OSHA Safety Hazard Information Bulletin on Potential Health Hazards Associated with Handling Pipe used in Oil and Gas Production

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MEMORANDUM FOR: REGIONAL ADMINISTRATORS

THRU: LEO CAREY
Director
Office of Field Programs

FROM: EDWARD BAIER
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SUBJECT: Health **Hazard Information Bulletin**: Potential Health Hazards Associated with Handling Pipe used in Oil and Gas Production

The State of Louisiana, Department of Environmental Quality has recently issued a notification concerning a potential health hazard associated with handling pipe used in oil and gas production that may be contaminated with radioactive scale from naturally-occurring radioactive materials (NORM). (Copies attached)

The concern is the possible inhalation and/or ingestion of scale particles contaminated with radium-226 and possibly other radioactive material that may become airborne during welding, cutting or reaming of pipe containing the radioactive scale. The State of Louisiana is using the term for this material Technologically Enhanced Natural Radiation (TENR), which is a subgroup of a larger group, referred to as naturally occurring radioactive materials or NORM.v

The investigation and regulatory control impact of most of these sources may have been overlooked by Federal and State agencies in the past, while stringent controls were placed on X-ray and other man-made sources of radiation.

Compliance Officers should be aware of the potential radiation hazard to workers due to TENR in the oil and gas industry.

Attachments

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY

BUDDY ROEMER
GOVERNOR

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October 20, 1988

RADIATION ASSOCIATED WITH OIL AND NATURAL GAS PRODUCTION AND PROCESSING FACILITIES

1. INTRODUCTION - Technologically Enhanced Natural Radioactive Material (TENR) Naturally-occurring radionuclides arc ubiquitous in the environment.

Under various circumstances, the radionuclides, primarily from the uranium and thorium decay series, can contaminate the environment to the extent that they pose real or potential public health risks. The investigation and regulatory control of the impacts of most of these sources have been overlooked by federal and state agencies in the past, while stringent controls were placed on X-ray and other man-made sources of radiation. This lack of strict controls has been due, in part, to the fact that the federal government has limited jurisdiction over TENR, and control was previously left up to the states, which often times did not have adequate programs or staff to deal with the problem. TENR is a subset of a larger grouping referred to as naturally-occurring radioactive materials (NORM), Regulations to deal with NORM are being developed by a task force of the Conference of Radiation Control Program Directors (CRCPD) and have been through six drafts to date.

It should be noted, however, that considerable work has been done by the CRCPD, the EPA, and individual states. The CRCPD established a task force to assess the potential for problems nationwide with NORM and make recommendations for implementation of effective control measures. Included in the two documents published were identification of specific TENR problems, a national inventory or NORM, and an evaluation of exposure pathways to man.

Additional work by EPA and individual states included a comprehensive health effects study related to the use of slag from elemental phosphorus plants for paving purposes in Idaho; an assessment of the phosphate mining industry in Florida, including an evaluation of guidelines for homes built on reclaimed mining lands; and complete radiation profiles of wet-process phosphoric acid production, natural gas processing, lignite mining and alumina production in Louisiana.

Much of this work was performed during the late 1970's and early `80's, and many of the recommendations have not been acted on by the EPA and other involved federal agencies. There does, however, appear at this time to be a resurgence of interest in the NORM area, particularly by the CRCPD and several interested states which make up the Conference membership. A federal-state committee was recently established and will make formal recommendations relative to the current situation with NORM and the need for future activities.

While there are over 100 naturally occurring radionuclides, public health problems are usually limited to the 30-odd radionuclides in the uranium and thorium decay series because of their relative abundance and toxicity, and they are generally the result of some technological enhancement of the isotopes.

The increased incidence of bone cancer in radium dial painters and lung cancer in fluorospar and uranium miners are examples of undesirable health effects due to exposure to these radionuclides. Other examples of increased population exposure to radiation include the radon problems in several western states due to construction over radioactive tailings and the use of reclaimed phosphate mining land in Florida.

Of particular interest to Louisiana is the growing awareness of related problems of the radioactivity content of produced waters and contamination of equipment and facilities in the oil and natural gas production and processing industries.

