A Municipal Worker Struck by a Motor Vehicle While Patching a Pothole - Massachusetts

Investigation: # 06-MA-027-01
Release Date: December 28, 2007

SUMMARY

On June 23, 2006, a 39-year-old male municipal utility worker (victim) was fatally injured while patching a pothole located at an edge of a roadway. After receiving a call about the pothole, which formed during a rain storm, the victim retrieved a backhoe, loaded its bucket with cold patch, and drove the backhoe to the pothole's location. The victim was standing in front of the backhoe's bucket while filling the pothole when he was struck head on by a minivan, crushing him between the backhoe's bucket and the minivan. A call was placed to the local police department by the operator of the minivan. The local police and fire departments and emergency medical services (EMS) arrived within minutes. EMS transported the victim to a local hospital where he was pronounced dead. The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, municipalities should:

- **Ensure that work zones are set up, at a minimum, in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD)*, Part 6, developed by the U.S. Department of Transportation Federal Highway Administration;**

- **Ensure that employees' exposure to moving traffic is minimized when working in and around streets and highways by developing temporary traffic control plans;**

- **Provide and ensure that employees wear appropriate personal protective equipment, including high visibility vests when working along roadways;**

- **Develop, implement and enforce a buddy system for employees working in roadways and around moving equipment;**

- **Develop, implement, and enforce equipment maintenance programs that include scheduled preventive maintenance and timely repairs to equipment;**

- **Develop, implement, and enforce a comprehensive safety program that includes training on hazard recognition and avoidance of unsafe conditions;**

- **Provide work environments that, at a minimum, meet all relevant Occupational Safety and Health Administration (OSHA) regulations and industry accepted standards of practice; and**

- **Consider the feasibility of purchasing and using automated machines for filling of potholes.**

INTRODUCTION

On July 7, 2006, the Massachusetts FACE Program was alerted by a newspaper clipping service that on June 23, 2006, a 39-year-old male municipal utility worker was fatally injured when he was crushed between a backhoe and a motor vehicle. An investigation was initiated. On August 30, 2006, the Massachusetts FACE Program Director traveled to the office of the municipal gas and light department and met with two representatives of the department. The police report, state police report, death certificate, and department information were reviewed during the course of the investigation. In addition, photographs of the incident location were taken.

The employer was a local municipality, and the victim worked within the gas and light department. The department had been in service for approximately 112 years at the time of the incident and had a total of 46 employees. Of these 46 employees, approximately 14, including the victim, were part of the gas division. The victim was one of five employees that held the job title of gas street worker. The victim had been an employee of the department for 14 years.

The department had neither a health and safety program nor an individual specifically in charge of health and safety. Employee training was provided through the Northeast Public Power Association. Most of the trainings that the Northeast Public Power Association provides are technical electrical courses, although some courses include safety training. Specific training for employees within the gas division was provided through the Northeast Gas Association. This training was also mostly technical-based. The department's representative reported that employees receive a uniform allowance and that the department covers the cost of personal protective equipment for employees, which includes, but is not limited to, reflective vests, hearing and eye protection. Employees are part of a small in-house collective bargaining unit, which did not have the capacity to provide training.

INVESTIGATION

The municipal gas and light department involved in the incident provides electrical and natural gas services to the municipality's residences and businesses. The municipality owns, operates, and maintains the electrical and gas infrastructure.

As a gas street worker, some of the victim's main tasks included constructing and maintaining gas lines, monitoring and repairing gas leaks, and evaluating and resolving gas pressure issues. Since many of these tasks involve trench work, the victim's routine tasks also included operating and maintaining heavy equipment, such as the backhoe involved in the incident. The victim had

a valid Massachusetts Commercial Driver's License and a Massachusetts Class 2A Hoisting Engineer's License. The Massachusetts Class 2A Hoisting Engineer's License is required in Massachusetts to operate hoisting equipment, which includes backhoes.

