CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS, INC.

POSITION

Relating to: Discrete Radium Waste Management

In 1986, the NRC's Division of Waste Management, Engineering Branch prepared a technical memorandum in response to a CRCPD request to perform a toxicity analysis of radium, using the same methodology as was used for other radionuclides in developing the shallow land disposal regulations (10 CFR 61). The technical memorandum used NUREG/CR-4370 (update of Part 61 Impacts Analysis Methodology) as its primary resource. In the memorandum, NRC considered radium-contaminated waste in two forms: wastes that resemble routinely generated low-level wastes such as ion-exchange resins, and sealed sources. For the former, waste classification limits were suggested that are similar to those specified in Section 61.55 for transuranic radionuclides; i.e., 10 nCi/g for Class A waste, and 100 nCi/g for Class C waste. For the latter, equivalent activity limits are suggested, provided that the sources are encapsulated in a manner that provides containment and stability. The values discussed below are the maximum limits allowed for burial at the disposal facilities, assuming disposal in a 55-gallon drum.

1. Richland, Washington – Waste Class limits for A, B, and C apply. The concentration may be averaged over the mass of the waste and the stabilization agent or matrix. Unity formula applies for mixtures of radionuclides. Concrete, when used as an encapsulation medium around a small volume of radioactive material; e.g., a sealed source centered in a 55-gallon drum containing concrete, shall have a formulated compressive strength greater than or equal to 2500 psi. The maximum limit for Ra-226 in a 55-gallon drum is 1.2 curies.
2. Barnwell, South Carolina – Sources must be encapsulated with a minimum of four (4) inches of cement on all sides. The cement must have a compressive strength of 2500 lbs. per square inch. If there are multiple radionuclides to be packaged, unity will be considered based on the above limits. Waste Class limits for A, B, and C apply. The concentration of radionuclides in sealed sources encapsulated or otherwise stabilized (with prior approval) shall be averaged over the volume of the sealed source, not the solidification agent or waste matrix.

3. Clive, Utah – Discrete sources are not accepted for disposal.

The above values should only be used as a guide. ***However, in all cases contact the site operator or state agency for specific disposal requirements and/or variance requests*.**

To assist in the disposal of discrete and concentrated sources, the CRCPD E-5 Committee has developed the attached radium disposal guidance (Attachments A and B).

Cindy Cardwell
CRCPD Chairperson

Original position adopted by CRCPD Membership May 20, 1984

This "amended" position was adopted by the CRCPD Membership on May 7, 2003.

ATTACHMENT A

RADIUM PACKAGING GUIDANCE FOR US ECOLOGY – RICHLAND

Discrete *Radium needles and sources*

1) Waste must be packaged as follows:

   i) Up to 1.2 Curies per drum.

   ii) Sources and/or needles shall be packaged in a USDOT Specification 2R container other WDOH approved 2R-Type container or lead pig. All voids within the 2R must be filled with structural concrete or cement. The 2R, 2R-type or lead pig shall then be sealed.

   iii) The 2R, 2R type or lead pig is geometrically centered and stabilized with structural concrete (2500-psi min.) in a 55-gallon USDOT Specification 7A drum.

   iv) Fill the 55-gallon, DOT 7A, container at least 95% full with structural concrete (2500-psi min.). Tap out any air voids. (Note: ensure inner 2R, 2R type or lead pig remains centered).

   v) Concrete must cure for at least 28 days prior to shipment in an environment where the temperature must be maintained between 40°F to 100°F during the curing period.

   vi) Waste will be Class C, Stable.

Disposal at the Richland LLRW disposal facility

Once the radium container is received at the disposal facility, the Class C container is placed in an Engineered Concrete Barrier (ECB). The ECB's are placed at the bottom of the trench but can be stacked two high. In all cases however, the top of the waste is a minimum of 23 feet below grade. A maximum of ten drums, totaling no more than 1.2 curies, may be placed in an ECB. Once all drums are placed in the ECB, structural concrete is poured into it so that all voids are minimized. Minimization of voids is accomplished by vibrating the concrete. The concrete is allowed to cure for a minimum of seven days, and then any standing water from the hydration of the concrete is removed. The ECB is then topped off with enough grout to seal the lid on the ECB. The lid is then bolted down. The ECB's have 7-8 inch thick reinforced concrete walls, and 15-inch thick reinforced concrete lids and bottoms. The ECB's have been evaluated and have demonstrated to meet all applicable requirements of 10 CFR 61 and Washington Administrative Codes (WAC) 246-249 and 246-250.

