

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/90-41
50-368/90-41

Operating Licenses: DPR-51
NPF-6

Dockets: 50-313
50-368

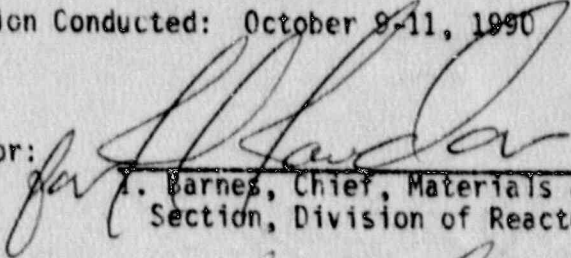
Licensee: Entergy Operations, Inc.
Route 3, Box 137G
Russellville, Arkansas 72801

Facility Name: Arkansas Nuclear One (ANO)

Inspection At: ANO, Russellville, Arkansas


Inspection Conducted: October 9-11, 1990

Inspector:


J. Barnes, Chief, Materials and Quality Programs
Section, Division of Reactor Safety

10/31/90
Date

Approved:


E. J. Callan, Director, Division of Reactor
Safety, Region IV

10/31/90
Date

Inspection Summary

Inspection Conducted October 9-11, 1990 (Report 50-313/90-41)

Areas Inspected: Nonroutine, announced followup inspection in regard to material defects that were identified during onsite fabrication of a ASME Section III Code Class 1 piping subassemblies.

Results: Within the areas inspected, one noncited violation (paragraph 2.4) was identified pertaining to inadequate receipt inspection of ASME Section III Code Class 1 piping material. An inspector followup item (paragraph 2.7) was identified with respect to review of the resolution of the condition report that was initiated in response to the identified material problem. The licensee's planned actions in response to this problem appeared comprehensive and should provide for appropriate resolution.

9011140032 901101
PDR ADOCK 05000313
Q PNU

Inspection Conducted October 9-11, 1990 (Report 50-368/90-11)

Areas Inspected: No inspection of Unit 2 was conducted.

Results: Not applicable.

DETAILS

1. PERSONS CONTACTED

ENERGY

- *D. W. Boyd, Licensing Specialist
- G. Cleruvenki, Metallurgist
- *J. T. Fisicaro, Manager, Licensing
- *L. W. Humphrey, General Manager, Quality
- *G. T. Jones, General Manager, Engineering
- *R. King, Supervisor, Licensing
- *R. Lane, Manager, Engineering Standards and Programs
- *D. B. Lomax, Superintendent, Engineering Programs
- *W. L. McDaniel, Senior Buyer, Purchasing
- *H. H. Northrop, Manager, Stores Operations
- *G. D. Provencher, Manager Quality Assurance (QA)
- *J. Taylor-Brown, Quality Control/Quality Engineering Superintendent
- J. Ray, Supervisor, Nondestructive Examination (NDE)
- *C. L. Tyrone, Manager, Material Engineering
- *T. L. Weir, General Manager, Materials
- *J. W. Yelverton, Director Operations

NRC

- *C. C. Warren, Senior Resident Inspector
- *L. J. Smith, Resident Inspector

The NRC inspector also interviewed other licensee employees during the inspection.

*Denotes those attending the exit interview conducted on October 11, 1990.

2. FOLLOWUP ON DEFECTIVE ASME SECTION III CODE CLASS 1 PIPING MATERIALS (92701)

2.1 Background

During onsite fabrication of an ASME Section III Code Class 1, 2 1/2 inch Schedule 160, piping subassembly for Design Change Package (DCP) 89-1012B (High Pressure Injection Modification), a transverse defect was observed on the outside diameter of the SA-312 Type 316 austenitic stainless steel piping material. Examination of other pipe from the same purchase order (PO), PO 890186, identified the presence of additional defects in the piping material. The licensee initiated a condition report (CR), CR-1-90-0398, which included in its actions placing the material produced by the applicable pipe manufacturer (Sandvik) under Quality Control (QC) hold and segregated pending problem resolution.

