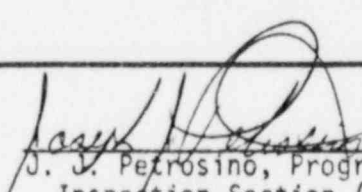
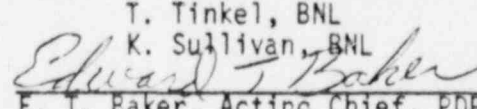


ORGANIZATION: NUTHERM INTERNATIONAL INCORPORATED
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REPORT NO.: 99900779/87-01	INSPECTION DATE: 11/16-20/87	INSPECTION ON-SITE HOURS: 172
CORRESPONDENCE ADDRESS: Nutherm International Incorporated ATTN: Mr. L. Hinson, President 501 South 11th Street Mount Vernon, Illinois 62864		
ORGANIZATIONAL CONTACT: Mr. Ronald Heifner - QA Manager TELEPHONE NUMBER: (618) 244-6000		
NUCLEAR INDUSTRY ACTIVITY: Nutherm International Incorporated (NI) fabricates, designs, tests and qualifies electrical devices and control systems for both commercial and military nuclear facilities. Approximately 98 percent of NI's business is nuclear related.		
ASSIGNED INSPECTOR:  J. J. Petrosino, Program Development and Reactive Inspection Section (PDRIS) 1/7/88 Date		
OTHER INSPECTOR(S): R. Moist, NRC/NRR T. Tinkel, BNL K. Sullivan, BNL		
APPROVED BY:  E. T. Baker, Acting Chief, PDRIS, Vendor Inspection Branch 1/8/88 Date		
INSPECTION BASES AND SCOPE: A. BASES: Appendix B to 10 CFR Part 50, and 10 CFR Part 21. B. SCOPE: Follow-up to allegations concerning alleged NI disregard of the NRC QA program requirements in regard to its execution of quality activities.		
PLANT SITE APPLICABILITY: Bellefonte (50-438/439); Braidwood (50-456/457); Browns Ferry (50-259/260/296); Byron (50-455); Clinton (50-461); Diablo Canyon (50-323/275); Dresden (50-237/249); LaSalle (50-373/374); Limerick (50-352/353); Nine Mile Point (50-220/410); Oyster Creek (50-219); Peach Bottom (50-277/278); Perry (50-440); Quad Cities (50-254/265); (continued on next page)		

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PLANT SITE APPLICABILITY (continued): River Bend (50-458); Sequoyah (50-327/328); Susquehanna (50-387/388); Three Mile Island (50-289/320); Watts Bar (50-390/391); and Zion (50-295/304).

A. VIOLATIONS:

None.

B. NONCONFORMANCES:

1. Contrary to Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50, and Section 2 of the NI QA manual (QAM):
 - a. Section 10 of the QAM does not prohibit a person from inspecting their own work;
 - b. Section 10 of the QAM does not require QA inspection and monitoring activities in NI's equipment testing facility; and
 - c. NI has not established procedures to control its periodic use of rented measuring and test equipment (M&TE).
2. Contrary to Criterion III, "Design Control," and Criterion VI, "Document Control," of Appendix B to 10 CFR Part 50; Sections 3.0, 4.0, and 5.0 of NI's QAM and NI QAP #3.0.00:
 - a. NI "Qualification Results Index" (QRI) forms, which are used as specific hardware instruction riders to NI's generic functional and test procedures that delineate design parameters for testing, do not indicate that an independent technical review was performed. Additionally, QRI's do not correctly and/or fully translate the design requirements into test parameters and quality standards;
 - b. Equipment qualification procedures and functional test procedures did not indicate that an independent review was performed to verify technical adequacy; and
 - c. In the pre-1986 time period the engineering manager did not perform the required design verification activity for several design drawings.

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3. Contrary to Criterion X, "Inspection," of Appendix B to 10 CFR Part 50, NI is not providing adequate QA inspection/verification control of quality related activities as follows:
 - a. NI has failed to implement the QA inspection or monitoring program for its equipment testing facility;
 - b. NI management allows the same technician who performed equipment test activities to inspect his/her own work and sign the "QA inspector approval" block; and
 - c. NI management allowed the equipment test facility supervisor to sign the "QA Approval" block for testing results that were performed by his technicians.
4. Contrary to Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50, NRC observations of equipment tests and record reviews indicate that NI is neither adequately controlling nor effectively monitoring its safety-related activities that are being performed in its equipment test facility.
5. Contrary to Criterion XVII "Quality Assurance Records," of Appendix B to 10 CFR Part 50, adequate records were not in evidence to indicate personnel qualification for several past and present NI employees. The following NI employee files [identified by employee initials] were found to be either incomplete, incorrect, or indeterminate as to the relevant experience and/or education: HB, CG, GW, SS, DW, GJ, SDJ, LH and PB.
6. Contrary to Criterion XVIII, "Audits," of 10 CFR Part 50, NI management allowed the last two QA department annual audits to be led by a QA inspector that has direct QA responsibilities. The report numbers are QA-86-AE, dated 12/23/86, and QA-85, dated 12/06/85.

