that the training of those operators is reasonably necessary to protect affected employees from those risks. In particular, as detailed in Section IX, *Preliminary Regulatory Impact and Regulatory Flexibility Analysis and Environmental Impact Assessment*, later in this preamble, OSHA estimates that the improper operation of powered industrial trucks causes 85 fatalities, 34,902 serious injuries, and 61,800 non-serious injuries annually, and that revision of and compliance with the requirements of the OSHA standard for the training of powered industrial truck operators will reduce the risk of fatality and injury by 25 percent (preventing 17 to 22 fatalities, 10,898 to 14,118 serious injuries and 15,450 non-serious injuries).

OSHA emphasizes that its risk assessment is based on employee exposure to the hazards of the operation of powered industrial trucks, hazards that exists in a large range of industries. Although Section IX, *Preliminary Regulatory Impact and Regulatory Flexibility Analysis and Environmental Impact Assessment*, later in this preamble, presents OSHA's estimate of the costs and benefits of the revision of the training requirement in terms of the Standard Industrial Classification (SIC) codes for the industries regulated, OSHA does not believe that the risk associated with these hazards vary according to what SIC code a vehicle may be operated in. Thus, some of the industry categories within the scope of the final rule that will have compliance costs have had few or no documented powered industrial truck accidents or injuries or fatalities during the period covered by the PRIA. In this case, OSHA has considered developing a scope of the rule to cover those situations it has determined to be hazardous. As explained more fully below, OSHA has determined that the lack of prior documented injuries and deaths in some SIC Codes does not indicate that the employees in those industries are not exposed to significant risks from the unsafe operation of powered industrial trucks. As the summary of the PRIA explains in detail, OSHA has determined that it is appropriate to include those industries within the scope of the standard because employees in those industries are exposed to the same kinds of hazards as employees in industries for which there are reported injuries and fatalities.

Even in industry sectors in which no injuries or fatalities have been reported, the Agency believes there is sufficient information for OSHA to determine that employees who work in areas in which powered industrial trucks are operated or operate those vehicles face significant risks, based on analysis of the elements of the hazards identified and of the similarity of hazard elements between industry sectors. Therefore, the Agency has determined that all employees who operate those vehicles or work in areas in which those vehicles are operated face a significant risk of material harm and that compliance with the powered industrial truck standard is reasonably necessary to protect affected employees from those risks, regardless of the number of accidents and injuries reported for the SIC code to which the employer has been assigned.

Also, because of the difficulties the Agency has experienced in compiling a database for powered industrial truck accidents, injuries or fatalities may have occurred in industries, including those for which no incidents have been documented, without being recorded. In addition, the SIC code-based organization of incident data may mask actual or potential hazards of the operation of powered industrial trucks because, while a business is classified for SIC purposes according to its principal activity, the workplace may also contain warehousing areas where materials are stored as a ''secondary'' purpose, that have necessitated the use of powered industrial trucks with their resultant injuries or fatalities. For example, a new car dealer would be classified under the new car dealer SIC, even though the dealer may store a large number of auto accessories, such as tires and batteries. In many instances, large quantities of items like batteries are palletized for ease of handling. When these pallets of material are delivered to the dealer, the items are either removed from the pallet and handling manually, or the pallet and the material are moved with some type of powered industrial truck, such as a pallet jack. Although the workplace is a new car dealer, a powered industrial truck is in use and an accident would have nothing to do with selling new cars. Therefore, OSHA believes, based on the limitations of the accident data and the circumstantial nature of many vehicle accidents, that it is appropriate to require that employers protect affected employees from the hazards of vehicle operations in all workplaces where powered industrial trucks are used, rather than to characterize workplaces according to the injury or fatality experience of the SIC codes in which they have been classified.

The Agency also notes that many accidents that occur as a result of powered industrial truck operations are not classified as an accident involving a truck. For example, if a powered industrial truck is used to lift an employee who is standing on the forks of the vehicle and the employee falls from those forks while aloft, the accident could be classified as a fall from height or a fall from an elevated platform. In both instances, the fact that the employee was unsafely taken aloft on the forks of a powered industrial truck and fell from those forks is not transferred to the accident report because the accident was attributed to other causes.

Finally, it is well established in the OSH Act enforcement context that the lack of injuries or deaths to a particular employer's employees does not establish that the employees are not exposed to a hazard. In a frequently quoted passage, the Fifth Circuit long ago observed that ''the goal of the Act is to prevent the first accident, not to serve as a source of consolation for the first victim or his survivors'' *(Mineral Industries & Heavy Construction Group* v. *OSHRC*, 639 F.2d 1289, 1294 (5th Cir. 1981)). This principle applies to regulatory actions as well. Once the agency determines that exposure to a particular condition constitutes a significant risk, it need not repeat that analysis for every situation or type of workplace in which the condition is found.

In addition, those segments with fewer trucks and, consequently fewer accidents, will have lower costs for training and evaluation. However, the risk to each individual operator for each year of operation is approximately the same as in industries with more trucks and operators. This approach was upheld in *International Union, UAW*, v. *OSHA*, —F. 2d—, (D.C. Circ., October 21, 1994)

For all of the foregoing reasons, OSHA has determined that it is inappropriate to exclude any of the SICs merely because they have not recently had documented powered industrial truck injuries or fatalities, insofar as those SICs contain workplaces where those vehicles are operated.

D. Conclusion

OSHA has determined that the powered industrial truck standard, like other safety standards, is subject to the constraints of section 3(8) of the OSH

Act, that the standard is ''reasonably necessary or appropriate to provide safe or healthful employment and places of employment.'' But the standard is not subject to the section 6(b)(5) requirement that it limit significant risk ''to the extent feasible.''

The Agency believes that the use of powered industrial trucks in the workplace by untrained or poorly trained employees poses significant risks and that the need to require that only properly trained employees operate those vehicles is reasonably necessary to protect affected employees from those risks. OSHA also has determined that compliance with the standard for the training of those operators is technologically feasible because many companies offer the type training that the standard would require. In addition, OSHA believes that compliance is economically feasible, because, as documented by the Preliminary Regulatory Impact Analysis (Ex. 2), all regulated sectors can readily absorb or pass on initial compliance costs and economic benefits will ultimately exceed compliance costs. In particular, the Agency believes that compliance with the powered industrial truck training requirement will result in substantial cost savings and productivity gains at facilities that utilize powered industrial trucks that might otherwise be disrupted by accidents and injuries.

As detailed in the Summary of the Preliminary Regulatory Impact Analysis, the standard's costs, benefits, and compliance requirements are consistent with those of other OSHA safety standards. For example, the Hazardous Waste Operations and Emergency Response standard (29 CFR 1910.120) requires the use of existing technology and well accepted safety practices to eliminate at least 32 deaths and 18,700 lost workday injuries at a cost of about $153 million per year (54 FR 9311–9312; March 6, 1989). The Excavations standard (29 CFR 1926, Subpart P) also drew on existing technology and recognized safety practices to save 74 lives and over 800 lost workday injuries annually at a cost of about $306 million (54 FR 45,954; Oct. 31, 1989). Additionally, the Grain Handling Facilities standard (29 CFR 1910.272) relied primarily on simple housekeeping measures to save 18 lives and 394 injuries annually, at a total net cost of between $5.9 million and $33.4 million (52 FR 49,622; Dec. 31, 1987). Also, compliance with the planning, work practice, and training provisions of the Process Safety Management standard (29 CFR 1910.119) will reduce the risk of catastrophic fire and explosion (330 fatalities and 1917 injuries and illnesses annually) by 80 percent, at an annualized cost of $888.7 million in the first five years and at an annualized cost of $470.8 million in the following five years.

IX. Summary of the Preliminary Economic, Feasibility and Regulatory Flexibility Analyses and Environmental Impact Assessment

A. Introduction

Executive Order 12866 and the Regulatory Flexibility Act require Federal Agencies to analyze the costs, benefits and other consequences and impacts of proposed standards and final rules. Consistent with these requirements, OSHA has prepared a preliminary economic analysis for the proposed revisions to and adoption of the powered industrial truck operator training provisions which are proposed in this document.

This analysis includes a description of the industries that would be affected by the regulation, an assessment of the benefits attributable to adoption of the proposal, a determination of the technological feasibility of the proposed revisions, estimation of the costs of compliance, a determination of the economic feasibility of compliance with the proposed provisions, and an analysis of the economic and other impacts of this rulemaking. The Advisory Committee on Construction Safety and Health is currently reviewing the proposed rule for applicability to the construction industry and based on the Advisory Committee's recommendations, OSHA may extend the coverage of the proposed rule to this sector in the future.

Affected Industries

Using powered industrial truck sales data provided by the Industrial Truck Association (ITA), OSHA estimates that there are 822,831 industrial trucks in use in industries covered by the proposed standard. Industries with the largest number of powered industrial trucks include wholesale trade-non-durable goods (SIC 51) with an estimated 109,232 powered industrial trucks, and food and kindred products (SIC 20) with an estimated 71,275 such trucks.

The proposed OSHA revisions will cover workers who operate powered industrial trucks. This includes operators using these vehicles in the general industry and maritime sectors. The population-at-risk in powered industrial truck accidents consists primarily of the operators of these trucks. Operators of powered industrial trucks include workers employed as designated truck operators as well as those who might operate powered industrial truck as part of another job. These alternate users of powered industrial trucks include shipping and receiving clerks, order pickers, maintenance personnel, and general temporary workers. Non-driving workers such as warehousemen, materials handlers, laborers and pedestrians who work on or are present in the vicinity of powered industrial trucks are also injured or killed in powered industrial truck accidents. Estimates of the number of non-driving employees are not included in the population-at-risk numbers presented in this economic analysis. However, non-driving employees are included in the number of preventable fatal and non-fatal injuries estimated to be associated with compliance with the proposed rule.

OSHA estimates that approximately 1.2 million workers are employed as industrial truck operators in industries regulated by OSHA. Industries with the largest number of operators include wholesale trade (SIC 51) with 163,848 operators, and food and kindred products (SIC 20) with 106,913 operators.

Technological Feasibility

OSHA could not identify any requirement in the proposed standard that raises technological feasibility problems for establishments that use industrial trucks. On the contrary, there is substantial evidence that establishments can achieve compliance with all requirements using existing methods and equipment. In addition, the standard introduces no technological requirements of any type. Therefore, OSHA has preliminarily concluded that technological feasibility is not an issue for the proposed standard.

Costs of Compliance

The proposed OSHA industrial truck operator training standard would expand the initial training required by the existing standard to include information on the operating instructions and warnings appropriate to the type of truck used, the specific hazards in the workplace where the truck will be operated, and instructions pertaining to the requirements of the OSHA standard. Additionally, the proposed standard requires employers to monitor the performance of industrial truck operators through an annual evaluation and to provide remedial training when this evaluation suggests that such training is needed.

OSHA estimates that the first year cost of compliance with the proposed standard will be $34.9 million and that the annual cost of compliance thereafter will be $19.4 million. Table 12 outlines the annual costs by each sector affected by the proposed standard. Industry sectors with the highest estimated annualized compliance costs are manufacturing, with $9.8 million, and wholesale and retail trade with $5.6 million. Existing industry practice was taken into consideration when calculating costs, i.e., where employers have already voluntarily implemented practices that would be required by the proposed standard, no cost is attributed to the standard. OSHA welcomes comments on the preliminary costs and assumptions presented in this Preliminary Economic Analysis.

TABLE 12.—ESTIMATED ANNUALIZED COMPLIANCE COSTS FOR THE PROPOSED INDUSTRIAL TRUCK OPERATOR TRAINING STANDARD

Sector	Initial evaluation	Initial training	Monitoring	Remedial training	Total
Agriculture	$2,457	$28,637	$39,404	$2,251	$72,749
Mining [a]	1,109	12,923	17,778	1,016	32,825
Manufacturing	332,222	3,872,651	5,327,726	304,441	9,837,040
Transportation and Utilities	91,344	1,064,777	1,464,847	83,706	2,704,674
Wholesale and Retail Trade	189,193	2,205,396	3,034,033	173,373	5,601,996
Finance, Insurance, & Real Estate	2,607	30,389	41,807	2,389	77,192
Services	37,477	436,859	601,001	34,343	1,109,679
Total	656,408	7,651,632	10,526,595	601,519	19,436,154

[a] Oil and gas extraction.

Note: Costs are annualized over 10 years at a 7 percent interest rate (annualization factor 0.1424).
Source: US Department of Labor, OSHA, Office of Regulatory Analysis, based on ERG [1, Section 3].

Benefits

An estimated 85 fatalities and 34,902 injuries result annually from industrial truck-related accidents. As presented in Table 13, OSHA estimates that full compliance with the proposed standard will prevent between 17 and 22 of these fatalities per year and between 10,898 and 14,118 lost workday injuries. These preventable fatalities and injuries are in addition to lives saved and injuries prevented by OSHA's existing standard.

The proposed standard will also reduce property damage and training-related litigation. OSHA's preliminary analysis of the impacts of improved training show reductions in property damage valued at an estimated $8 million to $42 million annually. In addition, OSHA estimates that approximately $770,018 will be saved annually in damages and settlements in court cases that would have been awarded as a result of injuries caused by deficiencies in industrial truck operator training.

TABLE 13.—NUMBER OF FATALITIES AND INJURIES PREVENTED BY COMPLIANCE WITH THE PROPOSED POWERED INDUSTRIAL TRUCK TRAINING STANDARD

Industry group	Total number of industrial truck fatalities	Preventable fatalities under proposed standard		Total number of industrial truck injuries	Preventable injuries under proposed standard	
		Low	High		Low	High
Forestry, Fishing and Agricultural Services	0	0	0	219	68	88
Mining—oil and gas extraction	1	0.2	0.3	84	26	34
Manufacturing	30	5.9	7.7	14,895	4,651	6,025
Transportation, communication, and utilities	20	3.9	5.1	4,265	1,332	1,725
Wholesale and retail trade	25	4.9	6.4	12,012	3,751	4,859
Finance, insurance, and real estate	0	0	0	212	66	86
Services	9	1.8	2.3	3,215	1,004	1,300
All industries	85	17	22	34,902	10,898	14,118

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis, based on ERG Report (1, Section 4).

