

October 17, 1996

Mr. K. L. Cool, Director
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909-7528

Dear Mr. Cool:

The U.S. Nuclear Regulatory Commission has completed its review of your amended license application for the Michigan Department of Natural Resources (MDNR) owned portion of the Hartley and Hartley Landfill. Before issuing a license, the NRC has a number of comments and questions (enclosed) on your application that need to be addressed. Please respond to this request within 60 days of this letter. If you are not able to respond to this schedule, please advise us promptly and prepare an alternative schedule.

If you have any questions, please contact Jack Parrott of my staff at (301) 415-6700. Any correspondence regarding this application should reference the docket number specified below.

Sincerely,

[ORIGINAL SIGNED BY:]

Michael F. Weber, Chief
Low-Level Waste and Decommissioning
Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 40-9015
Enclosure: As stated
cc: D. Gruben, MDNR
M. Hartman, MDEQ
G. Bruchmann, MDEQ
J. Dehmel, SC&A
J. Basta, Dykema Gossett

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U.S. NRC Comments on the Amended License Application
from the State of Michigan Department of Natural Resources (MDNR)
on the MDNR Owned Portion of the Hartley & Hartley Landfill

General Comments

- 1) In reference to your letter of July 18, 1996, update all the information in the license application that pertains to the name or qualifications of the Radiation Safety Officer (RSO).
- 2) There are numerous references through out the application to the RSO or designee. Identify the potential designee(s) and include their qualifications.
- 3) Provide a summary table of all the scheduled reviews, audits, etc., mentioned throughout the license application that will be performed by the RSO and/or management.
- 4) The Radiation Safety Committee members should be independent from the MDNR Office that has project management responsibility for the site.
- 5) During periods of inactivity, how often will surveillance of the site be carried out?

Specific Comments

- 1) (Page II-2) NRC does not regulate naturally occurring radium as a separate radionuclide but only as it occurs as a decay product of licensed material. The licensed material in this case is thorium and uranium; therefore, radium should not be listed separately in the license application.
- 2) (Page II-4) Describe the evaluation and approval process for site activities. Will radiation work permits be used?
- 3) (Page III-1) How often will management perform its audit of the radiation protection program? Define who the management is in this case.
- 5) (Page III-3) How often will the RSO review the field procedures?
- 6) (Page III-9) How often will the "checking" of surveys, tests, etc., be done?
- 7) (Page IV-1) Identify where the records pertaining to the license and site will be kept.
- 8) (Page IV-2) Has a liquid waste discharge permit been issued by the Bay County Department of Water and Sewer? If so, describe the discharge restrictions it contains.

- 9) (Page IV-3) All three waste streams described should be monitored for radiation.
- 10) (Page IV-3) Please provide a site map showing the on-site location and footprint of the proposed waste storage building.
- 11) (Page V-16) This page states that bioassay analysis is indicated when airborne concentration of soluble uranium ≥ 0.2 mg/m³. Should this be soluble thorium?
- 12) (Page V-32) In reference to particulate effluents please see the attached NRC Information Notice entitled "Compliance with 10 CFR Part 20 for Airborne Thorium". Be sure that your license application conforms to this guidance.
- 13) (Page V-46) What are the predetermined action levels described on this page, or how will they be determined?
- 14) (Page V-64) The phone number for NRC Region-III is now 630-829-9500.
- 15) (Page VI-8) Will the waste storage building be vented? If not, are there provisions for monitoring the air before entry?

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON D.C. 20555

March 25, 1996

NRC INFORMATION NOTICE 96-18: COMPLIANCE WITH 10 CFR PART 20 FOR AIRBORNE THORIUM

Addressees

All material licensees authorized to possess and use thorium in unsealed form.

Purpose

This notice is provided to alert recipients to radiological problems that may be encountered in using thorium in unsealed form. These problems were identified by U.S. Nuclear Regulatory Commission (NRC) inspectors, during inspections of the approximately 120 licensees authorized to use unsealed thorium, some of which are engaged in processing and manufacturing activities that pose a potential for generating significant airborne radioactive contamination. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

NRC inspections at facilities using thorium in unsealed form revealed a number of programmatic weaknesses in the control and monitoring of airborne thorium hazards at an unexpectedly high proportion of these facilities. One of the areas of weakness frequently encountered was worker intake monitoring programs that did not appear capable of adequately quantifying intakes for purposes of demonstrating compliance with the requirements of 10 CFR Part 20, particularly the annual limits on intake (ALI). A second area of concern was the frequent lack of adequate licensee efforts to maintain exposures as low as reasonably achievable (ALARA), as required by 10 CFR 20.1101(c). NRC inspectors repeatedly observed intakes and resulting organ doses that appeared to be unnecessary, or avoidable, in view of the potential to reduce them by implementation of relatively simple ALARA measures. Some of the intakes in these cases were evaluated and produced organ doses in the 0.2 to 0.3 Sv (20 - 30 rem) range in a year. Such high doses, representing a substantial fraction of the maximum permissible organ doses, cannot be viewed as acceptable unless justified by a thorough ALARA analysis. In most of the observed cases, however, an adequate ALARA assessment had not been performed.

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Demonstration of compliance with dose limits to members of the public, from airborne thorium, was also found, in some cases, to have been less than adequate. In some cases, the licensees were found to have no adequate monitoring systems for their airborne effluents, and in others the methods used to quantify these effluents did not possess sufficient sensitivity to enable demonstration of compliance.

