

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-482/87-37 Operating License: NPF-42

Docket: 50-482

Licensee: Wolf Creek Nuclear Operating Corporation (WCNOC)
P.O. Box 411
Burlington, Kansas 66839

Facility Name: Wolf Creek Generating Station (WCGS)

Inspection At: Burlington, Kansas

Inspection Conducted: December 7-11, 1987

Inspector:

D. E. Norman
D. E. Norman, Reactor Inspector, Plant Systems
Section, Division of Reactor Safety

1/28/88
Date

Approved:

R. E. Ireland
R. E. Ireland, Chief, Plant Systems Section
Division of Reactor Safety

1/28/88
Date

Inspection Summary

Inspection Conducted December 7-11, 1987 (Report 50-482/87-37)

Areas Inspected: Routine, unannounced inspection of a followup and participation in a sample selection for NRC Compliance Bulletin 87-02; and a followup of actions regarding IE Information Notice 86-53 and other previously identified heat shrinkable tubing problems.

Results: Within the areas inspected, no violations or deviations were identified.

DETAILS1. Persons ContactedWCNOC

- *C. E. Parry, Superintendent, Quality Engineering
- R. E. Gimple, Engineer, Materials Quality
- *J. C. Goode, Engineer, Licensing
- C. A. Snyder, Manager, Purchasing and Material Services
- *K. Harvey, Supervisor, Quality Control (QC) Services
- *T. Dougan, Materials Quality
- G. T. Pendergrass, Engineer, Licensing
- *C. W. Fowler, Supervisor, Instrumentation & Control (I&C)
- *B. McKinney, Superintendent, Technical Support
- *D. R. Prichard, Engineer, Nuclear Plant Engineering (NPE)
- O. L. Maynard, Manager, Licensing
- *S. C. Hopkins, Engineering Specialist, I&C
- *M. G. Williams, Superintendent, Regulatory Quality Administration
- *W. M. Lindsay, Supervisor, Quality Systems
- *W. J. Rudolph, Manager, Quality Assurance
- *C. G. Patrick, Superintendent, Quality Evaluation
- *J. L. Stokes, Manager, Material Services
- *R. D. Flannigan, Supervisor, Compliance Engineering
- *G. D. Boyer, Plant Manager
- *R. Benedict, Superintendent, QC
- *J. M. Pippin, Manager, NPE

NRC

- *B. L. Bartlett, Resident Inspector

*Denotes those present at the exit interview.

2. Inspection Summarya. NRC Compliance Bulletin 87-02

As a result of limited testing of fasteners by the NRC, the need to obtain additional information on the adequacy of fasteners used in nuclear power plants has been demonstrated. Bulletin 87-02 requests that licensees review receipt inspection and internal controls of fasteners, and independently determine through testing whether fasteners in stores meet chemical and mechanical specification requirements.

This inspection was performed in order to review the licensees programs for controlling fasteners and to participate with the

licensee in selecting a sample of fasteners to be tested. The following areas were included in the inspection:

- (1) Test Lab Selection Review - The test lab selected to perform the fastener testing was initially qualified by the licensee and placed on the Approved Vendor List (AVL) on January 6, 1981. The lab was last evaluated on February 25, 1987, and is scheduled for reevaluation in January 1988. They have been qualified to perform chemical, mechanical, metallurgical, and metallographic testing.
- (2) Procedures Review - The following procedures, which have been implemented by the licensee to control receipt storage and issuance of purchased material including fasteners, were reviewed by the NRC inspector:
 - ° KP-2122, September 10, 1986, "Material and Services Receipt"
 - ° QCP-7.1, Revision 5, March 30, 1987, "Receipt Inspection"
 - ° KP-2123, September 10, 1986, "Material Storage and Handling"
 - ° KP-2124, September 10, 1986, "Material Issue"

When used by trained personnel, these procedures should provide guidance to control material adequately from the point of receipt to issue.

- (3) Sample Selection - The sample selection plan, proposed by the licensee for fasteners to be tested, was reviewed by the NRC inspector, who participated in the selection and identification of the items in the sample. During the sample selection, three identical items of each sample were selected in order to provide alternate items in case of testing problems. Materials from the following specifications were included in the sample:

(a) Safety-related bolts/studs

- ° SA-193, Grade B7 - two studs
- ° SA-564, Grade 630 - two studs
- ° A-307, Grade B - one bolt
- ° A-325, Type 1 - two bolts
- ° A-490 - one bolt
- ° A-449 - two hexhead cap screws

(b) Safety-related nuts

- SA-194 - two grade B6 and four grade 2H
- A-563 - two grade A and one each grade B and C

(c) Nonsafety-related bolts/studs

- A-193 - four grade B7 and one grade B8 studs
- A-564, Grade 630 - one bolt
- A-307, Grade A - three bolts
- A-325, Type 1, one bolt

(d) Nonsafety-related nuts

- A-194 - four grade 2H and one each grade B6 and B8
- A-563 - three grade A and one grade C

b. Raychem Splices

- (1) IE Information Notice 86-53 - This notice was issued on June 26, 1986, to alert licensees to a potentially generic safety problem involving the improper installation of heat shrinkable tubing over electrical splices and terminations. No specific action or written response was required by the notice. The NRC inspector reviewed internal documentation which showed that the licensee did not consider it necessary to inspect splices at WCGS since procedures, workmanship, and inspection were considered to be adequate.
- (2) Splice Installation Procedures - Inplace procedures for installing Raychem shrinkable tubing over splices at WCGS are written to comply with recommended Raychem installation instructions and should produce configurations which have been tested and qualified. The following procedures and documents were reviewed by the NRC inspector:
 - INC S-0506, Revision 3, November 16, 1987, "Wire Splicing and Termination with Raychem" (Note: applicable to instrumentation splices only);
 - CNT-511, August 27, 1985, "Installation and Inspection of Cable Lugs and Connectors"; and
 - Work Request 04979-87 - Sample of procedure used by electrical maintenance in splicing with Raychem shrinkable tubing.

