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AUTH.NAME AUTHOR AFFILIATION
CURTIS,N.W. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards response to NRC question on SER Open Item 33 re flashing in ECCS pump suction lines. NPSH for ECCS pumps is adequate to preclude local flashing in suction piping.

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NORMAN W. CURTIS
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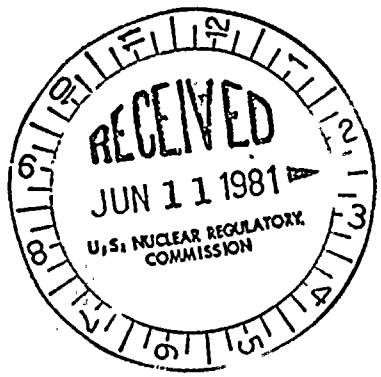
June 10, 1981



Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO NRC QUESTION 211.296
ER 100450 FILE 841-1
PLA-834

Dear Mr. Schwencer:

Attached please find our response to the Commission's question on SER Open Item #33 regarding flashing in the ECCS pump suction lines.

We believe that this response indicates that there is adequate NPSH available to the ECCS pumps to preclude local flashing in the suction piping.

Very truly yours,

R J Shovlin for

N. W. Curtis
Vice President-Engineering and Construction-Nuclear

Attachment.

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S/1

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211.296. We have reviewed the suction piping for all ECCS pumps to determine if adequate NPSH is available to preclude local flashing in the pipe. Local flashing can occur if the absolute pressure at that point ($h_{a'}$) is less than the vapor pressure (h_{vpa}) of the fluid in the pipe. ($h_{a'} = h_{stat} + h_{atm} - h_{fic} > h_{vpa}$)

The suction piping for the core spray system is horizontal from the suction strainer to the outside of the suppression pool penetration and thereafter it slopes down continuously to the pumps without any vertical rises. Therefore taking the location outside of the penetration (Elevation 658'-1") as the highest point in the system. (Refer to Mode "E" of the CS NPSH calculations presented as a response to SER Open Item 33 by letter PLA-779.) For simplicity, conservatively assume that all 8.88 feet of friction loss (h_f) is between the suction strainer inlet and the first drop right outside of the suppression pool penetration. Using the NPSHA numbers from that calculation, the available $h_{a'}$ would be:

$$h_{a'} = (670-658.08) + 33.16 - 8.88 = 36.2 \text{ feet}$$

The required pressure is the vapor pressure at 200°F: $h_{vpa} = 27.61$ feet. Since the $h_{a'} > h_{vpa}$ there is adequate pressure at this point to prevent local flashing. The remainder of the piping from this point to the pump does not go upward, therefore we can conclude that there is no local flashing.

Similarly the suction piping for the RHR system is horizontal from the suction strainers to the outside of the suppression pool penetration and thereafter it slopes down continuously to the pump without any vertical rises. Therefore taking the location outside of the penetration (Elevation 658'-1") as the highest point in the system. (Refer to Mode "C-2" of the RHR NPSH calculations presented as a response to SER Open Item 33 via letter PLA-779).

For simplicity, conservatively assume that all 6.7 feet of friction loss (h_f) is between the suction strainer inlet and the first drop right outside of suppression pool penetration. Using the NPSHA numbers from that calculation, the available $h_{a'}$ would be:

$$h_{a'} = (670-658.08) + 33.16 - 6.7 = 38.38 \text{ feet}$$

The required pressure is the vapor pressure at 200°F: $h_{vpa} = 27.61$ feet. Since the $h_{a'} > h_{vpa}$ there is adequate pressure at this point to prevent local flashing. The remainder of the piping from this point to the pump does not go upward, therefore we can conclude that there is no local flashing.

However, the suction pipe for the HPCI pump takes a vertical rise of four feet inside the suppression pool, to the elevation of the suppression pool penetration, elevation 658'-1". Refer to the NPSH calculation presented in the FSAR section 6.3.2.2.1.2. For simplicity, conservatively assume that all 16 feet of friction loss (h_f) is between the suction strainer inlet and the high point.

Using the NPSHA numbers from this section, the available $h_{g'}$ would be:

$h_{g'}$ = (670*-658.08) + 33.16 - 16 = 29.08 feet

The required pressure is the vapor pressure at 140°F: h_{vpa} = 6.8 feet. Since the $h_{g'} > h_{vpa}$ there is adequate pressure at this high point to prevent local flashing. The remainder of the piping from containment isolation valve to the pump does not go upward and therefore there is no local flashing.

