# *Massachusetts FACE • Occupational Fatality Report*

Massachusetts Department of Public Health
Occupational Health Surveillance Program
Fatality Assessment and Control Evaluation Project

**Carpenter Fell from the Roof of a Single Family Home Under Construction - Massachusetts**

**Investigation: # 10-MA-036-01**
**Release Date: March 23, 2012**

---

## SUMMARY

On November 29, 2010 a 45-year-old male carpenter (victim) was fatally injured when he fell from the roof of a two-story single family home that was under construction. The victim was erecting pipe staging (tubular scaffolding) at the time of the incident. Needing an additional plank for the scaffolding, the victim climbed onto the house's roof to access a plank on a roof bracket located at the roof's edge. When the victim reached the roof bracket, it collapsed causing the victim and the wood plank to fall approximately 19 feet to the ground below. Both the company owner and the co-worker heard the noise of the victim and the plank falling to the ground and went to the victim. The company owner placed a call for emergency medical services (EMS). Personnel from the local fire department, EMS, and police department arrived within minutes of the call. The victim was transported to a local hospital and then was transported to a larger hospital where he was pronounced dead five days later. The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, employers should:

- **Provide fall protection for all employees exposed to fall hazards of six feet or more;**
- **Eliminate the use of adjustable roof brackets that are not equipped with locking mechanisms; and**
- **Develop, implement, and enforce a comprehensive safety and health program that addresses fall prevention, hazard recognition and avoidance of unsafe conditions.**

## INTRODUCTION

On December 13, 2010, the Massachusetts FACE Program was notified by the Occupational Safety and Health Administration (OSHA) through the 24-hour Occupational Fatality Hotline that on December 4, 2010, a male carpenter had died of injuries previously sustained in a fall from a roof of a residential structure. An investigation was initiated. On February 23, 2011, the Massachusetts FACE Program Director traveled to the construction project's general contractor's office and met with the company owner to discuss the incident and then traveled to the incident location. The police department report, death certificate and the OSHA fatality and catastrophe report were reviewed during the course of the investigation.

The victim was a self-employed carpenter who was routinely hired as a subcontractor by one general contractor. The general contractor reported that the victim started as one of his employees 16 years

before the incident and was an employee for six years. After six years, the victim chose to become a subcontractor.

The general contractor is a residential framer/carpenter and has been in business for 26 years. The general contractor has five employees, including one office worker. The general contractor's main projects are building houses and additions to houses. The main tasks for these projects, which the victim was routinely involved in, are exterior framing, installing windows and doors, and interior framing and finished woodwork. All other aspects of the construction, such as foundation, masonry, electrical, plumbing, and roofing tasks were subcontracted out to trade specialists.

The company did not have a health and safety program, but did provide on-the-job training to employees. Both the victim's business and the general contractor were registered with the state as Home Improvement Contractors. The victim and the general contractor were both licensed with the state as Construction Supervisors. The general contractor had workers' compensation insurance coverage. There was no union representation.

## INVESTIGATION

The job involved in the incident was the construction of a new single family home. Construction of the home started about eight months prior the incident. The work crew on site the day of the incident had been at this particular project five days per week for the six months leading up to the incident. The typical work day for the crew started at 7:30 a.m. at the work site and ended at 4:00 p.m.

Most of the exterior framing had been completed on the structure, including framing of the main section of the house and a two story garage. The main section of the house is about two and one half stories high, with a 9-in-12 pitch roof and a roof edge height of approximately 19 feet (Figure 1). The one section of the structure that was not yet framed was the breezeway to be located in the front of the house between the house and the garage. The breezeway had not yet been framed because the design of the breezeway had not been completed at the time construction began.

At the time of the incident, the roof was not shingled, but most of the roof was covered with a vapor barrier that had previously been installed by a roofing contractor. Reportedly, a roof bracket scaffold that had been installed by the victim and a co-worker two months prior to the incident had been regularly used throughout these two months. When the roofing contractor installed the vapor barrier, the roof bracket scaffold had been removed and then reinstalled by the roofing contractor.

The roof bracket scaffold was made of four adjustable roof brackets that were installed approximately 12 feet apart and planked with 2x10 inch boards. The roof brackets are made of galvanized steel and wood (Figure 2). The two main pieces of the bracket are: 1) the base and 2) the platform support arm. The base section consists of a rectangular piece of wood with two notches at one end and a metal plate with nail holes attached to the other end of the wood piece. The metal plate, which is connected to the platform support arm by a hinge, is used to fasten the bracket's base to the roof (Figure 2).

The platform support arm is made up of two rectangular steel pieces connected by a hinge and a rectangular wood piece attached directly to one of the steel pieces (Figure 2). When the roof bracket is in use, the support arm's wood piece is inserted into one of two notches in the base's wood piece to create a 45 or 60 degree angle platform. Wood planking is positioned on the support arm creating the

platform. The support arm has two punctured dimples to grip the wood planking to prevent it from moving.

The day of the incident, the work crew was made up of three workers. The workers included the company owner and the victim, who both arrived at the work site at 7:30 a.m., and a co-worker, who was an employee of the company and arrived at 8:00 a.m. The weather was sunny and cool with a high around 44 degrees Fahrenheit and little to no wind. There was no precipitation that day and for the few days prior to the incident.

