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SUBJECT: Submits Dec. 1978 Program Activity Review, comprised of info 277
 from selected sections of monthly rept, w/section on contract 278
 & billing status removed. Lists meetings held & provides 293/296
 task-by-task activity summary. 298/321/324/325

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PROJECTS DIVISION

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MFN-031-79

February 5, 1979

U. S. Nuclear Regulatory Commission
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Office of Nuclear Reactor Regulation
Washington, D. C. 20555

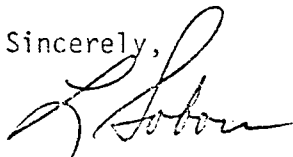
Attention: Mr. C. I. Grimes, Task Manager
Mark I Containment Long-Term Program

Gentlemen:

SUBJECT: MARK I CONTAINMENT ACTIVITY REVIEW
DECEMBER 1978

The purpose of this letter is to forward ten (10) copies of a December 1978 Program Activity Review for your information. This review lists the meetings held and provides a brief task-by-task activity summary for the month. It is being provided to you on behalf of the Mark I Owners Group. The document is comprised of information extracted from selected sections of a monthly report prepared by General Electric for the Mark I Owners Group. Sections on contract and billing status have been removed.

Sincerely,



L. J. Sobon, Manager
BWR Containment Licensing

LJS/d

Enclosures (10)

cc: L. S. Gifford (GE, Bethesda)
File: 2.9.2/2.10

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MARK I CONTAINMENT PROGRAM

PROGRAM ACTIVITY REVIEW

DECEMBER 1978

GENERAL ELECTRIC COMPANY

San Jose, California

1. MEETING SUMMARY

<u>Date</u>	<u>Attendees</u>	<u>Place</u>	<u>Meeting Content</u>
12/1/78	GE/NUTECH	San Jose	LDR - Incorporation of Utility Comments Review
12/2/78	GE/NUTECH	San Jose	LDR - Incorporation of Utility Comments Review
12/6/78	GE/EPRI/NUTECH	Palo Alto	Orifice Location Specification for EPRI 1/12 Scale 3D Pool Swell Tests
12/7/78	TRC/GE/NUTECH	Conference Call	Final Plant Unique Analysis Application Guide Content
12/7/78	GE/NUTECH	San Jose	T-Quencher Thermal Mixing Analysis
12/8/78	GE/NUTECH	San Jose	LDR - Review of Remaining Sections and Application Guides Before Publishing
12/13/78	GE/NUTECH	San Jose	LDR - Summary of Final Review Changes
12/13/78	GE/NUTECH	San Jose	Quencher Pool Temperature Limit
12/14/78	GE/NUTECH	San Jose	Resolution of Comments on Tasks 7.1.2.2 and 7.1.1.1
12/20/78	GE/NUTECH	San Jose	T-Quencher Thermal Mixing Analysis
12/28/78	GE/NUTECH	San Jose	TMM vs CMM Fluid Mass Modeling

III. ACTIVITY SUMMARY

Task 3.0 - Structural Acceptance Criteria

The Plant Unique Analysis Application Guide (PUAAG) is being published with the content basically the same as the draft report transmitted to the Owners on October 30, 1978. The final report is scheduled for transmittal to the Owners and the NRC in January 1979.

Final TRC/GE/Bechtel comments have been resolved on the Basic Torus Shell Analysis - Task 3.1.5.3. The results of the analysis indicate a ratio of dynamic to static reserve margin of 1.82 for a representative torus shell when subjected to a typical DBA pool swell loading. Applicable results of this analysis have been incorporated in the PUAAG. The Basic Torus Shell Analysis report will be transmitted to the Owners and NRC in February 1979.

Bechtel has completed contacts with Utilities, AEs and vendors to assemble available information on the pump and valve operability criteria applied in the design of Mark I plants. A letter report will be transmitted for TRC review in mid-January 1979.

A GE/NUTECH meeting was held on December 28, 1978 to review the progress of the tributary mass matrix (TMM) versus consistent mass matrix (CMM) comparison of modeling the suppression pool water mass. At that time, an implicitly derived NASTRAN 3D consistent fluid mass matrix had been merged into a STARDYNE reduced mass matrix. However, a rigid body virtual mass comparison and the STARDYNE eigenvalues were not consistent with earlier CMM results reported by TVA. Therefore, additional efforts are underway to derive an explicit NASTRAN 3D consistent fluid mass matrix and repeat the comparisons. The status and increased level of effort of this activity will be reviewed in the TRC meeting on January 24, 1979.