The location where the incident took place is a public roadway comprised of asphalt with two travel lanes, one eastbound travel lane and one westbound travel lane (Figure #1). Each travel lane is approximately 12 feet wide and separated by a painted solid yellow line. There are also painted white fog lines that designate the northern edge of the westbound lane and the southern edge of the eastbound lane. The incident location was residential and the section of roadway is straight with granite curbing and a sidewalk on one side of the street, the eastbound travel lane side (Figure #2). The speed limit for this section of the roadway is 30 miles per hour (MPH).

Two days prior to the incident, the gas division had been performing work on an underground gas line. To complete this task a trench had been excavated. The trench's location was at the northern edge of the westbound travel lane of the roadway. When the work to the underground gas line was completed, the trench was backfilled and the roadway was patched with asphalt.

On the night of the incident, the victim was one of two people working on call to handle any emergency situations. During that night, a rain storm had passed through the area, which caused a two foot by three foot section of the asphalt patch to wash out, resulting in the pothole. The local police department had received a call from a resident about the pothole. In turn, the police notified the gas and light department. Around the same time, the gas and light department received a call for a second emergency, which was not associated with the pothole. The victim was going to start the task of patching the pothole alone while his coworker attended to the second emergency. The coworker had planned to meet up with the victim and assist the victim with patching the pothole once his task was completed.

At approximately 9:45 p.m., the victim retrieved the department's backhoe, filled the backhoe's bucket with cold patch and drove the backhoe to the pothole's location. The backhoe, manufactured in 2001, was over seven feet wide, approximately ten feet tall and was equipped with a panel of six lights across the top front edge of the cab. The backhoe was also equipped with a rotating yellow beacon light that was mounted on the right edge of the cab.

When the victim arrived at the pothole location, he parked the backhoe facing east in the westbound travel lane along the northern edge of the roadway. The backhoe's bucket was positioned just west of the pothole and raised approximately 14 inches from the ground. It was dark, raining lightly, and the temperature was approximately 60 degrees Fahrenheit. The victim was wearing a grey t-shirt and blue jeans. No warning devices for oncoming motor vehicles were set up.

At the time of the incident, the victim was alone, standing in front of the backhoe's bucket shoveling the cold patch into the pothole. Two of the six lights on top of the backhoe's cab were lit, illuminating the pothole and facing towards oncoming traffic. At the same time, a minivan

was traveling approximately 22 MPH in a westerly direction in the westbound travel lane. The minivan struck the victim crushing his legs against the front edge of the backhoe's bucket. The impact pushed the backhoe back in the westerly direction. The backhoe came to a stop in the eastbound travel lane. At this point the victim was partially pinned underneath the minivan.

The operator of the minivan got out of the vehicle, observed the victim and placed a 911 call. A local neighbor who was also a paramedic started to assist the victim. Within minutes, the local police department arrived followed by the local fire department and emergency medical services. After an unsuccessful attempt to manually push the minivan off of the victim, a police car was used to push the vehicle off the victim. The victim was then transported to a local hospital where he was pronounced dead.

The police investigation report of the incident noted that the yellow beacon located on the backhoe's cab was not functional at the time of the incident. It is unclear the how long the yellow beacon had been out of service.

CAUSE OF DEATH

The medical examiner listed the cause of death as traumatic amputation below knees of right and left lower extremities with blunt head injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Municipalities should ensure that work zones are set up, at a minimum, in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD)*, Part 6, developed by the U.S. Department of Transportation Federal Highway Administration.

Discussion: The U.S. Department of Transportation's (DOT) *Manual on Uniform Traffic Control Devices (MUTCD)* sets forth the basic principles that govern the design and usage of traffic control signs and devices[1]. Part 6 of the MUTCD provides specific work zone designs to be used during roadway construction, maintenance, and utility operations. To help ensure employee safety while performing these and other roadway operations, employers should follow the MUTCD minimum standards and guidelines recommended in Part 6.

