

MIFACE Investigation Report: #13MI020

SUBJECT: Roofer Falls From Roof Edge When He Stepped on Insulation Overhang

Summary

In the winter of 2013, a male roofer in his 40s died when the cantilevered 2” rigid roof insulation he stepped on broke, causing him to fall approximately 26 feet to the frozen ground. The firm had a fall protection program including a safety monitor, warning line, and personal fall arrest system (PFAS). The foreman had dual responsibilities: installing insulation and acting as the warning line’s safety monitor. The decedent was not wearing fall protection while working



Figure 1. Roof location where decedent fell

inside of the warning line attaching insulation. A coworker who was wearing a full body harness with retractable lanyard and tied off to an approved anchor point screwed to the metal roof deck was working at the roof edge cutting the insulation flush with the roof. While leaning over the edge, the coworker’s cell phone fell out of his pocket to the ground. The foreman had left the roof to obtain more roofing material. When the coworker left to retrieve his cell phone, the decedent left his work area to finish the remaining four feet of insulation work at the roof edge. He did not put on his full body harness and attach to the anchor site. A coworker saw him, stand up and stretch, and then take a step backward onto the insulation extending over the roof edge. The overhanging insulation was unable to support his weight and broke, causing him to fall approximately 26 feet to the frozen ground below. Emergency response was called. The decedent was airlifted to a local hospital where he died several hours later.

MIFACE investigators identified the following items as key contributing factors in this incident:

- Personal fall arrest system not utilized.
- Safety monitor had other duties and not present on roof at time of incident.
- Cell phone on roof in violation of company policy.

- Possibility of wind speed as a contributing factor.
- Unusual roof top work (no parapet structure) for the company.

RECOMMENDATIONS

- Employers should ensure that workers are protected against falling while working at an elevation. This includes, but is not limited to, maintaining the integrity of an established warning line system and ensuring the use of personal fall arrest equipment.
- Employers should, in addition to developing and implementing a health and safety program, develop mechanisms to ensure adherence to the health and safety program. One approach is to ensure the company's culture has safety as a core value.
- The State of Michigan should distribute MIOSHA-required safety and health regulations when individuals apply for a Builders or Maintenance and Repair License and to all roofing companies. An alternative approach would be to require commercial roofing companies and roofing companies directly subcontracted by all building contractors to receive training analogous to a MIOSHA Construction 10-hour course.

BACKGROUND

In the winter of 2013, a male roofer in his 40s died when the cantilevered 2" rigid roof insulation he stepped on broke, causing him to fall 26 feet to frozen ground. MIFACE was notified of this fatality by the MIOSHA 24-hour ASAP hotline. MIFACE contacted the company owner who agreed to speak with the MIFACE researcher. During the course of writing this report, MIFACE reviewed the decedent's death certificate, medical examiner and police reports, and the MIOSHA file. All pictures used in this report are courtesy of the responding police department and MIOSHA file.

The decedent's employer was a commercial roofing contractor. The firm had been in business for 18 years. The firm was a subcontractor on this construction site. The firm employed eight individuals on a full-time basis, but hired seasonal workers from the union hall when needed. The decedent worked full time and was paid by the hour. The normal work shift was 7:00-a.m. – 3:30 p.m. The decedent was a journeyman roofer and member of a Roofers Union. The decedent had successfully completed the Union's apprentice roofer training program. The decedent had worked for the company for 16 years.

The firm had a written safety and health program (accident prevention program (APP)) as required by MIOSHA. The safety program was written in English and included written safety rules and procedures for roofing activities, including a fall prevention policy and a disciplinary procedure. The firm utilized a consultant provided by their insurance company to assist in development of their APP. The company owner was responsible for the overall safety program. On site, safety responsibilities were delegated to the foreman.

Each year in January, the firm reviewed the AAP with employees. Employees signed a sheet and, by signing, agreed to abide by the firm's written safety rules. All new employees were required to attend an initial safety orientation and review the information in the safety manual. The firm held weekly toolbox talks for all employees covering a variety of safety topics as they relate to jobs in progress and documented the training. Safety training for employees was provided by the company, the union, and a trade association. In 2008, all employees (including the decedent) successfully completed a 10-hour MIOSHA training course. The foreman who was on-site the day of the incident had completed the 30-hour OSHA training provided by the Construction Association of Michigan.