PROCEDURE FOR RADIUM WASTE DISPOSAL AT RICHLAND

1. Contact US Ecology for a preliminary assessment of your waste. Any special packaging, treatment or analytical requirements can usually be identified at this time. US Ecology will then prepare a written packaging approval request and submit it to the Washington Department of Health for review.

2. WDOH will review the request and determine whether or not your waste packaging is acceptable. If WDOH determines that your waste packaging is acceptable, they will inform US Ecology in writing. US Ecology will then forward a copy of the WDOH correspondence letters, a WDOE site use permit application, and a generator registration form to the generator and/or broker. (Unless otherwise requested, US Ecology will send the approval and the permit application to the broker, if applicable.) There is no state of Washington charge for review of your request.

3. Once the Washington Department of Ecology (WDOE) receives a completed and signed copy of a Site Use Permit application and a check for the permit fee, a Site Use Permit can be issued by WDOE.

4. The Site Use Permit will be mailed by WDOE to the generator. WDOE normally issues Site Use Permits at the end of each calendar month. The permit year is 4/1 to 3/31 for NARM generators.

5. All NARM shipments to US Ecology must be accompanied by a WDOH-approved shipping and disposal manifest. The *only* manifest currently approved is the NRC Uniform Manifest.

In all cases, contact the site operator or state agency for specific disposal requirements and/or variance requests **prior to packaging.**

ATTACHMENT B

RADIUM PACKAGING GUIDANCE FOR DURATEK/CNS BARNWELL

S.C. Radioactive Material License Number 097, Amendment 48, Condition 44, regarding radioactive waste containing Radium.

The licensee shall not receive any sealed sources containing Radium unless specifically approved by the Department.

For sources specifically approved by the Department, the total activity per package attributable to Radium may not exceed 50 μ Ci (microcuries), and the sources must be packaged as follows:

1. Radium sources must be placed in an appropriate USDOT Specification 2R container or other Department approved packaging, centered and surrounded on all sides by a minimum of four inches of concrete with a compressive strength of 2500.

2. Other acceptable sources may be placed with the Radium provided the summation of the ratios of all radionuclides do not exceed unity for the designated waste classification.

Disposal at the Barnwell LLRW disposal facility

Once the waste package is received at the disposal facility, it is placed in the appropriate disposal trench within an engineered concrete vault. The location of the waste within the disposal trench will be documented. Once all the concrete vaults are placed a backfill of sand is used to fill the interstitial spaces between each vault. When all the vaults in the disposal trench are filled a layer of sand, followed by a layer of soil is placed over the vaults, and settlement is allowed to occur prior to placement of a synthetic trench cap designed to prevent water infiltration. The trenches and barriers have been evaluated and found to meet all applicable requirements of 10 CFR 61 and provisions of S.C. Department Regulation 61-63 (Title A).

PROCEDURE FOR RADIUM WASTE DISPOSAL AT BARNWELL

1. Contact Duratek/Chem-Nuclear Systems (Mr. Jimmy Still @ (803) 541-5011) for a preliminary assessment of your waste. Any special preparation or disposal conditions can be discussed at this time. Duratek/Chem-Nuclear Systems will prepare a waste variance letter request and submit it to the S.C. Department of Health & Environmental Control for review and concurrence.

2. The Department will review the request and determine whether or not the waste, proposed packaging and disposal is acceptable. If the Department provides concurrence with the submittal they will inform Duratek/Chem-Nuclear Systems by letter and inform them of any additional conditions.

3. The waste generator is then responsible for obtaining a S.C. Low-Level Radioactive Waste Transport Permit. Information regarding obtaining the permit can be obtained by calling Department representative Ms. Arlene Wilkes @ (803) 896-4247.

4. The radioactive waste transport permit will be mailed to the waste generator by the Department. The Department issues these permits for each calendar year. Each permit is valid from 01/01 to 12/31.

5. All Radium shipments to Barnwell for disposal must be follow provisions specified by and accompanied by applicable shipping papers required by 49 CFR, Department Regulation 61-83, Transportation of Radioactive Waste Into or Within South Carolina, and S.C. Radioactive Material License Number 097, Amendment 48.

In all cases, contact the site operator or state agency for specific disposal requirements and/or variance requests prior to packaging.