

CHAPTER 10: RADIOACTIVE MATERIALS

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PURPOSE AND APPLICABILITY OF REGULATIONS

Many facilities use radioactive material (RAM) in diverse ways or have radioactive wastes. Exit signs may contain tritium and smoke detectors may contain americium-241. Other examples of industrial uses of RAM include devices to measure the density of concrete or blacktop, determine the thickness of paper and rolled steel as it is made, find cracks in pipes or airplane surfaces, test for lead in paint, or monitor the flow of sludge through pipes at a sewage treatment plant. Research facilities and academic institutions use RAM during the development of new pharmaceuticals to “tag” certain molecules to follow their progress through chemical or biological processes and in other research activities. Medical facilities inject patients with RAM to diagnose medical conditions and for therapeutic treatments. Medical facilities also use large radiation sources for cancer treatment. Radium paint was once used on aircraft instruments, naval compasses, military vehicle instruments, and on clocks and watches to make the numbers and lines glow in the dark.

Naturally occurring radioactive material is found as uranium in clay and bricks, granite, shale, or other rocks. It is found as radium in soils, or as radium sulfate scales on some pipes and fittings from the oil and gas industry and as the naturally radioactive constituent of potassium, potassium-40. Natural gas and products derived from natural gas, such as propane, contain radon-222. When radon-222 decays, lead-210 can plate out on the interior of pipes and process equipment.

AGENCIES AND THEIR LAWS AND RULES

Several state and federal agencies regulate the possession, use, transport, transfer, and disposal of radioactive material. The purpose of these requirements is to ensure the safe use and disposal of radioactive material. Some of these requirements, and the applicable regulatory agencies, are:

- The **U.S. Nuclear Regulatory Commission** (U.S. NRC) regulates the use of source, byproduct, and special nuclear material under the authority of the U.S. Atomic Energy Act. These regulations are published under Title 10, Parts 1 through 171 of the Code of Federal Regulations (**10 CFR Parts 1 - 171**).
- The Michigan Department of Environment, Great Lakes, and Energy (EGLE), **Radiological Protection Program** registers the possession and use of certain diffuse forms of naturally occurring radioactive material under the authority of Public Health Code, Public Act 368 of 1978, as amended (Act 368).
- The **U.S. Department of Transportation** and **Michigan State Police, Commercial Vehicle Enforcement Division** oversee transportation of radioactive material under Title 49 of the Code of Federal Regulations (49 CFR). See Chapter 4.4 for more information about the transportation of radioactive materials.
- The **Michigan Department of Labor and Economic Opportunity, Radiation Safety Program** is responsible for the registration and inspection of medical (x-ray and mammography machines) and non-medical radiation machines and facilities.

10.1 ENVIRONMENTAL MONITORING AND RADON GAS

The **Environmental Monitoring Program** operates an environmental monitoring network around each of Michigan's nuclear power plant sites. The program collects and analyzes several types of samples, including direct radiation, air, surface water, and milk from the environs of the nuclear plants. Unit laboratory analyses also include samples collected by other program staff during investigations of potentially contaminated sites, during emergency response activities, and from routine staff compliance investigations.

EGLE's **Indoor Radon Program** provides education on the risks associated with exposure to radon gas and works closely with local health departments throughout the state to implement outreach efforts at the local level. The radon hotline (800-723-6642 or 800-RADONGAS) and website (www.Michigan.gov/radon) serve as a technical resource for the public..

10.2 NUCLEAR FACILITIES

EGLE's [Radiological Emergency Preparedness Program](#) provides scientific expertise and advice to state and local decision makers in the event of an emergency at a nuclear power plant. The state-wide program, which is coordinated by the Michigan State Police, Emergency Management and Homeland Security Division, is a partnership between industry and all levels of government. EGLE's program staff develop and implement the Nuclear Facilities Emergency Management Plan, train emergency response personnel, and are responsible for executing certain emergency response actions.

10.3 RADIOACTIVE MATERIAL IN THE ENVIRONMENT

Radioactive materials exist naturally in our environment and certain industrial processes, like drilling for the production of oil, gas, and brine, can concentrate these materials. Other processes that may concentrate radioactive materials include municipal drinking water and wastewater treatment. All of these processes can lead to radium contamination on production equipment, in waste sludges, and in other solid residuals. The Radiological Protection Program works with other EGLE staff to monitor and evaluate the public health and environmental consequences of these naturally occurring radioactive materials. Radiological Protection Program staff identifies and coordinates remediation of radioactively contaminated sites and works with other state and federal agencies to assure proper site cleanup and disposition of contaminated materials.

10.3.1 U.S. NRC Licensing

The U.S. Nuclear Regulatory Commission regulates source, byproduct, and special nuclear material. It also regulates nuclear power plants and high-level radioactive waste storage and disposal. The Region III office near Chicago, Illinois, can be contacted at 800-522-3025.

10.4 EMERGENCY ASSISTANCE

Program staff responds to radiation alarm trips at scrap metal facilities and landfills and to citizen concerns and complaints regarding radioactive materials. During normal business hours, contact the [Radioactive Materials Program](#) at 800-662-9278 regarding any radiation emergency or for questions about radioactive material during business hours. Off-hour radiation emergencies can be reported through EGLE's Pollution Emergency Alerting System (PEAS) hotline at 800-292-4706 or by contacting the Michigan State Police Operations Center at 517-241-8000. A facility must also meet the emergency reporting requirements of other federal or state agencies for hazardous or radioactive material. Radiological Protection Program staff are trained and equipped with radiation detection instrumentation to act as first responders to radiation emergencies 24 hours a day, 7 days a week.