C. OPEN/UNRESOLVED ITEMS:

Several aspects of the allegation and associated issues were not fully reviewed or evaluated due to the NRC inspection team time constraints. Therefore, the following items will be classified as open items pending subsequent NRC or vendor actions:

- (1) Personnel Qualification (See Section E.4.a)
- (2) Correct Performance of Testing (See Section E.4.b)
- (3) Radiation Testing Failures of Devices (See Section E.4.c)
- (4) Procurement and Receipt Inspection Control (See Section E.4.f)
- (5) Quality Assurance Procedures/Instructions (See Section E.15)

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- (6) Audits (See Section E.4.g)
- (7) 10 CFR Part 21 Potentially Reportable Items (Associated Allegation Aspect)

D. STATUS OF PREVIOUS INSPECTION FINDINGS:

Neither reviewed nor discussed.

E. INSPECTION FINDINGS AND OTHER COMMENTS:

1. Entrance and Exit Meetings

The NRC inspection team informed NI management of the scope of the inspection during the November 16, 1987 entrance meeting, and summarized the inspection findings, observations, and NRC staff concerns during the exit meeting on November 20, 1987.

2. Nutherm Management Commitments

The Nutherm management staff recognized its QA program weaknesses after the NRC inspection team started to identify problem areas, and stopped all of its safety-related activities in order to assure its QA program implementation was valid. Even though NI was not obligated to the Commission to take corrective action until after it received this report, NI voluntarily committed to stop its current work, review its procedures and instructions that control its current activities, revise the documents as required, and ensure that the required independent technical adequacy reviews are performed. The NRC staff believes that this approach is appropriate for the circumstances.

3. Background

This inspection was conducted to examine allegations that have been received by the NRC staff with respect to the method in which NI implements its nuclear quality related activities. The specific areas of concern that were communicated to NRC staff members include the following: (a) personnel qualifications, (b) correct performance of testing and inadequate/incomplete procedures, (c) corrective action of test deviations, (d) recording of raw test data, (e) adequate translation of design bases, (f) procurement/receipt inspection control, and (g) external audits.

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4. Review of Allegations

The NRC inspection team observed functional and equipment qualification tests that were being performed by NI personnel, reviewed NRC licensee purchase order packages, personnel education/qualification records, hardware qualification/test result records, internal audit reports, program implementing procedures/instructions, design drawings/specifications, and other associated documents. The inspectors also conducted interviews with NI personnel at various levels to gain an understanding of how the daily NI quality activities were carried out.

Not every aspect of the allegation was reviewed due to the inspection team time constraints; however, for each aspect of the allegation that was reviewed, the results are described below.

a. Personnel Qualifications:

Allegation Aspect: (1) Personnel with no technical background were given the responsibility to write technical procedures, plans, and reports; (2) would falsify information; and (3) functional testing was not performed by qualified personnel.

Inspection Finding:

- (1) It was determined that NI would typically allow non-technical personnel, such as secretaries, to write technical procedures and reports. It should be noted that this practice is not necessarily incorrect, provided that a technically competent and qualified person performs a review for technical adequacy of the document. However, it was revealed that NI's procedures and instructions that were written by non-technical personnel did not always receive technical review and approval (Nonconformance B.2 was identified in this area).
- (2) The efforts of the NRC inspection team did not reveal any evidence that would substantiate this allegation aspect;
- (3) Functional testing was not specifically reviewed to determine whether or not qualified personnel were performing the tests in the past; however, current QA inspectors and lab technicians appear to have adequate qualification to perform their job functions. A review of NI's personnel files and QA files indicated that, in all cases, NI has

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not maintained adequate employee files that provide evidence of the qualifications of personnel to perform their job activities affecting quality. (Nonconformance B.5 was identified in this area.) Therefore, this will require a further review.

Based on the above data, this allegation aspect is partially substantiated, and additional reviews will be performed during a future inspection.

b. Correct Performance of Testing:

Allegation Aspect: (1) Actual testing sequence of numerous projects were not performed in the correct sequence; (2) testing procedures were inadequate; (3) thermal aging tests include sloppy record keeping, humidity levels are documented on reports but not in testing records, test time period duration was based on weak link activation energy methodology without determining the lowest activation energy, and devices were not sent out for thermal gravimetric analysis (TGA); and (4) seismic and design basis event testing contained deviations.

Inspection Finding:

- (1) A review of seven equipment qualification packages indicated that their tests were performed in the correct sequence;
- (2) An overall problem with NI's technical procedures and instructions was identified. The inspection revealed that many of the NI procedures were written by non-technical personnel or by personnel that did not have documented and/or applicable experience to perform their job function. This methodology would be adequate if the QA program requirement for an independent "technical review for adequacy" had been performed by qualified personnel. However, the majority of the NI technical procedures were "approved" by the QA manager, instead of the engineering manager as required;
- (3) This area was not reviewed in enough detail to determine whether or not NI is maintaining control.
- (4) Ibidem.

Based on the above data, this allegation aspect is substantiated in part. Additional reviews will be performed in this area during a future NRC inspection.

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c. Corrective Action of Test Deviations:

Allegation Aspect: Radiation testing failures of devices such as: thermal cutouts, relays, switches, humidity transmitters, heating elements, auxiliary contacts, and temperature controllers have repeatedly failed without NI corrective action.

Inspection Finding: The radiation testing program was not reviewed; therefore, this allegation aspect is indeterminate and will be reviewed during a future NRC inspection.

d. Raw Data Recording:

Allegation Aspect: "...in many cases raw test data is unavailable to review since the raw data was not required for many reports and the projects were not reviewed by clientele QA inspectors."

