

**Case 211. 42-year-old construction laborer died when the gases in the 6,000-gallon underground diesel storage tank he was cutting ignited and caused an explosion.**

A 42-year-old male construction laborer died when the gases in the 6,000-gallon underground diesel storage tank he was cutting ignited and caused an explosion, propelling the decedent approximately 35 feet in the air. It was raining heavily at the time of the incident. The air temperature was approximately 58 degrees F. The tank had been filling with water and the service station owners had hired the decedent's employer to decommission the tank. Per the police report, one of the decedent's coworkers stated that the crew was "to cut open the tank and fill it with a pile of dirt located near the hole/empty tank." The tank was located approximately 10 feet from the northwest pump island. Employees had previously cut a 6-foot by 5-foot hole in the concrete and using shovels had excavated the hole to expose the underground storage tank. The tank was located approximately three feet below grade. Earlier in the day, another company had pumped the water that had previously filled the tank. The worker who pumped the water out of the tank noted that gas was coming out of a 2-inch pipe that was open near the tank. No air monitoring for levels of explosive gasses or oxygen was performed inside the tank prior to the decedent beginning his cuts on the top of the tank. The decedent used a right angle grinder with cutting wheel attached to cut a 2-foot 4-inch wide by 4-foot 8-inch long opening in the top of the tank. He made one cut to the south, one to the west and one to the north. According to the Fire Department, the cut to the north was not completed. It was during the north cut that the sparks from the cutting wheel ignited the gases in the tank resulting in the explosion. The explosion caused the tank top to partially tear near the east side and stick up in the air. The explosion propelled the decedent approximately 35 feet in the air. He landed on the ground 13 feet to the southeast of the tank. His handheld grinder was found 48 feet east of the tank. The explosion also caused a part of the tank piping to dislodge. This piping was found approximately 130 feet away southeast of the tank. The decedent was declared dead at the scene.

The Fire Department's fire investigator's opinion was "that the explosion originated in the underground gas tank." The investigator "further believed that the explosion originated from the sparks from the tool being used on this tank." Because of the potentially hazardous situation and to prevent further injuries if another explosion occurred, Fire Department personnel conducted air monitoring using a 4-gas monitor for methane (CH<sub>4</sub>) oxygen (O<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S) and carbon monoxide (CO) at 15-minute intervals. The Fire Department investigation report indicated that at 1300 hours, the gas levels above grade approaching the explosion site were: 0%, 20.5%, 0 parts per million (ppm), and 0 ppm respectively. At 1305, gas levels below grade were: 9-15%, 20.5%, 3.0 ppm, and 95 ppm respectively. At 1350 below grade gas levels were: 8%, 19.5%, 2 ppm, and 70 ppm respectively. At 1610, the gas levels were determined to be 3%, 19.5%, 2 ppm, and 70 ppm respectively. Monitoring activity concluded at 1635. For all of above grade monitoring for the four gases, the gas level readings were unchanged from 1300 readings.

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

**SERIOUS: MICHIGAN OCCUPATIONAL SAFETY AND HEALTH ACT, ACT 154, P.A. 1974, AS AMENDED, SECTION 11(a)**

The employer did not furnish to each employee, employment and a place of employment, which was free from recognized hazards that were causing or were likely to cause death or serious physical harm to the employee:

Employer did not furnish to each employee employment and place of employment, which is free of recognized hazards that are causing or likely to cause death or serious physical harm to employees.

Employees are directly exposed to an untested hazardous environment, atmospheres. Employees were engaged in the termination of an underground gas storage tank in place. While in the process of cutting a 2-foot by 4-foot opening in the top of a 6,000 gallon steel tank, tank exploded causing one fatality. Employee was utilizing a right angle grinder tool with a cutting wheel attached.

Among other methods, one feasible and acceptable method to correct this hazard is to follow NFPA 30, 1996 edition – 2-4.4.3 Permanent Closure of Tanks in Place and Appendix C attached.

