



SECTION 3

CHAPTER 15

NATURAL OCCURRING RADIOACTIVE MATERIAL - NORM

Acknowledgement Troy Botts, Jr. will be the program administrator for this company. The program administrator will be responsible for all NORM-related safety, health and environmental issues.

Purpose This policy will focus on NORM issues related to oil and natural gas operations.

Scope All company employees who work in areas that may contain hazards associated with NORM

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NORM Awareness

Definition NORM is defined as a material that is radioactive.

Types of Radiation

- Alpha -The largest in size, easiest to stop, and does the most damage once it's inside your body.
- Beta - Smaller than alpha particles, more penetrating power than alpha and does similar bodily damage as alpha.
- Gamma- Most penetrating power, more difficult to stop, and does bodily damage only by chance.

Regulations Currently there are no Federal regulations that specifically address the handling and disposal of NORM wastes.

Most states that are affected by oilfield-related NORM issues have enacted specific NORM regulations. As an example, the Railroad Commission of Texas regulates NORM-related oil and gas issues in Texas. NORM regulations may vary from state to state.



**Areas of
Exposer**

NORM is found almost everywhere. It is found in public water supplies, some foods, the air, soil, and even in the potassium in our bodies.

Health risks are low from exposure to low levels of NORM. However, activities involving the below may increase exposure levels to workers.

- the extraction
- mining
- beneficiating
- processing
- use
- transfer
- transport
- storage
- disposal
- recycling of NORM-contaminated materials.

Workers employed in the area of cutting and reaming oilfield pipe, removing solids from tanks and pits, and refurbishing gas processing equipment may be exposed to particles containing levels of alpha-emitting radionuclides that pose health risks if inhaled or ingested.

NORM encountered in oil and gas exploration and production operations will originate in subsurface formations. These formations may contain radioactive materials such as uranium and thorium and their daughter products, radium 226 and 228. NORM can be brought to the surface with the formation water that is produced in conjunction with oil and gas. NORM in these produced waters typically consists of the radionuclides, radium 226 and 228. In addition, radon 222 and also daughter products may be found in produced natural gas.

Because the NORM levels are typically so low in produced water and natural gas, it is not a problem until it becomes concentrated in some manner. Through temperature and pressure changes that occur in the course of oil and gas operations, radium 226 and 228 found in produced water may co-precipitate with barium sulfate scale in well tubular and surface equipment. Concentrations of radium 226 and 228 may also occur in sludge that accumulates in oilfield pits and tanks. These solids become sources of oil and gas NORM waste. In gas process activities, NORM generally occurs as radon gas in the natural gas stream. Radon decays to Lead-210, then to Bismuth-210, Polonium-210, and finally to stable Lead-206. Radon decay elements occur as a film on the surface of inlet lines, treating units, pumps and valves associated with propylene, ethane and propane processing streams.



**Regulated
NORM**

Regulated NORM means naturally occurring radioactive material that exhibits more than a threshold amount of radiation. In most states, oilfield equipment and piping that is greater than 50 micro R/hours (measured with a Ludlum micro R meter and 44-2 probe) is considered regulated NORM. Sludges, scales and soils that exceed 30 picocuries of Radium 226 and/or 228 (by lab analysis) are regulated NORM. Gas plant process equipment that exceeds 50 micro R/hours measured with a Ludlum micro R meter and 44-9 probe or 180 counts/minute measured with a count rate meter are also considered regulated NORM.



Surveys

- Surveys should be performed on oil and gas field production equipment (including but not limited to wells, gathering line locations, compressor stations, tank batteries, pipe racks, and equipment storage areas) and in the gas plants.
- Surveys should be performed by persons trained to use the instruments and who understand the guidelines in place.

Survey Procedures

Prior to beginning the survey, set the audio switch on (optional), set the fast/slow switch to fast, and set the meter scale to x1. The audio response is nearly instantaneous and some surveyors find they are able to survey more effectively using an audio signal. Measure the local background radiation level and record the level on the NORM Survey Data Sheet. Once NORM is located, use either the fast or slow setting, change the meter scale as appropriate, and move the detector slowly to detect the maximum level, which should then be recorded on the NORM Survey Data Sheet.

Background radiation levels should be established by surveying several nearby areas that appear undisturbed, but exhibit similar native soil character. These readings should be taken several meters from any disturbed areas, if possible. Roads or other areas that may contain fill material should not be used for establishing background. Background survey areas should be mapped or described and background readings should be recorded.

When surveying equipment, all accessible parts should be surveyed. This includes representative surveys of the full length of the equipment along with surveying all openings, inlets, and outlets. The detector should be held within one centimeter of the surface and should be monitored continuously throughout the survey. For any equipment that is to be transported off site, the survey levels should be documented on a NORM Survey Data Sheet even if the levels were at or below background.

When surveying drums or other containers of NORM-contaminated sludge, scale, or soil, initially identify all drums >50 micro R/hour as "Potential NORM Pending Analysis." Any drum less than 10 micro R/hour above background can be released as non-NORM. However, any drum of NORM waste 10-50 micro R/hour must be sampled according to soil sampling guidelines prior to release as non-NORM. Otherwise, it may be handled as NORM material without further testing.

GRAVITY

Special precautions are required when entering a vessel, tank, or working on piping or pumps that contain NORM. The presence of NORM should be communicated to employees and contractors who may be exposed during work activities



Instruments

Shall be calibrated at intervals not to exceed 12 months and after servicing other than battery replacement.

- Shall be able to measure from 1micro R/hr through at least 500 micro R/hr.
- Shall be calibrated by a person licensed or registered by the agency, another agreement state or licensing state, or. the U.S. Nuclear Regulatory Commission (NRC).
- Demonstrate accuracy within plus or minus 20% using a reference source.
- Need to obtain the Quality Assurance/Quality Control (QNQC) documentation of calibration.
- NORM surveyors shall perform operational checks of their survey instruments prior to use; battery checks and proper responses to appropriate radioactive check sources shall be included.
- Maintain records of these calibrations and QNQC documentation for 5 years after the calibration date.

Safety Note: These instruments are not intrinsically safe. Sparking may occur when detector cables are connected or disconnected, or when switches are turned on or off. Hot work procedures must be initiated when an explosive atmosphere may be present.

**Protection
Against NORM**

Employees will be protected against radiation by the following methods:

- Time- Employee's time spent in high radiation areas will be limited.
- Distance- Equipment with high radiation levels will be labeled and in a fenced area to allow distance between employee and equipment.
- Shielding - Employees will use proper shielding, protective clothing and PPE when working with or near NORM-contaminated equipment.



**Handling of
NORM**

Handling of NORM requires the following work practices:

- Purge vessels prior to entry.
- Use respirators while working inside vessels.
- Use respirators while performing grinding and chipping operations.
- Use protective clothing to avoid direct skin contact.
- Do not eat, drink, smoke or chew in a contaminated area.
- Keep the number of personnel to a minimum in a contaminated area.
- Keep NORM wet while handling or transporting to reduce dust.
- Thoroughly wash hands and face after NORM exposure.
- Discard or wash protective outer garments daily.

For specific state regulations, contact the state oil and gas regulatory agency.
