

## EXECUTIVE SUMMARY

NAC International, Inc.  
NRC Inspection Report No. 71-0018/96-210 - 72-1015/96-209

A dual inspection was performed at NAC International, Inc. (NAC), to verify compliance with the requirements of 10 CFR Part 71 and 10 CFR Part 72.

- Regarding the requirements of 10 CFR Part 71, the inspectors examined transportation activities associated with NAC transportation packagings and verified corrective actions taken regarding the findings identified during the November 1989 transportation inspection at NAC (Inspection Report No. 90-01).
- Regarding the requirements of 10 CFR Part 72, the inspectors reviewed the dry storage pre-application design controls for the Universal Multi-Purpose Canister System; evaluated the design controls for the Model NAC-S/T dry storage system; and assessed the design amendment regarding the Model NAC-STC transportation packaging to include storage.

The inspectors verified the implementation and determined the effectiveness of NAC's management, design, and maintenance controls.

### Management Controls

The inspectors determined that NAC's quality assurance program was not in compliance with 10 CFR Part 71 and 10 CFR Part 72. Program deficiencies were identified in numerous areas. NAC has undertaken actions to bring the quality assurance (QA) program into compliance.

### Design Controls

The inspectors determined that portions of the NAC design control process were inadequate. The inspectors found that certain design documents were not signed as being reviewed, not signed by all required reviewers, or were signed by unqualified reviewers. The inspectors also found that certain required design documents were not used, design modifications were documented incorrectly, and design documents were not updated to reflect design modifications.

### Maintenance Controls

The inspectors determined that required periodic maintenance of transportation packagings was not performed in accordance with the requirements of the Certificates of Compliance. The inspectors identified instances where leak tests were not performed, replacement parts from unqualified vendors were used, identification and disposition of nonconforming items were not controlled, uncalibrated equipment was used, and uncertified personnel performed maintenance activities.

The inspectors identified nonconformances regarding the requirements of 10 CFR Part 71 and 10 CFR Part 72. The nonconformances are summarized in Table 1. It should be noted that the requirements of 10 CFR Part 71, Subpart H, and 10 CFR Part 72, Subpart G, are similar.

Because of the similarities between the requirements of these Subparts, the nonconformances identified by the inspectors are applicable to both Subparts. However, the nonconformances in this inspection report are identified with respect to the specific Subpart requirements based on the activities inspected.

An exit meeting was held on September 26, 1996, with the individuals identified in Table 2, to present the preliminary inspection findings. After the presentation of the findings, NAC outlined a preliminary action plan to resolve the findings that were identified.

Based on the commitments made to the inspectors at the exit meeting and the telephone conversation between Mr. E. Davis, President and Chief Executive Officer, NAC, and Mr. C. Haughney, Acting Director, Spent Fuel Project Office, NMSS, on September 30, 1996, NRC issued a Confirmatory Action Letter (CAL) to NAC dated September 30, 1996.

Mr. Davis responded to the CAL in a letter dated October 7, 1996, and, as committed to in the CAL, provided an action plan to correct the findings identified by the inspectors and bring the NAC QA Program into compliance with NRC regulations.

As part of NAC's Action Plan presented in its letter dated October 7, 1996, NAC committed to "Reconfirm the adequacy of the maintenance for each transportation cask prior to its next use."