2.2 Procurement

The inspector reviewed Section 7.0 of the QA Manual Operations, "Control of Purchased Material, Equipment and Services," Revision 12, and the following documents:

- ° Entergy Operations Company Directive C6.401, "Purchasing," Revision 0
- ° Arkansas Power & Light Energy Supply Procedure 213, "Nuclear Procurement," Revision 0
- ° Procurement and Materials Management Manual, Section 4, "Purchase Requisitions - ANO," Revision 0

From review of PO 890186, it was noted that the Sandvik 2 1/2 inch Schedule 160 pipe had been procured from a materials supplier, Radnor Alloys, Inc. The inspector verified that this vendor was included in the ANO Qualified Vendors List (QVL). It was ascertained from discussion with QA staff that the vendor had been included in the QVL on the basis that their quality system program had been accredited by ASME (i.e., Quality System Certificate QSC-526). This practice was consistent with the criteria contained in Section 7.0 of the QA Manual Operations and has also been determined by the staff (Information Notice 86-21 and Information Notice 86-21, Supplement 1) to be acceptable. The inspector questioned why an audit of the vendor, to verify satisfactory implementation of the quality system program, had not been performed at the time of order placement. Licensee personnel informed the inspector that independent testing had been utilized to provide assurance that the materials furnished by the vendor conformed to the requirements of ASME Materials Specification SA-312 Type 316. The inspector verified that samples from two heats of Sandvik 2 1/2 inch Schedule 160 pipe (PO 891015), received from Radnor Alloys, Inc., had been sent by ANO to a testing laboratory. Review of the test results showed satisfactory chemical composition, mechanical properties, flattening test data, and ASTM A262 Practice E corrosion test results. Comparison of the laboratory chemical composition data against that recorded on the Sandvik certified material test reports (CMTRs) showed reasonable agreement for the two heats.

Review of the technical requirements contained in POs 891015 and 890186 showed that appropriate test documentation requirements had been imposed on the vendor. The inspector did note, however, that procurement controls could have been strengthened by requiring the vendor to submit for licensee review and approval the ultrasonic (UT) examination procedure used for the ASME Section III Code Class 1 required volumetric examination of the pipe material.

2.3 Examination of Piping Material and Review of Vendor Documentation

The inspector examined the segregated Sandvik piping and a section which had been removed that contained a transverse defect. The outside surface of the piping was noted to exhibit an "orange-peel" appearance, with the defect in the removed section being clearly visible.

A review was performed of the documentation furnished by Radnor Alloys, Inc. for the Sandvik pipe supplied in response to POs 891015 and 890186. The Sandvik CMTRs indicated that the pipe had been manufactured by AB Sandvik Steel of Sweden and then shipped to the Sandvik Steel Company in Scranton, Pennsylvania. The CMTRs contained the AB Sandvik ASME Quality System Certificate number but did not identify that the pipe had been manufactured in accordance with a specific ASME Section III Code class. It was noted that the material was subsequently tested as if it had been produced by a manufacturer whose quality system program had not been established to be in accordance with the requirements of NCA-3800 of the ASME Section III Code. Specifically, each length of pipe was checked (by Laboratory Testing, Inc.) with respect to chemical composition and mechanical properties, and a flattening test and hydrostatic test also performed. The recorded results from the product verification activities were verified by the inspector to conform to ASME Material Specification SA-312 Type 316 requirements.

Laboratory Testing, Inc. additionally performed the ultrasonic (UT) examination of the piping material which was required by ASME Section III Code Class 1. Review of the vendor certification showed that the required axial and circumferential UT examinations had been performed by an automated scanning technique. The absence of the vendor UT procedure precluded detailed verification of compliance of the examination technique with ASME Code requirements. It was noted that scanning speed was recorded as less than 20 inches per second. Paragraph T523.2 of Article V in Section V of the ASME Code requires that the rate of search unit movement shall not exceed 6 inches per second unless calibration is verified at the scanning speed. It could not be established from the vendor certification whether calibration was verified for scanning speeds used that exceeded 6 inches per second. It was further noted that Laboratory Testing, Inc. had rejected some of the Sandvik piping as a result of the UT examinations (e.g., Heat 462942 - 48' 5 1/2" accepted, 8' 7 1/2" rejected; Heat 478246 - 178' 4" accepted, 1' 10" rejected).

2.4 Receipt Inspection

The inspector reviewed QA Operating Procedure QA0-11, "Receipt Inspection and Independent Testing," Revision 1, and Material Management Administrative Procedure 1033.001, "Receipt Inspection" Revision 22, with respect to the guidance given regarding inspection for material defects. Paragraph 5.1.3.5 of Procedure QA0-11, Revision 1, required the inspector to perform a visual examination for manufacturing defects and physical damage. The procedure did not elaborate on types of material defects or acceptance criteria. Procedure 1033.001, Revision 22, did not specifically address material defects, with the nearest subject guidance in the procedure being to perform a visual inspection to assure that workmanship was satisfactory to meet the requirements of ANSI N45.2.2. The failure of receipt inspection to identify the visibly evident transverse material defects is an apparent violation of Criterion VII of Appendix B to 10 CFR Part 50 and paragraph 5.1.3.5 of Procedure QA0-11, Revision 1. However, a violation is not being cited because the circumstances meet the criteria specified in Section V.G.1 of the NRC's Enforcement Policy. Licensee actions initiated in response to this problem are discussed in paragraph 2.7 below.

