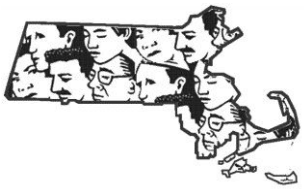
MA FACE
Occupational Fatality Report



Carpenter Fatally Injured after Falling from an Extension Ladder – Massachusetts

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Investigation: # 15-MA-037-01

Massachusetts Department of Public Health
Occupational Health Surveillance Program

SUMMARY

On August 1, 2015 a 49-year-old male carpenter (victim) employed by a residential contractor was fatally injured after falling from an extension ladder. The victim and a co-worker were on site to perform gutter work on a house. The victim was climbing an extension ladder that was set up on stone pavers to access the roof. While climbing the ladder, the victim fell to the ground below when the base of the ladder slipped out and then the ladder fell to the left. The co-worker went to assist the victim and the co-worker and the homeowner placed calls for emergency medical services (EMS). EMS and local police arrived within minutes. The victim was transported to a local hospital where he died 16 days later.

Contributing factors identified in this investigation included: an incorrect ladder type/duty rating was being used; the ladder was overloaded; and the ladder was set up on a surface that was not flat.

The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, employers should:

- **Ensure that the correct equipment, both types and ratings, are provided and used for the tasks being performed;**
- **Ensure ladders are set up properly before use and equipped with accessories that will help stabilize the ladder;**
- **Provide all employees with training on ladders, and other equipment such as scaffolding and aerial lifts, when they will be used to complete tasks; and**
- **Develop, implement, and enforce a safety and health program that addresses hazard recognition and avoidance of unsafe conditions.**

INTRODUCTION

On September 8, 2015, the Massachusetts FACE Program was alerted by the Occupational Safety and Health Administration (OSHA) that a male carpenter had died from injuries sustained when he fell from a ladder the month prior. On December 7, 2015, a representative from the Massachusetts FACE Program traveled to the incident location and then met with the company owner at the company office to discuss the incident. The police report, death certificate, company information, and the OSHA fatality and catastrophe report were reviewed during the course of the investigation.

EMPLOYER

The employer was a small construction company that had been in business for over 25 years. The company's main business was home improvement that included general contracting, carpentry, additions, decks, window replacement, siding, and remodeling of kitchens and baths. In the winter months, the company also provided snow removal services. The company had approximately eight employees and generally employees worked six days per week. The company had low employee turnover. Employees did not have union representation.

SAFETY AND HEALTH PROGRAMS AND TRAINING

At the time of the incident, the company did not have a safety and health program. The company did hold monthly tool box talks with employees. New employees hired typically had previous experience. All new employees were provided with some on-the-job training, but this training was not specific to ladders. The employer did provide fall protection, but it was up to the employees if they wanted to use the fall protection. The employer had a valid Massachusetts Department of Public Safety's construction supervisor license. The company had workers' compensation insurance as required by law in Massachusetts (G.L. c. 152, Sec. 25A).

VICTIM

The victim was a 49-year-old male carpenter. He had worked at the company for about 13 years and he had previous experience as a carpenter prior to coming to work for this company. It was reported in the police report that the victim weighed between 350 and 400 pounds. The day of the incident, a Saturday, the victim and a co-worker arrived at the company's office location around 8:30 a.m. and picked up supplies needed for the job. They then drove to the incident location and started the job. The incident occurred at approximately noon, about three hours into the shift.

INCIDENT LOCATION

The incident occurred at a two family house within a residential neighborhood of a city. The main front section of the house was two stories with a high-pitch roof. The back part of the house, where the incident occurred, had a section that was one story in height with a low slope roof (Figure 1). At the back of the house was a sublevel stairwell and patio (Figures 2 and 3). The patio area measured approximately nine feet by 11 feet. The patio was made of two sizes of pavers; one paver was five by five inches and the other paver was eight inches by 5 inches. The top of the pavers were slightly convex and overall the patio was not level. There were gaps

between the pavers that were filled in with stone dust. There were also retaining walls built out of stone blocks and stairs leading up to the backyard space. A metal fence was installed at the top edge of one of the retaining walls and a metal gate was located at the top of the stairs. In this sublevel patio area were two doors that led to the house's basement (Figure 2). The distance from the single story section of roof to the backyard level was about 10 feet and the distance from this roof to the sublevel patio floor level was about 20 feet.

