

April 5, 2000

Raymond D. Daniel, Director
Quality Assurance Department
Elgar Electronics, Incorporated
9250 Brown Deer Road
San Diego, California 92121

SUBJECT: NRC INSPECTION REPORT 99900871/2000201
(NOTICE OF NONCONFORMANCE)

Dear Mr. Daniel:

On March 13-16, 2000, the United States Nuclear Regulatory Commission (NRC) performed an inspection at the Elgar Electronics (Elgar), Incorporated, facility in San Diego, California. The enclosed report presents the findings of that inspection. The inspection was conducted to review selected portions of your program relating to the implementation of your quality assurance program activities regarding uninterruptible power supplies, electrical inverters, power line conditioners, associated spare parts, and the safety-related services that are provided to commercial nuclear power plants. This inspection specifically focused on engineering and equipment qualification activities. The inspectors assessed Elgar's conformance to customer procurement requirements and compliance with NRC regulations.

The inspectors determined that the implementation of your quality assurance program was generally acceptable, but found one area where Elgar failed to meet certain NRC requirements imposed by customers, particularly in the area of technical and seismic adequacy of acceptance testing. As discussed herein, weaknesses were identified in the area of maintaining the seismic qualification of installed Elgar equipment through design reconciliation for new or replacement component designs and verification of seismic adequacy of commercial grade items dedicated for nuclear safety-related service. The inspectors determined that your program and its implementation was not in full compliance with 10 CFR Part 50, Appendix B requirements. This nonconformance is cited in the enclosed Notice of Nonconformance (NON), and the circumstances surrounding it are described in detail in the enclosed report. You are requested to respond to the nonconformance and should follow the instructions specified in the enclosed NON when preparing your response.

R. D. Daniel

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In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC's Public Document Room.

Sincerely,

/RA/

Theodore R. Quay, Chief IQMB
Division of Inspection Program Management
Office of Nuclear Reactor Regulation

Docket No. 99900871

Enclosures:

1. Notice of Nonconformance
2. Inspection Report 99900871/2000201

R. D. Daniel

-2-

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NOTICE OF NONCONFORMANCE

Elgar Electronics, Incorporated
San Diego, California

Docket No.: 99900871

Based on the results of an inspection conducted on March 13 through 16, 2000, it appears that certain of the Elgar Electronics, Incorporated (Elgar) activities were not conducted in accordance with NRC requirements.

10 CFR 50, Appendix B, Criterion III, "Design Control," states in part, that measures shall be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems and components.

10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," require in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Section 06, "Instructions, Procedures, and Drawings," of Elgar's QA Manual, Document 0050001, Revision R, dated October 22, 1998, requires Elgar to establish a system which will guarantee that the activities affecting quality functions and quality verification activities are prescribed in documented instructions, procedures and/or drawings.

Contrary to these requirements:

1. Elgar did not ensure that measures or requirements were formally established in Elgar procedures and instructions to ensure that an Elgar process, "new part justification reports," (NPJR), used for the selection and review for suitability of application of its supplied uninterruptible power supplies and inverter materials, parts, and equipment were accomplished in accordance with these instructions or procedures. Additionally, since approximately September 1996, Elgar's nuclear engineering staff developed and used a "component comparison table" to enhance the NPJR process, but did not establish any formal requirements or guidance in its procedures or instructions to ensure that those activities were also accomplished in accordance with procedurally defined safety-related engineering activities, and

2. The below listed Elgar procedures did not contain adequate requirements or guidance to ensure that its acceptance test procedures (ATPs) and NPJRs contained measures to ensure that seismic adequacy activities for applicable components were satisfactorily accomplished. These components are supplied and used in Elgar's Class 1E electrical inverter and uninterruptible power supply systems installed in operating nuclear power plants. (Nonconformance 99900871/2000201-01)
- Procedure 0460602-01, "Spare Parts/Commercial Grade Items Dedication Change Log," Revision H, dated November 5, 1998.
 - Procedure 0460602-02, "Commercial Grade Item Dedication Procedure, ATP Development," Revision B, dated May 5, 1994, and
 - Procedure 0460604-01, "Commercial Spare Parts Procedure," Revision C, dated December 12, 1994.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555, with a copy to the Chief, IQMB, Division of Inspection Program Management, Office of Nuclear Reactor Regulation, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each nonconformance: (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 your corrective actions and preventive measures were or will be completed.

