

Ionizing Radiation Safety Compliance Game Plan



The 11 things you must do to protect workers from hazardous radiation.

Radiation is a hazard at not only medical and nuclear sites but also industrial workplaces where X-ray machinery, ultrasonic welding devices, lasers and other radiation-emitting equipment is used. As OHS director, you need to ensure that your company complies with the radiation safety requirements of your jurisdiction. Here's an 11 step Game Plan to accomplish that objective.

Industrial Radiation Hazards

Radiation is a form of energy emitted from a body or source that's transmitted in waves through space before being absorbed into another body. Radiation is all around us. It's what heats the earth and enables us to make calls on our smartphones. But while most of the radiation that we're exposed to isn't harmful, some forms can cause cancer and other serious health damage. The difference between benign and friendly radiation is the frequency of the waves and whether it's strong enough to alter the molecules contained in the cells of our body.

Workplace dangers come mostly from machinery and equipment that emits what's called 'ionizing,' or high-energy radiation. Sources of ionizing radiation at industrial workplaces include X-rays and radioactive materials. The higher the emitted energy, the greater the danger.

Nonionizing radiation, including ultraviolet light, visible light, infrared light, microwaves, radio waves and electricity, doesn't have enough energy to alter molecules. But it may still have biological effects such as heating or initiating what are called photochemical reactions that mess with the chemistry of a molecule.

Here are the X things you must do to comply with radiation safety laws.

This article addresses general radiation workplace safety requirements. It doesn't cover workers nuclear power plants, which are regulated by federal law, nor requirements applying only to specific types of

equipment or devices.

1. Do a Radiation Hazard Assessment

The first step in controlling radiation hazards is to identify and assess them. Sources of potentially harmful radiation at industrial, non-medical sites may include:

- Welding equipment;
- Lasers;
- Certain types of lamps;
- X-ray equipment;
- Microwaves;
- Induction heaters;
- Power lines;
- and Radar.

2. Notify Exposed Workers of Radiation Risks

You must notify workers of the hazards they face and the precautions necessary to protect themselves before assigning them to positions or work areas that expose them to potentially harmful radiation. Key information to provide exposed workers includes:

- The worker's safety responsibilities and duties;
- The type of radiation source to which the worker will be exposed;
- The reproductive and other hazards posed by that particular type of radiation;
- The maximum exposure limits for that particular type of radiation; and
- The uses and limitations of the radiation facility, equipment and sources the worker will use.

3. Implement Engineering Controls for Radiation Exposure

The optimal solution to radiation hazards is to eliminate them by substituting machinery or equipment that doesn't emit dangerous radiation. If that's not reasonably practicable, implement engineering controls to minimize exposure. For example, engineering controls for X-rays may include:

- Installation of shielding or physical barriers on or near X-ray sources;
- Encapsulating X-ray sources in lead;
- Diaphragms, cones and adjustable collimators or other suitable devices to limit the dimensions of the useful X-ray beam; and
- Locks or interlocks.

4. Keep Worker Radiation Exposure Below Acceptable Limits

You must limit workers' exposure to radiation to limits specified in the OHS or radiation safety regulations of your jurisdiction and stay as low as possible under those limits. Exposure to ionizing radiation is typically measured in Sievert (Sv) or milliSievert (mSv). To determine safe exposure levels, you must calculate:

- 'Effective dose,' or the amount of ionizing radiation, measured in mSv,

absorbed by the worker's whole body, adjusted for the energy level and type of radiation and the differing susceptibilities of the organs and tissues irradiated; if only part of the body is exposed the effective dose is the sum of the weighted equivalent doses in all irradiated tissues and organs; and

- 'Equivalent dose,' or the amount of ionizing radiation, measured in mSv, absorbed by a specific body part and adjusted for the energy level and type of radiation.

Exposure limits vary by jurisdiction. For example, in BC, workers' exposure to ionizing radiation can't exceed an annual effective dose of 20 mSv and an annual equivalent dose of:

- 150 mSv to the lens of the eye;
- 500 mSv to the skin, averaged over any 1 cm² area at a nominal depth of 7 mg/cm², regardless of the area exposed; or
- 500 mSv to the hands and feet.

There are also exposure limits for particular forms of ionizing and non-ionizing radiation.

5. Monitor Radiation Exposure Levels

You must also continually monitor each worker's actual exposure. Monitoring is typically done via use of personal dosimeters that measure accumulated exposure to radiation over a period of time, typically 3 months. Because the impact of radiation on health may not be apparent and may develop over time, some jurisdictions also require employers to conduct medical monitoring of workers exposed to radiation.

6. Implement Safe Work Procedures for Radiation Work

Develop a radiation safety policy and work procedures for:

- Installation, use and maintenance of radiation equipment;
- Exposure monitoring and dosimeter use;
- Personnel that may operate radiation equipment;
- Proper use of required PPE; and
- Actions to be taken in response to emergencies.

7. Provide Appropriate PPE for Radiation Exposure

Make sure you furnish and ensure the safe use of PPE to protect workers from radiation exposure, which may include lead aprons, goggles or other eye protection, protective gloves and skin cream. Remember that PPE may be required not just for operators of radiation equipment but those who work in nearby areas.

8. Post Radiation Danger Warning Signs

Post signs warning of radiation dangers and displaying the radioactive symbol at all entrances of work rooms or areas where hazardous levels of radiation may be present. Radiation equipment should also have appropriate warning signals, systems and devices appropriate for the particular type of equipment and the hazards it poses.

9. Train Workers on Radiation Safety Rules

Provide workers who are exposed to radiation safety training covering, at a minimum:

- Radiation hazards;
- Your radiation safe work procedures;
- The engineering and administrative controls you use to manage radiation hazards;
- How to use, inspect, maintain and store the required PPE;
- Radiation accidents and emergency response procedures; and
- Radiation accident reports.

Verify that workers understand and are capable of applying their training. Keep records of the training you provide and when you provide it. Provide refresher training at least every 3 years.

10. Take Special Precautions for Pregnant Workers

Because radiation exposure is so dangerous to pregnant workers and fetuses, most jurisdictions require employers to take special measures to protect them. First, the worker must notify the employer that she's pregnant or trying to get pregnant. Upon getting such notification, you must reassess the worker's job duties and training needs for the balance of the pregnancy. If the worker remains exposed, you must limit her exposure to the stricter limits that apply for pregnant workers and constantly monitor her levels of exposure throughout the pregnancy.

11. Report Radiation Accidents or Overexposures

Require workers and supervisors to immediately report accidents involving radiation equipment. Such accidents may also trigger OHS incident reporting rules, especially if they involve serious injury, lost work time or offsite medical treatment. In addition, radiation safety laws typically require reporting of malfunctions involving radiation equipment.