# Naturally Occurring Radioactive Materials (NORM) Standard

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# 1. PURPOSE

This Standard establishes minimum requirements for the identification, management, and disposal of Naturally Occurring Radioactive Materials (NORM) associated with Expand Energy operations.

# 2. SCOPE

This Standard is applicable to employees and assets of Expand Energy (EXE), its affiliates or subsidiaries, located on EXE properties or elsewhere on the company's behalf.

Contractors **shall** have their own Standards that meet or exceed regulatory requirements.

# 3. DEFINITIONS

**µR/hr (micro-Roentgen per hour) –** A unit of radiation exposure describing the amount of radiation to which a person or material is exposed. Specialized radiation detection equipment is used to measure radiation exposure.

**Background Level –** Radiation levels currently emanating from the natural environment.

**CPM (counts per minute) –** The amount of radiation emitted by decaying atoms in one minute.

**Decontamination –** The act of removing radioactive particles from an object.

**DOT (Department of Transportation) –** Federal agency responsible for drafting regulations to ensure safe transport of hazardous materials in commerce.

**NORM –** Naturally Occurring Radioactive Material, which includes all naturally occurring radioactive elements in the environment. NORM may also be referred to as Technologically Enhanced NORM ("TENORM") by various regulatory entities to distinguish radionuclide concentrations which have been concentrated or increased by or as a result of industrial processes.

**NORM Survey –** A survey conducted with radiation detection equipment to determine levels of radioactivity present. The results determine what further action is necessary.

**NORM Waste –** Materials destined for disposal that contain levels of radiation requiring additional surveys or laboratory analysis. Examples of waste materials include soils, sludge, scale, and remediation material, such as personal protective equipment (PPE).

**Particulate Generating Activity (PGA) –** Tasks that may cause NORM contaminated material to become airborne: welding, grinding, torch or plasma cutting, polishing and sandblasting.

**pCi/g (picoCuries per gram) –** A unit of measurement for the concentration of radioactivity present in a sample of NORM media as determined through laboratory analytical testing.

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**Qualified NORM Contractor (QNC) –** Maintenance contractor with the requisite skill, experience, knowledge, equipment, trained employees and written NORM management procedures that qualify them to perform PGA or other maintenance on equipment below 2,000 µR/hr. See also Specifically Licensed NORM Contractor (SLNC).

**Specifically Licensed NORM Contractor (SLNC) –** Contractor specializing in NORM handling and decontamination. These contractors have the requisite skill, experience, knowledge, equipment, specific state license(s), trained employees and written NORM management procedures that qualify them to handle NORM ≥ 2,000 µR/hr. See also Qualified NORM Contractor (QNC).

**Transfer of Ownership –** The act of moving ownership of oil and gas equipment, facilities, and/or property to another general licensed company that will operate the equipment, facilities, and/or property for oil and gas exploration and production. A transfer of ownership to an entity that will not continue operating the equipment, facilities, and/or property for oil and gas activities will need to be released for Unrestricted Use.

**Unrestricted Use –** Use of materials, facilities, soils, and/or real property that does not require any controls in place to protect an individual member of the public from exposure to radiation and radioactive material.

**Work –** Tasks that require opening equipment and/or piping, or other activities in which the worker has potential for direct contact with NORM contaminated scale or other materials, but which may or may not involve PGA.

# 4. ROLES & RESPONSIBILITIES

It is the responsibility of the Business Unit (BU) to implement the minimum requirements of this Standard and the NORM Management Procedure. However, each BU may develop more stringent protocols to comply with state requirements or to achieve more conservative NORM management goals in their area.

## 4.1. BUSINESS UNIT OPERATIONS

- Ensure that all work done on EXE locations, whether by employees or contractors, adheres to the requirements of this Standard, associated procedure and any BU specific protocols.
- Assign the role of BU Radiation Safety Officer (RSO) to the HSE Supervisor. They may then delegate or contract the role to a qualified individual.
- Ensure at least one employee or qualified contractor in each BU where elevated NORM exists maintains credentials required to prepare shipments of hazardous materials, including Class 7 radioactive.
- Ensure that work restricted to QNC or SLNC is conducted by qualified individuals.
- Ensure that equipment is assessed for NORM prior to removal from an EXE location.

