

# BENZENE AWARENESS



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## 1. WHAT IS BENZENE?

- a. Benzene is a colorless, highly flammable liquid chemical with a sweet odor. It has been produced from coal since 1849 and from petroleum since 1941 and is a chemical familiar to many oil, gas and chemical workers. Smoking is prohibited in areas where benzene is used or stored.
- b. Benzene is known as an "aromatic hydrocarbon". Chemicals that are composed of only hydrogen and carbon are called hydrocarbons. Because of the distinctive smell of benzene (and related compounds), the benzene family is classified as "aromatic"; thus, the name, aromatic hydrocarbon. Benzene has an odor threshold of 12 ppm (12 x the OSHA PEL); therefore, not smelling it does not mean you are not being exposed. Benzene is a recognized carcinogen.

## 2. WHAT IS BENZENE USED FOR?

- a. Benzene is a valuable raw material and intermediate in the production of other organic chemicals. These chemicals include ethylbenzene, phenol, cyclohexane, styrene and maleic anhydride. Smaller amounts of benzene are used in manufacturing detergents, explosives, pharmaceuticals and dyestuffs. Benzene has become almost indispensable to the chemical industry and the wide range of its applications makes it especially imperative that every precaution be observed in its use.
- b. Some examples of uses of benzene include:
  - i. Additive in motor fuel. Large quantities of benzene go into the production of gasoline.
  - ii. Used extensively in the manufacture of many chemical compounds because it reacts easily with various chemicals, making the production of new chemicals much easier and faster. Used in the making of styrene, phenols, detergents, explosives, medicines and dyes.
  - iii. Benzene was used widely as a solvent. Its ability to dissolve organic compounds made it popular in the production of rubber, plastics, paints, inks, oil, and fats. It vaporizes easily and was used in processes where fast drying was necessary.

## 3. HEALTH HAZARDS OF BENZENE EXPOSURE

- a. Benzene poisoning occurs primarily through inhalation of its vapors. Although benzene can penetrate the skin, intact skin does not easily absorb benzene into the body.
- b. Benzene primarily attacks the blood-forming tissues of the body. Benzene damages the bone marrow where red blood cells, white blood cells and platelets are formed. These three components make up the blood and a shortage of any one of them will result in

serious blood disease. Benzene is known to affect all three of these components and thus workers exposed to benzene show a variety of blood diseases.

- c. Among the various blood diseases are anemia (shortage of red blood cells); leukopenia (shortage of white blood cells); and thrombocytopenia (shortage of platelets).
- d. Most serious is benzene's ability to cause leukemia, a fatal cancer of the white cell producing tissue. There are many types of leukemia classified by the duration and character of the disease as well as the type of cell involved. Acute leukemia, as the name implies, progresses rapidly while chronic leukemia develops slowly.
- e. Acute Benzene Poisoning
  - i. Acute poisoning refers to an exposure to a high level of benzene in a short period. This type of exposure usually happens in an enclosed space such as a tank or vessel with benzene residues, or from spills or equipment failure. Acute poisoning affects the central nervous system with symptoms such as dizziness, excitement, staggering gait; also, headache, nausea, fatigue, insomnia, flushed face, incoherent speech, tingling in hands and feet. Symptoms can last up to two weeks and the length of recovery will depend on the severity of exposure. However, if the exposure is severe enough, the breathing center of the brain is paralyzed, and death occurs.
  - ii. First aid for acute poisoning: keep the victim calm and quiet and move the victim to fresh air; CPR may be necessary. If benzene has met skin or eyes, remove contaminated clothing and flush affected area for 15 minutes.
- f. Chronic Benzene Poisoning
  - i. Chronic poisoning refers to exposure to low levels of benzene over a long period. This is the more common form of industrial benzene poisoning. In addition, if a person is rescued from an acute exposure, he or she may then develop chronic, long-lasting effects.
  - ii. Symptoms of chronic benzene poisoning are vague and thus deceptive. Tiredness, dizziness, headache, nausea, loss of appetite, weight loss and general weakness can easily be attributed to other causes. It is only later during the disease that nosebleeds, bleeding gums, pallor and purple disfigurations appear. Benzene may also cause damage to chromosomes, and that chromosomal damage also confirms the cancer-causing potential of benzene.