Dated at Rockville, Maryland
this 5th day of April 2000

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Report No.: 999000871/2000201

Organization: Elgar Electronics, Incorporated (Elgar)
9250 Brown Deer Road
San Diego, California 92121

Contact: Raymond D. Daniel, Director, Quality Assurance
(858) 458-0206

Nuclear Activity: Elgar provides safety related uninterruptible power supplies, electrical inverters, power line conditioners, associated replacement parts, components and field services to the nuclear industry.

Date of Inspection: March 13-16, 2000

Inspectors: Joseph J. Petrosino, Team Leader
Stephen D. Alexander, Reactor Engineer

Approved by: Daniel H. Dorman, Chief */RA/*
Quality Assurance and Safety Assessment Section, IQMB
Division of Inspection Program Management

1 INSPECTION SUMMARY

During this inspection, the NRC inspectors reviewed the implementation of selected portions of the Elgar quality assurance (QA) program, and reviewed activities associated with its component replacement parts and services to the nuclear industry.

The inspection bases were:

- Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Part 50 of Title 10 of the Code of Federal Regulations (Appendix B)
- 10 CFR Part 21, "Reporting of Defects and Noncompliance"

During this inspection, instances where Elgar failed to conform to NRC requirements and the Elgar QA program requirements contractually imposed upon them by NRC licensees were identified. These nonconformances are discussed herein.

2 STATUS OF PREVIOUS INSPECTION FINDINGS

2.1 Status and Conclusions

There were several open inspection findings documented in the 1990 and 1992 NRC Inspection Reports. Each of those Inspection Report findings, Elgar's responses and corrective actions were reviewed and found to satisfactorily address the concerns. Therefore, the following findings are considered closed: Violations' 92-01-01, 92-01-02, and 90-01-02; Nonconformances 92-01-03, 92-01-04, 92-01-05, 92-01-06, 90-01-04, and 90-01-05; Unresolved Item 92-01-07; and Open Item 90-01-09. There are no other open inspection findings or concerns from previous NRC inspections.

3 INSPECTION FINDINGS AND OTHER COMMENTS

3.1 10 CFR Part 21 Procedure

a. Inspection Scope

The NRC inspectors reviewed the procedure that Elgar adopted to implement the provisions of 10 CFR Part 21, Elgar Company Procedure 0010005-01, "Evaluation and reporting of Defects and Noncompliance Pursuant to 10 CFR21," Revision F, dated April 14, 1995, and conducted discussions with quality assurance and engineering personnel concerning Part 21 activities.

b. Observations and Findings

The inspectors identified a few ambiguities and weaknesses in the narrative of Procedure 0010005-01 during their review of the procedure. However, it was determined that Elgar's 10 CFR Part 21 procedure was adequately established to ensure that the salient portions of

10 CFR Part 21, such as §21.21, “Notification of failure to comply or existence of a defect and its evaluation,” are adequately implemented. Discussions were conducted with the Elgar QA Director and Nuclear Products Manager to discuss those weaknesses and ambiguities in the procedure and the inspectors obtained Elgar’s commitment to revise its Part 21 procedure within 90 days of the inspection report issuance date for the incorporation of the NRC inspector’s comments.

c. Conclusions

The NRC inspectors concluded that the Part 21 procedure which Elgar has developed and implemented met the requirements for Part 21 procedures in 10 CFR 21.21(a).

3.2 Review of Elgar Activities Regarding Qualification of Supplied Equipment

In recent years, Elgar has primarily been providing replacement components and related services for its uninterruptible power supply (UPS) units and inverters for its nuclear utility customers instead of new equipment with only a few notable exceptions (recently for example, Elgar refurbished another utility’s new surplus UPS for use as an additional or backup unit at the Clinton Power Station). In order to assess the adequacy of Elgar’s practices and activities in the area of maintenance of the seismic qualification of its safety-related equipment supplied to NRC-licensed facilities, the inspectors focused on three strategic areas:

- “New Parts Justification Reports” (NPJRs) in which Elgar typically included a seismic similarity analysis (reconciliation) for design changes, part upgrades, or availability or obsolescence-driven supplier/part substitution
- Acceptance Test Procedures (ATPs) which Elgar uses to perform the acceptance portion of commercial-grade dedication of purchased component parts and Elgar-built components and subassemblies
- Seismic Test and/or Analysis Qualification Reports used to qualify major modifications, and substantially different replacement components.