EQUIPMENT

The victim was climbing a heavy duty industrial aluminum extension ladder at the time he fell. The ladder was owned by the company and, prior to the incident, it was reported to be in good condition. The ladder was a class 1A and rated for up to 300 pounds. When fully extended, the ladder was 28 feet long. According to the manufacturer, the maximum working height was 25 feet and the highest standing level was just less than 21 feet. Attached to the ladder were legible manufacturer provided warning labels and a duty rating label. At the time of the incident, the ladder was not fully extended. Multiple other aluminum extension ladders were on site at the time of the incident. All ladders on site had a maximum rating of up to 300 pounds.

INVESTIGATION

The incident occurred on a Saturday afternoon in August. The temperature was 86 degrees Fahrenheit with mostly cloudy skies, wind of 10 miles per hour, and no precipitation. The job was to clean the aluminum gutters, refasten the flashing and gutters to the house, and to install heat cable and leaf guards. The job was expected to take one day to complete. The morning of the incident, the victim and the co-worker met up at the company office location around 7:30 a.m. to pick up supplies needed for the job. They then drove a company pickup truck to the job location arriving around 8:30 a.m.

Once on site, they started to set up multiple ladders at the back of the house. There were five ladders: an aluminum step ladder and four aluminum extension ladders, including the 28-foot extension ladder (ladder 1) that the victim fell from, and three other extension ladders, two of which had four-foot outriggers/stabilizers. Two of the extension ladders, the 28-foot ladder (ladder 1) and another ladder with an outrigger/stabilizer (ladder 2), were set up in the sublevel patio area and against the house. The top of ladder 1 was positioned just under the single story gutter and the top of ladder 2 two was positioned just under a first story window. Looking at the back of the house, the ladder with the outrigger/stabilizer was positioned to the right of ladder 1 (Figure 1). The distance from the top of ladder 1 to the where it was set up in the sublevel patio was approximately 20 feet.

A third extension ladder (ladder 3), also with an outrigger/stabilizer, was set up against the single story section of the house. The base of this ladder was positioned in the yard and extended above the roof line to access the single story section of roof. When looking at the back of the house, this ladder was the left-most positioned ladder (Figure 1). The workers brought a fourth extension ladder up to the single story roof and laid the ladder down on the roof. The step ladder was positioned on the single story roof in the closed position, leaning against the back wall of the second story portion of the house (Figure 1)

At the time of the incident, around noon, both the victim and co-worker were working on the back of the house. The co-worker was on the single story roof section of the house and using the step ladder in the closed position to clean the gutter of the two story section of the house. To continue his work, the co-worker needed to access the second story roof. The co-worker asked the victim to come up to the single story section of roof to help him set up the fourth extension ladder that was lying down on that section of roof.

The victim started to climb ladder 1, the 28-foot aluminum extension ladder, which was not fully extended, to assist the co-worker. It was unclear if the 28-foot ladder, which was set up in the sublevel patio, was repositioned to extend above the roofline before the victim started to climb the ladder. It was reported by the employer that the victim was not carrying anything in his hands while climbing the ladder. When the victim was climbing the ladder, the base of the ladder slipped out from beneath him and then the ladder fell to the left. The victim fell approximately 20 feet at the same time. The co-worker heard a noise and realized he could not see the victim anymore. The co-worker then went to see what had happened and saw that the victim had fallen and was lying on the patio and the ladder had landed on the metal gate at the top of the stairs (Figure 3). Both the co-worker and a resident of the house placed calls for emergency medical services (EMS). EMS arrived within minutes and the victim was transported to a local hospital where he died 16 days later.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. The Massachusetts FACE team identified the following contributing factors in this incident.

- Incorrect ladder type/duty rating was being used
- Ladder was overloaded
- Ladder was not set up on a flat, level surface

CAUSE OF DEATH

The medical examiner listed the cause of death as multiple traumatic injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that the correct equipment, both type and rating, are provided and used for the tasks being performed.

Discussion: The ladder being used at the time of the incident had a duty rating of Type 1A, extra heavy duty industrial ladder that was capable of supporting up to 300 pounds. The duty rating is the maximum weigh capacity the ladder can safely carry. This weight limit includes the worker and any tools or equipment that the worker will have on them.[1] As mentioned above, it was reported that the victim weighed between 350 and 400 pounds. It is difficult to determine to what extent the victim's using a ladder that had a duty rating of 300 pounds contributed to the

incident. It is always important to follow the manufacturers' user recommendations, warning labels, and the ladder's rated specifications. In this case, the employer supplied ladder was not adequate for the tasks being performed by the victim.

