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October 10, 1984

NUCLEAR LICENSING & SAFETY DEPARTMENT

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

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
License No. NPF-13
File: 0260/0272/L-860.0
Humphrey Containment Concerns
AECM-84/0476

The Containment Issues Owners' Group (CIOG) met with members of your staff on July 14, 1984 to review the results from the 1/10 scale bubble pressure equalization test and discuss conclusions regarding the effects of local encroachments on pool swell. The CIOG concluded on the basis of this test that local encroachments in the suppression pool do not affect the existing clean pool load definition. This conclusion was based on the fact that the pool surface velocity in the encroached pool is always less than the pool surface velocity in the clean portion of the pool. The breakthrough elevation is approximately the same in the clean and encroached portion of the pool. Finally, the water profile at the containment wall in the encroached region of the pool was similar to the profile present in the clean portion of the pool for larger scale tests.

Representatives of the CIOG met informally with members of your staff on August 17, 1984 to provide additional information regarding the 1/10 scale bubble pressure equalization test. In this meeting, the staff was provided with a set of 35 mm slides which showed single frames from the test films, a copy of the first draft of the test report for the 1/10th scale bubble pressure equalization test, and plots of pool surface velocity as a function of elevation up to the top of the test tank. This information was provided to the staff and their consultants at NRC staff request so that they could make an independent assessment of the data and the CIOG's conclusions.

On September 27, 1984, the CIOG met again with the NRC staff and their consultants to discuss the NRC's assessment of the test data. The staff concluded that the test was valid and that the results were applicable for existing Mark III plants. They also concluded that the test indicated no adverse consequences from the type B (3 test cells circumferential, 25% radial) and C (1 test cell circumferential, 50% radial) encroachments. Note that one test cell is equivalent to two columns of vents in a full size plant. However, they did conclude that there would be significant solid water impact at the Hydraulic Control Unit (HCU) floor elevation with a type A (3 test cells circumferential, 50% radial) encroachment. This conclusion differs from the CIOG conclusion that the presence of encroachments similar to those tested will not adversely affect pool swell impact loads in a Mark III plant.

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On September 28, 1984, the CIOG again met with the NRC staff and their consultants to discuss actions which would be taken to achieve final closure of the issue based on comments from the NRC staff and consultants. The CIOG stated that there appeared to be agreement between the CIOG and the NRC that encroachments which were smaller than the "B" series encroachment or the "C" series encroachment do not alter the existing clean pool load definition. The CIOG also stated that the six vent station - 50% radial extent of the "A" series encroachment was not representative of any encroachment in an existing Mark III containment plant. The NRC staff's concern is therefore focused on specific plant encroachments which exceed the size of the "B" and "C" series encroachments but are, in fact, smaller than the "A" series encroachment.

The CIOG committed to define loads on structures, piping and components which could be affected by the encroached pool swell. This commitment was made despite the fact that none of the Mark III plants have an encroachment as large as the "A" series tests. Loads will only be defined for encroachments which are larger than the "B" or "C" series encroachments. The loads will be defined using pool surface velocities and pool curvature from the 1/10 scale bubble pressure equalization test movies for the "A" series encroachment tests. This will represent a very conservative load definition since none of the CIOG members have a single encroachment as large as the "A" series encroachment.

Loads will be calculated separately for expansive structures such as the main steam tunnel and for small structures, such as piping, structural members and other components. The loads on expansive structures will be determined by calculating the momentum in the rising pool surface and determining a duration for the load based upon surface curvature observed in the 1/10 scale test films. The impulse on small structures will be determined for each affected structure using pool swell load definition methods and test data developed for Mark II containment plants. The velocity of the pool surface when the surface contacts each structure will be determined from the 1/10 scale test films. The impulse applied to the structures will be determined from Mark II methodology based on previously completed tests. The loads on a given structure will be divided into two increments with the timing of the load phased to account for pool surface shape observed in the 1/10 scale test. The methodology which will be used to define loads will be generic. A more detailed description of the methodology which will be used in defining these loads will be provided by the Containment Issues Owners Group in a separate submittal. The area of application for loads to be calculated will be specified by each member utility.