Economic Impacts and Regulatory Flexibility Analysis

OSHA assessed the potential economic impacts of compliance with the proposed standard and has preliminarily determined that the standard is economically feasible for all industry groups. Detailed information at the three-digit SIC level is presented in OSHA's Preliminary Economic Analysis. When an industry enjoys an inelastic demand for its products, an increase in operating costs can ordinarily be passed on to consumers. In this case, the maximum expected price increase is calculated by dividing the average estimated compliance cost in each industry by the average revenue for that industry. OSHA estimates that the average price increase would be negligible, about 0.0002 percent. Table 14 shows that the average price increase at the two-digit SIC level would be extremely small. (For impacts at the three-digit SIC level, see economic analysis, Table V–1). These estimates indicate that even if all costs were passed on to consumers through price increases, the proposed standard would have a negligible impact on prices overall.

Given the minuscule price increases necessary to cover the cost of the proposed training requirements, employers should be able to pass along compliance costs to customers. However, even if all costs were absorbed by the affected firms, the average

reduction in profits would be only 0.007 percent. As presented in Table 14, the largest potential decrease in profits—0.038 percent—would occur in SIC 51, Nondurable Goods. Because most firms will not find it necessary to absorb all of the costs from profits and should be able to pass most if not all of the standard's costs on to consumers, average profits are not expected to decline to the extent calculated here. OSHA, therefore, does not expect the revised standard to have a significant economic impact on affected firms or industries.

TABLE 14.—ECONOMIC IMPACT OF THE PROPOSED POWERED INDUSTRIAL TRUCKS OPERATOR TRAINING STANDARD

SIC/Industry sector	Value of industry shipments, receipts or sales ($ millions)	Annualized compliance costs	Compliance costs as a percent of sales	Pre-tax income ($ millions)	Compliance costs as a percent of pre-tax income
07 Agricultural services	NA	$72,749	.....	.....	.....
13 Mining—oil and gas extraction	$48,178	32,825	Negligible	.....	.....
20 Food and kindred products	387,601	1,774,023	0.0005	36,213	0.005
21 Tobacco products	32,032	43,951	0.0001	(1)	(1)
22 Textile mill products	65,706	384,461	0.0006	5,102	0.008
23 Apparel and other textile products	65,345	109,656	0.0002	3,548	0.003
24 Lumber and wood products	70,569	415,093	0.0006	2,881	0.014
25 Furniture and fixtures	40,027	194,006	0.0005	1,942	0.010
26 Paper and allied products	128,824	760,042	0.0006	7,307	0.010
27 Printing, publishing, and allied industries	156,685	435,959	0.0003	13,171	0.003
28 Chemicals and allied products	292,326	931,407	0.0003	24,169	0.004
29 Petroleum refining and related industries	158,076	92,786	0.0001	11,193	0.001
30 Rubber and miscellaneous plastics products	100,668	522,973	0.0005	5,366	0.010
31 Leather and leather products	9,142	47,059	0.0005	(2)	(2)
32 Stone, clay, glass, and concrete products	59,611	396,003	0.0007	2,664	0.015
33 Primary metal industries	132,837	567,368	0.0004	3,133	0.018
34 Fabricated metal products	157,077	717,423	0.0005	7,660	0.009
35 Industrial and commercial machinery and computer equip	243,479	900,774	0.0004	.....	.....
36 Electric and electronic equipment	197,880	492,784	0.0002	15,378	0.003
37 Transportation equipment	364,032	691,674	0.0002	1,916	0.036
38 Instruments and related equipment	127,160	141,176	0.0001	8,326	0.002
39 Miscellaneous manufacturing industries	37,131	218,423	0.0006	2,418	0.009
40 Railroad transportation	44,422	69,042	0.0002	.....	.....
41 Local, suburban, and interurban passenger transit	8,094	51,782	0.0006	.....	.....
42 Trucking and warehousing	110,103	1,800,849	0.0016	.....	.....
44 Water transportation	18,336	105,655	0.0006	.....	.....
45 Transportation by air	82,055	188,820	0.0002	.....	.....
46 Pipelines, except natural gas	2,098	4,707	0.0002	.....	.....
47 Transportation services	54,432	156,391	0.0003	.....	.....
48 Communications	232,257	60,673	Negligible	.....	.....
49 Electric, gas and sanitary services	292,280	266,754	0.0001	.....	.....
50 Durable goods	981,208	1,335,982	0.0001	4,880	0.027
51 Nondurable goods	943,174	2,201,118	0.0002	5,831	0.038
52 Building materials and garden supplies	115,855	426,997	0.0004	.....	.....
53 General merchandise stores	266,991	683,253	0.0003	.....	.....
54 Food stores	392,400	690,815	0.0002	.....	.....
55 Automatic dealers and service stations	587,890	67,212	Negligible	.....	.....
56 Apparel and accessory stores	106,128	39,537	Negligible	.....	.....
57 Furniture and home furnishings stores	113,673	136,581	0.0001	.....	.....
58 Eating and drinking places	211,036	28,035	Negligible	.....	.....
59 Miscellaneous retails	249,463	265,974	0.0001	.....	.....
60 Banking	48,477	15,103	Negligible	.....	.....
61 Credit agencies other than banks	69,148	6,293	Negligible	.....	.....
62 Security and commodity brokers and services	41,226	5,034	Negligible	.....	.....
63 Insurance carriers	521,036	27,269	Negligible	.....	.....
64 Insurance agents, brokers, and services	31,623	2,937	Negligible	.....	.....
65 Real estate	96,942	13,425	Negligible	.....	.....
67 Holding and other investment offices	47,301	7,132	Negligible	.....	.....
70 Hotels and other lodging places	64,630	13,486	Negligible	.....	.....
72 Personal services	59,052	13,486	Negligible	.....	.....
78 Motion pictures	43,838	17,164	Negligible	.....	.....
79 Amusement and recreation services	51,107	25,746	Negligible	.....	.....
80 Health services	285,040	72,743	Negligible	.....	.....
81 Legal services	96,179	4,495	Negligible	.....	.....
82 Educational services	4,617	64,569	0.0014	.....	.....
83 Social services	68,312	22,068	Negligible	.....	.....
84 Museums, art galleries, botanical and zoological gardens	3,551	1,226	Negligible	.....	.....
86 Membership organizations	39,118	7,765	Negligible	.....	.....
87 Engineering, accounting, research and management svcs	224,238	52,309	Negligible	.....	.....
89 Miscellaneous services, n.e.c.	23,871	15,938	0.0001	.....	.....

TABLE 14.—ECONOMIC IMPACT OF THE PROPOSED POWERED INDUSTRIAL TRUCKS OPERATOR TRAINING STANDARD—Continued

SIC/Industry sector	Value of industry shipments, receipts or sales ($ millions)	Annualized compliance costs	Compliance costs as a percent of sales	Pre-tax income ($ millions)	Compliance costs as a percent of pre-tax income
Totals	.....	19,436,154	0.0002	.....	0.007

[1] =included under SIC 20.
[2] =included under SIC 23.
Negligible denotes less than 0.00001 percent.
Source: US Department of Labor, OSHA, Office of Regulatory Analysis, based on ERG Report (1, Chapter 6).

In accordance with the Regulatory Flexibility Act of 1980 (5 U.S.C. 601 *et seq.*), OSHA has also analyzed the economic impact of the proposed standard on small establishments (19 or fewer employees), looking particularly for evidence that the rule would have a significant impact on a substantial number of small entities. Small businesses will incur lower compliance costs than larger businesses because the compliance costs depend directly on the number of industrial truck operators in a given facility. OSHA has preliminarily concluded that it would not have a significant impact upon a substantial number of small entities. Assuming a 15 percent turnover rate, compliance costs for a typical small business in public warehousing and storage (SIC 422) will be $1,188 in the first year and $280 annually thereafter. OSHA estimates that the average price impact for small establishments will not exceed 0.12 percent. Similarly, OSHA estimates that, if the average establishment could not pass any of these costs to its customers through this very small price increase (a highly unlikely scenario), the costs would impact average profits by less than 1.2 percent. These impacts are judged to be relatively minor; therefore, the proposed standard is economically feasible for small establishments.

XI. Environmental Assessment

The proposed rules have been reviewed in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the regulations of the Council of Environmental Quality (CEQ) (40 CFR part 1500), and DOL NEPA procedures (29 CFR part 11). The provision of the standard focuses on the reduction and avoidance of incidents involving powered industrial trucks. Consequently, no major negative impact is foreseen on air, water or soil quality, plant or animal life, the use of land or other aspects of the environment. Therefore, this revision is categorized as an excluded action according to subpart B, § 11.10 of the DOL NEPA regulations.

X. International Trade

This revision of the OSHA standards on powered industrial trucks and the promulgation of the same standard for other industries is not likely to have a significant effect on international trade because of the small magnitude of any price increase that would be required for passing forward compliance costs. As shown above, the maximum price increases generated from the proposed rule would be less that 1.0 percent for the majority of affected establishments. Further, none of the compliance requirements affect the demand for foreign-made safety equipment. It can be concluded, therefore, that there will be no measurable impacts on foreign trade.

XII. Federalism

This proposed regulation has been reviewed in accordance with Executive Order 12612 (52 FR 41685, October 30, 1987), regarding Federalism. This Order requires that agencies, to the extent possible, refrain from limiting state policy options, consult with states prior to taking any actions which would restrict state policy options, and take such actions only when there is clear constitutional authority and the presence of a problem of national scope. The Order provides for preemption of state law only if there is a clear Congressional intent for the Agency to do so. Any such preemption is to be limited to the extent possible.

Section 18 of the Occupational Safety and Health Act (OSH Act) expresses Congress' intent to preempt state laws relating to issues on which Federal OSHA has promulgated occupational safety and health standards. Under the OSH Act, a state can avoid preemption in issues covered by Federal standards only if it submits, and obtains Federal approval of, a plan for the development of such standards and their enforcement. Occupational safety and health standards developed by such Plan states must, among other things, be at least as effective in providing safe and healthful employment and places of employment as the Federal standards. When such standards are applicable to products distributed or used in interstate commerce they may not unduly burden commerce and must be justified by compelling local conditions.

The Federal proposed standard on powered industrial truck operator training addresses hazards that are not unique to any one state or region of the country. Nonetheless, states with occupational safety and health plans approved under section 18 of the OSH Act will be able to develop their own state standards to deal with any special problems which might be encountered in a particular state. Moreover, because this standard is written in general, performance-oriented terms, there is considerable flexibility for state plans to require, and for affected employers to use, methods of compliance which are appropriate to the working conditions covered by the standard.

In brief, this proposed rule addresses a clear national problem related to occupational safety and health in general industry. Those states which have elected to participate under section 18 of the OSH Act are not preempted by this standard, and will be able to address any special conditions within the framework of the Federal Act while ensuring that the state standards are at least as effective as their standard. State comments are invited on this proposal and will be fully considered prior to promulgation of a final rule.

XIII. Public Participation

Interested persons are requested to submit written data, views and arguments concerning this proposal. These comments must be postmarked by July 12, 1995, and submitted in quadruplicate to the Docket Office; Docket No. S–008, Room N2624; U.S. Department of Labor, Occupational Safety and Health Administration; 200

Constitution Ave., NW., Washington, DC 20210.

All written comments received within the specified comment period will be made a part of the record and will be available for public inspection and copying at the above Docket Office address.

Additionally, under section 6(b)(3) of the OSH Act and 29 CFR 1911.11, interested persons may file objections to the proposal and request an informal hearing. The objections and hearing requests should be submitted in quadruplicate to the Docket Office at the above address and must comply with the following conditions:

1. The objection must include the name and address of the objector;

2. The objections must be postmarked by July 12, 1995;

3. The objections must specify with particularity grounds upon which the objection is based;

4. Each objection must be separately numbered; and

5. The objections must be accompanied by a detailed summary of the evidence proposed to be adduced at the requested hearing.

Interested persons who have objections to various provisions or have changes to recommend may of course make those objections and their recommendations in their comments and OSHA will fully consider them. There is only need to file formal ''objections'' separately if the interested person requests a public hearing.

OSHA recognizes that there may be interested persons who, through their knowledge of safety or their experience in the operations involved, would wish to endorse or support certain provisions in the standard. OSHA welcomes such supportive comments, including any pertinent accident data or cost information which may be available, in order that the record of this rulemaking will present a balanced picture of the public response on the issues involved.

XIV. State Plan Standards

The 25 States with their own OSHA approved occupational safety and health plans must adopt a comparable standard within six months of the publication date of the final standard. These States are: Alaska, Arizona, California, Connecticut (for State and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for State and local government employees only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Island, Washington, and Wyoming. Until such time as a State standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in those States.

List of Subjects

29 CFR Part 1910

Motor vehicle safety, Occupational safety and health, Transportation.

29 CFR Part 1915

Motor vehicle safety, Occupational safety and health, Transportation, Vessels.

29 CFR Part 1917

Marine terminals, Motor vehicle safety, Occupational safety and health, Vessels.

29 CFR Part 1918

Longshoring, Motor vehicle safety, Occupational safety and health, Vessels.

XV. Authority

This document was prepared under the direction of Joseph A. Dear, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

Accordingly, pursuant to section 4, 6(b), 8(c) and 8(g) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), Secretary of Labor's Order No. 1–90 (55 FR 9033), and 29 CFR part 1911, it is proposed to amend 29 CFR parts 1910, 1915, 1917, 1918 and 1926 as set forth below.

Signed at Washington, DC, this 24th day of February, 1995.

Joseph A. Dear,

Assistant Secretary of Labor.

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for subpart N of part 1910 would be revised to read as follows:

Authority: Secs. 4, 6, 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736) or 1–90 (55 FR 9033), as applicable.

Section 1910.177 also issued under 5 U.S.C. 553 and 29 CFR part 1911.

Sections 1910.176, 1910.178, 1910.179, 1910.183, 1910.184, 1910.189, and 1910.190 also issued under 29 CFR part 1911.

2. Section 1910.178 would be amended by revising paragraph (l) and by adding appendices A and B at the end of the section to read as follows:

§ 1910.178 Powered industrial trucks.

* * * * *

(l) *Operator training.*

(1) *Operator qualifications.* (i) The employer shall ensure that each potential operator of a powered industrial truck is capable of performing the duties that are required of the job.

