UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Gaithersburg, Maryland 20899

September 2, 1987

Mr. Everett A. Wick
Technical Review Branch
Division of High-Level Waste Management
Office of Nuclear Materials Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Wick:

Enclosed is our reply to your August 20, 1987 request for general technical assistance, rendered under Task 4 of FIN-A-4171, "Evaluation and Compilation of DOE Waste Package Test Data". This reply concerns the ORNL document titled "Responses to Comments on draft 'Repository Environmental Parameters and Models/Methodologies Relevant to Assessing the Performance of HLW Packages in Basalt, Tuff and Salt,' NUREG/CR-41341R1".

In general, the responses to the comments are satisfactory. There are a few exceptions listed in an attachment to this letter, which gives views expressed mainly of A. Fraker, R. Ricker and E. Escalante. The ORNL responses were also reviewed by W. Liggett and R. Shull, who found no fault with the responses.

Should you either have questions concerning these comments or require further input from us on this topic, please contact me.

Sincerely,

Charles G. Interrante
Program Manager
Corrosion Group
Metallurgy Division

Attachment

Attachment to Letter from C.G.I. to E.A.W. dated Sept. 2, 1987

This ORNL report is a useful and informative document that will be referenced in the future. It should be noted that environmental parameters, models and methodologies developed at the time this report is issued are based on reference data that may be changed in the future: repository design (Section 3.3.5, p 23), repository environmental parameters (Appendix C), material/environment interactions, failure mechanisms and material degradation rates (Section B.1.2.2.1). This type of information is dated. Perhaps a cutoff date(s) for the references used to prepare this report should be added to the Introduction where the bounding assumptions are mentioned.

The following items are listed to give additional views on the comments and responses.

Section 1.3 (Technical Perspective) and Section 2.3.1.2 (Component Models) -- It is not sufficient to list only corrosion rate. Item 6 under these two sections should read as follows:

6. A corrosion model capable of predicting corrosion rates and corrosion-induced mechanical failures as functions of material, temperature, water chemistry, stress and radiation doses.

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Section 3.3 (Input Parameters) -- There should be a subheading, or an insert for this paragraph, with a few sentences that discuss uncertainties in materials properties. While it is universally accepted that there are variabilities in materials properties and that these can be related to processing variables, the magnitude and the importance of these variations and consequent safety margins are not always understood. A suggested addition follows:

"3.3.1a Materials -- Properties of materials (including metals, glass, etc.) can vary, due to variations in processing that give rise to differences in composition, physical and mechanical properties, etc. Thus, variations in processing should be controlled closely and/or accounted for by conservative property allowances."

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Section B.1.2.9.2 (Corrosion of Fuel Rod Cladding) -- Leave paragraph 2, line 12 as it was previously. It should say that "cracking occurs" and not "cracking is likely to occur".

Section B.2.2.1, 108 -- The sentence beginning, "However, Zircaloy ..." should be rewritten to read as follows: "However, SCC of Zircaloy was observed in dilute chloride solutions when it was polarized anodically [Cox 1973]."

In this way, the actual observation is quoted without a need for further discussion on the free corrosion potential and environmental factors that affect it. The sentence, as written, implies that at the free corrosion potential, SCC will not occur. This is not true in all cases.

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Section D.1.2 (Temperatures) -- The content of the response is not supported by data, and the project offices have not done convincing work to rule out low-temperature sensitization. It should not be assumed that subjective feelings of the authors and the three project offices are the same as the needed objective data. The response must be supported with strong arguments against the occurrence of this phenomenon, and there has not been any concerted effort to establish whether or not low-temperature sensitization can or will occur under specific repository conditions. Therefore, a statement regarding the possibility of low-temperature sensitization in stainless steel and the reference of Fox and McCright [UCRL-15619 Lawrence Livermore Laboratory, 1983] should be included.

Section D.2.1 (Groundwater Characteristics), p 157, last sentence of Paragraph 2 -- The response to the comment for p 157, second paragraph, last sentence is not adequate. Clearly, it has been pointed out in the original comment that nitric acid (dilute) can lead to significant corrosion of stainless steel: 0-5 mils/y at temperatures below 250°F and 5-20 mils/y at 250 to 300°F. [Fontana and Greene, 1978] This should be acknowledged or refuted by DOE, using adequate reference data. In addition, we note that the use of qualitative terms, like "seriously attacked", which was used in this particular response, should be avoided. Rather, more quantitative descriptions are preferred and often required.

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