# CHAPTER 515. MANAGEMENT OF SOLID WASTE

## SUBCHAPTER 45. NATURALLY OCCURRING RADIOACTIVE MATERIAL ("NORM")

## PART 1. GENERAL PROVISIONS

**252:515-45-1. Purpose and applicability**

(a) Purpose. This Subchapter establishes requirements for the management and disposal of naturally occurring radioactive material ("NORM") as defined in Oklahoma Administrative Code ("OAC") 252:515-45-2 at permitted solid waste disposal facilities in Oklahoma.

(b) Applicability. This Subchapter applies to:

(1) owners and operators of solid waste disposal facilities in Oklahoma that accept or propose to accept NORM waste for disposal; and

(2) generators of NORM who transport or arrange for transport of such waste to a solid waste disposal facility in Oklahoma for disposal.

(c) Relationship to other requirements. The requirements of this Subchapter are in addition to all other applicable requirements of this Chapter and OAC 252:410. In the event of a conflict between this Subchapter and other provisions of this Chapter and Chapter 410, the more stringent requirement shall apply. The restrictions on the disposal of radioactive waste described in OAC 252:410-20 shall not apply to the disposal of NORM waste as described in this Subchapter.

(d) Coordination with other agencies. Nothing in this Subchapter relieves any person from compliance with applicable requirements of the Oklahoma Corporation Commission, the Oklahoma State Department of Health , the Oklahoma Department of Environmental Quality Radiation Management Rules, the federal Occupational Safety and Health Administration, the federal Department of Transportation the United States Nuclear Regulatory Commission, or any other federal or state agency with jurisdiction over radioactive materials.

**252:515-45-2. Definitions**

The following words and terms, when used in this Subchapter, shall have the following meaning, unless the context clearly indicates otherwise:

**"Background radiation"** means radiation from cosmic sources; naturally occurring radioactive material, including radon, except as a decay product of source or special nuclear material; and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as combinator events to which individuals in the general population are exposed. Background radiation does not include radiation from source, byproduct, or special nuclear material regulated by the United States Nuclear Regulatory Commission.

**"Byproduct Material"** means (A) Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material; (B) The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" within this definition; C) Any discrete source of radium-226 that is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity; or (D) Any material that: (i) Has been made radioactive by use of a particle accelerator; and (ii) Is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity; and (E) Any discrete source of naturally occurring radioactive material, other than source material, that: The U.S. Nuclear Regulatory Commission (NRC), in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, the Secretary of Homeland Security, and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and Before, on, or after August 8, 2005, is extracted or converted after extraction for use in a commercial, medical, or research activity.

**"Commercial transporter"** means an owner/operator of any vehicle transporting NORM generated by others as a business for profit.

**"Generator"** means the owner/operator of any facility, institution, or business that produces NORM in any quantity.

**"Low Level Radioactive Waste (LLRW)"** means items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. LLRW is generated by those entities that possess a specific or general license to possess and use radioactive materials. These licenses are issued by either the NRC (Federal) or State regulatory authority depending on the location of the facility. These licenses include authorizations for industrial use, medical use, decommissioning activities, waste processors, research an development activities, manufacturing and distribution of radioactive sources or devices, and radiopharmacies.

**"Manifest"** means the shipping document, originated and signed by the generator, that accompanies each shipment of NORM waste from the point of generation to the disposal facility.

**"Naturally occurring radioactive material (NORM)"** means any nuclide that is radioactive in its natural physical state (i.e., not man-made), but not including source, byproduct, or special nuclear material. NORM in this definition includes material that has had its radionuclide concentrations increased by, or resulting from, controllable practices or past human practices, often referred to as Technologically Enhanced Natural Radioactive Material (TENORM).

**"NORM Waste"** means any solid, liquid, or gaseous material or combination of materials, excluding source material, special nuclear material and by-product material, that:

a. in its natural physical state emits radiation;

b. is discarded or unwanted;

c. prior to treatment or processing that reduces the radioactivity concentration, exceeds exemption criteria specified in OAC 252:515-45-4.

