

Employee Training

Occupational Exposure Limits

Radiation and radioactive materials have many practical uses and applications, across a variety of fields including medicine, industry, and electric power generation. Radiation exposures to those whose jobs bring them in contact with the use of radioactive materials are limited by the regulations of the Nuclear Regulatory Commission (NRC). Radiation exposures from radiation generating machines (e.g. x-ray equipment) are regulated by the individual states. Additionally, radiation exposures of all employees are limited by the regulations of the Occupational Health and Safety Administration (OSHA).

Occupational dose limits from radioactive materials may be found in the NRC regulations, which themselves are located in Title 10 of the Code of Federal Regulations (CFR), Part 20. Occupational dose limits for adults are in 10 CFR 20.1201 <http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/full-text.html#part020-1201> and are specified by three different external limits. An occupationally exposed adult, in one year, may receive no more than:

1. 5 rem (5,000 mrem) total effective dose equivalent
2. 15 rem (15,000 mrem) lens dose equivalent
3. 50 rem (50,000 mrem) shallow dose equivalent to the skin of the whole body or to the skin of any extremity

The term “extremity” is defined by the NRC as “hand, elbow, and arm below the elbow, foot, knee, or foot below the knee”. Occupational dose limits for those under the age of 18 are ten (10%) percent of those specified for adults (10 CFR 20.1207). <http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/full-text.html#part020-1207>

For pregnant employees who have formally declared their pregnancy, licensees must ensure that the dose equivalent to the embryo/fetus during the entire pregnancy does not exceed 0.5 rem (500 mrem). In addition, the licensee must make efforts to avoid substantial variation above a uniform monthly exposure to a declared pregnant woman (10 CFR 20.1208). <http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/full-text.html#part020-1208> The NRC will accept monthly exposures below 100 mrem as showing no substantial variation above a uniform monthly exposure rate (Regulatory Guide 8.13). <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/active/8-13/08-013.pdf> If the dose equivalent to the embryo/fetus is found to have exceeded 0.5 rem or is within 50 mrem of this dose by the time the woman declares her pregnancy, the licensee must ensure that the dose equivalent to the embryo/fetus does not exceed 50 mrem during the remainder of the pregnancy (10 CFR 20.1208(d)). <http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/full-text.html#part020-1208>

Simply working in the vicinity of radiation and/or radioactive materials does not necessarily require that your employer issue you a radiation dosimeter to monitor your radiation exposures. The use of individual radiation monitoring devices is required by:

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1. adults likely to receive in one year from sources external to the body, a dose in excess of 10 percent of the limits
2. minors likely to receive in one year from sources external to the body, a deep dose equivalent in excess of 100 mrem, a lens dose equivalent in excess of 150 mrem, or a shallow dose equivalent to the skin or to the extremities in excess of 500 mrem
3. declared pregnant women likely to receive during the entire pregnancy from sources external to the body a deep dose equivalent in excess of 100 mrem (all occupational dose limits continue to be applicable to the declared pregnant woman as long as the embryo/fetus dose limit is not exceeded)

It is up to the Radiation Safety Officer, with input from the Radiation Safety Committee (if formed), to determine whether or not workers are 'likely' to receive radiation doses that would require their wearing of individual radiation monitors. Should your job functions involving radiation/radioactive materials significantly change, you should inform your Radiation Safety Officer so that your need of radiation monitors can be accurately re-assessed.