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DESCRIPTION:

Ltr re our 11-14-75.....trans the following:

ENCLOSURES:

Info concerning ECCS Sump testing..........

PLANT NAME: Davis Besse #1

FOR ACTION/INFORMATION

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TOLEDO
EDISON

LOWELL E. ROE
Vice President
Facilities Development
(419) 259-5242

Docket No. 50-346

January 8, 1976

A. Schwencer, Chief
Light Water Reactors Branch 2-3
Division of Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Enclosed is the information regarding the Davis-Besse Nuclear Power Station Unit 1 pertaining to ECCS sump testing as requested in your letter of November 14. 1975.

Yours very truly,

Lowell E Roe

Enclosure

bj d/13

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RESPONSES TO NRC LETTER ON ECCS SUMP

Dated November 14, 1975

1. In reviewing the NPSH calculation as presented on page 6-79 of the FSAR, it was found that the dynamic head ($V^2/2gc$) was incorrectly subtracted from the equation for NPSHA. Making this correction the equation becomes.

$$NPSH = Pa + (Ea-Ep) - Hf - \frac{Pv}{\rho}$$

It was also discovered that the design flows were used in the calculation instead of pump runout flows. Runout flow is 4000 gpm for the decay heat pump and 1500 gpm for the containment spray pump. Also, the flood level used in the original calculation was 561'-0" instead of the correct level of 567.1 feet. Making these corrections and using the assumption that the pressure above the water of the sump surface (Pa) is equivalent to the vapor pressure of the pumping fluid at the pump inlet (Pv/ρ), the value of each term in the above equation was calculated and is listed below. Pipe and fittings losses were calculated using the information in Crane Technical Paper No. 410 based on a flow of 5500 gpm through each train of the sump suction piping and flows of 4000 and 1500 gpm in the separate decay heat pump suction and containment spray pump suction piping respectively.

	Flow	Ea	Ep	Hf	NPSHA	NPSHR
Decay Heat Pump 1-1	4000gpm	567.1	547.9	6.1	13.1	9.5
Decay Heat Pump 1-2	4000gpm	567.1	547.9	7.5	11.7	11.0
Containment Spray Pump 1-1	1500gpm	567.1	546.5	5.1	15.5	11
Containment Spray Pump 1-2	1500gpm	567.1	546.5	6.0	14.6	11

Ea is the flood level assuming 360,000 gallons of water from the borated water storage tank and subtracting the space occupied by the reactor vessel and the primary and secondary shield walls.

No water was assumed to come from the primary coolant system or the core flood system, for added conservation.

NPSHR was obtained from pump performance curves furnished by the vendors.

2. The piping between valves DH-9A and DH-9B and the decay heat pumps and the containment spray pumps is filled and vented during pre-operational testing. After it is filled it is maintained full by the static head of the borated water storage tank.

   The piping between the emergency sump and valves, DH-9A and DH-9B, is higher at the containment sump than it is at valves DH-9A and DH-9B; therefore, these remaining portions of the decay heat and containment spray pumps suction piping will vent as the sump and piping fills.

   For these reasons no air pockets can form in these piping sections.

3. The NPSH required for the containment spray pumps was tested by the manufacturer in accordance with the Hydraulics Institute Standards. The test was performed by throttling a valve in the suction line of the test apparatus while holding the flow rate constant at the design value of 1300 gpm. In accordance with the referenced standard, a 3% drop in pump head was used to indicate the onset of cavitation. Using the point thus obtained, the remainder of the NPSH required VS flow rate curve was extrapolated based on the extensive test and operating data accumulated for the pump model. From this curve the NPSH required for the containment spray pump at 1500 gpm is 11 feet.

   The NPSH required for the decay heat pumps was tested in accordance with the ASME Power Test Code Centrifugal Pumps PTC-8.2.

4. As discussed in part 1, the calculated NPSHA is based on pump runout flow. Based on these flows, adequate margin exists between NPSH required and available. Mechanical stops added to valves DH-14A and DH-14B ensure that the decay heat pumps do not pump runout under any conditions by ensuring the valve is throttled to provide sufficient pressure drop. Similarily, motor operated globe valves are located on the discharge of the containment spray pumps. These valves are automatically positioned upon initiation of recirculation from the emergency sump to provide sufficient pressure drop and thereby prevent exceeding of pump runout.

