

Radioactive Materials Handling & Emergency Preparedness

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Radiological Protection Section

- Radiological Emergency Preparedness
- State Indoor Radon Program
- Radioactive Materials Program

Radiological Emergency Preparedness Unit

- The Emergency Management and Homeland Security Division in the Michigan State Police coordinates disaster planning and response.
- The REP Unit prepares for accidents at commercial nuclear power plants, improvised nuclear devices, and radiological dispersal devices.
- The REP Unit participates in statewide planning, training, and exercises.

Nuclear Power Plants

- During an airborne release
 - Field teams in the radioactive plume take gamma readings and air samples.
 - The results are coded into computer models to see how much radiation dose people downwind would receive.
 - As necessary, the governor's representative at the State Emergency Operations Center would order an evacuation.
- After the release has ended
 - Field teams may take samples of soil, vegetation, crops, milk, and drinking water to send to a radiological laboratory for analysis.
 - Based on the results, protective actions would be ordered.



Radiological Emergency Preparedness Unit

- Trains volunteers from DEQ and other state agencies to staff field teams, the worker decontamination center, and the field team center.
- Trains county workers on proper radiation contamination control and decontamination.
- Calibrates over 4,000 pieces of equipment for state and county emergency workers.

RadResponder Network

- RadResponder allows real-time radiological data collection and transmission to decision makers. Picture from a simulated radioactive plume in Grand Rapids in 2017.

State Indoor Radon Program

- Program 100% funded from a State Indoor Radon Grant from the USEPA.
- Michigan's radon program began giving radon test kits to county and district health and environmental agencies to distribute to their citizens in 1993.
- Since 1993, we have over 190,000 results and have developed a map showing the percentage of kits that had results of 4 picocuries per liter (pCi/L) or greater.
- The USEPA recommends that homes be mitigated if results are 4 pCi/L or greater. For 100,000 people exposed for 30 years to that concentration, 730 never smokers and 6,200 current smokers could get lung cancer.

- Over 50% of people diagnosed with lung cancer die the first year. Annual treatment for a case of lung cancer is \$80,000.
- The Seller Disclosure Act (P.A. 92 of 1993) requires that you disclose to a prospective buyer if you know that your house has high radon levels.
- The Michigan Department of Licensing and Regulatory Affairs has Rule 400.1934(4) that requires child care homes to test for radon and mitigate if the concentration is equal to or greater than 4 pCi/L.
- The Michigan Occupation Health Standard, Part 381 “Ionizing Radiation,” R325.60603 “Exposure to airborne radioactive material” limits employee exposure to 30 pCi/L of radon-222 over a period of 40 hours in any workweek of 7 consecutive days.
- Michigan has no regulations requiring radon testing companies or mitigation companies to follow national standards.
- Michigan does not require landlords to disclose to renters if the radon concentration is high nor remediate if the renter tests and finds high concentrations.
- Some condominium associations and homeowner associations require approvals to change the exterior of the condo or home. Since installing a radon system usually involves running an exhaust pipe outside the home from the basement to the roof, some associations have not been receptive to radon mitigation.

Radioactive Materials Unit

- Outline:
 - Material containing uranium and thorium
 - Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)
 - U.S. Department of Transportation Special Permits

Naturally Radioactive Materials

- Rocks
- Soil
- Clay and anything containing clay (brick, pottery, etc.)
- Ores and feedstock before processing
- Coal
- Groundwater contains dissolved uranium, thorium, radium, and radon.
- 120 ppm (0.012%) of potassium is potassium-40.

Regulation of Radioactive Sources and Devices

- In Michigan, the U.S. Nuclear Regulatory Commission (USNRC) regulates all radioactive material sources and devices except for environmental radioactivity. Michigan is not one of the 37 states that have signed agreements with the USNRC to take over the USNRC jurisdiction in their state.

Exempt Uranium and Thorium

- Uranium and thorium at concentrations less than 0.05% by mass (500 ppm) are exempt under federal and state regulations. Radiological laboratories typically report concentrations in picocuries per gram (pCi/g).
- 500 ppm
 - Natural Uranium = 350 pCi/g
 - Uranium-238 = 167 pCi/g
 - Thorium-232 = 54.5 pCi/g

Non-Regulated Source Material

- Zircon products such as sand blast material, furnace brick, molds for the steel industry, etc.
- Rare earth products (grinding wheels, polishing compounds)
- Ceramic spun insulation (rock wool)
- Aluminum oxide abrasives
- Arc chutes, circuit breakers, and insulators from electrical substations and high-voltage power lines
- Coal ash and fly ash is usually less than 500 ppm source material

- Welding rods (exemption: up to 4,000 ppm thorium)
- Uranium glaze on pottery such as Fiestaware

Technologically Enhanced Naturally Occurring Radioactive Material

- There is no national definition of TENORM.
- In Michigan, we consider TENORM to be naturally occurring radioactive material whose concentrations of radium-226, radium-228, or lead-210 have been increased by human practices.
- We do not consider uranium and thorium, with their progeny in equilibrium, at any concentration to be TENORM. It is considered to be “source material.” The U.S. Nuclear Regulatory Commission requires a general or specific license if the concentration is greater than 500 ppm.

TENORM – Oil Production

- TENORM plates out on downhole pipes and inside surface pipes and equipment; is concentrated during filtration and processing; and can cause ground contamination.
- Same TENORM concerns as during oil production. After filtration through the central production facility, the major concern is lead-210. Radium-226 produces radon-222 which is a noble gas. It passes through all filtration media. When radon-222 decays, it produces lead-210 that plates out on surfaces.
- When distribution lines are cleaned, lead-210 waste is produced.

TENORM – Produced Water and Brine

- Produced water and brine contains dissolved radium and radon and may contain uranium and thorium. Holding tanks, tank sludge, pipes, and injection wells can have TENORM.

TENORM - Groundwater

- Any facility that draws large amounts of groundwater can have regulated concentrations of TENORM and source material in their filter media and as scale in process equipment.
- Cooling towers with TENORM

TENORM Disposal

- Radium-226, radium-228, and lead-210 at concentrations less than 5 pCi/g are unregulated.
- Radium-226 at concentrations less than 50 pCi/g and lead-210 at concentrations less than 260 pCi/g may be disposed in a Type II or a hazardous waste landfill with prior notification by the generator to the DEQ.
- Higher concentrations need to be sent out-of-state to a licensed disposal site.

Detection of Radioactive Material

- Radiation Portal Monitor
- Handheld Survey Meter

Identification of Radioactive Material

- Portable Gamma Spectroscopy

U.S. Department of Transportation - Special Permits

- If radioactive material is discovered at a landfill or a scrap yard, the DEQ can issue a Special Permit allowing the material to be transported back to where it came from or to another location. The radiation control program at the receiving state is responsible to identify the radioactive material and to document its handling or disposal. The Special Permit waives most of the manifest and operator training requirements from the U.S. Department of Transportation.