A week prior to the incident, the firm held a tool box talk covering "Warning Line and Safety Monitor Systems". The decedent and the foreman had attended this safety talk and had signed the attendance sheet. The toolbox talk covered topics such as when the warning line system for fall prevention should be used, what warning lines should be made of, distance above ground, tensile breaking strength, tipping force, where to place the warning line from edge of roof depending upon work activity, where to store materials and/or equipment, and the requirements of the safety monitor.

With both the general contractor and the firm's employees, the company owner discussed identified safety issues during the planning and design phases of the project. The firm had a preconstruction meeting and post bid interview to discuss the phases of construction.

The firm did not have a health and safety committee.

MIOSHA Construction Safety and Health Division issued the following alleged Serious citations at the conclusion of its investigation.

SERIOUS: FALL PROTECTION, PART 45, RULE 4502

- REF OSHA 1926.501(b)(10): Roofing work on low-slope roofs. Except as otherwise provided in paragraph (b) of this section, each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8m) or more above lower levels shall be protected from falling by guardrail systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet 915.25m) or less in width (see Appendix A to subpart M of this part), the use of a safety monitoring system alone (i.e. without the warning line system) is permitted.

No fall protection or safety monitor being used during roofing work. An employee was working outside of the established warning line system installing insulation at the roof's edge.

- REF OSHA 1926.502(h)(1): Safety monitoring systems [See 1926.501(b)(10)(k)] and their use shall comply with the following:

The employer shall designate a competent person to monitor the safety of other employees and the employee shall ensure that the safety monitor complies with the following requirements:

- (i) The safety monitor shall be competent to recognize fall hazards;
- (ii) The safety monitor shall warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;
- (iii) The safety monitor shall be on the same walking/working surface and within visual sighting distance of the employees being monitored;
- (iv) The safety monitor shall be close enough to communicate orally with the employee; and
- (v) The safety monitor shall not have other responsibilities which could take the monitor's attention from the monitoring function.

No safety monitor available during roofing work. The designated monitor left the roof while and employee was working outside of the warning line system without personal fall protection.

NOTE: MIFACE was notified by the employer after the publication of this report that the above alleged violations were dismissed during the employer appeal process. Revised April 17, 2014.

INVESTIGATION

The new building construction had two levels of flat/low .25/12 pitch sloped roofs. On the firm's first day on site, the foreman held a tool box talk and instructed employees about the job site setup, placement of warning lines (6 feet from the edge of the roof), and if outside of the warning lines, 100% requirement for personal fall arrest system use.

On site, the firm had a mobile fall protection cart which had locking pins for the wheels so it could be utilized on different sections of the roof (Figure 2). Additionally, the firm used a reusable roof anchor designed for use on steel roofs of 24-gauge or thicker if mounted with a minimum of 10 #8, ¾-inch long sheet metal screws per side on raised ribs of roof panel with pull in the long axis (Figure 3).



Figure 2. Fall arrest cart located on upper level

The company owner indicated that there were seven employees on site the day of the incident; the company owner was not present at the site. Workers reported it was windy that day; MIFACE checked the weather data and found that south-southeast wind speeds ranged from 15 mph to 20 mph.

Unique working conditions for the company were present for this roof work. The company owner indicated that at most sites where work was performed there was a parapet wall at the edge of the roof. Due to construction issues, no parapet walls were present on either roof level.

Three days prior to the incident, the firm had completed work on the main roof level. Work ended that day due to inclement weather. Work began the following Monday on the lower roof level. There was a 4-foot difference in height between the two roof levels. The firm did not have a tool box talk the day of the incident. Workers moved the warning lines to the approximately 65-foot by 75-foot lower roof, leaving a range of six feet to 16 feet away from the roof edge. Spacing between the warning line support posts was 15 feet and the height of the warning line ranged between 36” to 39” above the roof. The mobile fall cart was left on the upper roof due to the height issue. The workers installed the reusable anchor on the lower roof in accordance with the manufacturer’s instructions.

The decedent and several coworkers were working on the same roof level. The decedent, Coworker 2, other coworkers and the foreman (safety monitor) were working inside of the warning line screwing down the 2-inch rigid insulation. The foreman installed the fall arrest anchor. Coworker 1 donned his fall arrest harness, attached his retractable lanyard and proceeded to perform insulation trimming work outside of the warning line in the northwest corner of the roof.

The foreman left the roof to obtain more roofing material.



