

## CONNECTICUT DEPARTMENT OF LABOR DIVISION of OCCUPATIONAL SAFETY and HEALTH

### Powered Industrial Trucks (Fork Truck): Fork Extensions, Modifications and Attachments

By: Jeff Carter Safety Consultant

The stability of any powered industrial truck (fork truck) must account for two planes of action: side to side or lateral stability, and forward and back or longitudinal stability. The capacity (and stability) of a fork truck is based not only on the load weight but also the position of a load on the forks. Even though a given load may be within the maximum load rating of a fork truck, it can cause the fork truck to become unstable if the center of gravity of the load is located beyond the point on which the rating is based. That distance is typically 24" measured from the heel of the forks and 24" up, for most sit-down counterbalance fork trucks. Larger capacity trucks may use a 36" or 48" load center distance. This information is found on the truck's data plate, and generally depicts an evenly distributed load in the form of a 48" cube box with its center of gravity at 24" both side to side and front to back within the cube, and the load raised a given distance from the floor. The trained operator uses this information to determine if the actual load being lifted is within the safe lifting parameters.

Almost all counterbalanced powered industrial trucks have a three-point suspension system, that is, the vehicle is supported at three points. This is true even if the vehicle has four wheels. The truck's rear steer axle is attached to the truck by a pivot pin in the axle's center. When the points are connected with imaginary lines, this three-point support forms a triangle called the stability triangle which is depicted in Figure 1.

#### Inside this Issue:

Page 1 & 2 Powered Industrial Truck (Fork Trucks)

Page 2 Emphasis Program—Powered Industrial Trucks

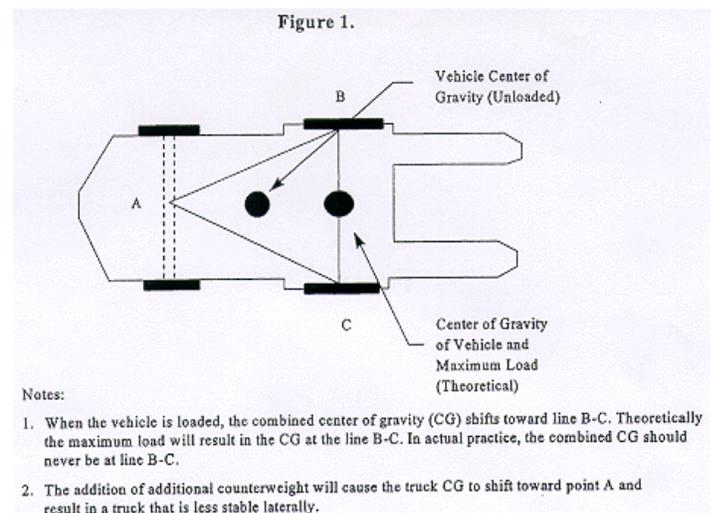
Page 3 Powered Industrial Trucks OSHA Personnel Lifting Provision & SHARP Update

Page 4 Hazard Corner & Training schedule

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

When the truck is loaded to its maximum capacity, the combined center of gravity of the vehicle and load falls through the center of the front axle. This is considered its threshold of stability.

American Society of Mechanical Engineers (ASME) standard B56.1, 2000, Safety Standard for Low Lift and High Lift Trucks, paragraph 7.38 discusses fork extensions. The consensus standard limits the length of the fork extension to 150% of the supporting fork length. The standard goes on to state that the rated load center of the fork extension should be 50% of the fork extension supporting length.



The following example considers only longitudinal stability although the same theory is applied to lateral stability. A 3000 pound truck with a 24 inch load center (4 foot forks) creates a 72,000 inch-pound load moment (3000 pound capacity times the 24 inch load center). A four foot supporting fork can be extended six feet with extension forks according to ASME B56.1. Six foot extension forks have a load center at three feet. With the extension installed on the 3000 pound truck, the maximum safe carrying capacity of the truck is 72,000 divided by the new 36 inch load center (3 foot = 36 inches) or 2000 pounds at the three foot load center. Fork extensions do not increase the lifting capacity of a truck. What they do is better stabilize longer loads.

