ORGANIZATION: Rotork Controls Limited
Bath, England

REPORT NO.: 99901066/89-01	INSPECTION DATE: October 9-10, 1989	INSPECTION ON-SITE HOURS: 36

CORRESPONDENCE ADDRESS: Rotork Controls Limited
Bath, England
BA1 3JQ

ORGANIZATIONAL CONTACT: Mr. Martin Hunt, QA Manager
TELEPHONE NUMBER: (0225) 28451

NUCLEAR INDUSTRY ACTIVITY: Supplier of safety-related and environmentally qualified valve actuators and actuator parts.

ASSIGNED INSPECTOR: Edward T Baker 1/16/90
E. T. Baker, Chief Date
Reactive Inspection Section No. 1, Vendor Inspection Branch

OTHER INSPECTOR(S): Uldis Potapovs, NRC

APPROVED BY: William Brach 1/24/90
E. William Brach, Chief Date
Vendor Inspection Branch

INSPECTION BASES AND SCOPE:

A. BASES: 10 CFR 50, Appendix B

B. SCOPE: Review QA program elements applicable to design control, procurement, and dedication of commercial grade items.

PLANT SITE APPLICABILITY: Pilgrim (50-293), Indian Point 2 & 3 (50-274 & 50-286), Susquehanna 1 & 2, (50-387 & 388), Sequoyah 1 & 2 (50-3272 & 328), Watts Barr 1 & 2 (50-390/391), Yankee Rowe (50-29), Seabrook 1 & 2 (50-443/444), Shearon Harris (50-400), Palo Verde 1 & 2 (50-528/529), Oconee 1, 2 & 3 (50-269/270/287),

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BATH, ENGLAND

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PLANT SITE APPLICABILITY: (continued)

Nine Mile Point 1 & 2 (50-220/410), Monticello (50-263), McGuire 1 & 2 (50-369/370), Hope Creek (50-354), Fermi 2 (50-341), Diablo Canyon 1 & 2 (50-275/323), Catawba 1 & 2 (50-413/414), Browns Ferry 1, 2 & 3 (50-259/260/296), Bellefonte 1 & 2 (50-438/439), ANO 1 & 2 (50-313/368)

A. VIOLATION:

None.

B. NONCONFORMANCES:

1. Contrary to Criterion IV of Appendix B to 10 CFR 50, the standard QA provisions Rotork imposes on their subcontractors do not require the subcontractors to pass down appropriate QA provisions. This results in subcontractors purchasing material and accepting the material based on a Certificate of Conformance (CoC) or Certified Material Test Report (CMTR) without requiring the supplier to have any controls or verifying the validity of the certification. (89-01-01)

2. Contrary to Criterion VI of Appendix B to 10 CFR 50 and Paragraph 3.8 of Rotork's QA Manual, Volume 2 of the QA Manager's QC Procedures contained four obsolete procedures. (89-01-02)

3. Contrary to Criterion VII of Appendix B to 10 CFR 50 and Paragraph 6.2.10 of Rotork's QA Policy Manual,

   a. Paragraph 4.5 of the Purchasing Department Manual allowed the Purchasing Department to order from companies not approved by QC. (89-01-03)

   b. Rotork has not established measures to assess the effectiveness of the control of quality by their subcontractors. (89-01-04)

   c. Testing performed under Procedure QC-80 does not assure that suppliers of material effectively control quality because all required material properties are not verified and the results of the testing are not factored into the vendor's rating. (89-01-05)

4. Contrary to Criterion VIII of Appendix B to 10 CFR 50, heat treatment certifications for wormshafts supplied by Davall and TEE, Limited are not traceable to the individual wormshafts or the base material certification. (89-01-06)

5. Contrary to Criterion XVI of Appendix B to 10 CFR 50 and Paragraph 14.2 of Section 17 of Rotork's QA Policy Manual:

   a. Some vendors are not returning the "tear-off-slip" that describes their corrective actions taken on nonconforming products. In addition, a tracking system is not in place to assure that Rotork can identify which vendors have not submitted their corrective action. (89-01-07)

   b. Deviations or nonconforming material discovered as a result of material verification testing performed under Procedure QC-80 are not controlled under a program that requires documentation of the cause of the condition and the corrective action taken to prevent recurrence. (89-01-08)

   c. Contrary to Criterion XVII of Appendix B to 10 CFR 50 and Section 17 of the Purchasing Department Manual, the Purchasing Department could not locate Purchase Order 19889. (89-01-09)