Inspection Finding: The inspection team reviewed the raw data aspect in three areas; thermal aging, design basis events, and mechanical aging. Seven EQ report packages were reviewed and the raw data [circular and strip chart records] were found for all seven. However, in the mechanical aging area, it was determined that the technicians are not recording the raw test data as required after each cycle (Nonconformance B.4 was identified in this area).

Based on the above data, this allegation aspect is partially substantiated.

e. Inadequate Translation of Design Bases:

Allegation Aspect: "...The testing procedures were inadequate...some parts that require a three phase load were only tested single phase...engineering made a guess on how many hours the devices should be thermally aged...fasteners were not torqued...[personnel] performed tests with no technical testing procedures, EQ plans and reports...."

Inspection Findings: The NRC inspectors initial observations of NI personnel performing hardware testing activities determined that technical inconsistencies in its testing methods were obvious. Discussions with NI Technicians and a review of the procedures and instructions that were established to control the activities determined that an incomplete and/or inappropriate translation of the design bases was performed in many cases. The incomplete or inadequate design translation problems were

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further compounded because it was also revealed that an independent review and/or approval was not performed in many cases to ensure the technical adequacy of the documents (Nonconformances B.2 and B.4 were identified in these areas).

Based on the above data, this allegation aspect is substantiated in part.

- f. Procurement and Receipt Inspection Control:
Allegation Aspect: "...Questionable batchlot qualification methodology basis...with no traceability back to the manufacturer's specific batchlot. Some cases of buying from separate distributors at different times and using the same old batchlot numbers...."

This allegation aspect has not been reviewed during this inspection and will be reviewed during a future NRC inspection.

- g. Audits:
Allegation Aspect: "...Check into the external audits performed by the quality assurance department."

Inspection Finding: This aspect was not reviewed during this inspection and will be reviewed during a future NRC inspection.

5. Conclusions Concerning Allegations

Based on the partial substantiation of several allegation aspects, discussed in E.4 above, the NRC staff concludes that the concerns about the method in which NI has controlled its nuclear quality related activities are valid, and the staff has concerns in regard to the basis of NI's safety-related component Certificates of Conformance for previously supplied equipment.

6. QA Program Establishment

The inspectors determined by a QA manual (QAM) review that NI's QA program establishment in the QAM appears to be basically adequate with the exception of the nonconformance in B.1 above. However,

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this does not exclude the possibility of other deviations that may be in NI's QAM, and as discussed with NI management, an NI review should be performed.

Discussion: At the time of the inspection, it was determined that Class 1E activities at Nutherm are categorized into one of two general areas; production activities, which generally require the assembly of qualified components into a completed unit such as a motor control center, and the second is the equipment qualification test facility where individual components are tested for compliance with environmental or class 1E requirements.

Production units were found to be inspected and tested by quality assurance technicians who are independent of organizations responsible for the work and report directly to the quality assurance manager. Equipment facility test activities, however, were found to be performed by technicians who work directly under and report to the test lab manager. The same technicians are also responsible for the QA verification of work performed (nonconformance B.1 and B.3 were identified here). Although this obvious anomaly with Criterion X of Appendix B exists, these activities were found to be in conformance with the Nutherm QAM which does not specifically address itself to nonproduction activities (Nonconformance B.1 above).

7. Design Control

The NRC inspection team review of the areas of transferring technical specifications and parameters into procedures and instructions (design translation) and the document review and approval cycle indicated a QA program breakdown in regard to its implementation (Nonconformance B.2 was identified in this area).

Discussion: Contrary to Criterion III of Appendix B to 10 CFR 50, Section 4 of ANSI N45.2-1977, Section 3 and 5 of the NI QAM, Revision 0, dated June 18, 1986 and Section 4 of the NI QAM, Revision 4, dated January 30, 1985, Nutherm procedures and instructions, in general, were found to lack an adequate translation of required test parameters and specifications into the procedures, and often lacked an independent verification of design requirements for adequacy.

- a. Due to the wide variations possible for a specific type of component, Nutherm has developed the use of Generic Procedures. The generic test procedures were found to be accompanied by a

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qualification result index (QRI) instruction form which is prepared to define the test requirements and parameters for the specific type of component to be tested. For the majority of cases reviewed, however, the QRI instruction form was found to lack sufficient detail. For example, the QRI for Nutherm Project No. BPC-2475 was found to require the cycle aging test to be performed in accordance with Nutherm Procedure No. 9.7.10.10, Revision 3, "Operational Aging of Pushbutton and Selector Switches." This procedure states that the technician is to perform the test at a load equivalent to "rated current at nominal voltage." However, neither the procedure nor the QRI instruction stated the specific value for rated current. Based on discussions with Nutherm personnel it was identified that the specific values are obtained through the technicians' interpretation of the manufacturer's data sheets for the particular device being tested and typically are not delineated or transferred onto the procedures and instructions by the cognizant engineers. Numerous examples were identified, some of which are as follows:

<u>QRI No./Date</u>	<u>Prepared by/Title</u>	<u>Approved by/Title</u>	<u>Hardware</u>
(1) #1494, 12/85 #GPU-1759	SDJ/Design Engineer (Eng.)	BE/QA Eng.	Rotary Switch
(2) #1495, 12/85 GPU-1759	SDJ/Design Eng.	BE/QA Eng.	Control Switch
(3) #1403, 10/85 #NMP-1841	SS/Eng.	LH/Vice President	Switch
(4) #1467, 3/86 #NMP-1841	PB/EQ Secretary (Secy.)	None	Selector Switch
(5) #1759, 1/86 #GPU-1759	SDJ/Design Eng.	None	Control Switch
(6) #1514, 12/85 #GPU-1759	GH/Metallurgist	None	Rotary Switch
(7) #1529, 1/86 #GPU-1897	PB/EQ Secy.	None	Thyrite Protector
(8) #1526, 1/86	GH/Metallurgist and AE/EQ Secy.	None	Current Alarm

