

ORGANIZATION: Schulz Electric Company

REPORT NO.: 99901269/94-01

CORRESPONDENCE ADDRESS: Mr. Robert C. Davis, President
Schulz Electric Company
30 Gando Drive
New Haven, Connecticut 06513

NUCLEAR INDUSTRY ACTIVITIES: Performs dedication of commercial grade motors and sub-components for safety-related applications and repairs safety-related motors.

INSPECTION CONDUCTED: January 24 - 28, 1994

PREPARED BY: Bill H. Rogers 3/1/94
Bill H. Rogers, Team Leader Date
Reactive Inspection Section No. 2
Vendor Inspection Branch

APPROVED: Gregory C. Cwalina 2/2/94
Gregory C. Cwalina, Chief Date
Reactive Inspection Section No. 2
Vendor Inspection Branch

OTHER INSPECTORS: Stephen D. Alexander
Joseph J. Petrosino

INSPECTION BASES: 10 CFR Part 21 and Appendix B to 10 CFR Part 50

INSPECTION SCOPE: To evaluate selected portions of the Schulz Electric Company quality assurance program and implementation in dedicating commercial grade items for safety-related use and repairing safety-related motors in accordance with the requirements of Appendix B to 10 CFR Part 50.

PLANT SITE APPLICABILITY: Numerous

1 INSPECTION SUMMARY

1.1 Violations

Contrary to the requirements of Section 21.21 of 10 CFR Part 21, "Notification of failure to comply or existence of a defect and its evaluation," Schulz Electric Company (Schulz) had not adopted appropriate procedures to ensure that Schulz would evaluate deviations within 60 days of discovery or provide an interim report to the NRC of any deviation evaluation that could not be completed within 60 days of discovery; and to ensure that Schulz would inform the purchasers or affected licensees within five working days of deviations that Schulz determined that it did not have the capability to evaluate to determine if a defect existed. (94-01-01)

Contrary to the requirements of Section 21.6 of 10 CFR Part 21, "Posting requirements," Schulz had not posted Section 206 of the Energy Reorganization Act (ERA) of 1974 as required by 10 CFR 21.6. (94-01-02)

1.2 Nonconformance

Contrary to Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50, Schulz had not maintained the calibration records and associated files as required to adequately ensure that the items listed in the measuring and test equipment (M&TE) calibration program would be properly controlled, calibrated, and adjusted as necessary, as evidenced by numerous discrepancies between the calibration files and the Material and Test Equipment Calibration Log concerning calibration dates, calibration due dates, and equipment activity status. (94-01-03)

2 STATUS OF PREVIOUS INSPECTION FINDINGS

There was no previous NRC inspection of this facility.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 Entrance and Exit Meetings

During the entrance meeting on January 24, 1994, the NRC inspectors discussed the scope of the inspection and the areas to be reviewed. During the exit meeting on January 28, 1994, the NRC inspectors discussed their findings and concerns with Schulz's management and staff.

3.2 Background

Schulz performs a wide variety of services related to the repair and sales of commercial grade and safety-related motors. Work on safety-related equipment includes basic overhauls through complete rewinds. Schulz also dedicates commercial grade motors for use in safety-related applications.

The facility maintains steam cleaning facilities and burnout ovens to assist in overhaul preparation and winding removal. Form, random, and edge wound replacement coils are produced on automated winding machinery. Rewound motors are finished in a vacuum-pressure-injection (VPI) tank where Epoxylite resin is applied followed by oven curing. Testing capabilities for use on rewind or dedicated motors include dynamometers, high potential testing, infrared thermographic imaging, vibration analysis, and dynamic balancing. The 48,000 square foot facility can support repairs on equipment up to 8000 HP, 7000VAC.

