UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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CHICAGO, IL 60604-3590

MAR 19 1998

REPLY TO THE ATTENTION OF: SRF-5J

Mr. Johnny W. Reising
United States Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239-8705

Subject: Technical Review Comments on "Authorized Limits For Fernald Copper Ingots"

Dear Mr. Reising:

The United States Environmental Protection Agency (U.S. EPA) has reviewed the above-referenced document as part of its oversight activities for the Fernald Environmental Management Project. The document, which is dated September 1997, was received by U.S. EPA on February 17, 1998, and was prepared by the Argonne National Laboratory, Environmental Assessment Division, for the U.S. Department of Energy.

U.S. EPA's review of the document focused on its technical adequacy. U.S. EPA identified several deficiencies in the approach presented in the document. U.S. EPA's general and specific review comments are enclosed.

Please contact me at (312) 886-4591 if you have any questions.

Sincerely,

E Jablonowski

Gene Jablonowski
Remedial Project Manager
Federal Facilities Section
SFD Remedial Response Branch #2

Enclosure

cc: Tom Schneider, OEPA-SWDO
Bill Murphie, U.S. DOE-HDQ
John Bradburne, FERMCO
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Tom Walsh, FERMCO

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ENCLOSURE

TECHNICAL REVIEW COMMENTS ON
"AUTHORIZED LIMITS FOR FERNALD COPPER INGOTS"
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

(Four Pages)

TECHNICAL REVIEW COMMENTS ON "AUTHORIZED LIMITS FOR FERNALD COPPER INGOTS"

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Not Applicable (NA) Page #: NA Line #: NA
Original General Comment #: 1
Comment: The text discusses seven alternatives for disposing of the copper ingots. Of these, two alternatives were considered further: unrestricted free release and disposal at the Nevada Test Site. However, the restricted reuse alternative apparently should have been further evaluated but was screened out based on poor demand. The text further states that although copper may be appropriate as a component for certain disposal containers, no design has been selected for manufacture on a production scale. The Savannah River Site (SRS) has approximately 100 tons of stainless steel that served as reactor process water heat exchangers. Because these exchangers have become volume-contaminated, they cannot be free released. SRS is currently working with the Oak Ridge National Laboratory to fabricate high-level waste containers from the stainless steel. Similarly, the potential for restricted reuse of the copper ingots in a new design should be reconsidered and the text should be revised accordingly.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2
Comment: The option to free release the contaminated copper raises a question regarding secondary waste generation that should be further evaluated. Because the contaminated copper contains impurities at levels too high to permit direct use, the material would have to go to a refinery to increase the copper's purity. However, if radionuclides partition with the slag material as the dose assessment suggests, the resultant radioactivity of the slag would increase substantially. If the radioactivity levels are high enough, the slag could be considered low-level waste for disposal purposes. Furthermore, it is not clear whether impurities removed during refining will result in slag that is considered hazardous waste. Based on these two uncertainties, copper refining could result in the generation of a mixed waste that would require treatment and disposal. This possibility should be discussed in the text.

Commenting Organization: U.S. EPA Commentor: U.S. EPA

Section #: NA Page #: NA Line #: NA
Original General Comment #: 3
Comment: The dose assessment for free release of copper raises two issues that should be further assessed. First, in conducting the dose assessment, the computer code RESRAD-RECYCLE was used. Although the generic RESRAD computer code has been validated, approved, and used throughout the U.S. Department of Energy complex, it is not clear if the RECYCLE version has undergone the same review and acceptance. Therefore, further discussion regarding the validation and/or approval of the RECYCLE code should be provided in the text.

Second, some of the input parameters associated with exposure assumptions are not provided in the text. For example, no inhalation or ingestion rates are provided. The text should be revised to either include these parameters or a justification for their absence.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
Comment: The results of the dose assessment should be reevaluated. According to Table 8, during copper refining, 100 percent of the radionuclides partition to the slag; however, only 1.1 percent of the copper partitions to slag. This result means that the slag is assumed to be about 90 times more radioactive than the original copper. Based on an exposure time of 10 hours, a dust loading of 0.003 gram per cubic meter (g/m^3), and an assumed default inhalation rate of 2.5 cubic meters per hour (m^3/hr), a slag worker would be exposed to about 3.5 millirem from the inhalation pathway alone, as the equation below shows.