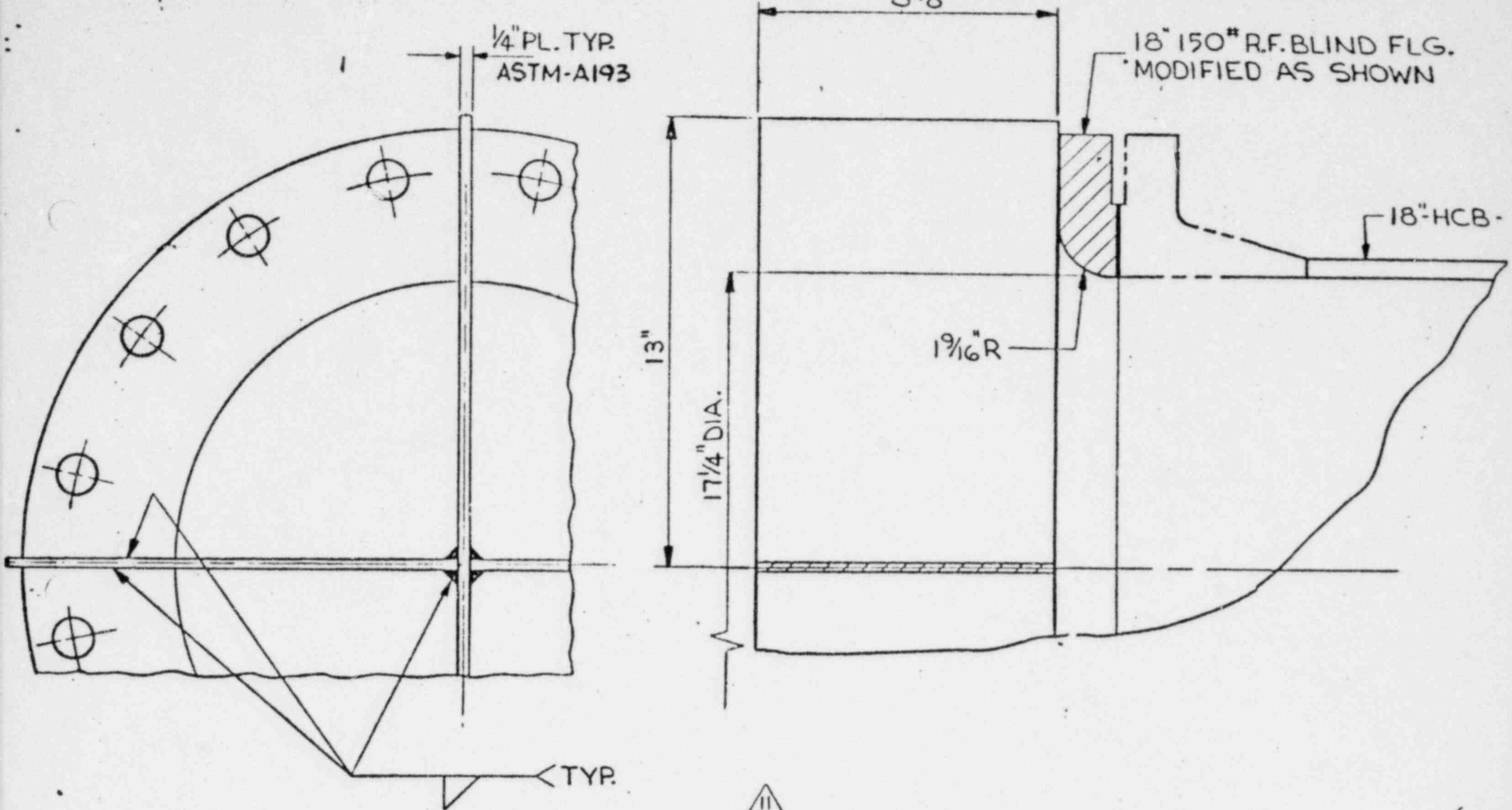
5. Based on the assumption of suction from the sump with no additional flow provided to the sump, there is no minimum test flow which could be used to verify the calculations. Due to the low capacity of the sump, the flow must be extremely low for the test to be of sufficient duration. This low flow would not yield meaningful pressure drop data as the pressure drop would be too insignificant for measurement. With the sump piping modified as detailed in response to question 6, a minimum flow of 1500 gpm could be used to verify the calculations.

6. Due to the presence of various items in the vicinity of the containment sump it is not considered feasible to expand the capacity of the sump. For instance, located adjacent to the sump are the incore instrumentation piping and tunnel. If a temporary cofferdam were erected for the sump testing, and the cofferdam were to fail, it could significantly damage the incore instrumentation piping. It would be extremely difficult to construct a temporary cofferdam around the sump due to physical limitations such as, insufficient area and interference with piping and cable trays.

   As an alternate to expanding the capacity of the sump, a pressure drop test at design flow rate could be performed by installing temporary piping between the two inlet pipes in the emergency sump. Flow would be established from the borated water storage tank to the sump inlet through one train, through the temporary piping into the inlet for the other train, to the suction of the decay heat pump and containment spray pump, and back to the borated water storage tank. The head loss in the piping would be measured with pressure indicators. The measured pressure loss would be compared to the calculated loss. It should be noted that the calculated loss would be modified to account for the different arrangement at the sump (no inlet losses).

7. The maximum gravity drain rate from the borated water storage tank to the containment sump has been calculated to be 11,100 gpm, for train 1 and 10,400 gpm for train 2.

8. An anti-vortexing device has been designed for the inlet of each line in the emergency sump. The design of the device is shown on the attached sketch. A study is currently in progress which will analytically verify that vortexing will not occur.



DETAIL-"A"
ANTI-VORTEX
SCALE: 3"=1'-0"
THIS DWG. (E-3).