C. UNRESOLVED ITEMS:

Review of the actuator assembly design basis and the control of design modifications identified that sufficient information was not available to demonstrate that certain design/material modifications did not compromise the environmental qualification of this equipment. Three separate items: O-rings, terminal blocks, and heater assemblies are included in this concern and are discussed in detail in Section 3.a of this report. (89-01-10, 89-01-11, 89-01-12)

D. STATUS OF PREVIOUS INSPECTION FINDINGS:

There were no findings during the previous inspection.

E. INSPECTION FINDINGS AND OTHER COMMENTS:

1. The NRC staff informed Rotork's management representatives of the scope of the inspection during the entrance meeting on October 9, 1989, and summarized the inspection findings and observations during the exit meeting on October 10, 1989.

2. Tour of Facility

The first activity conducted was a tour of the manufacturing, receiving, and warehouse areas. During the tour the inspectors reviewed shop travelers that identified and controlled work in progress, including inspection and testing; procedures for performing assembly, inspection, and test activities; calibration of inspection and test equipment; and interviewed various manufacturing, inspection, and test personnel. Operations in all three areas were well controlled. Personnel had been with the company for considerable time and were very knowledgeable concerning their jobs. Equipment was in good condition and based on the calibration labels, were within calibration.

3. QA Program

Rotork has a single QA program written to meet BS 5750, "Specification for design/development, production, installation and servicing," a British national standard very similar to Appendix B to 10 CFR 50. The program has been audited by several companies from the United States, including Rotork Controls, Incorporated, Rochester, New York, and have been found to meet the requirements of Appendix B. Rotork applies this program to the safety-related, environmentally qualified, electric motor driven actuators sold for use in commercial nuclear power plants in the United States.

The inspection concentrated on the control of parts or assemblies, purchased from subcontractors, including evaluation and selection of subcontractors and design control for parts supplied by subcontractors.

a. Design Control/Equipment Qualification

The basis for environmental and seismic qualification of the actuators, including the control of design changes and modifications were reviewed to assess the effectiveness of QA program implementation in this area.

The environmental and seismic qualification of Rotork actuators is based on Wyle Laboratories Test Reports 43979-1 and 58364, Revision B. The testing was conducted in 1978 using two actuators, Part Nos. 11NAZT1, and 90NAZT1.

During the inspection, design information, material specifications, and procurement records were reviewed with

emphasis on parts and assemblies subject to environmental degradation. This review identified several concerns as described below:

(1) O-ring Seal (Terminal Block), Drawing 209369, Item 18

This seal is used as an environmental barrier for the terminal block (DWG No. 20885101) and for the actuator outside cover. Drawing No. 209369 identifies the O-ring material as rubber having 45-55 Shore hardness and notes that "Material to withstand working temperature range of -30°C to + 70°C." The parts list identifies the material as "Nitrile Rubber." A recent (May 5, 1989) Rotork purchase order for these O-rings was reviewed to determine the basis of purchase. The vendor was Aztech Seals Limited of Andover and was identified as an approved supplier on Rotork's approved vendor list. The O-rings were ordered to the above drawing number and a Certificate of Conformity was requested. No other technical requirements were specified.

The inspectors expressed concern that the material specifications for this item were not sufficiently definitive with respect to the material formulation to assure similarity between the O-rings qualified by the Wyle Laboratories test and O-rings purchased subsequently. Significant formulation changes affecting the material's response to radiation or high temperatures could be made by the supplier within the broad product specification used to define this material. Rotork believed, but could not verify, that no changes had been made to the material formulation. This issue was identified as an unresolved item. (89-01-10)

(2) Terminal Block (DWG 20885101)

The terminal block functions as an electrical feed-through as well as an environmental barrier within the actuator electrical enclosure. The terminal block assembly, Drawing No. SN 20882101, dated November 11, 1977, specifies the following alternate materials: BIP BEETLE DMC GRADES 6908 G3/B and 6908 G/B. It was not clear from available records which block material was qualified by the Wyle test report. Correspondence in Rotork files suggested that the 6908 G3/B material

was to be discontinued by the supplier. Additionally, Drawing SN 20882102, Issue 102, dated July 17, 1984, added an alternate adhesive material for potting the electrical terminals. The alternate material was Araldite Grade AY 105 with HY951 hardener and was to be heat cured at 40°C for 12 hours.

