

AUG 11 1988

Dr. Charles G. Interrante, Program Manager  
Metallurgy Division - Corrosion Section  
National Bureau of Standards  
U.S. Department of Commerce  
Gaithersburg, MD. 20899

Dear Dr. Interrante:

We have reviewed NBS' Monthly Letter Report for June 1988 for FIN A-4171, "Evaluation and Compilation of DOE Waste Package Test Data." Comments on the MLR are presented below in Attachment 1.

Actions resulting from this letter are considered to be within the scope of FIN A-4171. No changes in costs or delivery of contracted products are authorized. Please notify me immediately if you feel this letter will result in additional costs or delay in delivery of contracted products.

Sincerely,

Charles H. Peterson  
Technical Review Branch  
Division of High-Level Waste Management  
Office of Nuclear Material Safety  
and Safeguards

Enclosures: Att. 1

cc: w/Att. 1:

Dr. Neville Pugh, Director  
Metallurgy Division

Dr. David Anderson, Group Leader  
Metallurgy Division

DISTRIBUTION WITH ATT. 1

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ATTACHMENT 1

COMMENTS ON MONTHLY LETTER STATUS REPORT  
JUNE 1988 (FIN A4171)

1. Pg 2, Search Strategy

We note that it is planned to include "modelling" in the search strategy beginning in July. While it may be unlikely to occur in the titles of all articles and documents dealing with mechanisms of reactions, nevertheless please also include "mechanisms" and "welds" in the strategy. Each MLR should report the strategy used that month.

At this stage in the development of the database, it would seem a proper objective is to include all DOE documents dealing directly with the waste package, at least by title. However, it would also appear appropriate to include definitive literature on relevant modes of degradation of waste package materials. Perhaps the former could be accomplished by the clerical staff after someone on your professional staff makes the initial judgment as to relevance.

2. Pg 3, Category 1 Reports

Please minimize the time spent on UCRL-53795 and SAND85-7117 as these appear to be more appropriate for other technical groups to review. It is becoming apparent that the reports in each of the three categories should be labelled in the listings as to whether they deal with data only or also cover mechanisms. This could be a step toward facilitating selection of reports for Category 1. It would also help make clear whether all areas of interest are getting reasonably equal coverage in the reviews.

3. Pg 5, Vitrified Waste Form

The review of PNL-5157 has been continuing for several months. Please report what has been found in the chapters completed thus far to aid in deciding whether there is sufficient reason to complete the review of this lengthy document.

4. Pg 7, Task 2

As discussed recently, we should have a review session in August to determine whether any of the findings should be incorporated in the SOW for FY89.

## 5. Attachment B - Draft Reviews

Bullen et al. Effect of Phase Stability on Corrosion of Stainless Steels

- a. Apparently, the authors did not state a purpose and the reviewer undertook to identify two: (1) to review the literature on phase stability of selected stainless steels and (2) to summarize the impact of phase stability on degradation of steels. While there is material addressing the first objective, none of the material abstracted from the document reviewed addresses the imputed purpose of relating phase stability to corrosion behavior.
- b. Since no tests were conducted, the material presented under TEST CONDITIONS should be in some other section, perhaps AMOUNT OF DATA. Also, the information given is well-known and is probably in text books. What is new? What were the findings with respect to impact of phase stability, metastability, or instability on degradation of the steels reviewed?
- c. Under AMOUNT OF DATA, what do each of the figures show specifically? For example, one shows the effect of sigma phase formation on impact strength. What was the effect? A reduction by 10%, 100%? Or was it an increase?
- d. Under UNCERTAINTIES IN DATA:
  - Is it known why the presence of ferrite makes austenite stable? Or is the point simply that ferrite is stable and austenite is unstable?
  - It is stated that austenite is stable for at least 40 years. At what temperature?
  - It is stated that transformation of austenite to martensite could adversely affect the mechanical properties of the steel. Under what conditions does this happen? Always?
  - It is stated that carbides precipitating at grain boundaries are predominantly a compound consisting of 6 atoms of C and 23 atoms of M (e.g., Cr). What other precipitates are present? How much is "predominantly"?
  - It is stated that formation of a sigma phase can reduce fracture toughness? What are the necessary conditions for formation of a sigma phase?
- e. Under KEYWORDS, please add "sigma phase", "carbides", "intermetallic phase", "chi phase", and "Laves phase".
- f. Under DEFICIENCIES, how many papers were reviewed by the authors? Was there any critical comparison of results made by the authors?

g. Under CONCLUSIONS:

The first two are certainly not new.

The third appears as an important generalization: carbide precipitation was observed in all of the austenitic alloys. The fourth suggests that carbide precipitation does not always lead to sensitization and the potential for intergranular stress corrosion cracking. Is the latter always intergranular or is it sometimes transgranular? Under what conditions is carbide precipitation not deleterious?

The 825 alloy should be identified better - was it an Incoloy?

The finding that no intermetallic phases were documented for the 825 alloy also represents an important generalization.

- h. The reviewer poses a good question: should metastable materials be used in a repository if stable materials are available?

Aines: Plan for Glass Waste Form Testing for NNWSI.

- a. Does the test plan indicate how many replicates and how many controls will be used? At this stage, the duration of the tests is of especial importance. Is there any indication of whether an attempt will be made to extrapolate the results to at least 300-1000 years from the period represented by the data?
- b. In view of the work reported in PNL-5157, why is the proposed work necessary?
- c. In the GENERAL COMMENTS section, the discussion of proposed modelling is unclear. Thermodynamics is not a study of processes as much as a study of point functions, endpoints, discrete stages, and ultimate equilibria. Is it possible to state briefly how the authors propose to couple thermo and kinetics? Are there some assumptions as to the rate of approach to equilibrium?
- d. The PNL-5157 study on glass leaching mechanisms is a relatively recent example of a program carried out by several organizations. A critical comment made by several reviewers was the lack of integration of the various chapters of the report. A similar concern could apply to the proposed work.