

# Farwell & Hendricks, Inc.

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January 2, 1991

Mr. Alan R. Herdt, Acting Chief  
Vender Inspection Branch  
Division of Reactor Inspection and Safeguards  
Office of Nuclear Reactor Regulation  
United States Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852

Subject: F&H Response to USNRC Docket No. 99900918/90-01

Reference: USNRC Notice of Nonconformance 11/09/90  
USNRC Extension Letter 12/12/90

Gentlemen:

This letter and enclosures are in response to your reference letters.

Farwell & Hendricks, Inc. has defined in this letter and enclosures steps taken to correct the nonconformances, prevent the recurrence, and completion dates.

Farwell & Hendricks, Inc. would like to define its process of defining safety functions in dedication programs to respond to the USNRC nonconformance, as stated in the subject inspection report "...processed them through their dedication program for use in safety-related nuclear plant service, and sold them to nuclear utilities without conducting a complete review for suitability of application of equipment essential to the safety-related functions of structures, systems, and components or verifying the adequacy of design through a complete testing program."

F&H supplies dedicated items to the requirements of the customer purchase order. Generally, for third party supply these purchase orders do not identify the specific application or safety function. Therein, when this occurs F&H envelopes selected published catalog performance characteristics which satisfy the qualification document that defines the safety function of the item. F&H qualification documentation is submitted to the client for his approval; client approval denotes acceptance of the safety function by the end user of the system. Note the

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**RETURN TO REGULATORY CENTRAL FILES**

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PDR QA999 ENVFARWE  
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nonconformances in the USNRC inspection report are all third party supply with corresponding qualification documentation; therein, either the utility approved the qualification plan prior to testing or the final generic qualification report and associated performance testing of safety-related critical characteristics. No USNRC nonconformances were noted when F&H had the original qualification and/or design documentation and thereafter determined the appropriate safety function and required test verification.

F&H had isolated deficiencies in implementing dedication in project 60500 and 60058 which has resulted in F&H establishing a programmatic upgrade as part of the corrective action to more clearly identifying and documenting the method of confirming critical characteristics. Enclosure I.2 will address project 60500 and enclosure I.3 will address project 60058.

The USNRC concerns on Molded Case Circuit Breakers will be addressed in two sections: "Prior MCCB Program" will address the USNRC write-up on project 60447.1, 74001 a repeat sale of 60447, and 74000; and "Improvements to the Later Phase MCCB Program" which the USNRC defined as additional verification beyond the utility approved MCCB test procedure in project 74002 and 74003. This provides the corrective action on MCCB. Enclosure I.1.1 and I.1.3 will address the USNRC concerns on prior programs; and enclosure I.1.2 will address improvements to the later phase MCCB programs.

Programmatic upgrades as part of the corrective action includes:

- (1) Upgrade the technical procedures and the data package process to more clearly identifying and documenting the method of confirming each critical characteristics with a completion date of March 31, 1991;
- (2) Upgrade the fraudulent receipt inspection procedure for MCCB as necessary with a completion date by March 31, 1991;
- (3) Create a fraudulent detection procedure for all third party dedicated items which are not drop shipped directly from the original equipment manufacturer's primary point of distribution with a completion date by March 31, 1991. (Note: This seldom occurs, but occasionally it is the only way an item can be procured);
- (4) Stressing the importance of eliminating typographical errors, which can mislead the reviewer, even though the author understood at the time of writing the document; i.e., a MCCB THED 136050WL is not the same word as THED 13605 OWL to be completed by January 31, 1991.



Mr. Alan R. Herdt  
January 2, 1991  
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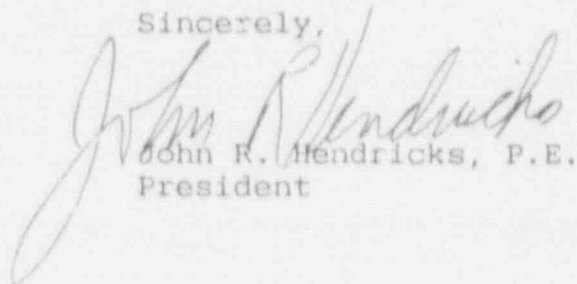
Additional training of all affected personnel to stress the importance of documenting component safety functions, critical characteristics, and performance of mild environment analysis to be completed by January 31, 1991.

Farwell & Hendricks, Inc. wants to thank the members of the inspection party for their professionalism and technical exchanges. The inspection helped F&M improve our program by having:

- Technical exchanges;
- Independent review by USNRC personnel identifying areas for improvement;
- Discussion with production staff enforcing the importance of proper documentation; and,
- As a result of this evaluation the extreme importance of easily retrievable documentation and proper concise documentation was highlighted. It required many man-hours to retrieve information in documentation storage files and reconstruct the data flow to respond to the USNRC concerns, which could have been avoided if initially structured properly.

Please call should you have any questions.

Sincerely,



John R. Hendricks, P.E.  
President

JRH:11  
encls

NON-CONFORMANCE REPORT AND  
CORRECTIVE ACTION REQUESTCAR NO. 33

TO: JRH DEPARTMENT: Corporate DATE: 12/3/90  
CC: RAW JOB NO. N/A  
CC: MEL P.O. NO. N/A INITIATED BY: MEL

1. REQUIREMENTS: See Enclosure 11.3 NRC Docket No. 99900918/90-012. OBSERVATION: See Enclosure 11.3 NRC Docket No. 99900918/90-013. RECOMMENDATION: Provide (1) a description of steps that have been or will be taken to correct these items; (2) a description of steps that have been or will be taken to prevent recurrence; and (3) the dates the corrective actions and preventive measures were or will be completed.SCHEDULED COMPLETION DATE: 3/31/91 ACKNOWLEDGED BY: J. R. Hendrick4. CAUSE: See Enclosure 1 F&H Response to Docket No. 99900918/90-015. RESPONSE: See Enclosure 1 F&H Response to Docket No. 99900918/90-01Prepared By: Max E. Lilly Date: 1/2/91Potentially Reportable Per 10CFR21 ☐ YES ☒ NO JRH 1/2/91Verified By: John R. Hendrick Q A Dept. JRH Date: 1/2/91Other Verification If Requested: Loy A. Wroste Date: 1/2/91

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## Enclosure I

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- I.2 F&H Response to Nonconformance #90-01 A.2
- I.3 F&H Response to Nonconformance #90-01 A.3

ENCLOSURE I.1.1  
PRIOR MCCB PROGRAMS (EARLY PHASE)

## INTRODUCTION

Farwell & Hendricks, Inc. sold 20 GE MCCB's, part number THED 136050WL to PSE&G in project 60447.1, July 14, 1988, prior to USNRC IEB 88-10 received December 9, 1988 at F&H; and a repeat order documented in 74001, April 14, 1989. F&H thereafter sold MCCB's to NUSCO on March 28, 1989 to the same pre-qualification and dedication program for NUSCO application except 100% testing was conducted instead of sampling which was unique to 60447, PSE&G.

The USNRC concern for prior programs were:

- (A) Not a complete review of suitability of application to safety-related function;
- (B) Not completely verifying the adequacy of design through suitable testing programs in that:
  - (1) Not all critical characteristics were verified,
  - (2) Acceptance criteria for some testing was inadequate to verify applicable critical characteristics.
  - (3) Not all MCCB to be dedicated were tested, and
  - (4) Not all items performance was consistent with the stated basis for the acceptance criteria; and,
- (C) Traceability to Circuit Breaker Manufacturer was not established.

F&H, as is standard practice when performing dedication or qualification on first kind of application, communicates with the client to determine acceptance criteria and test parameters. F&H on project 60447 had numerous phone calls with PSE&G to jointly determine the safety parameters that needed to be verified for the specific site application. F&H thereafter submitted a plan/procedure/final report to the utility as fulfillment of the purchase order contract requirement. F&H received payment upon engineering release to purchasing that F&H has fulfilled the utility requirements. Please note from July 14, 1988 to the post-NRC IEB 88-10 program 74002 and 74003 the utilities have increased their MCCB testing requirement for F&H contractual compliance, although as noted in enclosure I.1.2, those requirements still did not satisfy USNRC concerns for MCCB critical characteristics performance verification.



Enclosure 1.1.1

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The MCCB critical characteristics for project 60447 were:

- (1) Insulation resistance greater than 1 megohm at 1000VDC;
- (2) Satisfying thermal trip at 300% of rated current; and,
- (3) Satisfactory instantaneous magnetic trip function at five to ten times rated current.

After discussions with PSE&G and their return of a draft procedure, the 60447.1 procedure was followed. This procedure was poorly written since "TEST REQUIREMENTS d" did explain industry tolerances on instantaneous testing, although only the upper limit was used but not the lower limit, and confused the USNRC reviewer resulting in this statement, "(3) satisfying instantaneous magnetic trip function at 1000 + 500%" and related comments on proper instantaneous test techniques and tolerances (see page 8 of 10, second paragraph from USNRC report). Per discussions with PSE&G in 1988 as reflected in the data sheets, ten times the 50 amp rating was used at 500 amp instantaneous with a -7.5% and plus 40% tolerance (500 amp, +200, -37.5) since as initially stated in "Test Requirement d ... was to verify functioning of the instantaneous trip systems of the MCCB. In verifying testing, it is more important to determine that the instantaneous trip feature is operating and will trip the circuit breaker, than to determine the exact current value at which the instantaneous trip feature operates...." Thereafter the next three paragraphs talked about typical industry tolerances and has no relevance to the sole purpose of verifying the MCCB would trip when subjected to a high overload current and that the instantaneous trip feature worked.

F&H agreed that the early utility approved procedures did not adequately address contact resistance, millivolt drop test, fault interrupting capability, thermal overcurrent trip, or instantaneous tripping to the published manufacturers rating curve. Although since the utility determines the specific application safety function and appropriate verification of that safety function the generic verification of most of the MCCB critical characteristics discussion above may not have been required; versus generic MCCB application or function; i.e., the new enhanced MCCB dedication qualification program verifies all known Generic MCCB applications assuming no credit for field, technical specification, routine, preventive maintenance testing, or specific system applications such as changing state only when overloaded.

F&H will discuss herein the specific USNRC concerns above.

- (A) Since the utility had involvement, it is assumed by F&H that the suitability of application to safety-related function was addressed by PSE&G or they could not have provided the contractual guidelines of the test acceptance

Enclosure 1.1.1

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criteria. Thus, this should not be a safety concern since the utility defines its safety function to F&H as translated into the final documentations.

- (B) The procedure did not require that all critical characteristics be verified and the specific acceptance criteria was adequate for PSE&G application, although it must be noted the overcurrent trip testing used NEMA maximum trip time and not design minimum and maximum time, and instantaneous did not use time-current curves with NEMA tolerances but a ten-time value of 50 amps as a target value to verify the MCCB will trip.

Additionally, per the proposal/telephone discussions which resulted in a purchase order to F&H; PSE&G per the proposal committed to sampling per MIL-STD-105 on their order. Please note F&H has not performed sampling on any other MCCB since PSE&G and the basis for sampling was drop shipment from the factory. Finally, F&H test performance was consistent with the stated acceptance criteria as reflected on the individual data sheets, which has the acceptance criteria stated next to the raw data collected. Although this may not have been what the USNRC required, it was what the utility desired as reflected in the procedure/final report.

- (C) Finally, USNRC concerns in receiving practices of untraceable MCCB are addressed. Herein, F&H will document a data package documentation mistake in that all MCCB shipped to PSE&G were drop shipped from the factory and the one MCCB from GESCO was used as the qualification test sample which was maintained by F&H and was evaluated as new, see Enclosure 1.1.3.

In conclusion, F&H agrees that 60447 methodology is not acceptable for design verification of a MCCB with multiple/potentially generic application as are the MCCB intended at CECO/PG&E. They are suitable for their specific safety application if the utility properly defined that application. The utility accepted F&H documentation, therefore F&H appropriately met the contractual/technical requirement of the utility. The correction of an untraceable MCCB is contained herein, and will be incorporated into the documentation of the 60447.1 data package by March 31, 1991. The preventive measure has already been implemented in our receiving/inspection procedure for drop shipment/new verification of MCCB, which the USNRC inspection party reviewed during the audit as used on project 74002/74003. Although this procedure was acceptable to USNRC audit personnel, it is scheduled to be updated to provide additional directions for new employees to follow.

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Sampling testing of MCCB critical characteristics was isolated to project 60447.1 and PSE&G utility unique per pre-USNRC IEB 88-10 utility insight. Since the MCCB performed similarly in five of 16 and two of four groupings and it was pre-USNRC IEB 88-10 this practice was acceptable for drop shipment from the factory and is no longer employed. The resulting corrective action was implemented as verified by USNRC review of projects 74002/74003.

The balance of the testing for critical characteristics for one unique 50 amp MCCB which was per utility defined safety functions. Further corrective action is:

- (1) This was acceptable verification per utility technical contract;
- (2) F&H should inform the utility that they have not performed their evaluations correctly; therein, F&H testing was limited and may not have addressed the end usage; or,
- (3) The USNRC audits the utility to evaluate that utility procurement practice.

F&H selects (1) above unless the USNRC informs us to the contrary.

The USNRC reviewed the Phase Two Projects 74002/74003 testing which is being upgraded in enclosure I.1.2; thereby, addressing steps taken to prevent recurrence with documented application in data packages effective January 1, 1991 and technical procedures by March 31, 1991. The technical procedure will be a summary of procedure 74003 and Enclosure I.1.2.

ENCLOSURE I.1.2  
IMPROVEMENT TO LATER PHASE MCCB PROGRAM

## INTRODUCTION

F&H on project 74002, Westinghouse MCCB, for PG&E developed and submitted for approval the test requirement per PG&E site specification methods of verifying proper performance; and on project 74003 for CECO, General Electric MCCB, the method of verifying proper performance. These procedures are per client contractual technical approval. F&H per this response is upgrading the test procedure to fulfill USNRC concerns while not invalidating F&H contractual commitment, but enhancing and enlarging the data base that will satisfy the USNRC concerns on dedications. These enhancements are implemented in all data packages starting on January 1, 1991 and will be incorporated in a technical procedure by March 31, 1991.

Specific enhancements will be reflected in additional sections in future data packages and additional revised data sheets. This section excludes the USNRC review of acceptable areas of instantaneous trip, mechanical test, fraudulent and new MCCB receipt inspection procedure, etc.

### Time Delay Overcurrent Trip (Thermal)

Prior practice was to test individual poles at 300% rating since this response will be indicative of its response throughout its entire overcurrent tripping range. This load was chosen because the wattage per pole from line to load is low enough so that transfer of heat into the nonactive pole space is minor and does not appreciably affect the test result. A maximum limit was established.

This practice has been superseded with a three-location check per individual pole; low end, 300%, and upper end bound by the minimum and maximum design value of the manufacturer's time current curve. The 300% location was maintained for the above reason and most clients specify 300%. The upper end at approximately 80% of the time delay portion of the time-current curve provides adequate assurance that the tripping characteristics conform to published curves since trip functions overlap in the region from 300% of rated current to the beginning of the instantaneous portion of the curve.

The lower end is defined as approximately 200% because as the range approaches 100% - 150% extreme minimum and maximum time limits develop; i.e., for the type HKA Westinghouse MCCB, at 150% the minimum time is 11 minutes and the maximum time is 2.8+ hours, or approaching infinity. This lower portion of the minimum curve defines the tripping time characteristics of the MCCB for continuous current for which the MCCB will remain closed.

Thus, a three-point check provides an expected tolerance curve (or table) verifying per individual pole thermal trip within the design

Enclosure I.1.2  
Page 2

limits of the time current curve. The 200%, 300%, and 80% time delay/lower limit (typically 400%) provides a narrow enough minimum-maximum time limit to provide meaningful data. Generally the individual pole spread increases at the lower percentages. See Figure 1 of a typical result.

#### Rated Hold-In

The following will be explicitly stated in dedication documentation.

Rated current hold-in tests are required to address all expected variation in service conditions in order to verify satisfactory performance of safety function under all normal design conditions. Confirmation requires the three-location check per individual poles be satisfied in the overcurrent trip verification test described above.

The demonstrated test data of the thermal overcurrent test following the manufacturer's published time current curves should never trip at 100% load because the curves become asymptotic to the vertical 100% current line; i.e., the maximum and minimum in clearing time converge and are unbounded.

Load reductions are realized in actual service when rated under UL-489 criteria. MCCB are sized in accordance with manufacturer's literature such that the maximum continuous (greater than three hours) load on a MCCB in an enclosure at 25°C ambient will not exceed 80% of the MCCB nameplate current rating.

Endurance design test verification, ongoing factory testing and independent U.L. inspectors assure proper hold-in if the proper thermal element is installed in the MCCB. Therein, the expected tolerance curve from a three-point check would be expected to be lower than other MCCB of the same rating near or below the minimum thermal overcurrent test when a smaller thermal element is in a specific sized MCCB (i.e., a 40 amp thermal element in a 50 amp frame) and toward the maximum or greater than the maximum when a larger thermal element is in a specific sized MCCB (i.e., a 60 amp thermal element in a 50 amp frame). Please note U.L. is only concerned with short circuit and overload, although random failure could occur if improper thermal element were installed. The reason this probably has never been detected by the USNRC is that many manufacturers perform 100% test to verify proper thermal elements (i.e., Siemens perform 100% test at 200% for four minutes for this purpose.). Additionally, the receipt inspection procedure verifies a proper U.L. label.

The above paragraph, when satisfied, defines acceptable demonstrated hold-in results.



Enclosure I.1.2

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#### Individual Pole Resistance (Millivolt Drop)

The purpose of the individual pole resistance test is to determine the contacts are not corroded, loose, misaligned or have low contact pressure. If these conditions occurred irregular heat would be generated causing the MCCB to trip prematurely.

Thus, engineering judgment stated that individual pole resistance is satisfied if all three performance verification test of mechanical cycling, instantaneous trip testing, and three-point overcurrent thermal trip testing fulfill their individual acceptance criteria. Manufacturers use this test during specific stages of manufacturing for production control and trending. Manufacturers will not provide a value with tolerances for independent verification. Each family of breakers has significant variances that are functions of contact surface area, and the amount of wear, such as, coating on the contact prior to any verification test. The value continuously changes during dedication verification testing. After dedication testing repeatability may become possible, therefore, it is the opinion of industry experts that this test could be used after installation to provide trending information as to contact wear.

#### Short Circuit Interruption Test

The verification requires destructive testing of a prototype to confirm capabilities of the design and determine its susceptibility to common mode failure due to design defects, overrating, etc. Confirming consistency of production quality control and trending the expected rate of random failure, if applicable, in service often requires destructive testing of a statistical sample of productive MCCB.

The quality controls on a manufactured Underwriters Laboratories rated MCCB can be divided into U.L. rated verification and production testing within the manufacturer's commercial quality control program.

U.L. related verification consists of: An engineering prototype submittal which is the starting point for design capabilities. Additionally overload, endurance, short circuit, and tripout is verified by these prototypes. Initial product inspections for the first production lot is also verified as is a recycle test performed by U.L. personnel schedule of 3, 6, and 24-month per preselected U.L. verification variable. Random monitoring by U.L. during routine production is accomplished by independently removing samples and performing U.L. verification testing. Design changes are submitted to U.L. for approval, for example a complete re-submittal would be required for a change of contact material or size. Please note U.L. is only concerned with short circuit and overload, although random failure could occur if improper thermal elements were installed. The

Enclosure I.1.2

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reason this probably has never been detected by the USNRC is that many manufacturers perform 100% test to verify proper thermal elements (i.e., Siemens perform 100% test at 200% for four minutes for this purpose.).

Typical OEM manufacturing quality consist of: (1) thermal and magnetic trip tests during production at a current sufficient to reach the trip setpoints but are not conducted at rated voltage. The thermal trip test is conducted as part of the calibration process and generally uses a preset current of approximately 250% to 300% of nominal thermal trip current setting; (2) dielectric test are performed on all MCCB; and, (3) MCCB are date coded to provide traceability.

Additionally, some OEM's perform millivolt drop test at selected locations in manufacturing to provide quality trending data. End-of-line product testing on a sampling basis is also conducted. Most OEM's have U.L. inspectors visiting individual plants one to three days per week observing normal products or end-of-life testing or randomly selected items for U.L. testing.

The importance is that these tests provide certain assurances for commercial application. They are usually go no-go tests, and do not address nuclear safety functions, qualification or concerns of changing instantaneous current trip levels since this is not regulated by U.L. U.L. concerns are for personnel safety. Thus, a manufacturer that changes a performance variable such as instantaneous trip levels is not concerned with U.L. inspectors since it does not effect personnel safety. Changes in short circuit are a concern for U.L. verification and labeling authorization; therein a valid U.L. label demonstrates these characteristics were acceptable to U.L. inspectors.

Additional, reasonable assurance is provided:

- (1) By visiting manufacturers and understanding the above U.L. process;
- (2) Noting the USNRC in NRC IEB 88-10 stated MCCB traceable to the Circuit Breaker Manufacturer are manufactured under controlled conditions to conform to a proven design;
- (3) U.L. inspectors insure design parameters, such as short circuit ratings are maintained;
- (4) Compliance to other design parameters, mechanical cycle, instantaneous trip, thermal trip, and insure design verification.

Thus, confirmation of reasonable assurance is traceability to a valid U.L. label drop shipped from the manufacturer. F&H receipt inspection procedure for new/nonfraudulent MCCB insures proper receipt of valid

Enclosure I.1.2  
Page 5

U.L. labeled MCCB. Manufacturers will not ship for commercial liability any MCCB that loses a U.L. rating; therein, a temporary loss due to failing a U.L. on-going test has resulted in placing MCCB on hold and not shipping until the U.L. label has been re-established for that specific MCCB. In summary, these tests are part of the U.L.'s on-going product verification. Thus, for a new MCCB, credit can be taken for this factory test; i.e., a critical characteristic for design, but not a critical characteristic for dedication acceptance. This requires a valid U.L. label.

If reasonable assurance is not acceptable, then complete assurance would be as follows: Note typical short circuit interruption test of two or three MCCB per U.L. one-day testing cost \$15,000 to \$20,000. If credit is not granted for the above, every shipment, every line item would have a \$15,000 to \$30,000 charge prior to the typical \$700 through \$2,000 charge for each nuclear grade MCCB. This would be unreasonable assurance.

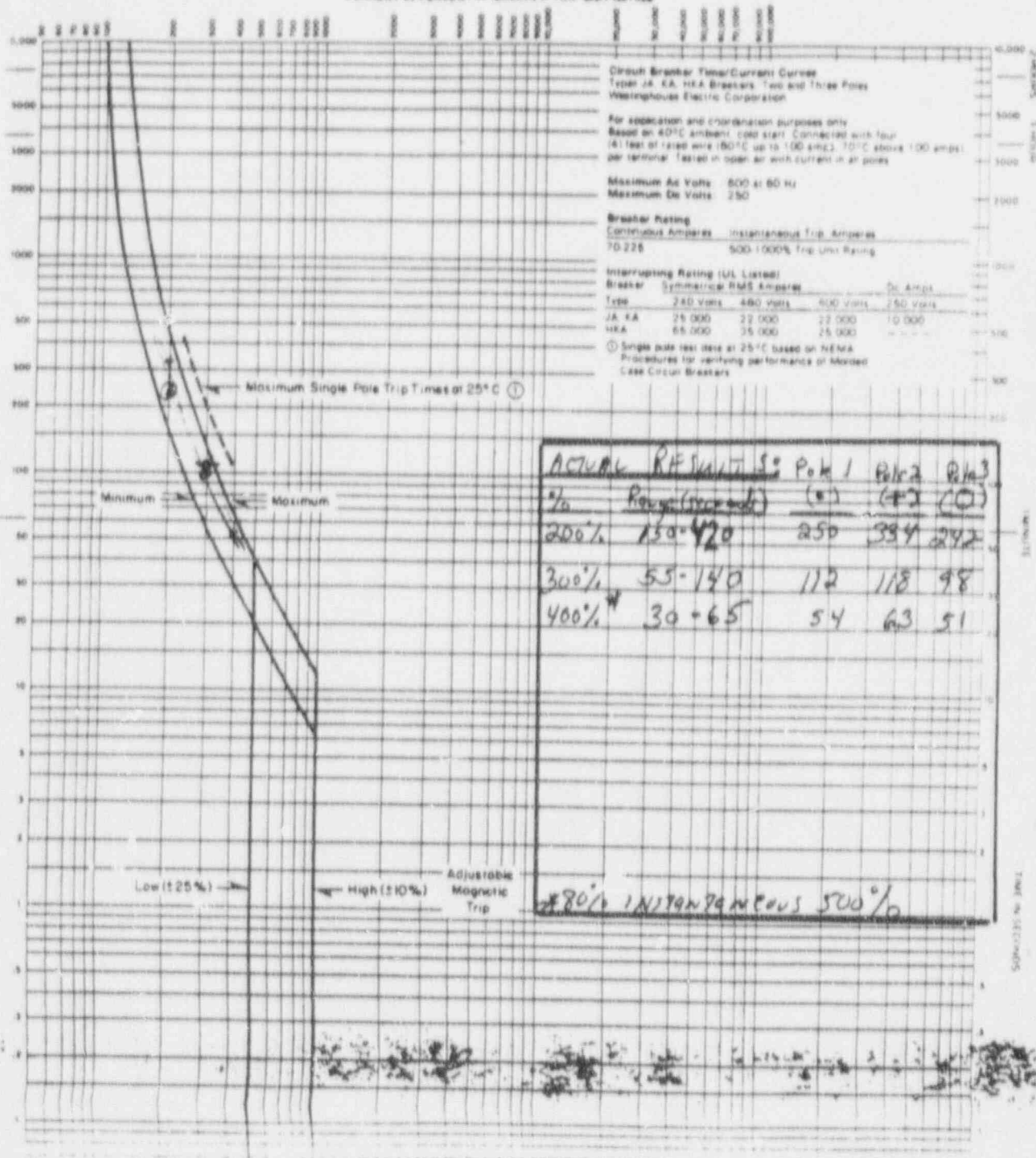
In conclusion, the corrective action is integrating the above analysis with the prior USNRC acceptable test sections from project 74003 into data packages effective January 1, 1991 and a specific technical procedure and associated MCCB unique data package by March 31, 1991.

