



Fatality Investigation Report

OR FACE 2003-16-01

Load of lumber shifts and falls on construction worker killing him

Summary

A 32-year-old construction worker was killed when a load of lumber being lifted to the second story of a residence under construction, shifted and fell on him. Law enforcement officers investigating the scene reported that another worker was on the second floor helping to guide the load into position and acting as a safety spotter. The equipment that was being used to lift the load was a rough terrain forklift. The load being lifted was extended beyond the ability of the rough terrain type forklift to counterbalance and it upended. The load shifted and the falling bundle of lumber struck the victim, who was attempting to climb through a stairwell hole to access the second floor at the same time. The victim was killed instantly. Neither the loader operator nor the victim was aware of the others position or activity.

Recommendations:

- ✓ **Never work under a load being lifted into position. No one should be allowed within the swing of a crane or lift, unless they are expected to be there e.g., spotters, guides etc. No one should ever be allowed to be directly under the load at any time.**
- ✓ **Stay within the safe working parameters of the crane or lift and do not exceed the recommended load or reach specifications. Ensure that all mobile equipment operators are trained or certified in the operation of the equipment prior to use.**
- ✓ **Designate a person to act as a spotter and communicate with others on site and the equipment operator. There should be a communication system worked out between all workers, i.e., hand signals, whistles, walkie-talkies (if out of visual range).**
- ✓ **Communicate to workers what kinds of work activities are planned and any safety expectations.**
- ✓ **Ladders should extend beyond the surface being accessed and tied off to increase stability, when in use.**

Key Words: Construction

INVESTIGATION:

This incident occurred during the construction of a residential dwelling. The framing subcontractor and his crew had finished framing the home's first story and were beginning to work on the second story. The interior walls had been completed and a stepladder was being used to access the second floor through an open stairwell where the stairs had not yet been built.

The framing crew consisted of 4 Hispanic males and the non-Hispanic subcontractor. The crew had been on site 3 or 4 days when the incident occurred.



Photo 1. Forklift in position after the load came down. Note board pile in front of the forklift, preventing the forklift from getting closer to the second story.

A wire wrapped bundle of lumber was being lifted into position using a rented rough terrain forklift. A worker on the second floor was assisting the operator in moving the bundle of lumber into position as a spotter. The crane boom was fully extended while the forklift was positioned approximately 10 ft in front of the home to place the load in the center of the second floor.

Photo 2 demonstrates the vertical height above the second floor, crane extension and equipment placement from home. This photo was taken immediately after the forklift had its load removed and its rear tires were lowered onto the ground. This is similar to the position that it would have been in, before the forklift was upended. The load being lifted was estimated to weigh approximately 3600-3800 lbs. The maximum load for the forklift with the boom fully extended at this arc was 2000-3000 lbs.

The victim had worked for the subcontractor for approximately 2 years and was the crew's lead framer. He was Mexican and language was occasionally a barrier to communication. According to witnesses, the victim's ability to understand English was better than his ability to speak the

language. The victim, however, acted as the crew leader and routinely translated information to the other crewmembers.

At the time of the incident, he was standing on the top of a stepladder in the home's stairwell while the load was being lifted into position, above him. According to law enforcement reports, the victim was working with his head just at the level of the top plate or slightly above. He was wearing a hard hat when the bundle of lumber struck him. According to witnesses on the scene, neither the employer nor the victim was aware of what the other was doing. As the load shifted, the safety spotter is reported to have given a hurried warning to the victim. But the warning was too late and the bundle of lumber fell striking the victim in the area of the upper torso and head. He was momentarily pinned between the stepladder and the bundle of lumber. The load shifted slightly again and came to rest above the stairwell. The victim was released and fell approximately 8 feet to the first floor deck, where he was found dead. The initial crush injury was likely fatal.



Photo 2.

Rough terrain forklift in approximately the position it would have been in just before coming down. Traverse boom is in the position it was in, when sitting on the roof (boom extension unchanged). Note height of lift from ground (~22-24 ft). The equipment has not been moved out of position.

Official Cause of Death: Severe trauma to the head.

Key Words: Construction

Recommendation/Discussion

- ✓ **Never work under a load being lifted into position. No one should be allowed within the swing of a crane or lift, unless they are expected to be there e.g., spotters, guides etc. No one should ever be allowed to be directly under the load at any time.**

Discussion: Loads being lifted by overhead cranes or lifts can fall causing injury to those below. The work area immediately beneath the lift should be clear. No workers or other employees' should ever be allowed to remain under a load being lifted overhead. If there is a possibility that the lift will take place over occupied areas, those employees safety should also be considered, especially if they are not part of the construction effort, e.g., office workers. These employees should be asked to evacuate the area, during the time of the overhead work. The only exception for allowing people in the swing of a crane is for spotters or employees guiding the load. Even then, employees working in the swing of the crane should never work directly under the load. Employees working within the swing of a crane should wear highly visible clothing to allow them to stand out from the background. Workers should wear hard hats any time there is a chance of an overhead hazard i.e., a possibility of injury to the head from small falling objects. When there is the chance of other "non essential personnel" entering the area where lifts are being performed, use caution tape, safety watchers and erect barricades to minimize incursions into the swing of the boom. The use of highly visible personal protective equipment (e.g., safety vests and hard hats) help equipment operators to locate workers and are a warning to others that special precautions must be taken to enter the area or they should stay out. Employees who may be incidental to the lift should be advised of any lift activities occurring at the work site and how to avoid risk of injury.