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<u>QRI No./Date</u>	<u>Prepared by/Title</u>	<u>Approved by/Title</u>	<u>Hardware</u>	
(9) #1570, 3/86 #1759-63	SDJ/Design Eng.	None	Signal Isolator	
(10) #1540, 1/86 #FPL-1676	DW/Technical Asst.	None	OSA Relay;	
b. A review of EQ and functional test procedures revealed numerous examples where a technical review of the procedure by an independent, qualified reviewer, had not been performed. Specific examples, identified during the review, include the following:				
<u>Procedure Title/No.</u>	<u>Prepared by/Title</u>	<u>Approved by/Title</u>		
(1) Operations Aging for Thyrite Protector, #9.7.10.30, 5/86	PB/EQ Secy.	RH/QA Manager (Mgr.)		
(2) Baseline test for Cycle Duration of Thyrite Protector, #9.7.10.29, 5/86	PB/EQ Secy.	RH/QA Mgr.		
(3) Baseline Testing of Solitech Controllers, #9.7.10.22, 12/85	LH/President	RH/QA Mgr.		
(4) Mechanical Cycle Aging of Airflow Switches, #9.7.10.17, 11/85	MAM/QA Assistant	RH/QA Mgr.		
(5) Baseline Testing of Disconnect Switches, #9.7.10.6, 11/85	MAM/QA Assistant	RH/QA Mgr.		
(6) Operational Aging of Push Button, Selector Switches, #9.7.10.10, 4/86	PB/EQ Secy.	RH/QA Mgr.		

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<u>Procedure Title/No.</u>	<u>Prepared by/Title</u>	<u>Approved by/Title</u>
(7) Function Test for AC Transformer, #9.7.10.39, 3/86	HB/Project Mgr.	RH/QA Mgr.
(8) Baseline Testing for Voltage Relays, #9.7.10.26, 1/86	SDJ/Design Eng.	RH/QA Mgr.
(9) Functional Testing for Temperature Controllers, #7.2.07, 2/85	BE/QA Eng.	RH/QA Mgr.
(10) Functional Testing on Analog and Digital Meters, #7.2.0.6, 3/86	SDJ/Design Eng.	RH/QA Mgr.
(11) Functional Testing of Solitech Solid State Power Controllers, #7.2.13, 10/86	SDJ/Design Eng.	RH/QA Mgr.

In addition to the generic functional and environmental qualification test procedures listed above, the majority of job-specific QRI instruction forms reviewed were also found to lack an independent technical review. Examples of these include:

<u>QRI-NTL Number</u>	<u>Nutherm Project No.</u>	<u>Rev.</u>	<u>Date</u>
(1) 1494	GPU-1759	0	12/23/85
(2) 1495	GPU-1759	0	12/23/85
(3) 1403	NMP-1841	0	10/29/85
(4) 1467	NMP-1841	1	03/05/86
(5) 1496	GPU-1759	0	01/20/86
(6) 1524	GPU-1759	0	12/26/85
(7) 1529	GPU-1897	0	01/21/86
(8) 1526	GPU-017	0	01/07/86
(9) 1570	GPU-1759	0	03/06/86

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- c. Section 3 of the NI QA Manual, "Design Control," states, in part: that "The Quality Assurance Manager shall be responsible for verifying the implementation of an effective Design Control program, when applicable...The Project Engineer(s) assigned the responsibility for a specific project shall be accountable for ensuring that the requirements of this section are implemented, when applicable..." and "The Engineering Manager shall be responsible for ensuring that the appropriate technical aspects are performed and that designers, engineers, analysts and verifiers are in conformance with this Design Control program, when applicable."

Section 4 of NI quality assurance procedure (QAP) 3.0.00, Revision 0, 1, and 2, states, in part: "...Once the Project Manager has completed submittal drawings in accordance with Procedures 3.1.00, 3.1.01, 3.1.02, 3.3.00, he shall submit them to the Engineering Manager for approval. The Engineering Manager shall review for technical acceptability of the design, compliance to the specification and purchase order, and for compliance to procedures." NI QAP 3.0.00, Revision 1, dated July 9, 1986 and QAP 3.0.00, Revision 0, dated February 16, 1985 were reviewed. These revisions also require the NI Engineering Manager to approve drawings.