3.3 10 CFR Part 21 Program and Implementation

3.3.1 10 CFR Part 21 Procedure

The inspectors reviewed the Schulz 10 CFR Part 21 program which included the implementing procedure, Schulz Shop Instruction (SI) SI-102, "Identifying and Reporting Under 10 CFR Part 21." SI-102 appeared to include adequate provisions to ensure that Schulz employees would inform the Quality Assurance (QA) Manager of deviations identified in safety-related equipment. However, the inspectors determined that SI-102 was not in compliance with the current requirements of section 21.21 of 10 CFR Part 21, "Notification of failure to comply or existence of a defect and its evaluation," in that it did not contain provisions that would ensure that Schulz would (1) evaluate deviations within 60 days of discovery or provide an interim report to the NRC of any deviation evaluation that can not be completed within 60 days of discovery and (2) ensure that Schulz would inform the purchasers or affected licensees within 5 working days of deviations that Schulz determined that it did not have the capability to evaluate to determine if a defect exists. This was identified as Violation 94-01-01.

Schulz took corrective action during the inspection and revised, reissued, and reposted SI-102. The revision was reviewed by the inspectors who determined that it appeared to be adequate. Schulz indicated that it had just recently received the latest revision of 10 CFR Part 21 from an NRC licensee and had not yet performed a detailed comparison to SI-102 prior to the inspection. Schulz also stated that it intended to subscribe, through the Federal Superintendent of Documents, for an annual subscription of the "CFR Sections affected" in order to promptly

take actions to revise its programs as necessary to prevent recurrence of having inadequate procedures or programs in the future. Since adequate corrective and preventive actions were taken regarding Violation 94-01-01, no response is required.

3.3.2 10 CFR Part 21 Posting

Section 21.6 of 10 CFR Part 21, "Posting requirements," requires that parties subject to the regulation post documents including Section 206 of the Energy Reorganization Act of 1974 (ERA). The NRC inspectors determined that Schulz had not posted Section 206 of the ERA. Schulz representatives indicated that they were not aware that Section 206 of the ERA was required to be posted. This was identified as Violation 94-01-02.

The inspectors supplied a copy of Section 206 to Schulz which took immediate corrective action by posting copies of Section 206 with its other posted documents. Schulz reviewed its procedures and discussed this aspect of 10 CFR Part 21 with the inspectors as actions to prevent recurrence. The inspectors noted that Schulz appeared to have adequately ensured that the reporting of deviations by Schulz employees to management was satisfactorily in place. Since adequate corrective actions were taken regarding Violation 94-01-02 no response is required.

3.3.3 10 CFR Part 21 Evaluations

The inspectors reviewed potential deviation evaluations that had been performed by Schulz. None of the evaluation packages that were reviewed indicated that a deviation to licensee procurement documents had been identified. The evaluation packages appeared to adequately document the rationale for the Schulz decision and generally provided a comprehensive background, scope of the situation and a detailed explanation. One potential deviation concerned a digital megohmmeter (serial number 3191) that was found to be out-of-tolerance during a periodic calibration. Schulz determined the actual out-of-tolerance parameters of the device, identified the time period in question, identified the safety-related jobs that the device had been used for and demonstrated that the out-of-tolerance condition was within the acceptance criteria for each job. No concerns were identified in this area.

3.4 10 CFR Part 50 Appendix B QA Program and Implementation

3.4.1 Organization, Records, and Indoctrination

The inspectors interviewed the Schulz QA Manager to determine whether or not he was adequately independent of any cost and scheduling considerations. The inspectors determined that the QA Manager reported directly to the Schulz President and appeared to

be appropriately independent from production and manufacturing considerations.

During the review of quality related documents it was determined that the Schulz documents related to quality were generally comprehensive and complete, the exception being those records associated with the calibration of measuring and test equipment (see Section 3.4.2).

The inspectors reviewed Schulz's QA training program and employee training records. The initial Schulz QA program indoctrination for its employees occurred on February 27, 1992, and appeared to have been accomplished within a reasonable period of time from the January 1, 1992, QA program start date. The team also noted that Schulz indoctrinated new employees within 60 days of their hire date and the new employee indoctrination included discussion of the QA Manual, QA procedures, Shop Instructions, Appendix B to 10 CFR Part 50, and 10 CFR Part 21. Based on the review of Schulz employee indoctrination and training records for different levels of Schulz employees, it appeared that Schulz's training and indoctrination program contained a comprehensive QA program outline and included 10 CFR Part 21 as one of the major topics. This area was considered a strength that added to the effectiveness of Schulz's QA program implementation.