**"Purposeful dilution"** means a deliberate act of mixing clean or unlike materials with NORM-contaminated materials for the purpose of changing waste classification or reducing the measured concentration of radioactivity.

**"Radiation safety officer (RSO)"** means an individual who has the responsibility to apply and enforce the overall radiation safety program at a facility or site.

**"Radium-226 (Ra-226)"** means a naturally occurring radioactive isotope of radium with a half-life of approximately 1,600 years, commonly found in oil and gas production waste, phosphate mining waste, and water treatment residuals.

**"Radium-228 (Ra-228)"** means a naturally occurring radioactive isotope of radium with a half-life of approximately 5.75 years.

**"Source Material"** means uranium or thorium, or any combination thereof, in any physical or chemical form, or ores which contain by weight one-twentieth of one percent or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

**"Special Nuclear Material"** means plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the NRC determines to be special nuclear material, or any material artificially enriched by any of the foregoing but does not include source material.

**"Total effective dose equivalent (TEDE)"** means the sum of the effective dose equivalent for external exposures and the committed effective dose equivalent for internal exposures, expressed in millirem (mrem) or millisievert (mSv).

**"Waste characterization"** means the process of identifying and quantifying the radioactive constituents and concentrations in a waste through sampling, laboratory analysis, and process knowledge, as required by OAC 252:515-45-32.

**252:515-45-3. Prohibition on purposeful dilution**

Purposeful dilution of NORM waste to render it exempt from the requirements of this Subchapter or to reduce its concentration below any applicable acceptance criterion shall not be performed.

## PART 3. WASTE ACCEPTANCE AND CHARACTERIZATION

**252:515-45-31. Generator requirements**

(a) **Certification required**. For any NORM waste to be disposed at a solid waste disposal facility in Oklahoma, generators shall submit a certification to the DEQ and to the receiving facility that the waste:

(1) is not a hazardous waste as defined in OAC 252:205;

(2) has been characterized in accordance with OAC 252:515-45-32; and

(3) does not exceed the applicable concentration limits specified in OAC 252:515-45-34.

(b) **Process or waste stream changes.** In the event the waste-generating process or the resultant waste stream changes in a manner that may affect the radioactive characteristics of the waste, the generator shall immediately notify the DEQ and the receiving facility and shall update the certification required by (a) of this Section.

(c) **Verification**. The DEQ may require the generator to provide documentation in support of the certification. Such documentation may include, but not be limited to, laboratory analysis, material safety data sheets, or additional information regarding the waste stream or generation process.

(d) **Compliance with other laws.** The requirements of this Section do not relieve a generator from compliance with requirements of the Oklahoma Corporation Commission, 40 CFR Part 262, or any other applicable federal or state laws, rules, or regulations.

**252:515-45-32. Waste characterization**

(a) **Characterization required.** Prior to initial shipment of NORM waste to a permitted disposal facility, the generator shall characterize the waste by determining the concentration of radium-226 and radium-228, expressed in picocuries per gram (pCi/g).

(b) **Analytical methods.** Waste characterization shall be performed using analytical methods approved by the United States Environmental Protection Agency (EPA) or other methods approved in writing by the DEQ. At a minimum, analysis shall include:

(1) combined radium-226 and radium-228 concentration, in picocuries per gram;

(2) gamma spectroscopy to identify radionuclide composition; and

(3) any additional analyses the DEQ determines are necessary to adequately characterize the waste.

(c) **Sampling protocol.** The generator shall develop and implement a sampling protocol that ensures representative samples are collected from the waste. The sampling protocol shall be made available to the DEQ and to the receiving facility upon request.