Although the OSHA standard 1910.178 does not specifically discuss fork extensions, OSHA will generally accept an employer's actions if they comply with a consensus standard.

### Powered Industrial Truck Fork Extensions

Industrial powered trucks (fork trucks) can be equipped with attachments to increase their usefulness. Boom extensions, hoppers, rug rams, drum carrier/rotators, cylinder caddies, and drum grippers are often seen on the manufacturing floor. These modifications and additions affect capacity and safe operation and therefore must have the truck manufacturers prior written approval. With the modification, the truck's capacity, operation, and maintenance instruction plates, tags, or decals must be changed to indicate the truck's new capacity rating.

Many of these attachments are not manufactured by the truck manufacturer. Truck manufacturers may not approve a product they are not familiar with. OSHA recognizes the truck manufacturers reluctance to approve the attachment and therefore will accept approval from a qualified Registered Professional Engineer (RPE) after the employer receives no response or a negative response from the powered industrial truck manufacturer. If the manufacturers response was negative, then the engineer, prior to granting approval for the modification or addition, would need to perform a safety analysis and address all safety and/or structural issues contained in the manufacturers disapproval. Additional points to remember:

- The discussion above considers a static condition. An operator that drives fast, erratically, applies the brakes abruptly, and turns quickly can easily tip the truck over.
- A load which is not near the maximum capacity of the vehicle but is biased toward the fork tips can easily create an unstable condition.

- The fork extension and attachment weight must be considered as part of the payload. Reduce the overall capacity by the weight of the fork extension or attachment.
- A load's center of gravity can be approximated by the operator. If conditions will allow, place the load on a length of pipe which will act as a fulcrum. Adjust the pipe until the load is balanced. This is the center of gravity of the load and the distance from the side of the load to the fulcrum point is the load center. The load center distance can be used by the operator to calculate the truck's safe lifting capacity.
- Adding more counterbalance weight to the truck moves the truck's center of gravity toward the truck's rear steer axle which is attached to the truck by a pivot pin in the axle's center. This is unstable because the truck is in a very narrow band of stability.
- If while carrying a load the steering feels 'light', the truck is unstable and the operator has very little control over the truck.
- When traveling with a load keep the load as low as possible.

The maximum weight capacity of a truck can be misleading to the uninformed. When purchasing a truck, consider your actual load weight and configuration, and any fork extensions, modifications and attachments you may use. Also consider the height the load will be raised to and the surface driven on. Receive written approval from the truck manufacturer for the modification or attachment, or from a qualified RPE. Identify the new capacity of the truck by replacing the truck's data plate.

## Emphasis Program *Powered Industrial Trucks*

On December 1, 1998, the Occupational Safety and Health Administration published the Powered Industrial Truck (PIT) Operator Training; Final Rule, 29 CFR Parts 1910, 1915, 1917, 1918, and 1926. This final rule revised 1910.178 Paragraph (l) and was intended to reduce the number of serious injuries and deaths by improving the training for PIT operators.

The new standard requires PIT operator training that is based on the operator's prior knowledge and skill, the type of PIT being operated in the workplace, the hazards of the workplace, and the operator's demonstrated ability to operate a PIT. The final rule also requires refresher training if the operator is involved in an accident or "near miss" or has been observed operating a PIT in an unsafe manner. Evaluations of operators' performance are also required by the new requirement paragraph.



Since 2002, there has been an OSHA Region 1 Emphasis Program designed to reduce injuries and fatalities related to PITs. OSHA estimates that there are approximately 1.5 million workers in the United States who operate PITs and these vehicles are a significant source of serious and fatal injuries. PITs are used in almost all industries and on almost all construction sites to move, raise, lower, or handle materials. A BLS study indicates that industrial truck related fatalities in private industry have increased steadily from 79 in 1992, to a high of 146 in 2000. This study also indicated 50% of the forklift fatalities occurred in manufacturing and construction with the remainder of fatalities in mining, agriculture, transportation, wholesale, retail, and services. A review of OSHA Region 1 statistics from 1992 through 2001 indicated that there were 35 PIT related fatalities which accounted for 9% of all fatalities during that time period.



