

The *BSO Plus Safety Topic* is a review designed from the BSO Plus agenda. This safety topic is your way to stay current on the safety information over the 3 years between BSO Plus and BSR.

## RADIATION / NORMS

### RADIATION

#### What is radiation?

Radiation is both natural and man-made. Our bodies are exposed to natural radiation every day -- from soil and underground gases to cosmic radiation from the sun and outer space. We're also exposed to radiation from our own inventions -- medical procedures, televisions, cell phones and microwave ovens. Radiation isn't necessarily always dangerous. It depends on its strength, type and the length of exposure.

If you work with x-ray equipment, radiography instruments for equipment inspection, or nuclear density gauges, you could be potentially exposed to radiation. Exposure to radiation is regulated under Ontario Regulation 861 for X-Ray Safety.



Radiation can be classified as non-ionizing or ionizing.

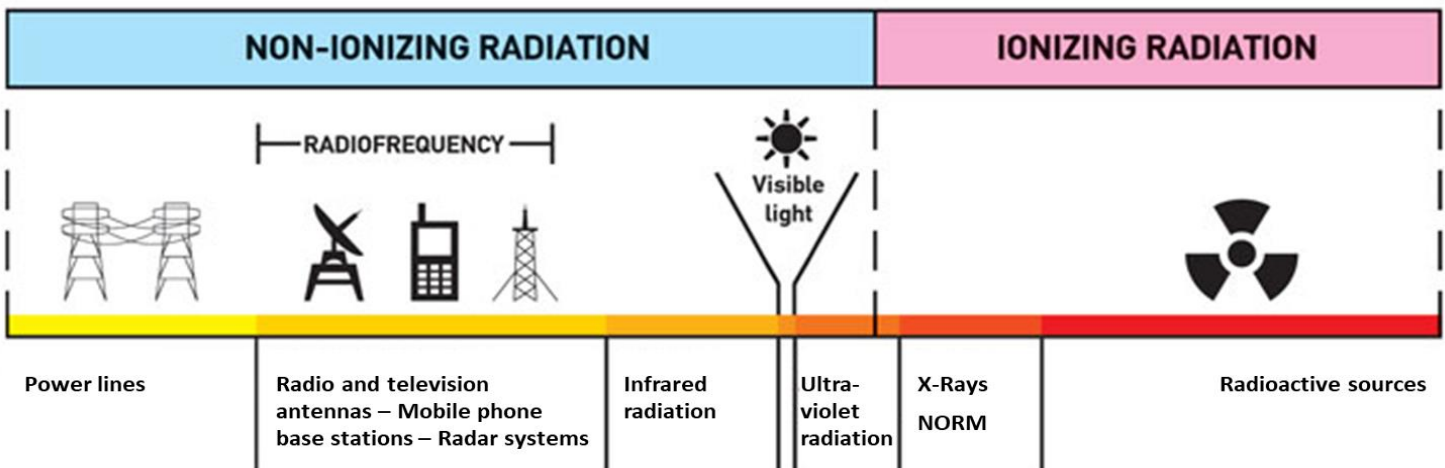
**Non-ionizing radiation** has enough energy to move or vibrate atoms, but not enough to remove electrons.

**Ionizing radiation** has sufficient energy to remove electrons from atoms or molecules. The loss of an electron results in the formation of a charged atom, called an ion. The damaging effects of ionizing radiation result from this ability to change the chemical composition of matter with which it interacts.

There are natural and artificial sources of ionizing radiation. Artificial sources of radiation include X-ray machines, radiography instruments for equipment inspection, radioactive isotopes used in nuclear medicine, gamma cameras, nuclear gauges and nuclear power plants.

Natural sources of radiation include:

- background radiation from space,
- cosmic radiation from cosmic rays,
- terrestrial radiation from minerals in the earth's crust,
- radiation from inhaling radon gas,
- radiation from ingesting food and drinking water that may contain radioactive potassium-40, and
- minerals such as uranium and thorium are radioactive and give off radiation when the nucleus breaks down or disintegrates.



## Why is radiation harmful?

When the body absorbs radiation, it can cause changes on a cellular level leading to cancer and reproductive abnormalities. It is therefore important for workers, especially pregnant women, to limit their exposure to radiation in their workplaces. People can be exposed to this hazard without any sensation or awareness.

Acute health effects include burns and radiation sickness. Radiation sickness is also called 'radiation poisoning'. It can cause premature aging or even death. If the dose is fatal, death usually occurs within two months.

Non-ionizing radiation is unlikely to cause cancer. However, if the energy level is high enough, there may be other effects on human health.



## How do we protect ourselves from radiation?

The risk of radiation-induced diseases depends on the total radiation dose that a person receives over time.

The main ways to control radiation exposure include engineering controls, administrative controls and personal protective equipment.

Examples of these controls include:

- Training and education
- Reducing exposure time
- Increasing the distance from the radiation source
- Using a physical barrier that modifies the pathway between worker and source of radiation
- Monitoring of exposures (individual and collective)
- Recording exposures
- Providing health surveillance
- Complying with established radiation exposure limits



## NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM)



Low levels of radiation are known to be present in some of the local refineries, including Naturally Occurring Radioactive Materials (NORM).

Natural radioactive elements are present in very low concentrations in earth's crust and are brought to the surface through human activities such as oil and gas exploration. All extracted oil and gas can contain small amounts of Radon 222.

The feedstock arriving at some sites contains NORM. These sites will have a NORM Management Program in place to manage it. Controls for NORMs exposures generally include policies and procedures, training, monitoring, safe work permits, and appropriate PPE.

**If you will be working in areas with radiation (including NORM), you will be required to take additional site-specific training.**