When patching a single pothole, as in this case, or performing other roadway work that will occupy a location for up to one hour, employers should follow the short-duration roadway work as outlined in Part 6G, Types of Temporary Traffic Control, within the MUTCD. Because most short-duration roadway work is usually maintenance and utility based operations, the MUTCD recommends traffic control devices that have greater mobility. The MUTCD specifically states that worker safety during short-duration roadway work should not be compromised by using fewer traffic control devices.

The MUTCD acknowledges that during short-duration work it can sometime take longer to set up the work zone properly. Therefore, the MUTCD suggests that appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of, or to reduce the number of signs. In addition, the MUTCD suggests that these vehicles may be augmented with signs or arrow panels.

Recommendation #2: Municipalities should ensure that employees' exposure to moving traffic is minimized when working in and around streets and highways by developing temporary traffic control plans.

Discussion: Employees who are required to complete tasks in and around roadways face multiple hazards, one of which is being struck by oncoming motor vehicles. These hazards are increased when responding to emergencies on roadways at night and during inclement weather because the operators of passing motor vehicles may have reduced vision and consequently reduced reaction time[2].

To ensure worker safety, which would help ensure motorist and pedestrian safety as well, employers should develop temporary traffic control plans (TCP) that outline the temporary traffic control devices to be used and how they should be set up during roadway work[3]. These TCPs should be based on the MUTCD as discussed in Recommendation #1. An individual TCP should be developed for each highway and street project. For more routine tasks, such as patching potholes, a more general TCP could be developed and modified when appropriate. A TCP for patching potholes should include, but not be limited to:

- Assessing the work site upon arrival to determine the best location for mobile equipment and appropriate number and locations of warning signs and lights;
- Positioning mobile equipment to provide a physical barrier between employees on foot and moving traffic;
- Turning the equipment's steering wheel into the curb or roadside and engaging the brake;
- Wearing high-visibility safety apparel at all times;
- Facing and watching for approaching traffic as much as possible; and
- Spending as little time as possible in and around the roadway.

In this case, the backhoe was positioned facing east in the westbound lane, which placed the victim in between the backhoe and oncoming traffic. If the backhoe was positioned facing west in the westbound lane, the backhoe could have acted as a barrier between the victim and the oncoming minivan and may have minimized his injuries.

Recommendation #3: Municipalities should provide and ensure that employees wear employer supplied appropriate personal protective equipment, including high visibility vests when working along roadways.

Discussion: Municipal workers, including department of public works and power department employees, face many hazards while working. These employees are routinely on foot working along roadways, bringing them close to motor vehicle traffic with no barriers between them and the moving vehicles. At the time of the incident, the weather conditions were dark with light falling rain. The clothing being worn by the victim, blue jeans and a grey t-shirt, did not contain reflective material.

The Manual on Uniform Traffic Control Devices (MUTCD) states that all workers exposed to the risks of moving roadway traffic or construction equipment should wear high-visibility safety apparel. The MUTCD refers to the American National Standard Institute's (ANSI) standard for High–Visibility Safety Apparel (ANSI/ISEA 107-1999)[4]. This standard, published by the International Safety Equipment Association (ISEA), recommends specific types of reflective equipment while working in or near moving traffic. This standard specifies three classes of garments based on the workers' activities. These classes are:

- Class 3 garments provide the highest level of visibility for workers who face serious hazards with high task loads that require attention away from their work where traffic exceeds 50 miles per hour (mph).
- Class 2 garments are intended for use where greater visibility is necessary during inclement weather conditions and when activities occur near roadways where traffic speeds exceed 25 mph.
- Class 1 garments **(**not for use along highways and streets**)** are intended for use in activities that permit the wearer's full and undivided attention to approaching traffic. There should be ample separation of the worker from traffic, which should be traveling no faster than 25 miles per hour.