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- Identify adequate number of NORM surveyors for the area.
- Procure an adequate number of NORM-detecting instruments.
- Ensure that used production equipment is assessed for NORM prior to purchase.
- Ensure that locations to be released for Unrestricted Use are assessed for NORM.
- Notify BU RSO of any NORM related issues.

## 4.2. HSER (CORPORATE)

- Assign the role of corporate Radiation Safety Officer (RSO).
- Ensure the Environmental Due Diligence process includes NORM assessment prior to acquisition of oil and gas producing assets.
- Support operations in divestitures of contaminated assets, whether to another operator or for unrestricted use.

## 4.3. CORPORATE RADIATION SAFETY OFFICER (RSO)

- Complete necessary training and certification as described by federal, state, and local regulations.
- Maintain all Standard, Procedure, and training materials, ensuring compliance with federal, state, and local requirements as well as industry best practices.
- Support BU RSO in establishing and reviewing BU specific NORM requirements.
- Develop, conduct, and coordinate training related to NORM.
- Select, evaluate, and coordinate onboarding of SLNC approved for NORM decontamination and disposal.
- Evaluate written NORM programs of QNC.

## 4.4. BUSINESS UNIT RADIATION SAFETY OFFICER (RSO)

- Attend 40-hour NORM RSO training. In business units without significant NORM contamination, RSO training is optional.
- Establish and periodically review BU specific NORM management protocols to comply with more stringent state requirements or to achieve more conservative NORM management goals in the area.
- Coordinate and administer BU training.
- Reinforce with field personnel the basic safe work practices and environmental protections described in the procedure.
- Conduct additional responsibilities as detailed in the NORM Management Procedure.

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# 5. REQUIREMENTS

## 5.1 Action Limits

Equipment is considered NORM contaminated when NORM readings at the surface indicate exposure at or exceeding 50 µR/hr (including natural background).

Occupational exposures to workers **shall** remain below 2,000 µR/hr for continuous exposure (40 hours/week).

NORM contamination **shall** be included in a site assessment prior to releasing real property for Unrestricted Use for sites with historical NORM contamination. Release for Unrestricted Use is permissible for soils at or below 30 pCi/g Radium (Ra226 or Ra228).

See the NORM Management Procedure for details on NORM surveying, storing, transporting and worker protection.

## 5.2 NORM Surveys

Comprehensive facility-wide NORM gamma surveys of all onsite equipment, piping and tanks **shall** be conducted on all EXE locations with oil or gas production or produced water processing between years one and three of initial production or acquisition. Facility surveys should be conducted routinely thereafter on a schedule determined by the BU RSO. Facility surveys are documented on the NORM Gamma Survey Form (HSER-ENV-EXE-FRM-025) or equivalent current electronic version.

Limited scope gamma, alpha and beta surveys on equipment, material, land and personnel are conducted under conditions as described in the NORM Management Procedure.

Qualified NORM surveyors **shall** adhere to the surveying protocols detailed in the NORM Management Procedure.

## 5.3 Labeling and Marking

- NORM contaminated equipment at or exceeding 50 µR/hr **shall** be labeled “NORM”.
- Storage containers holding NORM contaminated wastes or soils **shall** be labeled as “NORM.”
- Labels and postings **shall** be conspicuous to the worker, weatherproof and legible.

## 5.4 Worker Protection

EXE adheres to the radiation protection guiding principle of keeping exposures As Low As Reasonably Achievable (ALARA). In general, ALARA is achieved by reducing the time duration of exposure to radiation, increasing the distance from radiation source and

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maintaining appropriate shielding from the radiation source. The NORM Management Procedure describes specific methods for minimizing worker exposure.

There are two main pathways for worker exposure to NORM at oil and gas facilities: external and internal. Internal exposure, such as after inhalation or ingestion, could accumulate in the body and cause damage over time, but can be minimized through simple engineering, administrative and PPE controls.

EXE NORM Standard requirements that minimize internal exposure to NORM are as follows:

- NORM contamination levels **shall** be assessed prior to opening equipment.
- Employees **shall** follow standard work practices that limit exposure.
- Employees **shall not** perform PGA on equipment that is surveyed to read 50 µR/hr and above.
- Employees may perform Work above 50 µR/hr, so long as the task does not involve PGA.
- Employees **shall not** open equipment surveyed to read 2,000 µR/hr and above. Equipment reading above 2,000 µR/hr **shall** be decontaminated by a SLNC.