# AB DE-ION® CIRCUIT BREAKERS Types JA and KA MARK 75® Type HKA

33199 OPG013

70-225 Amperes, 2 and 3 Poles, 600 Volts Ac Max.  
250 Volts Dc

CURRENT IN PERCENT OF BREAKER TRIP UNIT RATING



## Enclosure I.1.3

- A. See Enclosure II.3 NRC Docket No. 99900918/90-01, specifically Section A.1 of Appendix A of the Notice of Nonconformance which states, in part, F&H's measures for control of purchased materials were not adequate, this is in regards to a Commercial Grade MCCB to be dedicated as safety-related not having a traceable path to the original Circuit Breakers Manufacturer (CBM). This applied to a MCCB utilized in F&H Project 60447.
- B. F&H reviewed Project No. 60447 which indicated that the MCCB identified above was utilized as a qualification test sample, was not provided as a safety-related item, and was found acceptable for the application in which it was utilized at F&H. The subject MCCB is currently in the test sample storage area in it's original shipping box at F&H. Extracts from the F&H Data Package 60447.1, QA records from the 60447 Master File, and other records are attached to provide objective evidence to support statements made in this enclosure to address this portion of nonconformance 90-01 A.1.

F&H ordered 17 each GE THED 136050WL MCCB's under F&H P.O. number E0555 from General Electric Service Company (GESCO) of Cincinnati, Ohio. This order was drop shipped from GE Plainville, CT on 5/27/88 via Emery-Next Day Air. F&H performed receiving on these MCCB's on 6/1/88 which identified a discrepancy with the shipment on Non-Conformance Report and Corrective Action Request 60447-1. The discrepancy was that 1 each of the MCCB's had an incorrect P/N of THED 136040WL. A replacement and return material authorization request was placed verbally on 6/1/88 with GESCO. The replacement was shipped 6/1/88 from GESCO in Cincinnati, Ohio via UPS under UPS shipper #OH 479-979 (which is GESCO) PKG ID #786313. F&H performed receiving on the replacement breaker 6/3/88. The replacement breaker received on 6/3/88 is the MCCB identified in nonconformance 90-01 A.1. Please note, the inspection report identified it as being shipped from Chicago, IL. Note: Chicago, Illinois is on the packing slip to show where to send payment. Two blocks below that is the "SHIPPED FROM" box which states Cincinnati.

F&H utilized the MCCB shipped from GESCO as the qualification test sample. This item was removed from the F&H Commercial Grade Inventory storage area for use in the qualification program on 6/11/88 by Greg Morrison, see attached Form TF-002-1 Rev. 1. The box in which the MCCB was shipped in was tagged with a sticker labeled "TEST SAMPLE - NOT FOR RESALE" and the test sample #60447-11-01-01 was hand-written on the side of the box at that time. The MCCB was also tagged the same way to include the sticker.



F&H shipped to PSE&G 16 each THED 136050WL MCCB's identified as 60447-01-01-20 through 60447-01-16-20 on 6/23/88. F&H shipped 1 each MCCB THED 136040WL back to GESCO on 6/7/88. F&H still had possession of the 60447-11-01-01 test sample. At this point in time, F&H had not yet received the MCCB's to be identified later as 60447-01-17-20 through 60447-01-20-20. Therefore, the 16 MCCB's shipped to PSE&G had to be the 16 MCCB's drop shipped from GE Plainville, CT via Emery-Next Day Air.

F&H ordered 4 each THED 136050WL breakers under F&H P.O. #0629 from GESCO of Cincinnati, Ohio. This order was drop shipped from Plainville, CT on 6/30/88 via Emery-Next Day Delivery. F&H performed receiving on these breakers on 7/1/88. The 4 each breakers were identified as F&H Tag numbers 60447-01-17-20 through 60447-01-20-20. These breakers were shipped on 7/14/88 from F&H to PSE&G. F&H still had possession of 60447-11-01-01 test sample. Therefore, the 4 each MCCB shipped to PSE&G had to be the 4 each drop shipped from Plainville, CT via Emery-Next Day Delivery.

F&H visually inspected the test sample in accordance with the guidelines provided in F&H TP 13-005 which defines the method for inspecting MCCB for newness/nonfraudulence with acceptable results.

- C. F&H has evaluated the above described information in order to assess the impact on the quality of F&H Project 60447 with respect to purchased material control for the items provided to PSE&G and the qualification statements made as a result of Project 60447. All items provided to PSE&G have a documented traceable path to the CBM. The test sample was visually inspected, evaluated, and was determined to be acceptable for the application in which it was utilized by F&H. Therefore, there is no adverse impact on the quality of the items provided to PSE&G with respect to traceability nor is there any adverse impact on the quality of the qualification statements made as a result of Project 60447.
- D. Corrective action outside the action identified in Enclosure I.1.1 and I.1.2 is that F&H will revise Data Package 60447.1 to include the clarification of traceability contained in this enclosure no later than 3/31/91. Documentation which shows compliance will be incorporated into the F&H QA record system.

A list of the attached records is as follows:

- I.1.3.a F&H Receiving Records for 1st 17 Breakers Received
- I.1.3.b Non-Conformance Report and Corrective Action Request 60447-1
- I.1.3.c F&H Receiving Records for Replacement Breakers
- I.1.3.d MOC with UPS for Tracking Replacement Breaker shipment
- I.1.3.e Extracts from F&H Report 60447 which Identifies Test Sample
- I.1.3.f Form TF-002-1 Rev. 1 shows Test Sample removal from F&H CG Inventory Storage Area
- I.1.3.g Packing Slip which shows Return of THED 136040WL
- I.1.3.h F&H Shipping Records which show shipment of 1st 16 each Breakers
- I.1.3.i F&H Receiving Records which show receipt of 4 each THED 136050WL Breakers
- I.1.3.j F&H Shipping Records which show shipment of 4 each Breakers
- I.1.3.k MRDR 60447-01 and Associated Records for 60447-11-01-01

I.1.3.a

F&H Receiving Records for  
1st 17 Breakers Received

FARWELL & HENDRICKS, INC.  
RECEIVING INSPECTION CHECKLIST

Project Number 60447 CAR # 1  
F&H Purchase Order No. E0555 Item # ALL

Received lot meets the requirements of the original purchase order (Note 1). Y ☒ N

Part numbers of all units in the received lot are the same as that required by the purchase order (Note 1). Y ☒ N

Total number of units received in shipment comprise total of the units ordered (Note 1). ☒ N

All required documentation (by P.O.) for items received was present (Note 1). ☒ N

Vendor quality report complete. ☒ N

NOTE 1 : If deviations exist, place lot on hold and complete form QA-015 - Corrective Action Request.

Place this form, a copy of the F&H P.O. and a copy of the packing list (fasten in that order) in the Project Notebook and copy the master file.

Provide accounting with a copy of this form, F&H P.O., and original packing list.

Receiving  
Performed By:

James B. Jones  
Signature

6/1/88  
Date





05/27/88 1309104 33199 0PG020 Progress Is Our Most Important Product 60447 1PG175

6 REC	175	3394429	0000000	052788
PROD DEPT	CUSTOMER ORDER NO	CHARGE TO LOC	SHIP TO LOC	SHIP RECD TYPE MO DAY YR
175	50101100	3394429	0000000	052788
175	50101100	3394429	0000000	052788
175	50101100	3394429	0000000	052788

# GENERAL ELECTRIC COMPANY

CONSTRUCTION EQUIPMENT MANUFACTURING AND TECHNOLOGY OPERATIONS  
41 WOODFORD AVE.  
PLAINVILLE, CONN. 06062

GENERAL ELECTRIC CO  
GEN ELEC SUPPLY CO DIV  
900 EAST ROSS AVE  
CINCINNATI OH

EMERY-NEXT DAY AIR

PAGE 1  
DATE SHIPPED

SHIP TO - NAME & ADDRESS

FARWELL & HENDRICKS  
ATTN: JIM HANNER  
1000 FORD CIRCLEE  
SUITE C  
MILFORD OH

PLEASE REFER TO OUR  
WHSE. PICK LIST NO.  
IN ALL CORRESPOND-  
ENCE WHICH SHOULD  
BE ADDRESSED TO:  
41 WOODFORD AVE.  
PLAINVILLE, CONN. 06062

OH 60555/60447

ORDER REFERENCE NO.	DATE OF ORDER MO DAY YR	WHSE. PICK LIST NO.	DATE ISSUED MO DAY YR
*****	052788	175	0373899 052788

SHIP PREPAID FROM PLAINVILLE, CT. (UNLESS OTHERWISE INDICATED) AND VIA

SHIP CODE STD CAR 34 SHIP PREPAID FROM PLAINVILLE, CT. (UNLESS OTHERWISE INDICATED) AND VIA  
STD CUST PO# 27080101100

SHIP CODE  
STD - PAY & STAND  
CHG - PAY & CHARGE  
COL - COLLECT

ITEM NO	NS CODE	QUANTITY	CATALOG NUMBER	STK. LOC.	X MARK	NO. CTNS	DESCRIPTION
***** STOCK ITEMS *****							
002	-00	51	TCAL12	A61	X		BEELINE PA CONVERTED 646-06856-IP ORD BY JACK 8*336-3706
			NAED = 3164-07588				17 PKGS (0003)
001	-60	17	THED136050	HM	2		2 PKGS (0006) + 5
			NAED = 3164-07295				
CHK	2	2484					
WGT		63					
CUB		10.2					

1.1.3.b

Non-Conformance Report and  
Corrective Action Request 60447-1

NON-CONFORMANCE REPORT AND  
CORRECTIVE ACTION REQUESTCAR NO: 1TO: DRPCC: HRCC: ISHDEPARTMENT: RecJOB NO: 60447P.O. NO. E0555DATE: 6/1/88INITIATED BY: DB1. Requirement: VENDOR TO SUPPLY PART AS LISTED ON  
F&H P.O.2. Observation: F&H P.O. REQUESTS 17 PCS OF PIN THEO136050  
VENDOR SHIPPED 16 PCS OF THEO136050 WL AND 1 PCS  
THEO136040 WL

Potentially Reportable Per 10CFR21

☐ YES☒ NO3. Recommendation: CALL VENDOR AND HAVE 1 ITEM REPLACED  
WITH CORRECT PART.Scheduled Completion Date: 7/1/88Acknowledged By: [Signature]4. Cause: SHIPPING ERROR ON THE PART OF VENDOR5. Response: REPLACEMENT PART RECEIVED 6/3/88. WRONG PART  
RETURNED TO GESCO 6/3/88.Prepared By: DB

Response

Date: 6/3/88Verified By: Max E. Lilly

QA Dept

OTHER IF REQUESTED

Verification Date: 6/3/88

Date:

1.1.3.c

F&H Receiving Records for Replacement Breakers

**FARWELL & HENDRICKS, INC.  
RECEIVING INSPECTION CHECKLIST**

Project Number 60447CAR # NAF&H Purchase Order No. E0555Item # REPLACEMENT ITEM  
FOR WRONG PIN  
ON ORIGINAL REC

Received lot meets the requirements of the original purchase order (Note 1).

☒ Y ☐ N

Part numbers of all units in the received lot are the same as that required by the purchase order (Note 1).

☒ Y ☐ N

Total number of units received in shipment comprise the total of the units ordered (Note 1).

☒ Y ☐ N

All required documentation (by P.O.) for items received was present (Note 1).

☒ Y ☐ N

Vendor quality report complete.


☒ Y ☐ N

NOTE 1 : If deviations exist, place lot on hold and complete form QA-015 - Corrective Action Request.

Place this form, a copy of the F&H P.O., and a copy of the packing list (fasten in that order) in the Project Notebook and copy the master file.

Provide accounting with a copy of this form, F&H P.O., and original packing list.

Receiving  
Performed By:

  
Signature

6/3/85  
Date



33199 0P6025

PACKING  
SLIP  
ISSUED

GE Supp.

General Electric Company

SEND PAYMENT SHOWING INVOICE NUMBER & INVOICE DATE TO

GE SUPPLY

GE SUPPLY CO.  
PO BOX 70241  
CHICAGO, IL 60673

1-U-M-S 002087369  
CHICAGO

10th prox net lth 250

PAYMENT TERMS

% CASH DISCOUNT AS INDICATED BELOW BY ITEM

STOMER NUMBER 75980	YOUR ORDER NUMBER AND DATE 60555/60447	DATE SHIPPED 8-1-88	SHIPPED FROM FARWELL & HENDRICKS, INC.	SHIP TO FARWELL & HENDRICKS, INC. 1006 FORD CIRCLE, SUITE C MILFORD OH 45150	TRANSPORTATION TERMS FUS ALLOW	REL NO 270	GE SUPPLY ORDER NO 800239	CR TO HSE 270	GE SUPPLY JOB NO	PAGE 1 of 1	CUSTOMER PHONE 411416					
VOICE DATE	YOUR ORDER NUMBER AND DATE 60555/60447	REQ SHIP DATE	SESSION NO	SESSION DATE	VENDOR CODE	CUSTOMER REQUESTED SHIP VIA	QUANTITY SHIPPED	QUANTITY ORDERED	ENTERED BY 7724	NO. OF PACKS 1	WEIGHT	CHECKED BY	COILS REELS	PIECES PALETS	CUSTOMER REFERENCE 60555/60447	TOTAL
6050WL 3P-600V-50A CB																

BY THIS INSTRUMENT IS CONDITIONED ON THE TERMS AND CONDITIONS OF THE ORDER, INCLUDING ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY BUYER ARE OBJECTED TO AND WILL NOT BE BINDING. OFFICIALLY ASSENTED TO IN WRITING BY AN AUTHORIZED REPRESENTATIVE OF GE SUPPLY MANAGEMENT

IS THAT THE MATERIALS DESCRIBED ABOVE ARE INCORPORATED INTO THE PROJECT NAMED

RECEIVED BY  
MUST BE SIGNED

BY 1/88

ITEM



GE Supp.

General Electric Company

FARWELL & HENDRICKS, INC.

1006 FORD CIRCLE, SUITE C  
MILFORD  
OH 45150

YOUR ORDER NUMBER AND DATE  
60555/60447

GE SUPPLY ORDER NO  
800239

411416

KG-DESCRIPTION

QUANTITY SHIPPED

QUANTITY ORDERED

AGED NUMBER  
783164-06282

WAREHOUSE LOCATION  
GE CIRC

TOTAL ITEMS SHIPPED

AMOUNT

MISC. CHGS.

SHIPPING/HANDLING

CUTTING/PARALLELING

OTHER

AMOUNT IF PAID BY CHECK



I.1.3.d

MOC with UPS for  
Tracking Replacement Breaker Shipment

Farwell & Hendricks, Inc.

PARK 50 TECHNECENTER  
1000 FORD CIRCLE  
MILFORD, OHIO 45150  
(513) 831-9390  
FAX: (513) 831-9398

## MEMORANDUM OF CONVERSATION

FIRM NAME UPS DATE 12-19-90 TIME 8:15 JOB # 60447  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
TALKED WITH Jo Ann PHONE NO. 241-5161  
REPORTED BY MDM

## SUBJECT:

THE D1360 SOWL CIRCUIT BREAKER WHICH WAS SHIPPED 6-1-88  
UNDER SHIPPER NO. OH 479-979 PKG ID # 786313

She informed me that this package was shipped from  
900 E. Ross Ave in St. Bernard. It is G.E. Supply  
- Wholesale Only. Phone # 243-7877

I.1.3.e

Extracts from F&H Report 60447  
which Identifies Test Sample

Farwell & Hendricks, Inc.  
Report No. 60447  
Revision 0  
Date July 13, 1988

## NUCLEAR ENVIRONMENTAL QUALIFICATION REPORT

FOR

MOLDED CASE CIRCUIT BREAKERS  
I-T-E JD63B400  
I-T-E HF63B125  
G.E. THED136050WL

PREPARED BY:

FARWELL & HENDRICKS, INC.  
1000 FORD CIRCLE, SUITE C  
MILFORD, OHIO 45150  
(513) 831-9390

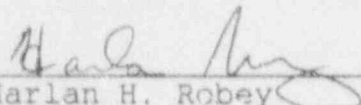
This is the property of Farwell & Hendricks, Inc. and contains proprietary and confidential information which must not be duplicated or disclosed other than as expressly authorized by a Corporate Officer of Farwell & Hendricks, Inc. in writing.

This report (numbered above) is exclusively prepared to support the qualification of items listed herein, or items referenced in Certification of Compliances issued only by Farwell & Hendricks, Inc. reference this qualification report number.

This report may not be used for any other purpose or by any other organization except Farwell & Hendricks, Inc. or their authorized agents.

## REVIEWS AND APPROVALS

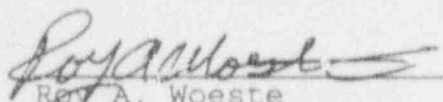
PREPARED BY:

  
Harlan H. Robey  
NEQ Engineer

INDEPENDENT DESIGN REVIEW BY:

  
David P. Rettig  
Engineering Manager

REVIEWED AND APPROVED BY:

  
Roy A. Woeste  
Quality Assurance Manager

REVIEWED AND APPROVED BY:

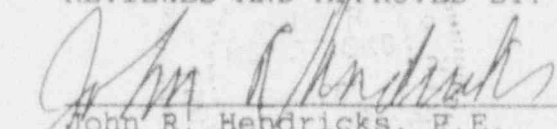
  
John R. Hendricks, E.E.  
President

TABLE 3.1  
Test Sample Description Summary

Circuit Breaker Part Number	Ampere Rating	Number of Poles	Maximum Voltage Rating (AC)	UL Listed Interrupting Rating RMS Symmetrical Amps (KA) AC Volts			Outline Drawing Figure No.
				240	480	600	
G.E. THED136050WL	50	3	600	65	25	18	3.1
I-T-E JD63B400	400	3	600	65	35	25	3.2
I-T-E HF63B125	175	3	600	65	35	22	3.3

TABLE 3.2  
F&H Tag Number Assignment

Circuit Breaker Part Number	F&H Tag Number
G.E. THED136050WL	60447-11-01-01
I-T-E JD63B400	60447-12-01-01
I-T-E HF63B125	60447-13-01-01



I.1.3.f

Form TF-002-1 Rev. 1  
shows Test Sample removal  
from F&H CG Inventory Storage Area

1A



60447-11-01-01

Farwell & Hendricks  
Item No.

## PROJECT MATERIAL RECEIPT, INSPECTION, DISPOSITION, AND LOG

Farwell & Hendricks  
Project No. 60447

1. Customer: P.S.E. + G  
Customer Item No.: 1  
Manufacturer: General Electric  
Manufacture Part Number: THEO 136050WL  
Description: Molded Case Circuit Breaker  
Test Type: Qualification

11. Receipt:
- Date: 6-11-88 Carrier: UPS
- Shipping Condition: OK
- Received By: Greg Morrison
- Tagged By: Greg Morrison

- III. Removal From Container:
- Item Complete                      Yes X      No

- IV. Special Instructions: \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- Completed By: \_\_\_\_\_

- V. Final Disposition:
- Scored/Returned To: FLH
- Date: 11/9/88 Signed: J. E. W.

# TEST SAMPLE ACTIVITY LOG

TF-002-2 Rev 1

Activity	Date Removed From Storage	By	To Location	Date Returned To Storage	Comments
R-I + Functional Stored F+H	6-14-88 <del>11/7/88</del>	Greg Monson J. E. W.	Functional AREA Storage	11/7/88	

33199 OPG033

I.1.3.g

Packing Slip which shows Return of THED 136040WL

SHIP TO:

G.E. Supply Co.  
900 East Ross Ave.  
Cincinnati, OH 45217

P.T.T.N: Mike Gallagher

SHIP FROM:

FARWELL & HENDRICKS, INC.  
1000 FORD CIRCLE SUITE C  
MILFORD, OHIO 45150

# PACKING LIST

CUSTOMER NO. E0555

DATE SHIPPED 5/2/88

FOB Melton, OH

AIR BILL NO           K/A          

BILL OF LADING Y/A

carrier - UPS

平陽縣 平陽縣 平陽縣 平陽縣

~~NA~~

ORDER DATE

N/A

F&amp;H PROJECT NO.

60447

ITEM	QUANTITY ORDERED	DESCRIPTION
1	17	G.E. Circuit Breaker P/N THED 1360 VC Wrong Part # sent
2	1 Lot	Material Return Authority

[illegible]

**THANK YOU FOR YOUR ORDER**

THIS ORDER WAS SHIPPED FROM OUR PLANT IN  
GOOD CONDITION - IF IT ARRIVES DAMAGED  
FILE CLAIM WITH CARRIER IMMEDIATELY!

W - Customer  
C - Master File  
P - Project NoteBook  
G - QP

TOTALS	QUANTITY 2	CARTONS 2	TOTAL WEIGHT 3 1/2 lbs.
PACKED BY J. J. Winebrenner			DATE 5/2/68
CHECKED BY Mar G. Hill			DATE 6/2/68

I.1.3.h

F&H Shipping Records  
which show shipment of 1st 16 each Breakers

FARWELL & HENDRICKS, INC. 33199 OPG037  
SHIPPING INSPECTION CHECKLIST

Project Number : 60447  
Customer P.O. # : 11-263623  
Customer P.O. Item # (s) : 12345  
F&H Packing List # : 88C120

Shipped Lot meets the requirements of the Purchase Order.

Y

N

Part Numbers of all units in the shipped lot are the same as that required by the purchase order (NOTE: If deviations exist, place lot on hold and complete Form QA-015 (Corrective Action Request)).

Y

N

Packing complies with ANSI 45.2.2 Level B or C (See attached guidelines).

Y

N

Verify packing list to include Part Description, Model No., Serial No., F&H No., and P.O. No.

Y

N

Verify correct shipping address.

Y

N

Verify special shipping instructions met. (special instructions) UPS

Y

N

Arrange transportation.

Y

N

Place this form, a copy of the F&H Packing List, and the Shipper's Form (Bill of Lading, Airbill, Copy of UPS Log) (fasten in that order) in the Project Notebook and a copy in the Master file.

Provide copies of the packing slip to a) Accounting  
b) QA

SHIPPING PERFORMED BY:

James W. Melbrenner  
Signature

6/23/88  
Date



PACKING SLIP FORM		CUSTOMER P.O. #: P1-263623		PAGE 1 OF 1	
SHIP FROM: FARWELL & HENDRICKS, INC. 1000 FORD CIRCLE, SUITE C MILFORD, OHIO 45150 (513) 831-9390		SHIP DATE: 6/23/88 ←		PREPARED BY: J. E. Carr DATE: 6/23/88	
		F&H PROJECT #: 60447			
		F&H PACKING LIST #: 88C120			
SHIP TO:		Receipt and Inspection is deemed to be automatic and consummated unless Farwell & Hendricks, Inc. receives notification of non-acceptance or rejection within 5 working days after receipt of goods by the customer. Claims for damage occurring during shipment must be filed and handled by the customer receiving the goods and the carrier and/or carriers. Copies to: Master File, Project Notebook, and Quality Assurance			
CLIENT: PSE&G ADDRESS: Maintenance Mgr. Salem (0630) Nuclear Dept. - Central Receiving End of Buttonwood Rd. TB-001 Hancocks Bridge, NJ 08038 ATTN: PHONE:					
		SHIP VIA UPS		F.C.B. N/A	AIR BILL NO. N/A
ITEM #	QUANTITY	DESCRIPTION		IDENTIFICATION NUMBER	
1	14	Circuit Breaker with Lugs, 600V 3 Pole 50 GE Part No. THED 13605QWL RFQ # 0632824 F&H Tag #s 60242-01-17-20, 01-18-20, 01-19-20, + 01-20-20 are B/O		F&H Tag # 60447-01-01-20 thru 60447-01-20-20	
2	3	Circuit Breaker with Lugs, 600V 3 Pole 400 I.T.E. Part No. JD63B400 RFQ # 0632824		F&H Tag # 60447-02-01-03 thru 60447-02-03-03	
3	10	Circuit Breaker with Lugs, 600V 3 Pole 125 I.T.E. Part No. HF63B125 RFQ # 0632824		F&H Tag # 60447-03-01-10 thru 60447-03-10-10	
5	1 lot	Certificates of Conformance for Items 1, 2, and 3 C of C's are going to be telecopied on 6/24/88		C of C #60447.01 C of C #60447.02 C of C #60447.03	
TOTALS		QUANTITY 30	CARTONS 7	TOTAL WEIGHT 277 lbs.	
PACKED BY: J. E. Carr		DATE: 6/23/88	CHECKED BY: Max E. Jolly	DATE: 6/23/88	

ADDRESS: 1000 FORD CIRCLE, SUITE C/MILFORD, OHIO 45150/513-831-9390/TELECOPY 513-831-9398

I.1.3.1

F&H Receiving Records which show  
receipt of 4 each THED 136050WL Breakers

FARWELL & HENDRICKS, INC.  
RECEIVING INSPECTION CHECKLIST

Project Number 60447 CAR # NA  
F&H Purchase Order No. E0629 Item # ALL

Received lot meets the requirements of the original purchase order (Note 1). ☒ Y N

Part numbers of all units in the received lot are the same as that required by the purchase order (Note 1). ☒ Y N

Total number of units received in shipment comprise the total of the units ordered (Note 1). ☒ Y N

All required documentation (by P.O.) for items received was present (Note 1). ☒ Y N

Vendor quality report complete. ☒ Y N

NOTE 1 : If deviations exist, place lot on hold and complete form QA-015 - Corrective Action Request.

Place this form, a copy of the F&H P.O., and a copy of the packing list (fasten in that order) in the Project Notebook and copy the master file.

Provide accounting with a copy of this form, F&H P.O., and original packing list.