The ANSI standard also states that a competent person designated by the employer should be responsible for selecting the appropriate class of garment for the workers. A competent person, as defined by the Occupational Safety and Health Administration (OSHA), is a person who, through training or knowledge, is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Recommendation #4: Employers should develop, implement and enforce a buddy system for employees working in roadways and around moving equipment.

Discussion: When workers on foot are located in roadways and focusing on the tasks their performing it may be difficult for the workers to recognize or react to moving vehicles. When workers on foot are required to work in roadways and around moving equipment a buddy system should be developed, implemented and enforced. This buddy system should require workers to be assigned a buddy to spot them when working on foot in roadways and around moving equipment. This would allow a worker to focus on a task while another coworker watches for the movement of vehicles and other hazardous situations. If a buddy system was in place, the

coworker might have been onsite and observed the oncoming vehicle bringing it to the attention of the victim.

Recommendation #5: Municipalities should develop, implement and enforce equipment maintenance programs that include scheduled preventive maintenance and timely repairs to equipment.

Discussion: Regularly scheduled preventive maintenance for equipment, such as backhoes, is an important way to ensure that the equipment is in safe working condition. When a problem is identified that jeopardizes the safety to the operator or any other person, the vehicle or equipment should be taken out of service and repaired before being placed back in service. In this case, the backhoe involved in the incident was equipped with a rotating yellow beacon light mounted on top of the cab that was not operable at the time of the incident. It was not clear how long the light had been out of service.

If the backhoe's yellow beacon light had been operable and on at the time of the incident, the operator of the minivan might have had advanced warning that the backhoe was in the same travel lane as in which he was driving. This advanced warning could have provided the operator the time needed to stop the minivan before striking the victim.

Recommendation #6: Municipalities should develop, implement, and enforce a comprehensive health and safety program that includes training on hazard recognition and avoidance of unsafe conditions.

Discussion: The employer did not have a comprehensive health and safety program, but did send employees to local associations for training. These trainings, which were technical-based courses, did not necessarily address the hazards of working in and around roadways. A comprehensive written safety program that includes training on common hazards that municipal employees face, such as trenching, electrical and work zone hazards should be provided to employees and the contents of the training enforced. The health and safety program and trainings should also address hazard recognition and the avoidance of unsafe conditions.

Work zone safety training for municipal workers should include, but not be limited to, how to work next to motor vehicle traffic in a way that will minimize exposure to moving vehicles, as well as the proper techniques for warning device usage, placement, and retrieval. Training municipal workers in roadway work zone safety, including work zone set up and design and appropriate personal protective equipment, would provide these workers the knowledge to better protect not only themselves, but also the pedestrians and motorists in the communities in which they work. This training should be updated annually and based, at a minimum, on the MUTCD, Part 6, which governs work zone designs.

Hazard recognition training should be based on an evaluation of the tasks employees will perform for all potential hazards. These identified hazards and their controls should be

incorporated into hazard recognition training. The training should also include specific instructions that employees should not risk physical harm to accomplish tasks.

The training program content and the names and dates of employees completing the training should be documented and retained by the employer. Employers should ensure that the trainer who provides training is qualified through education and/or experience to conduct training. As a reference, a summary of the Occupational Safety and Health Administration's (OSHA) draft proposed safety and health program rule, which discusses employee training, has been included at the end of this report.

In addition, OSHA has developed a Web page that addresses how to implement health and safety programs (www.osha.gov/SLTC/safetyhealth/evaluation.html). This Web page includes a link to the OSHA draft proposed safety and health program rule, mentioned above, as well as other useful links. There is also a Roadway Safety Awareness Program available at http://wzsafety.tamu.edu/program_download/. This Roadway Safety Awareness Program, which is available in English, Spanish, and Portuguese, provides an overview of common hazards in highway and road construction and prevention measures.

Recommendation #7: Municipalities should provide work environments that, at a minimum, meet all relevant Occupational Safety and Health Administration (OSHA) regulations and industry accepted standards of practice.