If it is determined that NORM contaminated material exists at a level exceeding the regulatory threshold, then a Worker Protection Plan (WPP) **shall** be developed and implemented by the SLNC. If the WPP is required by state regulation, then the WPP **shall** be approved by the specified entity.

## 5.5 Storage of NORM Contaminated Equipment and Waste

NORM storage areas **shall** be designed and managed as detailed in the NORM Management Procedure.

NORM contaminated out of service equipment and NORM wastes **shall** be stored no longer than one year from the day that it was placed out of service or otherwise determined to be a waste. The RSO may evaluate and approve business need to extend storage period or may specify more stringent protocols to comply with state requirements or to achieve more conservative NORM management goals in their area.

## 5.6 Sampling NORM Contaminated Equipment and Material

Sampling of environmental media such as soil, sludge and liquids for laboratory analysis of NORM concentrations **shall** adhere to standard environmental sampling protocols and industry best practices for the applicable media. Such protocols ensure collection of an adequate number of representative samples.

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Sampling of NORM contaminated equipment and piping presents unique challenges beyond standard environmental sample collection protocols. The steps necessary to access the material to collect a sample must be developed on a case-by-case basis by the RSO considering worker and environmental protection, available vendor resources and local regulations.

## 5.7 TRANSPORTATION

Equipment or material being transported over public roads may require laboratory analysis of radioactivity prior to transport to determine the regulatory status under DOT rules. NORM transportation requirements are detailed in the NORM Management Procedure.

## 5.8 DISPOSAL

State regulations, local vendor availability and recycling and disposal facility acceptance criteria **shall** be evaluated to determine proper disposal of NORM contaminated waste. Wastes **shall** be transported and disposed by approved waste vendors. See the Waste Management Standard and Waste Handling and Documentation Procedure.

## 5.9 DECONTAMINATION

Equipment that is surveyed to read at or above 2,000 µR/hr **shall** be scheduled for decontamination. Only approved SLNC shall conduct NORM decontamination.

## 5.10 TRANSFER OF OWNERSHIP / RELEASE FOR UNRESTRICTED USE

### 5.10.1 LAND / SOIL

A site assessment including NORM **shall** be conducted prior to release for Unrestricted Use if any equipment on the location ever read ≥50 µR/hr during the site's producing lifespan. If there is no record of a survey, then an area survey **shall** be conducted to determine the need for sampling and decontamination. Combined radium 226/228 of 30 pCi/g or less is the Expand action level for land to be released for Unrestricted Use. This criteria may vary by state.

### 5.10.2 EQUIPMENT

An equipment survey **shall** be conducted prior to Transfer of Ownership of surplus or out of service equipment to another operator. If equipment is to be released for Unrestricted Use, as opposed to transfer to another operator, decontamination **shall** be required for equipment ≥50 µR/hr. A standard bill of sale is used to document ownership transfer.

EXE **shall not** purchase used production and/or gas processing equipment reading ≥50 µR/hr. Any used equipment must be surveyed or have a survey provided by the supplier indicating NORM levels at background levels prior to Expand taking ownership.

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### 5.10.3 DONATIONS

A NORM survey **shall** be conducted on any used production or gas processing equipment to be donated. Donations surveyed to read ≥50 µR/hr **shall** be decontaminated prior to donation.

# 6. TRAINING

Employees **shall** complete training appropriate to their roles and responsibilities in the BU. Training curricula includes NORM Awareness (once), NORM Surveyor (once), DOT Class 7 function specific (every three years) and NORM Radiation Safety Officer (40 hours) or more frequently as needed.

# 7. AUDIT REQUIREMENTS

Audits **shall** be periodically conducted by HSER to confirm compliance with this Standard.

# 8. STANDARD EXCEPTIONS

Requirements outlined in this Standard **shall** be followed, unless a Standard Exception is filed on behalf of, and with the approval of the Operations Manager. The Company's Standard Exception Form is to be utilized to properly document any exceptions.

# 9. REFERENCES

- Expand NORM Procedure
- Expand NORM Gamma Survey Form (HSER-ENV-EXE-FRM-025)
- Expand Waste Management Standard
- Expand Waste Handling and Documentation Procedure
- Department of Transportation: 49 CFR 173 Subpart I Class 7

# 10. DOCUMENT CONTROL TABLE

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