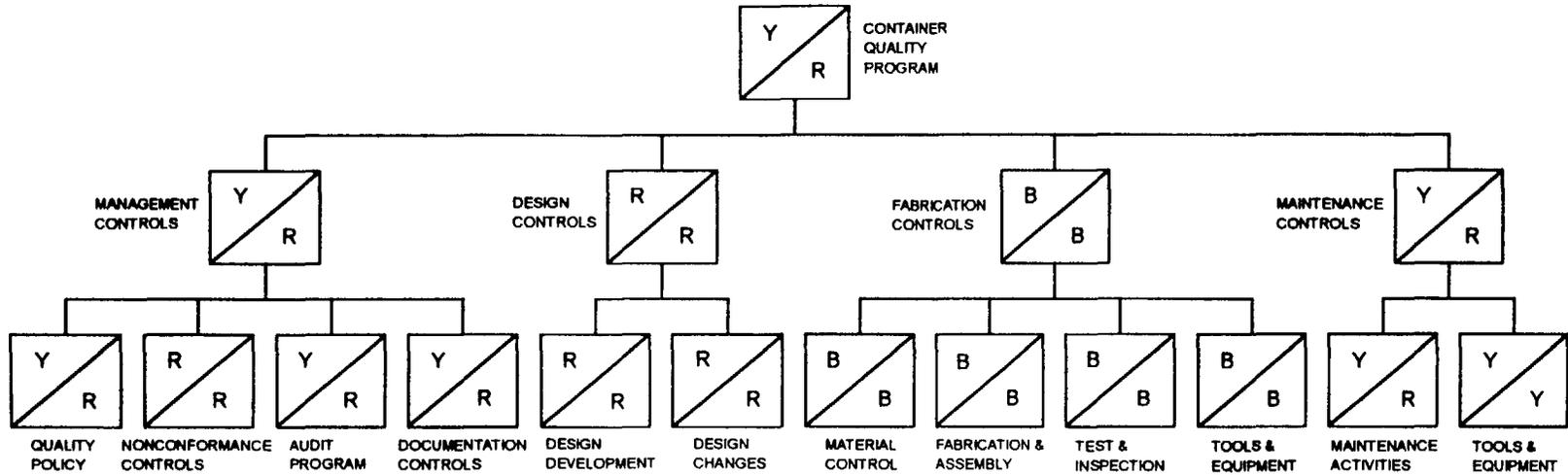
On October 30-31, 1996, an inspection was performed of the annual maintenance and preuse testing of the NAC-LWTs. The inspector determined that the maintenance and testing were performed adequately from a technical standpoint, but that procedure compliance was lacking. NAC management consequently directed that work be stopped, procedures be revised, and personnel be retrained before maintenance and testing of the NAC-LWTs is resumed.

The results of the inspection are shown pictorially in the Inspection Results Summary that follows (Reference NUREG/CR-6314, "Quality Assurance Inspections for Shipping and Storage Containers"). This summary shows that, overall, the QA program described in procedures and instructions meet regulatory requirements. However, the implementation of the NAC QA program does not meet regulatory requirements and application commitments.

**Table 1**  
**Summary of Nonconformances**

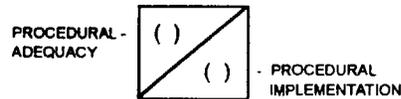
10 CFR Section	Description of Nonconformances	Number
71.103	Quality assurance organization	1
71.105	Quality assurance program	1
71.107	Package design control	8
71.111	Instructions, procedures, and drawings	5
71.115	Control of purchased material, equipment, and services	1
71.121	Internal inspection	1
71.131	Nonconforming materials, parts, or components	1
71.133	Corrective action	1
71.135	Quality assurance records	3
72.146	Design control	3
72.150	Instructions, procedures, and drawings	7
72.152	Document control	1

## INSPECTION RESULTS SUMMARY



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### PERFORMANCE ELEMENT LEGEND



### PERFORMANCE CODES

- G (GREEN) - SURPASSES REGULATORY REQUIREMENTS AND APPLICATION COMMITMENTS
- Y (YELLOW) - MEETS REGULATORY REQUIREMENTS AND APPLICATION COMMITMENTS
- R (RED) - DOES NOT MEET REGULATORY REQUIREMENTS AND APPLICATION COMMITMENTS
- B (BLUE) - NOT APPLICABLE, OR INSUFFICIENT DATA

PERSONS CONTACTED

The inspectors held an entrance meeting on September 23, 1996, to present the scope and objectives of the NRC inspection. On September 26, 1996, the inspectors held an exit meeting to present the preliminary findings of the inspection. In addition to the NRC inspectors, individuals present at the entrance and exit meetings are listed in Table 2.

Table 2  
Entrance/Exit Meeting Attendees

Bill Barrett	Quality Assurance Engineer
Edward Davis	President and Chief Executive Officer
Chris DeLance	Quality Assurance Coordinator
Willington Lee	Vice President and General Manager, Engineering and Design Services
Susan Frant Shankman*	NRC - Chief, Transportation Safety and Inspection Branch
Thomas Shelton	Manager, Cask Operations
Howard Smith	Director, Quality Assurance
Ivan Stuart	Group Executive Vice President, Engineering and Design Services
Thomas Thompson	Manager, Licensing, Engineering and Design Services
James Viebrock	Senior Vice President, Site and Transportation Services
* Present at exit meeting only.	