Discussion: The federal Occupational Safety and Health Act requires private sector employers to provide workplaces that are free from recognized hazards likely to cause death or serious physical harm to employees. While private sector employees are covered by federal OSHA, public sector employees in Massachusetts are not. The Massachusetts Division of Occupational Safety (DOS), in accordance with Chapter 149 Section 6, is charged with inspecting public sector workplaces in Massachusetts and determining what procedures and practices are required to protect workers[5]. As a matter of policy, DOS references OSHA Standards as well as other consensus standards, such as ANSI, in determining whether proper procedures are being followed to protect workers.

In this case, adhering to the OSHA standard 29 CFR 1926.202, *Barricades*, which refers to the MUTCD for design and usage of traffic control signs and devices and work zone designs[6] and the ANSI high-visibility safety apparel standard[4] that addresses appropriate apparel to be worn when working in and around roadways, may have minimized the victim's injuries.

Recommendation #8: Municipalities should consider the feasibility of purchasing and using automated machines for filling potholes.

Discussion: Although expensive to purchase, automated pothole filling machines enable workers to fill potholes without exiting the truck's cab[7]. This system consists of a truck with two

hoppers. One hopper holds emulsion and another holds aggregate. The truck is also equipped with a boom and a spray nozzle located in front of the cab. The controls for the automated system are located inside the cab and include a joystick controller for the boom and spray nozzle. Once the automated pothole filling machine is at the location of a pothole, the process of filling a pothole includes:

1) cleaning out the pothole using high-volume air
2) coating the pothole with hot asphalt emulsion
3) filling the pothole with aggregate and hot asphalt emulsion
4) topping the pothole with a coat of aggregate

Some truck-based automated pothole filling machines are also equipped with an arrow display board mounted on the back of the truck that lights up to warn approaching drivers of the roadway work.

REFERENCES

1. U.S. DOT 2003. *Manual on Uniform Traffic Control Devices (MUTCD)*, 2003 Edition, Revision 1, U.S. Department of Transportation Federal Highway Administration. http://mutcd.fhwa.dot.gov/. Date accessed: 6/18/2007.

2. NIOSH. Safety and Health Topic: Highway Work Zone Safety. http://www.cdc.gov/niosh/topics/highwayworkzones/. Date accessed: December 28, 2007.

3. NIOSH 2001. *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*, Department of Health and Human Services, Center for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2001-128.

4. ANSI/ISEA 2004. American National Standard for high-visibility safety apparel. New York, NY: American National Standards Institute, ANSI/ISEA 107-2004.

5. General Laws of Massachusetts, Title XXI, Labor and Industries, Chapter 149: Section 6. *Safety devices and means to prevent accidents and diseases generally; fees for structural painting.*

6. Code of Federal Regulations [2002]. 29 CFR 1926.202. *Barricades.* Washington DC: U.S. Government Printing Office, Office of the Federal Register.

7. TranSafety, Inc. [2003]. *Automated Pothole Patching--Better Patches for Less Money.* Road Management & Engineering Journal. www.usroads.com/journals/rmj/9704/rm970404.htm. Date accessed: December 28, 2007.

Figure 1 – Location of the incident.