3.2.1 Review of NPJRs

a. Inspection Scope:

The inspectors reviewed selected NPJRs for various types of components issued over the last several years for design reconciliation of components and parts. The NPJRs sampled represented components and parts that had to be replaced in the design due to obsolescence, unavailability, different suppliers, and other reasons. In addition, the inspectors reviewed selected component comparison matrices or tables, which were included in more recent NPJRs and have been in use by Elgar since approximately September 1996. The Elgar engineering staff stated that the comparison matrices/tables were developed to improve their new part design reconciliation process. Consequently, the inspectors evaluated the adequacy of Elgar’s design reconciliation with regard to impact on seismic qualification.

b. Observations and Findings:

Review of several recent and a few older NPJRs revealed that the reports all used standard language to describe and address part differences and were not part-specific. When seismic capability of a new part was addressed, the NPJR used the non-part-specific standard language and the assertions were largely unsupported by part-specific technical information. In some instances, attached or available technical information was inconsistent with the standard assertions. Around September 1996, Elgar revised its process for new part design reconciliation by including component comparison tables or matrices.

The part or component comparison tables that the inspectors reviewed not only addressed differences between the current changes in component design, but were designed to (and in most cases did) address the previous changes, updates, substitutions, or other reasons, that had been inadequately evaluated by the original NPJR process. However, the files still contained the old non-part-specific "boilerplate" NPJR forms which, as stated previously, were not substantiated in most cases.

In addition, the inspectors found inconsistency in the use of the new process. In one of the most recent NPJR files, dated March 8, 2000, for capacitors, a difference in working voltage was identified (old part rated for 150 volts, new part for 100 volts), but there was no explanation, and no provision for an explanation, of the acceptability of the identified difference. Further, the new process still did not consistently and rigorously address potential impact on the seismic qualification of the part, its parent component or subassembly, or of the installed equipment in which the new part would be used.

In looking for a cause of the inadequate and inconsistent implementation of the NPJR process, the inspectors reviewed and discussed three procedures with the Elgar staff that would be applicable to the process being reviewed. These were:

- Procedure 0460602-01, "Spare Parts/Commercial Grade Items Dedication Change Log," Revision H, dated November 5, 1998;
- Procedure 0460602-02, "Commercial Grade Item Dedication Procedure, ATP Development," Revision B, dated May 5, 1994; and
- Procedure 0460604-01, "Commercial Spare Parts Procedure," Revision C, dated December 12, 1994.

The inspectors found that none of the three procedures contained narrative which would provide measures to control the NPJR or comparison table process. Discussions were conducted with the Elgar staff and it was determined that although some of the staff knew about the weakness in the procedures, the problem was not identified or corrected in accordance with Elgar's QA program. The inspectors noted that these activities affected quality and Elgar's objectives of ensuring maintenance of seismic qualification, both before and after instituting the comparison table practice.

c. Conclusions:

On the basis of the review of a sample population of recent NPJRs, the inspectors concluded that both the original NPJR process and the new part comparison process inadequately addressed impact on seismic qualification. These program weaknesses create the possibility that deviations related to critical characteristics of basic components may not be appropriately evaluated. The inspectors further concluded that the lack of procedural guidance for implementing NPJR process and the improved component comparison table process, activities affecting quality, were contrary to the requirements of Elgar's QA manual and Criterion III and Criterion V of Appendix B to 10 CFR Part 50. Accordingly, Nonconformance 99900871/2000201-01 was cited.

3.2.2 Review of Acceptance Test Procedures

a. Inspection Scope:

The inspectors evaluated the adequacy of Elgar's program and its implementation for acceptance of commercial-grade items, especially with regard to verification of production items' seismic capability or ruggedness (seismic adequacy approach). This assessment was not performed for design verification, as is supposed to be done through NPJRs, but for verification of conformance of individual items to their design specifications such that there is reasonable assurance that the items received and used in safety-related Elgar equipment will perform their safety functions under all design basis conditions, including seismic conditions. In the course of this evaluation, the inspectors reviewed Elgar procedures for commercial-grade dedication, including development of acceptance test procedures (ATPs) as well as selected individual ATPs themselves. ATPs reviewed were:

- ATP T27-XXX-XX, Revision H, dated February 26, 1993, "Acceptance Test Procedure for Commutating Capacitors" was the latest effective revision of the generic ATP for oil-filled commutating capacitors used in the silicon-controlled rectifier (SCR) control circuits of Elgar inverters. [Note: Elgar's generic ATP procedures specified herein reflected X's in their serial numbers.]
- ATP T26-XXX-XX, Revision B, dated July 30, 1993, "Acceptance Test Procedure for Computer Grade Aluminum Electrolytic Capacitors," was the latest effective revision of the generic ATP for electrolytic capacitors used as input filter capacitors in Elgar inverters.
- ATP T61-003-15, Revision A, dated January 18, 2000, "Acceptance Test Procedure for 4 Pole Double Throw, 3A, 115VDC Coil Relay (ARD)," was the initial release of the specific ATP for Potter & Brumfield Type R10E relays used as an additional set of auxiliary contacts for the DC input circuit breaker in Elgar inverters. Elgar acknowledged that the "(ARD)" in the title of this ATP was an error.
- ATP T61-ARD-4S, Revision B, dated June 16, 1999, "Acceptance Test Procedure for P/N 861-ARD-4S Relay," was the latest effective revision of the specific ATP for Westinghouse/Eaton Cutler-Hammer Type ARD relays used in the input capacitor pre-charge circuit of Elgar inverters.

