

ASTSWMO
RADIATION CLASSIFICATION & IDENTIFICATION CHART

PURPOSE

The Radiation Classification & Identification Chart was developed by the ASTSWMO Radiation Focus Group, as an educational and research tool for State and Territorial Managers.

RADIATION CHART

The radiation classification and identification chart is designed to address the laws regarding radioactive material. The four types of waste addressed in the chart are naturally occurring radioactive material (NORM), accelerator produced radioactive material, atomic energy act material (AEA material) and 11(e)2 byproduct material. The chart is divided into the following categories:

1. Classification of Waste
2. Description or Definition of Waste
3. Examples or Explanations
4. Regulatory Authority/Jurisdiction
5. Disposal

The Radiation Focus Group encourages individual States to modify or expand on the chart as appropriate.

RADIATION FOCUS GROUP:

The ASTSWMO Radiation Focus Group is comprised of 8 State members representing a range of State environmental program sizes and geographical diversity. The mission of the Focus Group is to identify national level radiation issues, coordinate State input, encourage improved partnership between State and Federal Agencies; and produce issue papers and other products as necessary to promote State interest on national radiation issues involving site cleanup and health and safety at federal facilities and other site.

Should you have any questions concerning the chart please contact any of the following Radiation Focus Group members:

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RADIATION CLASSIFICATION & IDENTIFICATION CHART

RADIOACTIVE MATERIAL - WHO REGULATES IT? WHERE DOES THE SOLID WASTE GO?					
Naturally Occurring Radioactive Material (NORM)					
CATEGORY	DESCRIPTION OR DEFINITION	EXAMPLES OR EXPLANATIONS	REGULATED		DISPOSAL
			BY	UNDER	
Not concentrated	Ubiquitous; always present in solid waste	Includes potassium-40, uranium, thorium, radium, carbon-14, hydrogen-3	Not regulated		Not considered radioactive waste
Technologically enhanced naturally occurring radioactive material (TENORM)	NORM that is concentrated as the result of some human technological activity	Tailings from mines, mills (other than U); scales and brines from oil and gas wells; sandblasting grit; refractory brick; wastes from water treatment systems	Some States	State laws	Varies by State; where regulated, State may set limits on, or require special approval for, acceptance at solid waste facilities
Sealed sources and luminous devices	Principally radium-226; concentrated and used in sealed sources and luminous paints and coatings	Sealed sources were formerly used in medicine; luminous paints were used on timepieces, instrument dials, markers, and other devices.	Most States regulate sealed Ra-226 sources and production of luminous devices; exemptions exist for possession & use of some devices	State laws	Sealed sources considered radioactive waste; must go to licensed disposal facilities; some exemptions exist

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Accelerator Produced Radioactive Material

CATEGORY	DESCRIPTION OR DEFINITION	EXAMPLES OR EXPLANATIONS	REGULATED		DISPOSAL
			BY	UNDER	
Medical	Produced in particle accelerators, cyclotrons in hospitals, medical schools, universities	Gallium-67; positron emitters used in positron emission tomography (PET scans)	States only	State laws	Most are short lived-- disposal by decay in storage; long-lived activation products must go to licensed disposal facility
Academic and private research	Linear accelerators, cyclotrons, particle accelerators	Colleges and universities operate for research	States only	State laws	
Federal research	Linear accelerators, cyclotrons, particle accelerators	Located at national labs	DOE EPA RCRA-Delegated States States	DOE Orders RCRA, TSCA RCRA, FFCA, & State Haz Waste Laws State laws governing disposal of solid and hazardous waste	Most are short lived -- disposal by decay in storage; long-lived activation products require disposal as radioactive waste

Note: Naturally occurring radioactive material and Accelerator produced Radioactive Material are often referred to collectively as **NARM**.

