



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATING TO MARK I CONTAINMENT PROGRAM - VACUUM BREAKER INTEGRITY  
NIAGARA MOHAWK POWER CORPORATION  
NINE MILE POINT NUCLEAR STATION, UNIT NO. 1  
DOCKET NO.: 50-220

1.0 INTRODUCTION

In addition to the staff's Safety Evaluation (SE) dated January 22, 1985, of the suppression chamber, torus attached piping, and pressure relieving lines, under the newly defined loadings, the Mark I containment program required the assurance of the structural integrity of vacuum breakers during operation in all Mark I plants. This additional requirement was categorized as a separate effort, as the adequacy of these other components was already discussed in the separate SE dated January 22, 1985.

The staff's contractor, Franklin Research Center (FRC), has performed an evaluation of the structural integrity of vacuum breakers in the Nine Mile Point Nuclear Station, Unit No. 1 (NMP 1) for the NRC staff. Results of the review are reported in the attached Technical Evaluation Report (TER), TER-C5506-331, "Structural Evaluation of the Vacuum Breakers (Mark I Containment Program), Niagara Mohawk Power Corporation, Nine Mile Point Nuclear Generating Station Unit 1." FRC has concluded that the analytical methods used by Niagara Mohawk Power Corporation (the licensee) to evaluate stresses of critical components are adequate, and, therefore, that the vacuum breakers in NMP 1 will provide adequate margins of safety under the revised loadings in the Mark I containment for all operating conditions, and therefore need not be modified.

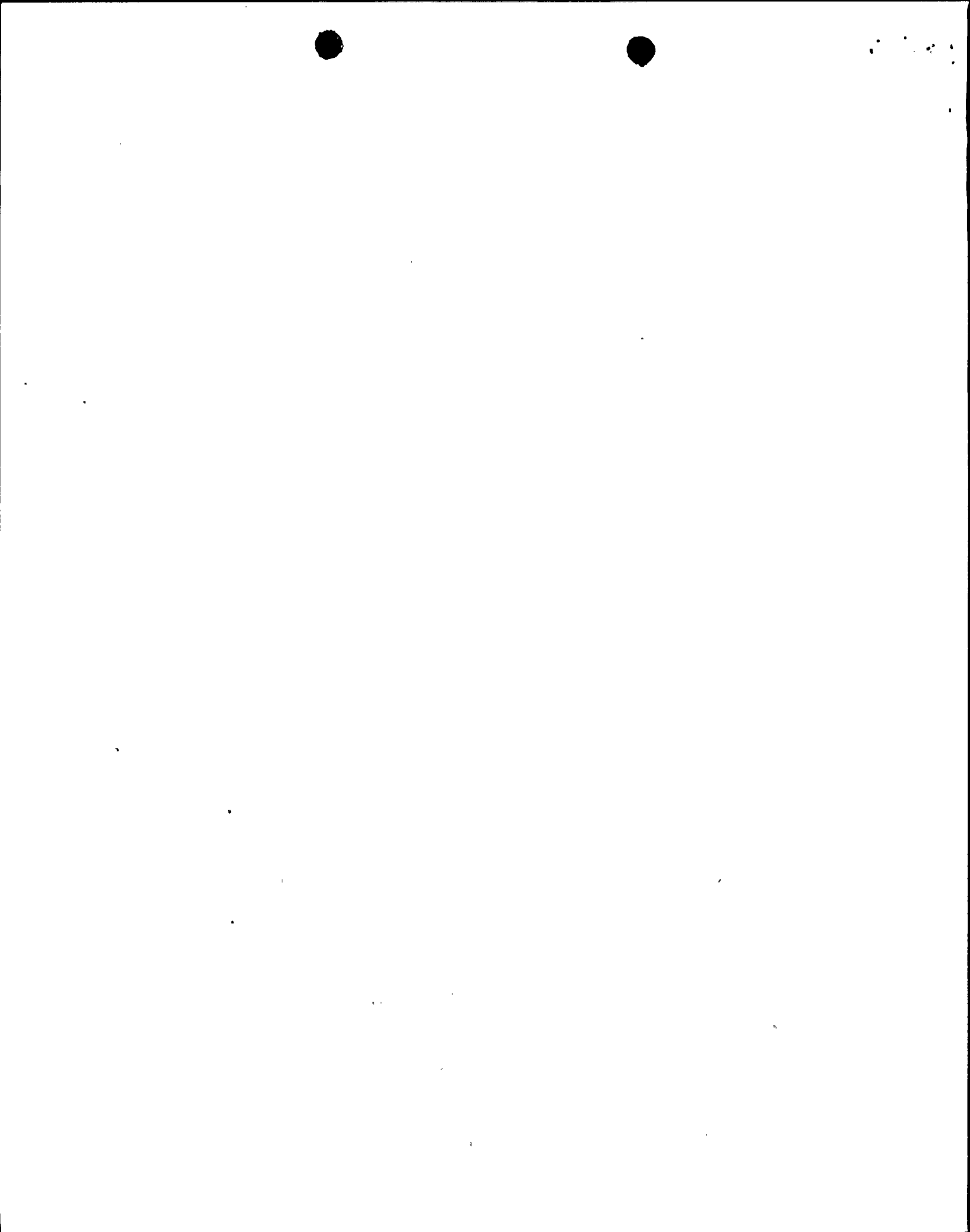
The staff's and licensee's letters for this evaluation are discussed in the attached TER. The findings of the TER are given below. NRC staff has reviewed the attached TER and concurs with the FRC findings.

