

VENDOR INSPECTION REPORT

U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
REGION IV

Report No. 99900293/78-01

Program No. 44060

Company: Energy Products Group  
235 Kilvert Street  
Warwick, Rhode Island 02886

Inspection Conducted: September 25-26, 1978

Inspectors: *J. W. Sutton*  
J. W. Sutton, Contractor Inspector, Vendor  
Inspection Branch

11/5/78  
Date

*R. L. Brown*  
R. L. Brown, Contractor Inspector, Vendor  
Inspection Branch

11/5/78  
Date

Approved by: *D. E. Whitesell*  
D. E. Whitesell, Chief, Components Section I,  
Vendor Inspection Branch

11/6/78  
Date

Summary

Inspection on September 25-26, 1978 (99900293/78-01)

Areas Inspected: Implementation of 10 CFR 50, Appendix B, and applicable codes and standards, including, assessment of the cause, corrective action, and general considerations relative to five (5) types of ball valves failures as described in five (5) 10 CFR 50(e) reports from the Arkansas Nuclear One - Unit 2 Facility, and to close outstanding items from the previous inspection. The inspection involved twenty-eight (28) inspector-hours on site by two (2) NRC inspectors.

Results: No deviations or unresolved items were identified during this inspection.

781229 0274

DETAILS SECTION

A. Persons Contacted

Energy Products Group (EPG)

\*J. R. Walter, Director of Engineering  
M. J. Feiring, President  
\*L. R. Tucker, Consultant  
\*L. P. Capron, QA Manager  
J. Callaway, Assembly Foreman  
L. Gold, Engineering Mechanics and Analysis  
L. Earvolino, Materials Engineer

\*Denotes the individuals that attended the exit interview (paragraph D).

B. Action on Previous Inspection Findings

1. (Closed) Deviation (Report No. 77-01): QA Manual not revised to current Code addenda. The inspector verified that the revised QA Manual reflects the current code addenda revisions. In addition, a log of code addenda reviews is being maintained. The QA Manual is being reviewed each six (6) months and the review is being documented.
2. (Closed) Unresolved Item: Nonconforming items observed stored in areas that appeared not to meet the commitments of the word "Segregation" as stated in MA 4133.15. Section 12.3 of the QA Manual was revised to show that a hold tag affixed to the nonconforming item provides acceptable segregation. This revision is a result of an EPG inquiry to the ASME Section III committee. The ASME, April 13, 1978, reply to item (2) states that "Tagging is an acceptable method of segregating materials or items".

C. Reported 10 CFR 50.55(e) Deficiencies

1. Objectives

The objectives of this area of the inspection were to determine the generic implication of the deficiencies occurring in EPG manufactured valves and valve actuators, as reported by Arkansas Power and Light Company Nuclear One-Unit 2, under 10 CFR 50.55(e) requirements.

The deficiencies were as follows:

- a. Efcomatic actuated EPG Ball Valve failure to fully close. Four (4) valves.
- b. Efcomatic actuated EPG Ball Valve failed blocking lever arms. Four (4) valves.
- c. Efcomatic Actuated Ball Valves 90VDC motors (incorrect motor voltage rating). Four (4) valves.
- d. EPG Motor Operated Ball Valves failed extension stems. Four (4) valves.
- e. EPG Efcomatic Actuated Ball Valve Seismic qualification. Four (4) valves.

Also to determine what corrective action has been taken by EPG to prevent recurrence of the above.

2. Method of Accomplishment

The above objectives were accomplished by reviewing the Arkansas Power and Light Company (APL) contract requirements and other commitments, together with EPG QA/QC documents and records involving the discrepancies as reported by APL to NRC under 10 CFR 50.55(e) requirements. The following documents were reviewed and examined:

- a. Efcomatic Actuated EPG Ball Valves failure to fully close.
  - (1) EPG Engineering Problem Report.
  - (2) Valve test data, Job EH-1834.
  - (3) Original and followup design computations - 1975 and 1978.
- b. Efcomatic Actuated EPG Ball Valve failed blocking lever.
  - (1) EPG Engineering Problem Report.
  - (2) EPG Design Comparison for blocking lever arms.



- (3) EPG Comparison of minimum strength of modified lever arms with original levers relative to spring forces.
- (4) Testing Computations for blocking lever arms (serial 19796) dated August 27, 1970.
- c. EPG Efcomatic Actuated Ball Valves 90V DC motor.
  - (1) EPG Quality Problem Report.
  - (2) EPG QA memo dated September 20, 1978, to all QA inspectors pertaining to inspection of electrical components.
  - (3) EPG Purchase Order No. 2202, dated November 11, 1975.
  - (4) Motor verification test. Four (4) motors.
  - (5) Valve data sheet, Job No. 6600-6600-M-2124A, Revision 2.
  - (6) EPG Drawing No. D-4200.
- d. EPG Motor Operated Ball Valves failed extension stems.
  - (1) EPG Engineering Problem Report.
  - (2) EPG Engineering evaluation of item materials and spring loading calculations.
- e. EPG Efcomatic Actuated Ball Valve Seismic qualification.
  - (1) Bechtel Specification 6600-M-2124A, Appendix 3, paragraph 1.3, Environmental.
  - (2) Design Specification 6600-M-2124A, Section 3.0, Design Information.
  - (3) IEEE Standard No. 323, dated April 1971.
  - (4) Specification for Solenoid Valves - ES-1003, dated August 29, 1978.
  - (5) EPG Certification (Seismic) Reports Nos. ES-104-75, November 11, 1975, and ES-101-75, January 14, 1977.
  - (6) Bechtel approval of Seismic Report ES-104-75.