10.5 RADIOACTIVE WASTE DISPOSAL

Discuss disposal options for radioactive wastes with the Radioactive Materials Program staff by calling 800-662-9278 or emailing RadioactiveMaterial@Michigan.gov.

10.5.1 Tritium Exit Signs

Do NOT landfill [exit signs that contain tritium](#). These should be returned to the manufacturer, if possible, or properly disposed of by a licensed radioactive waste disposal contractor. A label should be on the signs giving proper disposal directions. These exit signs, disposal contractors, and disposal sites are regulated under [10 CFR by the U.S. NRC](#).

The shipping requirements for these exit signs are regulated under the [US. Department of Transportation regulations in 49 CFR](#). Contact the shipping companies for their specific policies and contact the Michigan State Police, [Commercial Vehicle Enforcement Division](#) with shipping questions.

10.5.2 Waste Industrial Smoke Detectors

Remove any batteries from the detector and handle the battery as a universal waste or under the applicable hazardous waste regulations for that company's hazardous waste generator status (see [Chapter 2](#)).

The requirement a company must follow depends on whether the smoke detector contains radioactive material or if it could be considered a hazardous waste. There are two types of materials commonly found in smoke detectors.

- Older models may contain a non-exempt radium-226 source that is regulated by the U.S. Nuclear Regulatory Commission. These detectors should be returned to the manufacturer or disposed as radioactive waste.
- Newer models may contain a small americium-241 source. The combined smoke detector and americium source are specifically exempted in the federal regulations allowing homeowners to dispose individual detectors in a sanitary landfill. Large quantities, such as those collected during a major construction renovation or hazardous waste collection project, should not be disposed without first checking with officials of the U.S. NRC or [Radioactive Materials Program](#) staff.

Some smoke detectors could be subject to the hazardous waste regulations because the amount of metal in the detectors may fail the Toxicity Characteristic Leaching Procedure. Small quantity generators and large quantity generators cannot put hazardous waste smoke detectors in the trash. Conditionally exempt small quantity generators may dispose smoke detectors in licensed solid waste landfills if they do not contain radioactive materials above exempt quantities. However, if smoke detectors are not classified as a hazardous waste and do not contain radioactive materials above exempt quantities, then they may be sent to a licensed landfill. Companies should contact the landfill if disposing of large numbers (roughly around 25 or so) because the waste load

may set off the landfill's radiation detectors. Smoke detectors should not be recycled for metal or incinerated.

Contact EGLE's [Radioactive Materials Program](#) regarding potential safety concerns when numerous smoke detectors are disposed of at the same time or regarding nuclear regulations.

10.5.3 TENORM

Under the NREPA, a material is classified as Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) if it has undergone a human process that increases its concentrations of its naturally occurring radioactive isotopes. Material is not considered TENORM if:

- It has not undergone a human process that would increase its concentration.
- The Ra-226, Ra-228, and Pb-210 concentrations are all individually below 5 picocuries per gram (pCi/g).
- It is classified as source material by the U.S. NRC.

Common materials classified as source material by the U.S. NRC and specifically exempted include coal ash, refractory/furnace brick, circuit breakers, rockwool insulation, ceramics, uranium ore, photographic film/negatives/prints, lantern mantles, vacuum tubes, and welding rods.

To dispose of TENORM, the following table provides an upper bound acceptable concentration that the 3 different types of landfills in Michigan might accept. A landfill listed as enhanced has implemented additional environmental monitoring and other radiological control measures.

Acceptable Upper Bound Concentrations (pCi/g) by Landfill Type

Nuclide	Type III	Type II	Type II - Enhanced	Type I	Type I - Enhanced
Ra-226	< 5*	<25	<50	<50	<500
Ra-228	< 5*	<25	<50	<50	<500
Pb-210	< 5*	<25	<260	<260	<500

*Type III landfills may not accept TENORM. Concentrations less than 5 pCi/g are excluded from the definition of TENORM for disposal purposes.

WHERE TO GO FOR HELP

Websites, program contacts, and publications/resources for common radioactive material regulations topics

State and Federal Radioactive Material Regulations

EGLE, [Radioactive Materials Program](#)

517-284-5185 | RadioactiveMaterial@Michigan.gov

Radon Gas in Indoor Air

EGLE, [Indoor Radon Program](#)

800-723-6642 | Radon@Michigan.gov | Michigan.gov/Radon

Registration and Inspection of Radiation Machines

MIOSHA-Radiation Safety Program

517-284-7820 | RSSInfo@Michigan.gov | Michigan.gov/RSS (“Radiation Safety”)

U.S. DOT Hazardous Materials Transportation

U.S. Department of Transportation

800-467-4922 or 517-853-5990 | phmsa.dot.gov

Michigan State Police, Commercial Vehicle Enforcement Division

517-241-0506 | Michigan.gov/MSP/Divisions/CVED

Michigan Center for Truck Safety

800-682-4682 | TruckingSafety.org