II. PRODUCED WATERS

The occurrence of environmentally high concentrations of radioactivity, specifically radium isotopes in oil field production waters (also called oil field brines, produced water, produced wastewater or formation water) is well documented [1, 2, 3, 4, 5, 6]. It appears that the radionuclides are leached from the clay minerals and are associated with the decay of uranium and thorium atoms [5, 8].

The radium levels observed in most saline produced waters from the Gulf Coast Region exceed proposed and existing radium discharge limits applied to other sectors [3]. Radium 226 and 228 activity was found in all 41 samples of brines in one survey [5]. Activity ranged from 19 to 2800 pCi/l (picoCuries/liter; 1 pCi = 1 x 10-(12)Ci). Seventy-six percent of the samples tested contained 50 pCi/l of total radium. Produced water samples from Louisiana platforms exhibited total radium activities of 605-1215 pCi/l in a recent study [7].

EPA [3] reports that average open ocean surface waters contain about 0.05 pCi/liter; coastal waters probably do not generally contain much higher than 1 pCi/liter; proposed drinking water standards restrict the permissible Ra-226 content to less than 5 pCi/liter (averaged); NRC regulations governing the operations of licensees permit no more than 30 pCi/liter in liquid discharges to unrestricted access areas. Fifty pCi/liter is the level of activity that distinguishes between hazardous and nonhazardous wastes under proposed EPA regulations.

It has been estimated that production water from the Leeville Oil Field coastal Louisiana) contributed up to 1.76 Curies of radium to the marsh around the field in a 5-year period [3]. It is our understanding that some fields have been in production for 40 years or more. It is therefore possible that the total radium released to the environment at these old fields could be in excess of 10 Curies over the lifetime of the fields.

III. TENR CONTAMINATION OF EQUIPMENT AND FACILITIES

Recent Investigations have Identified radioactive "scale" resulting from the production of oil and associated brines which contained Ra-226 concentrations up to 100,000 pCi/gm [9]. Environmentally high concentrations of naturally-occurring radionuclides (e.g. Ra-226, Pb-210) in precipitates collected from the bottom of oil-water separators and from ditches and pits used for disposal of production water have also been reported [1].

DEQ's Nuclear Energy Division (NED) has recently obtained information indicating radium-226 radioactivity of up to 8,700 pCi/gm in soil contaminated with radioactive scale at pipe storage areas [10, 11, 12]. Natural background radium-226 activity in Louisiana soils ranges from less than one to about 7 pCi/gm [13]. EPA has proposed a cleanup limit for radium-226 in uranium mill tailings of 5 pCi/gm (above background) in the top 15 cm (6 in.) of soil and 15 pCi/gm at depths below the top layer [10]. The Conference of Radiation Control Program Directors has proposed remedial action above 6 pCi/gm [10].

Contaminated piping from refineries has been found in scrap iron yards in New Orleans, Baton Rouge, and Lake Charles. The State of Mississippi has found contaminated pipe used in the construction of bleachers at schools. And, NED has found the concentrations of radium in oil field production ponds to be elevated. Readings made recently in a pipe reaming area at a pipe yard in Houma were such that monitoring of employees would be required if it were a licensed nuclear installation [10].

The magnitude of the problem is difficult to estimate, but it is not unrealistic to expect contamination at all oil and gas production sites and pipe handling facilities.

IV. CONCERNS

The following is a list of some of the questions and concerns we have that are related to TENR-contamination in the oil and gas industry:

1. There are basically no regulations governing the handling and disposal of TENR-contaminated materials except for uranium mill tailings.

2. TENR-contamination in varying degrees of severity may exist at every oil and gas production site and pipe handling facility in the state, and may have also entered in substantial quantities into scrap yards and metal reclamation facilities.

3. Radium-226 has a half-life of 1620 years, so these contaminated sites will be of concern for centuries. Many of these sites, especially the pipe yards, are within city limits and could easily be used for residential or commercial purposes. If buildings were constructed over radium-contaminated soil, the resulting radon concentrations could pose a serious health threat.

4. The environmental consequences and health risks associated with disposal of TENR-contaminated oil field wastes (e.g., incineration and land farming) are largely unknown.

5. Workers employed in the area of cutting and reaming oil field pipe may be exposed to dust particles containing levels of alpha-emitting radionuclides that could pose very serious health risks.