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Atomic Energy Act Material (AEA Material)

CATEGORY	DESCRIPTION OR DEFINITION	EXAMPLES OR EXPLANATIONS	REGULATED		DISPOSAL
			BY	UNDER	
Source material	Defined as thorium and uranium, except definition excludes special nuclear material	Ores with concentrations less than 0.05 percent by weight and ores of any concentration before they are mined are exempted	NRC DOE	AEA	can be LLRW, GTCC - must go to licensed disposal facility; some exemptions exist
			Agreement States	State Laws	
Special nuclear material	Defined as plutonium, uranium-235, uranium enriched in U-233 or 235	Radionuclides that can be used in reactor fuel	NRC DOE	Atomic Energy Act	can be LLRW, GTCC, TRU, or HLW - must go to licensed disposal facility (none available for HLW)
			Agreement States - only those quantities insufficient to form a critical mass	State Laws	
Byproduct material [as defined in AEA, Section 11(e)1]	Radioactive material produced in reactors	Ex: cobalt-60, cesium-137, iodine-131; includes many radionuclides used in medicine, research, and industry	NRC DOE	Atomic Energy Act	can be LLRW or GTCC - must go to licensed disposal facility (GTCC to go to HLW repository); some exemptions exist.
			Agreement States	State Laws	
Byproduct material [as defined in AEA, Section 11(e)2]	Tailings or waste from processing any ore for its source material (U, Th) content	Uranium mill tailings and processing wastes; contain concentrated thorium and decay products, including radium	see next table	see next table	see next table

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11(e)2 Byproduct Material

Subcategories Defined by Sites and History

SUBCATEGORY	DESCRIPTION OR DEFINITION	EXAMPLES OR EXPLANATIONS	REGULATED		DISPOSAL
			BY	UNDER	
Title I Sites	Non-federal sites where U was processed for sale to the federal gov prior to 1/1/71	Sites specifically listed in law	DOE	Title I of Uranium Mill Tailings Radiation Control Act	Either stabilized in place or disposed of at 11(e)2 licensed disposal facility
Title II Sites	U mills licensed by NRC or Agreement States as of 1/1/78		NRC 11(e)2 Agreement States (Colorado, Washington, & Texas)	Title II of the Uranium Mill Tailings Radiation Control Act	
FUSRAP sites	Federal and privately owned sites contaminated during WW II and Post-WWII MED & AEA activities; plus other sites added by Congress	US Army Corps of Engineers is remediating	<i>No federal agencies regulate the radioactive material at FUSRAP sites</i>	<i>Corps operating under CERCLA</i>	In some cases, may be sent to RCRA-C and RCRA-D landfills, LLRW disposal facilities, uranium mills (for recycling)
			States	Some State laws may restrict or prohibit disposal at RCRA-C or RCRA-D facilities	

Notes:

1. This table only refers to laws regarding radioactive materials (RAM). Other laws may also apply. Any of the above radioactive materials can occur in wastes that are also hazardous wastes under RCRA and corresponding State laws. The EPA and NRC define "mixed waste" as low-level radioactive waste that is also either a listed or a characteristic waste under RCRA. That means the EPA and NRC term only refers to AEA radioactive material. However, NORM and TENORM (not AEA material) do occur in hazardous wastes and such wastes may require disposal as mixed waste.

The hazardous components of mixed waste is regulated by EPA under RCRA and by those States that have been delegated authority by EPA pursuant to RCRA.

2. This table only covers disposal of solid wastes. Liquid and airborne radioactive wastes can be discharged to the environment if they meet applicable federal and state regulations.
3. Radioactive material (for example, iodine-131 and gallium-67) administered to patients becomes non-regulated material once the patient release criteria are met. This RAM can find its way into solid waste. Such disposal may not violate radioactive materials regulations. Individual state laws and regulations should be referred to.

Acronyms and other definitions

AEA - federal Atomic Energy Act

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act

DOE - US Department of Energy

GTCC - greater than Class C (i.e., rad waste that contains radionuclides in concentrations greater than the maximum allowed in Class C LLRW)

FUSRAP - formerly utilized sites remedial action program

LLRW - low-level radioactive waste

Licensed disposal facility - disposal facility licensed to receive radioactive material

MED - Manhattan Engineer District (WW II project to develop atomic bomb)

NRC - US Nuclear Regulatory Commission

RCRA - Resource Conservation and Recovery Act

Th- thorium

U - uranium

UMTRCA - Uranium Mill Tailings Radiation Control Act