Licensee Procedure INC S-0506 will permit a splice configuration in which the shim is not overlapped by the sleeve. While this does not comply with Raychem instructions, the licensee has test reports, discussed in paragraph 6.b.(5) of this report, which show the qualification of this configuration. Also, Raychem has

reportedly stated that the overlap is not essential to qualification as long as the splice has a minimum seal length of 2 inches. The procedures reviewed appear acceptable for making qualified Raychem splices.

- (3) Craft Training - The NRC inspector reviewed KGET 323 13.1F, "Raychem Basic Installer/Inspector Training Course," for heat shrinkable products for nuclear power plants. An attendance list of personnel attending the course on September 24, 1987, was also reviewed. Training for the proper selection, installation, and inspection of Raychem shrinkable tubing appeared to be adequate.
- (4) Previously Identified Problems - During the EQ inspection performed by the NRC at WCGS in October 1987, Raychem splices were identified which did not match the documented qualified configuration in the following areas: bend radius was less than five times splice outside diameter (OD), seal lengths were less than 2 inches, and sealant was missing or not visible from the end of some shrink tubing. As a result of the findings, the licensee pursued the following actions:
 - (a) Instrumentation Cable Splices - In the process of performing a sample inspection of instrumentation cable splices to determine if problems identified by the NRC were generic, the licensee discovered that the Raychem tubing was too small for the bolted connection bolt size on the sample selected. As a result, a 100 percent reinspection was performed and shrink tubing was replaced on all 552 instrumentation splices.
 - (b) Control Cable Splices - Based on a MIL-STD-105 sample plan, the licensee inspected 50 splices from the 290 control circuit splices at WCGS. Using inspection criteria, which will be discussed later in this report, no defects were identified.
 - (c) Power Cable Splices - Power cable splices and terminations were not inspected since they were determined by the licensee to be outside the scope of the reinspection program because they were qualified in a configuration which was different from the instrumentation and control splices.
- (5) Qualification Test Reports - As a result of the NRC EQ inspection and the subsequent licensee walkdown inspection of Raychem shrink tubing, it was found that some splices did not comply with the Raychem recommended configurations which had been qualified and supported by documentation in the equipment qualification work packages (EQWP). During the present

inspection, the NRC inspector reviewed Wyle Reports 17859-02B/02P, dated March 11, 1987. These reports, which reported on testing of various Raychem configurations for Commonwealth Edison plants, are now being used by the licensee to support qualification of the following conditions, which were not previously supported by EQWP documentation:

- 1/2-inch minimum seal length
- minimum bend radius of 1.2 times splice OD
- Effective diameter over bolted connections greater than permitted by Raychem configuration (actual values which are a function of lug size, bolt length, and shrink tubing size are presented in site instructions).

(6) The NRC inspector performed a walkdown inspection of splices for instrumentation, control, and power systems. The following potential deficiencies which apparently did not comply with qualification documentation in place at the time of the inspection were identified during the walkdown:

(a) Instrumentation Cable Splices

- Generic - Raychem recommends that cut ends of shrink tubing be smooth and free from jagged edges or nicks. Numerous tubing was identified with jagged edges.
- Penetration ZNI-279
 - Seal lengths of 1 1/2 inch were identified on Scheme 3BBI15EA
 - WCSF-200 tubing appears too small for the 0.5 inch X 0.6 inch bolted connection on Scheme 3BBI15EA
 - A bare conductor was exposed at the cable breakout on Scheme 3BBI15DA
 - A shim appears to be needed on one end of a splice in Scheme 3BBI15DA

(b) Control Cable Splices

- J-Box SJ-HV-0005 - Seal lengths of 0.25 and 0.30 were identified. Also, one splice had a split approximately 1/2 inch long through the outer sleeve.
- J-Box SJ-HV-0012 - WCSF-115 shrink tubing, without a shim, was installed over a 0.06 inch Conax. This is beyond the use range of the shrink tubing.

(c) Power Cable Splices and Motor Connections

- ° Hydrogen Mixing Fan Motor CGN03D
 - It could not be determined visually whether or not the motor connections included a molded kit to seal around individual conductors, and the work package which documented installation of the connections was not available for review.
 - Shrink tubing was installed over braided insulation.
 - Shrink tubing over one connector had been nicked.
- ° Penetration ZNE-268 (Containment Cooling Fan)
 - WCSF-500 shrink tubing used in this penetration was too small for the lug and bolt size and for the 1.15 inch cable.
 - The seal length over all splices was approximately 1 inch rather than 2 inches as recommended by Raychem.
 - Bolt pads were not used as required even though bolt lengths and tang widths for all connections were greater than 0.87 inch.

The findings identified in paragraphs 2.b(6)a-c are considered unresolved pending review by the licensee to determine availability of additional EQ documentation, when required, and determination of operability for items found to be unqualified (482/8737-01).

3. Unresolved Item

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. One unresolved item discussed during the inspection is discussed in paragraphs 2.b(6)a, b, and c.

4. Exit Meeting

An exit interview was conducted on December 11, 1987, at which time results of this inspection were discussed with members of the WCNO staff.