Attachment 3

Calculation Note CN-CI-02-51 Rev. 00
RCS Hot Leg RTD Nozzle and Flow Measurement Nozzle Repair – Design Verification for St. Lucie Units 1 & 2
(Non-Proprietary Version)
(6 Pages)

Calculation Note CN-CI-02-51 Rev. 00
RCS Hot Leg RTD Nozzle and Flow Measurement Nozzle Repair – Design Verification for St. Lucie Units 1 & 2
(Proprietary Version)
(57 Pages)

Westinghouse Non-Proprietary Class 3

WESTINGHOUSE ELECTRIC COMPANY LLC

Calculation Note Number		Revision	Charge Number	Page
CN-CI-02-51-NP		00	110658	1
Project	**Releasable (Y/N)**	**Shop Order Number**	**Files Attached (Y/N)**	**Total No. Pages**
St. Lucie Units 1 and 2	Y	NA	N	6

Title: RCS Hot Leg RTD Nozzle and Flow Measurement Nozzle Repair - Design Verification for St. Lucie Units 1 and 2

Author(s) Name(s)	Signature / Date	For Pages
John F. Kielb	John F. Kielb 9/4/02	All

Verifier(s) Name(s)	Signature / Date	For Pages
Paul O'Brien	Paul O'Brien 9/5/02	All

Manager Name	Signature / Date
Bruce Hinton	Bruce Hinton 9/6/02

Westinghouse

Record of Revisions

Rev	Date	Revision Description
00	09/06/02	Original Issue

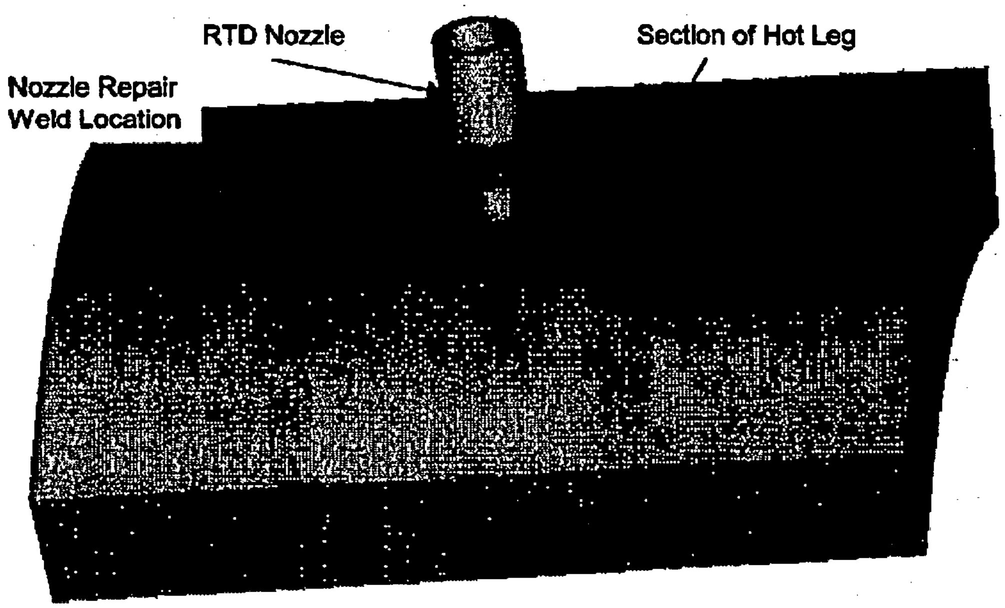
Table Of Contents

1.0 Introduction

1.1 Background / Purpose

Florida Power and Light Company (FPL), as the operating agent for St. Lucie Nuclear Plants, Units 1 and 2, has requested this analysis of welded nozzle repairs of its Reactor Coolant System (RCS) hot leg RTD and Flow Measurement nozzles for one fuel cycle. The RTD and Flow Measurement nozzles, referred to herein as instrumentation nozzles are Inconel Alloy 600 (SB-166) construction, and are welded to the SA-516 Grade 70 hot leg piping. The existing weld is a J-groove partial penetration weld on the ID of the hot leg. Industry experience has shown that the cracks caused by primary water stress corrosion cracking (PWSCC) may develop in the nozzle base metal or in the J-weld, possibly leading to leakage of the reactor coolant.

FPL has indicated in its Purchase Order (Reference 23) that during the upcoming St. Lucie Unit 1 outage (cycle 18) these nozzles will be examined for evidence of leakage. Nozzles showing evidence of leakage will be repaired, with an expectation that the repair will be adequate for one more fuel cycle. As directed by Reference 23, the repair will consist of an additional partial penetration weld with a fillet reinforcement applied to the external surface of the hot leg pipe at the junction with the nozzle. The weld joint will comply with Figure NB-4244 (d)-1, design (e), of Reference 3, with the exception that the λ dimension will be zero (0) inches (i.e., no gap). Additionally, Appendix B3 indicates FP&L will use a minimum weld size of .250 inch. A figure showing the RTD nozzle in a section of the Hot Leg is provided below.



The existing weld will no longer be considered the pressure boundary, thereby relocating the pressure boundary function from the interior to the exterior weld on the hot leg pipe. The nozzle will not be severed and the existing J-weld will not be disturbed. Although this is not a typical design configuration - due to the differential thermal expansion that is caused between the nozzle and the pipe wall - this repair approach has been used before as a short-term repair option. Note that since the inner weld is no longer considered the pressure boundary, the primary coolant can be in contact with the carbon steel vessel. Reference 24 concludes that this is acceptable for the required one fuel cycle of operation that is the basis for this calculation note.

The purpose of this calculation note is to provide documentation that the weld repair is acceptable per the criteria of Reference 3.

2.0 Summary of Results and Conclusions

Information for Sections 2.0 – 2.3 is proprietary to Westinghouse Electric.

3.0 Assumptions and Open Items

Information for Sections 3.0 – 3.2 is proprietary to Westinghouse Electric.

4.0 Acceptance Criteria

Information for Section 4.0 is proprietary to Westinghouse Electric.

5.0 Computer Codes Used In Calculation

Information for Section 5.0 is proprietary to Westinghouse Electric.

6.0 Calculations

Information for Sections 6.0 – 6.3 is proprietary to Westinghouse Electric.

7.0 References

1. [ ]
2. ASME Boiler and Pressure Vessel Code, Section XI, Division 1, 1989 Edition
3. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NB, 1989 Edition
4. ASME Boiler and Pressure Vessel Code, Section III, Division 1, Appendices, 1989 Edition
5. [ ]

6. [ ]
7. [ ]
8. [ ]
9. [ ]
10. [ ]
11. [ ]
12. [ ]
13. [ ]
14. [ ]
15. [ ]
16. [ ]
17. [ ]
18. [ ]
19. [ ]
20. [ ]
21. [ ]
22. [ ]
23. [ ]
24. [ ]