Receiving  
Performed By:

*Harold Borden*  
Signature

4/1/88  
Date

## FARWELL &amp; HENDRICKS, INC.

PURCHASE ORDER FORM		P.O. NO.:	PREPARED PURCHASING:	PAL 1 OF 1	
Purchase Order Level: CQ		E0629/60447	DATE: 6/20/88		
Non-Taxable (X)		APPROVED ENGINEERING:	APPROVED QUALITY ASSURANCE:	APPROVED FINANCE:	
Taxable ( )		DATE: 6/21/88	DATE: 6/21/88	DATE: 6/21/88	
VENDOR: G.E. Supply Co. ADDRESS: 900 Ross Ave. Cincinnati, Ohio 45217  ATTN: Jack Craig PHONE: 482-3723 TELECOPY: 482-3703			THE CONDITIONS SET FORTH ON THIS AND ATTACHED SHEETS ARE PART OF AND GOVERN ACCEPTANCE OF THIS ORDER. THIS P.O. NO. "MUST" APPEAR ON ALL INVOICES, PACKING SLIPS, AND PACKAGES. VENDOR "MUST" SIGN ACCEPTANCE COPY AND RETURN TO F&H TO VALIDATE APPROVAL.  CONFIRMING ORDER: ( ) Verbal ( ) Written Date ____/____/____		
ACCOUNTING DISTRIBUTION		TERMS	ENDOR	F.O.B.	SHIP VIA
60447		NET 30 DAYS	GESUPP	MILFORD, OH	UPS
ITEM #	QUANTITY	DESCRIPTION	DATE REQUIRED	UNIT PRICE	AMOUNT
1	4 ea.	Moulded Circuit Breakers Manufacturer: General Electric P/N: THED 136050 Technical Information: 3 Pole, 600 Volts, 50 AMPS	06/27/88 7/1/88	219.60	878.40
2	24 ea.	Lugs P/N: TCA1 12 Lugs to be installed by Farwell & Hendricks, Inc.	06/27/88	N/C	N/C
				SUBTOTAL	878.40
				DISCOUNT	
				TAX	
				TOTAL	878.40

402-293-9768

33199 0PG042

Progress Is Our Most Important Product

GENERAL ELECTRIC  
COMPANYCONSTRUCTION EQUIPMENT MANUFACTURING  
AND TECHNOLOGY OPERATIONS  
41 WOODFORD AVE.  
PLAINVILLE, CONN. 06062

175	501313AA	3394629	0000000	063088
ORDERS REC LOC	CONTR UTIL LOC	26 SPEC HEAD	10 TMS	11 DEST
3394629	3394629	1	00	00
12 TAX	13 OFF TAX	14 SALES DIST	15 REN	16 LOG ORD
374	646			04
IHF=G HOTO				

CUSTOMER OR G.E. AGENT - NAME &amp; ADDR

GENERAL ELECTRIC CO  
GEN ELEC SUPPLY CO DIV  
900 EAST ROSS AVE  
CINCINNATI OH

45217

EMERY-NEXT-DAY-DELV

PAGE 1

DATE SHIPPED

ACTUAL ROUTING

SHIP TO - NAME &amp; ADDRESS

FARWELL & HENDRICKS  
1000 FORD CIRCLE  
SUITE C  
MILFORD, OHIO

45156

PLEASE REFER TO OUR  
WHSE. PICK LIST NO.  
IN ALL CORRESPOND-  
ENCE WHICH SHOULD  
BE ADDRESSED TO:  
41 WOODFORD AVE.  
PLAINVILLE, CONN. 06062

	NUMBER	WEIGHT	TRANS CHGS
CASES			
CAR- TONS	1		
SKIDS			
TOTAL			
			PACKED BY
			CHECKED BY

ATTN DAVE BORDEN

28 ORDER REFERENCE NO.	29 DATE OF ORDER	30 WHSE. PICK LIST NO.	31 DATE ISSUED
*****	063088	0392304	063088
32 NMB	33 PI	34 SHIP PREPAID FROM PLAINVILLE, CT. (UNLESS OTHERWISE INDICATED) AND VIA	SHIP CODE
CHG		CUST PO# 270801313AA	STD - PAY & STAND CHG - PAY & CHARGE COL - COLLECT

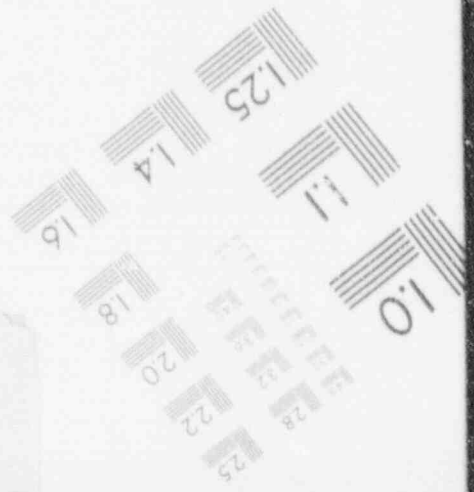
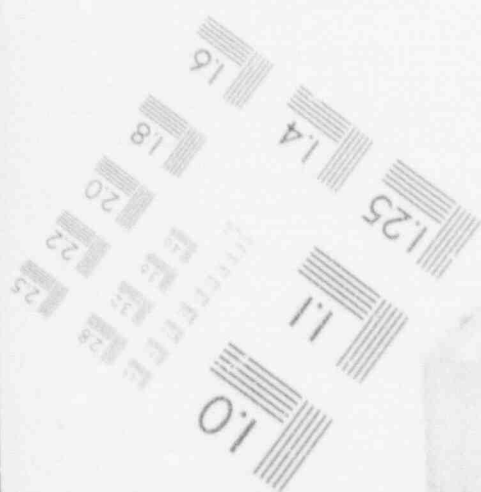
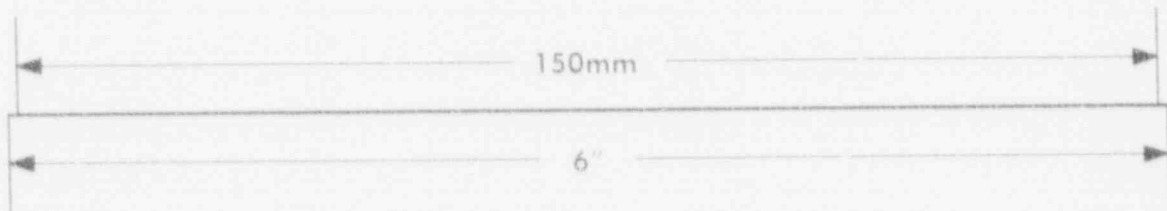
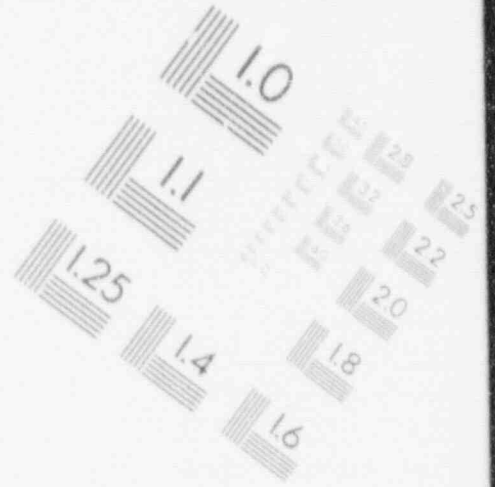
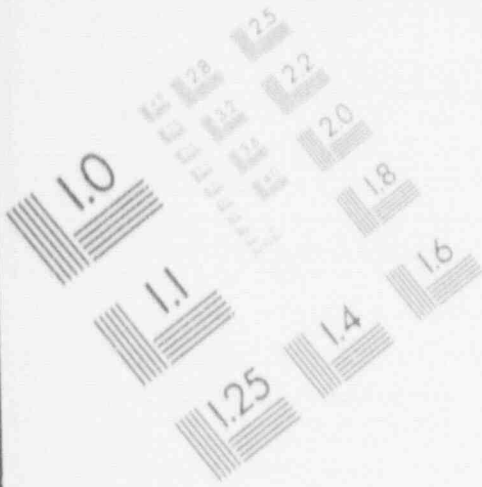
A ITEM NO.	B TRANS COF	C QUANTITY	D CATALOG NUMBER	STR LOC	X MARK	NO. CTNS	E DESCRIPTION
***** STOCK ITEMS *****							
001	-00	4	THED136050	HM	X		JACK 8-336-3700
NABD = 3164-06275							
CHK	1	584					
WGT		14					
CUB		2.4					

AIR  
2

ORDER - PACKING LIST

# 1

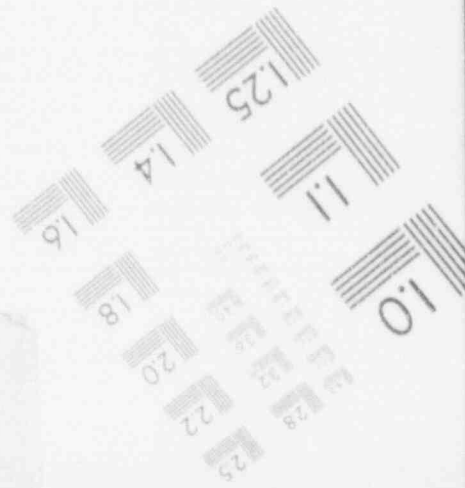
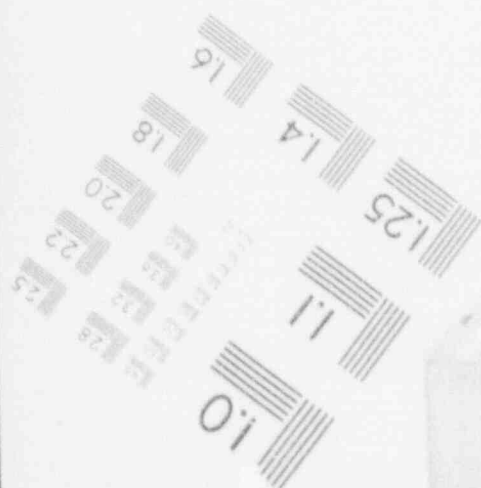
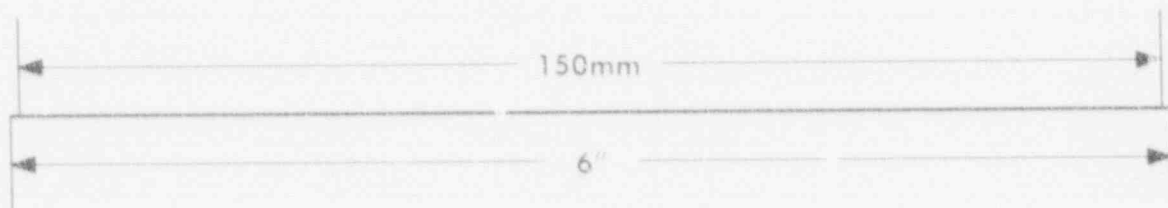
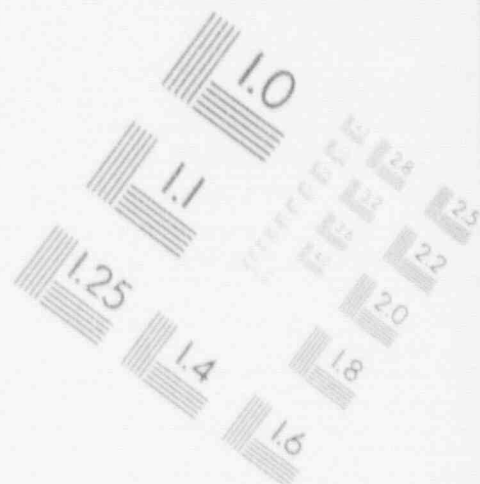
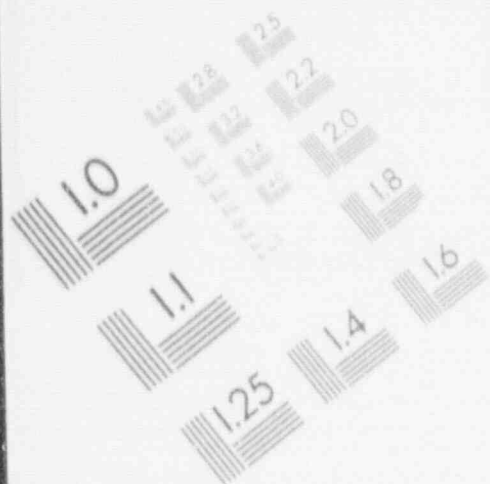
## IMAGE EVALUATION TEST TARGET (MT-3)





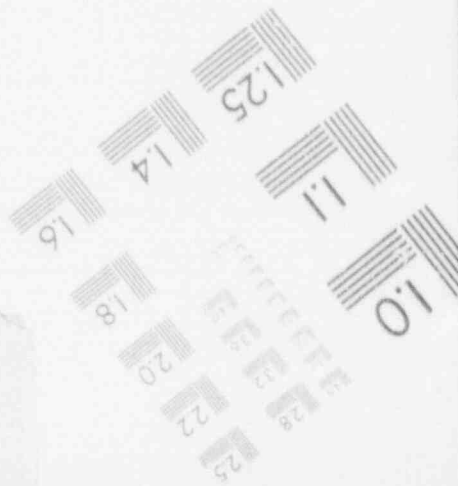
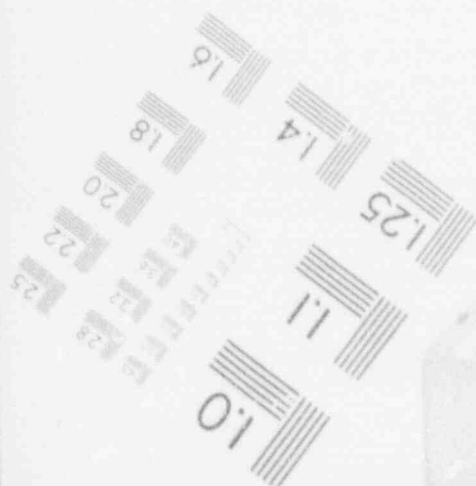
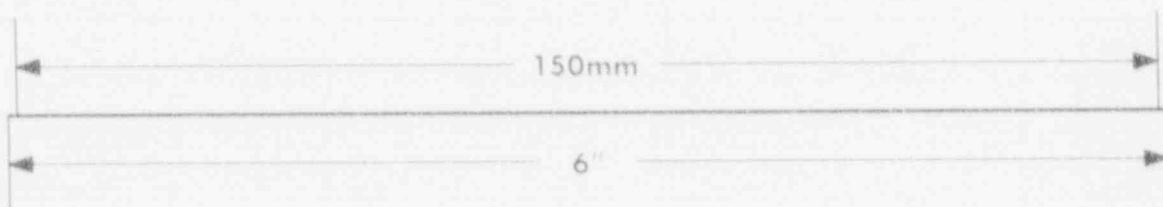
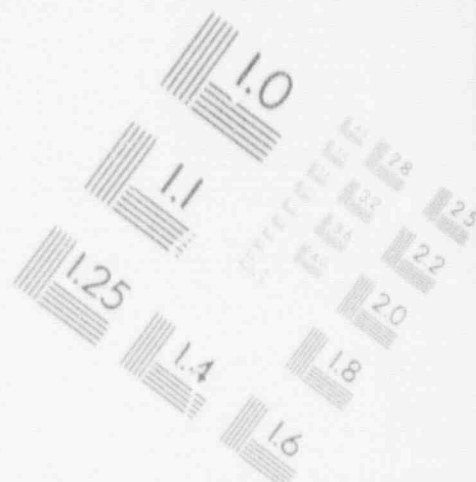
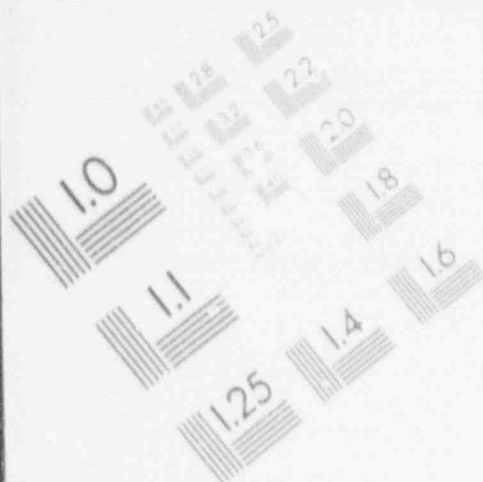
1

IMAGE EVALUATION  
TEST TARGET (MT-3)



1

IMAGE EVALUATION  
TEST TARGET (MT-3)



I.1.3.j

F&H Shipping Records which show  
shipment of 4 each Breakers

33199 OPG044

FARWELL & HENDRICKS, INC.  
SHIPPING INSPECTION CHECKLIST

Project Number : 60447  
 Customer P.O. # : PI-263023  
 Customer P.O. Item # (s) : 01  
 F&H Packing List # : 281-20

Shipped Lot meets the requirements of the Purchase Order.

(Y) N

Part Numbers of all units in the shipped lot are the same as that required by the purchase order (NOTE: If deviations exist, place lot on hold and complete Form QA-015 (Corrective Action Request)).

(Y) N

Packing complies with ANSI 45.2.2 Level B or C (See attached guidelines).

(Y) N

Verify packing list to include Part Description, Model No., Serial No., F&H No., and P.O. No.

(Y) N

Verify correct shipping address.

(Y) N

Verify special shipping instructions met. (special instructions) a/k

(Y) N

Arrange transportation.

(Y) N

Place this form, a copy of the F&H Packing List, and the Shipper's Form (Bill of Lading, Airbill, Copy of UPS Log) (fasten in that order) in the Project Notebook and a copy in the Master file.

Provide copies of the packing slip to a) Accounting  
b) QA

SHIPPING PERFORMED BY:

Harry K. Shon  
Signature

07-14-88  
Date

PACKING SLIP FORM		CUSTOMER P.O. #: P1-263623		PAGE 1 OF 1	
SHIP FROM: FARWELL & HENDRICKS, INC. 1000 FORD CIRCLE, SUITE C MILFORD, OHIO 45150 (513) 831-9390		SHIP DATE: 07/14/88		PREPARED BY: <u>H K J</u> DATE: <u>7/14/88</u>	
		F&H PROJECT #: 60447			
		F&H PACKING LIST #: 88C120			
SHIP TO:  CLIENT: PSE&G ADDRESS: MAINTENANCE MGR. SALEM (0630) NUCLEAR DEPT. - CENTRAL RECEIVING END OF BUTTOWOOD RD. TB-001 HANCOCKS BRIDGE, NJ 08038  ATTN: PHONE:		Receipt and Inspection is deemed to be automatic and consummated unless Farwell & Hendricks, Inc. receives notification of non-acceptance or rejection within 5 working days after receipt of goods by the customer. Claims for damage occurring during shipment must be filed and handled by the customer receiving the goods and the carrier and/or carriers.  Copies to: Master File, Project Notebook, and Quality Assurance			
		SHIP VIA  UPS		F.O.B.  N/A	
				AIR BILL NO.  N/A	
ITEM #	QUANTITY	DESCRIPTION	IDENTIFICATION NUMBER		
1	4	CIRCUIT BREAKER WITH LUGS, 600V 3 POLE SOA. U.E. PART NO. THED 136050WL RFQ #0632824	F&H TAG # 60447-01-17-20 THRU 60447-01-20-20		
2	1 LOT	CERTIFICATE OF COMPLIANCE  NOTE: THESE ITEMS ARE THE ITEMS THAT WERE BACK ORDERED FROM PREVIOUS SHIPPING DATE 06/23/88.	C OF C #60447.01 REV. 1		
TOTALS		QUANTITY <u>5</u>	CARTONS <u>2</u>	TOTAL WEIGHT <u>20 lbs.</u>	
PACKED BY: <u>Harold Johnson</u>		DATE: <u>7/14/88</u>	CHECKED BY: <u>Max J. J.</u>	DATE: <u>7/14/88</u>	

I.1.3.k

MRDR 60447-01 and Associated Records  
for 60447-11-01-01



## MATERIAL REJECTION AND DISPOSITION FORM

Project # 60447

MRDR # 01

## PART A:

Resp: JRH F&H PO #: E0555 Part Name: MCCB  
 CC: RAW PO Item #: 1 Part #: THED 136050WL MSL  
 CC: MEL F&H Tag #: 60447-11-01-01 Mfg/Vendor: GE / GESCO 12/21/90

Reason For Rejection: Items 1, 2, 3, 8, and 9 on the F&H visual inspection checklist for MCCB's were checked unsatisfactory, see attached checklist.

Initiated By: MSL

Initials

12/27/90  
Date

## TECHNICAL DISPOSITION

- ☐ Use-as-is; see justification ☐ Repair/Rework; see justification  
☐ Rejected; return to vendor ☐ Rejected; scrap  
☐ Received complete shipment, date \_\_\_\_/\_\_\_\_/\_\_\_\_ ☒ Other; see justification  
☐ Order replacement(s) as follows: \_\_\_\_\_

Justification: See attached; based upon attached the MCCB identified herein is considered new as provided by GE. This MCCB could be considered a typical THED 136050WL commercial grade MCCB as generally provided by GE.

Engineering Approval: MSL 12/27/90

Signature

Date

Quality Assurance Approval: Max G. Lilly

Signature

Date

## PART B

Administrative Disposition:

☐ Applicable☒ Not Applicable

Resp: \_\_\_\_\_ Accepted by: \_\_\_\_\_ Close out by: \_\_\_\_\_  
 CC: \_\_\_\_\_ Date: \_\_\_\_\_ Date: \_\_\_\_\_

- ☐ Ordered replacements via F&H P.O. # \_\_\_\_\_ Date \_\_\_\_\_  
☐ Returned to Vendor via RMA # \_\_\_\_\_  
☐ Issued F&H P.O. # \_\_\_\_\_ for repair/rework; see remarks  
☐ Scrapped; date \_\_\_\_\_ per General Manager or designate; initials \_\_\_\_\_  
☐ Order; see remarks

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## F&amp;H VISUAL INSPECTION CHECKLIST FOR MCCB'S

F&H PROJECT NO. 60447 DATE INSPECTION 12/21/90  
 F&H TAG NO. 60447-11-01-01 F&H SERIAL NO. N/A, see Tag No.

1. ☐ Satisfactory ☒ Unsatisfactory

A. ☐ I have reviewed the applicable Form CB-001 for accuracy and completeness with satisfactory results. This review constitutes completion of preparation for receipt for this shipment.

B. ☐ I have compiled a record which provides traceability to the OEM. This record includes the F&H Purchase Order and the Packing List from the OEM.

2. ☐ Satisfactory ☒ Unsatisfactory

The individual box(s) which contained these MCCB's was unopened and factory sealed prior to the start of this inspection activity. *Note: Package had a UPS sticker, Test Sample - Not for Repair sticker, a packing slip envelope, and 60447-11-01-01 on the box, see attached photocopies.*

3. ☐ Satisfactory ☒ Unsatisfactory

The date code(s) stamped on these MCCB's are as follows:

S/N <u>60447-11-01-01</u>	Date Code <u>D812+</u> is visible through black ink
S/N _____	Date Code <u>Mark over</u>
S/N _____	Date Code <u>D815+E</u> is legible in GE ink (white)

Document on an attached sheet if necessary

4. ☒ Satisfactory ☐ Unsatisfactory

Condition of label on individual MCCB's, i.e. original factory labeling of proper color and which corresponds to labeling on carton, NO alterations (white-outs, handwritten characters, improperly affixed such as removed and re-affixed) NO labeling or marking of a third party (non-OEM) or other discrepancies. *Note: Test Sample - Not for Repair sticker was affixed as well as metallic tag # 60447-11-01-01.*

5. ☒ Satisfactory ☐ Unsatisfactory

Condition of ☒ UL, ☐ UR, or ☒ CSA label (when present), i.e. appears satisfactory, NO alterations, photocopies, or third-party alterations. *Note: If UL or UR should be present and is not, check Unsatisfactory.*

6. ☒ Satisfactory\* ☐ Unsatisfactory ☐ N/A  
 S/N 60447-1B01-01 S/N \_\_\_\_\_ S/N \_\_\_\_\_

Condition of terminals: Correct size and type and mounted as required by F&H P.O. Properly plated not poorly plated, dipped, or painted, NO evidence of being previously installed, wire-brushed, mismatched, or unusual scratches.  
 \*the screw driver marks on fastener heads was per project use; no other wear visible.

7. ☒ Satisfactory ☐ Unsatisfactory

Rating: Rating is per frame size, rating stamp on handle or switch (when present) is consistent with labeling. 50A

8. ☐ Satisfactory ☒ Unsatisfactory ☐ N/A

Condition of Manufacturer Seals (when present): Properly affixed and unbroken, NO broken seals or seals which appear removed and resealed.

Seal Type: Potting removed and fastener appears to be a different type (not uniform)

9. ☐ Satisfactory ☒ Unsatisfactory

Overall condition of MCCB's: Appear new and unused, NO evidence of tampering, previous use, or installation, NO visible defects, water damage, shipping damages, or evidence of being installed (especially at terminals).

#### 10. Nonconformances

Any item checked unsatisfactory above is considered a material non-conformance and must be documented in accordance with TP 16-002 which requires the QA Department to be notified immediately via MRDR. The MRDR's associated with this form (if any):

MRDR NO's: 60447-01 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

The MCCB's referenced above by F&H Tag No. and S/N were visually inspected in accordance with F&H TP 13-005 at the F&H facility. The result of this visual inspection activity is satisfactory except for the nonconformances (if any) indicated in Section 10 above.

PERFORMED BY: Max G. Liddy 12/27/90  
 Signature Date

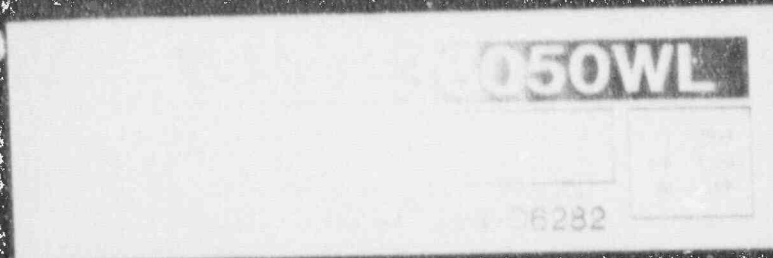
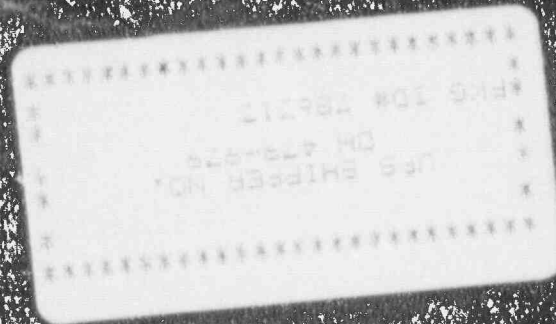
WITNESSED/VERIFIED AND APPROVED BY: John R. Harshbarger 12/27/90  
 Level II Signature Date

NOTE: This activity must be witnessed by an F&H Level II individual when the performed by section is signed by an F&H individual whose personnel qualification/certification status is less than Level II. This activity will be verified by at least an F&H Level II individual when the performed by section is signed by an F&H individual whose personnel qualification/certification status is equal to or greater than Level II.



\*\*\*\*\*  
\*  
\* PKG ID# 786313 \*  
\* OH 479-979 \*  
\* UPS SHIPPER NO. \*  
\*  
\*\*\*\*\*





TEST SAMPLE  
NOT FOR RESALE



33199 0P6052



33199 0P6053



33199 OPG054



## Technical Disposition

Justification - The justification for the items 1, 2, 3, 8, and 9 identified as unsatisfactory is as follows:

- Item 1 - There is no traceable path to the point-of-manufacture. The MCCB was shipped from GESCO in Cincinnati, Ohio, who is a distributor. This visual inspection is being performed to address the lack of documentation which shows a traceable path to the circuit breaker manufacturer and addresses the MCCB as a non-fraudulent MCCB.
- Item 2 - This MCCB was received on 6/3/88 at F&H. The original shipping container was opened at that time. F&H retained the container. The MCCB was stored in that container since 1988. The container has original GE labeling and a UPS shipping label. Visual inspection of the box (container) indicates that this is the OEM packaging.
- Item 3 - There is a date code D812+, marked over in black magic marker type ink, that is still visible in the upper left corner of the breaker where the OEM generally stamps the date code. There is a date code of D815+E stamped in white ink in the upper right corner. This date code appears to be stamped in genuine GE ink. There is an MOC from F&H to GE Plainville, CT which indicates that this is acceptable, see attached MOC.
- Item 8 - The manufacturer seal was removed from one of the four fasteners which secure the two molded halves together; the upper left one. The fastener also appeared to be different from the other three. The appearance of the four fasteners was not uniform in that the fastener from where the potting was removed appeared dull and gray while the other three appeared shiny and silver in color. There is an MOC from F&H to GE Plainville, CT which indicates that this is acceptable, see attached MOC.
- Item 9 - The MCCB did not appear new and unused, specifically at the terminals. This item was used as a test sample at F&H. The signs of use at the terminals appear to be consistent with that limited prior use as the only markings were at the screw heads. Given that, there are no other signs of use outside the 60447 project. The terminals appear to be as provided by the OEM with the exception of the use at F&H. In conclusion, for Item 9, this breaker does not appear to be altered or modified which would indicate this breaker is acceptable for the application in which it was utilized by F&H.