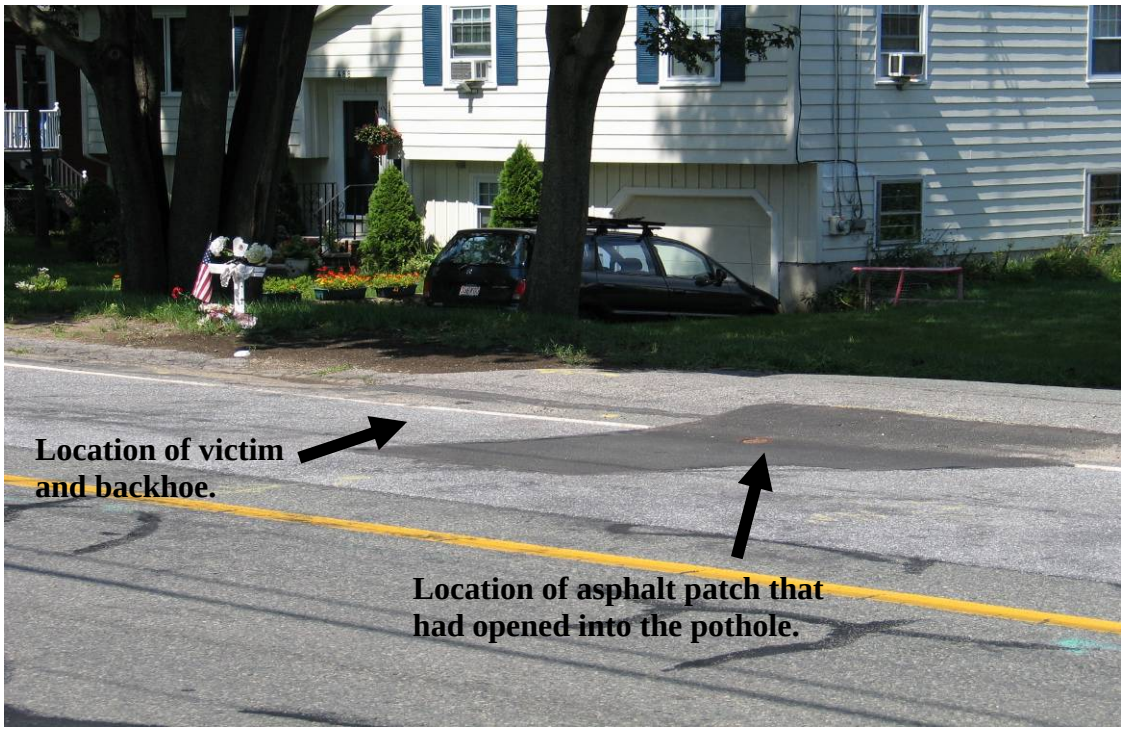
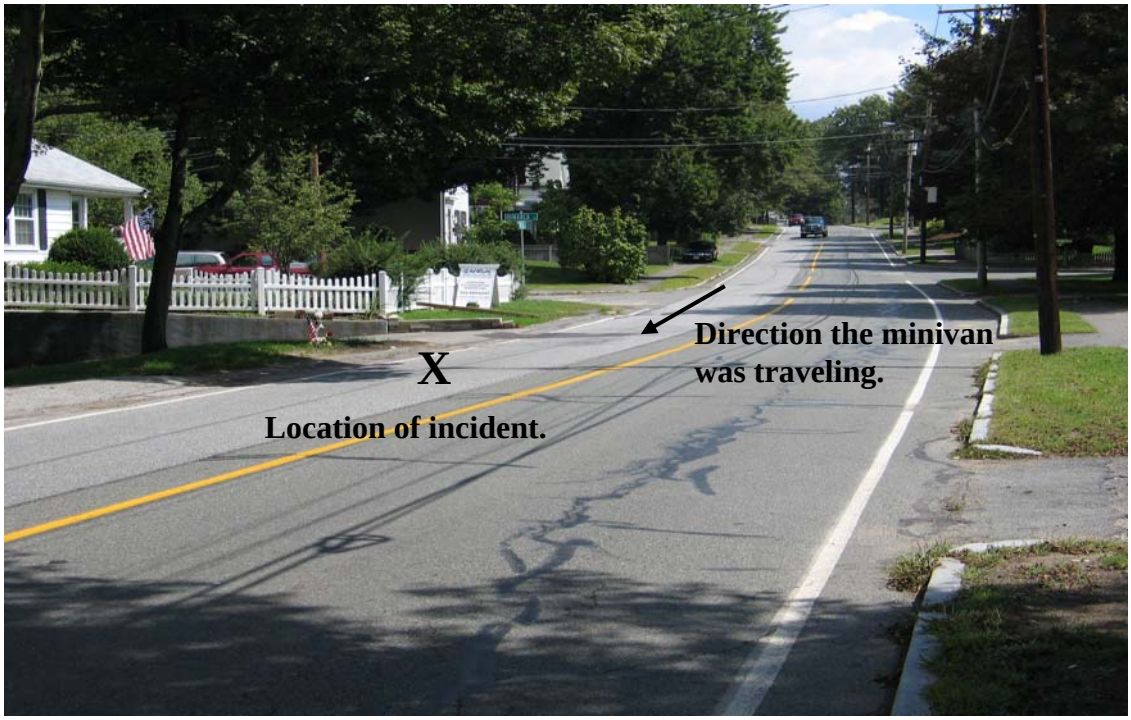