$$\text{Dose} = \text{InR} \times \text{ET} \times \text{PEF} \times \left(\sum \text{DCF} \times \text{Cs}\right)$$

Where:
- InR - Inhalation rate: 2.5 m^3/hr
- ET - Exposure time: 10 hr
- PEF - Particulate emission factor: 0.003 g/m^3
- DCF - Dose conversion factors for inhalation:
  - U-234 - 1.33 E-1 millirem per picocurie (mrem/pCi)
  - U-235 - 1.32 E-1 mrem/pCi
  - U-238 - 1.18 E-1 mrem/pCi
  - Tc-99 - 8.33 E-6 mrem/pCi
- Cs - Radioisotopic concentration of slag:
  - U-234 - 184 picocuries per gram (pCi/g)
  - U-235 - 27.3 pCi/g
  - U-238 - 177 pCi/g
  - Tc-99 - 4.8 E4 pCi/g

Considering that the slag worker dose is estimated as 0.02 mrem in the text, further evaluation of the dose assessment should be conducted and the text should be revised accordingly.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Table S-1 Page #: 2 Line #: NA
Original Specific Comment #: 1
Comment: Table S-1 proposes authorized limits for uranium (U) and technetium 99 (Tc-99) for release of the copper ingots for reuse. However, it is not clear if these limits are absolute ("not to exceed") values or an average for the entire inventory of copper. Based on the text, it appears that these values may actually represent average concentrations. If this is the case, the text should be revised to include a maximum limit on the activity.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: 3.4 Page #: 13 Line #: NA
Original Specific Comment #: 2
Comment: Although Tc-99 was not detected, it is assumed to be present in the copper ingots. The presence of Tc-99 suggests that the uranium present in the gaseous diffusion process was irradiated and then reprocessed. Based on this assumption, U-236, as well as some transuranics, may also be present. The text should be revised to address this issue.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Table 6 Page #: 19 Line #: NA
Original Specific Comment #: 3
Comment: The table states that the copper content of a set of sterling flatware is 1.1 kilograms (kg). However, the text on Page 21 notes that most of this mass is silver, with only 0.082 kg as copper. It is also possible that some other mass entries presented (such as the one for a trumpet) include non-copper components as well (such as the valve pistons, springs, and other items and the alloy material in the brass of the trumpet). The flatware entry should be corrected and the other entries should be checked to ensure that they include only copper content. In addition, the risk calculations should be rerun, if necessary, with the correct input data.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Table 9 Page #: 25 Line #: NA
Original Specific Comment #: 4
Comment: The table lists exposure parameters for workers involved in handling the copper. Under some of the scenarios, the workers are exposed to half of the total mass of copper; in others, workers are exposed to the

entire mass. The entire mass exposure scenario could be true even for workers, such as the Fernald loader and the ingot loader, who apparently perform essentially identical functions. In addition, the division of the total copper mass between sheets and coils and the lack of other intermediate forms and associated exposures in the product manufacture step does not seem to account for all of the products listed in Table 6. For instance, some products, such as musical instruments, involve significant hand work in fitting parts together. The text should either be revised to explain the rationales for the various nonstandard exposure parameters or use relatively consistent parameters.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Table 9 Page #: 25 Line #: NA
Original Specific Comment #: 5
Comment: The dust loading values provided are in terms of grams per cubic centimeter. At the values specified, this unit is highly improbable and probably should be corrected to grams per cubic meter.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: Table 13 Page #: 29 Line #: NA
Original Specific Comment #: 6
Comment: The text specifies a cost of $22,000 for verification sampling and analysis, including monitoring, decontamination and repackaging of the copper ingots. However, no supporting text is provided to justify this cost. Further discussion of how this cost was determined should be provided in the text. Furthermore, some uncertainties should also be discussed. For example, if the slag from refining the copper is too radioactive, disposal as low-level or mixed waste would be required. The text also assumes that 100 percent of the ingots will require surface decontamination. However, it is not clear if the verification sampling and analysis cost includes disposal of decontamination waste.

Commenting Organization: U.S. EPA Commentor: U.S. EPA
Section #: 10.3 Page #: 41 Line #: NA
Original Specific Comment #: 7
Comment: Although a radiation technician could monitor 240 square feet per hour, the geometry of the ingots would prevent this value from being achieved. Cylindrical objects require at least three and probably four vertical scans to complete the survey. Therefore, survey rates using standard, flat geometries should be reconsidered and revised as necessary.

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