3.4.2 Control of Measuring and Test Equipment

The inspectors reviewed section 12 of the Schulz QA manual, "Control of Measuring and Test Equipment," Revision 4, dated September 15, 1993. Section 12 required that a procedure be established and contain provisions to ensure that all measuring and test equipment used for activities affecting quality were calibrated and adjusted at intervals based on the characteristics of the individual instruments.

The inspectors also reviewed Quality Assurance Procedure (QAP) 12, "Control of Measuring and Test Equipment," revision 4, dated September 15, 1993, which implemented the requirements of Section 12 of the QA manual. QAP 12 required that a calibration file be established to retain the certificates of calibration and associated documentation. The certificates of calibration were required to be stamped with a due date indicating when the current calibration would expire.

The calibration files were arranged in two sections, active and inactive. The inspectors reviewed the active section and located fifteen files which displayed due dates that had passed, which indicated that the item was not currently calibrated. The inspectors then compared these files with the January 24, 1994, version of the Meter and Test Equipment Calibration Log (MTECL), a computer data base which listed the Schulz Electric Company

item number (SEC number), an item description, the latest date of calibration, the calibration due date, and the item's location. Comparison of the calibration files to the MTECL showed several discrepancies as follows:

Seven items, SEC numbers 2018, 3030, 3054, 3060, 3097, 3101, and 3162, were not listed in the MTECL. Discussion with Schulz indicated that these items were no longer used and therefore not in the calibration program, and that the files should have been previously removed from the active file and placed in the inactive file.

Two items, SEC numbers 3088 (Simpson KW meter) and 3089 (Simpson volt meter), had latest calibration dates of October 25, 1993, and calibration due dates of April 25, 1994, indicating that the meters were currently in calibration, which conflicted with the calibration files. Schulz reviewed the calibration files, determined that the most recent calibration certificates had been misfiled, and located the calibration certificates for both items in the calibration file of a related piece of equipment which had been calibrated at the same time. The calibration dates and due dates on the certificates agreed with the dates in the MTECL.

The calibration certificate for SEC number 1016 (outside micrometer) listed the calibration date as February 8, 1991, and the due date as February 6, 1993. The MTECL listed the calibration date as February 6, 1991, the calibration due date as February 6, 1994, and the item location as "QA cabinet." Schulz indicated that this item was no longer in use at the facility and had been destroyed. Schulz further indicated that calibration due date of February 6, 1994, and the item location listed in the MTECL were erroneous, that the item listing should have been removed from that MTECL, and that the calibration file should have been removed from the active file and placed in the inactive file.

The calibration certificate for SEC number 1018 (inside micrometer) listed the calibration date as February 8, 1991, and the calibration due date as February 6, 1993. The MTECL listed the calibration date as February 6, 1991, and the calibration due date as February 6, 1994. Schulz located the item and inspection revealed the storage case (the item was a multi-piece set) to have a calibration sticker affixed which listed a calibration date of January 6, 1991, and a calibration due date of January 6, 1994. The calibration sticker dates did not agree with either the calibration certificate or the MTECL. Schulz did indicate that this item was no longer being used in a manner which required calibration (currently used as a transfer standard). Schulz

further indicated that the calibration due date listed in the MTECL was erroneous, that the item listing should have been removed from the MTECL, and that the calibration file should have been removed from the active file and placed in the inactive file. Schulz did not provide an explanation for the date discrepancy between the calibration sticker and the calibration certificate.

The inspectors observed calibration stickers on a variety of items available for use in the facility, in addition to those previously discussed devices, and found all to be currently in calibration and the listed calibration dates to be in agreement with those listed in the calibration files and the MTECL.

The inspectors concluded, based on the numerous discrepancies identified between the calibration files and the MTECL, that Schulz had not maintained the calibration records and associated files as required to adequately ensure that the items listed in the M&TE calibration program would be properly controlled. This was identified as Nonconformance 94-01-03.