Farwell & Hendricks, Inc.

pg 1 of 2

PARK 50 TECHNECENTER  
1000 FORD CIRCLE  
MILFORD, OHIO 45150  
(513) 831-9390  
FAX: (513) 831-9398

## MEMORANDUM OF CONVERSATION

FIRM NAME General Electric DATE 12/27/90 TIME 330 JOB # 60447  
ADDRESS 41 Woodford Avenue  
CITY Plainville STATE CT ZIP 06062  
TALKED WITH Mark Sweitzer and Rick Jeffries PHONE NO. 203 747-7111  
REPORTED BY Max E. Lilly (MEL)

## SUBJECT:

MCCB THED 136050 FTH Tag. No. 60447-11-01-01

MEL discussed the above MCCB with Mark Sweitzer and Rick Jeffries who are application engineers at GE. MEL stated that the date code D812+ was marked over (but still visible) and another date code D815+ E was also stamped on the MCCB. MEL stated that MEL ~~threw~~<sup>me</sup> understood what the date codes meant (per attached correspondence) except for the fact that there were two dates and what the E meant. MEL also stated that the potting was removed from the upper left fastener and that the fastener there did not appear uniform with the other three.

Rick Jeffries stated that the E meant Plainville CT coding. Rick Jeffries stated that based on the marked over date code meaning the MCCB originated in Humacao P.R. in the twelfth fiscal week of 1988 and the other date code meant Plainville CT coding in the fifteenth fiscal week of 1988 that the probable cause was as follows:

CONT. ON NEXT PAGE

Farwell & Hendricks, Inc.

pg 2 of 2

PARK 50 TECHNECENTER  
1000 FORD CIRCLE  
MILFORD, OHIO 45150  
(513) 831-9390  
FAX: (513) 831-9398

## MEMORANDUM OF CONVERSATION

FIRM NAME See pg 1 of 2 DATE \_\_\_\_\_ TIME \_\_\_\_\_ JOB # \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
TALKED WITH \_\_\_\_\_ PHONE NO. \_\_\_\_\_  
REPORTED BY \_\_\_\_\_

## SUBJECT:

Humacao P.R. sends breakers to Plainville so Plainville can perform the activities necessary to make the items acceptable to GE. Rick stated that this was per Plainville request, was "pre-ordained", and was not a rare or unusual practice. Rick stated that there were different reasons for this such as:

1. Humacao P.R. might have been short of necessary parts
2. Rework to be acceptable to GE

GENERAL ELECTRIC

33199 OPG058

pg 1 of 2

CONSTRUCTION EQUIPMENT BUSINESS OPERATIONS  
GENERAL ELECTRIC COMPANY • 41 WOODFORD AVENUE • PLAINVILLE, CONNECTICUT 06062 • (203) 747-7111

April 12, 1985

Datel Engineering  
3400 Blue Spring Road  
Huntsville, Ala 35810  
ATTN: Mr. Deepak Bhatia

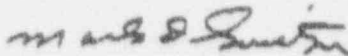
Dear Mr. Bhatia:

Our circuit protective devices are stamped with a serial date code. This code is read as follows:

Example: J101 +

1. First letter - denotes the manufacturing location
2. First number - denotes the year of manufacture
3. Next two numbers - indicate the fiscal week of manufacturing.
4. The last notation will be either an (\*) which indicates the 1970 years or a (+) to indicate the 1980 years. **(E) INDICATES THE 1990 YEARS.**

Yours truly,



Mark D. Sweitzer

db/5620L

NOTE: This correspondence was faxed to F&H on 10/31/90 by GE ED&C Prod. Mgt. to breakdown the GE date code. GE apparently submitted this prior correspondence to F&H in lieu of rewriting the letter specifically for F&H. Note: Fax info. is indicated below.

MSJ 12/27/90



P.2/2

6138319390 # 2

203 747 7543 +

XEROX TELECOPIER 295 : 10-31-90: 2:10 PM: OCT 31 '90 13:30 GE ED&C PROD MGT



33199 OPG059

Q.C.I. 2A1.8

pg 2 of 2

ATTACHMENT

The following code letters shall be used to designate origins:

- A - Auburn, Maine
- B - Bloomington, Illinois (1)
- C - Palmer, Puerto Rico
- D - Humacao, Puerto Rico
- E - Plainville, CT - Comp & Equip.
- F - Cutler Hammer - Lincoln, IL.
- G - San German, Puerto Rico
- H - Singapore
- I - COGEMEC - Milan, Italy
- J - Arecibo, Puerto Rico
- K - Morristown, Tennessee
- L - Midwest Electric
- M - Brazil
- N - Nogales, Mexico
- P - Vega Baja, Puerto Rico
- Q - West Lake Products, Inc.
- R - Interplex, New Haven, CT. (2)
- S - North Hollywood, CA.
- T - Houston, Texas
- U - California Fabrication Co.
- Y - Taian Electric Co. - Taipei, Rep. of China
- W - Seattle, Washington
- X - Pass & Seymour - Syracuse, N.Y.
- Y - Salisbury, N.C.
- Z - Selmer, Tennessee
- AB- Abilities, Inc. - Albertson, N.Y.
- BH- Switchgear Operations - Burlington, IA.
- DR- Dominican Republic
- GA- Atlanta Service Shop - Chamblee, GA.
- IE- IEM, Fremont, CA.
- JJ- Jones Instrument Co. - Stamford, CT
- KX- Knoxville, TN. - USCO
- MA- Manati, Puerto Rico
- ME- Mebane, N.C.
- MS- Micro Switch, Mars Hill, NC
- SD- Shellbeter - Huron, SD
- VA- Vega Alta I, P.R. (Control)
- VB- Vega Alta II, P.R. (Pilot)

NOTE: For each decade, a different character will be used in the fifth position:  
 1960 decade -  
 1970 decade +  
 1980 decade \* (For Q-Line circuit breakers with the Posi-Vu feature,  
 a "P" was substituted for "+" during the introduction  
 of this feature.)  
 1990 decade =

(1) Used for CBI, Palmer, Puerto Rico until March, 1989.  
 (2) Used for Oberlin, Ohio until February, 1989.

\* Denotes Change From Previous Issue.

REV. 11 - 8/16/89 (1223P)/(0046P)

## Enclosure I.2

## F&amp;H Response to Nonconformance #90-01 A.2

- A. See Enclosure II.3 NRC Docket No. 99900918/90-01, specifically, Section A.2 of Appendix A of the Notice of Nonconformance which states, in part, the dimensions are critical characteristics which should have been verified for the Bussmann fuses dedicated in F&H Data Package 60500.
- B. F&H reviewed Project No. 60500 which indicated that the fuseblocks and fuses dedicated by that project were done so by use of two data packages, 60500.2 and 60500.1, respectively. Extracts of those data packages are attached to show which item(s) applied to each data package and to provide objective evidence to support statements in this enclosure.

The information presented in Data Package 60500.2 Section IV is valid as it applies only to the fuseblocks.

The information presented in Data Package 60500.1 Section IV could have been more clearly defined as it was intended to provide the basis for not performing physical measurements on the fuses.

Review of Data Package 60500.1 indicates that the methodology intended to address the dimensional verification requirement was review of manufacturer's literature, CG audit, and UL listing for the fuses.

Review of the CG audits of Bussmann and Gould Shawmut indicates that each supplier has been audited at least twice by F&H. One each prior to and one each after F&H Project 60500. The results were satisfactory within the scope of those commercial grade audits. Extracts of those CG audits are attached to show acceptability.

- C. F&H evaluated the controls referenced in Data Package 60500.1 for impact on the quality of the fuses supplied to American Electric Power Company. This included discussion with the 60500 Project Engineer.

The evaluation concluded that the 60500.1 Data Package intended to address the critical characteristic of dimensions by the fuses' fit as defined in the manufacturer's literature and acceptable UL listing which were supported by commercial grade audits.

The methodology could have been more clearly defined and presented in 60500.1 Data Package, however, based upon the above referenced controls there should be no adverse impact on the quality of the fuses supplied to American Electric Power Company.

- D. Farwell & Hendricks, Inc. has implemented corrective action to correct this item and to preclude it's reoccurrence. This was done on a project specific level and by refinements of standard practices as follows:

Project Specific: Review and Evaluation of F&H DP's 60500.1 and 60500.2 indicates that there was no adverse impact to quality on the fuses provided to AEP. Therefore, the review and evaluation was sufficient corrective action to correct that matter and no further project specific corrective action is required except that F&H will incorporate into the 60500.1 Data Package the results of the review and evaluation.

Standard Practices: The F&H QA Department reviewed many data packages with the USNRC Inspector for this parameter during the inspection and has closely monitored this parameter in data packages submitted since June 25, 1990, which indicates that this is apparently an isolated case.

F&H has, however, made organizational and operational refinements which address dimensional verification as a part of the standard receiving inspection activity as described below.

The organizational refinements consisted of hiring two individuals which were trained by the QA Manager to perform QC Inspector functions. These duties include receiving, performing dimensional verification, and tagging of CGI's as standard practice, prior to releasing the items to the Engineering Department for dedication project work. The resulting documentation is incorporated into a data package for review and approval to assure acceptability of the items.

The operational refinement was delegating the responsibility for assuring the receiving, dimensional verification, and tagging is performed by the procurement group. The QC Inspectors who perform these activities report directly to the QA Manager on quality matters. The specific project Engineer continues to retain responsibility for the acceptability of fit for CGI's to be dedicated by F&H, wherein only the responsibility to perform the physical measurements has been delegated to the procurement group.

The organizational and operational refinements are systematic controls which should provide adequate confidence and reasonable assurance that the parameters of dimensions (fit) required to be addressed by TP3-001 will be verified and that the non-conformance identified in Inspection Report No. 99900918/90-01 will not re-occur.

The corrective action defined herein was completed by December 31, 1990. Farwell & Hendricks, Inc. unless notified otherwise, considers the corrective action performed satisfactory to address the nonconformance and sufficient to close the matter.

A list of the attached records is as follows:

- I.2.1 Portions of DP 60500.2
- I.2.2 Portions of DP 60500.1
- I.2.3 Portions of CG Audit CQ90-04
- I.2.4 Portions of CG Audit CQ89-003
- I.2.5 Portions of CG Audit CQ89-06
- I.2.6 Portions of CG Audit CQ8604

I.2.1

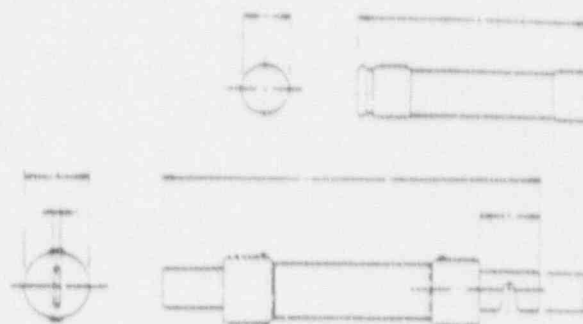
PORTIONS OF DP 60500.2

# fri-onic®-Class RK5 Time Delay Fuses TR/TRS

## Recommended Fuse Blocks For Tri-onic® Class RK5 Fuses

FUSE AMPERE RATING	CATALOG NUMBER			
	250V		600V	
	1 POLE	3 POLE	1 POLE	3 POLE
0-30	20306R	20308R	60306R	60308R
31-60	20606R	20608R	60606R	60608R
61-100	21006R	21008R	61006R	61008R
101-200	22001R	22003R	62001R	62003R
201-400	24001R	24003R	64001R	64003R

A variety of pole configurations and termination provisions is available. Refer to the fuse block section of this catalog for details, pages 174-181.



## Dimensions

AMPERE RATING	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
<b>250V-TR FUSES</b>										
0-30	2	51	1/8	14	—	—	—	—	—	—
31-60	3	76	1/8	21	—	—	—	—	—	—
61-100	5 1/4	149	1 1/8	27	1/8	3	3/8	19	1	25
101-200	7 1/8	181	1 1/8	40	3/8	5	1 1/8	28	1 3/8	35
201-400	8 3/4	219	2 1/8	53	1/2	6	1 3/8	41	1 7/8	48
401-600	10 3/4	264	2 3/8	66	1/2	6	2	51	2 1/4	57
<b>600V-TRS FUSES</b>										
0-30	5	127	1 3/8	21	—	—	—	—	—	—
31-60	5 1/2	139	1 3/8	27	—	—	—	—	—	—
61-100	7 1/8	200	1 3/8	34	1/8	3	3/8	19	1	25
101-200	9 3/4	244	1 3/8	46	3/8	5	1 1/8	28	1 3/8	35
201-400	11 3/4	295	2 3/8	66	1/2	6	1 3/8	41	1 7/8	48
401-600	13 3/4	340	3 1/8	80	1/2	6	2	51	2 1/4	57



# Tri-onic®-Class RK5

## Time Delay Fuses

TR

115 Volt Single Phase

UL Class RK5

TR Fuses

MOTOR HP	FULL LOAD AMPERES	RECOMMENDED FUSE AMPERE RATINGS			
		MINIMUM		TYPICAL	HEAVY LOAD
		1.0 S.F.	1.15 S.F.		
1/4	4.4	5	5	6 1/4	9
1/4	5.8	6 1/4	7	9	10
1/4	7.2	8	9	10	12
1/2	9.8	10	12	15	17 1/4
3/4	13.8	15	15	20	25
1	16	17 1/4	20	25	30
1 1/4	20	20	25	30	35
2	24	25	30	35	40
3	34	35	40	50	60
5	56	60	70	80	100
7 1/2	80	90	100	125	150
10	100	110	125	150	175

## SINGLE PHASE MOTOR FUSE SELECTION

230 Volt Single Phase

UL Class RK5

TR Fuses

MOTOR HP	FULL LOAD AMPERES	RECOMMENDED FUSE AMPERE RATINGS			
		MINIMUM		TYPICAL	HEAVY LOAD
		1.0 S.F.	1.15 S.F.		
1/4	2.2	2 1/4	2 1/4	3 1/4	4
1/4	2.9	3 3/4	3 3/4	4 1/4	5
1/4	3.6	4	4 1/4	5 3/4	6 1/4
1/2	4.9	5 3/4	6	7	9
3/4	6.9	7	8	10	12
1	8	9	10	12	15
1 1/4	10	10	12	15	17 1/4
2	12	12	15	17 1/4	20
3	17	17 1/4	20	25	30
5	28	30	35	40	50
7 1/2	40	45	50	60	70
10	50	50	60	70	90

### Minimum

Highest fuse rating which will provide both overload and short circuit protection per the NEC. Choosing this fuse rating eliminates the need for an overload relay. Nuisance fuse opening may occur if motor is loaded to its rating.

### Typical

Suggested rating when fuse is used in conjunction with an overload relay. Fuse sized near 150% of motor full load current.

### Heavy Load

Maximum size for effective short circuit protection. Not applicable for motors marked with code letter A.

# TRON<sup>®</sup> RECTIFIER FUSE

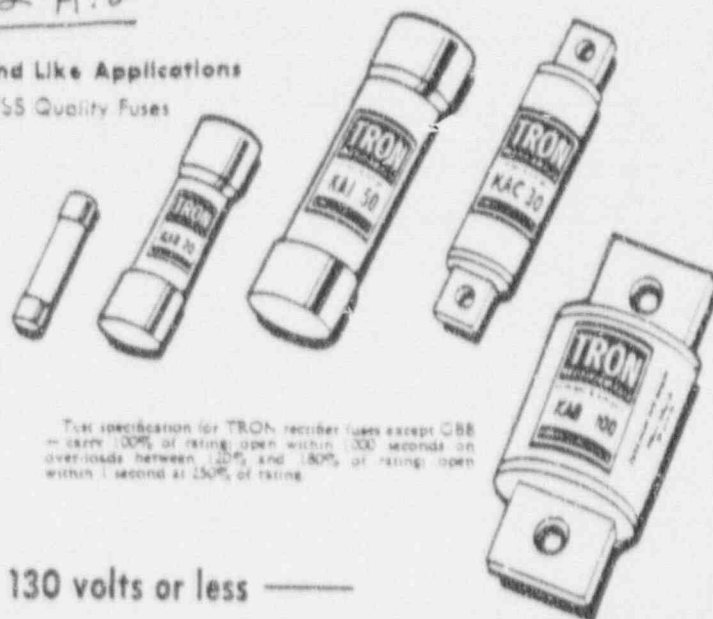
ATT ~~A.2~~ A.2

**For Protection of Semi-Conductor Rectifiers and Like Applications**  
Another Outstanding Development by the Makers of BUSS Quality Fuses

TRON rectifier fuses are especially designed for the protection of semiconductor rectifiers, SCR's, Thyristors, Solid State Devices or wherever a very fast acting fuse is needed. They provide extremely fast opening on overload and fault currents, with a high degree of restriction of the let thru current.

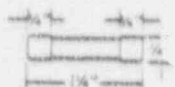
If each diode is protected by a TRON rectifier fuse, the fuse will open very quickly when the current drawn exceeds the rating of the diode.

Thus when a short-circuit occurs in a diode the fuse opens and takes that diode out of the circuit. This protects other good diodes in the rectifier which might otherwise be damaged.



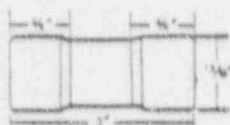
Test specification for TRON rectifier fuses except GBB  
= carry 100% of rating; open within 1000 seconds on overloads between 120% and 180% of rating; open within 1 second at 250% of rating

## For 130 volts or less



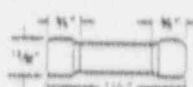
Voltage	Symbol	Ampere
130 or less	GBB	1, 1 1/2, 2, 3, 4, 5, 6, 7, 8, 9 or 10
65 or less	GBB	12, 15, 20, 25 or 30

Carton quantity 1  
Shipping weight 1 lb. per 100.  
Carry 100% of rating; Open at 150% of rating within 4 minutes; Open at 150% of rating within 1 second; 1-20 Amp fuses; Open at 250% of rating within 6 seconds (15-30 Amp fuses).



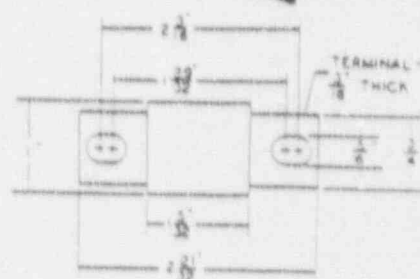
Voltage	Symbol	Ampere
130 or less	KAH	35, 40, 45, 50 or 60

Carton quantity 10  
Shipping weight 8 1/2 lbs. per 100.



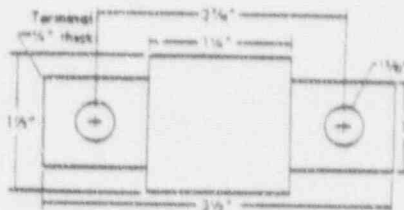
Voltage	Symbol	Ampere
130 or less	KAA	1 1/2, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25 or 30
130 or less	KAW	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25 or 30

Carton quantity 10  
Shipping weight 1 1/2 lbs. per 100.



Voltage	Symbol	Ampere
130 or less	KAA	70, 80, 90, 100, 125, 150, 200, 225, 250, 300, 350 or 400

Carton quantity 10  
Shipping weight 11 1/2 lbs. per 100.



Voltage	Symbol	Ampere
130 or less	KAA	450, 500, 600, 650, 800 or 1000

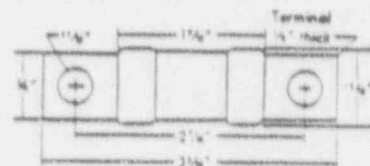
Carton quantity 10. Shipping weight 60 lbs. per 100.

## For 250 volts or less



Voltage	Symbol	Ampere
250 or less	KAB	1 1/2, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 17 1/2, 20, 25 or 30

Carton quantity 10  
Shipping weight 2 1/2 lbs. per 100.

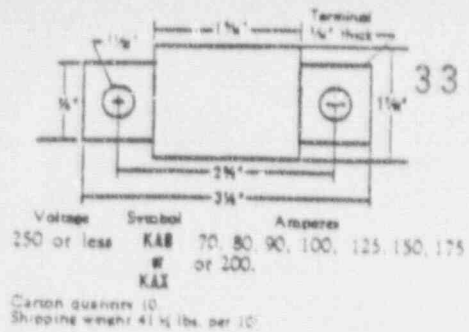


Voltage	Symbol	Ampere
250 or less	KAB	35, 40, 45, 50 or 60

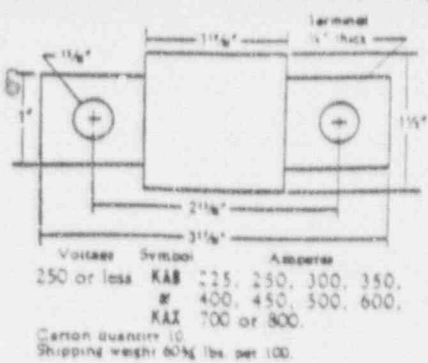
Carton quantity 10. Shipping weight 12 lbs. per 100.



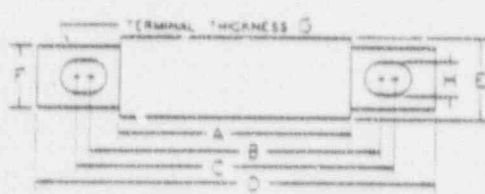
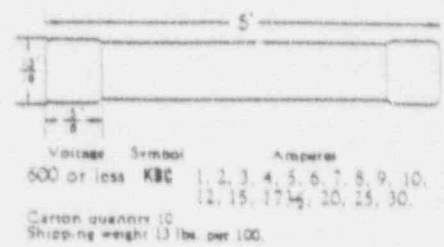
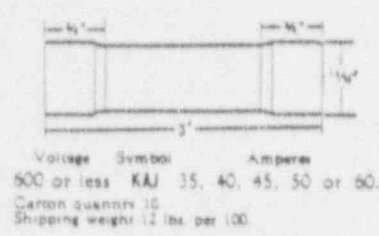
**BUSSMANN**



33199 OPG076



For 600 volts or less



Dimensions are in inches									
Symbol	Amperes Rating	A	B	C	D	E	F	G	H
KAC	0-30	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
	35-60	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
	65-100	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2
	110-200	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
	225-400	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
KBC	425-800	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2	6 1/2
	35-60	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
	65-100	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
	110-200	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2
	225-400	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
KBC	425-800	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
	35-60	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
	65-100	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
	110-200	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2
	225-400	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
KBC	425-800	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2

BUSS FUSE BLOCKS FOR RECTIFIER PROTECTION FUSES

Type	Fuse Symbol & amperes	Block No.	Dimensions of base - inches
1 pole	KAA 1 to 30	4515	1 1/2 x 2 1/4
2 pole	&	4525	1 1/2 x 2 1/4
3 pole	KAW	4535	2 1/2 x 2 1/4
1 pole	KAH 35 to 60	3520	1 1/2 x 3 1/4
2 pole	&	3544	2 1/2 x 3 1/4
3 pole	KAA	3545	4 1/2 x 3 1/4
1 pole	KAA 70 to 400	3575	1 1/2 x 3 1/4
2 pole	&	3580	2 1/2 x 3 1/4
3 pole	KAA 450 to 1000	3576	1 1/2 x 3 1/4
2 pole	&	3577	5 1/2 x 3 1/4
3 pole	KAB 1 to 30	4388	3/4 x 3 1/4
2 pole	&	4387	2 x 3 1/4
3 pole	KAX	3959	3 x 3 1/4
1 pole	KAB 35 to 60	3531	1 1/2 x 3 1/4
2 pole	&	3804	4 1/2 x 3 1/4
3 pole	KAB 70 to 200	3556	1 1/2 x 3 1/4
2 pole	&	3521	5 1/2 x 3 1/4
3 pole	KAB 225 to 800	3562	1 1/2 x 3 1/4
2 pole	&	3515	5 1/2 x 3 1/4

Type	Fuse Symbol & amperes	Block No.	Dimensions of base - inches
1 pole	KAC 1 to 30	3596	1 1/2 x 3 1/4
2 pole	&	3528	2 1/2 x 3 1/4
3 pole	KAC	2795	3 1/2 x 3 1/4
1 pole	KBC 35 to 60	2610	1 1/2 x 3 1/4
2 pole	&	3571	1 1/2 x 3 1/4
3 pole	KBC	3513	1 1/2 x 3 1/4
1 pole	KAC 70 to 100	3584	1 1/2 x 3 1/4
2 pole	&	2834	2 1/2 x 3 1/4
3 pole	KAC	3523	4 x 3 1/4
1 pole	KAC 110 to 200	3591	2 1/2 x 6 1/4
2 pole	&	3512	6 x 6 1/4
3 pole	KAC 225 to 400	3572	3 1/2 x 6 1/4
2 pole	&	3503	9 x 6 1/4
3 pole	KAC 425 to 800	3580	3 1/2 x 6 1/4
2 pole	&	3510	9 x 6 1/4
1 pole	KAJ 35 to 60	3519	1 1/2 x 4 1/4
2 pole	&	2833	2 1/2 x 4 1/4
3 pole	KAC	2860	4 1/2 x 4 1/4
1 pole	KBC 70 to 100	2713	1 1/2 x 5 1/4
2 pole	&	2760	5 1/2 x 5 1/4
3 pole	KBC 110 to 200	2650	1 1/2 x 5 1/4
1 pole	KBC 225 to 400	2714	2 1/2 x 6 1/4

GBB - Use an BUSS block for 1/2 x 1 1/4 inch fuse.