2.5 Training Requirements for Receipt Inspectors

The inspector reviewed QC Operating Procedure QCO-1, "QC/QE Personnel Qualification, Certification, and Training," Revision 4, in order to ascertain current certification and training requirements for Level II receipt inspectors. The procedure was found to be consistent with ANSI N4-5.2.6 for education and experience requirements. Review of the resumes for the two ANO Level II receipt inspectors showed that their education and experience were appropriate for Level II certification. The inspector noted from review of the procedure that training for the Level II receipt inspectors was indicated as recommended rather than mandatory. The inspector questioned this, in the context of adequacy for certification of new Level II inspectors, and was informed that a new training program was under development which would be factored into the procedure upon completion. The inspector confirmed this information by review of the ANO Business Plan, which indicated that development and implementation of receipt inspection training was scheduled to be completed by December 31, 1990.

2.6 Metallurgical Examination of Sandvik, 2 1/2 Inch Schedule 160, SA-312 Type 316 Pipe

A sample of Sandvik, 2 1/2 inch Schedule 160, SA-312 Type 316 pipe, Heat 462942, containing a transverse defect was sent by the licensee to a laboratory for metallurgical examination. Microscopic examination of a cross-section taken through the defect showed that the defect had an angled profile, which penetrated to a depth of 0.028 inches from the outside surface and was 0.086 inches in length. The laboratory noted that the metallographic sample was not removed from the worst area of the defect, and thus the maximum depth of the defect may have been greater than that observed in the sample. Metallographic examination additionally revealed the presence of scale at the tip of the defect and evidence of cold working in the regions adjacent to the outside and inside diameter surfaces. The laboratory concluded that the defect resulted from severe localized work hardening caused most probably by incorrect die angle and/or insufficient lubrication and/or inadequate extrusion speed. The "orange-peel" surface condition was stated to be indicative of work hardening of the surface material.

The inspector noted that SA-312 Type 316 pipe is required by the material specification to be furnished in a heat treated (i.e., solution annealed) condition. The presence of a cold worked structure in the material adjacent to the outside and inside diameter surfaces indicated to the inspector that either the material did not receive a solution annealing heat treatment, or the material was subjected to some form of cold working operation subsequent to heat treatment.

2.7 Licensee Actions

Upon identification of the defects in pipe procured by PO 890186, the licensee initiated CR-1-90-0398. Actions to be taken in response to this CR included:

- a. Placing the Sandvik 2 1/2 inch Schedule 160 pipe (Heat 462942 and 478246) procured by POs 891015 and 890186 under QC Hold and segregated to prevent use.
- b. Placing Sandvik 2 1/2 inch Schedule 160 pipe (Heat 40324) under QC Hold and segregated to prevent use, if visual inspection by an ANO metallurgist identified defects, or the CMTR documentation showed a high UT reject rate by the Radnor contractor laboratory. If found acceptable by initial visual inspection and CMTR documentation review, perform a 100 percent visual inspection of each piece and UT examine any suspect areas and 100 percent of the longest pipe piece.
- c. Visual inspection of 2 1/2 inch Schedule 160 pipe procured by PO 890186 that was provided by Radnor from another manufacturer. Perform UT examination of any suspect areas and 100 percent of the longest pipe piece.
- d. Metallurgical examination of the material to identify cause of the problem.
- e. Determination of whether other Sandvik material has been procured for use at ANO.
- f. Determination of whether deficiencies existed in the Radnor QA program which contributed to the problem.
- g. Assessment of the adequacy of the ANO material receipt inspection program requirements.
- h. Review of the adequacy of Material Specification SA-312 for ASME Section III Code Class 1 and 2 applications.
- i. Industry notification and review for 10 CFR Part 21 reportability.

Review of the resolution of CR-1-90-0398 is considered an inspector followup item (313/9041-01).

3. EXIT INTERVIEW

An exit interview was conducted on October 11, 1990, with those personnel denoted in paragraph 1 in which the inspection findings were summarized. No information was presented to the inspector that was identified by the licensee as proprietary.