REPORT DETAILS

1. Scope of Inspection

The inspectors examined the activities for the transportation packagings listed in Table 3 to determine whether these activities had been executed in accordance with the provisions of 10 CFR Parts 21 and 71. The corresponding Certificate of Compliance (COC) number is provided for reference.

Table 3  
Transportation Packagings

COC No.	Model	Quantity	Status
71-9010	NLI-1/2	5	Used routinely (leased to users)
71-9023	NLI-10/24	2	Never used (in storage)
71-9183	NAC-1	6	Being sold
71-9225	NAC-LWT	5	Used routinely (leased to users)

The inspectors also examined the pre-application design activities for the Universal Multi-Purpose Canister System (UMS) and the design control activities for the Models NAC-S/T and NAC-STC storage casks to determine whether these activities had been executed in accordance with the provisions of 10 CFR Part 72 and the commitments made in the Safety Analysis Reports (SARs) for the NAC storage casks.

The inspectors determined the acceptability of design and transportation activities through review of functional procedures and instructions; inspection of selected documents, records, and drawings; verification of personnel training, qualifications, and proficiency; and interviews with personnel responsible for various activities. The inspectors reviewed documents for completeness, adequacy, and appropriate approval signatures; and interviewed staff members to determine their knowledge of applicable policies and procedures.

The inspectors noted that NAC's quality assurance (QA) program is in a state of transition. NAC hired a new QA Director and QA Engineer in 1996. The QA Engineer, under the supervision of the QA Director, performed a comprehensive internal audit of the QA Program in July and August of 1996 and identified numerous findings. As a first step in taking corrective action regarding the findings identified, NAC revised its QA Program Manual to more accurately reflect its actual operation. However, at the time of the inspection, the revised NAC QA Program Manual had not been approved and no additional corrective actions regarding NAC's internal audit findings had been completed. The inspectors used the existing NRC-approved NAC QA Program Manual and current implementing procedures as a basis for performing the inspection.

The scope of the inspection included the review of management, design, and maintenance controls.

## 2. Management Controls

### 2.1 General

The inspectors reviewed company policies and procedures regarding the design and maintenance processes to determine the effectiveness of NAC's management controls. The inspectors reviewed the implementation of company policies and procedures based on the commitments made in the NAC QA Program and the SARs for the NAC storage casks. The inspectors based the evaluation of management controls on NAC's implementation of QA policy, nonconformance controls, documentation controls, and the audit program associated with the design and maintenance of the NAC storage casks.

### 2.2 Quality Assurance Policy

#### Inspection Scope

The inspectors reviewed NAC's QA policy and procedures to ensure effective QA Program implementation. The inspectors assessed QA policy based on the emphasis and controls it placed on ensuring that NAC's QA standards were met. The scope of the inspection of QA policy included the review of the QA program goals, objectives, and policies; personnel responsibilities; QA organizational independence; lines of communication; management involvement; and staffing levels.

#### Observations and Findings

The inspectors noted that NAC top management was most interested in QA Program. The President indicated a strong commitment to implementing a company-wide QA Program that would meet all commitments made to the U.S. Nuclear Regulatory Commission. NAC expects that this will be accomplished through the active participation of all NAC employees in the QA Program on a daily basis.

### 2.3 Nonconformance Control

#### Inspection Scope

The inspectors reviewed NAC's nonconformance control program to ensure that the measures established to control materials, parts, or components that do not conform to requirements, were effective. The scope of the inspection of nonconformance controls focused on verifying NAC's effectiveness in identifying, segregating, tracking, and controlling nonconforming items and program deficiencies.

The inspectors also reviewed procedures, internal postings, supplier notifications, reporting processes, and program controls in accordance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance."

#### Observations and Findings

The inspectors identified a significant nonconformance regarding 10 CFR 71.133, "Corrective action." This section states: "The licensee shall establish measures to assure that conditions adverse to quality . . . are promptly identified and corrected. In the case of a significant condition adverse to quality, the measures must assure that the cause of the condition is determined and corrective action taken to preclude repetition." The inspections identified an instance where corrective action was not taken regarding a previously identified violation.

During the NRC inspection at NAC on November 13-16, 1989, a violation was identified regarding the requirements of 10 CFR 21.6(a). The inspectors found that the regulations in 10 CFR Part 21, Section 206 of the Energy Reorganization Act of 1974, and procedures adopted pursuant to these documents were not posted. In its letter dated March 8, 1990, NAC stated, "The QA Manager or his designee shall perform a 'Quarterly' review of required postings to assure they are in place." However, records of the quarterly review of Part 21 postings were not available to the inspectors.