I.2.3

PORTIONS OF CG AUDIT CQ90-04

## AUDIT REPORT

Audit Report No.: CQ 90-04  
Date: November 2, 1990  
Audit Performed: 6/12&13/90

## Supplies:

Bussmann Fuse Div.  
114 Old State Road  
Ellisville, MO 63021

## Auditor Co:

Farwell & Hendricks, Inc.  
1000 Ford Circle  
Milford, OH 45150

Audit Scope: This commercial quality audit was performed to supplement Farwell & Hendricks Audit CQ 89-03 in the areas of QA/QC Program, UL Testing, Time-Current Curves, and Bill's of Material to document Bussmann's support data for their published characteristics in order to enhance and continue to support the Farwell & Hendricks dedication program.

Audit Summary: The results within the scope of the audit were satisfactory in that Bussmann has sufficient controls in place in order to provide reasonable assurance that the commercial grade fuses supplied to Farwell & Hendricks meet their published characteristics. Bussmann will maintain it's status on the Farwell & Hendricks Level II ASL and continue to support the Farwell & Hendricks dedication program.

PREPARED &amp; APPROVED BY:

*Max E. Lilly*  
\_\_\_\_\_  
Max E. Lilly  
Quality Assurance Manager

*11/2/90*  
\_\_\_\_\_  
Date



I.2.4

PORTIONS OF CG AUDIT CQ 89-003

## BUSSMAN DIVISION

## AUDIT REPORT

Audit Report No: CQ 89-003  
Date: March 31, 1989  
File: Supplier Audit File

ORGANIZATIONS AUDITED

Mr. Robert H. Carlson, P.E.  
Bussman Division  
P.O. Box 14460  
St. Louis, MO 63178

Mr. Donald G. Jones  
Bussmann Division  
1000 Craigmant Road  
Black Mountain, NC 28711

Mr. George W. Hale III  
Bussmann Division  
210 Redstone Hill Road  
Bristol, CT 06010

DATES OF AUDITS: January 13, 1989 - Black Mountain, NC  
February 23, 1989 - Bristol, CT  
March 1-2, 1989 - St. Louis, MO

AUDIT PURPOSES:

The purpose of the audit was to verify and document the degree to which Bussmann Divisions have suitably implemented their Quality Assurance Program in accordance with their Corporate Quality Assurance Policy. The Quality Assurance program is to support Farwell & Hendricks, Inc. in providing commercial grade fuse for resale to nuclear power generating stations.

SCOPE:

The audit covers all aspects of the Corporate Quality Assurance Manual to some degree at the facilities listed as being audited. A review of various Quality Assurance Documents. For compliance to quality procedures, witnessing selected activities. Review of design criteria engineering change notices and control of Bills of Materials.

Bussman Audit Report  
Page 3 of 9METHOD:

The audits were conducted utilizing Farwell & Hendricks, Inc. CQ audit check list, (1) by interviewing management and other personnel, (2) by selectively examining objective evidence in the form of procedures instructions, records, and (3) observing facilities and witnessing the performance of selected activities.

Personnel Contacted:

- 1 = Pre-Audit Meeting
- 2 = During Audit
- 3 = Post Audit Meeting

Robert Carlson P.E., Corporate Q.A. Manager	1, 2, 3
Donald G. Jones - Black Mountain Q.A. Manager	1, 2, 3
Larry Mudd - Plant Manager - Black Mountain	1, 2, 3
George W. Hale - Q.A. Manager - Bristol, CT	1, 2, 3
Larry Wharton - District Sales Manager	1, 3
James R. Patter - Plant Manager - Bristol, CT	2
Gregory Brick - QA Engineer - Bristol, CT	2
Vauren Wheeler - QC Supervisor - Bristol, CT	2
Andy Tynic - U.L. Tech. - Bristol, CT	2
Thomas A. Graman - Industrial Engr. Mgr. - St. Louis	2
Fred Levko - Electrical Design Mgr. - St. Louis	2
John Marshall - QA Engineer - St. Louis	2
Mart Wedfer - QA Engineer - St. Louis	2
Thomas D. Speas Jr. - Marketing Manager - St. Louis	2
R. Hurban - Plant Manager - St. Louis	2

PRE-AUDIT AND POST-AUDIT MEETINGS:

Pre-audit meetings were held at the beginning of each audit. The purpose and scope of the audit was detailed. At the Black Mountain meeting Bussmann's Corporate QA Manager gave an overview of the concepts of the Bussmann's Quality Policies and the direction Bussmann was going with their Quality Assurance Program. The concept of a Total Quality Assurance Program, certifying Bussmann's manufacturing plants and certifying Bussmann sub-vendors to the Quality Assurance Program. Farwell & Hendricks, Inc. presented at Black Mountain the concept of how this new relationship would benefit both companies and how this audit, and audits of the other plants, would support our dedication efforts for Bussmann fuses.

Post-audit meetings were held at the conclusion of each audit. Any outstanding items were covered and resolved.

AUDIT SUMMARY AND ASSESSMENT OF BUSSMANN'S QUALITY ASSURANCE PROGRAM

The audit results from all three (3) facilities indicate that Bussmann is implementing their Quality Assurance program in an effective and thorough manner. The Bussmann Division of Cooper Industries has committed itself to provide a product that meets or exceeds the requirements of its customers.

This commitment was evident through all levels of management and work force contacted. Each manager at the staff and plant level is cognizant of his responsibility to his total commitment of quality.

The total Quality Assurance Program implemented at Bussmann plants is designed to concentrate the efforts on prevention rather than reaction to problems. Bussmann has implemented statistical process control (SPC). This concept, (SPC), will help reduce rework, scrap and non-conforming material. Additionally, the total Quality Assurance Program has been extended to its sub-suppliers with great success. All sub-suppliers have been or in the process of being certified to Bussmann's Quality Assurance Program. This philosophy requires the supplier to take an active part and responsibility in supplying quality products to Bussmann.

It has been determined, within the scope of the audit performed that Bussmann Division has the necessary controls in place to support Farwell & Hendricks, Inc. as a nuclear distributor to supply fuses to nuclear power generating stations.

REFERENCE DOCUMENTS:

1. 10CFR 50 Appendix B
2. ANSI N 45.2
3. 10CFR 21
4. Bussmann Quality Assurance Manual. No. 106 Issued 1-26-89
5. Bussmann Plant Procedures Manuals - Current Revision
6. Farwell & Hendricks, Inc. Audit Checklist CQ-009 REV 2 1/88

SUMMARY BY CRITERIA FROM FARWELL & HENDRICKS, INC. AUDIT CHECK LIST

## 1. ORGANIZATION

The current Bussmann organizational chart is accurately depicted in the Quality Assurance manual and plant Quality Assurance Policy/Procedures Manuals. The Corporate Quality

Assurance Manager reports to the Vice-president of manufacturing. The Plant Quality Assurance managers report to the plant managers and have dotted line responsibility to the Corporate Quality Assurance Manager. Each Quality Assurance Manager has the authority and organizational freedom to identify problems and to initiate, recommend, and verify implementation of solutions.

The Quality Assurance functions has been determined to be a major function within the organization. This function is described in the Quality Assurance Manual and the Policies and Procedures Manuals generated by each plant.

## 2. QUALITY PROGRAM MANAGEMENT

Personnel performing activities related to quality have been trained in the concepts and requirements of the Total Quality Assurance (TQA) philosophy. Each plant within the Bussmann Division is audited and qualified to each of the six (6) TQA subsystems for compliance. The term certified is used to identify the plants which have implemented all the requirements of TQA. Each plant must pass and annual audit, by corporate QA, to maintain the certified status. The plants are in the process of implementing statistical methods to control processes. All new processes must satisfactory complete the process capability study for SPC before it can be implemented. Appropriate reports are generated and sent by the QA departments, and sent to the proper levels of management to keep them informed of the quality trends.

## 3. DESIGN CONTROL

Bussman Division has procedures and controls in place to implement changes to existing products and release to manufacturing new products. The engineering change request/change order system, as a minimum has corporate QA - Plant QA and the effected manufacturing facility review all request and approve all engineering change orders.

The St. Louis Engineering group is responsible for implementation and issuance of all ECO'S to the plant facility. Each plant then is responsible to implement the effected ECO'S. Engineering change orders contain essential information such as effective date, use of existing stock, etc. Engineering change numbers are put on all drawings and revision letters indicate the new revision of the changed document.

The documents used to purchase material for Bussmann have one material listed in the specification section of the drawing, however, the purchasing department may have the option to purchase for different suppliers. This maintains consistency of material purchased for fuses.



The Bills of Material for all the cartridge fuses were reviewed at the St. Louis Engineering Department. The non-metallic materials were taken from these bills of material. The Bills of Material are computer generated and indicate the latest revision level. The Bill of Material is also an indented Bill of Material which list the lowest level of components, such as raw material.

#### 4. INSPECTION AND TEST

Receiving inspection is performed on all material used in production. The receiving inspector documents the results on required forms. Part history is maintained on all vendors, via history cards and also maintain documented inspection results. Stamps and initials are used to identify who inspected the material. Material that has been inspected is identified by tags, therefore the stock room does not accept material that has not been inspected. Receiving inspection records are generally kept in the receiving inspection area. Sampling is performed to Mil-Std. 105D. Sampling plans were available for review during the audit.

Certificate of Compliance is used instead of receiving inspection. To assure the C of C is valid the vendor must be certified and maintain his certification from Bussmann. Through certification the vendor assures Bussmann that the quality of materials they shipped are such that no incoming inspection is required. This requires the vendor to have quality control program.

First piece inspection is performed on all new items purchased. First piece inspection is also performed on all manufacturing set-ups. These inspections are verified against engineering drawings and specifications. Systems are in place to assure that manufacturing has the latest revision to the drawing. Quality Control verifies this revision against the route sheet. Quality Control also uses inspection manuals which have procedures that are used for specific instructions. In-process inspections per inspection procedures are on two (2) hour intervals.

Tags, stamps, and initials are used to indicate the acceptance of material that is ready to be moved to the other operations or to the other departments as required by the shop order.

Final inspection is made on all fuses before they are packed. This final inspection is 100% inspected by production and audited by Quality Control. The inspection procedures require that Quality Control perform sampling to Mil-Std. 105D. The fuses that have been inspected by the Quality Control inspector are identified as to the inspector who performed the inspection.

Periodic samples from lots are taken by Quality Control to the U.L. lab for performance testing to assure compliance to U.L. standards.

#### 5. MANUFACTURING AND PROCESS CONTROL

Each manufacturing component lot is controlled by a shop order. Shop orders are released from production control and issued to the assembly or fabrication areas. All necessary operations, fixtures, and tools are called out on the shop order route sheet and in instruction manuals used in assembly. Bills of Materials also have instruction drawings, procedures and fixtures required to fabricate and assemble each type of fuse. Engineering changes are introduced in the manufacturing cycle via the ECO system. Date codes are stamped on the box of fuses or on the fuse itself as required by the procedure. Date codes are an alpha character which represents the last two digits of the year. This is followed by a Julian date (date of the year) then followed by the clock number of the person who performed the packing.

#### 6. MATERIAL CONTROL AND IDENTIFICATION

Material is stored in areas that meet the requirements of Bussmann procedures. Each item produced or purchased is identified by a unique part number. The part numbers have an engineering drawing associated with it and revision level on each engineering drawing.

Identification of completed fuses is applied to the fuse by labels etc. Identification of fuses are also placed on shipping boxes.

#### 7. HANDLING STORAGE AND SHIPPING

Storage and handling procedures are in place to preclude damage from handling and storage during manufacturing. Adequate handling containers and assembly containers are used during assembly to prevent the sub-assemblies from being damaged during final assembly of the fuses. Fuses are stored in containers, number of fuses in each container depends on the size of the fuse. The shipping is from the manufacturing plants to the St. Louis warehouse for Farwell & Hendricks, Inc. warehouse. Warehouse procedures in St. Louis are in place to handle the completed fuse for temporary storage until shipping.

The facility in St. Louis has procedures in place to handle customer orders. Purchase orders are sent to Customer Service, who enters into a computer system. The information contained on the purchase order is transcribed to a shop order with product numbers and additional information requested such as C of C, test data, etc. The product is pulled from the warehouse and sent to

Corporate Quality Control who will perform the resistance test, sign the C of C and other documentation before the product is sent to shipping.

#### 8. RECORDS

Sufficient records are maintained by each plant and at the corporate site to be able to trace orders back via the date code system. Procedures are generated to establish record retention for inspection, calibration, engineering changes and others deemed as necessary.

The records kept are in sufficient detail to be able to respond to customer problems or evaluations of manufacturing problems and to the implement corrective action.

Records are used as a bases for management action and evaluation of quality program effectiveness. Records are also maintained of field features to address trends in quality and to handle serious or potentially serious quality problems that may require recall from the field.

#### 9. SUPPLIER SELECTION

Methods and guidelines that define the activities required to develop a cost effective planning and control system for purchased materials. These guideline procedures provide input to purchasing for their selection and use of qualified/certified suppliers. The term certified for Bussmann meaning, a supplier who has a quality assurance system in place that will ensure delivery of acceptable material or has a proven past performance.

When required by Bussmann procedures, a vendor survey team consisting of a purchasing representative and a quality representative will conduct a survey. The minimum requirement for suppliers is to complete a vendor survey form and have approved by Quality Assurance.

Supplier rating systems are in place that monitor the supplier who has poor performance and as a means of identifying those suppliers who consistently furnish quality material. This information is generated by Quality Assurance and send via the purchasing department.

#### 10. NONCONFORMING MATERIAL:

Bussmann has in place through the TQA program procedures for the identification and documentation of non-conforming material. The procedures also includes the segregation of non-conforming material from acceptable material disposition is made through material review boards. These procedures are for both purchasing and manufactured material.

These procedures and forms also alerts other concerned departments that potentially discrepant material exist. Then decisions can be made by department representatives as defined by that procedure. When non-conforming material is detected in receiving from outside vendors, purchasing department shall inform the supplier for corrective action.

#### 11. CONTROL OF MEASURING EQUIPMENT

There are procedures in place to certify the traceably and shall include such information as source and traceably of calibration, date of calibration, results and person who certified the equipment accuracy. Calibration records were maintained on all measuring equipment. Standards used at the Bussmann plants are returned to the OEM or a qualified calibration laboratory which is traceable back to National Institute of Standards and Technology. All measurements and test equipment used to verify quality is calibrated within the Bussmann calibration procedures.

Prepared by:

Roy A. Woeste  
Roy A. Woeste  
Quality Assurance Manager

4/5/89  
Date

Approved by:

John R. Hendricks  
John R. Hendricks, P.E.  
President/Q.A. Engineering

4/5/89  
Date

I.2.5

PORTIONS OF CG AUDIT CQ89-06



## AUDIT REPORT

TO: Gould Incorporated  
Circuit Breaker Division  
374 Merrimac Street  
Newburyport, MA 01950

AUDIT REPORT # : CQ89-06  
DATE: October 25, 1989  
FILE AUDIT VENDOR FILE

Audit Scope

The purpose of the audit was to document Gould Shawmut Fuse Quality Assurance/Quality Control activities performed in providing commercial grade fuses to F&H for resale to the nuclear utilities. These QA/QC activities support the F&H dedication program.

Audit

## Program Implementation

Audit Date: October 9, 1989

References: 1) Gould-Shawmut QA Manual 1007 Division E  
Dated 5/22/89  
2) F&H Technical Procedure TP-8-001  
3) F&H Checklist CQ-009

PERSONS CONTACTED DURING THE AUDIT

	<u>Entrance Meeting</u>	<u>During</u>	<u>Exit Meeting</u>
Al Wilkson, Application Engineering Mgr.	X		
Albert Cox National Sales Mgr.	X		
Carl Dylingowski QA Engineer		X	X
Roy A. Woeste Lead Auditor	X	X	X

Elements Audited

1. General Program
2. Design Control
3. Inspection & Test in Receiving Inspection ONLY
4. Material Control and Identification
5. Production; Fabrication Area Only
6. Records; Inspection Records in Receiving Inspection ONLY
7. Non-Conforming Material Receiving Inspection ONLY
8. Calibration

### QUALITY PROGRAM MANAGEMENT

Quality Assurance Program at Gould-Shawmut in the Newburyport facility and also in their Satellite Manufacturing facilities. The Quality Assurance Manager has the complete authority and responsibility to the defining and implement the program and procedures, require to achieve the quality goals established for Gould Shawmut. The Quality Assurance manager reports to the plant manager at the Newburyport facility. Internal audits are conducted on an impartial basis by qualified personnel. It was verified during the audit that internal audits were conducted at the Marble Falls Facility, Toronto Facility, Newburyport Facility and corrective action was sent to the proper level of management to assure adherence to the Quality Assurance Program.

### DESIGN CONTROL

Gould-Shawmut has procedures and controls in place for changes to designs and new designs. They use the engineering changes to request (ECR) and engineering change orders. QA reviews and approves changes before releases. QA is also on the review board for ECR revision. Issue dates are indicated on all drawings. QA has controller drawings used in manufacturing process and are assured through controls that the ECR system that purchasing as the most current drawing.

### INSPECTIONS

Receiving inspections is performed in all purchase material used in production. The receiving inspector documents the results on the required forms. Stamps are used to identify material inspected and ready to be transferred, i.e. "P" is punched in the proper paper work when the material is ready to be transferred. Other departments, such as the stock room will not accept the material unless it has the proper identification. Mil-Std. 105D is used as a basis for sampling plans on purchased material. Non-conforming material is tagged and separated and must be approved to the disposition before it can be moved, returned, or reworked. This disposition is accomplished by the material review board. First piece inspection is performed in all set ups. The inspections are verified against the engineering drawings. The manufacturing drawings are controlled by QA/QC. Process inspections are performed at random during the manufacturing cycle. Final inspections is performed at the end of each run on parts and sub-assemblies before being put into stock or moved to another manufacturing process. It was determined within the audit that the 100% resistance check against the design standard is performed on all fuses before they are put in storerooms or shipped. F&H will purchase fuses from Gould-Shawmut that have been processed through the certification program performed by Gould-Shawmut employees. This certificate has the resistance value documented on a C of C and is sent with the shipment of fuses.

MANUFACTURING CONTROLS

Each component lot manufactured run is controlled on a shop order. QA/QC controls the drawing used in manufacturing. The shop order has sufficient information required to manufacture fuses consistently from manufacturing run to manufacturing run. Non-conforming material pulled from manufacturing segregated. Material has dispositions by QA/QC and manufacturing. QCI are used as manufacturing procedures and also used by quality Control as inspection procedures for each type of fuses that is produced.

CALIBRATION RECORDS

Calibration is performed on all equipment used to record quality data. The calibration, the instruments used to record quality data have sticker on each instrument which indicates a serial number, calibration due date and the person who initiated the calibration. The recall system is instigated by a card file and is instruments are recalled on a monthly basis. Information from the calibration is recorded on a card and is maintained for the life of that instrument. The standards used to calibrate in-house measuring instruments are sent out to qualified laboratories and it was determined that these standards are traceable to NIST standards.

PREPARED BY:

Roy A. Woeste  
Roy A. Woeste  
General Manager

APPROVED BY:

Max E. Lilly  
Max E. Lilly  
Quality Assurance Manager

I.2.6

PORTIONS OF CG AUDIT CQ 8604

## AUDIT REPORT COVER SHEET

Audit Report No. CQ8604  
Date: July 8, 1986  
File: Quality Assurance  
Subcontractor File

TO: John R. Hendricks  
FROM: Roy A. Woeste  
DATE OF AUDIT: June 18, 1986

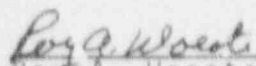
## Audit Scope:

The purpose of the audit is to document Gould Shawmut's Quality Assurance/Quality Control activities to support Farwell & Hendricks, Inc. (F&H) in providing commercial quality fuses for resale, as provided by Gould Shawmut per their QA/QC program.

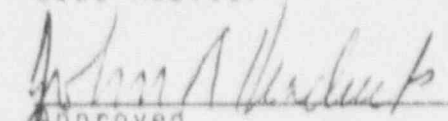
## Audit Summary:

Gould Shawmut has a written Quality Assurance Manual for use in the Newburyport manufacturing facility. Control Copy No. 1007, Revision C, Dated 10/4/84 was used during the survey. The survey was conducted on June 18, 1986 at the Newburyport, Massachusetts facility. It was determined that Gould Shawmut has the necessary procedures in place to support F&H's dedication program.

Attached are summary comments taken from the checklist QA-014-01, Rev. 1 that was used to perform the survey.

  
Roy A. Woeste  
Lead Auditor

7/8/86  
Date

  
Approved

7/8/86  
Date



## AUDIT CHECKLIST COVER SHEET

Audit Number: CQ8604  
Date Prepared: 6/30/86  
File: Quality Assurance  
Subcontractor File

- I. Organization to be audited: Gould Shawmut  
II. Type of Audit: Site Survey Commercial Grade Items  
III. Scheduled Date: June 18, 1986  
IV. References: Gould Shawmut QA Manual Control Copy #1007  
V. Audit Team: Lead Auditor, Roy A. Woeste

Approved: Roy A. Woeste  
Roy A. Woeste  
Quality Assurance Manager

Date: 7/8/86

John R. Hendricks  
John R. Hendricks, P.E.  
President & Q.A. Engineer

Date: 7/8/86

Personnel contacted during audit:

- \* William R. Amerson, Q.A. Manager
- Richard Carter, Calibration

- \* Attended Pre and Post Audit Conference

Gould Shawmut Survey  
No. CQ8604  
Page 1 of 3

#### Quality Program Management:

The quality assurance program at Gould Shawmut is used in the Newburyport facility. The Quality Assurance Manager has complete authority and responsibility to define and implement the program and procedures, required to achieve the quality goals established for Gould Shawmut. The Quality Assurance Manager reports to the Director of Operations at the Newburyport facility.

#### Design Control:

Gould Shawmut has procedures and controls in place for changes to designs and new designs. They use the Engineering Change Request (ECR) and Engineering Change Order (ECO) system. QA reviews and approves changes before releases. QA is also on the review board for ECR revisions. Issue dates are indicated on all drawings. QA has control of drawings used in the manufacturing process and are assured through controls in the ECR system that purchasing has the most current drawings.

#### Inspections:

Receiving inspection is performed on all purchased material used in production. The receiving inspector documents the results on the required forms. Stamps are used to identify material inspected and ready to be transferred, i.e. "I" is punched in the proper paper work when the material is ready to be transferred. Other departments such as the stock room will not accept material unless it has the proper punch. MIL-STD-105D is used for sampling plans on purchased material. Nonconforming material is tagged and segregated. All nonconforming must be approved as to the disposition before it can be moved or reworked. This is accomplished by the material review board.

First piece inspections are performed on all set-ups. The inspections are verified against the engineering drawings. The manufacturing drawings are controlled by QA/QC. Process inspections are performed at random during the manufacturing cycle. Final inspections are performed at the end of each run on parts and sub-assemblies before being put into stock or moved to another manufacturing process.

Final inspection is made on all product before it is stored. This final inspection varies from fuse to fuse, depending on the complexity of the fuses. At random tests such as x-ray and melt test are performed on production runs.

Procedures, Quality Control Instructions (QCI's) are used for inspections and test.

Gould Shawmut Survey  
No. CQ8604  
Page 2 of 3

#### MANUFACTURING CONTROLS:

Each component lot manufacturing run is controlled by a shop order. QA/QC controls the drawings used in manufacturing. The shop order has sufficient information required to manufacture consistently from run to run. Nonconforming material is pulled from manufacturing and segregated. The material has dispositions made by QA/QC and manufacturing. QCI's are also used as manufacturing procedures.

#### MATERIAL CONTROL:

Material pulled from the stock area is controlled by the shop order system. The shop order has the quantity required for that production run. Storage and handling procedures are in place to prevent material damage. All parts are identified by a unique part number. Final products are identified by model number and date codes. The date codes are stamped on the box of fuses.

#### RECORDS:

Sufficient records are maintained from inspection records to facilitate corrective action from suppliers and in-house production. The date of manufacture which is stamped on the fuse box will allow traceability back to a date of manufacturer.

#### SUB-SUPPLIERS:

Gould Shawmut does not have a formalized system of planned audits to select vendors. Visits are performed as required by purchasing and quality assurance. This visit or survey is not documented. Gould Shawmut is now in the process of sending each of their suppliers a questionnaire to be completed and returned. This questionnaire is to be used to evaluate the vendor.

#### NONCONFORMING MATERIAL:

Nonconforming material is adequately controlled to prevent nonconforming material from being inadvertently put into stock or in production runs. Nonconforming material is brought before a review board for disposition. Vendors are notified of nonconforming material for corrective action. In house production items are proceeded through reworks.

Gould Shawmut Survey  
No. CQ8604  
Page 3 of 3

COMMENTS:

The QA Manual states that it is in accordance with ANSI N-45.2. The criteria as stated in the manual conforms to the ANSI N-45.2 requirements. During the survey, it was discovered that Gould is not following the QA manual in all sections. For example, the QA system is to be reviewed on an annual basis. Vendors will be audited, and internal audits will be conducted at Gould. These deficiencies will not preclude Gould Shawmut from supplying commercial grade items to Farwell & Hendricks, Inc. These deficient areas, however, will not allow Gould Shawmut's Quality Assurance Program to be suitable as a nuclear grade supplier to Farwell & Hendricks, Inc. 10CFR50, Appendix B program.

## Enclosure I.3

## F&amp;H response to nonconformance #90-01 A.3

- A. See Enclosure II.3 NRC Docket No. 99900918/90-01, specifically, Section A.3 of Appendix A of the Notice of Nonconformance which states, in part, that the Norgren poppet valves dedicated on F&H Data Package 60058 were sold as safety-related without verifying the coil materials for a mild environment or a seismic application.
- B. F&H reviewed Project No. 60058 which indicated that the subject Norgren valve is P/N D1023C-00-C8 that is dedicated by F&H Commercial Quality Dedication Report No. 60058.1 dated September 8, 1986 for Nebraska Public Power District. Extracts from the dedication report and other QA records from the 60058 master file are attached to provide objective evidence to support statements made in this enclosure to address nonconformance 90-01 A.3.

The mild environment and seismic application that the valves were qualified and dedicated to was defined in the dedication plan which was approved by NPPD. The results were presented in the dedication report referenced above which was also approved by NPPD.

The coil materials of construction were not included in the System 1000 Mild Environment Analysis (MEA) due to, per discussion with the Project Engineer, engineering judgment which determined that the coil materials were not the "weakest link at 104°F" as specified on the NPPD P.O. by reference of the NPPD letter dated June 20, 1986 and the F&H letter dated July 9, 1990. The Project Engineer determined the Viton material in the valve to be the "weakest link at 104°F". The engineering judgment was not adequately documented nor included in the dedication report which would indicate the need for training to assure that all applicable constituent materials of safety-related components are addressed and adequately documented.

F&H has revised the System 1000 MEA of the subject valves to include the coil materials in accordance with the test procedure in the dedication plan. The analysis indicates that the coil materials will not invalidate or degrade the valves mild environment qualification and are acceptable for the specified application.

