

April 29, 2001

Mr. Stephen M. Bowman
Oak Ridge National Laboratory
Bethel Valley Road
Building 6011
Mail Stop 6370
Oak Ridge, TN 37831-6370

SUBJECT: NRC PROJECT JCN B0009, TASK ORDER 21, OUTLINE FOR SHIELDING
ANALYSIS AND MEASUREMENT GUIDE

Dear Mr. Bowman:

As requested in your letter dated, March 28, 2001, the Spent Fuel Project Office (SFPO) has reviewed the proposed outline for the "Technical Guidance and Recommendations for Shielding Analysis and Measurement Guide for Storage and Transport Casks." Enclosed are comments on the outline. The comments identify discussions which should be included in the expanded text of the guide. The placement of the discussions within the guide were just a first impression and may fit better at a different point depending on the overall structure of the guide.

Please contact me if you need clarification of any of the comments.

Sincerely,

/RA/

Carl J. Withee
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Enclosure: Comments on Draft Outline

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(Original Signed by:)

Carl J. Withee
Spent Fuel Project Office
Office of Nuclear Material Safety
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Enclosure: Comments on Draft Outline

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| OFC: | SFPO | E | SFPO | E | | | |
| NAME: | CJWithee:dd | | JGuttmann | | | | |
| DATE: | 4/26/01 | | 4/29/01 | | | | |

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Comments on Draft Outline for Shielding Guide

1. Review the shielding chapters of the standard review guides (NUREGs-1536, -1609, and -1617) for consistency and compatibility.
2. In Section I. (SOURCE TERM GUIDANCE), include a discussion of cases with the irradiation of ^{232}Th and the need to track the presence of ^{208}Tl . Also, discuss the fact that some package content limits are established by back calculating to determine what bounding curie amounts will give a limiting dose outside the cask. These back calculations may be based on a simple point kernel hand calculation. Additionally, warn the analyst to take care in assuring that all source terms are included in the analysis such as start-up sources and other neutron sources.
3. In Section I.B. (METHODS), discuss the accuracy and validity of the codes for higher burnup levels and whether there is an upper limit beyond which the code should not be used.
4. In Section I.C.1. (Active spent fuel isotopics), include a discussion of typical core operating values and good values to use for estimating the source term (i.e., core specific power, moderator temperature, fuel temperature, etc.). Also, add initial heavy metal mass to the list of important parameters.
5. In Section I.C.2. (Hardware activation), include the activation of the hardware in thimble plug assemblies.
6. In Section II.A. (MODELS), the homogenization discussion should warn against streaming effects on the side doses when a spent fuel basket contains support disks that run perpendicular to the cask axis. Also, discuss: 1) the need to account for axial burnup variations with peaking factors or more exact burnup profiles for gammas and neutrons separately, 2) the importance of modeling the shielding materials correctly including composition and densities, and 3) what constitutes a good gamma shield and a good neutron shield including the importance of shielding secondary gammas.
7. In Section II.B. (METHODS), include a discussion of the different modeling approaches for handling fuel and hardware source volumes. Consider the options of a discrete assembly lattice, homogenizing individual assemblies, homogenizing of the full source term in the cask cavity (i.e., the SAS4 options of IGO= 1, 2, 3 and 4). Also discuss the major shielding codes including their uses and weaknesses (e.g., the ray problems in DORT and the neutron limitations of point kernel techniques).
8. In Section II.C.2. (Treatment of various effects), include a discussion of the effects of boron mixed in the neutron shield on neutron and gamma doses. Also, make sure that the discussion of the flux-to-dose conversion factors is consistent with the standard review plans (e.g., NUREG-1536).

Enclosure

9. In Section II.C.3. (Scattering complexities), discuss the various skyshine codes and their potential accuracies. Also, discuss the importance of the moisture content in air for skyshine calculations.
10. In Section II.C.4. (Convergence and resolution), include a discussion on the use of variance reduction techniques.
11. In Section III. (MEASUREMENT GUIDANCE), pay special attention to neutron measurement methods including the techniques for calibration to account for the neutron energy (e.g., Bonner spheres, etc.).