



U.S. Department  
of Transportation

**Pipeline and  
Hazardous Materials Safety  
Administration**

JAN 17 2007

400 Seventh Street, S.W.  
Washington, D.C. 20590

Mr. James H. Portsmouth  
EnergySolutions  
345 Hills Street  
Richland, Washington 99354-5507

Ref. No.: 06-0238

Dear Mr. Portsmouth:

This is in response to your October 17, 2006 letter regarding the requirements for transporting Class 7 (radioactive) material under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Your questions are summarized and answered as follows:

Q1: The definition of LSA-II material in § 173.403 includes "other radioactive material in which the activity is distributed throughout and the average specific activity does not exceed  $10^{-4}$  A<sub>2</sub>/g for solids and gases, and  $10^{-5}$  A<sub>2</sub>/g for liquids." What methods may be used to demonstrate that the activity of radioactive material is "distributed throughout" for the purpose of classifying a material as LSA-II? Is the guidance in NUREG-1608 for determining if the activity is "distributed throughout," still applicable since it was published in 1998?

A1: The HMR do not specifically define the phrase "distributed throughout" as it applies to the definition of LSA-II or LSA-III material. Furthermore, the HMR do not specify qualitative or quantitative techniques to determine if radioactivity is "distributed throughout" a material. In July of 1998, the Department of Transportation and the Nuclear Regulatory Commission published a guidance document titled, "Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects;" NUREG-1608. The guidance in NUREG-1608 remains applicable for classifying material in accordance with the current regulations. The guidance in NUREG-1608 clarifies that the term "distributed throughout" may include non-homogeneous materials and states that both qualitative and quantitative methods may be used to determine if the activity of the radioactive material is considered to be distributed throughout. The guidance states that qualitative techniques may generally be used for LSA materials having radioactivity in quantities less than 1 A<sub>2</sub>, but for materials with radioactivity exceeding 1 A<sub>2</sub>, quantitative techniques are more appropriate. This determination can be made through reasoned argument, reference, calculation, or measurement. An acceptable method to quantitatively determine if a material's radioactivity is "distributed throughout" is provided in NUREG-1608 as follows:

"For *distributed throughout*, the material can be divided into ten or more equal volumes. The volume of each portion should be no greater than 0.1m<sup>3</sup>. The



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specific activity of each volume should then be assessed (through measurements, calculations, or process knowledge) and compared. Specific activity differences between any two volumes should not vary by more than a factor of 10.”

Q2: Because of the Department of Energy radioactive materials safety considerations for keeping worker exposure to radioactive materials As Low As Reasonably Achievable (ALARA), it is not always feasible to make extensive direct radiation or contamination measurements. When using the NUREG-1608 techniques, what are the DOT expectations for a shipper of LSA materials to document that they have in fact met the requirement of showing that the specific activity in the waste matrix does not vary by more than a factor of ten from one portion to another in the total volume of waste?

A2: It is the shipper’s responsibility to properly class and describe a hazardous material in accordance with the HMR. The recommended techniques in NUREG-1603 for determining if radioactivity is “distributed throughout” a material are guidance only; the HMR do not require that these techniques be applied. Alternative methods of determining if radioactivity is “distributed throughout” a material may be acceptable for the purpose classing an LSA material, provided the determination is adequately justified.


The techniques described in NUREG-1608 provide a conceptual framework for determining whether the radioactivity is “distributed throughout” a given LSA material. In applying those techniques, the shipper may use any information available to estimate whether the criteria stated there are satisfied. In most cases it would not be expected that the shipper physically divide up the material in 0.1 m<sup>3</sup> (or smaller) volumes and measure the average specific activity in each. However, if the total activity of the material exceeds 1 A<sub>2</sub>, some quantitative analysis is expected.

Q3: How is “void space” in a waste matrix of LSA material considered in the above question? Must it be included in the quantitative calculation of radioactivity?

A4: Under the method described in A1, void space does not have to be included in the calculation of activity distribution for the purpose of determining if a material is LSA under the HMR.

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,



John A. Gate  
Chief, Standards Development  
Office of Hazardous Materials Standards



Eichenlaub  
§173.403  
RAM Definitions  
06-0238

October 17, 2006

JHP-06-4455

Mr. Edward T. Mazzuillo, Director  
Office of Hazardous Materials Standards, PHH-1-  
Pipeline and Hazardous Materials Safety Administration  
U.S. Department of Transportation  
Attention: DHM-10  
400 7<sup>th</sup> Street S.W.  
Washington, D.C. 20590-0001

## REQUEST FOR CLARIFICATION OF THE HAZARDOUS MATERIALS REGULATIONS

Dear Mr. Mazzuillo:

The purpose of this letter is to request for clarification of the Hazardous Materials Regulations (HMR:49 CFR Parts 171-180) and in particular 173.403 Low Specific Activity (LSA) material (2) LSA II (ii), which states "other radioactive material is **distributed throughout** and the average specific activity does not exceed  $10^{-4}$  A<sub>2</sub>/g for solids and gases and  $10^{-5}$  A<sub>2</sub>/g for liquids". The term "distributed throughout" is somewhat ambiguous as used in the definition of LSA II. Could you please provide clarification on the definition of "distributed throughout". Additionally, could you provide clarification on the methods that could be used by a shipper of radioactive LSA materials to determine if a waste matrix of low level radioactive material could be considered "distributed throughout" recognizing the fact that most LSA materials are not homogenous in nature.

Previous guidance given on this topic in the NUREG 1608 publication known as the "orange book" states that "there is no need to quantitatively address the distribution of the nuclides in the LSA material for packages with radioactivity less than 1 A<sub>2</sub> in quantity." For quantities exceeding 1 A<sub>2</sub>, NUREG 1608 states that "the material can be divided into ten or more equal volumes. The volume of each portion should be no greater than 0.1 cubic meters. Specific activity differences between any two volumes should not vary by more than a factor of 10."

Please address each of the questions delineated below:

Question # 1: Does the previous guidance given in NUREG 1608 for the definition of "**distributed throughout**" still apply since this document was published in July 1998?



Question # 2: Because of Department of Energy radioactive materials safety considerations for keeping worker exposure to radioactive materials As Low As Reasonably Achievable (ALARA), it is not always feasible to take radiation surveys and or determine contamination levels by taking "swipes" for smearable contamination. In these circumstances, what are the DOT expectations for a shipper of LSA materials to document that they have in fact met the requirement of showing that the specific activity in the waste matrix is less than a factor of ten in each portion of the volume of waste?

Question # 3: How is "void space" in a waste matrix of LSA material considered in the above question? Is just the waste matrix itself considered in the determining if the volume of each portion of the waste matrix has a specific activity difference of 10 or less?

If you need any additional information regarding this request for interpretation, please contact me at (509) 376-7164 or by e-mail at [JHPortsmouth@energysolutions.com](mailto:JHPortsmouth@energysolutions.com)

Sincerely,

*James H. Portsmouth*

James H. Portsmouth  
Traffic Manager

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EnergySolutions: JHP file/LB