Conclusion: There is adequate NPSH available to preclude local flashing in the ECCS suction piping.

* Please note that FSAR will be revised to state that minimum low water level elevation inside the suppression pool is 670 feet.

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DESCRIPTION: Ltr with attachment re our letters of 4-17-75, and 4-23-75, provides add. info with regards to the LOCA related suppression pool hydrodynamic phenomena...

ENCLOSURES:

ACKNOWLEDGED

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TWO NORTH NINTH STREET, ALLENTOWN, PA. 18101 PHONE: (215) 821-5151

June 5, 1975

Dr. Walter R. Butler, Chief
Light Water Reactors Branch 1-2
Division of Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos. 50-387
50-388

SUSQUEHANNA SES
ADDITIONAL INFORMATION-CONTAINMENT DESIGN
ER 100450 FILES 840-2, 170
PLA-69

Dear Dr. Butler:

Your letter of April 17, 1975 indicated that the NRC requires additional information relative to the design of the containment for the Susquehanna Steam Electric Station, Units 1 and 2. You requested that we submit to you within thirty days our program and schedule for prompt resolution of the potential problems associated with the LOCA related suppression pool hydrodynamic phenomena identified by General Electric during Mark III testing.

Your letter of April 23, 1975 requested additional information related to the effects of main steam relief valve operation. You requested that we respond within 90 days or that we advise you within 15 days if we cannot meet this schedule. Subsequently, we informed you that we would submit our proposed program and schedule for resolving these issues the week of June 2, 1975. Since the investigations of the phenomena discussed in your letters are interrelated, we have chosen to respond to both subjects together.

Prior to receipt of your letters, we had begun a program to evaluate certain suppression pool phenomena. These phenomena, as identified in our April 4, 1975 letter to Mr. J. P. O'Reilly, are:

1. Suppression Pool Swell

2. Containment Vent Pipe Horizontal Loads from Steam Condensation.

3. Main Steam Safety/Relief Valve discharge pipe air clearing.

The program to investigate these three phenomena, and the other phenomena mentioned in your letter, is described in the attachment and reflects our long-term approach to resolution of these problems. The program and schedule were developed in conjunction with General Electric by the utilities owning plants with Mark II containments.

As part of our near term efforts to permit restart of containment construction, we have done a substantial amount of work in terms of defining bounding loads, based on information supplied by General Electric, and determining the capability of the existing structures. Based on this work, we have concluded that some of the "holds" placed on containment construction activities can be lifted. We have scheduled a meeting for June 17 with the NRC to discuss the bounding loads, methods of structural analysis used to determine structural capability, and our plans for the resumption of containment construction.

Very truly yours,

NW Curtis

N. W. Curtis
Vice President-Engineering & Construction

CTC:MAS

c-Messrs.
Mr. J. P. O'Reilly - US Nuc. Reg. Com.
Director-Region I
U.S. Nuclear Regulatory Commission
931 Park Avenue
King of Prussia, PA 19406

ATTACHMENT

MARK II CONTAINMENT PROGRAM & SCHEDULE

	Program	Schedule	LOCA Questions**	SRV Questions**
1.	Submit suppression pool and relief valve drawings reflecting current design.	July, 1975	1	1, 5*
2.	Submit a generic "Forcing Function Report" which will provide the time history of pool dynamic forcing functions and the methods for relating these functions to the containment structures and components.	Sept., 1975	2, 7*	1*, 2, 4*6
3.	Submit a description of suppression pool temperature monitoring system. (Temperature limits and transients will be described in the Final Safety Analysis Report.)	Oct., 1975	Not Appl.	7, 8, 9, 10
5.	Submit a preliminary assessment of containment structures and components based on the Forcing Function Report.	Nov., 1975	3, 4, 5, 6, 7*, 8	3, 4*, 5
5.	Submit a schedule for the generic test program and mathematical models which justify the forcing functions used to assess containment structures and components.	Dec., 1975	7	4
6.	Submit a schedule for the final assessment of containment structures and components.	First Quarter 1976	-	-

* Partial Answer

** Question Numbers correspond to the additional information requests contained in NRC letters dated April 17 and April 23, 1975.