(ii) In determining operator qualifications, the employer shall ensure that each potential operator has received the training required by this paragraph (l), that each potential operator has been evaluated by a designated person while performing the required duties, and that each potential operator performs those operations competently.

(2) *Training program implementation.*

(i) The employer shall implement a training program and ensure that only trained drivers who have successfully completed the training program are allowed to operate powered industrial trucks. Exception: Trainees under the direct supervision of a designated person shall be allowed to operate a powered industrial truck provided the operation of the vehicle is conducted in an area where other employees are not near and the operation of the truck is under controlled conditions.

(ii) Training shall consist of a combination of classroom instruction (Lecture, discussion, video tapes, and/or conference) and practical training (demonstrations and practical exercises by the trainee).

(iii) All training and evaluation shall be conducted by a designated person who has the requisite knowledge, training and experience to train powered industrial truck operators and judge their competency.

(3) *Training program content.* Powered industrial truck operator trainees shall be trained in the following topics unless the employer can demonstrate that some of the topics are not needed for safe operation.

(i) Truck related topics.

(A) All operating instructions, warnings and precautions for the types of trucks the operator will be authorized to operate;

(B) Similarities to and differences from the automobile;

(C) Controls and instrumentation: location, what they do and how they work;

(D) Power plant operation and maintenance;

(E) Steering and maneuvering;

(F) Visibility (including restrictions due to loading);

(G) Fork and attachment adaption, operation and limitations of their utilization;

(H) Vehicle capacity;

(I) Vehicle stability;

(J) Vehicle inspection and maintenance;

(K) Refueling or charging, recharging batteries;

(L) Operating limitations; and

(M) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(ii) Workplace related topics.

(A) Surface conditions where the vehicle will be operated;

(B) Composition of probable loads and load stability;

(C) Load manipulation, stacking, unstacking;

(D) Pedestrian traffic;

(E) Narrow aisles and other restricted places of operation;

(F) Operating in hazardous classified locations;

(G) Operating the truck on ramps and other sloped surfaces that could affect the stability of the vehicle;

(H) Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace; and

(I) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(iii) The requirements of this section.

(4) *Evaluation and refresher or remedial training.*

(i) Sufficient evaluation and remedial training shall be conducted so that the employee retains and uses the knowledge, skills and ability needed to operate the powered industrial truck safely.

(ii) An evaluation of the performance of each powered industrial truck operator shall be conducted at least annually by a designated person.

(iii) Refresher or remedial training shall be provided when there is reason to believe that there has been unsafe operation, when an accident or a near-miss occurs or when an evaluation indicates that the operator is not capable of performing the assigned duties.

(5) *Certification.*

(i) The employer shall certify that each operator has received the training, has been evaluated as required by this paragraph, and has demonstrated competency in the performance of the operator's duties. The certification shall include the name of the trainee, the date of training, and the signature of the person performing the training and evaluation.

(ii) The employer shall retain the current training materials and course outline or the name and address of the person who conducted the training if it was conducted by an outside trainer.

(6) *Avoidance of Duplicative Training.*

(i) Each current truck operator who has received training in any of the elements specified in paragraph (l)(3) of this section for the types of trucks the employee is authorized to operate and the type workplace that the trucks are being operated in need not be retrained in those elements if the employer certifies in accordance with paragraph (l)(5)(i) of this section that the operator has been evaluated to be competent to perform those duties.

(ii) Each new truck operator who has received training in any of the elements specified in paragraph (l)(3) of this section for the types of trucks the employee will be authorized to operate and the type of workplace in which the trucks will be operated need not be retrained in those elements before initial assignment in the workplace if the employer has written documentation of the training and if the employee is evaluated pursuant to paragraph (l)(4) of this section to be competent.

Note to paragraph (l): Appendices A and B at the end of this section provide non-mandatory guidance to assist employers in implementing this paragraph (l).

* * * * *

Appendixes to 31910.178

Appendix A—Training of Powered Industrial Truck Operators

(Non-mandatory appendix to paragraph (l) of this section)

A–1. Operator Selection

A–1.1. Prospective operators of powered industrial trucks should be identified based upon their ability to be trained and accommodated to perform job functions that are essential to the operation of a powered industrial truck. Determination of the capabilities of a prospective operator to fulfill the demands of the job should be based upon the tasks that the job demands.

A–1.2. The employer should identify all the aspects of the job that the employee must meet/perform when doing his or her job. These aspects could include the level at which the employee must see and hear, the physical demands of the job, and the environmental extremes of the job.

A–1.3. One factor to be considered is the ability of the candidate to see and hear within reasonably acceptable limits. Included in the vision requirements are the ability to see at distance and peripherally. In certain instances, there also is a requirement for the candidate to discern different colors, primarily red, yellow and green.

A–1.4. The environmental extremes that might be demanded of a potential powered industrial truck operator include that ability of the person to work in areas of excessive cold or heat.

A–1.5. After an employee has been trained and appropriate accommodations have been made, the employer needs to determine whether the employee can safely perform the job.

A–2. The Method(s) of Training

A–2.1. Among the many methods of training are the lecture, conference, demonstration, test (written and/or oral) and the practical exercise. In most instances, a combination of these methods have been successfully used to train employees in the knowledge, skills and abilities that are essential to perform the job function that the employee is being trained to perform. To enhance the training and to make the training more understandable to the employee, employers and other trainers have used movies, slides, video tapes and other visual presentations. Making the presentation more understandable has several advantages including:

(1) The employees being trained remain more attentive during the presentation if graphical presentation are used, thereby increasing the effectiveness of the training;

(2) The use of visual presentations allows the trainer to ensure that the necessary information is covered during the training;

(3) The use of graphics makes better utilization of the training time by decreasing the need for the instructor to carry on long discussions about the instructional material; and

(4) The use of graphics during instruction provides greater retention by the trainees.

A–3. Training Program Content

A–3.1. Because each type (make and model) powered industrial truck has different operating characteristics, limitations and other unique features, an optimum employee training program for powered industrial truck operators must be based upon the type vehicles that the employee will be trained and authorized to operate. The training must also emphasize the features of the workplace which will affect the manner in which the vehicle must be operated. Finally, the training must include the general safety rules applicable to the operation of all powered industrial trucks.

A–3.2. Selection of the methods of training the operators has been left to the reasonable determination of the employer. Whereas some employees can assimilate instructional material while seated in a classroom, other employees may learn best by observing the conduct of operations (demonstration) and/or by

having to personally conduct the operations (practical exercise). In some instances, an employee can receive valuable instruction through the use of electronic mediums, such as the use of video tapes and movies. In most instances, a combination of the different training methods may provide the mechanism for providing the best training in the least amount of time. OSHA has specified at paragraph (l)(2)(ii) of this section that the training must consist of a combination classroom instruction and practical exercise. The use of both these modes of instruction is the only way of assuring that the trainee has received and comprehended the instruction and can utilize the information to safely operate a powered industrial truck.

A–4. Initial Training

A–4.1. The following is an outline of a generalized forklift operator training program:

(1) Characteristics of the powered industrial truck(s) the employee will be allowed to operate:

(a) Similarities to and differences from the automobile;

(b) Controls and instrumentation: location, what they do and how they work;

(c) Power plant operation and maintenance;

(d) Steering and maneuvering;

(e) Visibility;

(f) Fork and/or attachment adaption, operation and limitations of their utilization;

(g) Vehicle capacity;

(h) Vehicle stability;

(i) Vehicle inspection and maintenance;

(j) Refueling or charging, recharging batteries.

(k) Operating limitations.

(l) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(2) The operating environment:

(a) Floor surfaces and/or ground conditions where the vehicle will be operated;

(b) Composition of probable loads and load stability;

(c) Load manipulation, stacking, unstacking;

(d) Pedestrian traffic;

(e) Narrow aisle and restricted place operation;

(f) Operating in classified hazardous locations;

(g) Operating the truck on ramps and other sloped surfaces which would affect the stability of the vehicle;

(h) Other unique or potentially hazardous environmental conditions which exist or may exist in the workplace.

(i) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(3) The requirements of this OSHA Standard.

A–5. Trainee Evaluation

A–5.1. The provisions of these proposed requirements specify that an employee evaluation be conducted both as part of the training and after completion of the training. The initial evaluation is useful for many reasons, including:

(1) the employer can determine what methods of instruction will produce a proficient truck operator with the minimum of time and effort;

(2) the employer can gain insight into the previous training that the trainee has received; and

(3) a determination can be made as to whether the trainee will be able to successfully operate a powered industrial truck. This initial evaluation can be completed by having the employee fill out a questionnaire, by an oral interview, or by a combination of these mechanisms. In many cases, answers received by the employee can be substantiated by contact with other employees or previous employers.

A–6. Refresher or Remedial Training

A–6.1. (The type information listed at paragraph A–6.2 of this appendix would be used when the training is more than an on-the-spot correction being made by a supervisor or when there have been multiple instances of on-the-spot corrections having to be made.) When an on-the-spot correction is used, the person making the correction should point out the incorrect manner of operation of the truck or other unsafe act being conducted, tell the employee how to do the operation correctly, and then ensure that the employee does the operation correctly.

A–6.2. The following items may be used when a more general, structured retraining program is utilized to train employees and eliminate unsafe operation of the vehicle:

(1) Common unsafe situations encountered in the workplace;

(2) Unsafe methods of operating observed or known to be used;

(3) The need for constant attentiveness to the vehicle, the workplace conditions and the manner in which the vehicle is operated.

A–6.3. Details about the above subject areas need to be expanded upon so that the operator receives all the information which is necessary for the safe operation of the vehicle. Insight into some of the specifics of the above subject areas may be obtained from the vehicle manufacturers' literature, the national consensus standards [e.g. the ANSI B56 series of standards (current revisions)] and this OSHA Standard.

Appendix B—Stability of Powered Industrial Trucks

(Non-mandatory appendix to paragraph (l) of this section)

B–1. Definitions

To understand the principle of stability, understanding definitions of the following is necessary:

Center of gravity is that point of an object at which all of the weight of an object can be considered to be concentrated.

Counterweight is the weight that is a part of the basic structure of a truck that is used to offset the weight of a load and to maximize the resistance of the vehicle to tipping over.

Fulcrum is the axis of rotation of the truck when it tips over.

Grade is the slope of any surface that is usually measured as the number of feet of rise or fall over a hundred foot horizontal distance (this measurement is designated as a percent).

Lateral stability is the resistance of a truck to tipping over sideways.

Line of action is an imaginary vertical line through the center of gravity of an object.

Load center is the horizontal distance from the edge of the load (or the vertical face of the forks or other attachment) to the line of action through the center of gravity of the load.

Longitudinal stability is the resistance of a truck to overturning forward or rearward.

Moment is the product of the weight of the object times the distance from a fixed point. In the case of a powered industrial truck, the distance is measured from the point that the truck will tip over to the line of action of the object. The distance is always measured perpendicular to the line of action.

Track is the distance between wheels on the same axle of a vehicle.

Wheelbase is the distance between the centerline of the front and rear wheels of a vehicle.

B–2. General

B–2.1. Stability determination for a powered industrial truck is not complicated once a few basic principles are understood. There are many factors that influence vehicle stability. Vehicle wheelbase, track, height and weight distribution of the load, and the location

of the counterweights of the vehicle (if the vehicle is so equipped), all contribute to the stability of the vehicle.

B–2.2. The ''stability triangle'', used in most discussions of stability, is not mysterious but is used to demonstrate truck stability in rather simple fashion.

B–3. Basic Principles

B–3.1. The determination of whether an object is stable is dependent on the moment of an object at one end of a system being greater than, equal to or smaller than the moment of an object at the other end of that system. This is the same principle on which a see saw 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 other end of the device, 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–3.2. Longitudinal stability of a counterbalanced powered industrial truck is dependent on the moment of the vehicle and the moment of the load. In other words, if the mathematic product of the load moment (the distance is from the front wheels, the point about which the vehicle would tip forward) the system is balanced and will not tip forward. However, if the load-moment is greater than the vehicle-moment, the greater load-moment will force the truck to tip forward.

B–4. The Stability Triangle

B–4.1. 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 it has four wheels. The steer axle of most trucks is attached to the truck by means of a pivot pin in the center of the axle. This three point support forms a triangle called the stability triangle when the points are connected with imaginary lines. Figure 1 depicts the stability triangle.

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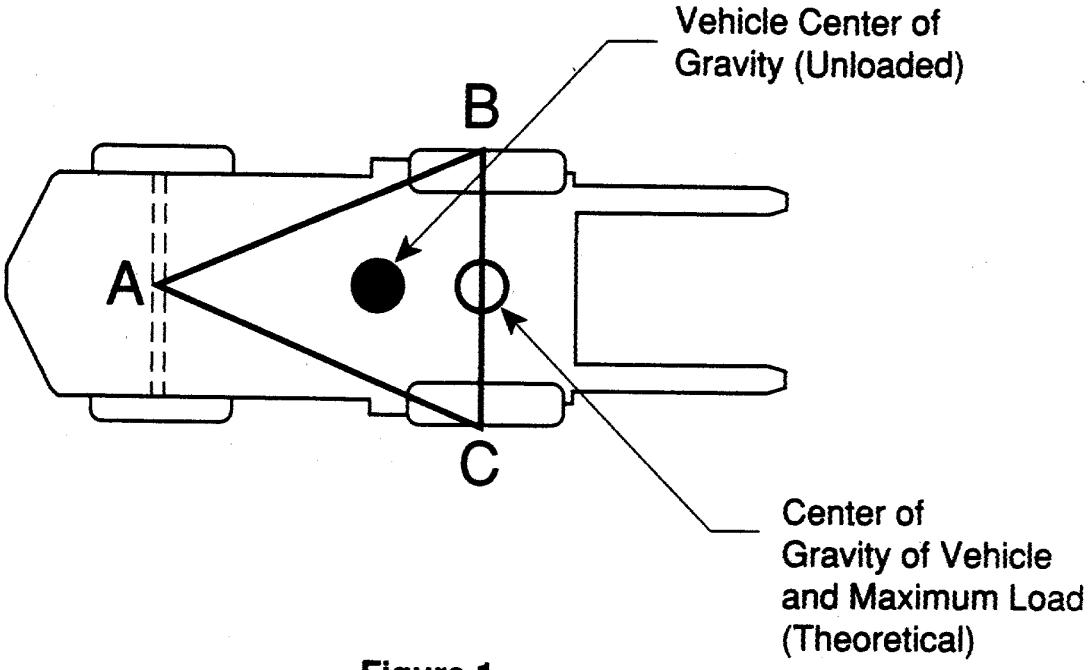

Figure 1.