(d) **Frequency.** Waste characterization shall be performed:

(1) prior to the initial shipment from each waste-generating process;

(2) whenever the waste-generating process or source material changes in a manner that may affect the radioactive characteristics of the waste; and

(3) at least annually for ongoing waste streams, unless the DEQ approves a less frequent schedule based on demonstrated consistency of the waste stream.

(e) **Non-uniform waste.** For drums, containers, or shipments of NORM waste that are not of uniform concentration, the average concentration of combined radium-226 and radium-228 for each container or shipment shall not exceed the applicable acceptance criterion specified in OAC 252:515-45-34.

**252:515-45-33. Screening at point of receipt**

(a) **Radiation detection required.** Each solid waste disposal facility authorized to accept NORM waste under this Subchapter shall install and maintain fixed radiation detection monitors capable of detecting radiation sources as small as 0.25 millicuries of cesium-137 (Cs-137) at all points of waste entry.

(b) **Hand-held detectors.** Hand-held radiation detectors shall be available at the facility and shall be used to screen individual loads or containers when:

(1) the fixed radiation detection system indicates elevated radiation levels; or

(2) the waste is received from a generator not previously approved to ship NORM waste to the facility.

(c) **Calibration.** All radiation detection equipment shall be calibrated in accordance with the manufacturer's recommendations, and calibration records shall be maintained for a minimum of five (5) years.

(d) **Verification of characterization.** The facility owner or operator shall verify that each shipment of NORM waste is accompanied by the documentation required by OAC 252:515-45-75 and that the reported concentration is consistent with the facility's detection measurements. Shipments that are not accompanied by required documentation or that exhibit radiation levels inconsistent with reported concentrations shall be rejected and the DEQ shall be notified within twenty-four (24) hours.

**252:515-45-34. Waste acceptance criteria**

(a) **Maximum concentration.** NORM waste accepted for disposal at a solid waste disposal facility authorized under this Subchapter shall not exceed a combined concentration of radium-226 and radium-228 of fifty picocuries per gram (50.0 pCi/g).

(b) **Contaminated equipment.** Equipment contaminated with NORM that does not exceed a maximum exposure level of one hundred microroentgens per hour (100 μR/hr), including background radiation, at any accessible location may be accepted for disposal at a facility authorized under this Subchapter.

(c) **Volume limitations.** No facility authorized under this Subchapter shall accept more than:

(1) twenty-five thousand (25,000) tons of NORM waste per calendar year; or

(2) three thousand (3,000) tons of NORM waste in any single calendar month;

unless the DEQ has provided prior written approval for larger quantities for a specific cleanup or remediation project.

(d) **Facility-specific limits.** The DEQ may establish facility-specific acceptance criteria necessary for protection of human health and the environment that are more stringent than the limits in (a), (b), and (c) of this Section based on site-specific conditions, including but not limited to hydrogeologic characteristics, liner design, and proximity to sensitive receptors.

**252:515-45-35. Prohibitions**

(a) **Non-composite lined landfills.** The disposal of NORM waste subject to regulation under this Subchapter is prohibited in all solid waste disposal facilities that are not lined with a composite liner as specified in OAC 252:515-11.

(b) **Concentration limit.** The disposal of NORM waste with a combined concentration of radium-226 and radium-228 greater than fifty picocuries per gram (50.0 pCi/g) is prohibited in all solid waste disposal facilities in Oklahoma.

(c) **Rejection of prohibited waste.** If prohibited NORM waste is delivered to a solid waste disposal facility, the waste shall be rejected. The owner or operator of the facility shall:

(1) refuse to accept the waste for disposal;

(2) record the source, quantity, generator name and address, transporter identity, and other identifying information regarding the rejected waste;

(3) notify the DEQ of the rejection of such material in writing by the end of the next working day; and

(4) ensure the rejected waste is stored in a manner that prevents release to the environment pending removal by the generator or transporter.

(d) **Hazardous waste.** NORM waste that is also a hazardous waste as defined in OAC 252:205 shall not be managed under this Subchapter, but shall be managed in accordance with all applicable hazardous waste requirements.