Task 4.0 - Generic Structural Evaluation

Bechtel is proceeding with the checkout of the submerged structures computer programs as part of their Task 4.2.3 effort. Submerged structures computer programs for LOCA, bubble, condensation, Ramshead and T-Quenchers, are being accessed from the CDC Cybernet system and applied to typical structures. User documents for these programs are being reviewed. Bechtel has successfully executed test runs for the LOCA bubble and condensation codes; the Ramshead and T-Quencher codes are expected to be successfully accessed in January 1979.

The analysis of Type I and Type III vent pipe/ring header intersections, completed some months ago, has been in review by Bechtel's staff. Comments have now been resolved at Bechtel and the report will be submitted to the Mark I Owners for review in early February 1979.

Task 5.3 - Flexible Cylinder Tests

Bechtel has completed the vent header structural evaluation. Three reports summarizing this task will be issued for Utility review in January 1979.

III. ACTIVITY SUMMARY (CONTINUED)

Task 5.3 - Flexible Cylinder Tests - Continued

They include: (1) non-vent bay vent header analysis; (2) vent bay vent header analysis; and (3) vent header structural model. The non-vent bay analysis includes cases with and without vent header deflectors for both zero and full ΔP conditions. The Bechtel stress analyses indicate that a vent header deflector should be considered in the non-vent bay to reduce stress levels.

Task 5.5 - 1/4 Scale 2D Pool Swell Tests

The Task 5.5.3 plant unique pool swell tests were completed in October 1978. The final test report draft will be reviewed at a Utility/AE working group meeting in mid-February 1979; the final test report will be released in March 1979.

Supplementary pool swell tests requested by several Mark I Owners on a plant unique funding basis are in progress.

Task 5.6 - 1/12 Scale 3D Pool Swell Tests

EPRI is proceeding with additional 3D pool swell tests to clarify the effect of orifice location discussed in their October 1978 test report. Tests are being run at 3.3 feet submergence for both zero and full ΔP conditions. EPRI is targeting for the "50/50" (nominal) split orifice test data to be available in early March 1979 and the "100/0" (all resistance in vent line) data by mid-March 1979. A scheduling problem regarding incorporation of the test results into Part B of the LDR has been identified; all parties concerned are attempting to expedite the current schedule.

Task 5.10 - Miscellaneous Monitoring

The final report comparing the GE 1/4 scale 2D pool swell tests to EPRI 1/12 scale 3D pool swell tests will be issued in January 1979. The report indicates that the 3D/2D load ratio for torus up and down loads is less than or equal to 1.0. NRC has informally indicated that the Lawrence Livermore Laboratory (LLL) tests indicate a 1.17 3D/2D upload ratio. GE, EPRI and LLL will meet in January 1979 with NRC in an attempt to resolve the differences.

Task 5.11 - Full Scale Test Facility

The FSTF layup is continuing with periodic inspections being performed by Wyle/GE personnel. The final test report draft was forwarded for TRC review on December 12, 1978; TRC comments are expected in early January 1979. The final report is scheduled for issue in March 1979.

III. ACTIVITY SUMMARY (CONTINUED)

Task 5.14 - Submerged Structures

The submerged structure computer programs are being checked-out for AE use by Bechtel as part of Task 4.0 Generic Structural Evaluations. Modifications of the T-Quencher water jet model and the pressure transient used in the chugging model are being performed. The draft report comparing analytical predictions of LOCA-induced submerged structures drag to experimental results was released in December 1978. Final reports for this task will be issued in January-March 1979 time period.

Task 5.15 - Structural Hydrodynamic Interaction

This task consisted of: (1) a 1/12 scale chugging test using flexible and rigid flat plates; and (2) the development of a NASTRAN structural model to compare analytical predictions to the flat plate data. This comparison report was issued for review in December 1978. The comparison indicated that the model could be expected to be useful in analysis providing input source pressures are accurately defined.

Task 5.17 - Condensation Oscillation

The draft report summarizing the 1/12 scale Condensation Oscillation (CO) parametric test program and analysis performed by Aeronautical Research Associates of Princeton (ARAP) and S. Levy, Inc. (SLI) was issued for final review in December 1978. Sensitivity of CO loads to mass flux, air content in steam, and pool temperatures were presented to aid in interpretation of FSTF test data for the LDR.

