Ionizing Radiation

Introduction

Ionizing radiation sources may be found in a wide range of occupational settings, including health care facilities, research institutions, nuclear reactors and their support facilities, nuclear weapon production facilities, and other various manufacturing settings, just to name a few. These radiation sources can pose a considerable health risk to affected workers if not properly controlled. This page provides a starting point for technical and regulatory information regarding the recognition, evaluation, and control of occupational health hazards associated with ionizing radiation. This page is maintained as a product of OSHA’s Alliance with the American Biological Safety Association (ABSA).

Ionizing radiation is addressed in specific standards for the general industry, shipyard employment, and the construction industry.

Standards

This section highlights OSHA standards, directives (instructions for compliance officers), standard interpretations (official letters of interpretation of the standards), and other federal standards related to ionizing radiation.

OSHA

Note: Twenty-five states, Puerto Rico and the Virgin Islands, have OSHA-approved State Plans and have adopted their own standards and enforcement policies. For the most part, these States adopt standards that are identical to Federal OSHA. However, some States have adopted different standards applicable to this topic or may have different enforcement policies.

- General Industry (29 CFR1910)
  - 1910.120, Hazardous waste operations and emergency response [related topic page]
  - 1910.1096, Ionizing radiation (general industry)

- Shipyard Employment (29 CFR1915)
  - 1915.57, Uses of fissionable material in ship repairing and shipbuilding

- Construction Industry (29 CFR1926)
  - 1926.53, Ionizing radiation (construction)
  - 1926.65, Hazardous waste operations and emergency response

Federal Register

- Search all available Federal Registers.

Directives

- Memorandum of Understanding Between the OSHA and the U.S. Nuclear Regulatory Commission, CPL 02-00-086 [CPL 2.86], (1989, December 22). Delineates the authorities, responsibilities, and other activities between OSHA and NRC for occupational health and safety at radiation sites.
- Search all available directives.

Standard Interpretations

Clarification of OSHA’s Bloodborne Pathogens Standard as it relates to syringes and needles contaminated with both a bloodborne pathogen and radioactive nuclear medicine, (1996, October 29).


Male infertility and welding engineers, (1992, October 27). This interpretation includes a discussion of ionizing radiation sources from various welding operations.

Definition of an airborne radioactivity area, (1992, October 6).


Application of 1910.120 to emergency Responders at a nuclear power plants, (1991, January 28).


Ionizing radiation hazards in the workplace, (1990, September 27).

Application of 1910.120 to cleanup of nuclear and hazardous waste, (1990, April 4).

Clarification of the jurisdiction’s of OSHA and the NRC in nuclear power plants, (1987, January 8).


Respirator air quality standards do not apply where the NRC has jurisdiction, (1979, March 6).

Search all available standard interpretations.

Other Federal

Note: These are NOT OSHA regulations. However, they do provide guidance from their originating organizations related to worker protection.

Nuclear Regulatory Commission (NRC)

- 10 CFR 20, Standards for Protection Against Radiation

US Department of Energy (DOE)

- 10 CFR 835, Occupational Radiation Protection

Health Effects

General

- Radiation Protection, Environmental Protection Agency (EPA), Radiation Protection Division.
  - Health Effects
- For additional information on industries with potential ionizing radiation sources, see OSHA’s Safety and Health Topics pages on:
  - Healthcare Facilities
  - Hazardous Waste
  - Semiconductors

Pregnant Workers

Note: These are NOT OSHA regulations. However, they do provide guidance from their originating organizations related to worker protection.

Nuclear Regulatory Commission (NRC)

- 10 CFR 20, Standards for Protection Against Radiation. The NRC requires licensees to maintain exposure to the fetus of an occupationally exposed individual to 500 mrem (5 mSv) or less during the gestation period.

International Commission on Radiological Protection (ICRP)

- 1990 Recommendations of the International Commission on Radiological Protection. Report 60. Recommends a limit of radiation exposure to a member of the general public as 100 mrem/y (1 mSv/y) and the limit for the fetus of an occupationally exposed individual to 200 mrem (2 mSv) during the gestation period.

National Council on Radiation Protection (NCRP)

- Limitation of Exposure to Ionizing Radiation. Report 116. Recommends a limit of radiation exposure to a member of the general public as 100 mrem/y (1 mSv/y) and the limit for the fetus of an occupationally exposed individual to 50 mrem (0.5 mSv) per month during the gestation period.