#### **4. WHAT THE OSHA STANDARD SAYS (29 CFR 1910.1028)**

- a. The permissible exposure limit (PEL) was set by OSHA at one part per million (ppm) of benzene in the air. The standard calls for a 15- minute short-term exposure limit (STEL) of 5 ppm. The short-term limit was included because studies of refinery workers show excess leukemia risk among pipe fitters, maintenance workers, and in other jobs where intermittent peak exposures to benzene occur. This level of exposure is NOT typical of **H-2 Enterprises, LLC (H2E)** pipeline construction workers due to the extremely limited work conducted in or near facilities producing or using benzene.

- b. The action level of 0.5 ppm triggers other provisions of the standard including methods of compliance, personal protective equipment, employee monitoring, medical surveillance, medical removal protection, hazard communication, regulated areas and record-keeping. Loading and unloading operations at bulk wholesale storage facilities which use vapor control systems for all loading and unloading operations are excluded.

## **5. MONITORING**

- a. The Standard lays out the requirements for initial air monitoring, periodic monitoring, and monitoring frequency. Representative 8-hour time weighted average (TWA) employee exposures shall be determined based on one sample or samples representing the full shift exposure for each job classification in each work area. To determine compliance with 5 ppm, 15 minute STEL, operations should be measured where exposures are believed to be high such as where tanks are opened, filled, unloaded or gauged; where containers or process equipment are opened and where benzene is used for cleaning or as a solvent in an uncontrolled situation.
- b. If the initial monitoring shows employee exposure above the TWA, **H2E** will repeat the monitoring at least every six months while the exposure exists. If the initial monitoring shows exposures at or below the TWA, **H2E** will repeat the monitoring for each such employee every year that the exposure exists. The monitoring frequency depends on the exposure levels. **H2E** is required to monitor whenever there is a change in production, process, control equipment, personnel or work practices which may lead to additional or new benzene exposures. Employees must be notified, within 15 working days of receipt of results, of the monitoring results and employees or their designated representatives must be allowed to observe the monitoring.

## **6. REGULATED AREAS**

- a. When necessary, **H2E** will establish a regulated area limiting access to authorized persons, when benzene concentrations exceed or are expected to exceed the permissible exposure limits, either the 8-hour average or the 15-minute limit.

Note: OSHA considers "designated representative of employees" for exercising the right to observe monitoring and measuring procedures as an authorized person.

Benzene may be found at the following areas:

- i. Petroleum refining sites
- ii. Tank Gauging (tanks at producing, pipeline & refining operations)
- iii. Field maintenance locations

## **7. METHODS OF COMPLIANCE**

Unless **H2E** can prove they are unfeasible, engineering controls and work practices must be used to control benzene exposure levels.

- a. **Compliance Program**

- i. When exposures are over the PEL, **H2E** will establish and implement a written program for reducing exposures and copies must be made available upon request to employees and designated representatives.
- ii. H2E's plans are reviewed and revised to reflect the most recent exposure monitoring data on an annual basis by Safety Committee.

**b. Respiratory Protection**

- i. Respiratory protection should never be a substitute for proper engineering controls; i.e., substitution and direct exhaust ventilation. Respiratory protection can be used:
  - 1. If feasible controls cannot be implemented,
  - 2. during implementation of engineering controls, and
  - 3. during emergencies.
- ii. **H2E's** respiratory protection program is an OSHA approved program and complies with 29 CFR 1910.134.
- iii. H2E uses approved respiratory protection in accordance to airborne concentrations of benzene.

**c. Protective Clothing and Equipment**

- i. Protective clothing and equipment shall be worn, where appropriate, to prevent eye contact and limit dermal exposure to liquid benzene. Protective clothing and equipment will be provided by **H2E**.

