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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
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IE Information Notice No. 80-38: CRACKING IN CHARGING PUMP CASING CLADDING

Description of Circumstances:

In January 1980 Commonwealth Edison Company (CECo) reported to the NRC that a radiographic examination had revealed crack indications in the cladding on the suction end plate of the 1A charging pump at Zion Unit 1. This centrifugal charging pump 1A is one of two pumps installed in Zion Unit 1 for high head safety injection of borated water to the reactor loops. These pumps are additionally utilized as charging pumps during normal operation. ASME Section XI inservice inspection rules referenced in the plant technical specification requires pump examination only once during the 10 year service interval and this pump had been in service about 7 years.

The pumps are 2-1/2 inch, 11 stage, Type IJ manufactured by the Pacific Pumps Division of Dresser Industries. The pump casing end assembly in the area of interest, Figure 1, consists of a suction end plate of A515 grade 60 carbon steel plate welded to the casing barrel forging of A266 class 1 carbon steel using an Inconel weldment. The entire inner surface is clad with type 308 stainless steel applied by submerged arc welding.

An in-situ ultrasonic examination conducted in late April confirmed clad cracking indications at the barrel case to end plate inner radius for approximately 330 degrees around the circumference and that the cracking possibly extended into the pump base material in the bottom 180 degrees of the assembly. A review of the original radiographs revealed crack like indications in the clad overlay, however, not to the extent observed during this examination.

Subsequently, the entire suction end of the pump was removed and cross sections metallographically examined to further evaluate the nature and extent of the cracking. It was determined that initiation and propagation of the clad cracks probably resulted from stress concentration and dilution effects in the initial corner bead pass due to the difficult access and bead sequencing required by the fairly sharp corner geometry. Extension of the cracks at the base metal-clad interface ranged to a depth of 1/16 inch maximum in the 1-1/2 inch thick base material. These crack tip areas were well blunted and slightly cavitated from corrosion effects due lengthy exposure to the localized boric acid attack. Examination of the crack morphology revealed that the clad cracking essentially arrested at the base metal-clad interface and that base metal corrosion progressed at a relatively slow rate.

The 1A charging pump was replaced with a new pump provided with a casing constructed entirely of stainless steel. The licensee is currently developing improved NDE procedures for examination of the three remaining pumps at the next refueling outage. Further, the licensee and pump manufacturer are developing repair procedures in the event cracks are discovered in the remaining pumps.

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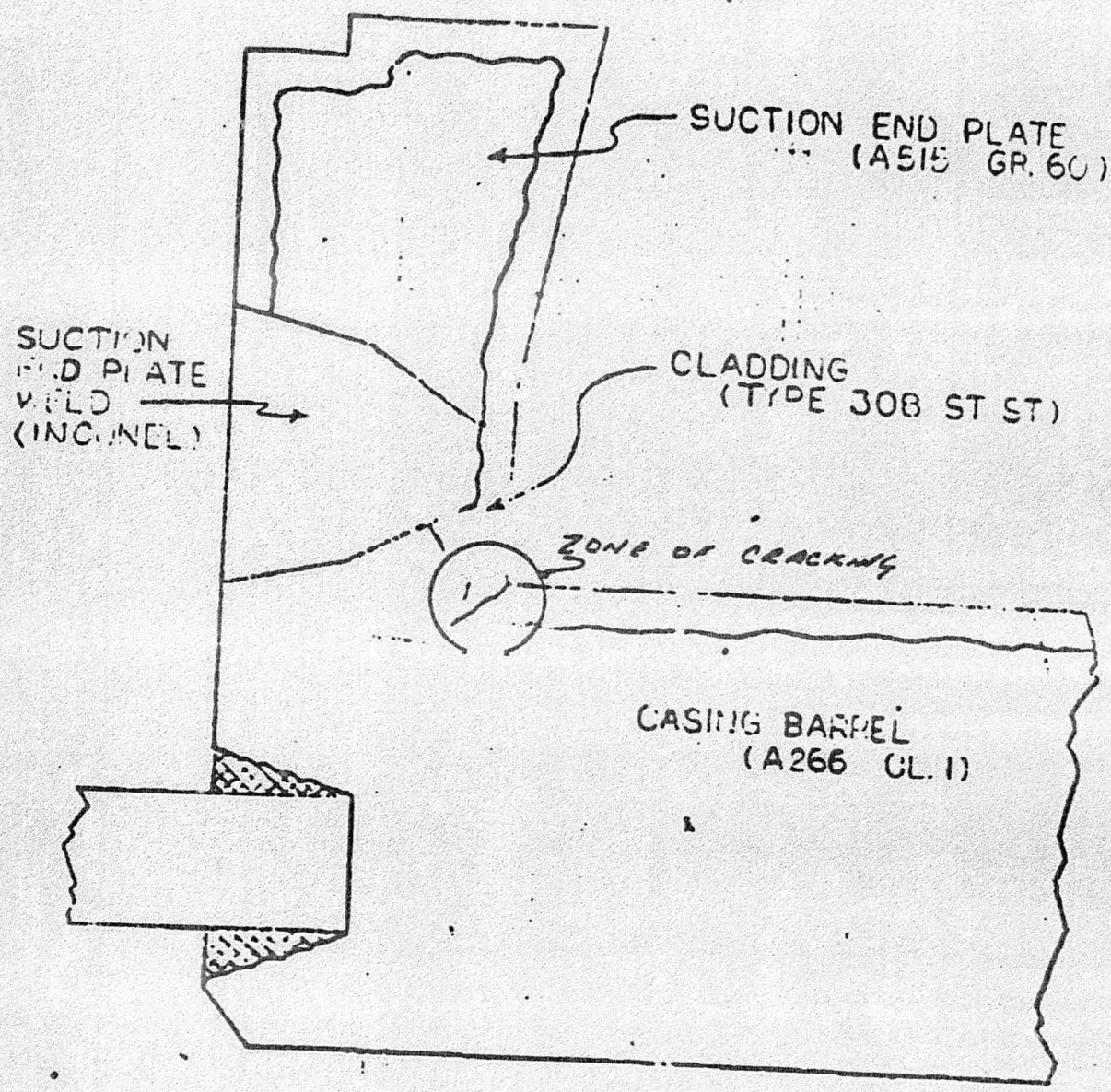
A corrosion evaluation provided CECo by Westinghouse indicates the corrosion rate of carbon steel subject to environmental conditions typical of the installed pumps is on the order of 2-1/2 to 4 mils per month. Additionally, a stress analysis of the pump casing by the manufacturer using ASME Section III, Subsection NC rules, indicates that at design conditions a flaw with depth of 0.763 inches could be tolerated.

Based on the available information no immediate safety concern is indicated. However, the observed conditions reveal a potential source of pump degradation over long term operations. Therefore, to assure maximum availability, it appears prudent to perform a nondestructive examination of this pump type at the earliest practical time during the first code required in-service inspection interval and if cracking is confirmed, take appropriate corrective actions per the rules of ASME Section XI BP&V Code.

This Information Notice is provided as a notificaton of a potential source of degradation of a safety related component that is still under review by the NRC staff. It is expected that recipients will review the information for possible applicability to their facility. No specific action or response is requested at this time. If you have any questions regarding this matter, please contract the director of the appropriate NRC Regional Office.

Enclosure:
Figure 1

FIGURE 1



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