The mild environment specified by NPPD is as follows:



MILD ENVIRONMENT - An environment expected as a result of normal service conditions and extremes (abnormal) in service conditions where seismic is the only design basis event (DBE) of consequence. The normal operational service conditions, for the dedication program reported herein are presented below.

#### NORMAL CONDITIONS

Maximum Temperature (F)	104
Average Temperature (F)	N/S
Relative Humidity, Max. (%)	N/S
Relative Humidity, Min. (%)	N/S
Radiation (rads)	N/S

N/S-Not Specified

The manufacturer published characteristics state that the valves will meet a service condition of 130°F which exceeds the NPPD specified profile of 104°F. Also, the representative qualification test sample was cycled 1093 times with satisfactory results in order to meet the specified wear-aging parameter at 1000 cycles.

The seismic application specified by the client was enveloped by seismic proof testing in accordance with the dedication plan. The coil materials were verified for use in the specified seismic application via lot qualification. The coils supplied to NPPD were received in the same batch as the qualification test sample which was subjected to the seismic testing. The supplier Norgren, certified the valves with a certificate that was supported by a F&H/NPPD commercial grade audit of Norgren.

NPPD required F&H to furnish cure dates, recommend shelf life and type of material for all shelf life items. Norgren does not provide cure dates or shelf life information for any material other than BUNA-N. NPPD was notified of this via participation in and F&H's submittal of the Norgren CG audit. NPPD was also notified of this via a statement in the dedication report on page 077 section D.3. This apparently satisfied NPPD as there was no comments on the audit report and the dedication report was approved.

- C. F&H evaluated the above described information in order to assess the impact on the quality of the valves supplied to NPPD. This included discussion with the 60058 Project Engineer.

The coil materials of construction were not included in the original System 1000 MEA of the valves. The evaluation concluded that there was sufficient information available to

support the coil materials of construction acceptability for the specified mild environment and seismic application, however, this information was presented in a cumbersome fashion that was not readily retrievable and reviewable. F&H has also revised the System 1000 MEA for the valves to include the coil materials of construction with acceptable results. Based upon the above, there is no adverse impact on the quality of the valves provided to NPPD.

D. F&H has defined the corrective action necessary to correct this item, preclude it's re-occurrence and the corresponding dates as follows:

1. Revise the System 1000 MEA for the valve to include the coil materials of construction in accordance with the applicable dedication plan
2. Assess the impact on the quality of the valves supplied to NPPD
3. Conduct training to ensure MEA's are adequately performed and documented for all applicable non-metallics on future orders
4. Revise and resubmit F&H Dedication Report 60058.1 to NPPD and/or contact NPPD to request specific instructions for course of action with respect to F&H Dedication Report 60058.1

F&H has completed the revision of the System 1000 MEA to include the coil materials of construction and has assessed the impact on the quality of the valves supplied to NPPD with acceptable results as 12/20/90.

F&H will conduct the training referenced above no later than 1/31/91. Documentation which shows compliance to the above will be incorporated into the F&H QA record system.

F&H will perform the necessary action with respect to F&H Dedication Report 60058.1 no later than 3/31/91. Documentation which shows compliance to the above will be incorporated into the F&H QA record system.

F&H, unless notified otherwise, considers the corrective action defined above satisfactory to address the nonconformance and when completed, sufficient to close the matter.

A list of the attached records is as follows:

- I.3.1 NPPD letter dated October 16, 1986 which approves report
- I.3.2 Extracts from F&H Dedication Report 60058.1
- I.3.3 F&H cover letter to NPPD and Extracts from Norgren CG Audit CQ86-87
- I.3.4 Norgren C of C for Valves P/N D10230C-00-C8
- I.3.5 NPPD P.O. 257201
- I.3.6 NPPD letter dated June 20, 1986 referenced on NPPD P.O. 257201
- I.3.7 F&H letter dated July 9, 1986 referenced on NPPD P.O. 257201
- I.3.8 Revised System 1000 MEA for valves to include coil materials of construction

Enclosure I.3.1

NPPD Letter Dated October 16, 1986



## Nebraska Public Power District

60058-1  
33199 DPG103

GENERAL OFFICE  
P.O. BOX 499, COLUMBUS, NEBRASKA 68501-0499  
TELEPHONE (402) 564-8561

October 16, 1986

Mr. Ray E. Woeste  
Farwell & Hendricks, Inc.  
Park 50 TechnoCenter  
1000 Ford Circle, Suite C  
Milford, Ohio 45150

Dear Mr. Woeste:

Subject: F&H Report No. 60058.1, Rev. 0

Reference: F&H Letter of Transmittal dated 9/8/86  
APA Letter ANL 117.10.91 dated 9/25/86  
NPPD P.O. 257201

Please be advised that the subject F&H report has been statused  
as "Approved" by NPPD. ←

If there are any questions or comments, please advise.

*Steve M. McClure*  
G. S. McClure  
Engineering Manager  
Nuclear Department

GSM/AJH:kw53-1P

cc: K. J. Done  
M. A. Hillstrom  
A. J. Hubl  
J. M. Nagl  
File 86046(2)  
AI 108

RECEIVED OCT 22 1986



Enclosure I.3.2

Extracts from F&H Dedication Report 60058.1

Fairwell & Hendricks, Inc.  
Report Number 60058.1  
Revision 0  
Date September 8, 1986

## COMMERCIAL QUALITY DEDICATION REPORT

FOR

NORGREN VALVES  
PART NUMBER  
D1023C-00-C8

PREPARED FOR

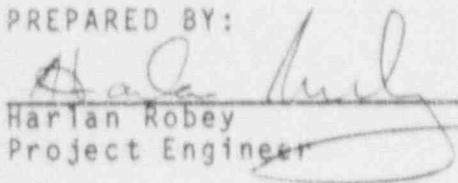
NEBRASKA PUBLIC POWER DISTRICT  
COOPER STATION  
1415 15TH STREET  
COLUMBUS, NEBRASKA 68601-0499

PREPARED BY

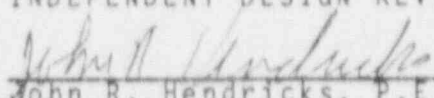
FARWELL & HENDRICKS, INC.  
1000 FORD CIRCLE, SUITE C  
MILFORD, OHIO 45150  
(513) 831-9390

## REVIEWS AND APPROVALS

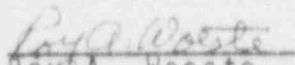
PREPARED BY:

  
Harlan Robey  
Project Engineer


INDEPENDENT DESIGN REVIEW BY:

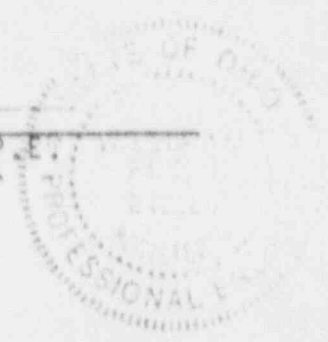
  
John R. Hendricks, P.E.  
President

REVIEWED AND APPROVED BY:

  
Roy A. Woeste  
Quality Assurance Manager

APPROVED BY:

  
William M. Rusen, P.E.  
Engineering Manager



## RECORD OF REVISIONS

REVISION NUMBER	ISSUE DATE	PREPARED BY	APPROVED BY	Q.A. BY	PAGES REVISED & DESCRIPTION
0	9/02/86	HHR	WMR	RAW	Original issue
1	10/17/86	HHR	CRF	RZ	As Indicated On Pages 1, 2, & 4

THE NUMBER OF PAGES IN THIS REPORT ARE DISTRIBUTED AS FOLLOWS:

Main Text	:	9
Subpages, Main Text	:	0
Appendix A	:	8
Appendix B	:	49
Appendix C	:	10
Appendix D	:	10
Appendix E	:	3
Appendix F	:	22
Appendix G	:	4
Appendix H	:	10
Appendix I	:	5

THE TOTAL NUMBER OF PAGES CONTAINED IN THIS REPORT IS 130

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60058 . 1PG003

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### 3. DEDICATION SUMMARY

#### 3.1 Procurement Control

Procurement Control was accomplished by a QA evaluation of the vendor, C.A. Norgren Co. on 7/29/86. The results of this survey indicate that the vendor possesses capabilities of process control, subcontractor control, design and design change control, QC inspection control, and good engineering practices. The vendor was able to provide F&H with a Certificate of Compliance to these controls on the parts purchased for dedication and testing.

Additionally, F&H performed 100% receipt inspection for dimensional and functional operability to the requirements of NPPD. Appendix C contains these results.



### 3.3 Seismic Qualification Summary and Conclusions

The complete seismic program is documented in Appendix F, including the OBE and SSE TRS test sample operability data, and test sample mounting details. A summary of the contents is presented in Table 3.3.1 below.

Table 3.3.1  
Seismic Summary

Test Description	Seismic Comments	Operability Comments
OBE 1	TRS enveloped RRS	Valves Pressure Boundary retained
OBE 2	TRS enveloped RRS	Valves Pressure Boundary retained
OBE 3	TRS enveloped RRS	Valves Pressure Boundary retained
OBE 4	TRS enveloped RRS	Valves Pressure Boundary retained
OBE 5	TRS enveloped RRS	Valves Pressure Boundary retained
SSE 1	TRS enveloped RRS	Valve changed status

The TRS enveloped the RRS while demonstrating operability. No anomalies occurred during this program.



# Nebraska Public Power District

GENERAL OFFICE  
P.O. BOX 488, COLUMBUS, NEBRASKA 68601-0488  
TELEPHONE (402) 504-8381

August 28, 1986

Mr. R. A. Woeste  
Quality Assurance Manager  
Farwell & Hendricks, Inc.  
Park 50 TechnoCenter  
1000 Ford Circle, Suite C  
Milford, Ohio 43150

Dear Mr. Woeste:

Subject: Review of Farwell & Hendricks Procedure for  
Qualification of AMOT and Norgren Valves

Reference: Farwell & Hendricks' letter of transmittal dated  
August 22, 1986

The following are NPPD's comments on the subject procedures:

Procedure 60067, Revision 1 - Approved  
Procedure 60058, Revision 1 - Approved



Sincerely,

*G. S. McClure*

G. S. McClure  
Engineering Manager  
Nuclear Department

GSM/AJH:kw98-1N

cc: A. G. Boesch  
K. J. Done (cc)  
J. R. Flaherty  
J. R. Hackney  
M. A. Hillstrom\*\*  
V. G. Hoefler  
A. J. Hubblayn  
L. A. Kubes  
J. M. Nagl (APA)  
D. L. Torczon  
File 86046(2)

Farwell & Hendricks, Inc.  
Procedure Number 60058  
Revision 1  
Date: 08/20/86

R1  
R1

COMMERCIAL QUALITY DEDICATION PLAN  
FOR  
NORGREN VAVLES

Prepared for

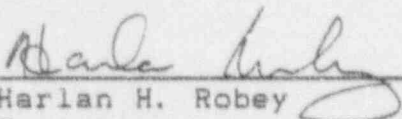
NEBRASKA PUBLIC POWER DISTRICT  
COOPER STATION  
1415 15TH STREET  
COLUMBUS, NEBRASKA 68601-0499

Prepared by

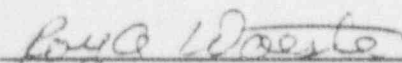
FARWELL AND HENDRICKS, INCORPORATED  
1000 FORD CIRCLE, SUITE C  
MILFORD, OHIO 45150  
(513) 831-9390

REVIEWS AND APPROVALS

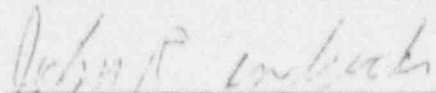
PREPARED BY:

  
Harlan H. Robey  
Engineer

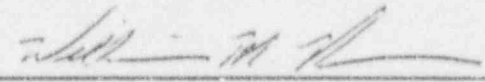
REVIEWED AND APPROVED BY:

  
Roy W. Woeste,  
Quality Assurance Manager

INDEPENDENT DESIGN REVIEW BY: R1

  
John R. Hendricks, P.E.  
President

APPROVED BY:

  
William M. Rusen, P.E.  
Engineering Manager

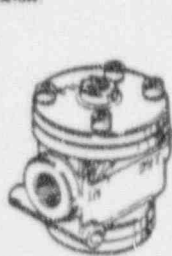
# PROSPECTOR® POPPET VALVES

NIP-70A  
December, 1981  
Supersedes March, 1980

## DESCRIPTION, SPECIFICATIONS AND OPERATION

READ ALL CAUTIONS AND WARNINGS CAREFULLY BEFORE INSTALLATION AND USE

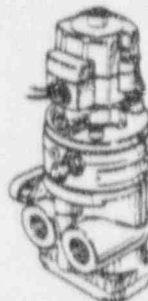
Norgren Prospector Poppet Valves are modular design, pilot-operated, 2-position, spring-return, directional control valves for use in industrial compressed air power transmission systems. Two mounting styles - inline and subbase; five functional types - 2-way, 3-way, twin 3-way, distributor/selector, and 4-way; four basic body sizes - 1/4, 1/2, 1 and 2-inch and a variety of interchangeable pilot operators - air, solenoid, manual, mechanical and auxiliary time delay heads can be used in many combinations to suit the particular application. A few of the possible combinations are shown below.



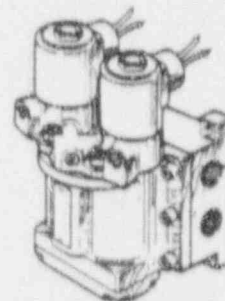
2-WAY  
AIR OPERATOR  
INLINE



3-WAY  
PEDAL OPERATOR\*  
INLINE



4-WAY  
SOLENOID OPERATOR  
AUX. TIME DELAY  
INLINE

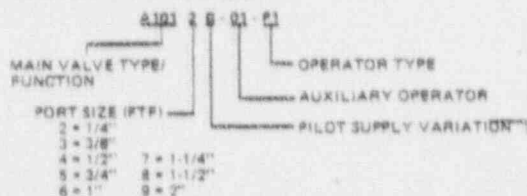


4-WAY  
MOMENTARY SOLENOID  
SUBBASE

\*Footguard, P/N 53771-01 is recommended for use with pedal operated valves.

### VALVE NUMBERING SYSTEM

The valve numbering system consists of ten characters which have identifying significance as illustrated by the example below and as further explained in the following paragraphs.



To identify main valves and operators which have nonstandard features such as fluorocarbon elastomers, special lubricants, etc., an additional code letter (see below) will appear at the end of the main valve number (A1012BV) on the main valve nameplate and at the end of the operator number (P1V) on the operator nameplate. When ordering your kit or requesting information for your particular valve, give both main valve and operator numbers exactly as found on their respective nameplates.

- V - Fluorocarbon elastomers
- L - Low temperature lubricant
- E - Low temperature seals and lubricant

### MAIN VALVE TYPE/FUNCTION

- |                        |   |
|------------------------|---|
| A101, A102, A103       | 2-Way, Normally Closed, inline  |
| B101, B102, B103       | 2-Way, Normally Open, inline  |
| C101, C102, C103, C104 | 2-Position Distributor, inline  |
| C103, C106, C108, C109 | inline. These main valves can be used vari-<br>ously as 2-position selector valves, as<br>3-way normally closed valves or as 3-<br>way normally open valves (see Opera-<br>tion). |
| D101, D102, D103, D104 | 3-Way, Normally Closed, inline  |
| D107, D108             | 3-Way, Normally Closed, inline (indicator)  |
| E101, E102, E103, E104 | 3-Way, Normally Open, inline  |
| F101, F102, F103       | 4-Way, inline   |

- F221, F222
- F323, F324
- G102, G103

- 4-Way, 4-Port Subbase
- 4-Way (Subbase Valve Less Subbase)
- Twin 3-Way, Normally Closed, inline

### PILOT SUPPLY VARIATIONS

The main valves have one of the following internal variations depending upon main valve primary (inlet) pressure, type of operator, and the type and condition of the fluid being handled.

**VARIATION 'B'** - Internal pilot supply. For applications where the main valve inlet pressure is 30 psig (2.1 bar) or higher.

**VARIATION 'C'** - Same as Variation B but with a check valve in the internal pilot supply passage. Can be substituted for Variation B, however, Variation B cannot be substituted for Variation C. Variation C should be used whenever valve operating conditions could result in transient drops in main valve internal pressure below 30 psig (minimum required operator pressure). Required when auxiliary time delay heads are used.

**VARIATION 'E'** - Same as Variation B but with a sustaining bleed piston. Required where a double (momentary signal) solenoid-pilot operator is used. Used only with normally closed valves.

**VARIATION 'F'** - Same as Variation B but with a restrictor in the internal pilot supply passage. Used with single and twin air operators only in conjunction with a remote 2-way valve or valves for bleed operation.

**VARIATION 'H'** - External pilot supply. Internal pilot supply passage plugged. Required where main valve inlet pressure is below the minimum required operator pressure (30 psig) but not below atmospheric pressure, or where contaminated air or fluids other than air are being handled.

**VARIATION 'J'** - Same as Variation H but with a heavier poppet return spring. Required where main valve inlet pressure is below atmospheric pressure (vacuum).

**VARIATION 'K'** - Same as Variation H but with a sustaining bleed piston. Required where a double (momentary signal) air operator is used. Main valve inlet pressure must be 30 psig (2.1 bar) or higher. Used only with normally closed valves.

**NORGREN**  
LITTLETON, COLORADO  
©1981, C. A. NORGREN CO.



## OPERATOR TYPES

The valve operators are identified by a two part alpha or alphanumeric code. The first part (alpha) identifies the type (or series) operator -

- A - Air or Air-Pilot Operator
- C or P - Single Solenoid-Pilot Operator
- D or F - Double (Momentary Signal) or Twin Solenoid-Pilot Operator
- K - Hazardous Location Solenoid-Pilot Operator (Single, Double or Twin)
- M - Manual or Mechanical-Pilot Operator

The second part (alpha or numerical) identifies the particular model operator (no manual override, nonlocking override, locking override and/or junction box) within the series. See NIP-708 for illustrations of the various operators.

## AUXILIARY OPERATORS

Auxiliary operators (time delay heads), if used, are identified by a two digit code. If none, "00" will appear. Refer to NIP-708 for description, operation, adjustment and maintenance of time delay heads.

## SPECIFICATIONS

### OPERATING APPLICATIONS AND MEDIA

Compressed air or vacuum.

### CAUTION

These products are intended for use in industrial pneumatic systems. They are designed and tested for use with filtered and lubricated compressed air at pressures and temperatures within specified limits.

For use with media other than filtered and lubricated air, for nonindustrial applications or for life support systems, consult factory for approval. These products must not be used in applications which do not fully comply with all rated operating conditions.

### MATERIALS OF CONSTRUCTION

Main valve body, piston(s) and poppet(s) - Aluminum alloy, corrosion resistance treated.  
Subbase - Aluminum alloy.  
Operators - Aluminum alloy, corrosion resistance treated; stainless steel, acetal, polycarbonate.  
Elastomers - Buna-N and, in addition, on P Series operators, polyurethane. Viton optional where lubricants or contaminants in the air system are incompatible with Buna-N and for high temperature applications.

### CAUTION

Compressed air systems may contain lubricants or contaminants which can attack and cause failure of elastomers and other materials used in these products. The user is cautioned to be certain that his compressed air system is fully compatible with materials utilized in these products.

### RATED OPERATING CONDITIONS

#### Maximum Pressures

The maximum inlet pressure for a specific main valve/operator combination is determined by the maximum allowable pilot pressure (internal or external) for the operator and by the main valve mounting style (inline or subbase). See table below.

MAXIMUM OPERATING PRESSURES - PSIG (BAR)				
OPERATOR MOUNTING STYLE	C4	A8, A9, C8/C3, CT, D4/D7, F6, F7, P0/P8, X0, X1, X4, X5, Y1ME DELAY HEADS	D0/D3, P4, P5, X2, X3	A1, A4, A6, C8, MA/MM
INLINE	100(6.9)	150(10.3)	250(17.2)	300(20.7)
SUBBASE	100(6.9)	150(10.3)	200(13.8)	200(13.8)

#### Minimum Pressures

##### MAIN VALVE INLET

Pilot Supply Variation -  
B, C, E, F or K 30 psig (2.1 bar)  
H Atmospheric  
J Vacuum (to 29" Hg)

## OPERATOR PILOT AIR SUPPLY/SIGNAL

All operators except air operators A1, A4 and A6 require a pilot air supply in addition to an actuation signal (low pressure air, electrical, manual or mechanical). Air operators A1, A4 and A6 require only an air signal from a remote source.

Pilot Air Supply (Internal or External): Equal to or greater than main valve inlet pressure but not less than 30 psig (2.1 bar)

#### Air Signal -

Air Operators A1, A4 and A6: Equal to or greater than main valve inlet pressure but not less than 30 psig (2.1 bar)  
Low Pressure Air-Pilot Operators A8 and A9 -  
A8: 3" H<sub>2</sub>O minimum  
A9: 10" H<sub>2</sub>O minimum  
The maximum signal pressure for these operators is 5 psig (3.4 bar)

## Temperature Ranges

### Buna-N Elastomers

Air (A1, A4, A6): Manual and Mechanical Operators:

-20 to 175°F (-29 to 79°C)\*

Low Pressure Air-Pilot Operators (A8, A9):

35 to 150°F (2 to 66°C)\*

Solenoid-Pilot Operators (Except CT):

-20 to 130°F (-29 to 54°C)\*

\*With dewpoint less than air temperature below 35°F (3°C).

### Fluoroelastomer Elastomers

Available for all main valves and all operators except A6, A8, A9 and P Series.

Solenoid-Pilot Operator (CT) -

Continuous Duty: Up to 170°F (77°C)

## Solenoid-Pilot Operator Electrical and Mechanical Ratings

Voltage & Frequency (Std)*		120V 60Hz 115V DC
Power Consumption @ 120V 60Hz/115V DC		P Series: 6W AC, 12W DC 50A inrush (AC) 21A Holding (AC) 10A DC
C, D, F & X Series:		12W AC/DC 26A inrush (AC) 17A Holding (AC) 0.8A DC
Coil Type		C (except CT), D & F Series (AC/DC): CT & X Series (AC/DC): P Series - AC DC
Duty: Continuous @ 85 to 105% of rated voltage		Varnished or Molded Epoxy Molded Epoxy Metal Encased
NEMA Classification		NEMA 1, 2, 3, 4, 4X, 12 & 13 NEMA 3B & 11 in addition to above
C0, C1, C4, C8, CT, D0, D1, D4, D5, F4 & F6 -		Varnished Coil: NEMA 1 Molded Coil: NEMA 1
C2, C3, C2, C3, D6, D7, F5 & F7 -		Varnished Coil: NEMA 1, 2, 3, 4, 4X, 12 & 13 Molded Coil: NEMA 3B & 11 in addition to above
X Series†		NEMA 7C, 7D, 8C, 8D, 9E, 9F & 9G
P Series:		NEMA 1, 2, 3 & 4
Conduit Connection		1/2-14 NPT 1/2-14 NPSM
Manual Overrides		None
C0, C2, C4, CT, D0, D3, D4, D6, P0, P3, X0, X2 & X4		
C1, C3, C8, D1, D3, D6, D7, P2, P5, X1, X3 & X5		Locking Type
P Series, P1, P4, P6 & P8:		Nonlocking Type

\*Other voltages and frequencies available. Check operator nameplate for ratings applicable to your unit. With P Series operators, the optional 110V 50Hz solenoid coil can also be used for 120V 60Hz operation. However, the reduced voltage operational limit for continuous duty of the 50Hz coil with 60Hz input is somewhat higher than that of the standard coil rated at 120V 60Hz.

†Meets the requirements of Underwriters Laboratories for use in hazardous locations as defined in the National Electrical Code (ANSI C-1975): Class I, Groups C & D; and Class II, Groups E, F & G.



**OPERATOR SIGNAL DURATION** — All operators except the double (momentary signal) air (A&B) and double (momentary signal) solenoid-pilot (DQ/D3, P4, P5, X2 & X3) require a continuously applied air/electrical signal or manual/mechanical force during the full period of time the main valve is to remain actuated. The double air and double solenoid-pilot operators are designed for use with two alternately applied, momentary air/electrical signals of 0.2 seconds minimum duration. Valves using these operators must have a sustaining bleed piston (pilot supply variation S or K) to maintain the pilot pressure on the piston during extended periods of operation. Either of the two signals can be applied continuously if necessary.

### MAINTENANCE

#### CAUTION

Anytime these valves are disassembled for repair or conversion to a different configuration, the reassembled valve must be checked for leakage and proper function prior to installation.

Installation, operation, maintenance and repair parts information will be found in the following supplementary instruction sheets.

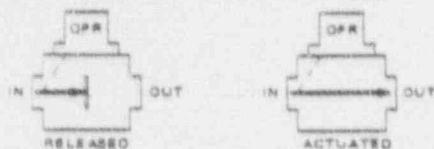
Installation/Service Kits	NIP-70B
Poppet Valve Operators	NIP-70C
Poppet Valve Bodies	NIP-70D
Poppet Valve Timers	NIP-70E

### OPERATION

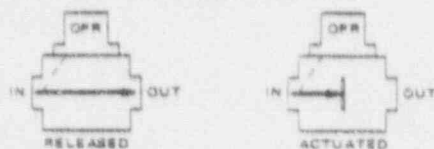
Internal Pilot Supply — — —  
External Pilot Supply — — —

#### 2-WAY

**NORMALLY CLOSED (A101, A102 & A103 Main Valves)**

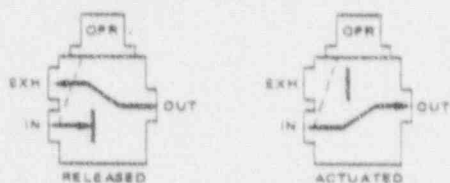


**NORMALLY OPEN (B101, B102 & B103 Main Valves)**

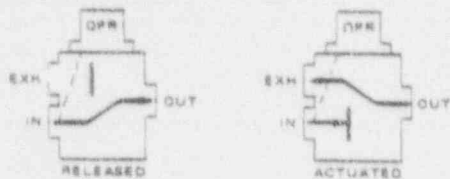


#### 3-WAY

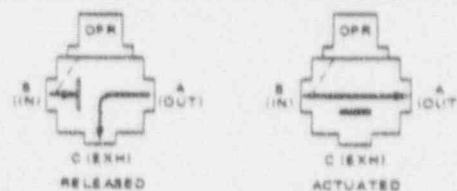
**NORMALLY CLOSED (D101 thru D106 Main Valves)**



**NORMALLY OPEN (E101 thru E104 Main Valves)**

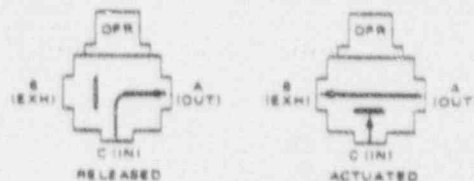


**NORMALLY CLOSED (C103, C106, C108 & C109 Main Valves)**



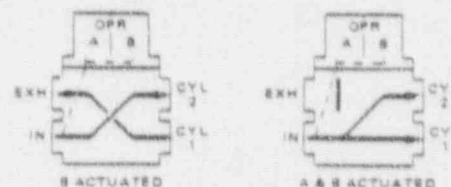
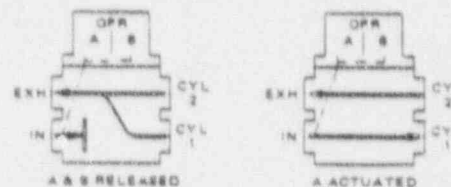
Use external pilot supply with C103 main valves in this application.