The work crew had spent the first half of the day performing some exterior framing on the residential structure. Then before noontime, the crew stopped for a lunch break and all three workers ate their lunch at the work site. After the lunch break, the work crew started to erect pipe staging (tubular scaffolding) at the front of the house, between the main section of the house and the garage to frame the breezeway (Figure 1). The crew erected four levels of the tubular scaffolding with some planking on each of the four levels. The victim and the co-worker were standing on the top level of the scaffolding when the company owner, who was standing on the ground setting up a ladder for the tubular scaffolding, asked the workers to add more planking to the scaffolding.

At approximately 3:30 p.m., the victim went to get a plank that was located on the roof of the main house at the roof brackets. According to the police report, the victim climbed from the top level of the tubular scaffolding that was being erected, to the peak of the house's main roof. When the victim climbed onto the roof, he placed his stomach on the roof and grabbed a 2x4 board (cleat) that was nailed approximately four feet down along the peak of the roof of the main house. The victim then slid/lowered himself down to the roof bracket. Although un-witnessed from this point forward, it appears that when the victim reached the plank for the roof bracket, his weight and momentum from sliding down to the roof bracket might have caused the plank to bounce.

When the plank bounced, it appears that it caused the metal support section of the roof bracket to lift up with the plank. During the bounce, the roof bracket's adjustable wood piece was pulled out of the notch of the roof bracket's wood piece, which is fastened to the roof, causing the roof bracket to fold down flat (Figure 3). When the roof bracket folded down flat, the plank and the victim fell approximately 19 feet to the ground below, where the victim struck his head.

Both the company owner and the co-worker heard the noise of the victim and the plank fall to the ground and went to assist the victim. The company owner immediately placed a call for emergency medical services (EMS) and the co-worker ran to the roadway to help direct EMS when they arrived. Personnel from the local fire department, EMS, and police department arrived within minutes of the call. The victim was transported to a local hospital and then was transported to a larger hospital where he was pronounced deceased five days later.

## CAUSE OF DEATH

The medical examiner listed the cause of death as blunt force trauma of head and torso with fractures of skull and ribs, and visceral injuries.

## RECOMMENDATIONS / DISCUSSION

**Recommendation #1: Employers should provide fall protection for all employees exposed to fall hazards of six feet or more.**

**Discussion:** On December 16, 2010, the Occupational Safety and Health Administration (OSHA) released guidance on fall protection in residential construction: STD 03-11-002, C*ompliance Guidance for Residential Construction*. Under this new guidance employers engaged in residential construction must comply with the OSHA fall prevention standard 29 CFR 1926.501 that states conventional fall protection must be used.

OSHA's fall prevention standard requires that employees engaged in residential construction activities who are exposed to fall hazards of six feet or more must be protected from falling by the use of conventional fall protection.[1] OSHA does not classify the use of roof brackets as conventional fall protection; therefore in most cases if roof brackets are used they should only be used in conjunction with conventional fall protection.

Conventional fall protection includes guardrail systems, safety net systems, or personal fall arrest systems (PFAS).[2] Two widely used options of conventional fall protection in residential construction are:

**1) Personal fall arrest system (PFAS).** A PFAS is designed to stop a worker's fall before they strike a lower level. A PFAS includes three major components:

a) Anchorage (tie-off point). Anchors must be capable of supporting at least 5,000 pounds or twice the intended load.

b) Body harness. A full body harness is required. Body belts can cause serious injury during a fall and are not allowed to be used as part of a fall arrest system.

c) Connector. A Connector links the harness to the anchorage and typically includes lanyards or lifelines.

**2) Guardrail system.** Guardrails are designed to stop a worker from falling. In residential construction when workers are accessing the roof of a building, guardrails can be installed along all the roof's edge and rake edge. Some of the guardrail requirements include that:

a) Top edge height of top rails must be installed at a height between 39 inches and 45 inches above the walking/working level and must be able to withstand a force of at least 200 pounds applied in any downward or horizontal direction;

b) Midrails must be installed at a height midway between the top edge of the guardrail system and the walking/working level.

Because this job was new construction of a house, a guardrail system may have been a good choice for fall protection. The guardrail system could have been installed early in the project and stayed in place for most of the construction process.

**Recommendation #2: Employers should eliminate the use of adjustable roof brackets that are not equipped with locking mechanisms.**

**Discussion:** There are a variety of both fixed and adjustable roof brackets available. When using adjustable roof brackets, only roof brackets with locking mechanisms should be used. The locking mechanisms available on some adjustable roof brackets will lock the platform support arm into the base section of the roof bracket. When the roof bracket's platform support arm is locked into the base, the hazard of the platform support arm lifting up and out of the base notch is eliminated. This type of hazard is not present with fixed roof brackets. As stated in OSHA's *Compliance Guidance for Residential Construction* (STD 03-11-002), roof brackets, except in extremely rare situations, must be used in conjunction with conventional fall protection (Recommendation #1).