**252:515-45-36. Exemptions**

(a) **Background concentrations.** Materials containing NORM at concentrations of combined radium-226 and radium-228 that are less than five picocuries per gram (5.0 pCi/g) above natural background radiation or 150 pCi/g of any other NORM radionuclide, provided that these concentrations are not exceeded at any time.

(b) **Coal combustion residuals.** Coal combustion residuals, including fly ash, bottom ash, slag, and flue gas emission control waste, from energy conversion facilities are exempt from the requirements of this Subchapter.
(c) **Other exemptions.** The DEQ may, upon its own initiative or upon written request, exempt other materials from the requirements of this Subchapter upon a determination that the materials do not pose a significant risk to public health, safety, or the environment.

## PART 5. DISPOSAL FACILITY REQUIREMENTS

**252:515-45-51. Authorization for NORM disposal**
(a) **Permit modification required.** No solid waste disposal facility shall accept NORM waste for disposal unless the facility's permit has been modified to authorize acceptance of such waste. Authorization shall be obtained through a permit modification in accordance with OAC 252:4-7-59(2) and the applicable requirements of this Subchapter.
(b) **Eligible facilities.** Only land disposal facilities with a composite liner system meeting the requirements of OAC 252:515-11-2(b) are eligible for authorization to accept NORM waste.
(c) **Application requirements.** The permit modification application shall include:
(1) a description of the types and estimated quantities of NORM waste proposed to be accepted;
(2) documentation that the facility's liner system and leachate collection system meet the requirements of OAC 252:515, Subchapters 11 and 13;
(3) a Waste Exclusion Plan (WEP), including screening and verification procedures consistent with OAC 252:515-45-33, and recordkeeping procedures consistent with OAC 252:515-45-73;
(4) a worker training and radiation safety program consistent with OAC 252:515-45-72;
(5) a monitoring plan consistent with OAC 252:515-45-71;
(6) an updated closure and post-closure plan addressing the presence of NORM waste, consistent with OAC 252:515-45-54; and
(7) updated financial assurance consistent with OAC 252:515-27.

**252:515-45-52. Design and construction standards**
(a) **Composite liner required.** Any landfill cell or unit that receives NORM waste shall be constructed with a composite liner system meeting requirements of OAC 252:515-11 for MSWLFs, NHIW, and other land disposal facilities.
(b) **Leachate collection system.** A leachate collection system meeting the requirements of OAC 252:515-13 shall be installed above the composite liner.

**252:515-45-53. Operating requirements**
(a) **Daily cover.** All NORM waste shall be covered by at least one (1) foot of non-NORM waste or daily cover material by the end of each operating day. For facilities that operate continuously, all NORM waste shall be covered at least once every twenty-four (24) hour period.
(b) **Depth below final cover.** NORM waste shall be placed at a depth greater than ten (10) feet below the surface of the final landfill cover.
(c) **Segregation.** NORM waste shall be placed in designated areas of the landfill cell as identified in the facility's Operation Plan. The facility shall maintain records sufficient to identify the location and approximate quantity of NORM waste placed in each area.
(d) **Dust and airborne contamination control.** The facility owner or operator shall implement measures to minimize the generation of airborne dust from NORM waste during unloading, placement, and compaction operations. Such measures may include water application, wind screens, or other methods approved by the DEQ.

