How to Prevent Injuries of Workers Who Operate or Work Near Forklifts

Safety Tips for Protecting Operators and Pedestrians in Your Commercial Printing or Bindery Business

by the
National Institute for Occupational Safety and Health
courtesy of Technifold USA

NIOSH

ALERT

Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts

WARNING!

Workers who operate or work near forklifts may be struck or crushed by the machine or the load being handled.

Workers: If you operate or work near forklifts, take these steps to protect yourself.

- Do not operate a forklift unless you have been trained and licensed.
- Use seatbelts if they are available.
- Report to your supervisor any damage or problems that occur to a forklift during your shift.
- Do not jump from an overturning, sit-down type forklift. Stay with the truck, holding on firmly and leaning in the opposite direction of the overturn.
- Exit from a stand-up type forklift with rear-entry access by stepping backward if a lateral tipover occurs.
- Use extreme caution on grades or ramps.
- On grades, tilt the load back and raise it only as far as needed to clear the road surface.
- Do not raise or lower the forks while the forklift is moving.
- Do not handle loads that are heavier than the weight capacity of the forklift.
- Operate the forklift at a speed that will permit it to be stopped safely.
- Slow down and sound the horn at cross aisles and other locations where vision is obstructed.
- Look toward the travel path and keep a clear view of it.
- Do not allow passengers to ride on forklift trucks unless a seat is provided.
- When dismounting from a forklift, set the parking brake, lower the forks or lifting carriage, and neutralize the controls.
- Do not drive up to anyone standing in front of a bench or other fixed object.
- Do not use a forklift to elevate workers who are standing on the forks.
- Elevate a worker on a platform only when the vehicle is directly below the work area.
- Whenever a truck is used to elevate personnel, secure the elevating platform to the lifting carriage or forks of the forklift.
- Use a restraining means such as rails, chains, or a body belt with a lanyard or deceleration device for the worker(s) on the platform.
- Do not drive to another location with the work platform elevated.

Typical sit-down type forklift.

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Workers who operate or work near forklifts may be struck or crushed by the machine or the load being handled.

The National Institute for Occupational Safety and Health (NIOSH) requests assistance in preventing injuries and deaths of workers who operate or work near forklifts. Most fatalities occur when a worker is crushed by a forklift that has overturned or fallen from a loading dock.

NIOSH investigations of forklift-related deaths indicate that many workers and employers (1) may not be aware of the risks of operating or working near forklifts and (2) are not following the procedures set forth in the Occupational Safety and Health Administration (OSHA) standards, consensus standards, or equipment manufacturer's guidelines.

This Alert describes seven incidents resulting in the deaths of seven workers who were either operating or working near forklifts. In each incident, the deaths could have been prevented by using proper safety procedures and equipment and by following the provisions of the OSHA standards.

NIOSH requests that editors of trade journals, safety and health officials, industry associations, unions, and employers in all industries bring the recommendations in this Alert to the attention of all workers who are at risk.

BACKGROUND

Forklifts, also known as powered industrial trucks, are used in numerous work settings, primarily to move materials. Each year in the United States, nearly 100 workers are killed and another 20,000 are seriously injured in forklift-related incidents [BLS 1997, 1998].

Typical sit-down type forklift.

Forklift overturns are the leading cause of fatalities involving forklifts; they represent about 25% of all forklift-related deaths.

FATALITY DATA

The following paragraphs summarize information about fatalities involving forklifts. The information is from databases that identify work-related fatalities in the United States.

National Traumatic Occupational Fatalities (NTOF) Surveillance System

In the United States, 1,021 workers died from traumatic injuries suffered in forklift-related incidents from 1980 to 1994. The NTOF Surveillance System uses death certificates to identify work-related deaths. These fatalities resulted from the following types of incidents:

Type of incident	*% total victims*
Forklift overturns	22
Worker on foot struck by forklift	20
Victim crushed by forklift	16
Fall from forklift	9

Census of Fatal Occupational Injuries (CFOI)

The Bureau of Labor Statistics CFOI identified 94 fatal injuries associated with forklifts in 1995 [BLS 1997].

CURRENT STANDARDS

Occupational Safety and Health Administration (OSHA)

OSHA has developed standards for powered industrial trucks (such as low- and high-lift trucks and forklift trucks) [29 CFR* 1910.178] and for forklifts used in the construction industry [29 CFR 1926.600; 1926.602].

Training

OSHA has promulgated the *Final Rule for Powered Industrial Truck Operator Training* [29 CFR 1910.178(l)], which became effective March 1, 1999. The standard requires operator training and licensing as well as periodic evaluations of operator performance. The standard also addresses specific training requirements for truck operation, loading, seat belts, overhead protective structures, alarms, and maintenance of industrial trucks. Refresher training is required if the operator is observed operating the truck in an unsafe manner, is involved in an accident or near miss, or is assigned a different type of truck.