Conference of Radiation Control Program Directors (CRCPD)

- Radiation Protection. Suggests state regulations for radiation protection. In Subpart D, the suggested regulations state that the limit on exposure to the fetus of an occupationally exposed worker be kept below 500 mrem (5 mSv) during the gestation period.

US Department of Energy (DOE)


Medical Doses
Safety and Health Programs

Measuring Exposure

Examples Programs for Pregnant Radiation Workers

Hazards and Solutions


Doses to the embryo and fetus from intakes of radionuclides by the mother. International Commission on Radiological Protection (ICRP) Report 88. Contains information on radiation doses from maternal intake of radioactive materials and potential biological effects.

Patient Information, Royal College of Radiologists. A variety of patient information leaflets on Diagnostic Radiology, Intervention Radiology, and Oncology.

Health Effects of Radiation Exposure during Pregnancy


Radiation Protection, Environmental Protection Agency (EPA), Radiation Protection Division.

Possible Health Effects of Radiation Exposure on Unborn Babies. Centers for Disease Control and Prevention (CDC). Discusses possible health effects to unborn babies from exposure to radiation.


Examples Programs for Pregnant Radiation Workers

Policy on Declared Pregnant Radiation Workers, University of Minnesota.
Radiation Safety Manual for Laboratory Users, Princeton University.
Pregnant Worker in Radiation Environment, University of Maryland.

Hazards and Solutions

Ionizing Radiation Presentations, OSHA Slide Presentations.

Introduction to Ionizing Radiation [5 MB PPT, 54 slides]. (2001). This is an updated version of the original lecture outline.


Prussian Blue (ferric hexacyanoferrate (II)) for Treatment of Internal Contamination with Thallium or Radioactive Cesium. US Food and Drug Administration (FDA), Center for Drug Evaluation and Research, (2010, September 7). Provides references to FDA approval of a new drug application for Radiogardase, also known as Prussian blue, to treat people exposed to radiation contamination, due to harmful levels of cesium-137 or thallium.


Measuring Exposure


Technical Equipment

Radiation Monitors and Meters. Contains sampling, measurement methods, and instrument information for ionizing radiation.

Hospital Investigations: Health Hazards. Describes investigation methods for health and safety hazards in health care facilities, including X-Ray sources.

Safety and Health Programs


Radiation Control Manuals from Department of Energy (DOE) Laboratories:

Fermilab Radiological Control Manual (FRCM). Fermi National Accelerator Laboratory (Fermilab), (2010).

Radiological Safety, Stanford Linear Accelerator Center (SLAC), (2010). Describes the engineering and administrative controls required to maintain personal radiation doses ALARA, to prevent uncontrolled or accidental exposure to ionizing radiation, and to prevent release of radioactive material into the environment.

SLAC Radiological Control Manual [2 MB PDF, 232 pages]. (2010, July 2). Summarizes the elements of the Radiological Health and Safety Policy and is intended to guide the actions of every person involved in radiological work at SLAC.


requirements of Jefferson Lab’s Radiation Protection Program (RPP) based on 10 CFR 835 and ensures that Radiation Control activities are conducted in accordance with this RPP. Includes formal plans and measures for applying the ALARA process to occupational exposure.

- **Office of Worker Safety and Health - Radiation Protection Policy**, US Department of Energy (DOE), (2011, February 7). Develops and issues the Department of Energy’s occupational radiation protection policy, requirements and guidance. Key regulatory topics covered in 10 CFR 835 include:
  - monitoring individual internal and external radiation dose,
  - radiation safety training,
  - workplace monitoring,
  - As Low As Reasonably Achievable (ALARA) programs,
  - radiation detection instrumentation,
  - posting and control of radioactive material,
  - radiation dose reporting.

- For additional information on safety and health programs, see OSHA’s Safety and Health Programs Safety and Health Topics Page.

**Additional Information**

**Related Safety and Health Topics Pages**

- Radiation

**Other Resources**

- **American Biological Safety Association (ABSA)**, OSHA Alliance Page.
- **American Industrial Hygiene Association**, Serves the needs of occupational and environmental health professionals practicing industrial hygiene and has two standing committees on radiation:
  - **Ionizing Radiation Committee** provides a forum for exchanging ideas and information about the impact of ionizing radiation on the workplace and in the community and to participate in the development and analysis of related technological and regulatory issues.

**Accessibility Assistance**: Contact the OSHA Directorate of Technical Support and Emergency Management at (202) 693-2300 for assistance accessing PDF materials.

*These files are provided for downloading.*