3.4.3 Audits and Surveys of Suppliers

Schulz had not used safety-related items or services in the dedication of commercial grade motors or repair of safety-related motors (Schulz dedicated the commercial grade items and services which it used). Consequently Schulz had not performed any audits of Appendix B quality assurance programs. Schulz had performed commercial grade surveys of seven companies who provided commercial grade items or services for use in the repair of safety-related motors. Schulz had taken credit for these vendors' activities for a portion of the dedication process and therefore had performed commercial grade surveys to verify the adequacy of those activities. The companies surveyed performed calibration services, material analysis, viscosity tests, and rebarring and restacking of rotors.

The inspectors reviewed a report dated July 7, 1992, which documented the June 22, 1992, survey of a company providing calibration services. The survey verified that activities were in compliance with MIL-STD-45662A, that the standards used were substantiated by certificates of calibration traceable to the National Institute of Standards and Technology (NIST) and that work was performed in accordance with the supplier quality assurance program. In addition, the survey verified implementation of attributes specific to the work to be performed for Schulz including the primary and secondary standards associated with applicable instruments, laboratory environment, calibration interval, calibration records for instruments and standards, calibration procedures, audits or surveys of subvendors, calibration stickers, and storage and handling. The

Schulz team identified one deficiency related to subvendors which was adequately resolved. The NRC inspectors concluded that Schulz's activities in the area of external audits and surveys appeared to be adequate.

3.4.4 Internal Audits

The inspectors reviewed the most recent internal audit of Schulz which had been performed July 13-14, 1993. Schulz had determined that the internal audit would be most effective if performed by a consultant, which was contracted to perform the audit of Schulz and document the results in an audit report. The inspectors reviewed the audit report, dated July 27, 1993, and determined the audit to have been comprehensive and performance based. The NRC inspectors concluded that Schulz's activities in the area of internal audits appeared to be adequate.

3.5 Review of Qualification, Dedication, and Repair Program and Implementation

3.5.1 Environmental Qualification

Electrical equipment important to safety is required to be environmentally qualified under certain conditions as specified in 10 CFR 50.49, "Environmental qualification of electrical equipment important to safety for nuclear power plants." Regulation 10 CFR 50.49 covers safety-related (Class 1E) equipment and certain non-safety-related equipment. It requires that this equipment (which includes motors), which is exposed to the harsh environment of a design basis accident (DBA), and which must perform a safety-related function in that DBA, must be qualified to withstand the harsh environment and perform its safety-related function or not fail in a manner detrimental to safety. Therefore, those motors important to safety in plant applications in which they are not exposed to a DBA harsh environment, or which, even if exposed, have no safety-related function in that DBA, or which have no credible failure modes adverse to safety, are not required to be environmentally qualified. Therefore, there is no requirement for safety-related motors in a "mild environment" to be qualified under 10 CFR 50.49.

Standards which some licensees and vendors have used to establish environmental qualification are American National Standards Institute (ANSI)/Institute of Electrical and Electronic Engineers (IEEE) Standard 323, "Qualification of Class 1E Electrical Equipment for Harsh Environments in Nuclear Power Plants," and ANSI/IEEE Std 334, "Qualification of Class 1E Motors for Harsh Environments in Nuclear Power Plants," and ANSI/IEEE Std 344, "Seismic Qualification of Class 1E Electrical Equipment for Nuclear Power Plants."

The use of some of these standards by NRC licensees or their vendors and subcontractors in qualification activities has been endorsed (not required) in Regulatory Guide (RG) 1.89 (Revision 1), which endorsed the 1974 edition of IEEE-323 and RG-1.100, which endorsed the 1975 edition of IEEE-344. The regulatory position stated in RG 1.89, Rev 1, was that IEEE 323-1974, as modified by the conditions stated in the regulatory guide, provides an acceptable method of qualifying electrical equipment "important to safety" in accordance with the requirements of 10 CFR 50.49.

The inspectors reviewed Schulz's motor dedication and repair programs for adequacy as it related to environmental qualification. The inspectors found that in all cases except one, Class 1E motors supplied to NRC licensees or rewound for NRC licensees by Schulz were not required to be environmentally qualified and therefore would not have been required to conform to 10 CFR 50.49 or expected to conform to the qualification standards discussed above.

