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REPLY TO
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March 16, 1990
BVY 90 - 033

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

References: a. License No. DPR-28 (Docket No. 50-271)
b. Letter BVY 89-31, VYNPC to USNRC, dated March 28, 1989.

Subject: Supplemental Information Regarding Vermont Yankee Feedwater Check Valve V28B Flaws Evaluation

Dear Sir:

In Reference (b), Vermont Yankee responded to an NRC staff request to provide the subject evaluation. This evaluation addressed two flaws detected during the Cycle 13 outage in-service inspection of feedwater check valve V28B. The two flaws exceeded ASME Section XI acceptance criteria, as provided in IWB-3500.

On March 5, 1990, M. Fairtile of NRC contacted L. Tremblay of VYNPC concerning NRC's review of the subject evaluation and the need for a formal transmittal to NRC of supplemental information regarding such review. This conversation was followed by a second telephone conversation between M. Fairtile and R. Smith of VYNPC, in which the exact nature of the information needed was discussed. It was agreed during this second conversation that VYNPC would formally transmit the requested supplemental information to NRC.

Please find attached Enclosure 1, which provides the supplemental information requested by NRC to complete review of this issue. Please also note that Vermont Yankee remains committed to replacement of the subject valve during the upcoming 1990 refueling outage.

Should you have any questions with the attached information, or require any additional information, please contact this office.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Leonard A. Tremblay, Jr.
Senior Licensing Engineer

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS

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Vermont Yankee Nuclear Power Station

Feedwater Check Valve V28B

Hardfacing/Casting Defects

Background

During the 1989 refueling outage at Vermont Yankee feedwater system check valve V28B was disassembled for inspection as part of the plant pump and valve inservice test program. While the valve was open for verification of proper check valve functions cracking was observed in a Stellite wear pad. (The wear pads provide a low wear surface for the piston to slide up and down on.) Further inspection revealed cracking on the wear pad on the opposite side of the valve. Ultrasonic examination was performed to determine the flaw depth; one flaw had a maximum flaw depth of 0.65 inches and the other a maximum flaw depth of 0.40 inches. Three other valves of the same design were disassembled and also found to have cracking in the Stellite wear pads. These valves were ultrasonically examined; the maximum flaw depth in any valve was 0.15 inches, which is within the ASME Section XI flaw acceptance criterion.

A fracture mechanics evaluation was conducted, and it was concluded that the valve was acceptable without repair for at least one cycle.

Description of Valves

Feedwater check valve V28B is a 16 inch angle piston check valve manufactured by the Walworth Company (manufacturer's style 5386 PSB). The purpose of the valve is to prevent flow out of the reactor pressure vessel or reactor containment in the event of a feedwater piping failure. The valve is shown in Figure 1.

The valve is made from A216 WCB cast carbon steel in the normalized and tempered condition. (The valve was heat treated by normalizing at 1700F for 3 hours, followed by air cooling and then tempered at 1180F for 3 hours, also followed by air cooling.) The valve was radiographed, liquid penetrant examined and hydrostatically tested at 3250 psig.

There are three other feedwater check valves of similar design at Vermont Yankee.

In order to minimize wear and prevent the valve piston from sticking open or closed due to galling four Stellite wear pads 90 degrees apart are provided in the piston bore. The wear pads are approximately one inch wide and run the full length of the piston bore. The wear pads were created by machining a 90 mil deep (approximate) groove in the bore and weld depositing Stellite. Following the weld deposit the bore was machined to the finished diameter. The Stellite is flush with the bore.

Description of Flaws

Visual cracking was observed in the Stellite wear pads in valve V28B. Ultrasonic examination indicated a flaw depth of 0.65 inches in one flaw and 0.40 inches in the second. The examination was hindered by the presence of internal casting defects, such that absolute determination of a continuous flaw depth was not possible. Since the actual flaw situation could not be determined it was conservatively assumed that the flaw was a continuous, surface connected semi-elliptical flaw.

The three other feedwater check valves of the same design were also disassembled and visually inspected for cracking. Stellite cracking was found in the three other valves. Ultrasonic examinations revealing flaw depths ranging from 0.10 to 0.15 inches. Given the difficulty of inspection due to the casting structure, the flaws are considered to be in the Stellite or perhaps slightly into the weld heat affected zone. These flaws are fully acceptable under the rules of ASME Section XI.

Flaw Evaluation

Since the flaws in valve V28B are rejectable under the rules of Section XI the flaws must be repaired or accepted by flaw evaluation techniques. Given the significant difficulty of beginning an unplanned repair in difficult circumstances a decision was made to pursue flaw evaluation and acceptance. Because of the location of the flaw (at the juncture of the two intersecting cylinders that make up the valve body) the standard Code rules in Section XI could not be used. A two dimensional finite

element analysis of the region containing the flaw was performed and the resultant stresses used in the fracture mechanics analysis.

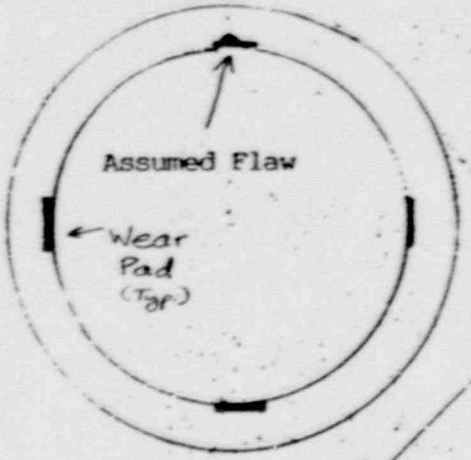
The results of the flaw evaluation demonstrate that the valve is acceptable for continued operation without repair.

Compensatory Measures

The USNRC required that augmented leak detection capability be installed at the valve location. Leak monitoring tape was installed on the valve prior to startup from the refueling outage.

Long Term Plans

The USNRC allowed plant startup without repair providing Vermont Yankee committed to repair or replace the valve at the next refueling outage (scheduled to begin in September 1990). After reviewing the options Vermont Yankee has decided to replace the valve.



View A-A
Showing Assumed Flaw

FIGURE 1