Mississippi Power & Light (MP&L) endorses the CIOG proposed approach for resolving this issue. The initial definition of plant unique input to loads evaluation is expected to be completed for the Grand Gulf Nuclear Station (GGNS) by November 9, 1984. The CIOG plans to meet with the NRC to discuss these loads in November. MP&L will complete a detailed structural analysis to verify that the GGNS structures, piping, and components can withstand the plant unique loads. A schedule for completing this analysis will be provided to the NRC during the planned CIOG-NRC meeting.

MP&L does not believe that this issue has any immediate safety significance. The GGNS TIP platform, which is the only significant encroachment in the GGNS suppression pool is calculated to cover only 3 vent stations circumferentially and extends over 52% of pool surface radially. This is significantly smaller than the "A" series encroachment in the 1/10 scale test

which covered the equivalent of six vent stations circumferentially and 50% of the pool radially. The GGNS TIP platform is more directly comparable to the "C" series encroachment which covered the equivalent of two vent stations circumferentially and 50% of the pool radially. The "C" series tests showed that the pool surface in the encroached region has a very low velocity when it reaches the HCU floor and that the surface appears to be breaking up into a froth and dropping towards the initial pool surface when the clean portion of the pool reaches the HCU floor.

The existing design pool swell froth loads for which all equipment and structures have been designed represent a very conservative load definition. The duration of the froth loads was artificially extended beyond the duration observed in the Pressure Suppression Test Facility (PSTF) tests to match the natural frequency of the structure. The peak pressure used in defining load versus elevation was also increased beyond the peak pressure observed in the tests. The tests used higher than expected driving pressures based on conservative methods for predicting drywell pressure response in the GGNS Final Safety Analysis Report.

The loading combinations used to evaluate all equipment and structures are extremely conservative. The pool swell froth load is assumed to occur concurrent with the safe shutdown earthquake (SSE) load and the loads associated with actuation of a single SRV. The application of all these loads simultaneously is highly conservative.

MP&L has completed a detailed evaluation to identify piping and equipment located in the area between the encroachment and the containment wall and above the suppression pool up to the HCU floor elevation. This evaluation included a comprehensive review of piping and structural drawings in conjunction with a plant walkdown of the affected area at and below the HCU floor grating. Attachment 1 to this letter lists the equipment, piping and miscellaneous structures which could be affected by the encroached pool swell. This list identifies the equipment or piping and its post accident function.

Attachment 1 indicates that piping and equipment which could be affected by encroached pool swell can be divided into approximately 4 categories as follows:

1. Equipment and piping which has no safety function and is not required to remain intact following the design basis accident (DBA)
2. Equipment and piping which is safety related but has no active function following the DBA and is not required to remain intact following the DBA
3. Equipment and piping which is safety related and has no active function following the DBA but must remain intact to preserve primary containment integrity
4. Equipment and piping which is safety related and provides a safety function following the DBA.

All of the safety related components and piping runs which are listed in Attachment 1 have redundant corresponding systems or components which will provide the same function. For example, the LPCI-A line provides redundant function for the LPCS, LPCI-B and LPCI-C subsystems. In addition, the interior containment isolation valves are redundant to the containment isolation valves located outside containment.

Attachment 1 demonstrates that very little of the piping in the portion of the containment affected by encroached pool swell contains horizontal piping runs. The only exception is the floor and equipment drain piping which are not safety related. Since only horizontal portions of the piping will experience significant loading from possible changes in the characteristics of the pool swell loads, it is important to note that only small sections of horizontal piping runs are present.

