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MURRAY R. EDELMAN
VICE PRESIDENT
NUCLEAR

November 1, 1984
PY-CEI/NRR-0151 L

Mr. P. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket Nos. 40-440;40-441
SER Outstanding Issue No. 8
Mark III Containment Concerns

Dear Mr. Youngblood:

The purpose of this letter is to provide an evaluation and proposed resolution program to address the effects of local encroachments in the suppression pool on pool swell impact loads in the Perry Nuclear Power Plant.

Attachment A describes our evaluation of the Perry encroachment configuration and t[illegible] results of the 1/10 scale bubble pressure equalization tests. Based on our evaluation, CEI believes that this issue does not raise any significant safety concerns. To confirm this conclusion and demonstrate that plant structures and components are designed for pool swell loads, a proposed program for verifying the load definition for testing of the plant specific encroachment is outlined in Attachment 2. The test specification for this effort is provided in Attachment 3.

The program and schedule for resolution supports our projected fuel load date. We believe that the evaluation provided herein and the confirmatory test program will enable this issue to be resolved for Perry Nuclear Power Plant.

Very truly yours,

M. R. Edelman
Vice President
Nuclear Group

MRE:njc

Attachments

cc: Jay Silberg, Esq.
John Stefano
J. Grobe

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Evaluation of Applicability of 1/10 Scale Mark III Encroachments Tests to Perry Nuclear Power Plant

In early 1984, a series of 1/10 linear Froude scaled Mark III encroachments tests were performed under the auspices of the Containment Issues Owners Group (CIOG). The CIOG concluded on the basis of this test series that local encroachments in the suppression pool do not produce pool swell loadings in excess of the clean pool design loads. This conclusion was based on the observations that:

1. The encroached pool response is always bounded by the clean pool response.

2. The encroached pool breakthrough height is always less than the design breakthrough height.

3. The encroached pool liquid profile on the containment wall is smaller radially than the clean pool wall profile.

The NRC and their consultants conclusions differed from the CIOG conclusions. The Staff's assessment concluded that there could be a significant solid water impact at the HCU floor level for type A encroachment (3 cells x 50%). However, they did feel that the smaller encroachments,* (i.e., "B" which was effectively 6 cells x 25% and "C" which was effectively 2 cells x 50%) would not cause an increase in design loads. In the NRC's evaluation with the type "B" encroachment, the water ligament appears to be thinner and broken up much more, i.e., to be froth-like, before it impacts at the HCU floor level. No adverse results were identified from the type "B" test data.

The Perry Sump room, which is the major encroachment in the suppression pool, is shown in attached Figure (1). The circumferential extent may be calculated in several ways due to the ambiguity of having a rectangular encroachment in an annular pool. Using the vent spacing on the drywell wall, the circumferential coverage is 4.3, while if the midpoint spacing is used, the circumferential coverage is 3.5 cells. Alternately a radial vector drawn through the encroachment corner shows that 32.6° or approximately 3.6 circumferential cells are covered. Thus, the circumferential coverage is less than the "A" or "B" series test encroachment configurations. The radial extent is only 35% which is less than the "A" or "C" series test encroachment configurations. Thus, the size of the Perry encroachment is closest to the 'B' series encroachments which was shown to exhibit froth-like impact characteristics.

A unique aspect of the Perry Sump Room is that it extends vertically up to the steam tunnel. thus not allowing breakthrough horizontally over the encroachment. The "B" series test shows that once the top surface of the bubble approaches the top of the modeled encroachment (approx. 10 ft. full scale) the bubble has achieved both vertical and horizontal breakthrough. This test series shows that breakthrough will occur irrespective of encroachment vertical height. Since the Perry encroachment is closest to the "B" series test configuration, vertical breakthrough is expected. This breakthrough would produce froth-like impact loads on equipment and structures located in the area adjacent to the sump room and approximately 10 ft. above the pool surface.

* Perry Equipment Hatch, Personnel Lock and TIP

A review of equipment and structures adjacent to the sump room was conducted to determine items affected by pool swell. Table 1 shows the results of that review. As can be seen from this attachment, only the LPCI (E12) piping and Steam Tunnel are required post accident. Due to the elevation of the LPCI piping and Steam Tunnel, froth-like impact loads (for which the equipment is designed) would be expected based on the results of the "B" series test.