NOTES:

1. When the vehicle is loaded, the combined center of gravity shifts toward line B-C. Theoretically the max 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.

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B–4.2. When the line of action of the vehicle or load-vehicle falls within the stability triangle, the vehicle is stable and will not tip over. However, when the line of action of the vehicle or the vehicle/load combination falls outside the stability triangle, the vehicle is unstable and may tip over. (See Figure 2.)

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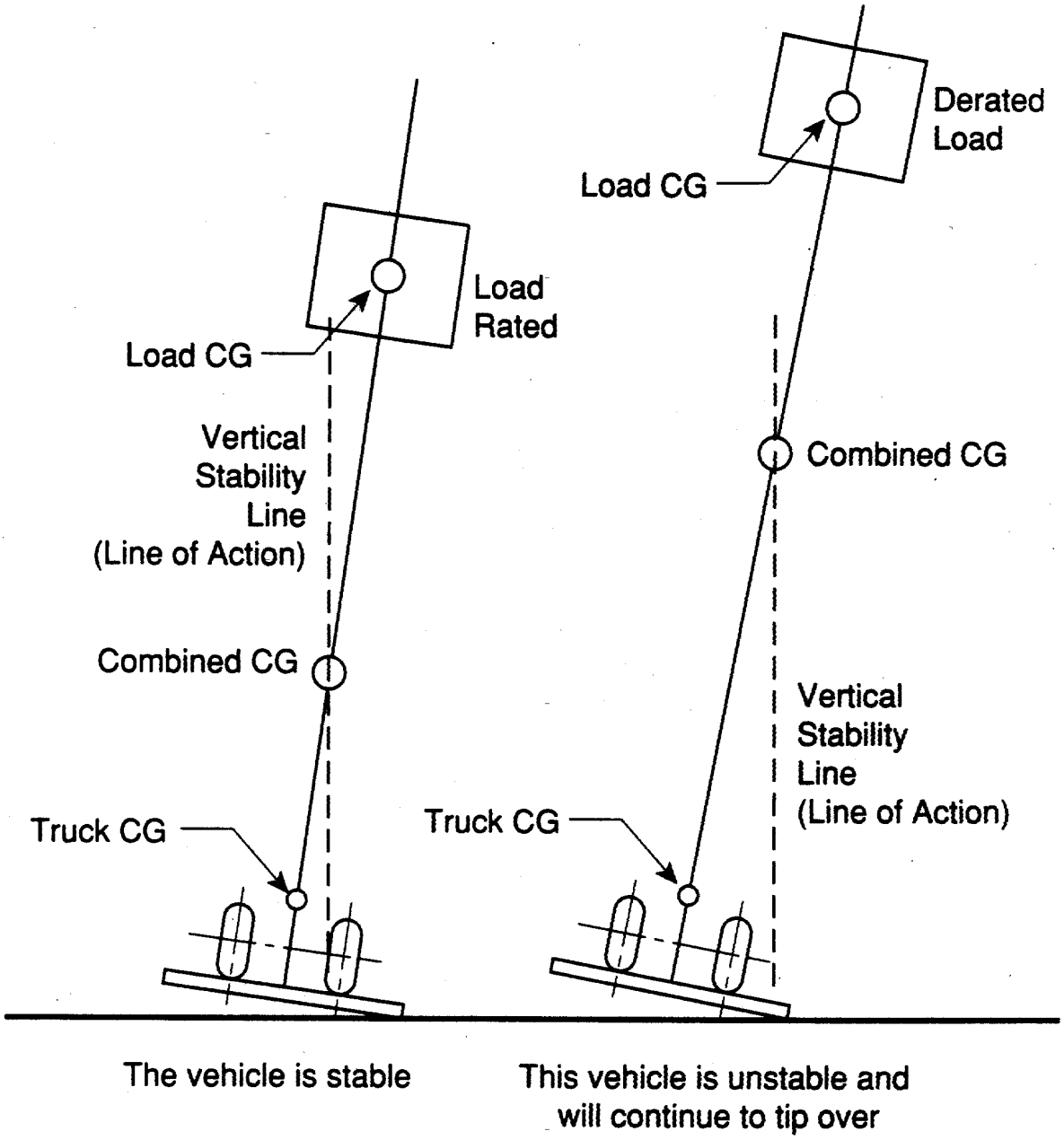

Figure 2.

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B–5. Longitudinal Stability

B–5.1. The axis of rotation when a truck tips forward is the point of contact of the front wheels of the vehicle with the pavement. When a powered industrial truck tips forward, it is this line that the truck will rotate about. 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 the tip forward, thereby causing loss of steering control. If the load-moment greatly exceeds the vehicle-moment, the truck will tip forward.

B–5.2. In order 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 a load center. Because larger trucks normally handle loads that are physically larger, these vehicles have greater load centers. A truck with a capacity of 30,000 pounds or less capacity is normally rated at a given load weight at a 24 inch load center. For trucks of greater than 30,000 pound capacity, the load center is normally rated at 36 or 48 inch load center distance. In order to safely operate the vehicle, the operator should always check the data plate and determine the maximum allowable weight at the rated load center.

B–5.3. 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. Calculation of 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), with an offset center of gravity, etc., then calculation of a maximum allowable load moment should be undertaken and this value used to determine whether a load can be 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 probable load is 60 inches long (30 inch load center), then the maximum weight that this load can weigh is 2,400 pounds (72,000 divided by 30).

B–6. Lateral Stability

B–6.1. The lateral stability of a vehicle is determined by the position of the line of action (a vertical line that passes through the combined center of gravity of the vehicle and the load) relative to the stability triangle. When the vehicle is not loaded, the location of the center of gravity of the truck is the only factor to be considered in determining the stability of the truck. As long as the line of action of the combined center of gravity of the vehicle and the load 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.

B–6.2. Factors that affect the lateral stability of a vehicle include the placement of the load on the truck, the height of the load above the surface on which the vehicle is operating, and the degree of lean of the vehicle.

B–7. Dynamic Stability

B–7.1. Up to this point, we have covered stability of a powered industrial truck without consideration of the dynamic forces that result when the vehicle and load are put into motion. The transfer of weight 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–7.2. 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.

PART 1915—OCCUPATIONAL SAFETY AND HEALTH STANDARDS FOR SHIPYARD EMPLOYMENT

3. The authority citation for part 1915 would be revised to read as follows:

Authority: Section 41, Longshore and Harbor Workers' Compensation Act (33 U.S.C. 941); secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736) or 1–90 (55 FR 9033), as applicable.

Sections 1915.120 and 1915.152 also issued under 29 CFR part 1911.

4. A new § 1915.120 with appendices A and B would be added to subpart G to read as follows:

§ 1915.120 Powered industrial trucks.

(a) *Operator training.* (1) Operator qualifications. (i) The employer shall ensure that each potential operator of a powered industrial truck is capable of performing the duties that are required of the job.

(ii) In determining operator qualifications, the employer shall ensure that each potential operator has received the training required by this paragraph, that each potential operator has been evaluated by a designated person while performing the required duties, and that each potential operator performs those operations competently.

(2) *Training program implementation.*

(i) The employer shall implement a training program and ensure that only trained drivers who have successfully completed the training program are allowed to operate powered industrial trucks. Exception: Trainees under the direct supervision of a designated person shall be allowed to operate a powered industrial truck provided the operation of the vehicle is conducted in an area where other employees are not near and the operation of the truck is under controlled conditions.

(ii) Training shall consist of a combination of classroom instruction (Lecture, discussion, video tapes, and/or conference) and practical training (demonstrations and practical exercises by the trainee).

(iii) All training and evaluation shall be conducted by a designated person who has the requisite knowledge, training and experience to train powered industrial truck operators and judge their competency.

(3) *Training program content.* Powered industrial truck operator trainees shall be trained in the following topics unless the employer can demonstrate that some of the topics are not needed for safe operation.

(i) Truck related topics.

(A) All operating instructions, warnings and precautions for the types of trucks the operator will be authorized to operate;

(B) Similarities to and differences from the automobile;

(C) Controls and instrumentation: location, what they do and how they work;

(D) Power plant operation and maintenance;

(E) Steering and maneuvering;

(F) Visibility (including restrictions due to loading);

(G) Fork and attachment adaption, operation and limitations of their utilization;

(H) Vehicle capacity;
(I) Vehicle stability;
(J) Vehicle inspection and maintenance;
(K) Refueling or charging, recharging batteries;
(L) Operating limitations; and
(M) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.
(ii) Workplace related topics.
(A) Surface conditions where the vehicle will be operated;
(B) Composition of probable loads and load stability;
(C) Load manipulation, stacking, unstacking;
(D) Pedestrian traffic;
(E) Narrow aisles and other restricted places of operation;
(F) Operating in hazardous classified locations;
(G) Operating the truck on ramps and other sloped surfaces that could affect the stability of the vehicle;
(H) Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace; and
(I) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.
(iii) The requirements of this section.
(4) *Evaluation and refresher or remedial training.*
(i) Sufficient evaluation and remedial training shall be conducted so that the employee retains and uses the knowledge, skills and ability needed to operate the powered industrial truck safely.
(ii) An evaluation of the performance of each powered industrial truck operator shall be conducted at least annually by a designated person.
(iii) Refresher or remedial training shall be provided when there is reason to believe that there has been unsafe operation, when an accident or a near-miss occurs or when an evaluation indicates that the operator is not capable of performing the assigned duties.
(5) *Certification.*
(i) The employer shall certify that each operator has received the training, has been evaluated as required by this paragraph, and has demonstrated competency in the performance of the operator's duties. The certification shall include the name of the trainee, the date of training, and the signature of the person performing the training and evaluation.
(ii) The employer shall retain the current training materials and course outline or the name and address of the person who conducted the training if it was conducted by an outside trainer.
(6) *Avoidance of duplicative training.*
(i) Each current truck operator who has received training in any of the elements specified in paragraph (a)(3) of this section for the types of trucks the employee is authorized to operate and the type workplace that the trucks are being operated in need not be retrained in those elements if the employer certifies in accordance with paragraph (a)(5)(i) of this section that the operator has been evaluated to be competent to perform those duties.
(ii) Each new truck operator who has received training in any of the elements specified in paragraph (a)(3) of this section for the types of trucks the employee will be authorized to operate and the type of workplace in which the trucks will be operated need not be retrained in those elements before initial assignment in the workplace if the employer has written documentation of the training and if the employee is evaluated pursuant to paragraph (a)(4) of this section to be competent.
(b) [Reserved]

Appendixes to § 1915.120

Appendix A—Training of Powered Industrial Truck Operators

(Non-mandatory appendix to paragraph (a) of this section)

A–1. Operator Selection

A–1.1. Prospective operators of powered industrial trucks should be identified based upon their ability to be trained and accommodated to perform job functions that are essential to the operation of a powered industrial truck. Determination of the capabilities of a prospective operator to fulfill the demands of the job should be based upon the tasks that the job demands.

A–1.2. The employer should identify all the aspects of the job that the employee must meet/perform when doing his or her job. These aspects could include the level at which the employee must see and hear, the physical demands of the job, and the environmental extremes of the job.

A–1.3. One factor to be considered is the ability of the candidate to see and hear within reasonably acceptable limits. Included in the vision requirements are the ability to see at distance and peripherally. In certain instances, there also is a requirement for the candidate to discern different colors, primarily red, yellow and green.

A–1.4. The environmental extremes that might be demanded of a potential powered industrial truck operator include that ability of the person to work in areas of excessive cold or heat.

A–1.5. After an employee has been trained and appropriate accommodations have been made, the employer needs to determine whether the employee can safely perform the job.

A–2. The Method(s) of Training

A–2.1. Among the many methods of training are the lecture, conference, demonstration, test (written and/or oral) and the practical exercise. In most instances, a combination of these methods have been successfully used to train employees in the knowledge, skills and abilities that are essential to perform the job function that the employee is being trained to perform. To enhance the training and to make the training more understandable to the employee, employers and other trainers have used movies, slides, video tapes and other visual presentations. Making the presentation more understandable has several advantages including:

(1) The employees being trained remain more attentive during the presentation if graphical presentation are used, thereby increasing the effectiveness of the training;

(2) The use of visual presentations allows the trainer to ensure that the necessary information is covered during the training;

(3) The use of graphics makes better utilization of the training time by decreasing the need for the instructor to carry on long discussions about the instructional material; and

(4) The use of graphics during instruction provides greater retention by the trainees.

A–3. Training Program Content

A–3.1. Because each type (make and model) powered industrial truck has different operating characteristics, limitations and other unique features, an optimum employee training program for powered industrial truck operators must be based upon the type vehicles that the employee will be trained and authorized to operate. The training must also emphasize the features of the workplace which will affect the manner in which the vehicle must be operated. Finally, the training must include the general safety rules applicable to the operation of all powered industrial trucks.

A–3.2. Selection of the methods of training the operators has been left to the reasonable determination of the employer. Whereas some employees can assimilate instructional material while seated in a classroom, other employees may learn best by observing the conduct of operations (demonstration) and/or by

having to personally conduct the operations (practical exercise). In some instances, an employee can receive valuable instruction through the use of electronic mediums, such as the use of video tapes and movies. In most instances, a combination of the different training methods may provide the mechanism for providing the best training in the least amount of time. OSHA has specified at paragraph (a)(2)(ii) of this section that the training must consist of a combination classroom instruction and practical exercise. The use of both these modes of instruction is the only way of assuring that the trainee has received and comprehended the instruction and can utilize the information to safely operate a powered industrial truck.

