

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

September 30, 1998 NOC-AE-000294 File No.: GO3.08 10CFR50 STI:30712192

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U.S. Nuclear Regulatory Commission Attention: Document Control Desk Washington, DC 20555-0001

> South Texas Project Units 1 and 2 Docket Nos. STN 50-498, STN 50-499 Response to Staff Questions on Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps

Reference: Letter from S. E. Thomas, South Texas Project, to the Nuclear Regulatory Commission dated August 3, 1998 (NOC-AE-000235)

In response to staff questions on the referenced letter regarding the Request for Additional Information on Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head (NPSH) for Emergency Core Cooling and Containment Heat Removal Pumps," the South Texas Project Nuclear Operating Company hereby submits the requested information. The staff questioned the numeric NPSH results reported in the above reference given the numeric inputs provided. There was a difference of 0.3 feet that was not explicitly included in the table for calculation MC-6220. Attachment 1 shows the revised table of values which includes the pump can losses of 0.3 feet to explain this difference. This level of detail was not included in the previous response. Attachment 2 is a copy of the reference which provides the can losses.

This letter contains no new commitments to the Nuclear Regulatory Commission. Should you have any questions in regard to this response, please contact Mr. K. D. House at (512) 972-8922 or me at (512) 972-7162.

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 S. E. Thomas, Manager, Design Engineering

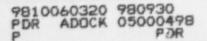
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Attachments:

 Revised Table-Current Engineering Calculation
Letter from Westinghouse to R. L. Rogers (Bechtel) dated August 29, 1985

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## **ATTACHMENT 1**

PUMP	REQUIRED NPSH	AVAILABLE NPSH	ha	h <sub>vpa</sub>	h (can)	h <sub>st</sub>	h <sub>ts</sub> (piping)	h <sub>fs</sub> (screen)
Low Head Safety Injection	16.5	21	h <sub>vpa</sub>	h <sub>a</sub>	0.3 ft	28.9 ft	6.62	1.01
High Head Safety Injection	16.1	20.8	h <sub>vpa</sub>	ha	0.3 ft	28.7 ft	6.56	1.01
Containment Spray	16.4	20.6	h <sub>vpa</sub>	h <sub>a</sub>	0.3 ft	28.9 ft	6.94	1.01

## Current Engineering Calculation (Source: Calculation MC-6220)

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Westinghouse Electric Corporation Water Reactor Divisions Nuclear Operations Division

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Box 355 Pittsburgh Pennsylvania 15230

August 29, 1985 S.O. No: 280

Ref.: ST-YB-WN-1102

Action Item No.: 755A T-1447

Mr. R. L. Rogers Project Engineering Manager Bechtel Energy Corporation 5400 Westheimer Court P.O. Box 2166 Houston, Texas 77252-2166

## SOUTH TEXAS PROJECT UNITS NUMBERS 1 & 2 CONTRACT NUMBERS 35-1197-4000 AND 35-1197-8000 CONTAINMENT SPRAY AND SAFETY INJECTION PUMPS NPSH

Dear Mr. Rogers:

Two questions concerning the net positive suction head (NPSH) requirements for the Containment Spray and Safety Injection pumps manufactured by Pacific Pumps have been raised by the project. The questions are as follows:

- 1. What is the required NPSH at the suction nozzle centerline of these pumps?
- Does the required NPSH specified by Pacific Pumps at the centerline of the first impeller include the effects of can losses?

The minimum required NPSH at the suction nozzle centerline is equal to the velocity head plus one haif of the suction nozzle (pipe) diameter expressed in feet. This criteria was used by Pacific Pumps to derive the family of NPSH curves for vertical pumps (identified as Pacific curve no. 28949) transmitted by Bechtel in the referenced letter. Although these generic curves were not specifically developed for nuclear pump applications, the information may be applied to the South Texas Plant multi-stage vertical pumps.

The available NPSH at the suction mozzle centerline must meet or exceed the minimum requirement defined in the preceding paragraph. The available NPSH equals the absolute pressure on the surface of the supply liquid plus the elevation head referenced at the suction nozzle centerline minus the vapor pressure of the supply liquid minus the suction line losses (please see the attached Pacific Pumps letter).

ST-WN-YB-1883

The Pacific Pump instruction manuals include test curves of the required NPSH at the centerline of the first impeller of these vertical pumps. The NPSH testing was performed using a special test rig which utilized the pumps destaged to two impellers. The test cans were very similar to those supplied with the pumps except the height of the can was greatly reduced. The test configurations were required in order to allow accurate NPSH measurements at the first impeller. NPSH testing requires actual cavitation at the first impeller, which would not have been possible with a full scale test rig since the static head provided by the can height precludes cavitation at the impeller.

The NPSH test rig accounted for all significant head losses resulting from the can configuration. The test can design included losses due to the  $90^{\circ}$  turn at the suction nozzle, the  $180^{\circ}$  turn at the bottom of the can and also swirl effects. The only losses not fully accounted for are those in the vertical section of the pump. These losses are very small in magnitude and are essentially offset by the downward velocity head gained in the pump. Pacific Pumps reports that the total head losses due to the can configuration are on the order of 0.3 feet of head; therefore, the measurement inaccuracy of the test is greater than the can losses.

It is important to recognize that these vertical multi-stage pumps have independent NPSH required at the first impeller and the suction nozzle. The NPSH required at the first impeller is provided by the manufacturer's design of the pump can. The project needs to provide only the required NPSH at the suction nozzle centerline.

If there are any question on this matter please feel free to call.

Very truly yours.

WESTINGHOUSE ELECTRIC CORPORATION

F. J. Twogood, Manager South Texas Project

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Attachment

cc:	R.	L.	Rogers (BEC)	11.	14	
			Melton (BEC)	11.		
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	E.	٧.	Dotson (HL&P)	31.	3A	
			Micotre(W Houston Office)	11.	14	
			Hogarth TH So. Texas Site)			

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