



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

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.

S. E. Thomas,
Manager,
Design Engineering

KAW

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

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P PDR

c:

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ATTACHMENT 1

Current Engineering Calculation (Source: Calculation MC-6220)

| PUMP | REQUIRED NPSH | AVAILABLE NPSH | h_a | h_{vpa} | h (can) | h_{st} | h_{fs} (piping) | h_{fs} (screen) |
|----------------------------------|------------------|-------------------|-----------|-----------|--------------|----------|----------------------|----------------------|
| Low Head Safety Injection | 16.5 | 21 | h_{vpa} | h_a | 0.3 ft | 28.9 ft | 6.62 | 1.01 |
| High Head Safety Injection | 16.1 | 20.8 | h_{vpa} | h_a | 0.3 ft | 28.7 ft | 6.56 | 1.01 |
| Containment Spray | 16.4 | 20.6 | h_{vpa} | h_a | 0.3 ft | 28.9 ft | 6.94 | 1.01 |



ST-WN-YB-1883

Westinghouse
Electric Corporation

Water Reactor
Divisions

Nuclear Operations Division
Box 355
Pittsburgh Pennsylvania 15230

August 29, 1985

M22.2

S.O. No: 280

Ref.: ST-YB-WN-1102

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

Action Item No.: 755A
T-1447

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?
2. 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 half 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 nozzle 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).

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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° turn at the suction nozzle, the 180° 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

RKA/mk/6737d

Attachment

- cc: R. L. Rogers (BEC) 1L, 1A
- W. I. Melton (BEC) 1L, 1A
- ~~W. I. Melton (BEC)~~ 1L, 1A
- E. W. Dotson (HL&P) 3L, 3A
- T. E. Nicotro (W Houston Office) 1L, 1A
- A. L. Hogarth (W So. Texas Site) 2L, 2A

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