- (7) Valve data sheet for Specification 6600-M-2124A, Revision 5.
- (8) Various memos and letters between EPG and Bechtel.
- (9) EPG Policy Procedure Release No. 9.03, titled "Customer Complaints."
- (10) Draft of EPG letter to San Onofre Nuclear Generating Station Unit 1.

f. Discussions with cognizant personnel.

3. Findings

As a result of the review of the above documentation and discussions with EPG management and cognizant personnel, the following conclusions were reached by the inspectors:

It was concluded that the reported valve/actuator deficiencies as indicated in the five (5) reported 10 CFR 50.55(e) reports were isolated cases covered under one (1) nuclear purchase order for ANO. The corrective action taken and documented by EPG was reviewed by the inspectors for implementation. In two (2) instances, Extension Stem failure and Broken Blocking lever arms, use of improper material was considered as the cause of the failures. Corrective action taken by EPG to prevent reoccurrence consisted of correction of Engineering Material Specifications and Training of Engineering Personnel. In regards to the in use of an electric motor smaller than specification requirements, it was determined that receiving inspectors had not been properly trained in the receipt of electrical equipment. The action taken to correct this deficiency has been implemented by the training and instruction of receiving inspectors.

Steps taken by EPG to correct the deficiencies and to prevent recurrence are as follows:

Item a

- (1) The four (4) installed valve actuators located in the field were modified by relapping the valve seat and reducing the amount of packing and was subjected to a design functional test at the design pressure. The valves performed satisfactorily.

- (2) The design manual seating assumptions were reviewed by Engineering and found to be satisfactory.
- (3) The seat drawing was revised to be consistent with the field modifications.

Item b

- (1) Review of design adequacy.
- (2) Redesign of the blocking lever arm using aluminum plate material (6061T6) in lieu of A-356-T6 aluminum casting and plate material.
- (3) Comparison between the increased strength of the revised blocking lever arm and the increased force due to the use of a more powerful spring.
- (4) Documentation of the modification performed and inclusion in the engineering file.

Item c

- (1) Replacement of the 90V motors.
- (2) Retraining of receiving and inspection personnel in the acceptance of procured electrical equipment.
- (3) Providing inspecting personnel with required procurement specification to properly receive complex electrical equipment.
- (4) Checklist for use by electrical receiving/inspection personnel.
- (5) Increasing the scope of instrumentation/inspection during in-house testing.

Item d

- (1) Design review of the extension stems.
- (2) Redesign of the extension stems using AISI 4140 cold rolled material in lieu of the original material A-29.
- (3) A survey of other extension stems using A-29 material in valves installed at ANO was performed.



- (4) The problem was reviewed by the project engineer, and the design engineering managers and their staff.
- (5) Documentation of design material changes for inclusion in the engineering files.

Item e

- (1) Review of the seismic qualification package.
- (2) Review of the seismic test specifications.
- (3) Seismic tests on a EFCO 4 actuator performed for Bechtel by Wyle Labs, which failed to meet the 3.0g loading requirements in the Z direction.
- (4) Modification made to the actuator hydraulic system foundations as result of the above test.
- (5) EPG will review the Wyle test results when made available to EPG by Bechtel.
- (6) Detailed reviews/interpretation of future specifications and contract requirements.
- (7) Notification was sent to the San Onofre Nuclear Plant informing them of the potential failure mode on similar EPG supplied valve actuators.

In addition, the inspectors were informed by Mr. J. R. Walter, Director of Engineering that valves/actuators similar to those installed at ANO had been manufactured under a different purchase order for San Onofre Unit-1. The area of concern is the seismic qualification of the valve actuators. The corrective action as listed in item (e) above appears to be satisfactory.

Region V, Office of Inspection and Enforcement, was notified by Vendor Inspection Branch of the reported possibility that the valve actuators on valves identified by EPG may not meet seismic requirements.

The Vendor Inspection Branch will review EPG's Design QA Program during their next scheduled inspection.

D. Exit Interview

- 1. The inspector met with the management representatives denoted in paragraph A, at the conclusion of the inspection on September 26, 1978.

2. The following subjects were discussed:
  - a. Scope of the inspection.
  - b. Findings during the document reviews.
3. The inspectors informed the vendor that it appeared that they have responded satisfactorily to correct the identified discrepancies and have established measures to prevent recurrence of similar occurrences.

The inspectors also informed the vendor that the NRC, Region IV Office will notify the NRC, Region V Office of the San Onofre problem for their action.

4. The vendor's comments were for clarification only.