**NORMALLY OPEN (C103, C106, C108 & C109 Main Valves)**



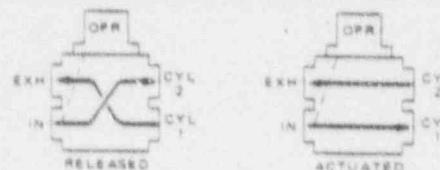
#### TWIN 3-WAY — INLINE

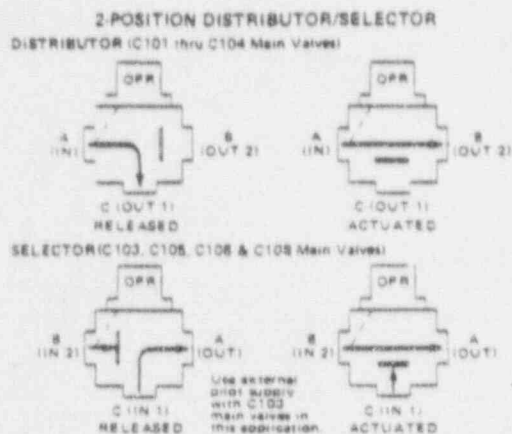
**NORMALLY CLOSED (G102 & G103 Main Valves)**



#### 4-WAY

**INLINE (F101, F102 & F103 Main Valves)**  
**4-PORT SUBBASE (F321, F322, F323 & F324 Main Valves)**





### D.1 Mild Environmental Analysis Summary

This appendix lists the parts and/or assemblies contained in the subject component. The analysis provides information on the expected life of the constituent materials of the parts and/or assemblies, as well as data on the radiation thresholds, by material.

### D.2 Mechanical and Electrical Component Analysis


The data is organized by major assembly for the subject component. Presented first is Table D.1, which documents the safety-related parts of the assembly, their designations, the materials of construction of each, and the failure parameters to be analyzed for each material.

Table D.1  
C.A. Norgren Co.  
Poppet Valve  
D1023C-00-C8  
Safety-Related Materials Analysis Data

Part Designator	Raw Material (generic)	Failure Parameter
Gasket	Viton (Armstrong N-8090)	Mechanical
O-Ring	Viton (Fluorinated Rubber)	Mechanical
Seal	Viton	Mechanical
Kit-Sol	Viton (Fluorcarbon Elastomer)	Mechanical

### D.3 Cure Dates and Shelf Life

There is no cure date provided by the manufacturer. The valves are custom made; they do not inventory parts. A conservative cure date of 1 year can be applied; July 29, 1985. The shelf life for Viton is 20 years (Ref. MIL-HDBK-695C, July 11, 1980). The expected life is substantially greater than 40 years. Therefore, this equipment will be acceptable for the balance of this plant's life without qualification replacements.



## ENVIRONMENTAL QUALIFICATION ANALYSIS FORM #1

Equipment Identification

Component Name : Poppet Valve  
Manufacturer : C.A. Norgren Co.  
Part Number : D10236-00-C8  
Other Description : F&H 60058

Equipment Location

Building : Not Specified  
Zone : Not Specified  
Elevation : Not Specified  
System : Not Specified  
Classification : Mild Environment


Qualification Status

This assembly is qualified with an expected life of greater than 40 years of operation at the specified conditions as defined in NPPD Purchase Order 257201, Amend 1, Dated 7/18/86 presented in Appendix A of this report.

Environmental Qualification Surveillance and Maintenance Requirements

- 1) As required for routine maintenance.

### E.1 Wear Aging Summary

The valve was aged for 1093 cycles which exceeded the requirements of 1000 cycles. The valve performed as specified after aging. The Wear Aging Testing Data Sheet is presented in this appendix. 



## F.1 Qualification Summary

The testing reported herein is in accordance with the dedication plan and purchase order as defined in Appendices B and A respectively.

The test response spectra enveloped the site requirements with 10% margin at the test levels for 5 OBE's and 1 SSE shown in Figure F.4 through Figure F.21.

A test run summary has been presented in Table 3.3.1 of the main body of this report.

Description of the test sample:

Part Description	:	Poppet Valve
Manufacturer	:	C.A. Norgren
Manufacturer's Part Number	:	D1023C-00-C8
F&H Tag Number	:	60058-01-00-08

Equipment Operability Requirement:

The valve shall retain pressure boundary during OBE testing. During the SSE, the valve shall change status (open) when an electrical signal is applied. A summary of the operability requirements has been presented in Table 3.3.1 of the main body of this report.

Test Sample Mounting:

The test sample was mounted to a rigid (within the seismic range) fixture using 2 (two) 1/4-20 grade 2 bolts and lock-washers torqued to 7 ft/lbs. The sample was oriented with the valve piston in a vertical position. The fixture in turn was clamped on the shake table, with its principal axes (if distinguishable) oriented parallel with the major axes of excitation of the shake table.

Enclosure I.3.3

F&H Cover Letter to NPPD and  
Extracts from Norgren CG Audit CQ86-87

*Farwell & Hendricks, Inc.*

1000 Ford Circle, Suite C  
Milford, Ohio 45150  
(513) 831-9390  
Telecopy (513) 831-9398

August 14, 1986

Nebraska Public Power District  
1414 15th Street  
Columbus, Nebraska 68601

Attention: Dave L. Torczon  
QA Specialist

Subject: C.A. Norgren Company  
Commercial Quality Audit

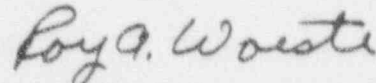
Dear Mr. Torczon:

Attached please find the results of the survey, and a copy of the checklist that was used during the audit.

The audit report less the checklist has been sent to Mr. John Travis at C.A. Norgren Company for his records.

I want to thank you for being with me during the audit, and I hope that Nebraska Public Power District and Farwell & Hendricks, Inc. continue in a long-working relationship.

Sincerely,



Roy A. Woeste  
Quality Assurance Manager

RAW/dlw

Attachments: 1) Audit Report  
2) Audit Summary  
3) Audit Checklist

## AUDIT REPORT COVER SHEET

Audit Report No. CQ86-07  
Date: August 7, 1986  
File: Quality Assurance  
Subcontractor File

TO: John R. Hendricks, P.E.  
FROM: Roy A. Woeste  
DATE OF AUDIT: July 29, 1986

## Audit Scope:

The purpose of the audit is to document C.A. Norgren Co. Quality Assurance/Quality Control activities to support Farwell & Hendricks, Inc. (F&H) in providing commercial quality valves for resale, as provided by C.A. Norgren per their QA/QC program.

## Audit Summary:

C.A. Norgren has a written Quality Control Manual for use in the Littleton, Colorado facility. The manual used during the survey was dated February 24, 1986. The survey was conducted on July 29, 1986 at the Littleton, Colorado facility. It was determined that the C.A. Norgren Co. has the necessary procedures in place to support F&H dedication program.

Attached are summary comments taken from the checklist QA-014-01, Rev. 1 that was used to perform the survey.

Prepared By:

Roy A. Woeste  
Roy A. Woeste  
Lead Auditor

Date

8/7/86

Approved By:

John R. Hendricks  
John R. Hendricks, P.E.  
President/QA Engineer


Date

8/7/86

Audit No. CQ86-07  
Date: August 5, 1986  
File: Quality Assurance  
Subcontractor File

## AUDIT SUMMARY

FARWELL & HENDRICKS, INC.  
INHOUSE REQUIREMENTS FOR THE  
PURCHASING OF C.A. NORGREN PRODUCTS

1. All future purchases to C.A. Norgren will be accompanied by a Certificate of Compliance from C.A. Norgren as to the acceptance of the final product testing. This is required because manufacturing is the last department to see the end product before it is packed. Quality Control does not 100% inspect the final products.
2. All dimensional checks, which can be obtained from the published documentation from C.A. Norgren, will be made on all devices sent to Farwell & Hendricks, Inc. Reason; their calibration system does not allow for periodic calibration of all test instruments used. The calibration to date is virtually nonexistent and only problems with calibration are identified. Also, the test instruments used in the final production test are not calibrated.
3. C.A. Norgren, as stated in the survey, does not perform shelf life or cure dates on any material other than Buna-n rubber and elastomers. C.A. Norgren does not maintain shelf life for any other material, such as Viton, as requested by the Nebraska Public Power District purchase order. 
4. C.A. Norgren Company QA Manual is written to the intend of ANSI Z1.8. Therefore, some of the requirements in 10CFR50 Appendix B and ANSI N45.2 do not apply.

PREPARED BY:

Roy A. Woeste  
Roy A. Woeste  
Lead Auditor

Date

8/5/86

APPROVED BY:

John R. Hendricks  
John R. Hendricks, P.E.  
President/QA Engineer

Date

8/5/86



#### QUALITY PROGRAM MANAGEMENT:

The Quality Control program at the C.A. Norgren Co. is used at the Littleton, Colorado facility. The Chief Quality Engineer has the complete authority and the responsibility to define and implement the program and the procedures required to achieve the quality goals established for C.A. Norgren Co. The Chief Quality Engineer reports to the Manager of Product Integrity. As stated during the survey, the Quality Control Department has sufficient authority and organizational freedom to identify and resolve Quality Control problems. This also includes access to the levels of management necessary to stop work if necessary. As summarized during the survey, the C.A. Norgren Co. has quality control procedures in place to verify and inspect product integrity. The program, at this point, does not define the overall Quality Assurance responsibilities.

#### DESIGN CONTROL:

C.A. Norgren Co. has procedures and controls in place for changes to existing designs and releasing new designs. They use the Engineering Change Request (ECR) and Engineering Change Order (ECO) system. Quality Control reviews the ECR's before they are released. Quality Control is also on the review board for ECR revisions. Issue dates and revisions are indicated on all drawings reviewed during the survey. The Engineering Department has control of drawings and releases the ECO's to manufacturing, production control, purchasing, process control, and quality control. It is the responsibility of each individual department to utilize the drawings on the latest ECR to the implementation of their portion within the company. Engineering also has the responsibility for updating the computerized list of the bill of materials used to manufacture the end products.

#### INSPECTIONS:

Receiving inspection is performed on all purchased material used in production. The receiving inspector documents the results on the required forms. Initials are used to identify material inspected and ready to be transferred to the storeroom or to the production facility. Tags are used to identify the acceptance or rejection of parts and receiving inspection. The use of the tags indicates to the stockroom that material with an accept tag and the initials of the inspector are ready to be moved to other areas within the facility. The receiving department uses a sampling plan where the reject number in all cases must be 0. The sampling plan is called C=0. Results from the inspections are recorded in a log book containing records of each lot received by vendor and is kept by the receiving inspector. The information from this log book is entered into a computer for the

tabulation of a vendor performance report. This report is used to evaluate each vendors performance to adhere to the quality standards set by the C.A. Norgren Co. It is the responsibility of purchasing to update this report and is performed on a monthly basis. Nonconforming material at the receiving inspection is written on a receiving inspection summary Form 8025. All nonconforming material must be approved as per the form before it can be moved or reworked. When vendor problems exist on a particular item, Quality Control will be at the disposal of purchasing to help correct the problem. Quality Control will assist purchasing and quality related problems and assist in the survey of new vendors as required.

First piece inspection and inprocess inspections are performed on setups as defined in the Quality Control Manual. Inspections are verified against the engineering drawings. First piece inspections are performed on high dollar scrap parts, chronic problem parts, and T&P parts only. This is defined in C.A. Norgrens QCP-G8 procedure. After the first piece inspection is given approval the roving inspector will periodically monitor the quality of the parts being produced. The roving inspector also has the responsibility for monitoring the quality of all of the parts in that area as time permits. The use of the acceptance tag or reject tag as required is used throughout the manufacturing process to determine the acceptance or the rejectance of manufactured items.

Final inspection tests is made on products before it is stored or ready for shipment. This final inspection varies depending upon the complexity of the valve and procedures are used to implement this final inspection. As verified in the survey, procedure IR90 was used for a leak test on a particular end product. Quality Control, at this point, does not normally verify the inspection on the end product. As defined in the Quality Control Manual, it is still the responsibility of the person performing the work to maintain a high quality level standard. Final inspection is performed on all parts and sub-assemblies going into stock and must be submitted for final inspection. These parts will be inspected for compliance to the engineering prints. Acceptable parts going to stock will be tagged with the current color acceptance tag and sent to the stock area. Parts which do not conform to the engineering print will be identified with deviation tags and an inspection summary form listing the discrepancies. The inspection summary form is then delivered to the Quality Control Engineer for proper disposition.

#### MANUFACTURING CONTROLS:

Each part, sub-assembly, or component lot run by manufacturing is controlled by a shop order. Quality Control reviews the shop orders during the inspections performed to adhere to quantities

and engineering drawings. As verified during the survey, the shop order has sufficient information required to manufacture consistently from run to run. Nonconforming material has sufficient documentation to indicate the status that it is not fit for use until it has been approved by the proper levels of management.

#### MATERIAL CONTROL:

Material pulled from the stock is controlled by the shop order system. The shop order has the quantity required for that production run. All parts in the stock room are identified by a unique part number and a location is assigned to each part within the stockroom. Final products are identified by unique model numbers and required information. Date codes are used to identify date of manufacturer. This date code is stamped on a steel name plate on the outside of the device. The date code is identified by the month and year of manufacture.

#### RECORDS:

As indicated during the survey, records are maintained for as long as the company can keep them. It was also stated that the company is in the process to change the record keeping system to a maximum of five years. The date code, which is stamped on the steel serial number plate on the outside of each device, allows traceability back to a month of manufacture for any corrective action.

#### SUB-SUPPLIERS:

The C.A. Norgren Co. does not have a formalized system of planned audits to select vendors. Visits are performed as required by Quality Control through the purchasing department to correct problems. These visits are not generally documented. The verification of the quality of the sub-supplier is verified at receiving inspection. In a review of the vendor rating summary reports, indicates that a high percent of the sub-suppliers are within the 90 percent range. Being 100 percent is the highest level.

#### NONCONFORMING MATERIAL:

Nonconforming material is adequately controlled through the use of the acceptance tags and reject tags to prevent the nonconforming material from being inadvertently put into stock or being processed further in production runs. Nonconforming material is wrote up on the proper forms in receiving inspection and in the

manufacturing process. In the receiving inspection, vendors are notified through purchasing of nonconforming material for corrective action. Nonconformances are identified by a statistical process control method. These parts and assemblies are identified by a pareto analysis. The top five scrap and rework problems are identified on a monthly basis through a scrap and rework report. The intent through the pareto analysis is to eventually have all the parts and assemblies in statistical control. That is: Once a part or assembly is brought into control, another one will take its place using the pareto principle.

## AUDIT CHECKLIST COVER SHEET

Audit Number: CQ86-07  
Date Prepared: 8/7/86  
File: Quality Assurance  
Subcontractor File

- I. Organization to be audited: C.A. Norgren Co.  
II. Type of Audit: Site Survey Commercial Grade Items  
III. Scheduled Date: July 29, 1986  
IV. References: C.A. Norgren Quality Control Manual 2/24/86  
V. Audit Team: Lead Auditor, Roy A. Woeste (F&H)  
Auditor, Dave L. Torczon, Nebraska Public  
Power District

Approved: Roy A. Woeste  
Roy A. Woeste  
Quality Assurance Manager

8/7/86  
Date

John R. Hendricks  
John R. Hendricks, P.E.  
President/QA Engineer

8/7/86  
Date

## Personnel contacted during audit:

\*John H. Travis  
Gorden Perice  
John Pousma  
Greg Rupp

\*Attended Pre and Post Audit Conference



Enclosure I.3.4

Norgren C of C for Valves  
P/N D10230C-00-C8



Date AUG 28 1986Customer Farwell & Hendrix**NORGREN**

## - QUALITY CONTROL CERTIFICATION -

Product/Item Certified: D 1023C-CB Quantity 8

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\_\_\_\_\_

\_\_\_\_\_

Conforms to Inspection Requirement Number 90# III By Assembly Date: AUG 28 1986

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\_\_\_\_\_

\_\_\_\_\_

Additional Tests Required and Completed: \_\_\_\_\_

\_\_\_\_\_

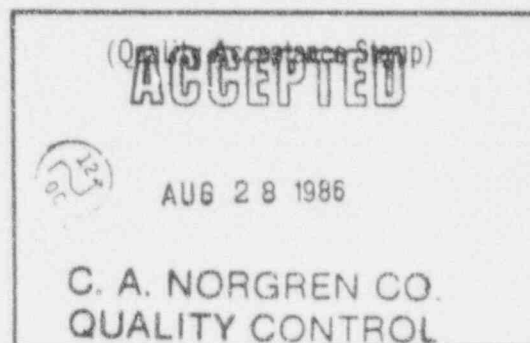
\_\_\_\_\_

\_\_\_\_\_

C. A. Norgren Order No.: 497248

Customer Order/Contract No.: F2279

Order Due Date: ASAP



\_\_\_\_\_  
Quality Control Supervisor

\_\_\_\_\_  
Quality Control Engineer

Enclosure I.3.5

NPPD P.O. 257201

257201

PURCHASE ORDER  
3. B/L, SHIPPING MEMO,  
VOICE, AND EVERY PACKAGE.

Page 1 of 5

PURCHASE ORDER  
NEBRASKA PUBLIC POWER DISTRICT

General Office: Columbus, Nebraska 68601

## NOTE SHIPPING INSTRUCTIONS

Date: JUL 10 1986

SHIP TO:

NEBRASKA PUBLIC POWER DISTRICT  
Cooper Nuclear Station  
P.O. Box 98  
Brownville, NE 68321

VIA UPS/Blue Label/Prepaid

DELIVERY REQUIRED Aug. 29, 1986

TO: ESSENTIAL  
Farwell & Hendricks, Inc.  
Park 50  
1000 Ford Circle  
P.O. Box 209  
Milford, OH 45150

Item No.	QUANTITY	Unit of Meas.	DESCRIPTION	Our Code		Our Account Number		
				Class	Item	Area	Account	Sub Account
			The purchase, dedicate, and seismically qualification of twelve (12) Norgren poppet valves and the purchase, dedicate, and seismically qualification of eight (8) AMOT valves.				23994	100:
			Reference: (1) Letter from NPPD to F&H dated June 20, 1986 (attached) (2) Letter from F&H to NPPD dated June 30, 1986 (attached) (3) Letter from NPPD to F&H dated June 24, 1986 (attached) (4) Letter from F&H to NPPD dated July 2, 1986 (attached) (5) Letter from F&H to NPPD dated July 9, 1986 (attached)					
1	1	Lot	To purchase and seismically qualify twelve (12) Norgren valves, for safety-related application, as described in Reference (1) and (2) letters. F&H Proposal No. [REDACTED]					
	6	ea.	Norgren Prospector Poppet Valve Model No. D-1-02-3-C-00-C8 3-Way, Inline, Normally Closed,					

Final report  
was submitted  
through  
19/12/86

F &amp; H, INC.

QA APPROVED [Signature]

ENGRG APPROVED [Signature]

DATE 7/11/86

NOTE: WE WILL NOT BE RESPONSIBLE FOR ANY  
GOODS DELIVERED WITHOUT A PURCHASE  
ORDER.PLEASE ACKNOWLEDGE THIS PURCHASE  
ORDER BY RETURN MAIL AND GIVE DATE OF  
SHIPMENT.SEND INVOICE, SHIPPING MEMO, AND B/L  
THE SAME DAY GOODS ARE SHIPPED.MAIL INVOICE  
IN  
DUPLICATE  
TOGeneral Office  
P. O. Box 499  
Columbus, Nebr. 68601It is a condition of this order, and by filling it you will be deemed to have agreed, that  
case any article sold and delivered to this District hereunder shall be protected by a  
patent or copyright, you will indemnify and save harmless this District from any and  
suits, claims, judgments and costs instituted or recovered against it by any person  
persons whomsoever on account of the use or sale of such article by this District  
violation of such patent or copyright.Acceptance of this order shall be deemed an agreement on the part of the seller to  
above conditions.

NEBRASKA PUBLIC POWER DISTRICT

Per [Signature]  
Purchasing Agent

57201

5 PURCHASE ORDER  
B/L SHIPPING MEMO.  
AND EVERY PACKAGE.

2 of 5

PURCHASE ORDER  
**NEBRASKA PUBLIC POWER DISTRICT**

General Office: Columbus, Nebraska 68601

NOTE SHIPPING INSTRUCTIONS

Date: JUL 10 1986

SHIP TO:

NEBRASKA PUBLIC POWER DISTRICT

Cooper Nuclear Station

P.O. Box 98

Brownville, NE 68321

VIA

UPS/Blue Label/Prepa

DELIVERY  
REQUIRED

Aug. 29, 1986

TO: ESSENTIAL  
Farwell & Hendricks, Inc.  
Park 50  
1000 Ford Circle  
P.O. Box 209  
Milford, OH 45150

QUANTITY	Unit of Meas.	DESCRIPTION	Our Code		Our Account Number		
			Class	Item	Area	Account	Sub Account
6	ea.	1/2" Basic Size, 3/8" Port Size, Internal Pilot Supply w/Check Valve Type C8 High Pressure					
		Solenoid Pilot Actuator. 125 VDC Coil. Main Valve & Pilot Pressure 250 psig. Tag (2) 20 SAL/PC-1A (2) 20 SAR/PC-2A					
		Norgren Prospector Poppet Valve Model No. D-1-02-3-C-00-MC 3-Way, Inline, Normally Closed, 1/2" Basic Size, 3/8" Port Size, Internal Pilot Supply w/Check Valve, Type MC Spring Return. Manual Actuator Mounted 90° to Main Valve Ports. Main Valve & Pilot Pressure 250 psig. Tag (2) HCV-1A (2) HCV-2A					

WE WILL NOT BE RESPONSIBLE FOR ANY  
GOODS DELIVERED WITHOUT A PURCHASE  
ORDER

PLEASE ACKNOWLEDGE THIS PURCHASE  
ORDER BY RETURN MAIL AND GIVE DATE OF  
ACKNOWLEDGMENT

IF INVOICE, SHIPPING MEMO, AND B/L  
SAME DAY GOODS ARE SHIPPED

MAIL INVOICE  
IN  
DUPLICATE  
TO  
General Office  
P. O. Box 499  
Columbus, Nebr. 68601

It is a condition of this order, and by filling it you will be deemed to have agreed, that in  
case any article sold and delivered to this District hereunder shall be protected by any  
patent or copyright, you will indemnify and save harmless this District from any and all  
suits, claims, judgments and costs instituted or recovered against it by any person or  
persons whomsoever on account of the use or sale of such article by this District in  
violation of such patent or copyright.

Acceptance of this order shall be deemed an agreement on the part of the seller to the  
above conditions.

NEBRASKA PUBLIC POWER DISTRICT

Per

*[Signature]*  
Purchasing Agent

No. **257201**  
 PUT THIS PURCHASE ORDER  
 ON B/L, SHIPPING MEMO,  
 CE, AND EVERY PACKAGE.

Page 3 of 5

PURCHASE ORDER  
**NEBRASKA PUBLIC POWER DISTRICT**

General Office: Columbus, Nebraska 68601

NOTE SHIPPING INSTRUCTIONS

Date: JUL 10 1986  
**SHIP-TO:**

NEBRASKA PUBLIC POWER DISTRICT  
 Cooper Nuclear Station  
 P.O. Box 98  
 Brownville, NE 68321

VIA UPS/Blue Label/Prep

DELIVERY  
 REQUIRED Aug. 29, 1986

TO: **ESSENTIAL**  
**Farwell & Hendricks, Inc.**  
**Park 50**  
**1000 Ford Circle**  
**P.O. Box 209**  
**Milford, OH 45150**

Item No.	QUANTITY	Unit of Meas.	DESCRIPTION	Our Code		Our Account Number		
				Class	Item	Area	Account	Sub Account
1	1	Lot	Ten copies of installation/maintenance instructions shall be sent to CNS Document Control before payment for material will be made.  The supplier will furnish cure dates, recommended shelf life, and type of material for all shelf life items. Age of material at shipment will not exceed 1/3 maximum shelf life.					
2	1	Lot	To purchase and seismically qualify eight (8) AMOT pressure valves, Model 1672E1G8, for safety-related application as described in Reference (3) (4), and (5) letters. <del>XXXXXXXXXX</del>  The supplier will furnish cure dates, recommended shelf life, and type of material for all shelf life items. Age of material at shipment will not exceed 1/3 maximum shelf life.					

NOTE: WE WILL NOT BE RESPONSIBLE FOR ANY GOODS DELIVERED WITHOUT A PURCHASE ORDER.

PLEASE ACKNOWLEDGE THIS PURCHASE ORDER BY RETURN MAIL AND GIVE DATE OF SHIPMENT.

SEND INVOICE, SHIPPING MEMO, AND B/L THE SAME DAY GOODS ARE SHIPPED.

MAIL INVOICE  
 IN  
 DUPLICATE  
 TO

General Office  
 P. O. Box 499  
 Columbus, Nebr. 68601

It is a condition of this order, and by filling it you will be deemed to have agreed, that, in case any article sold and delivered to this District hereunder shall be protected by a patent or copyright, you will indemnify and save harmless this District from any and all suits, claims, judgments and costs instituted or recovered against it by any person or persons whatsoever on account of the use or sale of such article by this District in violation of such patent or copyright.

Acceptance of this order shall be deemed an agreement on the part of the seller to the above conditions.

NEBRASKA PUBLIC POWER DISTRICT

Per

*[Signature]*  
 Purchasing Agent



No.

257201

## PURCHASE ORDER

## NEBRASKA PUBLIC POWER DISTRICT

General Offices: Columbus, Nebraska 68601

## NOTE SHIPPING INSTRUCTIONS

Date: JUL 14 1986

SHIP TO:

NEBRASKA PUBLIC POWER DISTRICT  
Cooper Nuclear Station  
P.O. Box 98  
Brownville, NE 68321

PUT THIS PURCHASE ORDER  
NO. ON B/L SHIPPING MEMO,  
E. AND EVERY PACKAGE.

