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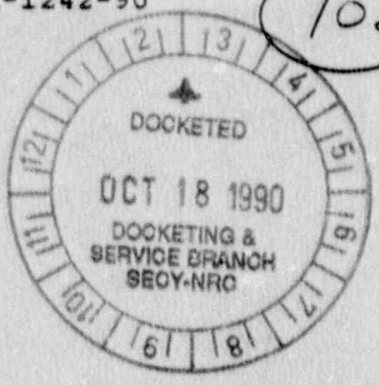

Donald R. Hopkins
Radiation Protection and Health Effects Branch
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Hopkins:

Enclosed are a number of documents that I have discussed with you and Harvey Scott of your office concerning your studies of the proposed limitations on LSA material shipping. The documents enclosed include:

* Intercompany memo (re. R.Anderson, November 8, 1988) outlining the compiled results and conclusions of our evaluation of the greater-than-Type A LSA proposed rule.

* Intercompany memo (re. R.Anderson, October 26, 1988) outlining the results of two of the three studies performed.

* Sum-of-fractions database of all cask shipments shipped to the Barnwell Site during a one year period of time (mid 1987 to mid 1988).

* Prepared paper, "Effect of the Proposed Adoption of the International Atomic Energy Agency Regulations, 1985 Revision, on the U.S. Radioactive Waste Transportation Industry".

* Comments to the proposed rules sent to the NRC, February 8, 1990.

* Comments cot he proposed rules sent to the DOT, February 8, 1990.

* Examples of shielding curves that could be modified for shipper compliance or regulatory enforcement if the 1 R/hr @ 3 meters were adopted.

I hope this is of some use during your analysis while revisiting the LSA rulemaking issue. If I can answer any questions concerning the enclosed, please don't hesitate to call.

Sincerely,

CHEM-NUCLEAR SYSTEMS, INC.

Mark S. Lewis
Radiological Engineer

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Date: November 8, 1988
611-2406U-88

TO: DISTRIBUTION LOCATION: COLUMBIA

FROM: R. ANDERSON RTA LOCATION: COLUMBIA

SUBJECT: COMPILED EVALUATION OF TYPE B-LSA CASK SHIPPING REQUIREMENTS UNDER NEW NRC/IAEA RULES

REF: (A) 611-0368U-88, Dated 10/27/88

(B) 611-0367U-88, Dated 10/26/88

1.0 OVERVIEW

This memorandum incorporates and summarizes all of the preceding engineering studies (Ref. A, B) related to the proposed 1990 NRC implementation of the 1983 IAEA regulations for shipment of LSA materials. As you are aware, the NRC plans are to develop an LSA-Type B limit based on waste activity equal to 2A1 (A1 values for each isotope are defined in 10CFR71 - as an example, A1 for Co-60 is 10.8 Ci). The IAEA limit differs from the NRC in that it is based on waste container dose rate, and is defined as less than 1R at 3 meters from the waste container. For a 14 series liner, this corresponds to a contact dose of about 18-20R.

The NRC proposes to implement this regulation in 1990. Current indications are that 70-90 additional ONSI shipments per year (which are now in Type A casks) would be in Type B casks. At present, there are about 15-25, 8-120B-Type B shipments per year. On the upside, the NRC would no longer regulate Type A containers. On the downside, it appears that use of the B-120A, 6-80, and 14-190H casks would decrease significantly.

2.0 CASE STUDIES

The CNSI engineering approach was based on developing supporting information to prove that:

A) There is no close correlation between waste activity (as measured by A1 value) and liner dose rate (as measured by contact dose). (In summary, the NRC approach does not put the U.S. into alignment with IAEA rules).

B) Even a poor correlation between A1 and 1R3m relates to values in the 3-4 A1 range.

Assistance on these studies was obtained from J. Allen (who evaluated A1 using the proposed IAEA rules and a sum-of-the-fractions methodology). L. Roberts and M. Macher assisted in modifying the shipment data base. H. Shamkhani and J. Anderson performed the shielding calculations.

Three specific studies were performed:

Study 1 - Waste all Co-60 (See Ref A)

In this study, all of the activity in 14 series waste liners was assumed to be Co-60. This case is representative since Co-60 is the dominant isotope, from both a quantity and shielding standpoint, found in radwaste. The Microshield Computer Program was used to calculate the dose at 3m from the liner.

Study 2 - 50 Representative Shipment/Comparison with Microshield Evaluation of Dose Rate (See Ref. B)

The isotopic data on fifty representative shipments from the CNSI data base was used to calculate (again using the Microshield Computer Program), the dose rate at 3 meters from the liner. These cases involved six different cask/liner types; both concreted and dewatered resins, and had A1 values ranging from 0.18 to 21 (with an average of 4.27) A statistical evaluation was used to calculate the average value of A1 and correlate to a dose rate at 3 meters.

Study 3 - 1987 Cask Shipping Data Base

The CNSI shipping form data on over 500 shipments made in 1987 was used. The A1 and radiation dose at 3m was evaluated for each case. A statistical evaluation was used to relate the averaged value of A1 to a dose rate at 3m.

Table I compares the result of the correlation of normalized value of A1 (xA1) to the 1R3m estimate. Note that for all cases the normalized value of xA1 is greater than 2A1 - - - but the statistical correlation is comparatively poor.

Table II shows the number of affected shipments of the 1987 (586) cask shipment basis (only Type A-LSA shipments were considered). Limiting values of 1.6, 2.0, 3.0 A1 and 0.8 and 1.0R at 3 meters were used. As the limit became more stringent, the number of shipments effected increased from 62 to 90 shipments per year, or from 10.5 to 15 percent of the total.

3.0 CONCLUSIONS

1. CNSI can certainly prove that an xA1 value should be greater than the NRC proposed 2.0 value. A value of 3A1, or possibly even 3.5A1 could be argued.

2. The impact of selecting 2A1, 3A1, or 1R3m as the guideline is comparatively insignificant to CNSI.

3.

4. The shipping data on about 12-15 percent of the RSR forms (relating to either dose, or possibly isotopic percentages) is highly suspect. Eliminating the suspect cases doesn't change the overall broad-based conclusions - - - but has considerable effect on the statistics. Of particular note was the calculated value of xA1 which relates liner dose value to contents. We arbitrarily eliminated all cases where xA1 was either less than 0.5 or greater than 15 to ensure that the comparison was realistic and the statistical evaluation was reasonable.

c J. Allen
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