6. Billions of gallons of produced water carrying TENR contamination are being released annually to the environment, particularly in coastal Louisiana. We have very little information on the fate and effects of the materials in the aquatic and terrestrial environments and on potential movement of TENR materials into food chains leading to human consumption.

7. There are some very difficult questions concerning potential liabilities for environmental contamination, workplace exposure to radioactive materials, and necessary remedial measures.

V. RECOMMENDED ACTION PLAN

1. Develop and disseminate an interim policy for handling TENR materials and protection for those working with contaminated pipe and equipment. (Done)

2. Develop preliminary pathways and potential health effects of exposure to TENR-contaminated materials (inhalation, ingestion, external exposure), as well as fish and shellfish consumption, if applicable.

3. Define and initiate a small strategic sampling effort to answer immediate information needs.

4. Establish a task force to assist in dealing with the TENR-contamination problem.

5. Research and develop legal framework for regulating TENR-contaminated materials.

6. Develop and implement strategies for characterizing and mitigating the problem. This is a nationwide problem, shared by all states in one degree or

another. It is therefore important to share information with other states and attempt to develop strategies and solutions which have wide applicability.

7. Identify potential sources of financial, human, and material resources that could be applied to the problem.

8. Obtain funding to deal with the problem.

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DEPARTMENT OF ENVIRONMENTAL QUALITY

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TECHNOLOGICALLY ENHANCED NATURAL RADIOACTIVE MATERIAL
INTERIM POLICY
PIPE SCALE

PURPOSE:

The purpose of this Interim policy is to establish radiation protection procedures with regard to handling, storing and disposing of technologically-enhanced natural radioactive material (TENR) found in pipe scale or soil contaminated by the cleaning of pipe scale. The guidance given is to be used in the development of procedures which will minimize exposure to the radioactive materials while the extent of the potential hazard is evaluated.

SCOPE:

This interim policy applies to any person who engages in activities which technologically alter the natural sources of radiation or their potential exposure pathways to man. There are presently no firm methods to deal with the problem on a permanent basis.

CONTROL OF MATERIAL:

Due to the large volumes of waste involved, there is no easy solution to the disposal of TENR-contaminated equipment or soil. The basic consideration, at this time, is to consolidate the contaminated material and separate it from non-contaminated material in an attempt to keep volumes as low as possible. This also serves to facilitate retrieval when an acceptable disposal method becomes available and to keep exposure to individuals as low as is reasonably achievable.

Consolidated materials should be stored in a controlled area which has a low occupancy. A radiation area survey should be performed and, if required, the area should be posted in accordance with Section 422 of the Louisiana Radiation Regulations.

Contaminated items should not be transferred to other individuals.

RADIOLOGICAL PRECAUTIONS:

The following precautions should be taken to minimize exposure to TENR-contaminated materials:

Employees and contractors should be advised of the presence of this contamination and of procedures to minimize exposure.

Direct skin contact with radioactive scale and solids should be avoided to the extent reasonably possible.

Eating, drinking, smoking and chewing should not be allowed in the work area where work is being performed on contaminated equipment or where contaminated soil is being handled.

Personnel should thoroughly wash their hands and face after working with contaminated equipment, and before eating, drinking, or smoking, and at the end of the day.

The number of personnel in the work area should be kept to a minimum.

If possible, openings on contaminated equipment should be sealed or wrapped in plastic. Work on contaminated equipment, such as cutting, grinding, sand-blasting, welding, drilling, or polishing should be kept to a minimum.

if work requires any action that might produce dust or if loose contamination is suspected, the following additional precautions should be taken:

A. A respirator appropriate for radioactive particulates should be worn.

B. Suitable coveralls and gloves should be worn.

C. Activities should be conducted in well-ventilated areas to which access has been restricted.

D. Plastic ground covers should be utilized to the extent possible to contain contaminants and facilitate cleanup.

E. Gloves, respirators, coveralls, and rags should be decontaminated or placed in double bags, sealed and held for proper disposal.

F. The need for Personnel Monitoring and Bioassay should be evaluated and provided if necessary. In addition to the general guidance given above for pipe scale, there may be other industrial operations, such as vessel entry, dismantling of equipment, refurbishing of equipment or transportation, which may also require precautionary procedures. For additional information or clarification, contact the Department of Environmental Quality, Nuclear Energy Division at 925-4518.