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NUCLEAR REGULATORY COMMISSION  
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JUL 2 1979

MEMORANDUM FOR: C. Burger, Research Program Manager, Structural  
Engineering Research Branch, Reactor Safety Research

FROM: R. Colmar, Plant Systems Branch, Division of  
Operating Reactors

SUBJECT: REVIEW OF EG&G DRAFT REPORTS ON TAP (A-1), WATER  
HAMMER

I have reviewed the following EG&G draft reports submitted in fulfillment of some of the subtasks of TAP A-1, Waterhammer, and I have the following comments. At this stage of completion in this program, it is not possible to provide a comprehensive, in-depth, technical evaluation of these reports. The current review is limited to such matters as the identification of any technical results requiring clarification, possible misrepresentations of NRC policy, consistency of technical conclusions, and other details such as the satisfactory fulfillment of the work statement and the general quality of the report.

1. "A State-of-the-Art Literature Review of Waterhammer," Report No. RE-A-79-044 by J. C. Watkins and R. A. Berry, April 1979 (EG&G).

The authors have presented a very extensive bibliography of works on the general subject of transient hydrodynamics but it is not clear how useful this material will be for NRC. The authors have evaluated the features of the various hydraulic codes in general terms but not in terms of their specific applicability or usefulness to the study of the waterhammer problems. It is not clear, for example, whether the general limitations of any particular code would be too restrictive to apply to waterhammer problems. Moreover, it would have been useful to know how the codes may be ranked in terms of the suitability for the problems of interest to use at NRC. For example, in the discussion of the K-Fix code, the authors did not identify the fact that this code as it presently exists was used unsuccessfully by EG&G to analyze the steam bubble collapse waterhammer in Task 4.4 of this same problem, TAP A-1.

In addition, the discussion of column separation on page 4 of the report is poor, if not incorrect. And, finally, the authors' ability to use English grammar, syntax, vocabulary, and writing style is substandard.

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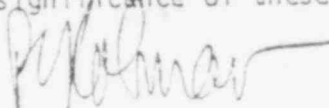
2. "Analysis Tool For Predicting Transient Hydrodynamics In Nuclear Piping Systems Contains Swing Check Valves" by R. A. Berry, Report No. RE-A-78-261, November 1978 (EG&G).

In this report RELAP 5 was adapted to describe the systems hydrodynamics causing a swing check valve to close following a complete, instantaneous pipe break just upstream of the valve. The object of this study was to formulate an analytical tool with which to calculate the waterhammer forces associated with the rapid check valve closure following the pipe break. A proper description of the hydrodynamics is complicated by the flashing, two-phase, choked flow condition that follows shortly after the pipe break. Because the calculation of the hydrodynamics forces on the check valve is made difficult by the complicated pipe break flow, every opportunity to verify the results is important. In this regard "typical pressure gradient" curve of figure 3 of the EG&G report is ambiguous and it is essential that this figure be clarified in order to increase our confidence in the results of the EG&G program. Moreover, the sample calculation provided by EG&G is for a break which is located about 14 feet from the valve instead of upstream of the valve as required by the original work statement.

It is to be noted that the purpose and value of the sample calculation is primarily to provide a test of the code in order to establish that the results can be judged to be reasonable. A sample case in which the break is just upstream of the valve is the most stringent and would be the best test of the code. It is essential that this case be calculated as soon as possible and it is highly recommended that such a case be calculated and figure 3 be clarified before the report is released in order to assure us that the code results are reasonable.

3. "Review and Evaluation of Actual and Potential Waterhammer Events in Nuclear Plants" by R. L. Chapman, O. M. Hanner, Jr., and M. E. Wells, Report No. CAAP-TR-042, February 1979.

This report was reviewed within PSB some time ago and the draft comments were sent to you recently under separate cover. The report contains useful information but our comments suggest that the report could be improved significantly. Among the principal improvements would be an evaluation of the available data, originating possible new scenarios by EG&G that might lead to insights into possible new sources of damaging waterhammer occurrences, and substantive recommendations by EG&G based on an evaluation of the safety significance of these results.

  
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