**SERIOUS: GENERAL RULES, PART 1, Rule 114(1)**

An accident prevention program was not developed, maintained, and coordinated with employees.

Accident Prevention Program not properly developed effectively, implemented, or coordinated with employees. Employees not adequately or properly trained / instructed for work in hazardous environments. Ineffective training resulted in one fatality, Program developed in English.

**SERIOUS: PERSONAL PROTECTIVE EQUIPMENT, PART 6**

- **RULE 622(1)**

A helmet, as prescribed in R408.40621, was not used to protect the employee where a hazard or risk of injury exists from falling or flying objects or particles or from other harmful contacts or exposures.

No helmet in use while employees are engaged in an underground gas storage tank operation. Employees are exposed to harmful contacts and exposures.

- **RULE 624(1)**

Face and eye protection, as prescribed in R408.40623, was not used where a hazard or risk of injury exists from flying objects or particles, harmful contacts, exposures such as glare, liquids, injurious radiation, electrical flash, or a

combination of these hazards. Table 1 was not used as a guide to elect the proper eye and face protection.

No safety glasses or other protection worn to protect employees from sparks, flying objects, etc. Employee is cutting open the top of a steel tank with a right angle grinder with cutting wheel attached.

#### SERIOUS: FIRE PROTECTION, PART 18

- RULE 1841(1)

An employer shall be responsible for the development and maintenance of a fire protection and prevention program to be followed during all phases of construction to reduce the chance of fire and injury to employees.

No fire protection and prevention program developed, maintained, and coordinated with employees. Employees were engaged in gas tank demolition/termination in place. Employees are exposed to hazardous on site conditions.

- RULE 1851(6)

In addition to the general requirements of this rule, fire extinguishers shall be supplied as follows:

- (a) Not less than 1 portable fire extinguisher that has a rating of not less than 20 BC units shall be located as follows:
  - Outside of, but not more than 10 feet from, a door opening to a room used for the storage of flammable or combustible liquids.
  - Not less than 25 feet, nor more than 75 feet, from an outside storage area.
  - On each tank truck or other vehicle used to transport or dispense flammable or combustible liquids.
- (b) Each service or fueling area shall have at least 1 portable fire extinguisher which has not less than a 20 BC unit rating and which is located within 75 feet of each pump, dispenser, underground fill opening, and lubricating or service area.
- (c) Storage locations for liquefied petroleum gas (L.P.G.) shall be provided with at least 1 approved portable fire extinguisher that has a rating of not less than 20 BC.
- (d) Each site of a hazardous process shall be provided with a portable fire extinguisher of an appropriate size and type. Other means for safety or control may be provided if approved or required by the process.

No fire extinguishers being provided. Employees are directly exposed to lethal type fire hazards and explosions.

#### SERIOUS: TOOLS, PART 19, RULE 1932(7)

A tool that is used in a potentially explosive atmosphere shall be designed and approved for such atmosphere.

Spark producing tool in use in a potentially hazardous atmosphere. Employee is cutting open top of underground gas storage tank with a Metabo right angle grinder with cutting wheel attached.

SERIOUS: DEMOLITION, PART 20

- RULE 2031(1)(a)  
It was not ensured that all of the following were done before the start of a demolition operation:
  - (a) An engineering survey of the structure and equipment is conducted by a competent person knowledgeable in demolition to determine all of the following:
    - The condition of the foundation, roof, walls, and floors.
    - Whether any adjacent structure will be affected by the demolition.
    - The utility service entering the building.
    - Any other conditions and equipment affecting the safety of an employee.
  
- RULE 2031(4)  
If an area or item, such as a pipe, tank, or bin, is known or suspected to contain a hazardous substance, then an employer shall ensure that testing is performed and the hazard eliminated before demolition is permitted to begin.

No testing of underground gas storage tank containing flammable substance. While cutting top of steel tank – tank exploded causing a fatality.