The original material was Araldite Grade 105 with HY972 hardener. After assembly, the parts were to be left undisturbed for 3 days to allow the Araldite to cure fully. Addition of the alternate adhesive was addressed in Engineering Design Modification Report No. P1566, dated July 18, 1984. This report, however, did not provide a technical evaluation of the potential effect of this modification on environmental qualification of the equipment. It noted that the modification was requested by Quality Control. Environmental qualification of the terminal block material/adhesive modifications was identified as an unresolved item (89-01-11).

(3) Heater Circuit P/N 40025 101

The original heater assembly, which was qualified by the Wyle Laboratory test, is described on Drawing MN 20871101, Switch Mechanism - US version (NA 1). This drawing specifies an ERG 2K, Reference 17EV (or WELWYN W 24) resistor connected by AMP "STRATO-THERM" splice, catalog No. 323794. It specifies the heater connection to be insulated by heat resistant sleeving, 7 x 5 mm (VIDAFLEX III glass fiber sleeve).

Drawing PN 40025 101, NA1 Heater Subloom, issued December 5, 1978, specifies a C.G.S. HSA25 2K heater attached with Hellerman "HELASHRINK" SVT 64 (VITON) heat shrink sleeve.

The design modification is addressed in Engineering Design Modification Report (DMR) issued May 12, 1978. The basis for the modification was stated as a need to reduce the high failure rate of existing ceramic heaters. The DMR summarizes the results of a special qualification test conducted on the new heater assembly. The testing consisted of irradiation to 200 megarad, flash test at 2KV for 1 minute, heat aging at 200°C for 3 hours and flash test at 2KV for 1 minute. The DMR did not compare these test parameters to the original Wyle qualification test which was identified as the qualification basis for the

equipment. It was also not clear that the new qualification information for the revised heater assembly was available to the recipients/users of the equipment. The inspectors expressed concern that unless it could be demonstrated that the heater assembly test parameters enveloped those of the Wyle qualification test, users of this equipment would not be able to establish a qualification basis for their particular environmental conditions unless they were provided with the new test information for the revised heater assembly. This concern was identified as an unresolved item. (89-01-12)

b. Procurement Document Control

In reviewing the standard provisions Rotork imposes on their suppliers, the inspectors noted that a provision requiring the subcontractor to impose QA requirements on his supplier was lacking. In reviewing an audit report for an audit performed at True Engineers, Limited, Report 260, dated June 13, 1985, the inspector noted that True Engineers Limited was accepting material based on CoCs. When the inspectors asked if True Engineers imposed any quality requirements on the supplier, the answer given was they did not. Therefore, the basis for Rotork's acceptance that chemical and mechanical properties of the material were acceptable is a CoC that has not been verified. This practice is not acceptable and was identified as Nonconformance 89-01-01.

c. Control of Purchased Material Equipment and Services

Rotork's QA Manual allows suppliers to be qualified based on product quality history, audits, or review and approval of the supplier's QA manual. Most of the suppliers are qualified based on product quality history. For all purchased material, Rotork maintains a computerized data base file, by supplier and part number, on the quality of the items supplied. Every three months the QA department calculates a Vendor Rating based on the number of parts supplied and the number accepted.

The rating is mailed to the vendor and included is a request for corrective action for a rating of 4 percent of greater rejected parts. If a company has a reject rate of 5 percent or greater for three consecutive quarters, the company is removed from the approved suppliers list.