Figure 2 – Location of incident and direction minivan was traveling.



SUMMARY OF OSHA'S DRAFT PROPOSED SAFETY AND HEALTH PROGRAM RULE FOR EMPLOYERS

(29 CFR 1900.1 Docket No. S&H-0027)

Core elements

- Management leadership and employee participation
- Hazard identification, assessment, prevention and control
- Access to information and training
- Evaluation of program effectiveness

Basic obligations

- Set up a safety and health program, with employee input, to manage workplace safety and health to reduce injuries, illnesses and fatalities.
- Ensure that the safety and health program is appropriate to workplace conditions taking into account factors such as hazards employees are exposed to and number of employees.
- Establish and assign safety and health responsibilities to an employee. The assigned person must have access to relevant information and training to carryout their safety and health responsibilities and receive safety and health concerns, questions and ideas from other employees.

Employee participation

- Regularly communicate with employees about workplace safety and health matters and involve employees in hazard identification, assessment, prioritization, training, and program evaluation.
- Establish a way and encourage employees to report job-related fatalities, injuries, illnesses, incidents, and hazards promptly and to make recommendations about appropriate ways to control those hazards.

Identify and assess hazards to which employees are exposed

- Conduct inspections of the workplace at least every two years and when safety and health information change or when a change in workplace conditions indicates that a new or increased hazard may be present.
- Evaluate new equipment, materials, and processes for hazards before introducing them into the workplace and assess the severity of identified hazards and rank those hazards that cannot be corrected immediately according to their severity.

Investigate safety and health events in the workplace

- Thoroughly investigate each work-related death, serious injury, illness, or incident (near miss).

Safety and health program record keeping

- Keep records of identified hazards, their assessment and actions taken or the plan to control these hazards.

Hazard prevention and control

- Comply with the hazard prevention and control requirements of the OSHA standards by developing a plan for coming into compliance as promptly as possible, which includes setting priorities and deadlines for controlling hazards and tracking the progress.

Information and training

- Ensure each employee is provided with safety and health information and training.
- If an employee is exposed to hazards, training must be provided on the nature of the hazards to which they are exposed to and how to recognize these hazards. Training must include what is being done to control these hazards and protective measures employees must follow to prevent or minimize their exposures.
- Safety and health training must be provided to current and new employees and before assigning a job involving exposure to a hazard. The training should be provided routinely, when safety and health information is modified or a change in workplace conditions indicates a new or increased hazard exists.

Program evaluation and maintenance

- Evaluate the safety and health program at least once every two years or as often as necessary to ensure program effectiveness.
- Revise the safety and health program in a timely manner once deficiencies have been identified.

Multi-employer workplaces

- The host employer's responsibility is to provide information about hazards and their controls, safety and health rules, and emergency procedures to all employers at the workplace. In addition, the host employer must ensure that assigned safety and health responsibilities are appropriate to other employers at the workplace.
- The contract employer responsibility is to ensure that the host employer is aware of hazards associated with the contract employer's work and how the contract employer is addressing them. In addition, the contract employer must advise the host employer of any previously unidentified hazards at the workplace.