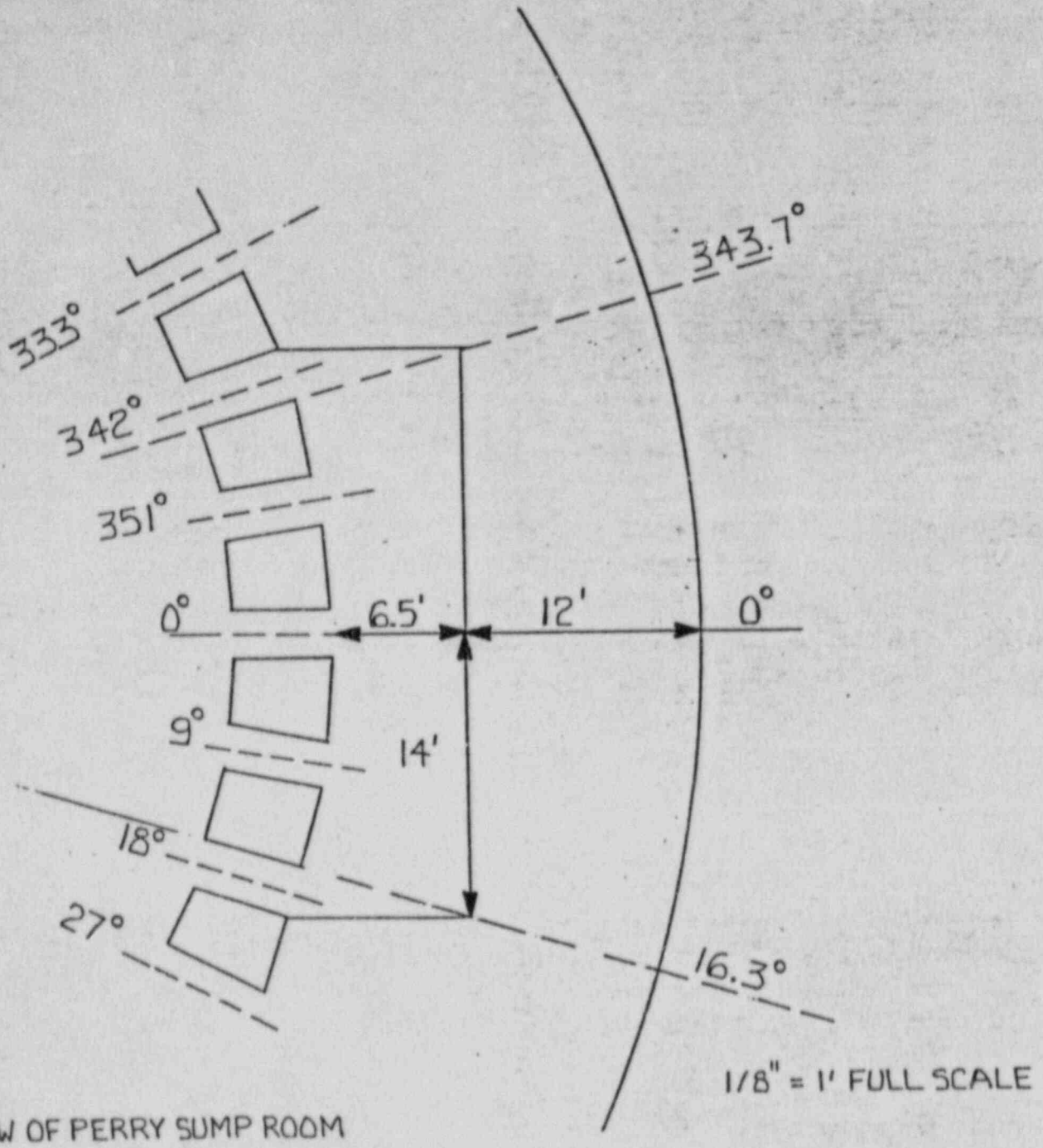
In conclusion, Perry feels that the 1/10 linear Froude scaled Mark III "B" series encroachment test results are applicable for our Sump Room encroachment. Since the LPCI piping and Steam Tunnel adjacent to this encroachment have been designed for froth impact, pool swell loads are not a safety issue.

To confirm this conclusion, Perry proposes to run a plant specific test in the 1/10 linear Froude scaled Mark III encroachment test facility. Attachment 2 is a schedule reflecting the program for resolving the Sump Room encroachment issue and Attachment 3 is the test specification. The test program and plans for final resolution, will be discussed in future meetings with the NRC staff.