- ATP T52-XXX-XX, Revision D, dated February 7, 1997, "Acceptance Test Procedure for Molded Case Circuit Breaker" was the latest effective revision of the generic ATP for molded-case circuit breakers (MCCBs) used in Elgar.

b. Observations and Findings:

The critical characteristics prescribed by the ATPs to be verified were generally appropriate, but some common weaknesses were identified. For example, none of the ATPs reviewed listed seismic adequacy, capability, or ruggedness as one or more critical characteristics. There was no provision for establishing the similarity (with regard to seismic-related attributes) of the part being dedicated to its counterpart that had been seismically qualified in tested equipment. Another common weakness identified was that the quality inspection listed as a critical characteristic in all of the ATPs reviewed did not provide for visual inspection of the part for its physical condition and configuration. Further, although the quality inspection required a verification of dimensional characteristics on one ATP; no measuring instrument was specified in the list of test equipment required. In another example [for a Westinghouse ARD relay] the ATP required dimensional tolerances to be verified; however, dimensional tolerances were not provided in the technical specification information sheets for that particular ARD relay.

Other technical deficiencies noted in the individual ATPs reviewed included: (1) a requirement for the dropout voltage to be measured, but not for the pickup voltage to be measured on a Potter & Brumfield auxiliary relay. This attribute was not identified as a critical characteristic in the ATP, even though it, along with dropout voltage and perhaps timing would be indicative of the relay's mechanical performance characteristics which could be used to demonstrate similarity to seismically tested relays of this type; (2) an ATP for the aluminum electrolytic capacitors incorrectly delineated the formula for calculation of maximum leakage current as ".006 x CV" instead of .006 x the square-root of CV (product of voltage and capacitance) as it should have been. Elgar had issued an engineering change notice for this error and corrected the procedure during the NRC inspection; (3) several deficiencies were noted in an ATP for molded-case circuit breakers (MCCBs), including lack of a check of contact or pole resistance and no test of breakers' instantaneous magnetic overload trip function required for fault or short circuit protection capability.

Finally, as a likely cause of these deficiencies, QA Procedure 0460602-02, Revision B, May 18, 1994, "Commercial Grade Item Dedication and ATP Development," did not address seismic adequacy verification methods. Additionally, it lacked guidance in general on systematic technical evaluation to derive critical characteristics from safety functions, to use industry guidance and operating experience including the provisions of pertinent NRC generic letters, and contained definitions of dedication terms that were inconsistent with those in 10 CFR Part 21.

c. Conclusions:

The NRC inspectors concluded that the procedures reviewed (as well as others as confirmed by Elgar) were inadequate with respect to maintaining the seismic qualification of Elgar-supplied equipment. That is, the reviewed procedures did not address the seismic capability or ruggedness of the items being dedicated nor their potential effect on the seismic qualification of that equipment. In addition, the inspectors found that Elgar's procedures governing the dedication of commercial-grade items did not adequately address seismic qualification; nor did they ensure that the ATPs developed in accordance with these procedures adequately addressed seismic qualification. Nonconformance 99900871/2000201-01 was identified in this area.

Finally, the inspectors concluded that while Elgar's verification of seismic capability or ruggedness of commercial-grade items was inadequate, absent component-specific evidence or operating/testing experience to the contrary, the potential impact on seismic qualification of installed Elgar equipment should be minimal for the following reasons:

- The ATP process, even with some weaknesses, should in general, provide reasonable assurance that commercial-grade items conformed to their design specification in terms of form, fit and function, at least under normal service conditions. The components could be expected to be reasonably similar to their tested counterparts in terms of seismic performance or ruggedness;
- Most components of the generic types being considered have undergone extensive evaluation by industry organizations such as the Electric Power Research Institute and the Seismic Qualification Utility Group, and
- Operating and testing experience suggests that the most frequent failure modes of most of the types of components in question are not the type that would likely be seismically-induced common-mode failures.

However, the inspectors pointed out to the Elgar staff that these mitigating factors do not relieve Elgar from its responsibility for verification of seismic adequacy of components used in safety-related applications.