Figure 3. Roof anchor located inside of the warning line on northwest roof corner

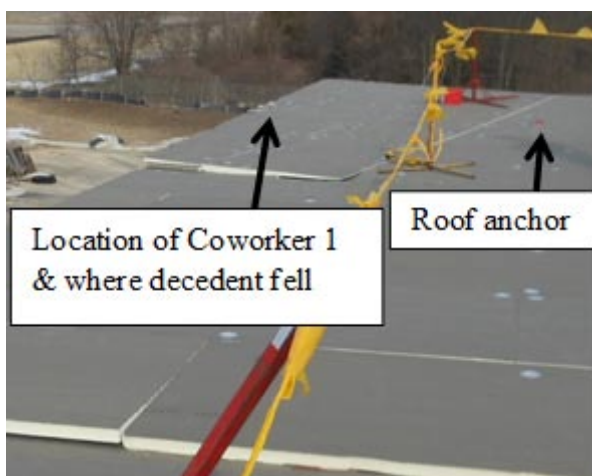


Figure 4. Location of roof anchor and decedent’s location when he fell

At some point while the foreman was gone, Coworker 1's cell phone fell out of his pocket. He had approximately four more feet of the 2-inch rigid insulation to trim flush with the roofline. Coworker 1 unhooked his retractable lanyard from his harness and left it on the roof. He went down to ground level to retrieve his cell phone.

Shortly after Coworker 1 left the roof, the decedent apparently wanted to help Coworker 1 finish trimming the insulation. With his harness in a bucket within the warning line area on the roof, the decedent proceeded outside of the warning line (Figure 4). Coworker 2 was on the roof working near the decedent. "Out of the corner of his eye", he saw the decedent stand up and unknowingly step onto a piece of tapered insulation that extended past the roofline. The cantilevered insulation was unable to support the decedent's weight and broke, causing the decedent to fall approximately 26 feet to the frozen ground below (Figure 5).



Figure 5. Two-inch rigid foam insulation which broke when decedent stood on it

As Coworker 1 was ascending the stairs after retrieving his cell phone, he heard Coworker 2 yell that the decedent fell. Coworker 2 immediately went downstairs to see what happened. He saw the decedent on the ground and then, as he ran to the general contractor's trailer, he called 911. The decedent was airlifted to a local hospital where he died several hours later.

CAUSE OF DEATH

The cause of death as listed on the death certificate was craniocerebral trauma. Toxicology on autopsy showed medications consistent with hospital treatment.

RECOMMENDATIONS/DISCUSSION

- Employers should ensure that workers are protected against falling while working at an elevation. This includes, but is not limited to, maintaining the integrity of an established warning line system and ensuring the use of personal fall arrest equipment.

MIOSHA regulations require employers provide and train employees to use fall protection equipment when working a leading edge six feet or more above a lower level to be protected from falling by guardrail systems, safety net systems, or a personal fall arrest system. A personal fall arrest system includes a full-body harness, lanyard, connectors, and appropriate anchorage points.

The decedent's harness, as part of a personal fall protection system, was available the day the incident occurred, but was not used. Despite the availability of a fall protection system and training on how to use, the deceased did not use the fall arrest system.

The foreman, who was acting as the safety monitor had other responsibilities that took his attention from his monitoring function. Not only was he working with the installation, he left the roof without either stopping the work, assigning another worker to get the roofing material, or appointing another individual to assume the safety line monitoring responsibility.

Employers must have procedures in place to ensure that when a safety line system is utilized, the safety monitor function is fulfilled. If the monitor was in place, he most likely would have observed the decedent go outside of the safety warning line without his personal fall arrest system in place and would have been able to prevent him from doing so.

A resource for information on fall prevention,, resources and training MIFACE recommends employers and employees access the Stop Construction Falls campaign, a national campaign to prevent construction worker falls. The Campaign encourages everyone in the construction industry to work safely and use the right equipment to reduce falls. Special emphasis and activity will focus on residential construction contractors and workers. Materials and resources are available on the Campaign website, www.stopconstructionfalls.com hosted by [CPWR-The Center for Construction Research and Training](http://www.cpcwr.com) (the NIOSH-funded [National Construction Center](http://www.ncccenter.org))

- Employers should, in addition to developing and implementing a health and safety program, develop mechanisms to ensure adherence to the health and safety program. One approach is being sure the company's culture has safety as a core value.

There is a distinction between "safety as a priority" and "safety as a core value". Priorities are competitive in nature and may change over time, but core values do not. Often, safety is considered a priority and is not integrated as an intrinsic company value.