Table 1
Equipment/Structures within Pool Swell Area

System	Size	Elevation Above Pool *	Classification	Post Accident Function
1. Piping				
LPCI (E12)	12"	18'10"	Safety	Required Post Accident
Fire Protection (P54)	4"	19'4"	Non-Safety	None
HVAC Vent (M11)	8"	19'8"	Non-Safety	None
2. Conduit				
1R33 R107X	2.5"	Approx. 19'9"	Non-Safety	None
1R33 C3060X	3"	Approx. 19'9"	Non-Safety	None
3. Equipment				
None	-	-	-	-
4. Valves				
None	-	-	-	-
5. Structures				
Steam Tunnel	N/A	Approx. 20'	Safety	Required Post Accident

* Pool Elevation 593'4"



TOP VIEW OF PERRY SUMP ROOM

FIGURE NO. 1

Sump Room Encroachment Issue
Closure Schedule

	Milestones	Schedule
1.	Conference call with NRC.	Oct. 5, 1984
2.	Authorized GE to proceed with plant specific test and justification "sump room encroachment is not a safety concern"	Oct. 5, 1984
3.	GAI/GE/CEI meeting to finalize test configuration and sump room encroachment justification.	Oct. 16, 1984
4.	Receive from GE test schedule & sump room justification.	w/o Oct. 22, 1984
5.	Response to NRC.	w/o Oct. 29, 1984.
6.	Issue Draft Test Specification	Nov. 2, 1984
7.	Meeting with NRC to Discuss Testing Program	Nov. 15, 1984
8.	Issue Draft Test Plan/Test Procedures	Nov. 16, 1984
9.	Issue Test Specification.	Nov. 19, 1984
10.	Issue Test Plan/Test Procedure	Nov. 30, 1984
11.	Start Shakedown Testing.	Dec. 3, 1984
12.	Start Testing Series.	Dec. 10, 1984
13.	Complete Testing Series.	Dec. 14, 1984
14.	Issue Apparent Test Report.	Jan. 11, 1985
15.	Issue Draft Test Report.	Feb. 4, 1985
16.	Proceed with Perry Sepcific Load Definitions (if needed).	Feb. 4, 1985
17.	Meeting with NRC to discuss Draft Test Report.	w/o Feb. 18, 1985
18.	Issue Final Test Report	Feb. 22, 1985
19.	Complete Load Definitions (if needed).	Feb. 25, 1985
20.	Start Perry Evaluation of Load Definations (if needed).	March 1, 1985
21.	Complete Evaluation (if needed).	May 1, 1985
22.	Meeting with NRC to discuss Closure of Issue.	w/o May 13, 1985

ATTACHMENT 3

TEST SPECIFICATION

MARK III 1/10 LINEAR FROUDE SCALED

PLANT UNIQUE RECTANGULAR ENCROACHMENTS TEST

(TEST SERIES 6102)

PWA NO. 5221KL REV.0

DRF NO. T23-00595

November 5, 1984

TABLE OF CONTENTS - TEST SPECIFICATION

1.0 INTRODUCTION/OBJECTIVES

The Mark III 1/10 linear Froude scaled rectangular encroachments tests (Test Series 6102), will be conducted to determine the effect of plant unique encroachments on a pool swell transient. Previous 1/10 scale testing (Test Series 6101) previously determined the effect of typical Mark III encroachments on the transient. The major modification of this test series is that plant unique encroachment geometries will be used.

2.0 EQUIPMENT TO BE TESTED

The multivent encroachment test will be performed in the drywell of the Pressure Suppression Test Facility (PSTF) utilizing a 1/10 linear Froude scale test system based on the Mark III containment geometry. As shown in Figure 1. This test tank will consist of a drywell (with volume of 44.8 ft^3) discharging into a weir annulus having 1/100 scale floor area per vent station (with width of 2.6 in.). In addition, six cells, each having three horizontal vents of 1/10 scale length (6 in.) and diameter (2.75 in.), discharging into a rectangular 1/10 linear scale pool of depth 22.2 in., width 22.6 in. and length 51 in., which represents a 48^o sector of a Mark III suppression pool, will be modeled The wetwell airspace volume need not be specifically modeled, since the entire test tank will be installed in a vacuum chamber for the test. The volume of the vacuum chamber, less the volume of the test tank and associated hardware and instrumentation must be greater than 220 ft^3. The test tank will contain removable encroachments attached to the simulated drywell wall in the corner of the suppression pool. This test facility will also include a quick opening valve which will admit the blowdown medium (air at atmospheric pressure) to drive the transient. These are the only primary suppression system components modeled. Safety relief valves, the residual heat removal system, and other auxiliary systems need not be simulated.

