

INSPECTION PROGRAM SUMMARY
NUCLEAR ENERGY SERVICES, INC.

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1. ABSTRACT

This report documents the personnel training, examination activities and results of the Vermont Yankee Feedwater Nozzle Inner Radius examinations performed on March 11 and March 12, 1983. Documented herein are all related support operations, applicable personnel and equipment certifications, the examination procedure with all field changes, and all final data.

2. REFERENCE DOCUMENTS

1. ASME Boiler and Pressure Vessel Code, Section XI, 1974 Edition, Summer 1975 Addenda, invoking the provisions of IWA-2240.
2. ASME Boiler and Pressure Vessel Code, Section V, 1974 Edition, Summer 1975 Addenda.
3. NUREG-0619; BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking.
4. NES Document 80A9021; NES ISI Operations QA Manual (latest revision).
5. NES Document 80A7616; Ultrasonic Examination Procedure for Reactor Vessel Feedwater Nozzle Inner Radius for Vermont Yankee Rev. 1.
6. NES Drawing 80C7617; Feedwater Nozzle Inner Radius Calibration Block VY-6-IR.
7. NES Drawing 80C7618; Feedwater Nozzle Inner Radius Examination Wedge CW.
8. NES Drawing 80C7619; Feedwater Nozzle Inner Radius Examination Wedge CCW.
9. NES Drawing 80E7620; Feedwater Nozzle As Built.

10. NES Drawing 80E7621; Feedwater Nozzle Barrel Plot.
11. NES Drawing 80E7622; Feedwater Nozzle Shell Plot.

3. INTRODUCTION

Nuclear Energy Services was contracted by Yankee Atomic Electric Company to perform an outside diameter ultrasonic examination of the Vermont Yankee Reactor Pressure Vessel Feedwater Nozzle Inner Radius, and a demonstration of the NES technique to the Nuclear Regulatory Commission on the Nine Mile Point Feedwater Nozzle Mock Up. In addition, NES also provided examination support in the form of the design and fabrication of calibration standards, inner radius examination wedges and the generation of an examination procedure. This preparation resulted in the successful examination of the four (4) feedwater nozzle inner radius areas including an evaluation and disposition of all recordable indications.

4. TEXT

NES examination of the nozzle inner radius entailed the execution of several tasks which composed the defined workscope.

Review, Design and Fabrication

NES reviewed the as built nozzle configuration and generated a drawing, 80E7620, Vermont Yankee Feedwater Nozzle As Built.

This drawing was used in the development of sound path plots for both the shell and the nozzle barrel area. NES Drawing 80E7622, Vermont Yankee Feedwater Nozzle Shell Plot, and NES drawing 80E7621, Vermont Yankee Feedwater Nozzle Barrel Plot were prepared to aid in the determination of scan paths, design of ultrasonic wedges and for use in training of personnel.

Examination wedges were designed and fabricated to provide a nominal 45° angle for the nozzle barrel examination. Two designs were utilized: NES drawing 80C7618, Vermont Yankee Feedwater Nozzle Inner Radius Examination Wedge CW (Clockwise Scan); and NES drawing 80C7619, Vermont Yankee Feedwater Nozzle Inner Radius Examination Wedge CCW (Counter-Clockwise Scan). Three wedges of each design were fabricated.

Simultaneously NES designed and fabricated calibration block VY-6-IR; Vermont Yankee Feedwater Nozzle Inner Radius Calibration Block, NES Drawing 80C7617. This calibration block was designed for use in all calibrations performed from the nozzle barrel.

The final item for the support task was the preparation of an independent examination procedure incorporating equipment, technique, personnel responsibilities and code requirements. NES document 80A7616; Ultrasonic Examination Procedure for Reactor Vessel Feedwater Nozzle Inner Radius for Vermont Yankee incorporates the above requirements and delineates the examination process from calibration to evaluation.

NRC Demonstration

The inner radius examination technique was demonstrated to the appropriate NRC personnel on February 3 and 4, 1983. This successful demonstration took place at Nine Mile Point utilizing their feedwater nozzle mock up. Qualification and examination approval was obtained from the NRC prior to the actual exam performance at the Vermont facility.

In addition to the NRC demonstration, the Nine Mile Point mock up was also used in the training of examination personnel satisfying procedural requirements.

Examination

Ultrasonic examinations were performed during the week of March 7, 1983. All exams were in accordance with NES document 80A7616; Ultrasonic Examination Procedure for Reactor Vessel Feedwater Nozzle Inner Radius for Vermont Yankee Rev. 1. Examinations were performed from both the shell side and the nozzle barrel side.

Shell exams were accomplished by calibrating on Vermont vessel block "RV3" utilizing a 70° angle beam shear wave technique. Nozzle barrel exams were accomplished by calibrating on calibration block VY-6-IR utilizing a 45° angle beam shear wave. Examinations were performed in both examination zones of all four nozzles with the following results:

<u>Nozzle #</u>	<u>Zone I</u>	<u>Zone II</u>
N4 A	complete	limited scan thermocouple tubes
N4 B	limited scan thermocouple tubes	limited scan thermocouple tubes
N4 C	limited scan thermocouple tubes	limited scan thermocouple tubes Level III evaluation Recorded for baseline data Disposition: Acceptable
N4D	complete	limited scan thermocouple tubes Level III evaluation 1, 2, & 4 Recorded for baseline data 3 non-relevant indication Disposition: Acceptable

Refer to Data Packages in Appendices for further information.

Conclusion

NES found all feedwater nozzle inner radius areas examined to be free of relevant indications.

NDT EXAMINATION
PROCEDURE