Forklift Maintenance

OSHA requires that industrial trucks be examined before being placed in service. They shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. When industrial trucks are used around the clock, they shall be examined after each shift. When defects are found, they shall be immediately reported and corrected [29 CFR 1910.178(q)(7)].

Forklift Operation

OSHA requirements for forklift operation are as follows:

- On all grades, the load and load-engaging means shall be tilted back, if applicable, and raised only as far as

*Code of Federal Regulations. See CFR in references.

needed to clear the road surface. The forks shall not be raised or lowered while the forklift is moving [29 CFR 1910.178 (n)(7)(iii)].

- Under all travel conditions, the truck shall be operated at a speed that will permit it to be brought safely to a stop [29 CFR 1910.178 (n)(8)].

- The operator shall slow down and sound the horn at cross aisles and other locations where vision is obstructed [29 CFR 1910.178 (n)(4)].

- The operator is required to look toward and keep a clear view of the travel path [29 CFR 1910.178(n)(6)].

- Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where the riding of trucks is authorized [29 CFR 1910.178 (m)(3)].

- Forklift trucks shall not be driven up to anyone standing in front of a bench or other fixed object [29 1910.178 (m)(1)].

Fair Labor Standards Act (FLSA) and Youth Employment

The FLSA [29 USC† 201 et seq.] (the primary law governing the employment of youth under age 18) includes work declared hazardous for youth by the Secretary of Labor. Hazardous Order No. 7, *Power-Driven Hoisting Apparatus Occupations*, prohibits workers under age 18 from using forklifts and similar equipment in nonagricultural industries [29 CFR 570.58]. In agricultural industries, minors under age 16 are prohibited from using forklifts [29 CFR 570.71 (a)(3)(ii)].

Not all working minors are covered by the FLSA. The regulations in agriculture do not apply to minors working on their parents' farms. Also exempted are youths aged 14 and 15 who are working under carefully regulated conditions in a bona fide vocational agriculture program.

American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI)

ASME/ANSI B56.1–1993 requires the following [ASME 1993].

Maintenance and Safety Equipment

- Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guard and safety devices, lift and tilt mechanisms, articulating axle stops, and frame members shall be carefully and regularly inspected and maintained in a safe condition (ASME/ANSI B56.1–1993m 6.2.7) [ASME 1993].

- When work is being performed from an elevated platform, a restraining means such as rails, chains, etc., shall be in place, or a body belt with lanyard or deceleration device shall be worn by the person(s) on the platform (ASME/ANSI B56.1, §4.17.1[b]) [ASME 1993].

Operation

- An operator should avoid turning, if possible, and should use extreme caution on grades, ramps, or inclines. Normally the operator should travel straight up and down (ASME/ANSI B56.1, §5.3.8[d]) [ASME 1993].

†*United States Code*.

- The operator of a sit-down type forklift should stay with the truck if lateral or longitudinal tipover occurs. The operator should hold on firmly and lean away from the point of impact (ASME/ANSI B56.1, §5.3.18[d]) [ASME 1993].

In addition to the above regulations, employers and workers should follow operator's manuals, which are supplied by all equipment manufacturers and describe the safe operation and maintenance of forklifts.

CASE REPORTS

The cases presented here were investigated by the NIOSH Fatality Assessment and Control Evaluation (FACE) Program. The case reports were selected to represent the most common types of fatal forklift incidents: (1) forklift overturns, (2) workers struck, crushed, or pinned by a forklift, and (3) falls from a forklift.

Case 1—Forklift Overturn

On September 18, 1996, the 43-year-old president of an advertising sign company was killed while using a sit-down type forklift to unload steel tubing from a flatbed trailer. He was driving the forklift about 5 miles per hour beside the trailer on a concrete driveway with a 3% grade. The victim turned the forklift behind the trailer, and the forklift began to tip over on its side. The victim jumped from the operator's seat to the driveway. When the forklift overturned, the victim's head and neck became pinned to the concrete driveway under the falling-object protective structure (overhead guard). An inspection of the forklift revealed that the right-side rear axle stop was damaged before the incident and was not restricting the lateral sway of the forklift when it turned. Also, slack in the steering mechanism required the operator to turn the steering wheel slightly more than half a revolution before the wheels started to turn. The forklift was not equipped with a seat belt [NIOSH 1996b].

Case 2—Forklift Overturn

On April 25, 1995, a 37-year-old shop foreman was fatally injured after the sit-down type forklift he was operating overturned. The victim was turning while backing down an incline with a 4% grade. The forklift was transporting a 3-foot-high, 150-pound stack of cardboard with the forks raised approximately 60 inches off the ground. No one witnessed the incident. The victim was found with his head pinned under the overhead guard. The forklift was not equipped with a seat belt [California Department of Health Services 1996].