In this case, either a fixed or adjustable roof bracket with a lock might have prevented the roof bracket from folding down flat and the planking from falling from the roof to the ground. In addition, when using roof brackets or any type of equipment, it is important to follow the manufacturer's instructions. It was reported that the roof brackets being used at the time of the incident were spaced 12 feet apart. Most manufacturers of roof brackets state that roof brackets should be used at no more than eight feet apart.

**Recommendation #3: Employers should develop, implement, and enforce a comprehensive safety and health program that addresses fall prevention, hazard recognition and avoidance of unsafe conditions.**

**Discussion:** At a minimum, a comprehensive safety and health program should include an explanation of the worker's rights to protection in the workplace, safe work practices workers are expected to adhere to, specific safety protection for all tasks performed, ways to identify and avoid hazards, and who they should contact when safety and health issues or questions arise.

As part of the development of safety and health programs, employers should evaluate tasks performed by employees for all potential hazards and incorporate information about these identified hazards and their controls into the program.[3] Employers should also use their employees' expertise throughout the program development process by seeking employee input. Once the safety and health 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 and new tasks are introduced into the workplace.

Employers should ensure that they have fully and effectively implemented their comprehensive safety and health programs by routinely performing assessments of work areas and work practices and immediately addressing any observed unsafe conditions. As part of the program's implementation, training should be provided to all employees on program topics.[4] In this case training topics would include, but not be limited to, fall hazards, fall protection, hazard recognition, and the avoidance of unsafe conditions.[4] All training provided to employees should be documented. Documentation should include: who provided the training and their qualifications, the content of the training, workers who were trained, and any assessments of workers' comprehension of the training. When the safety and health program is updated, employers should then provide additional training on the new and updated safety and health program topics.

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 617-969-7177. 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 website at www.mass.gov/dia/safety.

**REFERENCES**

1. Code of Federal Regulations, 29 CFR 1926.501 Duty to have fall protection. Washington D.C.: U.S. Printing Office, Office of the Federal Register.

2. Code of Federal Regulations, 29 CFR 1926.502 Fall protection systems criteria and practices. Washington D.C.: U.S. Printing Office, Office of the Federal Register.

3. DOL. OSHA Draft Proposed Health and Safety Program, Docket No. S&H-0027. www.osha.gov/dsg/topics/safetyhealth/nshp.html. Date accessed: May 17, 2011.Code of Federal

4. Regulations, 29 CFR 1926.21 Safety training and education. Washington D.C.: U.S. Printing Office, Office of the Federal Register.

**Figure 1 – Incident location**

**Figure 2 – Similar roof bracket to the one that was being used**

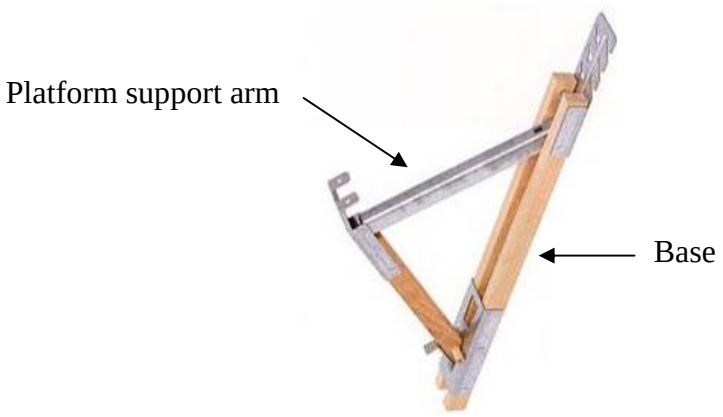


**Figure 3 – Roof with roof bracket folded flat**

Michael A. Fiore, MS, Director
Massachusetts FACE Program
Occupational Health Surveillance Program
Massachusetts Department of Public Health

Letitia Davis, Sc.D., Ed.M., Director
Occupational Health Surveillance Program
Massachusetts Department of Public Health

**********

**FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM**

The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on the causes of work-related fatalities. The goal of this program, known as Massachusetts Fatality Assessment and Control Evaluation (Massachusetts FACE) is to prevent future fatal workplace injuries. Massachusetts FACE aims to achieve this goal by identifying and studying the risk factors that contribute to workplace fatalities, by recommending intervention strategies, and by disseminating prevention information to employers and employees.

Massachusetts FACE also collaborates with engineering and work environment faculty at the University of Massachusetts at Lowell to identify technological solutions to the hazards associated with workplace fatalities.

NIOSH funded state-based FACE Programs currently include: California, Iowa, Kentucky, Massachusetts, Michigan, New Jersey, New York, Oregon, and Washington.

**********

Additional information regarding this report is available from:

Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th floor
Boston, Massachusetts 02108-4619
(617) 624-5627

## Evaluate this report

We would appreciate your feedback on these reports so we may continue to improve the MA FACE project and our investigation reports. A feedback form can be found at:
www.mass.gov/eohhs/docs/dph/occupational-health/report-evaluation.doc
The completed form may be returned by fax to (617) 624-5676, by mail to FACE, 250 Washington Street, 6th Floor, Boston, MA 02108, or by email to ma.face@state.ma.us.