## 2.4 Documentation Controls

### Inspection Scope

The inspectors reviewed NAC's documentation control program to determine the ability of the QA program to control quality-related documentation. The scope of the inspection of documentation controls included the review of instructions, procedures, and drawings for adequacy, approval signatures, release by authorized personnel, and availability.

### Observations and Findings

The inspectors identified nonconformances regarding the review and approval of design documents. The nonconformances are described in Section 3 of this Inspection Report.

## 2.5 Audit Program

### Inspection Scope

The inspectors reviewed NAC's QA audit program to verify that policies, procedures, and historical records, demonstrating that adequate QA standards had been implemented and practiced, were available. The scope of the inspection of the audit

program included verifying that internal audits and vendor audits had been scheduled and performed in accordance with approved procedures or checklists, that the audits were performed by qualified independent personnel, that the audit results were reviewed by management, and that follow-up actions were taken in areas found to be deficient.

### Observations and Findings

The inspectors found that NAC performed an internal audit in July and August of 1996. The audit was comprehensive and NAC identified numerous findings in most of the 18 criteria of 10 CFR Part 71, Subpart H, and 10 CFR Part 72, Subpart G. NAC's QA staff established an "Action Identification and Resolution Plan" to record, prioritize, and track the actions necessary to correct the audit findings.

The inspectors identified a nonconformance, having minor safety significance, regarding 10 CFR 71.111, "Instructions, procedures, and drawings." This section states: "The licensee shall prescribe activities affecting quality by documented instructions, procedures, or drawings . . . and shall require that these instructions, procedures, and drawings be followed." The inspectors identified an instance where a procedure was not followed.

The inspectors observed that NAC used Audit Finding Reports (AFRs) and Audit Finding Logs (AFLs) to record and track findings. However, the inspectors found that NAC did not have a procedure for using the AFRs and AFLs. The inspectors also found that AFR Nos. 96/E-04-F-01 through 07 were not completed and the 1996 AFL was not current.

## 2.6 Conclusions on Management Controls

The inspectors determined that NAC's QA Program was not in compliance with 10 CFR Part 71, Subpart H, and 10 CFR Part 72, Subpart G. NAC has undertaken actions to bring the QA Program into compliance.

## 3. Design Controls

### 3.1 General

The inspectors reviewed NAC's design controls in all phases of the design process, from the onset of design through the completion of testing and delivery. The inspectors examined original designs and design modifications to ensure that adequate evaluations and reviews were performed by qualified personnel in accordance with the COCs and SARs. The evaluation of design controls was based on NAC's control of original design development and modifications associated with the NAC storage casks.

### 3.2 Design Development

#### Inspection Scope

The inspectors assessed NAC's design development process based on the measures NAC had established to ensure that high standards of design control were implemented and practiced. The scope of the inspection of design development included the review of design control and design modification review; design and organization interfaces; use of appropriate regulatory requirements and quality standards in design activities; and design deviation control.

#### Observations and Findings

- 3.2.1 The inspectors identified a significant nonconformance regarding 10 CFR 71.103, "Quality assurance organization." This section states: "The licensee shall clearly establish and delineate in writing the authority and duties of persons and organizations performing activities affecting the safety related functions of structures, systems, and components." The inspectors identified an instance where signature authority was not controlled.

An unqualified individual was allowed to approve procedures affecting safety-related functions. Specifically, Document No. 260, "Design Control Procedure," required review and approval by the QA Manager. However, the procedure was signed by a QA administrative staff member for the QA Manager. Several other procedures were also signed by the same unqualified individual.

- 3.2.2 The inspectors identified significant nonconformances regarding 10 CFR 71.107, "Package design control." This section states: "The licensee shall establish measures to assure that applicable regulatory requirements and the package design . . . are correctly translated into specifications, drawing, procedures, and instructions. . . . These measures must include the establishment of written procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces. The design control measures must provide for verifying or checking the adequacy of design, by methods such as design reviews . . . ." The inspectors identified instances where design control was unacceptable.

- A. Leak test requirements specified in the COC were not translated into a maintenance procedure. Specifically, COC No. 71-9225 for the NAC-LWT packaging requires that a leak test be performed before first use and at least once within the 12-month period before each subsequent use. The packaging leak test was deleted from the NAC-LWT SAR and the Annual Maintenance Procedure, Document No. 315-P-03. The inspector identified one NAC-LWT packaging that did not undergo leak testing during its annual maintenance in August 1996.