Drawings were randomly selected from the master drawing file located in the Engineering Department. A review was performed of selected drawings dating from 1983-1986 to identify engineering personnel involved in preparing, reviewing and approving the drawings. NI personnel use initials to signify preparation, review and approval. Examples of the titles of the below identified personnel can be seen in 7.a and 7.b above. The following drawing information was obtained during review of these drawings:

NI REF. NO.	NI DWG NO.	DRAWN BY (DATE)	ENG. REVIEW (DATE)	ENG. APPROVAL (DATE)
NPP-2069	7023-56977-53	CTA (5/28/86)	SD (6/24/86)	DES (6/24/86)
*GPU-1759	7023-56767-53	JEB (10/29/85)	SD (11/11/85)	SS (11/12/85)
GPU-1759	7023-56742-53	JEB (10/9/85)	SD (10/10/85)	LH (10/10/85)
C-1167	7013-55219-53	GAW (12/9/83)	SD (1/6/84)	TLS (1/9/84)
*C-1167	7013-55215-53	GAW (12/9/83)	SD (12/13/83)	GT (12/13/83)
*BE-1214	5001-54983-43	JDS (4/25/83)	SD (4/27/83)	DJ (4/27/83)
PSE-2185	5001-57018-33	CTA (7/21/86)	SD (8/13/86)	DES (8/14/86)

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NI REF. NO.	NI DWG NO.	DRAWN BY (DATE)	ENG. REVIEW (DATE)	ENG. APPROVAL (DATE)
PGE-1762	4033-57009-33	HEE (7/11/86)	HB (7/11/86)	DES (7/11/86)
*GPU-2169	7023-56994-33	CTA (8/21/86)	SD (8/21/86)	HB (8/21/86)
GPU-1759	7023-56749-33	DRM (9/26/85)	SD (9/26/85)	LH (10/7/85)
GPU-1712	4033-56717-33	DRM (11/21/85)	DS (1/31/86)	DES (1/31/86)
*GPU-1712	4033-56689-33	DRM (9/26/85)	SS (9/27/85)	SD (10/3/85)
<p>A review of names, initials and responsibilities of engineering department individuals involved in preparation, review, and approval of the above mentioned drawings indicated that none of the drawings identified above by an asterisk (*) were approved by the Engineering Department Manager. The highest level of Engineering Department personnel involved with review and approval of these particular drawings was Project Manager.</p> <p>Some drawings in the customer order files (NI Reference No.) were examined during a brief general review of purchase order documentation. The following information was obtained during review of these drawings.</p>				
NI REF. NO.	NI DWG NO.	DRAWN BY (DATE)	ENG. REVIEW (DATE)	ENG. APPROVAL (DATE)
FEI 1868	7023-56414-23	DRM (2/1/86)	SD (2/3/86)	DES (2/4/86)
FEI 1868	7023-56400-33	JEB (10/7/85)	SD (10/9/85)	LH (12/6/85)
FEI 1868	7023-56420-33	JEB (10/30/85)	SD (10/30/85)	LH (12/6/85)
FEI 1868	7023-56401-33	CTA (1/13/86)	SD (1/14/86)	DES (1/14/86)
*TVA 1497	1023-55953-33	RW (10/26/84)	GJ (10/30/84)	SD (10/30/84)
<p>The drawing identified above by an asterisk (*) was not approved by the Engineering Department Manager. The level of the Engineering Department personnel involved with the review and approval of this drawing was Project Manager.</p> <p>The current NI Engineering Department Manager (DES) has been in this position since early 1986. He has a BSEE and is a registered Professional Engineer (P.E.). All drawings selected for review which were issued since he was appointed to this position were found to be approved by him with only the above noted exception. The engineering manager indicated that in some cases, (re: Dwg. #5023-57401-53 [WHC-2607]), he</p>				

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personally performs the design work if he decides he is most qualified. In these cases, he typically submits the design drawings for review and approval to his superior, Mr. L. Hinson - President of NI.

8. Inspection Activities

The NRC inspection team observations, reviews of test result forms, and review of the NI QAM indicates that QA has not been adequately assuring the quality of the work activities in its EQ and functional lab testing facility, with the exception of its annual QA audit of the facility. In addition, it was determined that NI's lab technicians that perform the testing are not prohibited from approving their own test results.

Discussion: The NRC inspectors determined by discussions, and observations that QA has not assured that the quality activities that are performed in the lab facility are verified [where and when necessary] "...by individuals other than those who performed the activity being inspected..." or, if disadvantageous, provide indirect control by methods such as monitoring processing methods, equipment, and personnel (Nonconformance B.1 and B.3 were identified in this area).

- a. NI has not implemented its program for the inspection or monitoring of activities affecting quality for any of the work activities that are performed in its testing laboratory, except for its annually scheduled QA audit;
- b. Discussions with NI lab personnel and a review of several of NI's current typical "functional test result" (FTR) forms that had their associated tests completed and were signed off as being verified by QA, revealed that management is allowing the lab technician that performed the work to sign off the form [test results] and use the "QA approval" block for their signature. Therefore, a review of a completed form indicates that QA review and approval was performed; and
- c. Discussions with NI personnel and a review of FTR records indicate that on the previous FTR revision, the test laboratory supervisor was using the "QA approval" block for his signature, indicating that a QA approval had been obtained.

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Component qualification testing performed at Nutherm was found to be categorized into either functional testing or mechanical aging testing with test data recorded on specific forms which relate to the type of test conducted. The previous revision of NI's mechanical aging test result forms were found to require signoff by both the technician and a quality assurance inspector; the current functional test form, however, only requires signoff by a quality assurance inspector. For all functional test forms reviewed, the QA inspector was the same person who performed the work. Subsequent discussions indicated that the practice of the lab technician who performed the work signing the block designated as "QA inspector approval" is the allowable NI practice. In addition, during a review of the previous revision of a mechanical aging test record for NI job #1841, it was noted that the typical form had two signoff blocks, one for QA approval and one for the lab technician signoff. In this example, the person who signed in the "QA approval" block was actually the testing lab manager (Nonconformance B.3 was identified in this area).