## Powered Industrial Trucks: OSHA Personnel Lifting Provision

By John Able, CSP



Special provisions should be used when using Powered Industrial Trucks to lift personnel. Effective July 2, 2003, OSHA removed and reserved 29 CFR 1910.178(m)(12)(i) through (iii) because this section was invalidly promulgated from a non-mandatory provision of a national consensus standard. When OSHA adopted the standard from ANSI B56.1-1969 in 1971, the consensus standard language was revised, making it appear to be a mandatory provision of the OSHA Standard when in fact the language in the consensus standard was advisory.

This action does not indicate that the underlying hazard addressed by these provisions is not serious. Indeed, if proper equipment, procedures and training are not provided, the lifting of personnel with powered industrial trucks poses hazards likely to cause death or serious injury to employees. As noted in OSHA's 1998 amendment to the Powered Industrial Trucks Standard, a significant percentage (4 to 14% depending on the study) of the 100 deaths and 95,000 injuries per year that involve powered industrial trucks result from falls from personnel lifting.

The **first thing** an employer should do is determine if the fork truck manufacturer allows the use of personnel lifting platforms. **If** this activity is allowed by the manufacturer, a new data plate should be obtained and installed on the vehicle. Only after permission has been received from the manufacturer can the employer move forward with the proper equipment, procedures, training, evaluation and supervision to prevent serious injury or death during lifting of personnel operations.

The most recent American Society of Mechanical Engineers' (ASME) current standard for powered industrial trucks (ASME B56.1 – 2000) addresses the hazards concerning lifting of personnel. Unfortunately, OSHA Standards cannot be updated as readily as national consensus standards which are typically reviewed on a cyclical basis. Employers should keep in close touch with experts in the field, ask lots of questions, and use all available resources to help ensure a safe workplace for all employees.

## Sharp Update...

On September 26, 2006, the New Hampshire Department of Environmental Services hosted the 4th annual US DOL OSHA Region 1 Safety and Health Achievement Recognition Program (SHARP) Luncheon. Approximately 75 people attended the event which took place at the Urban Forestry Center, Portsmouth, New Hampshire.

Oxley, Inc. of Branford Connecticut and Midwestern Connecticut Council on Alcoholism of Danbury, Connecticut were honored as first time recipients of the SHARP award.



Oxley, Inc. Branford, Connecticut (from left to right) Martin Sloan, Chief Executive Officer, Kenneth Tucker, CONN-OSHA Manager and Mr. John Bradshaw, Operations Manager



The Midwestern Connecticut Council of Alcoholism, Inc.(MCCA) (from left to right ) CONN-OSHA's Usha Maru Occupational Hygienist, and Kenneth Tucker Consultation Manager; Jim Hanock, Director of Facilities, and Members of the MCCA Safety and Health Committee

## Connecticut Safety Society

During the recent holidays **The Connecticut Safety Society** collected over 140 Teddy bears and assorted stuffed animals. They were donated to The Hartford Interval House for distribution.

In the photo, from left to right: CONN-OSHA's Erin Wilkins, Aaron Thompson, Catherine



Connecticut Department of Labor - OSHA  
38 Wolcott Hill Road  
Wethersfield, CT 06109

To receive the *Quarterly* electronically, contact [gregory.grayson@dol.gov](mailto:gregory.grayson@dol.gov). In the subject line type "*subscribe*" and provide the e-mail address. You may also reach us by phone at (860) 263-6900 or visit our website at <http://www.ctdol.state.ct.us/osha/osha.htm>

## Hazard Corner...



### *Fork Truck Instability Incident~*

*Mr. Robert Kowalski, Area Director Bridgeport Office U.S. Department of Labor- OSHA*

According to the U.S. Department of Labor's Bureau of Labor Statistics, an average of 100 workers are killed and 20,000 are seriously injured each year as a result of fork truck accidents. A significant number of these incidents can be directly related to fork truck instability.