- B. An independent review of a design calculation package was not completed. Specifically, design calculation package SF 487-001 for the design of the NAC-LWT cask drain pipe support bolts did not receive an independent review. This design calculation package contained 10 pages of calculations. Section 5.8.5 of NAC Document No. 260, "Design Control," specifies the requirements for an independent review. There were no signatures indicating that an independent review of the calculations was performed. In addition, the design calculation package was not signed by the Functional Manager nor the Project Manager authorizing the start of the review work and it did not have the Project Manager's signature closing the design effort.
  - C. A Work Request and Report (WRR) did not have evidence of required design review. Specifically, WRR GRR.17 was initiated to prepare operating procedures for Chapter 7, "Operating Procedures," of the NAC-LWT SAR. Operating procedures were required to support a revision to the NAC-LWT SAR which addressed Material Test Research Reactor (MTR) spent fuel. The procedures were for dry and wet unloading of MTR fuel. GRR.17 was completed without obtaining the signatures of an Independent Reviewer, Functional Manager, or Project Manager as required by Section 5.8 of NAC Document No. 260, "Design Control." The changes were incorporated into Revision 11 of the NAC-LWT SAR. Furthermore, GRR.17 did not have a required manager's signature for initiation of work.
  - D. WRR Log No. N95-12 was completed in December 1995 but did not contain a design results synopsis or the final approval of the Project Manager. Sections 5.8.4, 5.8.5, and 5.8.6 of NAC Document No. 260, "Design Control," provide requirements for completing the WRR, the independent review, and documenting final approval.
  - E. Numerous WRRs relating to Revision 11 of the NAC-LWT Cask SAR did not have evidence of the required design reviews. Specifically, WRR Log Nos. GRR.4, GRR.5, and GRR.12 were completed without obtaining final management approval signatures as required by Section 5.8 of NAC Document No. 260, "Design Control."
- 3.2.3 The inspectors identified significant nonconformances regarding 10 CFR 72.146, "Design control." This section states: "The design control measures must provide for verifying or checking the adequacy of design, by methods such as design reviews . . . . For the verifying or checking process, the licensee shall designate individuals or groups other than those who were responsible for the original design, but who may be from the same organization." Likewise, Section 5.8.5 of NAC Document 260, "Design Control," requires and describes independent review of designs. The inspectors identified instances where independent review of design information was unacceptable.

- A. A design package was reviewed and approved by an individual who was not independent from the original design effort. Specifically, a contractor working under direct NAC supervision developed an ANSYS model for performing structural analyses on EA790-2211, "Analysis and Licensing Three Dimensional Structural Finite Model of the UTC Cask Body Generated Using ANSYS Revision 5.2, UMS - 1220." The NAC supervisor administering the contractor's work provided a work description and directed the contractor's design activities. The NAC supervisor performed an independent review of the completed design calculation package and signed the review as both the Independent Reviewer and the Functional Manager. However, the level of involvement in the design process prevented the NAC supervisor from having adequate independence to perform the design review.
  - B. Design calculation packages were not reviewed. Specifically, the signatures of the Independent Reviewer, Functional Supervisor, and Project Manager were missing from the WRRs for the design calculation packages STC-75, "Quasi-Static Limiter Design Analysis," and STC-79, "Inner Lid Bolt Torque and Preload." The signatures of the individual performing the work and the Independent Reviewer were missing from the WRR for the design calculation package STC-570, "Design and Structural Evaluation of Revised Outer Lid."
  - C. The reviewers of calculation packages did not have sufficient independence. Specifically, one individual acted as the Independent Reviewer and Functional Supervisor on the WRRs for the design calculation packages STC-153, "PT-71 Vibration Analysis;" STC-571, "Test Plan and Equipment for 1/4 Scale Quasi-Static Test;" and STC-572, "1/4 Scale Quasi-Static Test and Reports."
- 3.2.4 The inspectors identified nonconformances, having minor safety significance, regarding 10 CFR 71.111, "Instructions, procedures, and drawings." This section states: "The licensee shall prescribe activities affecting quality by documented instructions, procedures, or drawings and shall require that these instructions, procedures, and drawings be followed." The inspectors identified instances where instructions, procedures, or drawings were not followed.
- A. A Computer Output Cover Sheet was not used in support of design activities as required by NAC procedures. Specifically, Sections 5.2.3 and 5.5.1.2 of NAC Document No. 260, "Design Control," required the use of a Computer Output Cover Sheet for all computer output generated in support of design activities. However, a Computer Output Cover Sheet was not used for WRR Log No. GRR.3 which contained computer output. The inspectors were informed that the Computer Output Cover Sheet was no longer required in its original form. The inspectors noted that a new process to replace the Computer Output Cover Sheet was implemented but was not proceduralized or used consistently.