Some manufactures make ladders that are Type IAA, which is a special-duty professional ladder that has a duty rating of 375 pounds. Although the Type IAA ladder duty rating might not have been adequate in this case, a ladder of this duty rating should be considered in certain situations. When a load to be applied to a ladder will be greater than the ladder's duty rating, employers should not allow that ladder to be used and then must consider other options. Two options would include using scaffolding or aerial lifts with the appropriate ratings so employees can complete the work safely.

Fall protection is not required by OSHA when climbing portable ladders. When the workers were on the roof and exposed to a fall of more than six feet to a lower level, this is when fall protection should have been used. The employer had provided the workers with fall protection in the form of personal fall arrest system (PFAS). This fall protection was on site, but was not being used when the workers were on the roof. PFAS are designed to stop a worker's fall before they strike a lower level. Typically, PFASs are designed for a worker who weighs up to 310 pounds. Workers, who weigh more than 310 pounds, including clothing and tools, will require fall protection equipment designed to handle higher weight. Employers should make certain that all of the fall protection components, including harnesses, connecting lanyards or self-retracting lanyards and anchorage (tie-off) are appropriate for the worker and the task they will be performing. In addition, the employer provided PFAS equipment should not exert over 1,800 pounds of fall arresting force to the worker.[2,3] Therefore, employers should seek professional assistance to ensure they are providing adequate fall protection when the employee who will be using the fall protection plus any clothing, tools and equipment they will have on them could exceed 310 pounds .

Recommendation #2: Employers should ensure ladders are set up properly before use and equipped with accessories that will help stabilize the ladder.

Discussion: In this case it appears that, in addition to the ladder being overloaded, there were other factors that contributed to the incident. These other factors include the ladder setup, lack of stability accessories, and potentially overreaching/overextension while standing on the ladder.

To minimize the hazard of falling from an unstable extension ladder, ladder stabilizers (also known as standoffs) should be used. Some of the ladders being use at the site the day of the incident had stabilizers, but not the ladder the victim was climbing when he fell. Ladder outriggers are also available and can help stabilize a ladder during use. Following the procedures outlined below will help prevent falls from extension ladders.[1,4]

To ensure proper extension ladder set up:

- Select the right ladder for the job and check the duty rating label to be sure the ladder can support you and your tools.

- Check for loose, cracked or greasy rungs, split side rails and worn shoes. Make sure the rung locks are in working order. Tag and remove defective ladders from the job site.
- Clear away debris and obstructions from the areas where the bottom and the top of ladders will be located.
- Don't place ladder in front of doors without blocking the door.
- Set the base on a secure, even surface at a horizontal distance of 1 foot for every 4 feet in height. Plywood can be used to make a firm level base.
- Call the electric company for assistance if working near power lines.

To ensure an extension ladder is as stable as possible:

- Secure the ladder's base by tying it to stakes, placing a board against the feet, or use a ladder base outrigger accessory.
- Secure the top of the ladder when possible.

When using a ladder to access a roof:

- Extend the ladder's side rails three feet above the roof edge.
- Consider installing ladder stabilizers that also contain side rail extenders with handles.

If work must be performed from a ladder, the following procedures can help minimize the risk of falling from the ladder:

- Never carry tools, equipment or supplies while climbing up or down a ladder; use tool belts or a hoist.
- Always face the ladder when using it.
- Never work from the top three rungs of a ladder.
- Keep both feet on the same rung while working.
- Keep your body centered between the side rails of the ladder; do not overreach.
- Maintain three points of contact with the ladder at all times.

In addition, just prior to this incident, it was reported that a co-worker had been using a step ladder in the closed position on a section of the house's roof. Step ladders are not designed to be used in the closed position and should never be used in a closed position and should never he used on sloped roofs.

The Ladder Safety smart phone application (app), developed by the National Institute for Occupational Safety and Health (NIOSH) provides feedback to the user on positioning extension ladders at the optimal angle. It also provides references and a safety guide for extension ladder and step ladder selection, inspection, accessorizing, and use. The Ladder Safety app is available for free download for both iPhone and Android devices.

Recommendation #3: Employers should provide all employees with training on ladders, and other equipment such as scaffolding and aerial lifts, when they will be used to complete tasks.