A–4. Initial Training

A–4.1. The following is an outline of a generalized forklift operator training program:

(1) Characteristics of the powered industrial truck(s) the employee will be allowed to operate:

(a) Similarities to and differences from the automobile;

(b) Controls and instrumentation: location, what they do and how they work;

(c) Power plant operation and maintenance;

(d) Steering and maneuvering;

(e) Visibility;

(f) Fork and/or attachment adaption, operation and limitations of their utilization;

(g) Vehicle capacity;

(h) Vehicle stability;

(i) Vehicle inspection and maintenance;

(j) Refueling or charging, recharging batteries;

(k) Operating limitations;

(l) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(2) The operating environment:

(a) Floor surfaces and/or ground conditions where the vehicle will be operated;

(b) Composition of probable loads and load stability;

(c) Load manipulation, stacking, unstacking;

(d) Pedestrian traffic;

(e) Narrow aisle and restricted place operation;

(f) Operating in classified hazardous locations;

(g) Operating the truck on ramps and other sloped surfaces which would affect the stability of the vehicle;

(h) Other unique or potentially hazardous environmental conditions which exist or may exist in the workplace;

(i) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(3) The requirements of this OSHA Standard.

A–5. Trainee Evaluation

A–5.1. The provisions of these proposed requirements specify that an employee evaluation be conducted both as part of the training and after completion of the training. The initial evaluation is useful for many reasons, including:

(1) the employer can determine what methods of instruction will produce a proficient truck operator with the minimum of time and effort;

(2) the employer can gain insight into the previous training that the trainee has received; and

(3) a determination can be made as to whether the trainee will be able to successfully operate a powered industrial truck. This initial evaluation can be completed by having the employee fill out a questionnaire, by an oral interview, or by a combination of these mechanisms. In many cases, answers received by the employee can be substantiated by contact with other employees or previous employers.

A–6. Refresher or Remedial Training

A–6.1. (The type information listed at paragraph A–6.2 of this appendix would be used when the training is more than an on-the-spot correction being made by a supervisor or when there have been multiple instances of on-the-spot corrections having to be made.) When an on-the-spot correction is used, the person making the correction should point out the incorrect manner of operation of the truck or other unsafe act being conducted, tell the employee how to do the operation correctly, and then ensure that the employee does the operation correctly.

A–6.2. The following items may be used when a more general, structured retraining program is utilized to train employees and eliminate unsafe operation of the vehicle:

(1) Common unsafe situations encountered in the workplace;

(2) Unsafe methods of operating observed or known to be used;

(3) The need for constant attentiveness to the vehicle, the workplace conditions and the manner in which the vehicle is operated.

A–6.3. Details about the above subject areas need to be expanded upon so that the operator receives all the information which is necessary for the safe operation of the vehicle. Insight into some of the specifics of the above subject areas may be obtained from the vehicle manufacturers' literature, the national consensus standards [e.g. the ANSI B56 series of standards (current revisions)] and this OSHA Standard.

Appendix B—Stability of Powered Industrial Trucks

(Non-mandatory appendix to paragraph (a) of this section)

B–1. Definitions

To understand the principle of stability, understanding definitions of the following is necessary:

Center of Gravity is that point of an object at which all of the weight of an object can be considered to be concentrated.

Counterweight is the weight that is a part of the basic structure of a truck that is used to offset the weight of a load and to maximize the resistance of the vehicle to tipping over.

Fulcrum is the axis of rotation of the truck when it tips over.

Grade is the slope of any surface that is usually measured as the number of feet or rise of fall over a hundred foot horizontal distance (this measurement is designated as a percent).

Lateral stability is the resistance of a truck to tipping over sideways.

Line of action is a imaginary vertical line through the center of gravity of an object.

Load center is the horizontal distance from the edge of the load (or the vertical face of the forks or other attachment) to the line of action through the center of gravity of the load.

Longitudinal stability is the resistance of a truck to overturning forward or rearward.

Moment is the product of the weight of the object times the distance from a fixed point. In the case of a powered industrial truck, the distance is measured from the point that the truck will tip over to the line of action of the object. The distance is always measured perpendicular to the line of action.

Track is the distance between wheels on the same axle of a vehicle.

Wheelbase is the distance between the centerline of the front and rear wheels of a vehicle.

B–2. General

B–2.1. Stability determination for a powered industrial truck is not complicated once a few basic principles are understood. There are many factors that influence vehicle stability. Vehicle wheelbase, track, height and weight distribution of the load, and the location

of the counterweights of the vehicle (if the vehicle is so equipped), all contribute to the stability of the vehicle.

B–2.2. The ''stability triangle'', used in most discussions of stability, is not mysterious but is used to demonstrate truck stability in rather simple fashion.

B–3. Basic Principles

B–3.1. The determination of whether an object is stable is dependent on the moment of an object at one end of a system being greater than, equal to or smaller than the moment of an object at the other end of that system. This is the same principle on which a see saw 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 other end of the device, 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–3.2. Longitudinal stability of a counterbalanced powered industrial truck is dependent on the moment of the vehicle and the moment of the load. In other words, if the mathematic product of the load moment (the distance is from the front wheels, the point about which the vehicle would tip forward) the system is balanced and will not tip forward. However, if the load-moment is greater than the vehicle-moment, the greater load-moment will force the truck to tip forward.

B–4. The Stability Triangle

B–4.1. 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 it has four wheels. The steer axle of most trucks is attached to the truck by means of a pivot pin in the center of the axle. This three point support forms a triangle called the stability triangle when the points are connected with imaginary lines. Figure 1 depicts the stability triangle.

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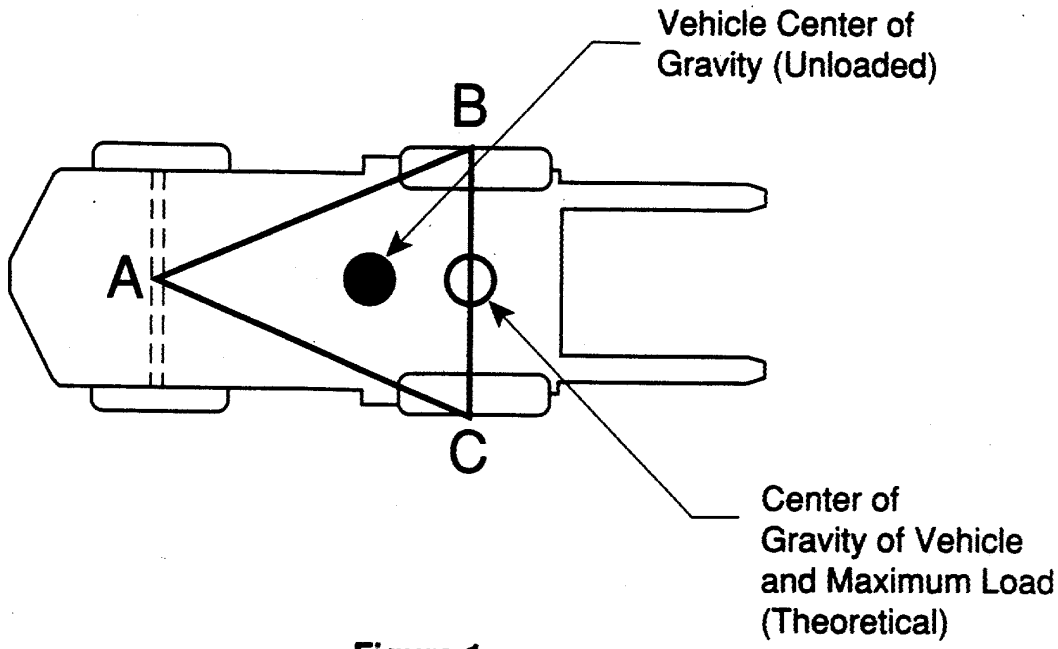

Figure 1.

NOTES:

1. When the vehicle is loaded, the combined center of gravity shifts toward line B-C. Theoretically the max 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.

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B–4.2. When the line of action of the vehicle or load-vehicle falls within the stability triangle, the vehicle is stable and will not tip over. However, when the line of action of the vehicle or the vehicle/load combination falls outside the stability triangle, the vehicle is unstable and may tip over. (See Figure 2.)

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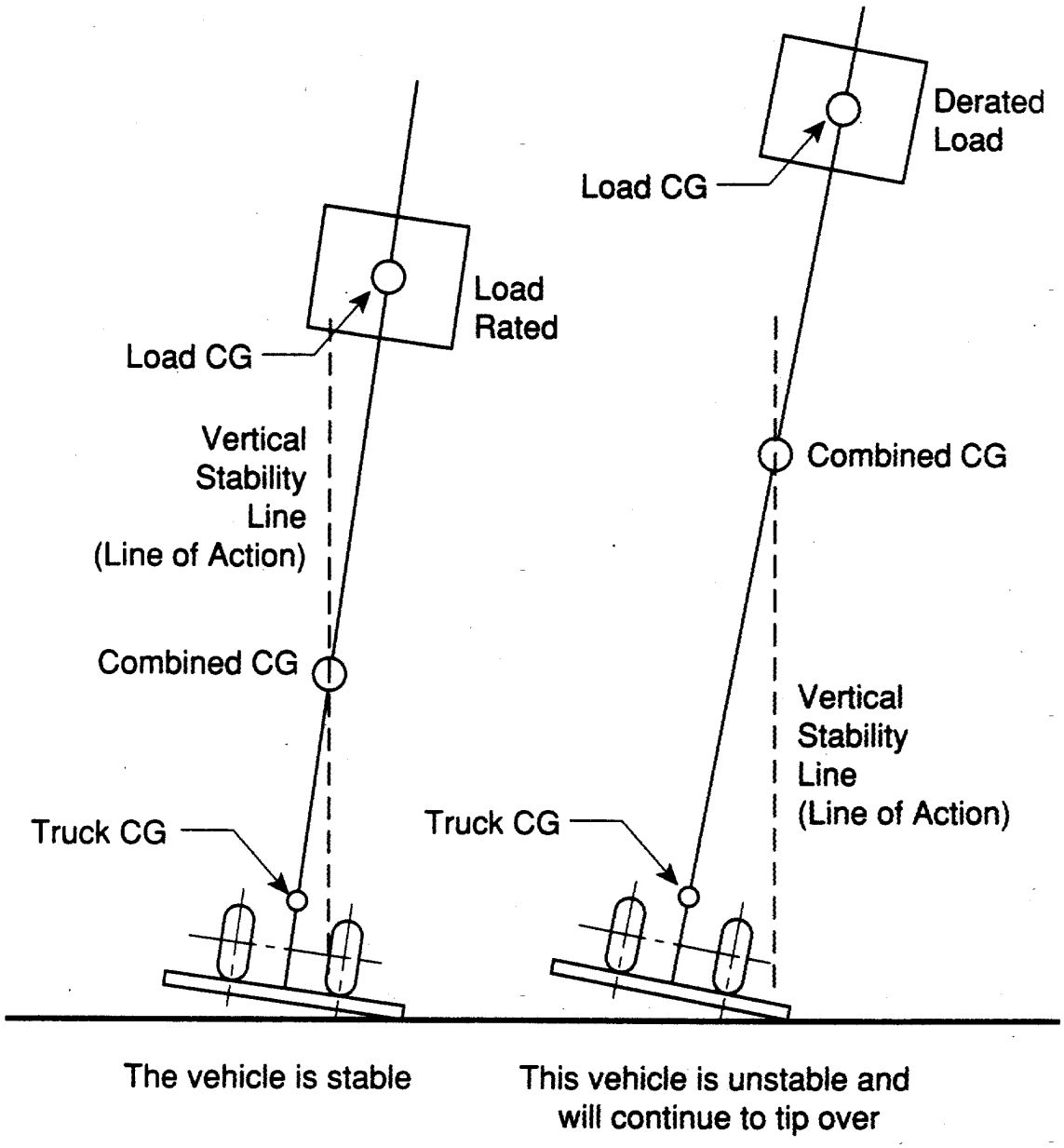

Figure 2.

BILLING CODE 4510–26–P

B–5. Longitudinal Stability

B–5.1. The axis of rotation when a truck tips forward is the point of contact of the front wheels of the vehicle with the pavement. When a powered industrial truck tips forward, it is this line that the truck will rotate about. 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 the tip forward, thereby causing loss of steering control. If the load-moment greatly exceeds the vehicle-moment, the truck will tip forward.

B–5.2. In order 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 a load center. Because larger trucks normally handle loads that are physically larger, these vehicles have greater load centers. A truck with a capacity of 30,000 pounds or less capacity is normally rated at a given load weight at a 24 inch load center. For trucks of greater than 30,000 pound capacity, the load center is normally rated at 36 or 48 inch load center distance. In order to safely operate the vehicle, the operator should always check the data plate and determine the maximum allowable weight at the rated load center.

B–5.3. 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. Calculation of 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), with an offset center of gravity, etc., then calculation of a maximum allowable load moment should be undertaken and this value used to determine whether a load can be handled. For example, if an operator is operating a 3000 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 probable load is 60 inches long (30 inch load center), then the maximum weight that this load can weigh is 2,400 pounds (72,000 divided by 30).

B–6. Lateral Stability

B–6.1. The lateral stability of a vehicle is determined by the position of the line of action (a vertical line that passes through the combined center of gravity of the vehicle and the load) relative to the stability triangle. When the vehicle is not loaded, the location of the center of gravity of the truck is the only factor to be considered in determining the stability of the truck. As long as the line of action of the combined center of gravity of the vehicle and the load 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.

B–6.2. Factors that affect the lateral stability of a vehicle include the placement of the load on the truck, the height of the load above the surface on which the vehicle is operating, and the degree of lean of the vehicle.

B–7. Dynamic Stability

B–7.1. Up to this point, we have covered stability of a powered industrial truck without consideration of the dynamic forces that result when the vehicle and load are put into motion. The transfer of weight 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–7.2. 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.

PART 1917—MARINE TERMINALS

5. The authority citation for part 1917 would be revised to read as follows:

Authority: Section 41, Longshore and Harbor Workers' Compensation Act (33 U.S.C. 941); secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736) or 1–90 (55 FR 9033), as applicable.

Section 1917.43 also issued under 29 CFR part 1911.

6. Section 1917.43 would be amended by adding a new paragraph (i) and by adding appendices A and B at the end of the section to read as follows:

§ 1917.43 Powered industrial trucks.

* * * * *

(i) *Operator training.*

(1) *Operator qualifications.* (i) The employer shall ensure that each potential operator of a powered industrial truck is capable of performing the duties that are required of the job.