However, unlike Rotork Controls, Incorporated, of New York, Rotork Controls, Limited does not perform receipt inspection on all parts received from vendors whose QA program has not been audited. The input to Rotork Controls, Limited's quality history data base is largely based on problems found during assembly and test. Therefore, critical characteristics that are not tested to the extremes of the design envelope are not adequately represented in the quality history. Examples of parts affected are the environmentally qualified parts and load bearing metallic parts. Because of the basis of the quality history, this practice is not considered adequate to assess the effectiveness of the supplier's QA program or to assure the quality of the parts received. This has been identified as Nonconformance 89-01-04.

In reviewing and discussing this issue, Rotork personnel stated that Procedure QC-80, "Material Certification," verified material properties. In reviewing QC-80 and the testing performed under QC-80, the inspectors determined that all required material properties were not being tested and the results of the testing were not being used in the Vendor Ratings.

The inspectors reviewed two test reports in detail, Test Reports 1736 and 1769. Report 1736 was for 5 wormshafts and 6 drive pins.

One wormshaft and one drive pin did not meet chemical specification requirements, one wormshaft did not meet hardness requirements, and three drive pins did not meet chemical or hardness requirements. Report 1769 indicated that a drive pin, Part Number 09332, was outside the required range for nickel content; 2.82 percent actual vs a required range of 3.00-3.75 percent. No mechanical tests were performed.

In neither case were the test results used as input to the Vendor Ratings, nor were test frequencies increased as a result of discovering nonconforming material, nor were the nonconformances documented under any formal program that would require corrective action. These problems were identified as Nonconformances 89-01-04, 89-01-05, and 89-01-08.

In the process of trying to trace some of the wormshafts, the inspectors determined that the heat treatment certifications for wormshafts manufactured by Davall and

heat treated by TEE, Limited were not traceable to the individual shafts, nor were they traceable to the base material certification that was used to show conformance to the chemical requirements. Rotork Drawing N21350103 for the wormshafts required certificates for chemical content and hardness. Therefore, the documentation used as a basis for acceptance was not traceable. Nonconformance 89-01-06 addresses this problem.

In discussions of how problems like these are communicated to the suppliers, the inspectors were informed that material rejected at receipt are documented on a Reject/Concession Note and sent to the suppliers. The note format included a tear-off-slip that is supposed to be completed by the supplier, describing his corrective action, and returned to Rotork. When the inspectors asked how the status of tear-off-slips were tracked, the external auditor stated that there was no mechanism for tracking the return of the tear-off-slips. The external auditor also stated that he was aware that some of the suppliers were not returning the tear-off-slips. This was identified as Nonconformance 89-01-07.

The inspectors also reviewed tests on gear cases, Part Number N21533. In performing the review the inspectors requested to see Purchase Order (PO) 19889 to Williams & Oakey for the gear case. The Purchasing Department could not locate a copy of PO 19889. This resulted in Nonconformance 89-01-09.

As part of the review of the control of subcontractors, the inspectors reviewed the applicable procedures. The highest tier document is the QA Policy Manual. It requires that all subcontractors be selected from the Approved Supplier File. The Purchasing Department Manual allows the purchasing department to purchase from companies not on the Approved Supplier File, providing they consult with the external auditor and or the QA Manager and arrange special provisions such as source inspection or extra receipt inspection. While the process was found to be acceptable and was being properly implemented, it was not in compliance with the QA Policy Manual. This was noted in Nonconformance 89-01-03.

During the review of the procedures, the inspectors consulted the latest index of approved procedures in trying to identify where certain requirements might be found. In searching for these procedures, the inspectors noted that

the QA Manager's copy of the QC Procedures, Volume 2, included a number of obsolete procedures; QC-174, "Calibration of Field Engineers Test Boxes;" QC-171, "Quadrex Test Rig Calibration;" QC-192 "Calibration of Final Inspection and Goods Inwards Inspection Millipot Test Boxes;" and QC-192, "Calibration of Paint Oven Temperature Recorder." This was identified as Nonconformance 89-01-02.

F. PERSONS CONTACTED:

Ivan Burnell, Applications and Design Support Manager
Martin Hunt, Quality Manager
George Malcolm, Engineering Director
Robert White, Product Engineer
Bill Whiteley, Managing Director

All parties listed above attended the exit meeting