A Condensation Oscillation Investigative Team (COIT) was formed in September 1978 to provide a vehicle for integrating the dynamic structural technology with fluid mechanics phenomena technology. COIT has developed an integrated technique for direct use of FSTF data in development of CO loads (with fluid/structure interaction accounted for) for plant unique application. FSTF CO test data has been expressed in Fourier series for subsequent structural analysis. Preliminary results show that the analytical procedure predicts torus shell stresses quite well and predicts column stresses conservatively. It is planned to complete the COIT efforts in January 1979.

Task 6.2.1 - T-Quencher Development

TRC comments on the draft final report for 1/4 scale T-Quencher testing at NUS have been received. The final report will be issued in January 1979.

III. ACTIVITY SUMMARY (CONTINUED)

Task 7.1/7.2 - S/RV Load Models

The Ramshead (Task 7.1.1.1) and T-Quencher (Tasks 7.1.1.2 and 7.1.2.2) model/data comparison reports are in the final stages of publication. The intent is to have these reports available for transmittal to the Owners and the NRC in late January 1979. The computer programs associated with these models are scheduled for release on the CDC Cybernet system in the same time period.

Task 7.3.3 - Vent Deflector Load Definition

The analytical effort to define pool swell loads on the vent header deflector has been completed. The results show that impact forces are small compared to acceleration drag and steady state drag forces. The analytical results have been shown to be significantly conservative. Test data is being obtained from the 1/4 scale 2D supplementary tests to provide a basis for some reduction in the analytical conservatisms. Plant unique vent header loads have been generated and will be included in a draft report scheduled for Utility review in January 1979.

Task 7.5.2 - T-Quencher Thermal Mixing

Meetings were held on January 7 and January 20, 1979 to review the status of the T-Quencher suppression pool thermal mixing analysis. Modeling techniques have been developed based on the use of energy/momentum relationships and empirical data from the Task 5.1.2 Monticello thermal mixing tests. The modeling technique was then used to predict the pool thermal mixing utilizing both T-Quencher cap holes and RHR circulation. The model applicability is now being extended in time to cover the duration of a stuck open relief valve transient. These efforts will be described at the Utility meetings scheduled for the week of January 22, 1979.

Task 7.6 - Load Definition Report (LDR) Preparation

Part A of the LDR was transmitted to the Mark I Owners and the NRC on December 28, 1978. Part B is scheduled for transmittal in mid-March 1979.

MARK I CONTAINMENT PROGRAM
STATUS OF TEST PROGRAMS

<u>Task No.</u>	<u>Description</u>	<u>Performing Agency/Facility</u>	<u>Scale</u>	<u>Phenomena Being Tested</u>	<u>Testing Fluid</u>	<u>Date for Completion of Testing</u>	<u>Comments</u>
3.2.1	Column Buckling Test	TES/TES	N/A	Dynamic Load Capacity	N/A	February 1977 (Complete)	---
3.2.2	Ring Header/Vent Pipe Intersection Test	Bechtel/Anamet	N/A	Load Capacity	N/A	Indefinite	Task put on hold on April 25, 1978. Reactivation of task will depend upon identification of need.
5.1.1	Monticello S/RV Ramshead Test	GE/HSP	Full	S/RV Discharge Loads	Air/Steam	July 1976 (Complete)	---
5.1.2	Monticello S/RV Quencher Test	GE/HSP	Full	S/RV Discharge Loads	Air/Steam	December 1977 (Complete)	---
5.2	4T High Temperature Tests	GE/GE	Full	Chugging Wall & Vent Loads	Steam	July 1976 (Complete)	Mark II configuration.
5.3.2	Flexible Cylinder Tests	EPRI/DSI	1/6 & 1/3	Fluid/Structure Interaction-Vent Header	Water	July 1977 (Complete)	---
5.3.3	Flexible Cylinder Tests	GE/HSC	1/4	Fluid/Structure Interaction-Vent Header	Air/Water	November 1977 (Complete)	---
5.4	Seismic Slosh	GE/SWRI	1/30	Seismic Slosh - Loads/Vent Uncovering	Water	July 1977 (Complete)	---
5.5.1	1/4-Scale 2D Test	GE/HSC	1/4	Pool Swell Scaling Laws	Air	November 1976 (Complete)	---
5.5.2	1/4-Scale 2D Test	GE/HSC	1/4	Downflow Oscillations	Air	October 1977 (Complete)	---
5.5.3	1/4-Scale 2D Test	GE/HSC	1/4	LDR Loads	Air	October 1978 (Complete)	Plant unique matrix and Vent Deflector Parametric Tests.