3.2.3 Evaluation of Seismic Qualification Reports

a. Inspection Scope:

In order to evaluate the adequacy of Elgar's seismic qualification practices in terms of recognition of circumstances when seismic testing or full analysis is warranted and also the adequacy of such testing and analysis, the inspectors reviewed recent major sales, modifications and similar projects to identify candidates for review and selected three full qualification reports for detailed review. These included:

- Generic seismic qualification testing on replacement analog panel meters performed for Elgar by Southern California Edison (SCE) at their test facility at the San Onofre Nuclear Generating Station (SONGS);
- Generic seismic qualification testing, also at SONGS, of a replacement inverter input (DC) circuit breaker and auxiliary relay, and
- A seismic analysis report, prepared by Elgar, for major modifications to a power line conditioner for Millstone-3. The seismic analysis on the refurbished inverter supplied to Clinton station was also discussed, but the unit was not substantially modified from its originally qualified configuration. The parts substitutions, revisions, improvements and other modifications that were incorporated had also been evaluated generically and discussed with the inspectors.

b. Observations and Findings:

Seismic Test Report 99-18645, Revision 0, dated May 5, 1999, "Seismic Test Report for Analog Panel Meters, Elgar UPS Model 253-1-102, was prepared under SCE/SONGS Job No. 031999-3742, Revision 2, per Elgar Purchase Order (PO) No. 536234. The purpose of the test was to seismically qualify a new type of analog electrical panel meters (specifically ac voltmeters) used on certain typical Elgar uninterruptible power supplies (UPSs) to replace the original types of meters that were no longer available to support customer meter replacement orders. The inspectors noted that while the detailed explanation of the test results described the loss of operability of one meter, the summary of test results tables in the front of the report indicated that all three meters passed even though the maintenance of an operability acceptance criterion was given in the table.

SCE/SONGS prepared Test Report 99-1742, Revision 0, dated December 7, 1999, "Test Report of Circuit Breaker and Relay Used in Elgar Inverter Model 752-1-101", under Elgar PO No. 537289. The purpose of the test was to qualify a replacement DC molded-case circuit breaker, General Electric (GE) Model TFJ224150 (fitted with an under voltage release (UVR) and a double-pole, double-throw auxiliary switch) used as the DC input breaker for the inverter, and also an auxiliary relay, Potter & Brumfield Type R10-E1Y4-V15.0K, to be used to replace the third set of auxiliary contacts no longer furnished with the circuit breaker. Some anomalies were noted, but each was satisfactorily dispositioned by Elgar.

Elgar prepared its own seismic qualification report for modifications to its power line conditioner (PLC) Model PLC 253-1-1, Nuclear Report No. Q.R. 802SU -- Addendum A, Revision A [original], dated November 4, 1997. The modifications qualified by the report were to be installed by Northeast Utilities in an Elgar PLC at Millstone, Unit 3. The methodology was qualification by analysis and extrapolation of existing test data as allowed under certain circumstances by ANSI/IEEE Standard 344-1975. This standard, when followed and used in conjunction with ANSI/IEEE Standard 323-1974, has been endorsed by NRC Regulatory Guide 1.100 as describing acceptable methods of meeting General Design Criterion 2 of Appendix A to 10 CFR Part 50. The inspectors determined that the original or unmodified PLC 253-1-1 had been qualified on the basis of its being or having the same components (and mounting hardware) as a subassembly of the Elgar UPS Model 253-1-101, which was originally qualified by test. The report concluded that while the only resonances found were, as required, well above the seismic response spectrum of interest, the strength of the mounting bolts for the

input plate assembly (with an additional capacitor) would have to be increased in order to use the same size bolts (1/4-20), yet maintain at least the original amount of design margin. The calculations showed that by upgrading the bolts from SAE Grade 5, with a proof load of 85 ksi to stronger Grade 8 bolts of the same size with a proof load of 120 ksi, the safety factor was actually improved by 11.2 percent; whereas with the weight of the third capacitor, the safety factor using Grade-5 1/4-20 bolts would have been degraded by 21.5 percent.

c. Conclusions:

The inspectors concluded that Elgar's recent practice with regard to performing seismic qualification testing and/or analysis when required for major modification and/or component replacements, and the adequacy of the qualifications performed was acceptable.

4 LIST OF PERSONS CONTACTED

R. Daniel,	Director, Quality Assurance
J. Turitto	QA Supervisor
W. Gaedke	Sustaining Engineer-Nuclear
R. Jones	Sustaining Engineer-Nuclear
D. Dattilo	Manager, Nuclear products
J. Drumel	Components Engineer-Nuclear
G. Richards	Sales/Customer Support Specialist