(ii) In determining operator qualifications, the employer shall ensure that each potential operator has received the training required by this paragraph, that each potential operator has been evaluated by a designated person while performing the required duties, and that each potential operator performs those operations competently.

(2) *Training program implementation.*

(i) The employer shall implement a training program and ensure that only trained drivers who have successfully completed the training program are allowed to operate powered industrial trucks. Exception: Trainees under the direct supervision of a designated person shall be allowed to operate a powered industrial truck provided the operation of the vehicle is conducted in an area where other employees are not near and the operation of the truck is under controlled conditions.

(ii) Training shall consist of a combination of classroom instruction (Lecture, discussion, video tapes, and/or conference) and practical training (demonstrations and practical exercises by the trainee).

(iii) All training and evaluation shall be conducted by a designated person who has the requisite knowledge, training and experience to train powered industrial truck operators and judge their competency.

(3) *Training program content.* Powered industrial truck operator trainees shall be trained in the following topics unless the employer can demonstrate that some of the topics are not needed for safe operation.

(i) Truck related topics.

(A) All operating instructions, warnings and precautions for the types of trucks the operator will be authorized to operate;

(B) Similarities to and differences from the automobile;

(C) Controls and instrumentation: location, what they do and how they work;

(D) Power plant operation and maintenance;

(E) Steering and maneuvering;

(F) Visibility (including restrictions due to loading);

(G) Fork and attachment adaption, operation and limitations of their utilization;

(H) Vehicle capacity;
(I) Vehicle stability;
(J) Vehicle inspection and maintenance;
(K) Refueling or charging, recharging batteries;
(L) Operating limitations; and
(M) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.
(ii) Workplace related topics.
(A) Surface conditions where the vehicle will be operated;
(B) Composition of probable loads and load stability;
(C) Load manipulation, stacking, unstacking;
(D) Pedestrian traffic;
(E) Narrow aisles and other restricted places of operation;
(F) Operating in hazardous classified locations;
(G) Operating the truck on ramps and other sloped surfaces that could affect the stability of the vehicle;
(H) Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace; and
(I) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.
(iii) The requirements of this section.
(4) *Evaluation and refresher or remedial training.* (i) Sufficient evaluation and remedial training shall be conducted so that the employee retains and uses the knowledge, skills and ability needed to operate the powered industrial truck safely.
(ii) An evaluation of the performance of each powered industrial truck operator shall be conducted at least annually by a designated person.
(iii) Refresher or remedial training shall be provided when there is reason to believe that there has been unsafe operation, when an accident or a near-miss occurs or when an evaluation indicates that the operator is not capable of performing the assigned duties.
(5) *Certification.*
(i) The employer shall certify that each operator has received the training, has been evaluated as required by this paragraph, and has demonstrated competency in the performance of the operator's duties. The certification shall include the name of the trainee, the date of training, and the signature of the person performing the training and evaluation.
(ii) The employer shall retain the current training materials and course outline or the name and address of the person who conducted the training if it was conducted by an outside trainer.
(6) *Avoidance of duplicative training.*
(i) Each current truck operator who has received training in any of the elements specified in paragraph (i)(3) of this section for the types of trucks the employee is authorized to operate and the type workplace that the trucks are being operated in need not be retrained in those elements if the employer certifies in accordance with paragraph (i)(5)(i) of this section that the operator has been evaluated to be competent to perform those duties.
(ii) Each new truck operator who has received training in any of the elements specified in paragraph (i)(3) of this section for the types of trucks the employee will be authorized to operate and the type of workplace in which the trucks will be operated need not be retrained in those elements before initial assignment in the workplace if the employer has written documentation of the training and if the employee is evaluated pursuant to paragraph (i)(4) of this section to be competent.

Note to paragraph (i): Appendices A and B provide non-mandatory guidance to assist employers in implementing this paragraph (i).

Appendices to § 1917.43

Appendix A—Training of Powered Industrial Truck Operators

(Non-mandatory appendix to paragraph (i) of this section)

A–1. Operator Selection

A–1.1. Prospective operators of powered industrial trucks should be identified based upon their ability to be trained and accommodated to perform job functions that are essential to the operation of a powered industrial truck. Determination of the capabilities of a prospective operator to fulfill the demands of the job should be based upon the tasks that the job demands.

A–1.2. The employer should identify all the aspects of the job that the employee must meet/perform when doing his or her job. These aspects could include the level at which the employee must see and hear, the physical demands of the job, and the environmental extremes of the job.

A–1.3. One factor to be considered is the ability of the candidate to see and hear within reasonably acceptable limits. Included in the vision requirements are the ability to see at distance and peripherally. In certain instances, there also is a requirement for the candidate to discern different colors, primarily red, yellow and green.

A–1.4. The environmental extremes that might be demanded of a potential powered industrial truck operator include that ability of the person to work in areas of excessive cold or heat.

A–1.5. After an employee has been trained and appropriate accommodations have been made, the employer needs to determine whether the employee can safely perform the job.

A–2. The Method(s) of Training

A–2.1. Among the many methods of training are the lecture, conference, demonstration, test (written and/or oral) and the practical exercise. In most instances, a combination of these methods have been successfully used to train employees in the knowledge, skills and abilities that are essential to perform the job function that the employee is being trained to perform. To enhance the training and to make the training more understandable to the employee, employers and other trainers have used movies, slides, video tapes and other visual presentations. Making the presentation more understandable has several advantages including:

(1) The employees being trained remain more attentive during the presentation if graphical presentation are used, thereby increasing the effectiveness of the training;

(2) The use of visual presentations allows the trainer to ensure that the necessary information is covered during the training;

(3) The use of graphics makes better utilization of the training time by decreasing the need for the instructor to carry on long discussions about the instructional material; and

(4) The use of graphics during instruction provides greater retention by the trainees.

A–3. Training Program Content

A–3.1. Because each type (make and model) powered industrial truck has different operating characteristics, limitations and other unique features, an optimum employee training program for powered industrial truck operators must be based upon the type vehicles that the employee will be trained and authorized to operate. The training must also emphasize the features of the workplace which will affect the manner in which the vehicle must be operated. Finally, the training must include the general safety rules applicable to the operation of all powered industrial trucks.

A–3.2. Selection of the methods of training the operators has been left to the reasonable determination of the employer. Whereas some employees can assimilate instructional material while seated in a classroom, other employees may learn best by observing the conduct

of operations (demonstration) and/or by having to personally conduct the operations (practical exercise). In some instances, an employee can receive valuable instruction through the use of electronic mediums, such as the use of video tapes and movies. In most instances, a combination of the different training methods may provide the mechanism for providing the best training in the least amount of time. OSHA has specified at paragraph (i)(2)(ii) of this section that the training must consist of a combination classroom instruction and practical exercise. The use of both these modes of instruction is the only way of assuring that the trainee has received and comprehended the instruction and can utilize the information to safely operate a powered industrial truck.

A–4. Initial Training

A–4.1. The following is an outline of a generalized forklift operator training program:

(1) Characteristics of the powered industrial truck(s) the employee will be allowed to operate:

(a) Similarities to and differences from the automobile;

(b) Controls and instrumentation: location, what they do and how they work;

(c) Power plant operation and maintenance;

(d) Steering and maneuvering;

(e) Visibility;

(f) Fork and/or attachment adaption, operation and limitations of their utilization;

(g) Vehicle capacity;

(h) Vehicle stability;

(i) Vehicle inspection and maintenance;

(j) Refueling or charging, recharging batteries.

(k) Operating limitations.

(l) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(2) The operating environment:

(a) Floor surfaces and/or ground conditions where the vehicle will be operated;

(b) Composition of probable loads and load stability;

(c) Load manipulation, stacking, unstacking;

(d) Pedestrian traffic;

(e) Narrow aisle and restricted place operation;

(f) Operating in classified hazardous locations;

(g) Operating the truck on ramps and other sloped surfaces which would affect the stability of the vehicle;

(h) Other unique or potentially hazardous environmental conditions which exist or may exist in the workplace.

(i) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(3) The requirements of this OSHA Standard.

A–5. Trainee Evaluation

A–5.1. The provisions of these proposed requirements specify that an employee evaluation be conducted both as part of the training and after completion of the training. The initial evaluation is useful for many reasons, including:

(1) the employer can determine what methods of instruction will produce a proficient truck operator with the minimum of time and effort;

(2) the employer can gain insight into the previous training that the trainee has received; and

(3) a determination can be made as to whether the trainee will be able to successfully operate a powered industrial truck. This initial evaluation can be completed by having the employee fill out a questionnaire, by an oral interview, or by a combination of these mechanisms. In many cases, answers received by the employee can be substantiated by contact with other employees or previous employers.

A–6. Refresher or Remedial Training

A–6.1. (The type information listed in paragraph A–6.2 of this appendix would be used when the training is more than an on-the-spot correction being made by a supervisor or when there have been multiple instances of on-the-spot corrections having to be made.) When an on-the-spot correction is used, the person making the correction should point out the incorrect manner of operation of the truck or other unsafe act being conducted, tell the employee how to do the operation correctly, and then ensure that the employee does the operation correctly.

A–6.2. The following items may be used when a more general, structured retraining program is utilized to train employees and eliminate unsafe operation of the vehicle:

(1) Common unsafe situations encountered in the workplace;

(2) Unsafe methods of operating observed or known to be used;

(3) The need for constant attentiveness to the vehicle, the workplace conditions and the manner in which the vehicle is operated.

A–6.3. Details about the above subject areas need to be expanded upon so that the operator receives all the information which is necessary for the safe operation of the vehicle. Insight into some of the specifics of the above subject areas may be obtained from the vehicle manufacturers' literature, the national consensus standards [e.g. the ANSI B56 series of standards (current revisions)] and this OSHA Standard.

Appendix B—Stability of Powered Industrial Trucks

(Non-mandatory appendix to paragraph (i) of this section)

B–1. Definitions

To understand the principle of stability, understanding definitions of the following is necessary:

Center of Gravity is that point of an object at which all of the weight of an object can be considered to be concentrated.

Counterweight is the weight that is a part of the basic structure of a truck that is used to offset the weight of a load and to maximize the resistance of the vehicle to tipping over.

Fulcrum is the axis of rotation of the truck when it tips over.

Grade is the slope of any surface that is usually measured as the number of feet of rise of fall over a hundred foot horizontal distance (this measurement is designated as a percent).

Lateral stability is the resistance of a truck to tipping over sideways.

Line of action is a imaginary vertical line through the center of gravity of an object.

Load center is the horizontal distance from the edge of the load (or the vertical face of the forks or other attachment) to the line of action through the center of gravity of the load.

Longitudinal stability is the resistance of a truck to overturning forward or rearward.

Moment is the product of the weight of the object times the distance from a fixed point. In the case of a powered industrial truck, the distance is measured from the point that the truck will tip over to the line of action of the object. The distance is always measured perpendicular to the line of action.

Track is the distance between wheels on the same axle of a vehicle.

Wheelbase is the distance between the centerline of the front and rear wheels of a vehicle.

B–2. General

B–2.1. Stability determination for a powered industrial truck is not complicated once a few basic principles are understood. There are many factors

that influence vehicle stability. Vehicle wheelbase, track, height and weight distribution of the load, and the location of the counterweights of the vehicle (if the vehicle is so equipped), all contribute to the stability of the vehicle.

B–2.2. The ''stability triangle'', used in most discussions of stability, is not mysterious but is used to demonstrate truck stability in rather simple fashion.

B–3. Basic Principles

B–3.1. The determination of whether an object is stable is dependent on the moment of an object at one end of a system being greater than, equal to or smaller than the moment of an object at the other end of that system. This is the same principle on which a see saw 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 other end of the device, 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–3.2. Longitudinal stability of a counterbalanced powered industrial truck is dependent on the moment of the vehicle and the moment of the load. In other words, if the mathematic product of the load moment (the distance is from the front wheels, the point about which the vehicle would tip forward) the system is balanced and will not tip forward. However, if the load-moment is greater than the vehicle-moment, the greater load-moment will force the truck to tip forward.

B–4. The Stability Triangle

B–4.1. 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 it has four wheels. The steer axle of most trucks is attached to the truck by means of a pivot pin in the center of the axle. This three point support forms a triangle called the stability triangle when the points are connected with imaginary lines. Figure 1 depicts the stability triangle.

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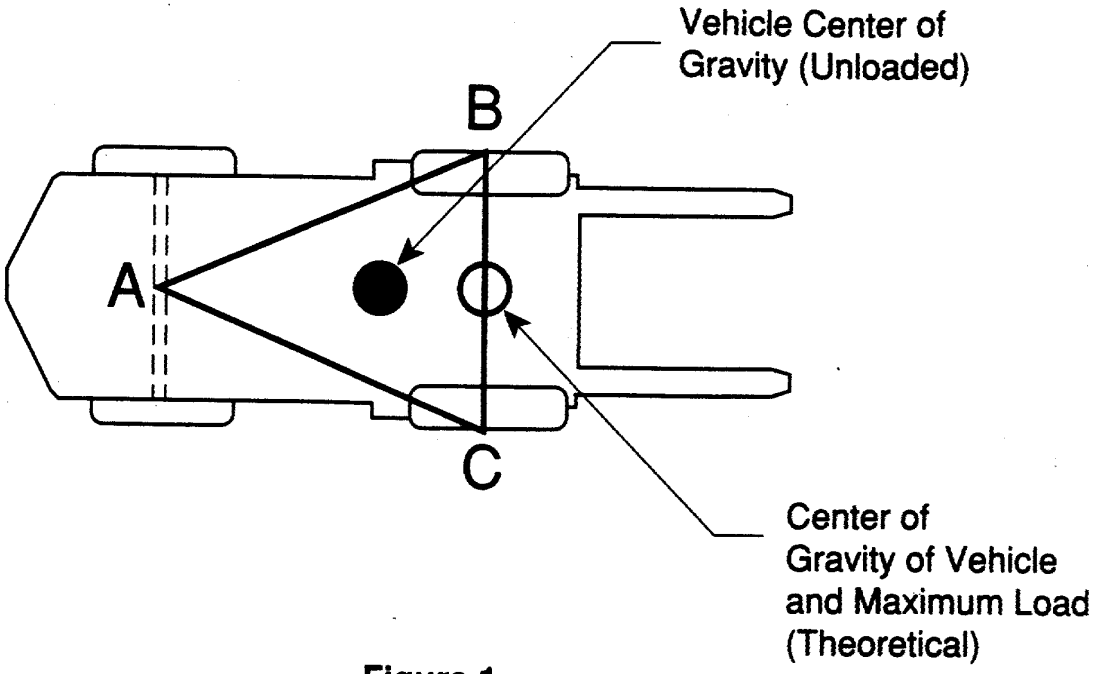

Figure 1.