- B. Master Logs were not used as required by NAC procedures. Specifically, NAC Document No. 204, "Controlled Documents," required the use of a Master Log for each project. However, when the inspectors requested Master Logs for various projects they were informed they were not used.

- 3.2.5 The inspectors identified a nonconformance, having minor safety significance, regarding 10 CFR 71.121, "Internal inspections." This section states: "The licensee shall establish and execute a program for inspection of activities affecting quality . . . to verify conformance with the documented instructions, procedures, and drawings . . . ." The inspectors identified an unsatisfactory internal inspection.

A manufacturing traveler for the fabrication of MTR baskets for the NAC-LWT contained recorded dimensions that were not within specified tolerances. Specifically, HI TECH Manufacturing Detail/Assembly Traveler, Serial No. 01749, recorded a length as 4.63 inches when the allowable was 43.6 inches +.06/-.00. The traveler was approved by QA. It should be noted that HI TECH took corrective action immediately in response to this finding and issued Nonconformance Report No. 1100.

- 3.2.6 The Inspectors identified a nonconformance, having minor safety significance, regarding 10 CFR 71.135, "Quality assurance records." This section states: "The licensee shall maintain sufficient written records to describe the activities affecting quality. The records . . . must include closely related specifications such as required qualifications . . . of equipment." The inspectors identified an instance where QA records were not acceptable.

Calculations on design analysis sheets were incorrectly changed. Specifically, design calculations and results on pages 4 and 24 of WRR Log No. GRR.4 were changed using inappropriate methods making them unacceptable as quality records. Changes were made to these calculations and results by use of improper line-outs, "white-out," and nonpermanent methods (e.g., changes made in pencil). These changes were made without any indication as to who made the changes or when the changes were made.

- 3.2.7 The inspectors identified significant nonconformances regarding 10 CFR 72.150, "Instructions, procedures, and drawings." This section states: "The licensee shall prescribe activities affecting quality by documented instructions, procedures, or drawings . . . and shall require that these instructions, procedures, and drawings be followed." The inspectors identified instances where procedures were not followed or were deficient.

- A. A Certification of Verification/Validation sheet modification was not controlled. Specifically, NAC Document No. 262, "Computer Software Control," required the use of a Certification of Verification/Validation sheet to be used when software was verified or validated. However, the

inspectors noted that the Certification of Verification/Validation sheet used for the "RBCUBED" software verification was modified, did not conform to Document No. 262, and did not contain all required information.

- B. Employee Training/Indoctrination Record forms were not used as required by NAC procedures. Specifically, NAC Document No. 414, "Indoctrination and Training," required the use of a NAC Employee Training/Indoctrination Record form which specified and provided a record of individual employee training. However, the inspectors were informed that the records were not consistently used. It should be noted that NAC provided the inspectors with an updated QA Training/Reading list that was being used in place of the Employee Training/Indoctrination Record form.
- C. The NAC "RBCUBED" software manual contained incomplete directions. Specifically, Section IV of the manual described computer input information such as free fall distance before impact, weight, angle of centerline, and associated units. The software manual contained notes that additional information such as length, deflection increment, and associated units were required to be added to Section IV. The additional information was not addressed in Section IV.
- D. File comparison worksheets generated to document satisfactory installation at individual personal computers (PCs) were not available for PC installations made in August and September of 1996. Specifically, Section 5.8.4 of NAC Document No. 260, "Design Control," requires the use of a Formatted Calculations Sheet or equivalent to document attachments supporting the WRR. WRR Log No. 1007 was initiated to perform verification of the Standardized Computer Analyses for Licensing Evaluation (SCALE) installation for PCs. WRR 1007 referenced supporting WRR Log Nos. N96-1 through 5, which documented the SCALE driver installation and PC configuration, as well as the verification of the analysis sequences. WRR Log No. N96-1 was later initiated to install SCALE on a network drive and remove it from local PC hard drives. It should be noted that in response to the inspector's request, the file comparison worksheet was prepared by NAC staff and included with WRR Log No. N96-1.
- E. WRR Log No. N96-1 did not contain the required Project Manager's signature before execution of the work. Specifically, Section 5.8.3 of NAC Document No. 260, "Design Control," provides specific work package interface requirements between the Project Manager and Functional Manager, prior to commencing work. However, these instructions for preparing and approving a WRR were not followed.
- F. A WRR was incorrectly classified. Specifically, the verification and documentation requirements and the classification of the computer program to be used for analysis are specified in Section 4.0 of NAC Document No. 262, "Computer Software Control." WRR Log No. N96-2, used for