3.0 TEST CONDITIONS

The initial conditions are to be set at the following values:

(1)	Drywell Initial Pressure	1.47 psia
(2)	Wetwell Initial Pressure	1.47 psia
(3)	Pool Initial Temperature	open
(4)	Top Vent Centerline Submergence	9 in.
(5)	Blowdown Medium	Air at atmospheric pressure

4.0 TEST QUALITY REQUIREMENTS

These tests will provide data to supplement the current product design basis and expand the product performance data base. Thus, all quality assurance procedural requirements, performance and evaluations shall be consistent with EOP 35-3.00 requirements for a Type B2 test program (design basis).

5.0 EXPECTED TEST RESULTS

The drywell pressure history will be measured to assure a response representative of the actual plant being tested. High speed movies of the pool response will be taken to determine the effect of the encroachment on the pool swell transient. It is expected that the encroached response will be slower than the clean pool response. It is also expected that impact characteristics at the HCU floor level will be less severe than those seen in the 'A' configuration of the Test Series 6101 testing (Reference 2).

6.0 ACCEPTANCE LIMITS

The measurement uncertainties and test initial conditions shall be set within generally expected instrument resolutions and possible environmental deviations. Initial conditions tolerances are given in the table below. However, deviations from these limits will be left to the discretion of the responsible test engineer in cases of adverse environmental or test conditions.

INITIAL CONDITIONS TOLERANCE

PARAMETER	SPECIFIED LIMITS
Initial Pool Temperature	
Initial System Pressure	1.37 - 1.57 psia
Pool Depth	22.1 - 22.3 in.

The required measurement accuracy for the drywell pressure measurement is $\pm$ 0.1 psia in the 0 to 5 psia range. The pressure measurement system must be capable of tracking a 10 psi/sec. transient. Data is to be recorded on a strip chart recorder with a dynamic response greater than the rest of the measurement system.

7.0 RECORDS AND RETENTION

Output from the Data Acquisition System (DAS), test logs, reduced data, and the method and results of the analysis performed shall be kept under Design Record File (DRF) number T23-00595 with M.N. King as designated Responsible Engineer. The DRF shall be closed and microfilmed following the issuance of the final test report in accordance with EOP 60-3.10.

8.0 DISPOSITION OF EQUIPMENT/MATERIAL

Equipment, facilities or other structures which are designed and built to fulfill the purpose of this test specification shall be consigned to either the responsible test component's inventory or the Test Facility Operation's inventory, whichever is considered appropriate by the Responsible Test Manager and Test Engineer.

9.0 TECHNICAL/LEGAL RISK EVALUATION (TRE/LRE)

A TRE/LRE is not required for these tests.

10.0 SPECIAL TEST REQUIREMENTS

Provision must be made for the filming of high speed motion pictures. The viewing window must be large enough such that the test

facility and a mirror which is at a 45° angle attached to one side of the test tank are easily visible in the films. Lighting from both the bottom and top of the tank must be available. The film speed should be approximately 500 frames per second.

REFERENCES

1. McNamara, EJ, "Test Specification - Mark III Encroachments 1/10 Linear Froude Scaled Bubble Pressure Equalization Test, (Test Series 6101)", PWA #3695ZZ Rev. OK, January 3, 1984.

2. Mintz, S. et al "Mark III Encroachments Summary Report", October, 1984.

Appendix A Plant Unique Encroachment Testing

A. Perry Sump Room

The Perry unique drywell pressure history is specified in Chapter 6 of the Perry FSAR. The Perry Sump Room is 28 feet long and 6.5 wide at its minimum distance as shown in Figure A-1. This room extends to the Perry steam tunnel which is located 20 feet above the initial pool surface. The initial submergence of the sump room is 16 inches. Details of how this encroachment will be modeled in the test will be specified in the Test Plan and Procedures (TP&P).

The initial matrix authorized by this specification is 3 repeat tests of the encroached pool response. If a field modification of the encroachment is required, however, up to 6 additional tests are also authorized.