In response to the regulatory violations noted above, NRC issued Confirmatory Action Letters (CALs) to a number of licensees, confirming commitments to taking specific actions to correct these deficiencies. Notices of Violation and other enforcement actions were also taken by NRC, in some cases. These actions, as well as extensive discussions with licensees, to alert them to the problems, have resulted in substantial improvements in most licensees' programs.

Discussion

The programs that licensees should develop for control of airborne hazards arising from the use of unsealed thorium do not differ in any basic respect from those needed in the case of programs to control the hazards from any airborne radioactive material. Facilities using thorium, however, must make allowances for certain constraints imposed by the nature of the thorium decay chain. The major constraint is the difficulty of measuring thorium-232 (Th-232) in the body after an intake using bioassay methods, either in vivo, such as whole body counting, or in vitro, such as urine analysis. This is caused, in part, by the relatively low ALI for Th-232, which is 37 Bq (1 nCi) for class W, and 111 Bq (3 nCi) for class Y aerosols, as well as the type of radiation emissions from the thorium decay chain, which are mostly alpha and beta radiations, with only relatively low-intensity gamma radiations.

The difficulties regarding the use of bioassay methods were increased after implementation of the revised 10 CFR Part 20, which became mandatory for all licensees on January 1, 1994. Intakes of Th-232 by inhalation before the Part 20 revisions were limited to 520 MPC-hours per quarter, where MPC was the maximum permissible concentration tabulated in the old Appendix B to 10 CFR Part 20. This was equivalent to an intake of about 700 Bq (19 nCi) per quarter for both the soluble and insoluble forms of thorium, or about 2800 Bq (75 nCi) per year. The revised Part 20 lowered that limit to ALIs of about 40 Bq (1 nCi) and 100 Bq (3 nCi) for classes W and Y aerosols, respectively. Therefore, bioassay methods that may have been capable of detecting intakes that were a small fraction of the allowable limits in the old Part 20 were no longer capable of the same performance under the revised Part 20 limits, and could therefore not serve the same monitoring functions in a routine airborne radioactivity control program as they did previously.

Although bioassay techniques are still useful in assessing relatively large intakes, they are not capable of providing routine monitoring for intakes substantially below the ALI. The air monitoring program therefore usually must assume a much greater importance at facilities using unsealed thorium than for other radionuclides. Facilities using thorium need to rely on accurate air sampling to estimate intakes that cannot be detected by bioassay techniques, which, in effect includes all intakes other than those that approach or exceed the ALI. Because of this reliance on air sampling to show compliance and assess internal doses, the air sampling program must be carefully designed to provide accurate intake estimates for all occupationally exposed workers, as well as members of the public who may be exposed to airborne thorium as a result of licensed operations. However, appropriate bioassay procedures should be established and available for use in assessing accidental or suspected high exposures, and for use in cases where adequate air sampling was inadvertently not provided. In this latter case, bioassay would provide an upper limit on the magnitude of any intake that may have occurred, even though it may not be capable of quantifying intakes below an ALI.

Air Sampling

The major deficiencies noted in air sampling programs at some of the inspected facilities included programs that did not provide samples that are representative of the intake by each exposed worker, monitoring frequencies that were far too low to be capable of detecting changes in air concentrations over time, and counting techniques that did not possess adequate sensitivity for their intended purpose.

One of the factors that led to non-representative samples was the excessive reliance on general area air sampling to monitor worker intakes in that area. Studies have repeatedly shown that air concentrations in a work area can vary by several orders of magnitude over distances of only a few feet, and a general area sample is most likely to grossly underestimate the intake of a worker involved in activities that generate aerosols. With rare exception, the most reliable method of assessing worker intakes is by use of personal air samplers. In the case of effluent sampling, the method chosen should be capable of obtaining a representative sample from the exhaust duct or other outlet. For aerosols, this usually means use of isokinetic sampling methods, and licensees should determine, for their particular case, whether such sampling methods are needed.

The choice of method of analysis should also be given careful consideration. This includes choice of the filter medium to use in the air sampler, air flow rates, as well as choice of counting techniques. These factors should be

selected to ensure that the desired monitoring sensitivity, expressed as a lower limit of detection (LLD), is achieved. A good guide as to the appropriate LLD to use in any application is that it should not exceed 10 percent of the value to which compliance is to be demonstrated.

ALARA

Licensees are required, by 10 CFR 20.1101(b), to demonstrate that the doses received by their workers, or by members of the public, as a result of their activities, are ALARA. The most effective method to maintain internal doses ALARA is usually to contain the radioactive material and prevent it from entering the air in the work space. Other methods might be use of wet processes, which have the effect of preventing or minimizing the generation of aerosols, or use of other engineering controls, depending on the details of the aerosol-generating process and the configuration of the workplace. Regardless of the choice of engineering controls, their use must include periodic maintenance to ensure continued effectiveness, as well as periodic checks to ensure that the systems remain effective.

If engineering controls fail to maintain airborne concentrations at sufficiently low levels, then other methods may be used, such as limiting stay times, or restricting access to the contaminated areas. Alternatively, respirators may be used to limit intakes during periods when other measures are not sufficiently effective. It should be noted, however, that 10 CFR Part 20 specifies that respirators are to be used only when other methods of control of intake fail to achieve the desired result or are impractical.

The above discussion on air sampling and ALARA is not exhaustive, and only highlights some of the most frequently encountered problems. Licensees should thoroughly evaluate their operations, and design and implement programs that would properly protect the workers, minimize intakes, and show compliance with applicable regulations. These evaluations are not one-time efforts, but should be ongoing and integral parts of the overall radiation protection program on site.