**252:515-45-54. Closure and post-closure requirements**
(a) **Closure plan.** The closure plan required by OAC 252:515-25-32 shall be updated to address the presence of NORM waste, including:
(1) the estimated total quantity and locations of NORM waste disposed in the facility;
(2) procedures for final cover construction that ensure NORM waste is placed at a depth greater than ten (10) feet below the final cover surface, as required by OAC 252:515-45-53(b);
(3) radiological survey procedures to confirm the effectiveness of the final cover in attenuating radiation; and
(4) provisions for any additional cover thickness required by OAC 252:515-45-53(c).
(b) **Post-closure monitoring.** In addition to the post-closure requirements of OAC 252:515-25, the post-closure plan shall include continued monitoring for radionuclide parameters in leachate and groundwater, as specified in OAC 252:515-45-71.
(c) **Post-closure period.** The post-closure care period for a facility that has accepted NORM waste shall be no less than thirty (30) years. The DEQ may determine a longer period is necessary based on site-specific conditions.
(d) **Deed notification.** The deed notification required by OAC 252:515-25-36 shall specify that NORM waste has been disposed at the facility and shall include the estimated total quantity of such waste.

## PART 7. MONITORING, RECORDKEEPING, AND REPORTING

**252:515-45-71. Monitoring requirements**

(a) **Baseline monitoring.** Prior to receipt of any NORM waste, the facility owner or operator shall establish background concentrations in leachate and groundwater of the following radionuclide parameters:

(1) radon;

(2) combined radium-226 and radium-228;

(3) gross alpha particle activity, including radium-226 but excluding radon and uranium; and

(4) uranium.

(b) **Leachate monitoring.** After commencement of NORM waste disposal, leachate shall be analyzed for the radionuclide parameters listed in (a) of this Section at the same frequency as groundwater samples are collected pursuant to OAC 252:515-9.

(c) **Groundwater monitoring trigger levels.** If radionuclides are detected in the leachate at a concentration greater than any of the following levels, the groundwater monitoring network shall begin analysis for radionuclide parameters:

(1) radon: four thousand picocuries per liter (4,000 pCi/L);

(2) combined radium-226 and radium-228: five picocuries per liter (5 pCi/L);

(3) gross alpha particle activity, including radium-226 but excluding radon and uranium: fifteen picocuries per liter (15 pCi/L); and

(4) uranium: thirty micrograms per liter (30 µg/L).

(d) **Response actions.** If groundwater monitoring results indicate that radionuclide concentrations exceed the trigger levels specified in (c) of this Section, the facility owner or operator shall notify the DEQ within fourteen (14) calendar days and shall implement assessment monitoring or submit an alternative source demonstration in accordance with OAC 252:515-9-91 through OAC 252:515-9-96.

(e) **Ambient radiation monitoring.** The DEQ may require the facility owner or operator to conduct ambient radiation monitoring at the facility boundary if the DEQ determines such monitoring is necessary to ensure compliance with the public dose limit specified in (f) of this Section.

(f) **Public dose limit.** The facility owner or operator shall conduct operations such that no individual member of the public receives a total effective dose equivalent (TEDE) exceeding one hundred millirem (100 mrem) per year from facility operations, exclusive of background radiation.

**252:515-45-72. Worker training and radiation protection**

(a) **Radiation Safety program required.** The facility owner or operator shall develop, implement, and maintain a worker training and radiation safety program. The training and safety program shall be approved by the DEQ prior to receipt of any NORM waste.

(b) **Radiation safety officer.** Each facility authorized to accept NORM waste shall designate a radiation safety officer (RSO) who shall:

(1) be responsible for implementing the radiation safety program;

(2) have authority to stop operations that present an immediate radiation safety concern; and

(3) be identified in the Radiation Safety Program.

(c) **Training frequency.** Initial training shall be completed before a worker is authorized to handle NORM waste. A one- hour refresher training shall be provided annually thereafter.

(d) **Training records.** Records of worker training, including the name of each worker trained, the date of training, and the subjects covered, shall be maintained for a minimum of five (5) years and shall be made available to the DEQ upon request.

