Purpose

The purpose of this program is to protect employees who may encounter ionizing radiation and its hazards while performing work.

Scope

This procedure applies to CARDINAL SURVEYS COMPANY operations where employees may be exposed to ionizing radiation.

This program is to ensure essential information regarding the hazard of ionizing radiation is communicated to our staff to minimize any potential exposure to ionizing radiation. When work is performed on a non-owned or operated site, the operator's or their radiation services contractor's program shall be followed.

Introduction

Exposure/Effects

As a rule, the dangers of radioactive exposure are less visible than those of other hazardous materials, and the presence of dangerous levels of radioactivity is hard to detect; it can only be detected with special monitors. Its effect on the human body may not be evident for days, weeks, or even years after exposure occurs. As ionizing radiation is applied to humans, the effects may include dermatitis, redness of the skin, skin cancer, hair loss, and eye inflammation.

The human body is able to tolerate a certain level of ionizing radiation; after all, we are continuously exposed to ionizing radiation from natural sources, such as cosmic radiation from outer space, and from radioactive materials in the earth. The degree of injury that is inflicted on a person by radiation exposure depends on several factors, such as the amount of the radiation dose, the duration of the dose, the rate at which the dose was received, the type of radiation received, and the body parts receiving the dose.

Requirements

The Occupational Safety and Health Administration regulates ionizing radiation at 29 CFR 1910.1096.

The annual permissible dose for total body exposure is five rem per year, with three rem permitted within a 13-week period. (Rem is a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one roentgen of X–rays).

No part of the body should be directly exposed to radiation. If there is a danger of exposing a body part, appropriate protection must be used. Lead aprons, gloves, and goggles should be worn by workers located in the direct field or in areas where radiation levels from scattering are high. All protective equipment should be checked annually for cracks in the lead and other signs of deterioration. For consistently elevated exposure, a thyroid shield and leaded glasses are recommended.

Definitions

"Dose" means the quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time.

“High radiation area” means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

"Rad" means a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad) = 0.001 rad).

"Radiation" includes alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.

“Radiation area” means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem; and

"Radioactive material" means any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

"Restricted area" means any area access to which is controlled by the CARDINAL SURVEYS COMPANY for purposes of protection of individuals from exposure to radiation or radioactive materials.

"Rem" means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 millirem (mrem) = 0.001 rem). The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions for irradiation.

Each of the following is considered to be equivalent to a dose of 1 rem:

- A dose of 1 roentgen due to X- or gamma radiation;
- A dose of 1 rad due to X-, gamma, or beta radiation;
- A dose of 0.1 rad due to neutrons or high energy protons;
- A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

"Unrestricted area" means any area access to which is not controlled by the CARDINAL SURVEYS COMPANY for purposes of protection of individuals from exposure to radiation or radioactive materials.

Procedure

CARDINAL SURVEYS COMPANY shall not possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified below:

TABLE G-18	Rems per calendar quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4
Hands and forearms; feet and ankles	18 3/4
Skin of whole body	7 1/2

No allowance shall be made for the use of protective clothing or equipment or particle size.

Precautionary Procedures and Personal Monitoring

Survey
CARDINAL SURVEYS COMPANY shall ensure that survey of the area has been taken and appropriate restricted areas established at the client worksite prior to beginning work. Survey means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

Monitoring
CARDINAL SURVEYS COMPANY shall ensure the supply of appropriate personnel monitoring equipment, such as film badges, pocket chambers, pocket dosimeters, or film rings, and shall require the use of such equipment by each employee who enters a restricted area. All shall be calibrated as required.

Signs and Emergency Signals

Signs
Symbols shall use the conventional radiation caution colors of magenta or purple on yellow background. The symbol prescribed by this paragraph is the conventional three-bladed design.

Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION RADIATION AREA.

Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION HIGH RADIATION AREA.

Each area or room in which radioactive materials in regulated amounts are stored shall post a sign or sings bearing the radiation caution symbol and the words: CAUTION RADIOACTIVE MATERIAL.

Emergency Signal

Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the employer or a supervisor of the activity are made aware of the entry.

The signal generator shall not be less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

A sufficient number of signal units shall be installed at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

The signal shall be unique in the plant or facility in which it is installed.

The minimum duration of the signal shall be sufficient to insure that all affected persons hear the signal.

The signal-generating system shall respond automatically to an initiating event without requiring any human action to sound the signal.

Once the system has been placed in service, periodic tests, inspections, and checks shall be made to minimize the possibility of malfunction.

In addition to the initial startup and operating tests, periodic scheduled performance tests and status checks must be made to insure that the system is at all times operating within design limits and capable of the required response. Specific periodic tests or checks or both shall include:

All employees whose work may necessitate their presence in an area covered by the signal shall be made familiar with the actual sound of the signal-preferably as it sounds at their work location. Before placing the system into operation, all employees normally working in the area shall be made acquainted with the signal by actual demonstration at their work locations.

Training

All individuals working in or frequenting any portion of a radiation area shall be informed on:

- The occurrence of radioactive materials or of radiation in such portions of the radiation area,

- The safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure, including but not limited to time, distance, shielding and methods of keeping exposure limits as low as reasonably achievable (ALARA).
- The applicable provisions of 1910.1096 for the protection of employees from exposure to radiation or radioactive materials, and
- Shall be advised of reports of radiation exposure which employees may request a copy of.

Recordkeeping

CARDINAL SURVEYS COMPANY shall post a current copy of the applicable regulations and a copy of the operating procedures applicable to the work conspicuously in such locations as to insure that employees working in or frequenting radiation areas will observe these documents on the way to and from their place of employment or shall keep such documents available for examination of employees upon request.

CARDINAL SURVEYS COMPANY shall maintain records of the radiation exposure of all employees for whom personnel monitoring is required and advise each of his employees in writing of his individual exposure on at least an annual basis.