**d. Medical Surveillance**

- i. Components of initial, periodic, and emergency medical examinations are specified. The Standard states what must be included in a physician's written opinion to the tested employee and outlines the medical removal protection plan which provides a 6-month rate retention clause for employees who must be temporarily removed from exposure and a permanent guarantee for permanent job removals. Should either of these removal options become necessary, **H2E** shall maintain the current wage rate, seniority and other benefits as though the employee had not been removed, or as is required by the union.
- ii. For exposure monitoring, records should be maintained for at least 30 years and for medical records, duration of employment plus 30 years.

**e. Host Facility Information**

- i. The Standard also calls for signs and labels, information and training, and record-keeping.
- ii. **H2E** will be made aware of the host facility's contingency plan provisions and will include that information in our Safety Orientation to all off our employees.
- iii. Employees will be informed where benzene is used in host facility and will be made aware of additional plant safety rules pertaining to benzene.

## **8. CONTROLLING BENZENE EXPOSURES**

Preventing the deadly hazards of benzene exposure requires a comprehensive and on-going occupational health program including medical examinations, biological and air monitoring, engineering controls, personal protective equipment and protective clothing, employee education, work practices and record-keeping. Below are some control measures which apply to benzene or any other cancer-causing substance.

- a. When a safer substitute is available, benzene should never be used.
- b. In the production as well as use of benzene as a raw material or intermediate in chemical manufacture, the process should be completely enclosed. A regulated area should be established so that entry and exit into a benzene area is controlled. Direct exhaust ventilation should also be provided to control possible exposure during maintenance and repair work.
- c. Regular air monitoring for benzene should be conducted to determine if control measures are effective. Employees should be allowed to observe the monitoring and results should be retained for 30 years and available to employees upon request.
- d. Workers at risk of exposure will be provided with appropriate protective clothing (coveralls or other full-body clothing) and gloves impervious to benzene which should be changed daily and laundered at H2E's expense. Separate lockers will be provided for work clothes and street clothes. Showers should be taken at the end of the workday before the employee goes home.
- e. Where there is the possibility of contact with liquid benzene, splash-proof face shields and goggles must be worn.
- f. Special procedures should be set up for maintenance work and entry into tanks or other enclosed spaces.
- g. H2E will keep exposure below 10 ppm through the use of recommended engineering and work practice controls, unless proven to not be feasible.

## **9. MEDICAL EXAMS**

- a. Workers exposed to benzene should take regular medical examinations. (Exposed to benzene means that there are measurable concentrations in the workplace air.) The frequency will depend on the extent of the worker's exposure. Any medical surveillance will be at no expense to the employee and should not be conducted by the company.
- b. All medical examinations will be conducted by an outside independent physician. In this way, we can protect the worker and insure confidentiality of results. The only person receiving individual test results will be the individual taking the test and his or her personal physician, if so desired.

## **10. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE**

- a. Fire extinguishers must be readily available in areas where benzene is used and stored. Because benzene is highly flammable it will be stored in tightly closed containers in a cool, well-ventilated area. Benzene vapor may form explosive mixtures in air. All sources

of ignition must be controlled. Use non-sparking tools when opening or closing benzene containers. Fire extinguishers, where provided, must be readily available. Know where they are located and how to operate them. Smoking is prohibited in areas where benzene is used or stored.

- b. All portable fire extinguishers shall be checked annually by a qualified fire extinguisher maintenance service.
- c. All **H2E** employees will be trained in the proper use of portable fire extinguishers.

## **11. TRAINING AND TRAINING RECORDS**

- a. Benzene Awareness Training will be conducted for all **H2E** employees who are assigned to work in any area where there is a known occupational exposure to benzene.
- b. **H2E** will provide every worker with information outlining how and where benzene is used in the plant, safe methods of handling, hazards involved, proper maintenance and cleanup methods, proper respirator usage and a description of medical surveillance and air monitoring programs. This information will also contain a description of emergency first aid procedures for benzene
- c. Training records shall be maintained on file at the Project by the Project Safety Coordinator.
- d. Non-compliance by any **H2E** employee with any part of this described program will result in disciplinary action as outlined in the Company's Corrective Action and Disciplinary Program found in this manual.