In addition to the piping and equipment located in the area affected by encroached pool swell, MP&L will also evaluate loads on portions of the main steam tunnel which are affected by encroached pool swell. Only 30 square feet of the main steam tunnel slab are affected by the encroached pool swell loads. The area of the main steam tunnel slab affected by encroached pool swell is located near the drywell wall. This is the region with greatest pool surface curvature as observed in the 1/10 scale test which would further decrease the severity of the resulting load. It is not anticipated that encroached pool swell loads will significantly affect the main steam tunnel structure.

During the meeting between the CIOG and the NRC on September 28, 1984, your staff requested each CIOG member to supply drawings showing details of the encroached area. Attachment 2 to this letter contains these drawings for GGNS. The GGNS TIP platform is located at Azimuth 33°, on a radius of 41'6" from the center of the containment. This is shown on drawing number C-1074B in Attachment 2.

MP&L remains committed to assuring that encroached pool swell does not adversely affect plant equipment or structures. Although MP&L does not believe that this issue has any immediate safety significance, MP&L will proceed on an expedited schedule to define loads on plant equipment and structures with data from the 1/10 scale tests and to evaluate these loads. MP&L views this effort as confirmatory.

Yours truly,

S H Hobbs

for L. F. Dale
Director

GWS/SHH:rg
Attachments

cc: Mr. J. B. Richard (w/a)
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ATTACHMENT 1

PIPING AND EQUIPMENT BETWEEN ENCROACHMENT AND CONTAINMENT WALL FROM SUPPRESSION POOL TO HCU FLOOR

SYSTEM	LINE NUMBER	VALVES	NOTE NO.
LARGE PIPE -			
G36	4"-HBD-152	F106	1
G36	4"-HBD-1010	F118	1
P45	4"-HBD-95	F010	2
P45	3"-HBD-753	---	2
P45	6"-HBD-753	---	2
P45	4"-HBD-766	F244	2
P45	4"-HBD-763	---	
P45	6"-HBD-763	F061, F245	2
P45	4"-HBD-757	---	2
P45	3"-HCD-31	F093	2
P45	4"-DBB-146	---	2
E51	20"-HBB-53	---	3
E12	18"-GBB-20	---	4
E12	14"-DBA-29	---	4
E30	30"-HBB-162	---	5
SMALL PIPE			
B33	3/4"-DCB-50	---	6
E51	2"-HBB-60	---	7
E12	1"-HBB-123	---	7
E12	1"-HBB-83	---	7
P45	2"-HBD-13	---	2
P45	2"-HCD-299	---	2
P45	2"-HBD-14	---	2

DESCRIPTION	EQUIPMENT NO.	NOTE NO.
OTHER EQUIPMENT		
Jet Pump "A" Instrument Rack	P010 (Item 124, Dwg M-1004)	8
Reactor Vessel Level & Pressure Instrument Panel	P004 (Item 179, Dwg M-1014)	9
Main Steam Flow Instrument Panel "A"	P015 (Item 180, Dwg M-1014)	8

DESCRIPTION	EQUIPMENT NO.	NOTE NO.
RPIS Multiplexing Unit	P021 (Item 184, Dwg M-1014)	10
Thermocouple (and associated conduits)	1M71TEN009A	11
Hydrogen Ignitor (and associated conduit)	1Q1E61D124	12

MISCELLANEOUS

Miscellaneous Floor Framing Steel (see Dwg C-1075)
Approximately 30 sq. ft. of Main Steam Tunnel Slab

NOTES TO ATTACHMENT 1

1. The RWCU system (G33/G36) serves no safety function. The subject piping is not safety related but has safety-related isolation valves. Valve F106 is a safety related isolation valve inside containment which is backed up by a redundant safety related isolation valve outside containment. Valve F118 is non-safety related. Only a 3'6" horizontal run of piping is located below the grating elevation.