Page 4 of 5

TO:

ESSENTIAL  
Farwell & Hendricks, Inc.  
Park 50  
1000 Ford Circle  
P.O. Box 209  
Milford, OH 45150

VIA

UPS/Blue Label/Prep

DELIVERY  
REQUIRED

Aug. 29, 1986

Item No.	QUANTITY	Unit of Meas.	DESCRIPTION	Our Code		Our Account Number		
				Class	Item	Area	Account	Sub Account
	8	ea.	<p>AMOT pressure valve Model 1672E 1G8 to sense main engine lube oil pressure 0-100 psi. Set to trip 20 psi falling for use on air pressure safety system, lockout pressure 125 psig.</p> <p>NOTE: An NPPD QA representative will meet with F&amp;H representative at the C. A. Norgren plant in Colorado and the AMOT plant in Richmond, CA., during surveillance activities of Items 1 and 2.</p> <p>STANDARD PURCHASE REQUIREMENTS FOR ESSENTIAL OR EQUIPMENT QUALIFICATION MATERIAL, PARTS, COMPONENTS, OR SERVICES</p> <p>1. The Supplier shall maintain a program which is in compliance with those portions of NRC Criteria 10CFR50, Appendix B, ANSI N45.2, and 10CFR21 applicable to the Supplier's scope of activities.</p>					

NOTE: WE WILL NOT BE RESPONSIBLE FOR ANY  
GOODS DELIVERED WITHOUT A PURCHASE  
ORDER.

PLEASE ACKNOWLEDGE THIS PURCHASE  
ORDER BY RETURN MAIL AND GIVE DATE OF  
SHIPMENT.

SEND INVOICE, SHIPPING MEMO, AND B/L  
THE SAME DAY GOODS ARE SHIPPED.

## MAIL INVOICE

IN  
DUPLICATE  
TO

General Office  
P. O. Box 499  
Columbus, Nebr. 68601

It is a condition of this order, and by filling it you will be deemed to have agreed, that  
case any article sold and delivered to this District hereunder shall be protected by a  
patent or copyright, you will indemnify and save harmless this District from any and  
suits, claims, judgments and costs instituted or recovered against it by any person  
persons whomsoever on account of the use or sale of such article by this District  
violation of such patent or copyright.

Acceptance of this order shall be deemed an agreement on the part of the seller to the  
above conditions.

NEBRASKA PUBLIC POWER DISTRICT

Per

*[Signature]*  
Purchasing Agent





Enclosure 1.3.6

NPPD Letter Dated June 20, 1986

**Nebraska Public Power District**

GENERAL OFFICE  
P.O. BOX 499, COLUMBUS, NEBRASKA 68601-0499  
TELEPHONE (402) 564-8561

June 20, 1986

Farwell & Hendricks, Inc.  
1000 Ford Circle, Suite C  
Milford, OH 45150

Attention: Mr. J. R. Hendricks

Dear Mr. Hendricks:

The District would like a proposal from your company to upgrade the components described below for safety related use. The following components are not listed in your equipment catalog.

1. Norgren Prospector Poppet Valve, Model No. D-1-02-3-C-00-C8, 3-way, inline, normally closed, 1/2" basic size, 3/8" port size, internal pilot supply with check valve, Type C8 high pressure solenoid pilot actuator, 125 VDC coil. Main valve and pilot pressure 250 psig.
2. Norgren Prospector Poppet Valve, Model No. D-1-02-3-C-00-MC, 3-way, inline, normally closed, 1/2" basic size, 3/8" port size, internal pilot supply with check valve, Type MC horizontal, spring return, hand lever actuator, mounted 90° to main valve ports. Main valve pressure 250 psig.

The valve supplier does not have a QA program in accordance with ANSI N45.2 or 10CFR50 Appendix B. (See attached letter from J. S. Larson to M. A. Hillstrom dated June 2, 1986.) A copy of vendor catalog information on these valves is attached. Both valves will be mounted in a mild environment.

Note: Mild environment includes seismic requirements and materials of construction that need to be considered. Seismic testing will be required in accordance with IEEE 323-1983. Material of construction consists of a list of components, materials, activation energies and an analysis showing the weakest link at 104°F.

The seismic response spectra curve for the Diesel Generator Building at Cooper Nuclear Station where these valves will be mounted is attached. For conservatism, the vertical component should be 2/3 of the horizontal component rather than 1/2 of the horizontal component as shown on the curve. The valves need to be functional during a hypothetical maximum earthquake which is two times the values shown on the curve.

Mr. J. R. Hendricks

Page 2


June 20, 1986

The valves will be mounted on free standing rigid instrument racks and the solenoid for the valve will be normally deenergized except for approximately one hour per month.

The lead time for purchasing these valves is approximately three to four weeks. Qualified valves are needed by August 15, 1986, for an upcoming plant modification.

Please provide a proposal with cost and the schedule to perform this work to my attention such that I receive it by June 27, 1986. The method of upgrading the valves to meet ANSI N45.2-1971 and 10CFR50 Appendix B needs to be addressed in detail. Thank you for your cooperation.

If there are any questions please contact Alois J. Hubl<sup>+</sup> (402-563-5701) or me.



G. S. McClure  
Nuclear Engineering Manager

GSM:mst19/4(13)  
Attachments

cc: A. J. Hubl  
V. G. Hoefler  
M. A. Hillstrom <sup>msv</sup>  
J. R. Hackney  
J. R. Flaherty  
E. M. Mace  
K. J. Done <sup>ksd</sup>  
J. Nagl (APA)  
File: 132(2) w/attachments

Enclosure I.3.7

F&H Letter Dated July 9, 1986

*Farwell & Hendricks, Inc.*

1000 Ford Circle, Suite C  
 Millard, Ohio 44130  
 (613) 881-8300  
 Telecopy (613) 831-8398

July 9, 1986

Nebraska Public Power District  
 P.O. Box 499  
 1415 15th Street  
 Columbus, Nebraska 68601-0499  
 Telecopy (402) 563-5551

Attention: John Hubbel

Subject: Farwell & Hendricks, Inc. Proposal No. 60067, Rev 1  
 Procurement of Eight (8) Pressure Valves for Safety-  
 Related Application.

Reference: 1) Telephone conversation with John Hendricks of  
 Farwell & Hendricks, Inc. on 7/9/86.  
 2) Farwell & Hendricks, Inc. Proposal 60058  
 to G. S. McClure.  
 3) Farwell & Hendricks, Inc. Proposal 60067 Rev 0

Dear Mr. Hubbel:

Farwell & Hendricks, Inc. (F&H) is pleased to provide the  
 following price and delivery schedule for the pressure valves  
 described in the Reference 1) telephone conversation. F&H will  
 provide:

Eight (8) Amot Controls Pressure Valves  
 Model No. 1672E1Q8

The firm, fixed price for these eight (8) valves is \$16,480 with  
 an estimated five (5) to six (6) weeks delivery after receipt of  
 purchase order.

The price distribution is as follows:

- \* Commercial price for ten. (10) valves.  
 Eight (8) valves to be shipped and two  
 (2) valves to be tested.....\$ 1,980

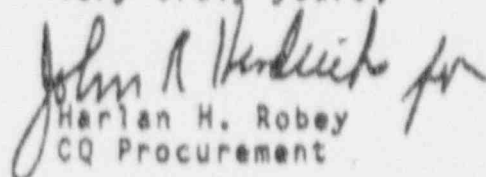


- \* Administrative costs to procure valves.....\$ 300
- \* Receipt/Inspection for verification of  
manufacturers ratings and critical  
characteristics.....\$ 800
- \* Seismic testing and mild environment  
analysis of materials of construction.  
The analysis to be based on a list of  
valve components, their constituent  
materials and activation energies,  
establishment of the weak link and a  
calculation of expected life for a  
service temperature of 104F.....\$ 7,500
- \* Wear aging of 1000 cycles to address a  
40 year life.....\$ 1,400
- \* QA assessment, surveillance and docu-  
mentation of the Amot Controls.....\$ 4,500  
-----
- \* T O T A L P R I C E .....\$16,480

An alternative price of \$10,900 is being provided should this program be conducted concurrently with 60058, i.e. seismic testing same time period, same curves, etc.

Thank you for the opportunity to provide you with this quotation. We look forward to serving the Nebraska Public Power District. If you have any comments or questions, or need additional information, please do not hesitate to call.

Very truly yours,

  
Harlan H. Robey  
CQ Procurement

HHR:jak

Enclosure 1.3.8

Revised System 1000 MEA

QUALIFICATION ANALYSIS REPORT  
SECTION 1. COMPONENT CHARACTERISTICS DEFINITION

---

COMPONENT NAME.....VALVE COIL  
MANUFACTURER.....NORGREN  
PART NUMBER.....2361-20  
OTHER DESCRIPTION...FOR VALVE D1023C-00-C8

---

## COMPONENT OPERATIONAL LIMITATIONS :

TEMPERATURE.....-20 TO 130F  
VOLTAGE.....115 VDC  
CURRENT.....NOT SPECIFIED  
CYCLE LIFE.....NOT SPECIFIED

---

## RADIATION REQUIREMENTS DURING NORMAL SERVICE LIFE (NSL) :

SARMA.....NOT SPECIFIED  
BETA.....NOT SPECIFIED  
NEUTRON.....NOT SPECIFIED

---

## RADIATION REQUIREMENTS DURING DESIGN BASIS EVENT (DBE) :

SARMA.....NOT SPECIFIED  
BETA.....NOT SPECIFIED  
NEUTRON.....NOT SPECIFIED

---

## QUALIFIED LIFE BASED ON THE FOLLOWING :

EXPECTED/DESIGN LIFE SAFETY FACTOR OF 1 BASED ON 40.00000 YEAR SERVICE LIFE

AGING TEMPERATURE	UNITS	AGING TIME AT THIS TEMPERATURE	UNITS
-------------------	-------	--------------------------------	-------

---

NO AGING PROGRAM DATA AVAILABLE

ENVIRONMENTAL TEMP.	UNITS	PERCENT OF TIME AT THIS TEMPERATURE (%)
---------------------	-------	---

---

40.00	C	100.000
-------	---	---------

## SECTION II. COMPONENT DEFINITION

MATERIAL FILE FOR : VALVE COIL

PAGE 1 OF 4

DESCRIPTION	ACTIVATION ENERGY	RADIATION THRESHOLD	QUALIFIED LIFE	EXPECTED LIFE
-------------	----------------------	------------------------	-------------------	------------------

ITEM DESCRIPTION : COIL TAPE	0.6100	1.0E6	0.0000e0	Y 1.9583e3 Y
COMMERCIAL NAME : 6TD43879-2 A2				
GENERIC NAME : GLASS TAPE				
MANUFACTURER : NOT STATED				
SLOPE: 7087.6238 INTERCEPT: -5.9863 CORRELATION: 0.9999				

MATERIAL CLASS : TAPE	SOURCE: WESTINGHOUSE ELECTRIC CORP
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 69
MATERIAL THICKNESS: N/A TEMP. RATING: 130C	RADIATION REFERENCE : 039-83C

ITEM DESCRIPTION : COIL TAPE	0.6100	1.0E6	0.0000e0	Y 2.9230e2 Y
COMMERCIAL NAME : 6TD43879-2 B2				
GENERIC NAME : GLASS TAPE				
MANUFACTURER : NOT STATED				
SLOPE: 7025.4869 INTERCEPT: -7.6899 CORRELATION: 0.9999				

MATERIAL CLASS : TAPE	SOURCE: WESTINGHOUSE ELECTRIC CORP
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 69
MATERIAL THICKNESS: N/A TEMP. RATING: 125C	RADIATION REFERENCE : 039-83C

ITEM DESCRIPTION : INSULATION	0.9400	1.0E5	0.0000e0	Y 4.7590e2 Y
COMMERCIAL NAME : NOT STATED				
GENERIC NAME : PAPER				
MANUFACTURER : NOT STATED				
SLOPE: 10954.4137 INTERCEPT: -19.7549 CORRELATION:				

MATERIAL CLASS : INSULATION SYSTEM	SOURCE: TRNCTNS AMER. INST. ELEC. ENG.
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 514-86A PAGE NUMBER : 5
MATERIAL THICKNESS: N/A TEMP. RATING: 100C	RADIATION REFERENCE : 126-83

ITEM DESCRIPTION : INSULATION	1.5000	1.0E5	0.0000e0	Y 1.7846e5 Y
COMMERCIAL NAME : NOT STATED				
GENERIC NAME : PAPER				
MANUFACTURER : NOT STATED				
SLOPE: 18373.9696 INTERCEPT: -37.5327 CORRELATION: 0.9995				

MATERIAL CLASS : INSULATION SYSTEM	SOURCE: TRNCTNS AMER. INST. ELEC. ENG.
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 514-86A PAGE NUMBER : 5
MATERIAL THICKNESS: N/A TEMP. RATING: 100C	RADIATION REFERENCE : 126-83

ITEM DESCRIPTION : INSULATION	1.5000	1.0E5	0.0000e0	Y 5.6129e6 Y
COMMERCIAL NAME : NOT STATED				
GENERIC NAME : KRAFT PAPER, PHENOLIC RESIN TREATED				
MANUFACTURER : NOT STATED				
SLOPE: 17411.5449 INTERCEPT: -31.0094 CORRELATION: 0.9999				

MATERIAL CLASS : CABLE/WIRE INSULATION	SOURCE: UNIVERSITY MICROFILMS INT'L
FAILURE PARAMETER : ELECTRICAL	ARRHENIUS REFERENCE : 520-86A PAGE NUMBER : 925
MATERIAL THICKNESS: .043" TEMP. RATING: 70C	RADIATION REFERENCE : 126-83

## SECTION II. COMPONENT DEFINITION

MATERIAL FILE FOR : VALVE COIL

PAGE 2 OF 4

DESCRIPTION	ACTIVATION ENERGY	RADIATION THRESHOLD	QUALIFIED LIFE	EXPECTED LIFE
ITEM DESCRIPTION : INSULATION	1.2700	1.0E7	0.0000e0	Y 8.2028e3 Y
COMMERCIAL NAME : VFO43879 A2				
GENERIC NAME : FIBER				
MANUFACTURER : NOT STATED				
SLOPE: 14685.0506 INTERCEPT: -28.8269 CORRELATION: 0.9999				
MATERIAL CLASS : INSULATION SYSTEM	SOURCE: WESTINGHOUSE ELECTRIC CORP			
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 66			
MATERIAL THICKNESS: N/A TEMP. RATING: 105C	RADIATION REFERENCE : 039-83C			
ITEM DESCRIPTION : INSULATING WASHER	1.4400	1.0E7	0.0000e0	Y 8.4629e6 Y
COMMERCIAL NAME : VK083879-1 A2				
GENERIC NAME : VARNISHED KRAFT				
MANUFACTURER : NOT STATED				
SLOPE: 16768.4402 INTERCEPT: -28.5441 CORRELATION: 0.9999				
MATERIAL CLASS : INSULATION SYSTEM	SOURCE: WESTINGHOUSE ELECTRIC CORP			
FAILURE PARAMETER : ELECTRICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 70			
MATERIAL THICKNESS: N/A TEMP. RATING: 105C	RADIATION REFERENCE : 039-83C			
ITEM DESCRIPTION : TAPE	1.1100	4.0E7	0.0000e0	Y 2.1431e9 Y
COMMERCIAL NAME : MYLAR				
GENERIC NAME : POLYETHYLENE TEREPHTHALATE				
MANUFACTURER : DUPONT				
SLOPE: 12857.4740 INTERCEPT: -10.5147 CORRELATION:				
ACTIVATION ENERGY DERIVED FROM TWO POINT DATA				
MATERIAL CLASS : PLASTIC	SOURCE: CHEM & ENGRG DATA SERIES			
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 282-63A PAGE NUMBER : 8			
MATERIAL THICKNESS: N/A TEMP. RATING: 105C	RADIATION REFERENCE : 126-83			
ITEM DESCRIPTION : LEAD WIRE	1.1500	1.0E8	0.0000e0	Y 1.4899e3 Y
COMMERCIAL NAME : PV083879-1 A2				
GENERIC NAME : POLYVINYL CHLORIDE				
MANUFACTURER : NOT STATED				
SLOPE: 13402.0988 INTERCEPT: -26.4337 CORRELATION: 0.9999				
MATERIAL CLASS : CABLE/WIRE INSULATION	SOURCE: WESTINGHOUSE ELECTRIC CORP			
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 76			
MATERIAL THICKNESS: N/A TEMP. RATING: 105C	RADIATION REFERENCE : 039-83C			
ITEM DESCRIPTION : LEAD WIRE	1.1500	1.0E8	0.0000e0	Y 1.5515e4 Y
COMMERCIAL NAME : PV083879-1 B2				
GENERIC NAME : POLYVINYL CHLORIDE				
MANUFACTURER : NOT STATED				
SLOPE: 13377.0365 INTERCEPT: -24.0105 CORRELATION: 0.9990				
MATERIAL CLASS : CABLE/WIRE INSULATION	SOURCE: WESTINGHOUSE ELECTRIC CORP			
FAILURE PARAMETER : MECHANICAL	ARRHENIUS REFERENCE : 039-83C PAGE NUMBER : 76			
MATERIAL THICKNESS: N/A TEMP. RATING: 105C	RADIATION REFERENCE : 039-83C			

MATERIAL FILE FOR : VALVE COIL

PAGE 2 OF 4

DESCRIPTION

ACTIVATION  
ENERGY

RADIATION  
THRESHOLD

QUALIFIED  
LIFE

EXPECTED  
LIFE

ITEM DESCRIPTION : MAGNET WIRE INSULATION  
COMMERCIAL NAME : NYSOL  
GENERIC NAME : POLYURETHANE WITH POLYAMIDE  
MANUFACTURER : REA MAGNET WIRE CO

1.2700 8.6E5 0.0000e0 Y 1.1224e5 Y

SLOPE: 14790.9520 INTERCEPT: -26.5491 CORRELATION: 0.9997

MATERIAL CLASS : CABLE/WIRE INSULATION  
FAILURE PARAMETER : ELECTRICAL  
MATERIAL THICKNESS: N/A TEMP. RATING: 130C

SOURCE: REA MAGNET WIRE CO  
ARRHENIUS REFERENCE : 220-33B PAGE NUMBER : 1  
RADIATION REFERENCE : 094-83

ITEM DESCRIPTION : MAGNET WIRE INSULATION  
COMMERCIAL NAME : 18 H FORMVAR  
GENERIC NAME : POLYVINYL FORMAL  
MANUFACTURER : PHELPS DODGE

0.9600 1.6E7 0.2200e0 Y 2.5325e3 Y

SLOPE: 11181.5615 INTERCEPT: -18.0089 CORRELATION: 0.9999

MATERIAL CLASS : CABLE/WIRE INSULATION  
FAILURE PARAMETER : ELECTRICAL  
MATERIAL THICKNESS: N/A TEMP. RATING: 105C

SOURCE: PHELPS DODGE  
ARRHENIUS REFERENCE : 185-83B PAGE NUMBER : 1  
RADIATION REFERENCE : 046-83

ITEM DESCRIPTION : VARNISH  
COMMERCIAL NAME : FORMVAR  
GENERIC NAME : POLYVINYL FORMAL  
MANUFACTURER : NOT STATED

0.7600 1.6E7 0.0000e0 Y 2.0919e2 Y

SLOPE: 8838.4930 INTERCEPT: -13.0168 CORRELATION: 0.9999

MATERIAL CLASS : CABLE/WIRE INSULATION  
FAILURE PARAMETER : ELECTRICAL  
MATERIAL THICKNESS: N/A TEMP. RATING: 105C

SOURCE: UNIVERSITY MICROFILMS INT'L  
ARRHENIUS REFERENCE : 520-86A PAGE NUMBER : 429  
RADIATION REFERENCE : 094-83

ITEM DESCRIPTION : VARNISH  
COMMERCIAL NAME : FORMVAR WITH EPOXYLITE 205-D2  
GENERIC NAME : POLYVINYL FORMAL WITH EPOXY  
MANUFACTURER : EPOXYLITE CORP

0.9300 1.6E7 0.0000e0 Y 1.9914e3 Y

SLOPE: 10778.7671 INTERCEPT: -17.7623 CORRELATION: 0.9919

MATERIAL CLASS : CABLE/WIRE INSULATION  
FAILURE PARAMETER : ELECTRICAL  
MATERIAL THICKNESS: N/A TEMP. RATING: 105C

SOURCE: EPOXYLITE CORP  
ARRHENIUS REFERENCE : 213-83B PAGE NUMBER : 10  
RADIATION REFERENCE : 046-83

ITEM DESCRIPTION : VARNISH  
COMMERCIAL NAME : ISOLITE 773/MH-30  
GENERIC NAME : POLYESTER-IMIDE  
MANUFACTURER : SCHENECTADY CHEMICALS

0.9500 3.4E5 0.0000e0 Y 1.7686e5 Y

SLOPE: 11076.5324 INTERCEPT: -14.2271 CORRELATION: 0.9934

MATERIAL CLASS : CABLE/WIRE INSULATION  
FAILURE PARAMETER : ELECTRICAL  
MATERIAL THICKNESS: N/A TEMP. RATING: 100C

SOURCE: SCHENECTADY CHEMICALS  
ARRHENIUS REFERENCE : 339-84A PAGE NUMBER : 11  
RADIATION REFERENCE : 046-83



## SECTION 11. COMPONENT DEFINITION

MATERIAL FILE FOR : VALVE COIL

PAGE 3 OF 4

DESCRIPTION	ACTIVATION ENERGY	RADIATION THRESHOLD	QUALIFIED LIFE	EXPECTED LIFE
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ITEM DESCRIPTION : VARNISH	0.7000	3.4E5	0.0000e0	Y 3.5192e3 Y
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COMMERCIAL NAME : ISOLITE 772M/MM-24C

GENERIC NAME : POLYESTER-AMIDE

MANUFACTURER : SCHENECTADY CHEMICALS

SLOPE: 8143.6851 INTERCEPT: -6.7748 CORRELATION: 0.9998

MATERIAL CLASS : CABLE/WIRE INSULATION

SOURCE: SCHENECTADY CHEMICALS

FAILURE PARAMETER : ELECTRICAL

ARRHENIUS REFERENCE : 339-84A PAGE NUMBER : 3

MATERIAL THICKNESS: N/A TEMP. RATING: 155C

RADIATION REFERENCE : 046-83

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## SECTION III. LIBRARY SOURCE DEFINITION

LIBRARY REFERENCES FOR : VALVE COIL

PAGE 1 OF 2

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LIBRARY CODE NO....039-83CDOCUMENT TITLE....QUALIFICATION REPORT WESTINGHOUSE  
ELECTRIC CORP TYPE AB CIRCUIT BREAKERS,  
REV. #2

AUTHOR.....W. D. PATTON

SOURCE.....WESTINGHOUSE ELECTRIC CORP

DOCUMENT NO.....IEEE 323-1974

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LIBRARY CODE NO....046-83

DOCUMENT TITLE....RADIATION DAMAGE TO ELASTOMERS,  
PLASTICS & ORGANIC LIQUIDS

AUTHOR.....C. G. COLLINS &amp; V. P. CALKINS

SOURCE.....GENERAL ELECTRIC CO

DOCUMENT NO.....APEX 261

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LIBRARY CODE NO....094-83

DOCUMENT TITLE....THE EFFECT OF NUCLEAR RADIATION ON  
ELASTOMERIC AND PLASTIC COMPONENTS AND  
MATERIALS

AUTHOR.....R. W. KING, N. J. BROADWAY &amp; S. PALINCHAK

SOURCE.....BATTELLE MEMORIAL INSTITUTE

DOCUMENT NO.....REIC #21

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LIBRARY CODE NO....126-83

DOCUMENT TITLE....RADIATION EFFECTS ON ORGANIC MATERIALS  
IN NUCLEAR PLANTS

AUTHOR.....M. BRUCE &amp; M. V. DAVIS

SOURCE.....EPRI

DOCUMENT NO.....REP. NP-2129

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LIBRARY CODE NO....185-83B

DOCUMENT TITLE....ARRHENIUS PLOTS FOR FIVE MAGNET WIRE  
COATINGS

AUTHOR.....N/A

SOURCE.....PHELPS DODGE

DOCUMENT NO.....N/A

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LIBRARY CODE NO....213-83B

DOCUMENT TITLE....HANDBOOK OF EPOXY RESINS, MCBRAW-HILL  
BOOK CO., 1967

AUTHOR.....H. LEE &amp; K. NEVILLE

SOURCE.....EPOXYLITE CORP

DOCUMENT NO.....N/A

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## SECTION III. LIBRARY SOURCE DEFINITION

LIBRARY REFERENCES FOR : VALVE COIL

PAGE 2 OF 2

LIBRARY CODE NO....220-B30

DOCUMENT TITLE....REA MAGNET WIRE COMPANY AIEE NO. 57  
LIFE TEST CURVES

AUTHOR.....N/A

SOURCE.....REA MAGNET WIRE CO

DOCUMENT NO.....N/A

LIBRARY CODE NO....282-B3A

DOCUMENT TITLE....DEGRADATION STUDIES OF POLYETHYLENE  
TEREPHTHALATE

AUTHOR.....MCMAHON, BIRDSALL, JOHNSON &amp; CAMILLI

SOURCE.....CHEM &amp; ENGRNG DATA SERIES

DOCUMENT NO.....VOL. 4, NO. 1

LIBRARY CODE NO....339-B4A

DOCUMENT TITLE....THERMAL ENDURANCE CURVES FOR ISO ITE  
773 AND 772M VARNISH ON MW-24, -26, -38  
&-35

AUTHOR.....N/A

SOURCE.....SCHENECTADY CHEMICALS

DOCUMENT NO.....N/A

LIBRARY CODE NO....514-B4A

DOCUMENT TITLE....ELECTRICAL INSULATION DETERIORATION  
TREATED AS A CHEMICAL RATE PHENOMENON

AUTHOR.....THOMAS W. DAKIN

SOURCE.....TRANSTNS AMER. INST. ELEC. ENG.

DOCUMENT NO.....VOL. 67, 1948

LIBRARY CODE NO....520-B6A

DOCUMENT TITLE....INSULATING MATERIALS FOR DESIGN AND  
ENGINEERING PRACTICE PART 1 & 2

AUTHOR.....F. CLARK

SOURCE.....UNIVERSITY MICROFILMS INT'L

DOCUMENT NO.....TK3421.C59

## Enclosure II

- II.1 NRC Letter stamped Dec. 12, 1990 which grants extension
- II.2 F&H Letter dated Dec. 3, 1990 which requests extension
- II.3 NRC Docket No. 99900918/90-01