BENZENE WORKPLACE EXPOSURE STANDARD

In September 2010, the Department of Labour lowered the Workplace Exposure Standard (WES) for benzene.

The old WES for benzene (as of 2002) was:
- 5ppm or 16mg/m³ TWA (Time Weighted Average)

The new WES for benzene (effective from September 2010) is:
- 1ppm or 3.19 mg/m³ TWA
- 2.5ppm or 7.8 mg/m³ STEL (Short Term Exposure Limit)

What is a Workplace Exposure Standard?

There are, in fact, a number of Workplace Exposure Standards (WES), and they are all designed to give a maximum limit that a person can be exposed to, for a particular substance, over a certain amount of time, and still remain healthy.

In the case of benzene, we use the following values:
- Time Weighted Average (TWA) – this means that you could be exposed to an average of up to 1ppm (part per million) benzene over the course of an eight-hour work day and not experience poor health effects.
- Short Term Exposure Limit (STEL) – 2.5ppm is the highest average level of benzene you can be exposed to over a 15-minute period throughout the working day.

How are WES used in the workplace?

WES are used in relation to monitoring hazardous substances in the workplace environment. You need special monitoring equipment to measure airborne substances in the workplace (often called air sampling). The equipment can cost a lot of money, and you need specialist training in how to take representative samples and make a correct analysis. In most workplaces, air sampling is done by occupational hygienists or people with similar qualifications and experience.

The specialist takes samples of the air the worker is breathing and has the samples analysed. The specialist is then able to determine if hazardous substances are likely to be present in the workplace air, and whether or not they exceed the WES for that substance or substances.

Employers must provide the results to the workers who are exposed to the substance being monitored.

Why did the Department of Labour change the WES for benzene?

The benzene WES was lowered because current research shows that adverse health effects of benzene can occur at concentrations lower than previously thought.

Lowering the WES value means more may have to be done in the workplace to reduce the level of worker exposure to this substance.

What are the health effects of benzene exposure?

At low levels, exposure to benzene can cause dizziness or sleepiness, a rapid heart rate, headaches, tremors, or confusion. At higher levels it can cause unconsciousness or even death.

Long-term exposure can have serious health consequences, particularly in the bone marrow, or through loss of red blood cells, which can lead to anaemia. It can interfere with your immune system, making you vulnerable to other illnesses.

Benzene can also cause cancer, particularly leukaemia and other cancers of the blood.

What occupations are linked to benzene exposure?

People are usually exposed to benzene by breathing in vapours that contain the substance. Benzene can also be absorbed through the skin, particularly if people handle liquids containing benzene and they are not protected from splashes.

Petrol refineries, service stations, bulk tank farms and petrol tank delivery drivers can potentially be exposed to benzene in petrol and petroleum products.

Benzene may also be used to manufacture plastics, pesticides, detergents, and other chemicals.

Chainsaw operators and mechanics may also be exposed to benzene vapours if they breathe in exhaust fumes.

1 While the average person may not experience adverse health effects, some people may still experience adverse health related to benzene exposure at this level or even below, because of individual susceptibility.
What can be done to reduce the amount of hazardous substances in the workplace air?

There are a number of ways to reduce hazardous substances in the air, but it depends on a number of things including the work process, the equipment used and the environment you work in.

Here are some general examples of what could be done to reduce worker exposure to hazardous substances:

- Substitute the hazardous substance for a less hazardous product;
  
  Years ago, benzene was used as a general solvent and was present in thousands of workplaces and homes. Today, benzene has been replaced by other solvents (e.g. toluene), which are still hazardous, but not as hazardous as benzene.

- Install extraction ventilation to take the air containing the hazardous substance away from the workers;

- Enclose manufacturing processes so that all of the work involving the hazardous substance is conducted in a separate room or chamber that no-one usually works in; and

- ONLY as a last resort: use personal protective clothing and equipment (PPE) to further reduce worker exposure.

Why can't we just rely on PPE to protect us from harm?

The Health and Safety in Employment Act 1992 places duties on employers to eliminate all significant hazards in the workplace to ensure the safest working environment.

But in a lot of cases, we need to work with certain machines, chemicals and hazardous processes in order to get the job done. If the hazards cannot be eliminated, the employer is required to isolate the hazards from the workers, e.g. by installing machine guards, or by enclosing loud machinery in muffling equipment.

Eliminating and isolating hazards can be initially expensive, and can take some time to develop. But they are the preferred method of hazard management, and make good business sense.

If some hazards cannot be eliminated or isolated, the employer must minimise employee exposure. Minimisation includes extraction ventilation, job rotation and using PPE.

Personal protective clothing and equipment may seem like the cheapest way to solve a hazardous substance exposure problem, but in most cases, it may end up costing the employer more money to manage it. Because PPE doesn’t form a total barrier of protection for the worker, many things could happen.

For example:

- Poorly maintained PPE (e.g. holes in gloves, unchanged mask filters) increases worker exposure
- People sometimes forget to wear the PPE
- People find it uncomfortable to wear the PPE and may take the risk of removing it in a hazardous work environment
- Consumable PPE can cost a lot of money to replace (e.g. mask filters, disposable gloves)
- The PPE may not provide protection against a large surge of a hazardous substance in the event of an accident
- The workplace environment has to be regularly monitored to check that hazardous substances are still within safe levels
- Workers may have to undergo biological monitoring (urine or blood tests) to assess whether they are still getting exposed even though they are using PPE.

In your workplace, the principles for dealing with hazardous substance exposure must be to:

**ELIMINATE, ISOLATE, MINIMISE.**

Further sources of information:

- Workplace Exposure Standards effective from 2010
- The Approved Code of Practice for the Management of Substances Hazardous to Health in a Place of Work

Contact the Department of Labour on 0800 20 90 20 or visit www.dol.govt.nz.