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# RELAP4/MOD6 ANALYSIS OF FORCED- AND GRAVITY-FEED REFLOOD TESTS

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## ABSTRACT

The RELAP4/MOD6[1] computer code is used for the analysis of the reactor core heat transfer during the reflooding phase of a postulated loss-of-coolant accident (LOCA) in a pressurized water reactor (PWR). The code requires the user to specify input parameters for the reflood heat transfer models. Results of previous comparisons of code calculations with experimental data have indicated no single selection of input parameters is adequate for a spectrum of tests and test facilities. These comparisons have also revealed the importance of dispersed-flow heat transfer and liquid entrainment during reflood calculations. Code user's guidelines[2] for the proper selection of input options have been developed from data comparisons with Westinghouse Full Length Emergency Core Heat Transfer (FLECHT) Low Flood Rate (LFR) Cosine Forced-Feed Tests. The RELAP4/MOD6 code assessments[3,4] performed using code reflood heat transfer inputs selected according to these forced-feed derived guidelines,[2] has shown the existing guidelines deficient for adequately predicting dispersed-flow heat transfer during reflood for other forced or gravity-feed reflood experiments with different test conditions.

This paper presents the development of revised guidelines and assesses the effect of those modifications on RELAP4/MOD6 data comparisons using previously analyzed reflood experiments. The paper also presents an assessment

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of the revised guidelines and the original guidelines against experimental data significantly different from previously analyzed tests. The following experiments were selected for the assessment of the revised guidelines:

FLECHT - Forced-Feed Low-Flooding-Rate Cosine-Bundle Test 2414,

FLECHT - Forced-Feed LRF Skewed-Bundle Tests 13404 and 13609,

Semiscale Mod-1 Forced-Feed Reflood Test S-03-A,

Semiscale Mod-1 Gravity-Feed Reflood Test S-03-8, and

FLECHT-SET Gravity-Feed Reflood Test 2213B.

The new data comparisons further confirm previous conclusions that RELAP4/MOD6, using the original guidelines, adequately predicts core hydraulic response but not core thermal response. Comparisons of the revised and original guideline calculations with experimental data indicate the revised guidelines provide a significant improvement in cladding temperature predicition at all elevations for the FLECHT Skewed Bundle Tests 13404 and 13609 and Semiscale Gravity-Feed Test S-03-8. For FLECHT Test 2414 and Semiscale Forced-Feed S-03-A, improvement was noticed at some core elevations but not at others; for FLECHT-SET Test 2213B, calculations using the original and revised guideline inputs showed little difference.

While the use of the revised guidelines does not provide adequate cladding temperature predictions at all elevations for all experiments, a significant improvement over the use of the original guidelines has been obtained for a variety of reflood calculations. The use of the revised guidelines is therefore recommended.

## REFERENCES


1 S. R. Fischer, et al, "RELAP4/MOD6 - A Computer Program for Transient Thermal-Hydraulic Analysis of Nuclear Reactors and Related Systems - User's Manual", CDAP-TR-003, Jan. 1978, EG&G Idaho, Inc., Idaho Falls, ID. Configuration Control No. 00010006 for the code and No. H0021IB for the associated steam tables.

2 C. D. Fletcher and G. E. Wilson, "Developmental Verification of RELAP4/MOD6, Update 1 With FLECHT LFR Cosine Test Data Base". PG-R-77-24, July 1977, EG&G Idaho.

3 G. E. Wilson, "Comparison of RELAP4/MOD6 With Forced-Feed Reflood Data", CVAP-TR-7-78, May 1978, EG&G Idaho.

4 C. D. Fletcher, "Gravity-Feed Reflood Data Comparisons Using RELAP4/MOD6, Update 3", CVAP-TR-9-78, May 1978, EG&G Idaho.