2.0 DISCUSSION

During steam condensation tests on BWR Mark I containments, the wetwell-to-drywell vacuum breakers cycled repeatedly during the transient phase of steam blowdown. This load was not included in the original load combinations used in the design of the vacuum breakers. Consequently, the repeated impact of the pallet on the valve seat and body created stresses that may impair its capability to remain functional.

A vacuum breaker is a check valve installed between the wetwell and the drywell. Its primary function is to prevent the formation of a negative pressure on the drywell containment during rapid condensation of steam

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in the drywell and in the final stages of a loss-of-coolant accident. The vacuum breaker maintains a wetwell pressure less than or equal to the drywell pressure by permitting air flow from the wetwell to the drywell when the wetwell is pressurized and the drywell is depressurized slowly.

### 3.0 EVALUATION

In the NMP 1 containment there are four 30" external type Atwood-Morrill vacuum breakers connecting the drywell and wetwell. It should be noted that on pages 8 and 15 of the attached TER, the size of the vacuum breakers for NMP 1 is listed as 18" external whereas the correct size is 30" external. Loadings on Mark I structures and vacuum breakers are based on the General Electric Company Report, NEDO-2188, "Mark I Containment Program Load Definition Report," Revision 2, dated November-1981. For vacuum breakers, the loadings included are gravity, seismic, and hydrodynamic loads. The hydrodynamic forcing functions were developed by Continuum Dynamics, Inc. by using a dynamic model of a Mark I pressure suppression system and the full scale test facility data. The system model was capable of predicting pressure transients at specific locations in the vent system. Loading across the vacuum breaker disc caused by pressure differentials based on test data was thus quantified as a function of time. This issue was reviewed and approved by NRC on December 24, 1984. Loadings were combined according to the Final Safety Analysis Report (FSAR) commitments.

To determine the structural integrity of the vacuum breakers, the licensee compared results from a finite element model and ANSYS program analyses with design limits specified in the ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC, 1977 Edition and addenda up to Summer 1977. It was found by the licensee that the hydrodynamic chugging force in NMP 1 will not significantly increase the impact velocity on vacuum breakers to cause any additional loading. Therefore, since the original design margin does not need improvement, the licensee recommended that no modifications were needed on the construction of its vacuum breakers.

### 4.0 CONCLUSION

It has been determined by the licensee that the design margins of the NMP 1 vacuum breakers are not affected by the hydrodynamic chugging force. The analytical methods of the analysis have been reviewed and have been judged to be adequate. The staff therefore concludes that the licensee's position that no modifications are needed is acceptable and that this issue is closed.

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Dated: November 24, 1986