**252:515-45-73. Recordkeeping requirements**

(a) **Operating record.** The facility owner or operator shall maintain the following records in the operating record:

(1) the type, quantity (by weight in tons), source, and generator of each shipment of NORM waste received;

(2) the date of receipt of each shipment;

(3) the concentration of combined radium-226 and radium-228, as reported by the generator, for each shipment;

(4) the results of radiation screening measurements taken at the facility for each shipment;

(5) the location within the facility where each shipment was placed;

(6) copies of all manifests required by OAC 252:515-45-75;

(7) copies of all generator certifications required by OAC 252:515-45-31;

(8) radiation detection equipment calibration records;

(9) worker training records as required by OAC 252:515-45-72(d);

(10) monitoring data, including leachate and groundwater radionuclide analyses; and

(11) records of any rejected shipments, including the information required by OAC 252:515-45-3(c)(2).

(b) **Retention period.** Records required by this Section shall be maintained for the life of the facility and throughout the post-closure period, unless a different retention period is specified elsewhere in this Subchapter.

(c) **Availability.** All records required by this Section shall be made available to the DEQ for inspection upon request.

**252:515-45-74. Reporting requirements**

(a) **Annual report.** The facility owner or operator shall include in the annual report required by OAC 252:515-19-40 a summary of:

(1) the total quantity of NORM waste received during the reporting year, by generator;

(2) the cumulative total quantity of NORM waste disposed at the facility since initial authorization;
(3) a summary of all leachate and groundwater radionuclide monitoring results; and
(4) a summary of any incidents involving rejected shipments, spills, or other occurrences related to NORM waste.

(b) **Incident reporting.** The facility owner or operator shall notify the DEQ within twenty-four (24) hours of discovery of any of the following:
(1) receipt of NORM waste exceeding the concentration limits of OAC 252:515-45-34;
(2) receipt of a shipment without required manifests or documentation;
(3) detection of radionuclide concentrations in leachate exceeding the trigger levels specified in OAC 252:515-45-71(c);
(4) any spill, release, or other uncontrolled discharge of NORM waste; or
(5) failure of radiation detection equipment.

**252:515-45-75. Manifest requirements**

(a) **Manifest required.** Each shipment of NORM waste transported to a disposal facility authorized under this Subchapter shall be accompanied by a manifest containing the following information:
(1) the generator's name, physical site address, and telephone number;
(2) the name, address, telephone number, and any applicable radioactive material license number of each transporter;
(3) the name, address, and telephone number of the designated disposal facility;
(4) a description of the waste material;
(5) the concentration of combined radium-226 and radium-228, in picocuries per gram, as determined by waste characterization under OAC 252:515-45-32;
(6) the total quantity of NORM waste by weight in tons and the number and type of containers; and
(7) the date of shipment.

(b) **Generator certification.** The following certification shall appear on the manifest and shall be signed and dated by an authorized agent of the generator: "I hereby certify that the contents of this shipment are fully and accurately described above, that the waste has been characterized in accordance with OAC 252:515-45-32, that the combined concentration of radium-226 and radium-228 does not exceed the applicable acceptance criteria, and that the waste is in all respects in proper condition for transport and disposal."

(c) **Manifest copies.** The generator shall:
(1) sign and date the manifest upon initial transporter acceptance of the waste;
(2) obtain the signature of the initial transporter and the date of acceptance;
(3) retain one copy for a minimum of three (3) years;
(4) provide the remaining copies to the initial transporter; and
(5) receive a fully signed copy of the manifest from the designated disposal facility within forty-five (45) calendar days of delivery to the initial transporter.

(d) **Unconfirmed manifests.** If the generator does not receive the signed manifest within forty-five (45) calendar days, the generator shall:
(1) notify the DEQ within seven (7) calendar days;
(2) conduct an investigation to determine the reason the manifest was not received; and
(3) report the results of the investigation to the DEQ within thirty (30) calendar days.

(e) **Exemptions.** Local, State, or Federal agencies or other community entities that remove abandoned, illegally dumped, orphaned, or emergency generated waste that may contain NORM from public land, right- of-ways, or waters of the state are exempt from the manifesting requirements that are stated in OAC 252:515-45-75.