The one exception noted was when Schulz rewound an in-containment fan cooler motor for the New York Power Authority's (NYPA's) Indian Point Nuclear Plant, Unit 3 (IP3), in 1984. The motor had originally been required to be qualified under the NRC's previous Environmental Qualification (EQ) requirements, the Division of Operating Reactors (DOR) Guidelines. Because the similarity of the new insulation system installed by Schulz to the original could not be determined, requalification of the rewound motor was undertaken for NYPA by Schneider Consulting Engineers (SCE). The November 1984 SCE Report, P801-09-2, "Report of Environmental Qualification Testing of a Class H Insulated Motor Stator for a Reactor Containment Fan Cooler Motor Installed at Indian Point 3 Nuclear Power Plant," indicated that for this qualification effort, Schulz had built a section of a motor stator with the same insulation system used in the rewound fan cooler motor. The inspectors determined that Schulz had not supplied the qualification service and therefore was not responsible for its technical adequacy. Schulz had only supplied the rewind services, using an insulation system approved by the NYPA, for which Schulz supplied documentation of materials and processes used, and supplied the test specimen to SCE. The inspectors did not identify any concern with Schulz's activities related to the NYPA rewind work.

The inspectors determined that Schulz had previously developed a qualification report (through the use of a consultant) which was intended to meet the requirements of 10 CFR 50.49. The inspectors reviewed a version of this qualification report and determined it to be less than adequate. However, discussions with the present Schulz QA manager indicated that he had never approved the consultant's report and an entirely new program was

currently under development. Schulz further indicated, and the inspectors confirmed, that it had delivered motors, certified to the qualification report, for only one PO. A Schulz sales representative had arranged the sale in 1993, during the tenure of the previous QA manager. The licensee's PO had invoked the qualification report and the associated Schulz certificate of conformance (CoC) certified the work to the qualification report. However, when the present QA manager determined, during a review of the files, that the motors had been sold, certified to the inadequate qualification report, he contacted the licensee to advise them of his review (as documented in a record of the telephone conversation). The inspectors reviewed the letter that Schulz had received from the licensee, in response to this call, which rescinded the EQ requirement for the motors in question. The inspectors concluded that Schulz had adequately resolved the situation and that its activities in this instance were not contrary to NRC EQ requirements. No other instances were identified in which Schulz had supplied motors or rewind services that did not meet (or were required to meet) NRC EQ requirements.

The inspectors discussed the new qualification program, currently in development by Schulz and a consultant (different from the group used for the previous qualification report), and determined that both the Schulz QA Manager and the consultant developing the program appeared to have an understanding of the previous qualification report's inadequacies and an intent and sufficient knowledge to develop a qualification program to meet the requirements of 10 CFR 50.49.

3.5.2 Seismic Qualification

Standards which some licensees and vendors have used to establish seismic qualification are ANSI/IEEE Standard 323, "Qualification of Class 1E Electrical Equipment for Harsh Environments in Nuclear Power Plants," and ANSI/IEEE Std 344, "Seismic Qualification of Class 1E Electrical Equipment for Nuclear Power Plants."

The use of these standards by NRC licensees or their vendors and subcontractors in qualification activities has been endorsed (not required) in Regulatory Guide (RG) 1.89 (Revision 1), which endorsed the 1974 edition of IEEE-323 and RG-1.100, which endorsed the 1975 edition of IEEE-344.

The regulatory position in RG 1.00 is that IEEE-344-1975, as modified by the RG, and when used in conjunction with IEEE-323, provides an acceptable method of seismically qualifying electrical equipment important to safety in accordance with General Design Criterion 3 of Appendix A to 10 CFR Part 50, the part of NRC regulations which requires seismic qualification of safety-related structures, systems, components and equipment.

The Schulz process for the dedication of motors for safety-related service was prescribed by Schulz Technical Evaluation (TE) 725. TE-725 was based on TE CGIM001, "Three-Phase Squirrel-Cage Induction Motors, NEMA Frame Size 680 and Smaller, Continuous and Intermittent Duty (Excluding Motor Operated Valves)," prepared by the Joint Utility Task Group (JUTG) of the Electric Power Research Institute (EPRI). CGIM001 addressed seismic qualification of motors by stating that the inherent seismic ruggedness of properly mounted and anchored motors, particularly of the type and size range covered by the TE had been demonstrated by seismic qualification testing and analysis and operating experience and therefore, it was not necessary to treat seismic performance of such motors as a critical characteristic that required verification as part of dedication.