MARK I CONTAINMENT PROGRAM
STATUS OF TEST PROGRAMS

<u>Task No.</u>	<u>Description</u>	<u>Performing Agency/Facility</u>	<u>Scale</u>	<u>Phenomena Being Tested</u>	<u>Testing Fluid</u>	<u>Date for Completion of Testing</u>	<u>Comments</u>
5.6.1	1/12-Scale 3D Test	EPRI/SRI	1/12	Pool Swell Loads	Air	July 1978 (Complete)	---
5.6.2	1/30-Scale 3D Test	GE/SWRI	1/30	Torus/Cylinder Geometry	Air	September 1977 (Complete)	Qualitative supplement to 5.6.1.
5.8	1/12-Scale 2D Test	GE/GE	1/12	Pool Swell Scaling Laws	Air	October 1976 (Complete)	---
5.11	Full Scale 3D Test	GE/Braun	Full	Chugging	Steam	August 1978 (Complete)	---
5.13	1/12-Scale 3D Test	GE/NUTECH	1/12	Chugging	Steam	September 1977 (Complete)	Qualitative multivalent effects.
5.14	Submerged Structures	GE/Wyle	1/3	Steady State & Transient Drag Loads	Air/ Steam	June 1977 (Complete)	---
		GE/NSC	1/4	Submerged Loads	Air	January 1978 (Complete)	---
		GE/SWRI	N/A	Components of Drag	Water	February 1978 (Complete)	---
5.15.2	Structural/Hydrodynamic Interactions	GE/Aerotherm	1/12	Fluid/Structure	Steam	April 1978 (Complete)	Flat plate only. Design level QC implemented.
5.16.1	Reduced Submergence	GE/GE Licensee	Full	Chugging	Steam	April 1977 (Complete)	Testing at Mark I submergence levels.
5.16.2	Chugging Mitigation	GE/GE Licensee	Full	Chugging	Steam	May 1977 (Complete)	Testing mitigator at Mark I submergence.
5.17	Condensation Oscillation	GE/ARAP	1/12	Condensation Oscillation	Steam	August 1978 (Complete)	Parametric testing.

MARK I CONTAINMENT PROGRAM
STATUS OF TEST PROGRAMS

<u>Task No.</u>	<u>Description</u>	<u>Performing Agency/Facility</u>	<u>Scale</u>	<u>Phenomena Being Tested</u>	<u>Testing Fluid</u>	<u>Date for Completion of Testing</u>	<u>Comments</u>
6.1.1	Chugging Parametrics	GE/NUTECH	1/12	Chugging	Steam	March 1977 (Complete)	Scoping parametrics.
		GE/Creare	1/12, 1/6,1/4	Chugging	Steam	July 1977 (Complete)	Scaling parametrics.
6.1.2	Chugging Mitigation	GE/NUTECH	1/12	Chugging	Steam	March 1977 (Complete)	Scoping mitigation.
		GE/Creare	1/6	Chugging	Steam	September 1977 (Complete)	Mitigation screening.
6.2.1	S/RV	GE/NUTECH	1/12	S/RV Discharge Loads	Steam	June 1977 (Complete)	Mitigation confirmation.
		GE/HUS	1/4	S/RV Discharge Loads - Phase I	Steam	July 1978 (Complete)	Quencher parametrics.
				Phase II		October 1978 (Complete)	Quencher parametrics.
6.3.1	Pool Swell Screening	GE/NUTECH	1/12	Pool Swell Downloads	Air	September 1976 (Complete)	Screening tests.
6.3.2	Pool Swell Mitigation	GE/NSC	1/4	Pool Swell	Air	November 1977 (Complete)	Qualification tests.
6.3.3	Vent Header Device	GE/NSC	1/4	Pool Swell	Air	November 1977 (Complete)	Vent impact mitigation.
7.5.2	T-Quencher Thermal Mixing	GE/NSP	Full	Pool Thermal Mixing-Phases I & II	Steam	November 1978 (Complete)	---