



Department of Energy  
Washington, D.C. 20545

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HQ:S:83:231

MAR 04 1983

Dr. J. Nelson Grace, Director  
CRBR Program Office  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Dr. Grace:

CELL LINER DESIGN VALIDATION PROGRAM

This letter transmits a description of the CRBRP Cell Liner Design Validation Program and Fallback Plan if the base criteria is not validated as requested by the NRC staff. The program identifies the Applicant's plan for confirming the adequacy of the cell liner design. The schedule dates in the program are the dates on which the information will be transmitted to the CRBRP-PO. Please allow two additional weeks for transmittal to the NRC.

This additional information is provided to address our most recent understanding of your concerns in this area.

Questions concerning the enclosure may be directed to Mr. P. Washer (FTS - 626-6179) or Mr. V. Fayne (FTS - 626-6394) of the Project Office Oak Ridge staff.

Sincerely,

John R. Longenecker  
Acting Director, Office of  
Breeder Demonstration Projects  
Office of Nuclear Energy

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CELL LINER DESIGN VALIDATION PROGRAM

The Project is committed to an overall program to establish the validity of the cell liner design. This program involves a combination of the analysis to establish the worst case loadings on the cell liner under DBA and TMBDB conditions and a test program to confirm the validity of the design criteria used in the design. Although the Project has high confidence that the combination of these analyses and the test program would confirm the adequacy of the current design, the Project has identified several fall back design options which are expected to result in an acceptable design. The current design analysis indicates that under DBA conditions, the largest stresses are in the Nelson studs in the vicinity of the liner/stud interface. The fall back options that will be pursued include reduction in the size of the Nelson stud, increasing stud flexibility or changing stud spacing. Under TMBDB conditions, current criteria do not take credit for increased ductility of the liner and stud material at elevated temperatures. As a fall back option for TMBDB conditions, credit can be taken for this increased ductility. There is a high degree of expectation that with increased ductility considerations, the current liner design would prove satisfactory under TMBDB conditions.

The following is a step-by-step description of the cell liner design validation program including fall backs that will be followed by the Project:

1. Complete analysis of rectangular penetration (DBA conditions).
2. Based on comparison of results from the analyses the worst conditions for stud-liner panel strains will be selected (DBA conditions).
3. A detailed three dimensional analysis of the case selected under item 2, will be performed to determine the strains in the region of the stud-plate juncture.
4. The results of item 3, will be evaluated against the liner criteria.
5. The evaluation of the analytical results for DBA will be presented to NRC with a proposed test program. Based on the discussions with NRC, the test program will be defined.

6. Upon completion of the test program, an evaluation will be made on the adequacy of the liner criteria and of the liner system based on the analytical and experimental results.
7. If the evaluation of 6 provides the adequacy of the liner system, no further work will be performed for DBA conditions.
8. If the evaluation of 6 shows that the system is not adequate, design changes that are likely to reduce the stresses/strains generated by the stud on the plate will be contemplated. Possible design changes are: Use of smaller diameter studs, change of stud spacing, more flexible studs.
9. Simplified analyses with different alternatives such as those mentioned above will be performed to select the optimum solution.
10. Based on the selected option (Item 9) a detailed analyses will be performed to calculate strains under the revised liner configuration.
11. Upon completion of 10, a new evaluation of the results versus the criteria and previous test results will be made. Further testing will be performed if necessary. It is expected that this will complete the validation of the liner system for DBA conditions.
12. The validation for TMBDB conditions will follow a similar process. Based on the DBA analytical results, the worst condition expected under TMBDB will be identified and a detailed analysis will be performed. The analytical results will be evaluated against the TMBDB criteria and test results. In case these evaluations show inadequate design margins under TMBDB condition, creep effects which conservatively have been ignored will be considered and are likely to show a decrease in the strains. The high ductility of the liner steel under TMBDB temperatures would be considered in the evaluation of the failure criteria.

A flow chart is attached which depicts all of the above activities with scheduled completion dates.

# CELL LINER ANALYSIS AND TEST PROGRAM FLOWCHART FOR DBA AND TMBDB