- ✓ **Stay within the safe working parameters of the crane or lift and do not exceed the recommended load or reach specifications. Ensure that all mobile equipment operators are trained or certified in the operation of the equipment prior to use.**

Discussion: Only employer-designated qualified employees should operate equipment. The operator should be very familiar with the equipment's design specifications and limitations so that the equipment's safe operating parameters are not exceeded. Operators must follow the manufacturer's recommendations regarding loading, reach and height. Forklift operators should receive operational and safety training before using the equipment. Training records should be maintained.

Guidance obtained from a local forklift safety expert suggests that a significant proportion of forklift up-endings occur when operators attempt to obtain maximum reach, by first achieving maximum height. When the load is lowered, however, the center of gravity moves far out in front of the machine causing it to up-end. Loading is a function of lift angle (height), the weight of the load and the reach of the forklift. After achieving design maximum reach/height the reach of the rough terrain forklift is reduced as height is increased (see attached load chart in appendix). This means the farther the boom is extended the less high it can be lifted. Static load testing should be done away from workers, on flat ground. Never attempt to move any forklift under load with its boom extended up or out.

Once proper reach and height have been determined either by load charts, the forklift should be placed as close to the building as possible to transfer the load.

Consult the lift specifications tables in the equipment handbook and determine lifting design parameters. Load charts on this rough terrain forklift can be easily accessed. For example, many manufacturers' post links to their web sites: e.g., <http://saesections.org/cis/links.html>, (under OEMs/Pettibone LLC).

- ✓ **Designate a person to act as a spotter and to communicate with others on site and the equipment operator. There should be a communication system worked out between all workers, i.e., hand signals, whistles, walkie-talkies (if out of visual range).**

Discussion: A safety spotter should be used whenever a lift is being performed and it is not possible for the lift operator to clearly see the place where the material is being placed. The role of the safety spotter is to communicate with the equipment operator and control access under the lift area. A system for communicating with others should be worked out prior to performing the lift. Effective communication can be achieved by voice, whistles, hand signals, walkie-talkies or some other agreed to method of sharing information. Spotters should also be used on the ground to observe equipment operation and warn if there is a potential for bystanders to enter the work area.

- ✓ **Start each workday with a short meeting to outline the days work expectations. Communicate to workers what kinds of work activities are planned and necessary safety precautions.**

Discussion: Because construction sites have many concurrent activities, the environment is constantly changing. It is a good idea to use the start of each work day to address the planned daily activities, for example, who is coming on the site and for what purpose. These daily talks e.g., 5-minute tailgate talk, can be used to discuss the daily work plan and provide an opportunity to address any potential safety concerns.

- ✓ **Use ladders that extend beyond the surface being accessed. Ladders should be tied off to increase stability when in use.**

Discussion: The victim was reportedly about to access the floor of a residence under construction. The ladder being used to access the second level of the home was an 8 ft fiberglass stepladder and did not extend onto the second floor. To access the construction area, workers would have had to stand on the top of the ladder and pull themselves up onto the working level, while stepping from the ladder to a point on the frame above the door and finally up to the second floors deck. Employers should provide ladders that extend beyond the floor or deck being accessed and ladders should be tied off to provide stability while workers are actively using them.



Photo 3. Workers at this site were using the top step of the stepladder to step from the ladder onto the door header (actually the landing for future stairs) and then finally onto the second floor. The victim was standing on this ladder attempting to access the second floor when the load shifted and fell, striking him. Use ladder that extends above the surface to provide additional stability. It's not uncommon to find construction workers carrying tools, equipment or wearing cumbersome tool belts that only serve to decrease their ability to maintain balance and prevent falls.



Photo 4. In upended position, the boom is extended between "D" and "E" load rating. Weight of load was calculated to be 3600-3800 lbs. extended ~24ft. The maximum load range at this reach and arc is 2000-3000 lbs.

For More Information

The Center for Research on Occupational and Environmental Toxicology at Oregon Health & Science University performs Fatality Assessment and Control Evaluation (FACE) investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR). The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

Oregon Fatality Assessment and Control Evaluation (OR-FACE) Program

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