Case 3—Forklift Overturn

On November 25, 1996, a 41-year-old male laborer was fatally injured when the sit-down type forklift he was operating fell off a loading dock and pinned him under the overhead guard. The forklift was not equipped with a seat belt. The loading dock had large cracks in the surface and was in need of extensive repair. It was raining when the victim left the storage building to lift a load from the back of a pickup truck. Evidence indicates that either the victim's forklift was too close to the outer edge of the loading dock (which crumbled) or the right front tire was caught in a large crack in the loading dock, causing the forklift to overturn [Indiana State Department of Health 1996].

Case 4—Worker Struck by Forklift

On October 19, 1995, a 39-year-old female punch press operator at a computer components manufacturer was fatally injured

while performing normal work tasks at her station. A forklift was traveling in reverse at high speed toward the victim's work station. A witness observed the forklift strike a metal scrap bin (about 3 by 5 by 3½ feet), propelling it toward the punch press station. The bin hit the press and rebounded toward the forklift. There it was hit once again and shoved back against the corner of the press, striking and crushing the victim against the press [NIOSH 1996c].

Case 5—Fall from Forklift

On July 21, 1997, a 36-year-old male electric-line technician was fatally injured after falling from and being run over by a forklift. While the operator was driving the forklift, the victim was riding on the forks. As the operator approached an intersection, he slowed down and turned his head to check for oncoming traffic. When he turned his head back, he could not see the victim. He stopped the forklift, dismounted, and found the victim underneath the right side of the forklift [NIOSH 1997a].

Case 6—Fall from Forklift

On September 24, 1997, a 61-year-old male maintenance manager of a shelter for the homeless died after falling 7 feet from a safety platform that had been elevated by a forklift. The victim had been raised in a steel-framed, cage-type safety platform that had not been secured to the forklift. The victim removed a fluorescent light bulb from its fixture and stepped to one side of the safety platform. When the victim shifted his weight from the center of the platform to the outer edge, the safety platform toppled off the forks. The victim fell about 7 feet, struck his head on a concrete floor, and was subsequently struck by the steel safety platform [NIOSH 1997b].

Case 7—Fall from Forklift

On September 6, 1995, a 47-year-old male assistant warehouse manager was fatally injured while working with a forklift operator to pull tires from a storage rack. The two workers had placed a wooden pallet on the forks of the forklift, and the victim then stood on the pallet. The operator raised the forks and victim 16 feet above a concrete floor to the top of the storage rack. The victim had placed a few tires on the pallet when the operator noticed that the pallet was becoming unstable. The victim lost his balance and fell, striking his head on the floor [NIOSH 1996a].

CONCLUSIONS

National fatality data indicate that the three most common forklift-related fatalities involve forklift overturns, workers on foot being struck by forklifts, and workers falling from forklifts. The case studies indicate that the forklift, the factory environment, and actions of the operator can all contribute to fatal incidents involving forklifts. In addition, these fatalities indicate that many workers and employers are not using or may be unaware of safety procedures and the proper use of forklifts to reduce the risk of injury and death.

RECOMMENDATIONS

Reducing the risk of forklift incidents requires a safe work environment, a safe forklift, comprehensive worker training, safe work practices, and systematic traffic management.

NIOSH recommends that employers and workers comply with OSHA regulations and consensus standards, maintain equipment, and take the following measures to prevent injury when operating or working near forklifts.

Employers

Worker Training

- Make sure that workers do not operate a forklift unless they have been trained and licensed.
- Develop, implement, and enforce a comprehensive written safety program that includes worker training, operator licensure, and a timetable for reviewing and revising the program. A comprehensive training program is important for preventing injury and death. Operator training should address factors that affect the stability of a forklift—such as the weight and symmetry of the load, the speed at which the forklift is traveling, operating surface, tire pressure, and driving behavior.
- Inform operators of sit-down type forklifts that they can be crushed by the overhead guard or another part of the truck after jumping from the overturning forklift. The operator of a sit-down type forklift should stay with the truck if lateral or longitudinal tipover occurs. The operator should hold on firmly and lean away from the point of impact.
- Train operators of stand-up type forklifts with rear-entry access to exit from the truck by stepping backward if a lateral tipover occurs.
- Ensure that operator restraint systems are being used on sit-down type forklifts. Since 1992, forklift manufacturers have been required to equip new sit-down type forklifts with operator restraint systems. Many manufacturers of these forklifts offer restraint systems that can be retrofitted on older forklifts. Many of the fatalities resulting from overturns of sit-down type forklifts might have been prevented if the operator had been restrained. The overhead guard of the forklift is generally the part that crushes the operator's head or torso after he or she falls or jumps outside of the operator's compartment. The risk of being crushed by the overhead guard or another rigid part of the forklift is greatly reduced if the operator of a sit-down type forklift remains inside the operator's compartment. Because many forklifts are not equipped with a restraint system and operator compliance is less than 100% on forklifts equipped with a restraint system, ***operators of sit-down type forklifts should be instructed not to jump from the operator's compartment but to stay inside by leaning in the opposite direction of the overturn***.
- Train operators to handle asymmetrical loads when their work includes this activity.