9. Test Control

The inspection team reviewed documentation packages to determine if EQ reports had been prepared, testing phases were performed in the proper sequence, raw data was in evidence for design basis event (DBE), thermal aging and mechanical aging, thermal gravimetric analysis (TGA), and other attributes. In addition, the inspection team reviewed documents and observed testing activities that were currently being performed.

Environmental Qualification: Five purchase orders (PO) were randomly selected by the NRC inspector from NI's computer generated listing. It was determined by the inspector that all five PO's were safety-related, had Part 21 and Appendix B to 10 CFR Part 50 imposed. Also, an EQ report had been prepared for each PO. It was determined that the EQ testing was for a mild environment for the selected PO's. The inspector selected seven EQ reports. Five of the EQ reports represented equipment which was tested for mild environment and the other two were selected from NI's EQ report file and represented equipment which was tested for harsh environment. After reviewing the PO's, it was determined that the requirements of IEEE 323-1974 were imposed. The testing sequence of all seven programs were performed in accordance with PO requirements. NI provided the necessary raw data for the design basis event and thermal aging. The inspector did not perform a detailed technical review of this data. The weak link materials and associated activation energies were discussed in each EQ report.

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NI performs numerous generic qualification tests of equipment. One EQ report (BPC-2023) was reviewed and evaluated in detail. The equipment tested was a Microswitch selector switch, a Microswitch heavy duty oiltight indicator, and Ohmite resistors. The temperature requirement was 235 degrees F for 30 minutes duration and then 100 degrees F for 3 days. The requirements were imposed by specification S023-505-5. Devices tested were of the same construction as those supplied. The EQ documentation had three evaluations recorded which indicated the materials of the tested specimens were of the same construction as the supplied equipment. The testing sequence was verified by reviewing the test specimen work order which showed the tests and dates the tests were performed. Review of the functional test data sheets showed that the dates tested matched with the dates on the work order. The functional test data sheets required two measurements to be recorded, however, only one measurement was recorded (Nonconformance B.4 was identified in this area).

Two TGA reports were reviewed to determine if NI subcontracts material analyses for equipment when materials are not known. As an example, TGA-004, dated February 6, 1986, was an analysis performed by Owens Corning for a General Electric indicator and a Master Specialists illuminated switch. TGA-001 report dated May 29, 1985 was an analysis performed by Carelco Laboratories for a General Electric motor. NI indicated that prior to 1984 no TGA analysis was performed. During the NRC inspectors' review of QA procedure 9.7.6.03, dated October 2, 1986, "Procedure for Issuing an Equipment Qualification Procedure or Report," it was noted that this procedure was not adequate in that it did not reference IEEE-323 (1974), which shows the minimum documentation needed in a EQ file. The procedure did not show a step by step method of formulating the EQ report.

Other Tests: In regard to other test lab activities, it was concluded that NI is not adequately controlling safety-related activities that are being performed in its equipment test lab facility (see nonconformance B.4 above). The basis for the nonconformance is discussed below:

- ° During a test lab walk through a technician was observed to test undervoltage relays for NI project No. TVA-2605, at a load current of 2.5 times less than the required load. The technician was asked to demonstrate how the required level of rated load current was determined since this value was not specifically stated within the test instructions or procedure. The technician submitted for review a copy of the manufacturer's

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data sheet for the relay under test and stated that the non-inductive load current and voltage used for the test was derived from a table of values located on the data sheet. The inspectors' review of this data sheet, however, found that the voltage and current ratings listed in the table were for inductive load and should have been increased by a factor 2.5 for non-inductive load applications.

In addition, Criterion XI requires, in part, that all testing required be performed in accordance with written test procedures. Contrary to this, a lab technician was observed to perform Environmental Qualification Test Procedure Number 9.7.10.10, Revision 3, dated April 22, 1986 for Nutherm Project Number BPC-2475, without adhering to the procedural requirements. Specific examples include the following:

- ° Step 4.1 of the procedure was found to require the use of an adjustable input power source but such a power source was not utilized;
- ° Step 4.2 of the procedure specifies the use of an adjustable load bank capable of rated current and nominal voltage including resistive and inductive loads. The test setup, however, was found to contain only resistive loading capability in lieu of the required inductive load;
- ° Step 5.1 of the procedure requires one contact of the device under test to be tested at rated inductive load. Contrary to this requirement, only a resistive load was being used; and
- ° Steps 5.5 through 5.7 of this procedure were found to require the technician to record raw data values of voltage and current following each cycle of the contactor. Contrary to this statement, it was observed during the performance of the tests that the voltage and current values were not being documented as required by the procedure. The procedure referenced above requires 6000 cycles of the contactor and a record maintained of voltage and current indications following each cycle. During the performance of the procedure, however, the technician was observed to record voltage and current indications only twice and stated that it was considered a normal practice. In addition, to a lack of data recording, it was also observed that such parameters are not typically monitored during the performance of the test (Nonconformance B.4 was identified in this area).

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10. Personnel Records

An attempt was made to review the education and experience of selected NI personnel involved with quality-related activities in regard to writing procedures, instructions, translation of design, technical adequacy review/approval, and similar documents that require varying degrees of various qualifications. Most of the QA training files were reviewed to derive a qualification profile for individuals. However, the information contained in the QA files varied from individual to individual. For example, resumes were evident for some individuals, while some files had no educational or background information. However, the payroll files did contain additional educational and background information that were used and considered as QA records by the inspection team. The NRC inspection team also noted that even when both the payroll and QA files were used some of the combined personnel files were found to be either incomplete, incorrect or indeterminate. The initials of the applicable personnel files that require updating include: HB, CG, GW, SS, DW, GJ, SDJ, LH, and PB (Nonconformance B.5 was identified in this area).