Discussion: In this case, the victim was not provided training on ladders, or other equipment he was using to complete the task. OSHA requires that employers provide proper ladder use and ladder safety training to employees who will use ladders to complete tasks. The OSHA regulation 1926.1060, *Training requirements* states that training on ladders shall enable each employee to recognize hazards related to ladders and stairways, and shall train each employee in the procedures to be followed to minimize these hazards.[5] As in this case, even if a worker has many years of experience using ladders, routine training on ladders can remind workers about proper ladder usage. Ladder training should include, but not be limited to:

- How to choose the correct ladder for the job, including type of ladder, length, and maximum load capacity.
- Proper inspection of the ladder prior to use.
- Proper placement and handling of ladders.
- Proper set up and use of a ladder (Recommendation #2).

If scaffolding had been used, the OSHA regulation 1926.454, *Training requirements* requires employers to provide employees with training when they will be using scaffolding and aerial work platforms to complete tasks.[6] Scaffolding and aerial work platform training should include, but not be limited to:

- How to choose the correct scaffold or aerial work platform for the job.
- Maximum weight capacity of the scaffold or aerial lift.
- Proper set up and use.
- Proper selection and use of fall protection.

All trainings should be performed by a *competent person* as defined by OSHA in Recommendation #2. Retraining should be provided for each employee as necessary. In addition, all training should be documented and the documentation should include who provided the training and their qualifications, the content of the training, workers who were trained, and the assessments of workers' comprehension of the training.

Recommendation #4: Employers should develop, implement, and enforce a safety and health program that addresses hazard recognition and avoidance of unsafe conditions.

Discussion: Having a companywide safety and health program is an important part of keeping employees safe. A safety and health program should include the systematic identification, evaluation and prevention or control of general workplace hazards and the hazards of specific jobs and tasks. The core elements of an effective safety and health program are management leadership, worker participation, hazard identification and assessment, hazard prevention and control, education and training, and program evaluation and improvement.[7] The program should also include an explanation of the workers' rights to protection in the workplace, and outline safe work practices workers are expected to adhere to, specific safety protection for all tasks workers perform, how workers can identify and avoid hazards, and who workers should contact when safety and health issues or questions arise.[7]

When developing a safety and health program, employers should start by performing a hazard analysis of all routine tasks performed by employees for potential hazards and incorporate information about these identified hazards and their controls into the program.[7] When determining potential hazards associated with equipment, the manufacturer's operator's manual and the equipment's warning decals should be reviewed and incorporated into the safety and health program procedures.

Employers should also use their employees' expertise throughout the program development process by seeking employee input. Once the program is developed, employers should continue to seek employees' input during the routine updating of the program. The program should be updated when safety concerns arise and when new equipment, tasks and chemicals are introduced into the workplace. In addition, for industries where work sites change with each job, the safety and health program should also require that a hazard analysis be performed for each job site before work begins to ensure that the required tools and personal protective equipment (PPE) needed to complete the tasks are available.

Employers should ensure that they have fully and effectively implemented their safety and health program by routinely performing assessments of tasks and immediately addressing any observed unsafe conditions. As part of the program's implementation, training (recommendation #3) should be provided to all employees on the program's topics and procedures, and should also include hazard recognition and the avoidance of unsafe conditions. All training provided to employees should be documented.

In this case, the safety and health program should include a section on proper ladder selection, use, and training (recommendations #1, 2, and 3). Some other topics that should be included in the program for construction contractors are scaffolding and fall protection. Fall protection must be provided to employees who are working from a height of at least six feet for construction-related-work.

The Massachusetts Department of Labor Standards (DLS) offers free consultation services to help small employers improve their safety and health programs, identify hazards, and train employees. DLS can be contacted at 978-242-1351. More information about DLS can be found on their Web site at www.mass.gov/dos/consult.

The Massachusetts Department of Industrial Accidents (DIA) has grants available for providing workplace health and safety training to employers and employees. Any company covered by the Massachusetts Workers' Compensation Insurance Law is eligible to apply for these grants. More information about these DIA grants can be found on their Web site at www.mass.gov/dia/safety.

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7. OSHA. Recommended Practices for Safety and Health Programs. OSHA 3885. 2016.
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Figure 1 – Incident location. The back of the house.

Figure 2 – Incident location. The back of the house showing a part of the sublevel patio.

Figure 3 – Incident location. The back of the house showing sublevel patio and the location where the victim landed after falling.