2. The floor and equipment drain system (P45) serves no safety function. The subject piping is non-safety related with safety related isolation valves inside containment (F010, & F061) which are backed up by redundant safety related valves outside containment. Valves F093, F244, and F245 are non-safety related.

3. The RCIC system (E51) is a safety related system but is not required to operate following a large break loss of coolant accident. Only a 7'7" horizontal piping run exists before the piping runs vertically into the suppression pool.

4. The RHR system (E12) is a safety related system used to shutdown the reactor following an accident. The subject piping is part of the LPCI mode of RHR. Redundancy of the LPCI capability is provided via RHR Division 2. One train of low pressure ECCS consists of two RHR pump while the other consists of the remaining RHR pump and one LPCS pump. No horizontal piping runs are present in the affected area. The only piping run is a 45° slope upwards out of the affected area.

5. The suppression pool makeup system (E-30) is a safety related system which provides water from the upper containment pool following a LOCA. A redundant upper pool dump line is located outside the area affected by encroached pool swell. The flow rate through one downcomer provides sufficient makeup to the suppression pool. In addition, all of this piping is vertical and should not be affected by the encroached pool swell.

6. This is a sample line from the reactor water test connection which is used for post accident sampling. This line is required to be functional after an accident. The line is primarily vertical with only a 9 inch horizontal run at El. 123'-9" and a 12 inch horizontal run at El. 131'-5". This line has been designed for 60 psi pool swell load at El. 123'-9" and 15 psi froth impact at El. 131'-5".

7. These lines are condensate drain lines from small relief valves and are not required for reactor safe shutdown, but do form a part of the containment boundary. All of the lines are vertical lines with only a small portion of horizontal runs subject to pool swell impact. 1"-HBB'123 does not have any horizontal run below El. 135'-4". 1"-HBB-83 has 3.5 feet of horizontal run at El. 123'-9" and is designed for 60 psi pool swell load. 2"-HBB-60 has only a 1'-5" horizontal run at El. 128'-3".

8. Previous analyses on pool swell effects on instrument racks were conducted in 1980 & 1981. These analyses showed that racks P010 and P015 did not require protection from pool swell effects. Neither of these pieces of equipment are required to provide an active safety function after a LOCA.

9. This panel is safety related and is protected by a pool swell barrier plate.

10. This panel is safety related; however, it is not required to function following an accident.

11. This thermocouple is not safety related and is not required to function following an accident.

12. A total of 12 igniters are located at the HCU floor elevation. An open circuit failure of the single igniter located in area affected by encroached pool swell will not affect operability of other igniters located at the HCU floor. A short circuit failure could cause a loss of power to approximately one fourth of the igniters in the Hydrogen Ignition System. There is sufficient redundancy under these circumstances for the system to adequately perform its design function. It should also be noted that the igniter assemblies are conservatively designed to withstand pool swell and short term immersion.

ATTACHMENT 2

Attachment 2 includes the following drawings:

Bechtel Drawing C-1044A Rev. 13	Unit 1 - Containment Concrete & Misc. Steel Plan at El. 135'-4" & 147'-7"
Bechtel Drawing C-1056 Rev. 11	Unit 1 - Containment Drywell Wall Concrete Developed El. Outside 90° - 270°
Bechtel Drawing C-1074B Rev. 9	Unit 1 - Containment Structural Steel Framing Plan - Floor El. 120'-10"
Bechtel Drawing C-1074D Rev. 9	Unit 1 Containment Pool Swell Deflectors Plans, Sections & Details
Bechtel Drawing C-1075 Rev. 32	Unit 1 Containment Structural Steel Framing Plan - Floor El. 135'-4" & El. 147'-7"
Bechtel Drawing M-1014 Rev. 23	Equipment Location Auxiliary Building & Containment Plan at El. 139'-0", 135'-4" & 147'-7"
Bechtel Drawing M-1301 Rev. 6	Area Piping Composite Containment El. 114'-6" & 120'-10" Area - Unit 1