11. Audits

The inspection team did not review the area of internal or external audits to any depth. However, it was noted that NI management has allowed the use of a QA inspector as the lead auditor on the QA department audits (Nonconformance B.6 was identified in this area).

12. Measuring and Test Equipment (M&TE)

The NRC inspectors reviewed the applicable NI QAM section, QAP 12.4.CO, "Calibration frequency," and inspected various M&TE equipment and logs. Various M&TE were found in the lab, receipt inspection, and shop areas. These M&TE were inspected for M&TE control numbers and for current calibration. The M&TE inspected are as follows:

<u>ITEM</u>	<u>NI CON. NO.</u>	<u>SER. NO.</u>	<u>CAL. DATE</u>	<u>CAL. DUE</u>	<u>CAL. BY</u>
		<u>Laboratory</u>			
PartLow Temp. Rec.	NI-149	599385	1/14/87	1/14/88	ISL Corp.
PartLow Temp. Rec.	NI-153	6275522	6/17/87	6/17/88	ISL Corp.
Beckman Multimeter	NI-148	30621038	11/6/87	11/6/88	ISL Corp.
Watlow Temp. Control	NI-312	Tag No. 2	9/17/87	9/17/88	GE Evans

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ITEM	NI CON. NO.	SER. NO.	CAL. DATE	CAL. DUE	CAL. BY
<u>Laboratory</u>					
Fluke Multimeter	NI-302	39410124	2/2/87	2/2/88	ISL Corp.
Fluke Ammeter	NI-304	---	6/10/87	6/10/88	ISL Corp.
Torque Wrench	NI-322	---	11/24/86	11/24/87	GE Evans
Multi-Amp Cur. Source	NI-330	46381-001/1	5/30/87	5/30/88	Multi-Amp
Multi-Amp Ammeter	None (rented)	MNC-2666	7/22/87	7/22/88	Multi-Amp
Watlow Temp. Cont.	NI-311	Tag No. 3	9/18/87	9/18/88	GE Evans
Beckman Multimeter	NI-131	10727022	6/22/87	6/22/88	ISL Corp.
Leeds & Northrop Temp. Rec.	NI-161	860670871 -586-08	3/4/87	3/4/88	NI
Analogic Temp. Indic.	NI-157	3002695	6/15/87	6/15/88	ISL Corp.
B&K "O" Scope	NI-315	10859	10/5/87	10/88	NI
<u>Receipt Inspec.</u>					
Continuity Meter	NI-159	5080131	9/15/87	9/15/88	ISL Corp.
Fluke Multimeter	NI-133	3340111	9/15/87	9/15/88	ISL Corp.
<u>Shop</u>					
Hypot	NI-101	3195	7/24/87	7/24/88	ISL Corp.
Meg-chek	NI-103	3351	8/11/87	8/11/88	ISL Corp.
Torque Wrench	NI-323	129277	11/26/86	11/26/87	GE Evans
<p>The November 17, 1987 M&TE computer printout data base was reviewed and the following were noted:</p> <ul style="list-style-type: none"> ° NI-103. The calibration date on the instrument label was August 11, 1987. The calibration date in the data base was July 25, 1986. ° NI-158. The data base indicates this item is in service and required calibration on September 26, 1987. Upon investigation the item could not be located. The technician responsible for calibration indicated this item had been removed from service because it failed calibration during its last calibration service. ° NI-313. The data base indicates this item is in service and required calibration on August 28, 1987. The instrument was located in the shop and was marked with a REFERENCE USE ONLY tag. 					

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° NI-315. The calibration date on the instrument label was October 5, 1987. The calibration date in the data base was October 1, 1986.

The rented ammeter (Ser. No. MNC-2666) found in the laboratory was not listed in the M&TE computer data base. Discussions with QA Manager confirmed that NI does not include rented items in the controlled M&TE program, even though this rented M&TE can be used for activities affecting quality (Nonconformance B.5 was identified in this area).

13. Control of Purchased Material, Equipment, and Services

The NRC inspectors briefly reviewed a number of NI purchase orders. However, the brief review only indicated that NI does procure some material directly as nuclear safety-related. However, most material purchased by NI is commercial grade. NI then dedicates the commercial grade material for use in nuclear Class 1E safety-related equipment delivered to their customers. Activities such as receipt inspection, environmental qualification, and final testing of completed assemblies are employed by NI as a basis for commercial grade material dedication. The following are examples of NI purchase orders for commercial grade material:

<u>PO No.</u>	<u>PO Date</u>	<u>Item</u>	<u>Grade</u>	<u>Receipt Insp. Invoked</u>
GPU-1759-09	1/23/86	Fuses/Fuse Blocks	Com.	Yes
GPU-1759-08	10/15/85	Rotary Relay	Com.	Yes
GPU-1759-07	10/15/85	Resistor	Com.	Yes
GPU-1759-10	11/8/85	Rotary Relay	Com.	Yes
GPU-2573	Various	Various	Com.	Yes

Selected NI purchase orders for M&TE calibration services were reviewed. The vendor's qualification status was ascertained by checking the Approved Vendors List (AVL) in effect at the time of purchase order issue. A summary follows:

<u>PO No.</u>	<u>PO Date</u>	<u>Vendor</u>	<u>Quality Req.</u>	<u>10CFR21 Invoked</u>	<u>Qualified Vendor</u>
3849	10/29/87	Indus. Ser. Lab.	10CFR50	Yes	Yes (Per 9/15/87 AVL)
3821	8/25/87	GE Evans	10CFR50	Yes	Yes (Per 6/4/87 AVL)
3772	5/7/87	Multi-Amp	10CFR50	Yes	Yes (Per 3/13/87 AVL)
3693	1/13/87	Indus. Ser. Lab.	10CFR50	Yes	Yes (Per 1/13/87 AVL)

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a. Purchase order GPU 2573-04 dated May 26, 1987 to Electroswitch was reviewed. Items 3, 4, and 5 on this purchase order were identified as nuclear safety-related and 10 CFR 50, Appendix B and 10 CFR 21 were both invoked. The AVL dated May 15, 1987 listed Electroswitch as a commercial rather than a nuclear vendor. Additional review and discussion with the QA Manager revealed documentation that showed that the QA Manager upgraded Electroswitch to a nuclear supplier on May 7, 1987, but the status code on the AVL was not changed. As a matter of additional note, the status code had not been changed as of the September 1987 issue of the AVL.

b. A number of receipt inspection records for selected purchase orders were reviewed. In general, receipt inspection consists of identifying material through verification of part numbers, verifying proper shipping quantity, and checking for visual shipping damage. The following receipt inspection documentation was reviewed:

<u>Receipt Inspection Date</u>	<u>PO No.</u>	<u>Item No.</u>	<u>Accepted</u>	<u>Inspector</u>	<u>Note</u>
6/4/87	2573/03	2	Yes	AE	1
6/4/87	2537-03	6	No	AE	2
6/10/87	2573-03	Various	Yes	TW	-
6/11/87	2573-03	1	Yes	TW	-
6/24/87	2573-03	5	Yes	TW	-
9/14/87	2573-03	1	Yes	AE	-
Not Recorded	1759-07	1.2	Yes	Not Recorded	1
1/29/86	1759-05	1.2	Yes	AE	1

Note 1: The NI control number of the M&TE used for testing was not recorded.

Note 2: Nonconformance report NCR 1263 dated 6/4/87 was issued.

14. Purchase Order Review

The NRC inspection team reviewed several NRC Licensee Purchase Orders (PO's), that resulted in several of the discussed nonconformances. Some of the NRC Licensee PO's that were reviewed include:

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<u>NI Ref. No.</u>	<u>Plant</u>	<u>Customer PO (Date)</u>	<u>Item</u>	<u>10CFR21 Invoked</u>	<u>Appendix B</u>	<u>Environment</u>
1599	Palo Verde	CVI P5-5665 (2/4/85)	Remote Panel Control	Yes	10CFR50	--
1037	Palo Verde	CTI 11212 (3/11/81)	Elec- trical Heater	Yes	10CFR50	--
1654	Brunswick	CPL 28030 (3/18/85)	Contact Relay	Yes	N45.2	Mild
1654	Brunswick	28031 (3/18/85)	Micro- switch	Yes	N45.2	Mild
1868	San Onofre (1)	FLUOR 441207-6 -0002-01 (11/13/85)	AC/DC Dist. Panels	Yes		Mild
1449	Hope Creek (1)	COMSIP E-7922-181 (8/10/84)	Humidity Element	Yes	10CFR50 N45.2	Mild
1497	Watts Bar	TVA 85K-9-835985 (10/12/84)	Duct Heater	--	--	--
1618	River Bend (1)	Buffalo Forge 72726 (1/28/85)	Power Stud Block	Yes	--	
1665	Bellefonte	85K5-8369 48 (5/7/85)	Bailey Power Supply	Yes	Yes	--
1670	Fitzpatrick	6N029 (12/9/85)	Panels w/BKR's	Yes	Yes	--

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NI Ref. No.	Plant	Customer PO (Date)	Item	10CFR21 Invoked	Appendix B	Environment
1699	Peach Bottom	DE 348898 (4/29/85)	2 pole/ 600 v BKR's	Yes	Yes	--
1701	Millstone	843241 (6/20/85)	CH Relays XFMR, TB's BKR's	Yes	Yes	--
1708	Oyster Creek	PP 0288839 (8/29/85)	Starter Unit, Motor CKT BKR	Yes	Yes	
<p>15. <u>Quality Assurance Procedures</u></p> <p>The QA procedures and instructions were not reviewed within the scope of this inspection. However, the NRC inspector perceives that problems will also exist in this area based on the above findings. Therefore, this area will be reviewed during a future NRC inspection.</p>						
<p>F. <u>NI PERSONNEL CONTACTED:</u></p> <ul style="list-style-type: none"> *W. Eckert, Chairman *L. Hinson, President *T. Stomberski, Vice President *D. Stephens, Engineering Manager *I. Gunin, EQ Manager *C. Baker, Lab Manager *R. Heifner, QA Manager *M. A. McCann, QA *S. Wade, Admin. *J. Winder, Engineering T. Johnson, EQ S. DeJournett, Engineering G. Pierce, Lab B. Revelle, QA A. Evrard, QA R. Winder, Lab 						
<p>*Attended exit meeting.</p>						