Forklift Inspection and Maintenance

- Establish a vehicle inspection and maintenance program.
- Retrofit old sit-down type forklifts with an operator restraint system if possible.

Lifting

- Ensure that operators use only an approved lifting cage and adhere to general safety practices for elevating personnel with a forklift. Also, secure the platform to the lifting carriage or forks.

- Provide means for personnel on the platform to shut off power to the truck whenever the truck is equipped with vertical only or vertical and horizontal controls for lifting personnel.

Workers on Foot

- Separate forklift traffic and other workers where possible.
- Limit some aisles to *workers on foot only* or *forklifts only*.
- Restrict the use of forklifts near time clocks, break rooms, cafeterias, and main exits, particularly when the flow of workers on foot is at a peak (such as at the end of a shift or during breaks).
- Install physical barriers where practical to ensure that workstations are isolated from aisles traveled by forklifts.
- Evaluate intersections and other blind corners to determine whether overhead dome mirrors could improve the visibility of forklift operators or workers on foot.
- Make every effort to alert workers when a forklift is nearby. Use horns, audible backup alarms, and flashing lights to warn workers and other forklift operators in the area. Flashing lights are especially important in areas where the ambient noise level is high.

Work Environment

- Ensure that workplace safety inspections are routinely conducted by a person who can identify hazards and conditions that are dangerous to workers. Hazards include obstructions in the aisle, blind corners and intersections, and forklifts that come too close to workers on foot. The person who conducts the inspections should have the authority to implement prompt corrective measures.
- Install the workstations, control panel, and equipment away from the aisle when possible. Do not store bins, racks, or other materials at corners, intersections, or other locations that obstruct the view of operators or workers at workstations.
- Enforce safe driving practices such as obeying speed limits, stopping at stop signs, and slowing down and blowing the horn at intersections.
- Repair and maintain cracks, crumbling edges, and other defects on loading docks, aisles, and other operating surfaces.

Workers

- Do not operate a forklift unless you have been trained and licensed.
- Use seatbelts if they are available.
- Report to your supervisor any damage or problems that occur with a forklift during your shift.
- Do not jump from an overturning, sit-down type forklift. Stay with the truck if lateral or longitudinal tipover occurs. Hold on firmly and lean in the opposite direction of the overturn.
- Exit from a stand-up type forklift with rear-entry access by stepping backward if a lateral tipover occurs.
- Use extreme caution on grades, ramps, or inclines. Normally you

should travel only straight up and down.

- On all grades, tilt the load back if applicable, and raise it only as far as needed to clear the road surface.
- Do not raise or lower the forks while the forklift is moving.
- Do not handle loads that are heavier than the rated weight capacity of the forklift.
- Operate the forklift at a speed that will permit it to be stopped safely.
- Slow down and sound the horn at intersections and other locations where vision is obstructed.
- Look toward the path of travel and keep a clear view of it.
- Do not allow passengers to ride on forklift trucks unless a seat is provided.
- When dismounting from a forklift, always set the parking brake, lower the forks, and neutralize the controls.
- Do not drive up to anyone standing in front of a bench or other fixed object.
- Do not use a forklift to elevate workers who are standing on the forks.
- Do not elevate a worker on a platform unless the vehicle is directly below the work area.
- Whenever a truck is used to elevate personnel, secure the elevating platform to the lifting carriage or forks of the forklift.
- Use a restraining means such as rails, chains, or a body belt with a lanyard or deceleration device for the person(s) on the platform.
- Do not drive to another location with the work platform elevated.

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We greatly appreciate your assistance in protecting the health of U.S. workers.

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For additional information, see ***NIOSH Alert: Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts*** [DHHS (NIOSH) Publication No. 2001–109]. Single copies of the Alert are available free from the following:

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NOTICE TO THE READER

The first edition of this Alert applied *only* to forklifts operated in a sitting position. However, this new edition includes a recommendation for employers and operators of stand-up forklifts with rear-entry access (see tear-out sheet and pages 6 and 7). In addition, the revised Alert contains several minor changes in wording to improve clarity.

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