verification of the shielding analysis sequence, was incorrectly classified as a Category 1 program on the Computer Resources Manual sheet. Similar analysis sequences were classified as Category 2 programs. It should be noted that NAC staff changed the Computer Resources Manual sheet to reflect the proper verification methodology.

- G. After a WRR specifying work in PCs was closed out, additional work was performed on a PC. Specifically, Revision 1 of WRR Log. No. N96-1 was approved in June 1996, to install the SCALE software on the network drive. The Independent Reviewer's and Functional Manager's approval signatures for the WRR were completed in July 1996, with final approval by the Project Manager on September 15, 1996. However, on September 16, 1996, the Software Installation and Testing Log indicated work was performed on a PC (Serial No. 5440741) and this WRR was referenced. The Software Log showed that work had been completed, that independent review had been performed, and the Functional Manager had approved completion. However, the Software Log did not specify the nature of the additional work nor how it related to WRR N96-1.

- 3.2.8 The inspectors identified a significant nonconformance regarding 10 CFR 72.152, "Document control." This section states: "The licensee shall establish measures to control the issuance of documents such as . . . drawings, including changes, which prescribe all activities affecting quality. These measures must assure that documents, including changes, are reviewed for adequacy, approved for release by authorized personnel, and distributed and used at the location where the prescribed activity is performed." The inspectors identified an instance where document control was unacceptable.

NAC Document No. 215, "Procedure for Preparation of Drawings," did not define actions to be taken to ensure drawing changes were properly captured in other affected documents. Specifically, certain UMS project drawings had been changed but the associated UMS Design Specification, which referenced the drawings, had not yet been updated to reflect the change. It should be noted that NAC was aware of the lack of procedural guidance and took interim actions to ensure appropriate personnel had correct document revisions. NAC had developed, but not yet implemented, a Quality Procedure to address the issue.

### 3.3 Modifications

#### Inspection Scope

The inspectors reviewed NAC's design modification controls to ensure that modifications made to the design received the same level of review as the original design and the modifications were correctly reflected in the design documentation. The scope of the inspection of design modifications included the inspection of

engineering changes, design reviews, and drawing and document changes to ensure that the design modification process was controlled and effective.

### Observations and Findings

The inspectors identified significant nonconformances regarding 10 CFR 71.107, "Package design control." This section states: "Measures must 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 materials, parts, and components of the packaging. . . . These measures must include the establishment of written procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces. . . . The licensee shall subject design changes . . . to design control measures commensurate with those applied to the original design." Likewise, NAC Document No. 260, "Design Control," provides specific interface requirements between the Project Manager and Functional Manager and requires that revisions be reviewed and approved using the same level of design controls and approvals that were applicable to the original release. The inspectors identified instances where design modification control was unacceptable.

- A. A design modification review did not include a review of associated materials and parts. Specifically, an alternate drain pipe had been designed and added to two of the five NAC-LWTs. The inspectors reviewed two design modification packages for this modification. One package contained calculations to determine the adequacy of the drain pipe support bolts. The second package documented changes to the associated SAR, drawings, procedures, and license to reflect the design modification. However, there was no review documentation available to the inspectors regarding the suitability of materials, parts, or an overall configuration fit-up.
- B. A WRR for a design modification did not show evidence of final approval. Specifically, WRR Log No. SF488-001 was initiated to amend the NAC-LWT COC to transport Georgia Tech research reactor fuel. WRR Log No. N95-12 was prepared to perform the associated source term calculations. However, WRR Log No. N95-12 did not contain the Project Manager's, nor Functional Manager's, approval signature.
- C. A modification to a design calculation package did not have a final approval signature. Specifically, calculation package STC-57 pertained to computing maximum fuel clad temperatures. The package was originally reviewed and signed on July 5, 1989, and then modified to correct an error. However, the Project Manager and Functional Manager did not sign the revised calculation package.