The NRC has not endorsed any of the EPRI JUTG TEs. The latest NRC Safety Evaluation Report to address the Generic Implementation Plan (GIP) of the Seismic Qualification Utility Group (SQUG), whose position on motors is consistent with the JUTG, contained caveats for seismic qualification of motors in systems with regard to items such as mounting, anchoring and electrical connections. However, with respect to motors of the type in question, in the absence of evidence to the contrary for specific motors, the NRC has not challenged the inherent seismic ruggedness of the motor itself generically nor the verification of the seismic adequacy approach for these items as is described in the GIP.

Review of the documentation that Schulz provided to licensees indicated that Schulz was clear in the fact that it was not providing motors that were necessarily seismically qualified. In addition, the technical evaluation clearly addressed the issue and stated the rationale for not considering seismic performance a critical characteristic, including references. Schulz's documentation also contained the qualifying statement that the inherent ruggedness is for "typical building floor response spectra," but that motors in high amplification mountings may require further evaluation. The inspectors concluded that Schulz's performance had been adequate with respect to seismic qualification and that the responsibility for any further evaluation required had been clearly transferred to the licensee.

3.5.3 General Review of Dedication and Repair Methods

The inspectors reviewed Schulz's program and its implementation for performing safety-related repairs, including rewinds, and for the dedication of commercial grade motors for safety-related applications and the dedication of materials, parts and services used in the repairs and rewinds. This included a review of documentation, interviews with personnel, observation of work techniques, review of files containing the records of rewind and

dedication jobs, and also review of the corresponding Schulz CoCs which typically certified only that the dedication activities were as stated in the customer-approved Schulz QA program.

The inspectors discussed the concepts of motor qualification and dedication with Schulz and noted that the existence of the various IEEE qualification and dedication standards, and their applicability to Class 1E motors, does not impose nuclear-unique design requirements on all motors or motor related materials. These items can meet the definition of commercial grade items, as contained in 10 CFR 21.3, and be dedicated for safety-related applications.

Schulz used TE-275 to determine the critical characteristics of motors being dedicated. Review of several dedication files indicated that weight had not been considered a critical characteristic related to seismic qualification. However, the weight of a dedicated motor would only have a bearing on the seismic qualification of the system or structure on which the motor is mounted, not on the seismic performance of the motor itself. The inspectors discussed consideration of motor weight with Schulz and noted that seismic qualification had been addressed in the Schulz Technical Evaluation as discussed above. A clarifying example was identified during the inspector's review in which Northeast Utilities requested that Schulz record the before and after weight of a motor they were having Schulz rewind and this was documented. Presumably, this was requested in order to enable the licensee to reanalyze the seismic response of the system in which the motor was installed to maintain qualification. However, absent such a specific application requirement in licensee procurement documents, Schulz would only be expected to comply with the stated requirements. It is clearly the licensee's responsibility to perform (or have performed) any additional evaluation that may be required as part of its own review for suitability of application under Criterion 3 of 10 CFR Part 50, Appendix B.

The inspectors reviewed the motor testing program and its implementation and determined it to be extensive and adequate. In addition to the required electrical and performance tests, testing was also performed by Schulz which demonstrated bearing, lubricant and seal performance under full load conditions (aging was not required). The lubricants and seals used were either identified to the licensee or, in many cases, the licensee provided the lubricant to be used.

The inspectors' review of the Schulz program for procurement and dedication of commercial grade materials used in Class 1E rewind jobs, as well as new motors being dedicated, indicated that in general, the program and its implementation was technically

sound, properly controlled and was in all cases fully documented and disclosed to the licensees.

4 PERSONNEL CONTACTED

- + R. Dahman, Chief Executive Officer
- *+ R. Davis, President
- *+ P. Kleine, QA Manager
- *+ K. Adams, QA Engineer
- + S. Yousif, Applied Energy Services

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- * Attended the entrance meeting on January 24, 1994
 - + Attended the exit meeting on January 28, 1994