Management systems and their associated policies and procedures depend upon the actions of individuals and groups for their successful implementation. Although the firm had a written Accident Prevention Program as required by MIOSHA Construction Safety Standard, Part 1, General Rules, including a fall protection protocol (the responsibilities of the safety monitor, the 100% use of fall protection) as well as a prohibition of a cell phone on a roof, had performed the required safety training, and provided employees with the tools to work safely (i.e. fall arrest system, warning line, etc.). the tragedy still occurred.

An effective safety program holds all employees (owners, supervisors/foreman, and employees) accountable for doing their jobs safely. In a strong safety culture, everyone feels responsible for safety and pursues it on a daily basis; employees go beyond the call of duty to identify unsafe conditions and behaviors and intervene to correct them. Likewise co-workers routinely look out

for one another and point out unsafe actions and conditions to each other. Over time the norms and beliefs of the organization *shift focus from eliminating hazards to eliminating unsafe actions and building systems that proactively improve safety and health conditions*. Employee safety and doing something the right way takes precedence.

The decedent's employer mentioned during the MIFACE interview that employee complacency may have been an issue in this incident. Complacency may have been an issue for both the foreman and the decedent. To help minimize "safety" complacency on the job, in addition to developing and implementing a safety program and its associated training, companies should look internally and make safety a "core" value. In addition, to reinforcing their commitment of this core value, employers should encourage employees to be a part of the solution - to think about "what could go wrong" while they work, keep their "mind on the task" they are performing and advance their perception of safety to include not only their personal adherence to safety policy/procedure, but to also ensure their coworkers do as well. To evidence commitment to safety as a core value, the company owner should perform unannounced site safety assessments to assess "compliance" with established safety protocols, model safe work procedures, and when necessary, conduct refresher training.

- The State of Michigan should distribute MIOSHA-required safety and health regulations when individuals apply for a Builders or Maintenance and Repair License and to all roofing companies. An alternative approach would be to require commercial roofing companies and roofing companies directly subcontracted by all building contractors receive training analogous to a MIOSHA Construction 10-hour course.

The MIFACE researcher has been informed by several commercial roofing company owners that they were unaware of which MIOSHA safety and health rules were applicable to them when they first formed their business. To highlight this lack of awareness, compare residential roofer requirements to a commercial roofing contractor. When working directly for a homeowner, an applicant for a Residential Builder or Maintenance & Alteration Contractor license (which includes Roofing) must complete 60 hours of approved pre-licensure education, although only seven hours is dedicated to safety, prior to taking the examination or submitting a license application to the Michigan Department of Licensing and Regulatory Affairs (LARA). When contracting with a Licensed Residential Builder or on a commercial structure, the roofer does not need to obtain the 60 hours of approved pre-licensure education. Thus, there is no equivalent training requirement for a roofing contractor subcontracted by a Licensed Builder.

MIFACE recommends that at a minimum, all roofing companies receive MIOSHA safety and health information. In addition, MIFACE recommends all commercial roofing companies and roofing companies directly subcontracted by all building contractors receive training analogous to a MIOSHA Construction 10-hour course.

There are more trades exposed to fall hazards on roofs, such as electricians, plumbers, and HVAC in addition to roofers who could benefit from fall hazard training. MIFACE encourages all trades who work on roofs to contact the union apprenticeship programs and non-union trades programs to receive proper training.

KEY WORDS: Fall, Commercial Roofing, Personal Fall Arrest System, Construction

RESOURCES

MIOSHA standards may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- Construction Safety Standard, Part 1, [General Rules](#)
- Construction Safety Standard, Part 45, [Fall Protection](#)
- State of Michigan, Department of Licensing and Regulatory Affairs, Corporations, Securities and Commercial Licenses, Licensing Division. http://www.michigan.gov/lara/0,4601,7-154-35299_61343_35414_60647_35455-193789--,00.html
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- Thompson, Steve. *Creating a Culture of Safety*. Aspen Risk Management Group. http://www.aspenrmg.com/Articles/creating_a_culture_of_safety.htm
- Weather Underground for wind speed and direction on day of incident. www.weatherunderground.com
- *Safety Culture: What is at Stake?* Center for Chemical Process Safety. <http://www.aiche.org/ccps/topics/elements-process-safety/commitment-process-safety/process-safety-culture/building-safety-culture-tool-kit/what-is-at-stake>

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