On a Friday afternoon in July, the Bridgeport Area Office of the USDOL-OSHA received a call from a Police Department in Southern Connecticut. A worker at a local car dealership had been involved in a fork truck incident. The worker had been assisting a neighboring business in the unloading of a tractor-trailer. Merchandise was being off loaded from the trailer and placed in a smaller vehicle. The worker had just placed a large item into the bed of the pickup. The fork truck was placed in reverse and the worker quickly backed up the fork truck, turning the steering wheel sharply. This motion caused the fork truck to flip onto its side, ejecting the worker. The worker became pinned under the overhead protection cage, sustaining a mortal injury.

An investigation into the incident revealed the following:

- The worker had not been trained in the proper operation of the fork truck.
- The fork truck had not been equipped with any type of operator restraint.
- When the fork truck was placed in reverse, the forks

were still raised.

In the "Employer's Guide to Material Handling Safety" under the section entitled "Lift truck tip over" is the following "**Turning too sharply with the forks raised, your truck can tip over, even at slow speeds and with no load.**"

The root cause of this accident was the instability of the fork truck. With the forks raised, the center of gravity was displaced. Turning the steering wheel sharply with the forks raised while traveling in reverse caused the truck to tip over. Because the operator was not wearing a seat belt, he was ejected from the seat and pinned under the overhead protection cage.

This accident could have been avoided if the following had occurred.

- Training of the operator in the correct operation of a fork truck.
- Understanding the dynamics of the fork truck while operating it with or without a load.
- The installation and use of a restraint system to prevent the operator from being ejected from the fork truck.

The accident depicted above occurred in July 1995. However as recently as October 2006, the Bridgeport Area Office has investigated another fatality with the exact same circumstances.

## CONN-OSHA ~ Training Update...

**Breakfast Roundtable** This discussion Group meets the third Tuesday of every month and the meetings are held from 8:15 am to 9:45 am. Pre-registration is required. To be placed on the e-mail distribution list, call John Able at (860) 263-6902 or email [able.john@dol.gov](mailto:able.john@dol.gov)

**Recordkeeping OSHA 300 February 16** The purpose of this workshop is to introduce the requirements and procedures related to the OSHA 300 Log. The presentation will cover recording requirements, include a discussion of the employee/employer relationship, which pre-existing cases can be limited in the OSHA forms, and exceptions for some categories of injuries and illnesses.

**Powered Industrial Trucks February 6 and May 8** Powered Industrial Truck Standard OSHA's 29 CFR 1910.178. This 3-hour workshop introduces participants to OSHA's Powered Industrial Truck standard and includes an in-depth review of operator training.

**Workplace Ergonomics March 13** Come and learn how to enhance your employees' moral, reduce workers' compensation costs and be a leader in creating a safe workplace. Class participants will learn how to create an ergonomically sound office environment and how to develop a comprehensive and successful ergonomic program.

**Work Zone Safety April 12** Basic guidelines for work zone traffic control and the requirements of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) with particular emphasis on short term work sites on roads and streets in rural and small urban areas will be presented.

Classes are free and held at 200 Folly Brook Boulevard, Wethersfield, CT in Conference Room A from 9 am - 12 noon. To register, contact John Able at (860) 263-6902 or [able.john@dol.gov](mailto:able.john@dol.gov). **Pre-registration is required.** For more training information, visit [www.ctdol.state.ct.us/osha/osha.htm](http://www.ctdol.state.ct.us/osha/osha.htm).

## Fatality & Casualty Reporting

**State & Town:** CONN-OSHA (860) 263-6946 (local) or 1-866-241-4060 (toll-free)  
**Private Employers:** Report to Federal OSHA at 1-800-321-OSHA(6742)