TECHNICAL EVALUATION REPORT
MISCELLANEOUS NOZZLE CRACKING: BRUNSWICK STEAM ELECTRIC PLANT, UNIT 2
FRC TASK NO. 92
NRC TAC NO. 06569

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REPORT OF TECHNICAL EVALUATION

UNIT: BRUNSWICK STEAM ELECTRIC PLANT UNIT NO. 2

LICENSEE: CAROLINA POWER AND LIGHT CO.

DOCKET NO 50-324

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1. SUMMARY

Carolina Power and Light Co. reported that a six-inch crack was discovered during a routine inspection on December 27, 1976. The crack was in the 2A residual heat removal (RHR) pump suction line adjacent to the suction line-to-weldolet weld. The weldolet was connected to a short, clean-out line. The crack was weld-repaired and the line was returned to service. Inspection of the other seven RHR pump suction lines revealed that no other cracks were present.

The cracking was believed to be the result of inadvertent overloading during installation, although no metallurgical investigation was conducted. In order to obtain additional information to resolve the cause of cracking, a survey of the suction lines was conducted in January, 1980. No cracking was noted during the three-year period since the weld repair. The amplitude of vibration during pump operation was found to be low.

It was concluded that the crack was caused by overloading during installation and was not the result of vibrational fatigue. This is considered to be an isolated, unique failure and not a generic issue.

2. INTRODUCTION

It was reported (Licensee Event Report (LER) 2-76-161, dated January 26, 1977) that a six-inch crack was discovered in the 2A RHR pump suction line during routine inspection on December 27, 1976. The crack was adjacent to the suction line-to-weldolet weld. The weldolet was connected to a flanged, four-inch, clean-out line, two feet, three inches long. The crack was weld repaired, radiographed and hydrostatically tested before the line was returned to service. Visual inspection was conducted of the other seven RHR pump suction lines. No evidence of cracking was observed.

According to the LER, initiation of the crack was believed to be due to inadvertent overloading during piping installation before issuance of the operating license. Subsequent thermal and pressure cycles during RHR system operation are believed to have caused propagation of the crack with eventual water leakage. Since the cracked material was not available for metallurgical examination, no definite resolution of the cause of cracking was possible.

3. TECHNICAL EVALUATION

In a letter, S. P. Carfagno (FRC) to G. Zech dated November 16, 1979, a survey of the eight RHR pump suction lines in the Brunswick Unit 2 plant was requested. In response to this FRC request, Carolina Power and Light conducted an inspection of the suction lines in January 1980. No evidence of any cracks or leakage was noted to have developed during the three years of operation since the initial crack was discovered and repaired.

Vibration tests, conducted on January 8, 1980, indicated that the vibrational amplitude at the flange was less than 0.001 inch when the pumps were operating.

Carolina does not believe that additional line support is required based on service experience and the low amplitude of vibration in the line.

FRC is in agreement with Carolina Power and Light that the cracking was probably initiated by an installation defect or damage during plant construction caused by some undefined action. It is apparent that the weld repair has been effective in correcting the leak. Additional support will not materially aid in mitigating the small amplitude of vibration. In fact, a welded support may introduce areas of stress concentration not now present in the line. The extended trouble-free service, over a period of five years for seven of the welded joints and three years for the repaired weld, indicates that the problem was limited to one weld that has been corrected satisfactorily.

4. CONCLUSION

Based upon technical evaluation of all factors involved with the suction line cracking, it is concluded that this crack was an isolated case, possibly caused by an initial welding defect or other construction related incidental damage, and is not indicative of an inherent design defect. The satisfactory three-year service life since the weld repair indicates that crack initiation and growth adjacent to

the weld has been eliminated for all practical purposes and should not be considered a generic problem.

Based upon recent visual inspection, measurements indicating low vibrational amplitude during pump operation, and three years of satisfactory service since the crack was weld repaired, FRC is in agreement that additional pipe supports should not be required on this line.

Stress risers caused by additional pipe supports, improperly welded, may actually increase the possibility of failure. However, routine visual inspection of these suction lines should be continued as a precautionary measure.