NOTES:

1. When the vehicle is loaded, the combined center of gravity shifts toward line B-C. Theoretically the max 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.

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B–4.2. When the line of action of the vehicle or load-vehicle falls within the stability triangle, the vehicle is stable and will not tip over. However, when the line of action of the vehicle or the vehicle/load combination falls outside the stability triangle, the vehicle is unstable and may tip over. (See Figure 2.)

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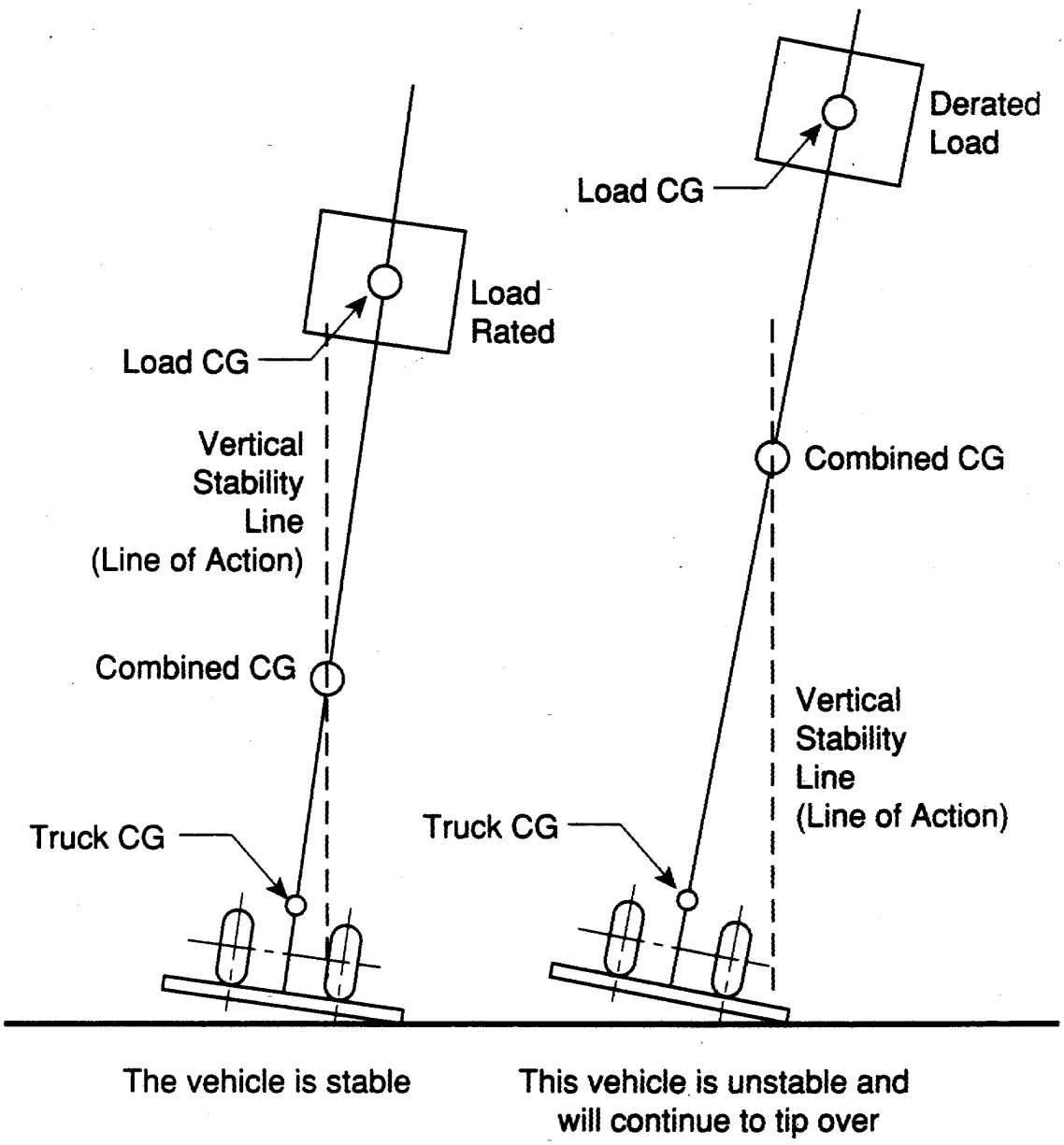

Figure 2.

BILLING CODE 4510–26–C

B–5. Longitudinal Stability

B–5.1. The axis of rotation when a truck tips forward is the point of contact of the front wheels of the vehicle with the pavement. When a powered industrial truck tips forward, it is this line that the truck will rotate about. 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 the tip forward, thereby causing loss of steering control. If the load-moment greatly exceeds the vehicle-moment, the truck will tip forward.

B–5.2. In order 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 a load center. Because larger trucks normally handle loads that are physically larger, these vehicles have greater load centers. A truck with a capacity of 30,000 pounds or less capacity is normally rated at a given load weight at a 24 inch load center. For trucks of greater than 30,000 pound capacity, the load center is normally rated at 36 or 48 inch load center distance. In order to safely operate the vehicle, the operator should always check the data plate and determine the maximum allowable weight at the rated load center.

B–5.3. 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. Calculation of 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), with an offset center of gravity, etc., then calculation of a maximum allowable load moment should be undertaken and this value used to determine whether a load can be 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 probable load is 60 inches long (30 inch load center), then the maximum weight that this load can weigh is 2,400 pounds (72,000 divided by 30).

B–6. Lateral Stability

B–6.1. The lateral stability of a vehicle is determined by the position of the line of action (a vertical line that passes through the combined center of gravity of the vehicle and the load) relative to the stability triangle. When the vehicle is not loaded, the location of the center of gravity of the truck is the only factor to be considered in determining the stability of the truck. As long as the line of action of the combined center of gravity of the vehicle and the load 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.

B–6.2. Factors that affect the lateral stability of a vehicle include the placement of the load on the truck, the height of the load above the surface on which the vehicle is operating, and the degree of lean of the vehicle.

B–7. Dynamic Stability

B–7.1. Up to this point, we have covered stability of a powered industrial truck without consideration of the dynamic forces that result when the vehicle and load are put into motion. The transfer of weight 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–7.2. 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.

PART 1918—SAFETY AND HEALTH REGULATIONS FOR LONGSHORING

7. The authority citation for part 1918 would be revised to read as follows:

Authority: Section 41, Longshore and Harbor Workers' Compensation Act (33 U.S.C. 941); secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736) or 1–90 (55 FR 9033), as applicable. Section 1918.77 also issued under 29 CFR part 1911.

8. A new § 1918.77 with appendices A and B would be added to subpart G to read as follows:

§ 1918.77 Powered Industrial Trucks.

(a) *Operator training.*

(1) *Operator qualifications.* (i) The employer shall ensure that each potential operator of a powered industrial truck is capable of performing the duties that are required of the job.

(ii) In determining operator qualifications, the employer shall ensure that each potential operator has received the training required by this paragraph, that each potential operator has been evaluated by a designated person while performing the required duties, and that each potential operator performs those operations competently.

(2) *Training program implementation.*

(i) The employer shall implement a training program and ensure that only trained drivers who have successfully completed the training program are allowed to operate powered industrial trucks. Exception: Trainees under the direct supervision of a designated person shall be allowed to operate a powered industrial truck provided the operation of the vehicle is conducted in an area where other employees are not near and the operation of the truck is under controlled conditions.

(ii) Training shall consist of a combination of classroom instruction (Lecture, discussion, video tapes, and/or conference) and practical training (demonstrations and practical exercises by the trainee).

(iii) All training and evaluation shall be conducted by a designated person who has the requisite knowledge, training and experience to train powered industrial truck operators and judge their competency.

(3) *Training program content.* Powered industrial truck operator trainees shall be trained in the following topics unless the employer can demonstrate that some of the topics are not needed for safe operation.

(i) Truck related topics.

(A) All operating instructions, warnings and precautions for the types of trucks the operator will be authorized to operate;

(B) Similarities to and differences from the automobile;

(C) Controls and instrumentation: location, what they do and how they work;

(D) Power plant operation and maintenance;

(E) Steering and maneuvering;

(F) Visibility (including restrictions due to loading);

(G) Fork and attachment adaption, operation and limitations of their utilization;

(H) Vehicle capacity;

(I) Vehicle stability;

(J) Vehicle inspection and maintenance;

(K) Refueling or charging, recharging batteries;

(L) Operating limitations; and

(M) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(ii) Workplace related topics.

(A) Surface conditions where the vehicle will be operated;

(B) Composition of probable loads and load stability;

(C) Load manipulation, stacking, unstacking;

(D) Pedestrian traffic;

(E) Narrow aisles and other restricted places of operation;

(F) Operating in hazardous classified locations;

(G) Operating the truck on ramps and other sloped surfaces that could affect the stability of the vehicle;

(H) Other unique or potentially hazardous environmental conditions that exist or may exist in the workplace; and

(I) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(iii) The requirements of this section.

(4) *Evaluation and refresher or remedial training.*

(i) Sufficient evaluation and remedial training shall be conducted so that the employee retains and uses the knowledge, skills and ability needed to operate the powered industrial truck safely.

(ii) An evaluation of the performance of each powered industrial truck operator shall be conducted at least annually by a designated person.

(iii) Refresher or remedial training shall be provided when there is reason to believe that there has been unsafe operation, when an accident or a near-miss occurs or when an evaluation indicates that the operator is not capable of performing the assigned duties.

(5) *Certification.*

(i) The employer shall certify that each operator has received the training, has been evaluated as required by this paragraph, and has demonstrated competency in the performance of the operator's duties. The certification shall include the name of the trainee, the date of training, and the signature of the person performing the training and evaluation.

(ii) The employer shall retain the current training materials and course outline or the name and address of the person who conducted the training if it was conducted by an outside trainer.

(6) *Avoidance of Duplicative Training.*

(i) Each current truck operator who has received training in any of the elements specified in paragraph (a)(3) of this section for the types of trucks the employee is authorized to operate and the type workplace that the trucks are being operated in need not be retrained in those elements if the employer certifies in accordance with paragraph (a)(5)(i) of this section that the operator has been evaluated to be competent to perform those duties.

(ii) Each new truck operator who has received training in any of the elements specified in paragraph (a)(3) of this section for the types of trucks the employee will be authorized to operate and the type of workplace in which the trucks will be operated need not be retrained in those elements before initial assignment in the workplace if the employer has written documentation of the training and if the employee is evaluated pursuant to paragraph (a)(4) of this section to be competent.

(b) [Reserved]

Appendixes to § 1918.77

Appendix A—Training of Powered Industrial Truck Operators

(Non-mandatory appendix to paragraph (a) of this section)

A–1. Operator Selection

A–1.1. Prospective operators of powered industrial trucks should be identified based upon their ability to be trained and accommodated to perform job functions that are essential to the operation of a powered industrial truck. Determination of the capabilities of a prospective operator to fulfill the demands of the job should be based upon the tasks that the job demands.

A–1.2. The employer should identify all the aspects of the job that the employee must meet/perform when doing his or her job. These aspects could include the level at which the employee must see and hear, the physical demands of the job, and the environmental extremes of the job.

A–1.3. One factor to be considered is the ability of the candidate to see and hear within reasonably acceptable limits. Included in the vision requirements are the ability to see at distance and peripherally. In certain instances, there also is a requirement for the candidate to discern different colors, primarily red, yellow and green.

A–1.4. The environmental extremes that might be demanded of a potential powered industrial truck operator include that ability of the person to work in areas of excessive cold or heat.

A–1.5. After an employee has been trained and appropriate accommodations have been made, the employer needs to determine whether the employee can safely perform the job.

A–2. The Method(s) of Training

A–2.1. Among the many methods of training are the lecture, conference, demonstration, test (written and/or oral) and the practical exercise. In most instances, a combination of these methods have been successfully used to train employees in the knowledge, skills and abilities that are essential to perform the job function that the employee is being trained to perform. To enhance the training and to make the training more understandable to the employee, employers and other trainers have used movies, slides, video tapes and other visual presentations. Making the presentation more understandable has several advantages including:

(1) The employees being trained remain more attentive during the presentation if graphical presentation are used, thereby increasing the effectiveness of the training;

(2) The use of visual presentations allows the trainer to ensure that the necessary information is covered during the training;

(3) The use of graphics makes better utilization of the training time by decreasing the need for the instructor to carry on long discussions about the instructional material; and

(4) The use of graphics during instruction provides greater retention by the trainees.

A–3. Training Program Content

A–3.1. Because each type (make and model) powered industrial truck has different operating characteristics, limitations and other unique features, an optimum employee training program for powered industrial truck operators must be based upon the type vehicles that the employee will be trained and authorized to operate. The training must also emphasize the features of the workplace which will affect the manner in which the vehicle must be operated. Finally, the training must include the general safety rules applicable to the operation of all powered industrial trucks.

A–3.2. Selection of the methods of training the operators has been left to the reasonable determination of the employer. Whereas some employees can assimilate instructional material while seated in a classroom, other employees may learn best by observing the conduct of operations (demonstration) and/or by having to personally conduct the operations (practical exercise). In some instances, an employee can receive valuable instruction through the use of

electronic mediums, such as the use of video tapes and movies. In most instances, a combination of the different training methods may provide the mechanism for providing the best training in the least amount of time. OSHA has specified at paragraph (a)(2)(ii) of this section that the training must consist of a combination classroom instruction and practical exercise. The use of both these modes of instruction is the only way of assuring that the trainee has received and comprehended the instruction and can utilize the information to safely operate a powered industrial truck.

