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August 12, 1974

Mr. James P. O'Reilly, Director  
Directorate of Regulatory Operations  
Region I  
U. S. Atomic Energy Commission  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Subject: Analysis of the charging pump choke filter vent line failures  
R. E. Ginna Nuclear Power Plant, Unit No. 1  
Docket No. 50-244

Dear Mr. O'Reilly:

On July 16, 1974 an interim report was submitted concerning abnormal occurrences 74-12 and 74-13. These involved failures which occurred at different times at welds on each end of the 3/4 inch vent nipple located on the pump discharge side of the charging pump choke filter. Since July 16, 1974 reports of independent analysis and investigative action have been received from Bechtel Corporation and Southwest Research Institute. Along with the independent analyses, an in-house review of the history of the vent line failures was made including a review of studies of the original evaluation and design of the charging pump filter system and the analysis after the installation of the choke filter in 1971.

The original vent line fillet welds were installed with the Shielded Metal Arc Welding Process. These welds had a leg size of about 5/8 inch which is larger than a normal fillet weld on a 3/4 inch pipe. On December 11, 1973 a pin hole leak was discovered in the weld between the nipple and weldolet. This leak was the result of a pore which propagated to the base of the weld. The two original fillet welds were removed and replaced with a new nipple and fillet welds with a leg size of about 3/4 inch using the Gas Tungsten Arc Welding Procedure. These welds failed on the following dates:

- A. June 29, 1974 - weld between nipple and valve
- B. July 2, 1974 - weld between nipple and weldolet.

The failure of the weld between the nipple and valve which occurred on June 29, 1974 was analyzed and the following information was obtained. The metallurgical analysis revealed a major crack with no secondary fissuring or evidence of corrosion. The sample was basically free of sensitization; therefore, it was concluded that the failure was the result of a fatigue mechanism.

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TO Mr. James P. O'Reilly

The cracked fillet weld between the weldolet and nipple which was discovered on July 2, 1974 was determined to be the result of a crack that propagated through the weld from an area where there was no fusion. This failure was accelerated because the area of no fusion acted as a stress riser thus causing the susceptibility to fatigue and failure.

The welds made as a repair to the leak of December 11, 1973 were normal for 3/4 inch socket welds and were adequate for the internal pressure pulsations exerted on the system and the dynamic stresses due to system vibration at normal conditions. However, based on data obtained in the original evaluation and design of the charging pump filter system <sup>1/</sup> it has been concluded that various modes of operation of the charging pump system could result in dynamic vibration of sufficient magnitude to produce a combined stress which caused the fatigue failure in these welds. Consequently these replacement welds were of insufficient size to recognize the dynamic response of the system. Review of the stress analysis made for this system verified this inadequacy. Therefore, to prevent recurrence of the fatigue failure, the vent line was reinstalled with fillet welds of the following leg sizes:

A. Valve to nipple - 1/2 inch leg size

B. Weldolet to nipple - 3/4 inch leg size.

The stress levels in the welds should now be reduced by a factor of about 6 to 1. The NSARB concurred with this corrective measure.

The Plant Operations Review Committee approved the additional recommendation to install a temporary support bracket designed to minimize vibrations in the vent line under any mode of operation.

The Plant Operations Review Committee also approved the final corrective action which is planned for our next refueling outage and will consist of relocating the vent line to the downstream side of the charging pump choke filter. The choke filter was installed in 1971 to eliminate pulsations which resulted in similar fatigue failures of pipe stub end connections. <sup>2/</sup> This filter effectively reduced the pulsations in the charging pump system by several orders of magnitude. Since the vent line which failed is located upstream of the filter it is subject to high dynamic pulsations as a result of the variable speed operation of the charging pumps. Relocation of this vent line downstream of the choke filter, as well as the corrective measures stated above, should prevent this problem from recurring in the future.

Very truly yours,

*Keith W. Amish*  
Keith W. Amish

<sup>1/</sup> Southwest Research Institute Report, "SGA Field Evaluation and Pulsation Analysis" (June 22-26, July 6-10, 1970)

<sup>2/</sup> Southwest Research Institute Report, "Charging System Filter Analysis" (May 10-12, 1971)