A–4. Initial Training

A–4.1. The following is an outline of a generalized forklift operator training program:

(1) Characteristics of the powered industrial truck(s) the employee will be allowed to operate:

(a) Similarities to and differences from the automobile;

(b) Controls and instrumentation: location, what they do and how they work;

(c) Power plant operation and maintenance;

(d) Steering and maneuvering;

(e) Visibility;

(f) Fork and/or attachment adaption, operation and limitations of their utilization;

(g) Vehicle capacity;

(h) Vehicle stability;

(i) Vehicle inspection and maintenance;

(j) Refueling or charging, recharging batteries.

(k) Operating limitations.

(l) Any other operating instruction, warning or precaution listed in the operator's manual for the type vehicle which the employee is being trained to operate.

(2) The operating environment:

(a) Floor surfaces and/or ground conditions where the vehicle will be operated;

(b) Composition of probable loads and load stability;

(c) Load manipulation, stacking, unstacking;

(d) Pedestrian traffic;

(e) Narrow aisle and restricted place operation;

(f) Operating in classified hazardous locations;

(g) Operating the truck on ramps and other sloped surfaces which would affect the stability of the vehicle;

(h) Other unique or potentially hazardous environmental conditions which exist or may exist in the workplace.

(i) Operating the vehicle in closed environments and other areas where insufficient ventilation could cause a buildup of carbon monoxide or diesel exhaust.

(3) The requirements of this OSHA Standard.

A–5. Trainee Evaluation

A–5.1. The provisions of these proposed requirements specify that an employee evaluation be conducted both as part of the training and after completion of the training. The initial evaluation is useful for many reasons, including:

(1) the employer can determine what methods of instruction will produce a proficient truck operator with the minimum of time and effort;

(2) the employer can gain insight into the previous training that the trainee has received; and

(3) a determination can be made as to whether the trainee will be able to successfully operate a powered industrial truck. This initial evaluation can be completed by having the employee fill out a questionnaire, by an oral interview, or by a combination of these mechanisms. In many cases, answers received by the employee can be substantiated by contact with other employees or previous employers.

A–6. Refresher or Remedial Training

A–6.1. (The type information listed at paragraph A–6.2 of this appendix would be used when the training is more than an on-the-spot correction being made by a supervisor or when there have been multiple instances of on-the-spot corrections having to be made.) When an on-the-spot correction is used, the person making the correction should point out the incorrect manner of operation of the truck or other unsafe act being conducted, tell the employee how to do the operation correctly, and then ensure that the employee does the operation correctly.

A–6.2. The following items may be used when a more general, structured retraining program is utilized to train employees and eliminate unsafe operation of the vehicle:

(1) Common unsafe situations encountered in the workplace;

(2) Unsafe methods of operating observed or known to be used;

(3) The need for constant attentiveness to the vehicle, the workplace conditions and the manner in which the vehicle is operated.

A–6.3. Details about the above subject areas need to be expanded upon so that the operator receives all the information which is necessary for the safe operation of the vehicle. Insight into some of the specifics of the above subject areas may be obtained from the vehicle manufacturers' literature, the national consensus standards [e.g. the ANSI B56 series of standards (current revisions)] and this OSHA Standard.

Appendix B—Stability of Powered Industrial Trucks

(Non-mandatory appendix to paragraph (a) of this section)

B–1. Definitions

To understand the principle of stability, understanding definitions of the following is necessary:

Center of Gravity is that point of an object at which all of the weight of an object can be considered to be concentrated.

Counterweight is the weight that is a part of the basic structure of a truck that is used to offset the weight of a load and to maximize the resistance of the vehicle to tipping over.

Fulcrum is the axis of rotation of the truck when it tips over.

Grade is the slope of any surface that is usually measured as the number of feet of rise of fall over a hundred foot horizontal distance (this measurement is designated as a percent).

Lateral stability is the resistance of a truck to tipping over sideways.

Line of action is a imaginary vertical line through the center of gravity of an object.

Load center is the horizontal distance from the edge of the load (or the vertical face of the forks or other attachment) to the line of action through the center of gravity of the load.

Longitudinal stability is the resistance of a truck to overturning forward or rearward.

Moment is the product of the weight of the object times the distance from a fixed point. In the case of a powered industrial truck, the distance is measured from the point that the truck will tip over to the line of action of the object. The distance is always measured perpendicular to the line of action.

Track is the distance between wheels on the same axle of a vehicle.

Wheelbase is the distance between the centerline of the front and rear wheels of a vehicle.

B–2. General

B–2.1. Stability determination for a powered industrial truck is not complicated once a few basic principles are understood. There are many factors that influence vehicle stability. Vehicle wheelbase, track, height and weight distribution of the load, and the location of the counterweights of the vehicle (if the vehicle is so equipped), all contribute to the stability of the vehicle.

B–2.2. The ''stability triangle'', used in most discussions of stability, is not

mysterious but is used to demonstrate truck stability in rather simple fashion.

B–3. Basic Principles

B–3.1. The determination of whether an object is stable is dependent on the moment of an object at one end of a system being greater than, equal to or smaller than the moment of an object at the other end of that system. This is the same principle on which 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 other end of the device, 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–3.2. Longitudinal stability of a counterbalanced powered industrial truck is dependent on the moment of the vehicle and the moment of the load. In other words, if the mathematic product of the load moment (the distance is from the front wheels, the point about which the vehicle would tip forward) the system is balanced and will not tip forward. However, if the load-moment is greater than the vehicle-moment, the greater load-moment will force the truck to tip forward.

B–4. The Stability Triangle

B–4.1. 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 it has four wheels. The steer axle of most trucks is attached to the truck by means of a pivot pin in the center of the axle. This three-point support forms a triangle called the stability triangle when the points are connected with imaginary lines. Figure 1 depicts the stability triangle.

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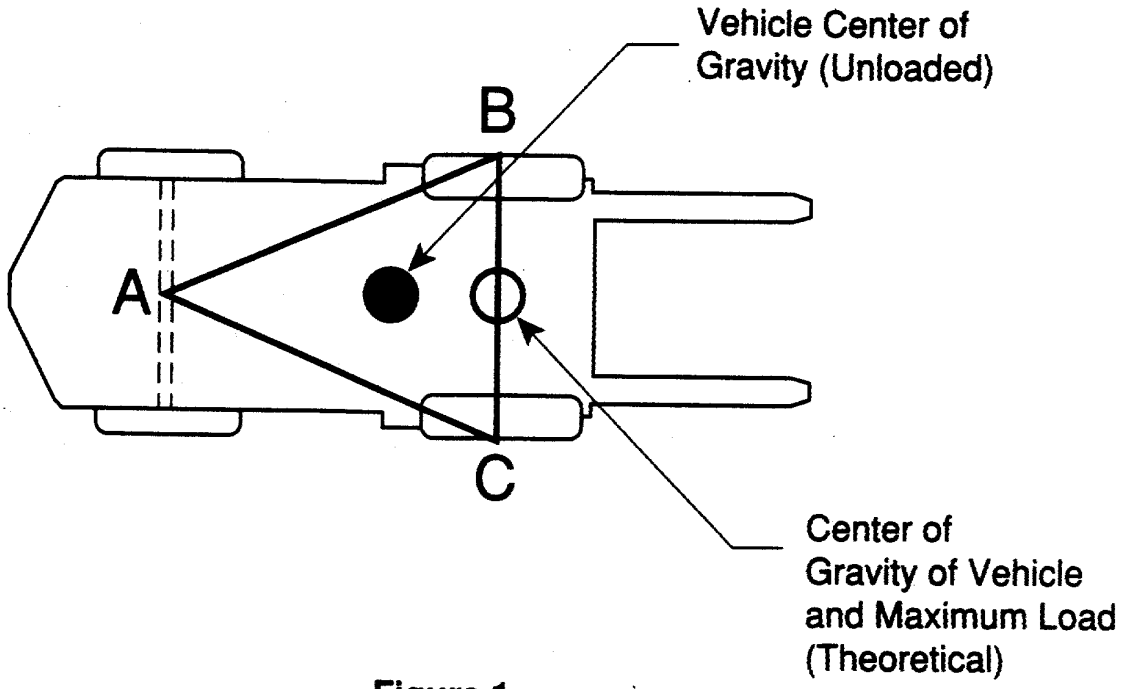

Figure 1.

NOTES:

1. When the vehicle is loaded, the combined center of gravity shifts toward line B-C. Theoretically the max 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.

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B–4.2. When the line of action of the vehicle or load-vehicle falls within the stability triangle, the vehicle is stable and will not tip over. However, when the line of action of the vehicle or the vehicle/load combination falls outside the stability triangle, the vehicle is unstable and may tip over. (See Figure 2.)

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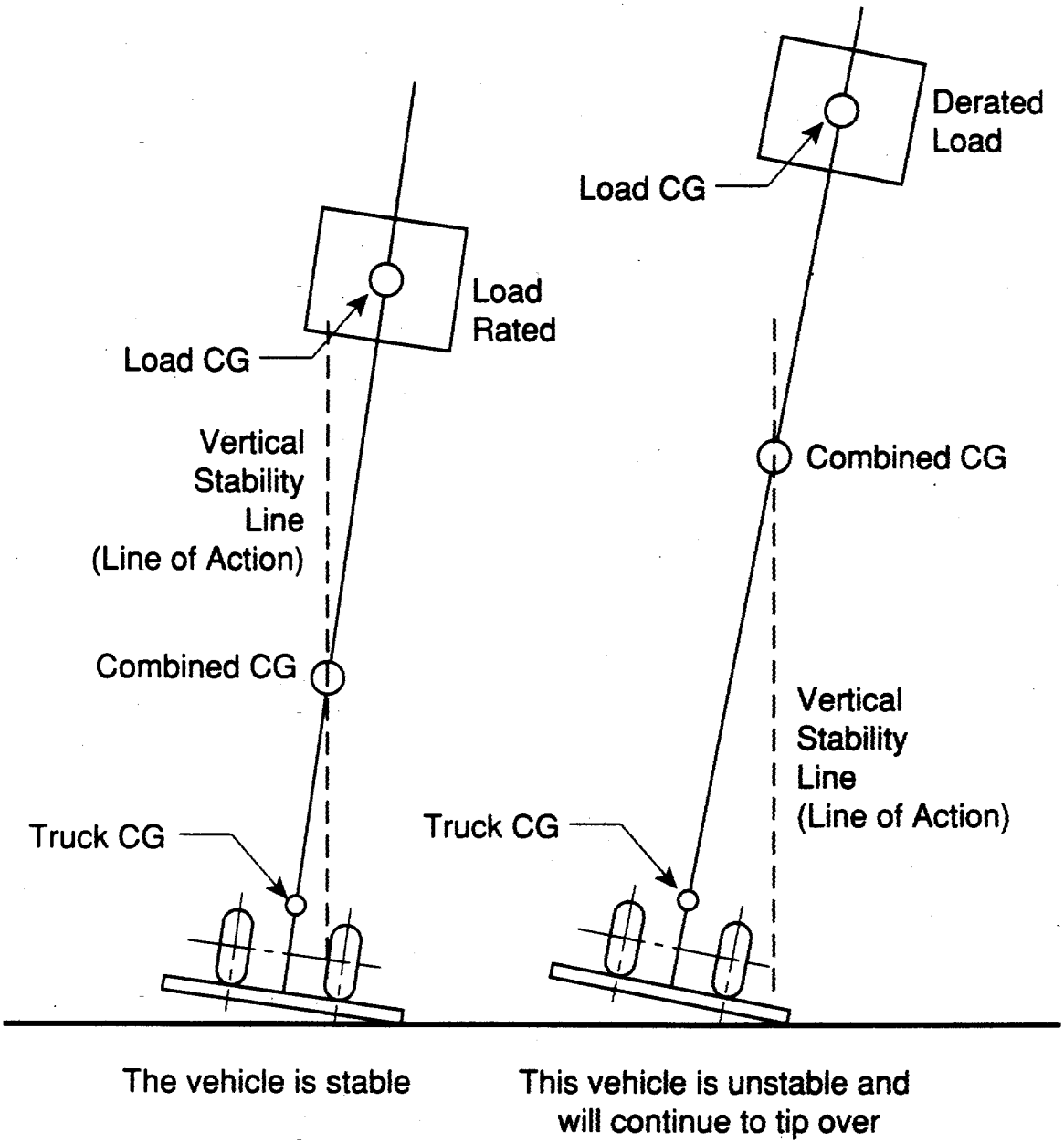

Figure 2.

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B–5. Longitudinal Stability

B–5.1. The axis of rotation when a truck tips forward is the point of contact of the front wheels of the vehicle with the pavement. When a powered industrial truck tips forward, it is this line that the truck will rotate about. 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 the tip forward, thereby causing loss of steering control. If the load-moment greatly exceeds the vehicle-moment, the truck will tip forward.

B–5.2. In order 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 a load center. Because larger trucks normally handle loads that are physically larger, these vehicles have greater load centers. A truck with a capacity of 30,000 pounds or less capacity is normally rated at a given load weight at a 24 inch load center. For trucks of greater than 30,000 pound capacity, the load center is normally rated at 36 or 48 inch load center distance. In order to safely operate the vehicle, the operator should always check the data plate and determine the maximum allowable weight at the rated load center.

B–5.3. 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. Calculation of 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), with an offset center of gravity, etc., then calculation of a maximum allowable load moment should be undertaken and this value used to determine whether a load can be handled. For example, if an operator is operating a 3000 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 probable load is 60 inches long (30 inch load center), then the maximum weight that this load can weigh is 2,400 pounds (72,000 divided by 30).

B–6. Lateral Stability

B–6.1. The lateral stability of a vehicle is determined by the position of the line of action (a vertical line that passes through the combined center of gravity of the vehicle and the load) relative to the stability triangle. When the vehicle is not loaded, the location of the center of gravity of the truck is the only factor to be considered in determining the stability of the truck. As long as the line of action of the combined center of gravity of the vehicle and the load 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.

B–6.2. Factors that affect the lateral stability of a vehicle include the placement of the load on the truck, the height of the load above the surface on which the vehicle is operating, and the degree of lean of the vehicle.

B–7. Dynamic Stability

B–7.1. Up to this point, we have covered stability of a powered industrial truck without consideration of the dynamic forces that result when the vehicle and load are put into motion. The transfer of wight 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–7.2. 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.

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