### Conclusions on Design Controls

The inspectors determined that portions of the NAC design control process were inadequate. The inspectors found that certain design documents were not signed as being reviewed, not signed by all required reviewers, or were signed by unqualified reviewers. The inspectors also found that certain design documents were not used, design modifications were documented incorrectly, and design documents were not updated to reflect design modifications.

However, through personnel interviews and review of UMS design documentation, the inspectors noted a significant improvement in the design and documentation control processes for recent activities. No findings were identified with respect to the implementation of design controls for the UMS. In addition, the inspectors observed a strong emphasis on design team coordination and communications for the UMS project.

#### 4. Maintenance Controls

##### 4.1 General

The inspectors reviewed NAC's maintenance controls to verify that procedures and programs were established to ensure that maintenance requirements were identified, maintenance activities are performed by qualified personnel, and that adequate tools and equipment are used. The inspectors focused their evaluation of maintenance controls in the areas of requirements, procedures, personnel, materials, and tools and equipment.

##### 4.2 Maintenance Requirements

###### Inspection Scope

The inspectors assessed maintenance requirements, controls, and guidelines to ensure that applicable maintenance was identified, performed, and documented. The scope of the inspection of maintenance requirements included the verification and adequacy of required maintenance, acceptance criteria, defect trending, and hold points.

###### Observations and Findings

The inspectors identified a significant nonconformance regarding 10 CFR 71.131, "Nonconforming materials, parts, or components." This section states: "The licensee shall establish measures to control materials, parts, or components which do not conform to the licensee's requirements in order to prevent their inadvertent use or installation." The inspectors identified an instance where the control of nonconforming packaging was unacceptable.

A nonconforming NAC-LWT was placed in service. Specifically, Step 3.12 of Document No. 315-P-03, "Annual Maintenance Procedure," required a cask trunnion inspection that included verifying that the trunnion bushing is easily

rotated. If the trunnion bushing did not rotate easily, it was to be replaced. The annual maintenance report noted that an NAC-LWT trunnion bushing would not rotate. The bushing was replaced, but still would not rotate. However, the maintenance report was signed as completed even though the nonconforming condition had not been corrected.

#### 4.3 Maintenance Procedures

##### Inspection Scope

The inspectors reviewed maintenance procedures to ensure that they had been documented, approved, and implemented for the performance of all maintenance activities. The scope of the inspection of maintenance procedures included the assessment of the maintenance requirements, the adequacy of the maintenance procedures to accomplish the maintenance requirements, and the root-cause analysis program for evaluating defects identified during the performance of maintenance activities.

##### Observations and Findings

The inspectors found the maintenance procedures were not acceptable. Leak testing requirements, required by the COC and NAC-LWT SAR, were deleted from the annual maintenance procedures. Refer to Paragraph 3.2.2.A of this Inspection Report for details.

#### 4.4 Maintenance Personnel

##### Inspection Scope

The inspectors reviewed maintenance personnel controls to ensure that personnel qualification requirements were identified, required training and experience levels were established and appropriate, and qualification examinations were performed. The scope of the inspection of maintenance personnel focused on personnel training, qualifications, and certifications.

##### Observations and Findings

The inspectors identified a significant nonconformance regarding 10 CFR 71.105, "Quality assurance program." This section states: "The licensee shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained." Likewise, NAC Document No. 190, "Training, Cask Maintenance Program," required that Certified Cask Operators perform maintenance on the NAC-LWTs. The inspectors identified an instance where the training/certification program was deficient.

Maintenance personnel qualifications were not current. Specifically, Certified Cask Operator certification documentation was inspected against the annual

maintenance records for the NAC-LWT cask. Certification records were not available to the inspectors showing that personnel who performed annual maintenance on NAC-LWT's in Taiwan were Certified Cask Operators. These NAC-LWT transportation packagings were later shipped to the United States. In addition, the same individuals were also not listed in the NAC Cask Qualification/Training Record.

#### 4.5 Maintenance Materials

##### Inspection Scope

The inspectors reviewed control of maintenance materials to assess the material control process, including the effectiveness of identifying materials, materials receipt inspections, controls for storage and handling before use, and materials traceability. The scope of the inspection of maintenance materials included the inspection of material specifications, procurement documentation, material receipt and inspection, and spare parts control.

##### Observations and Findings

- 4.5.1 The inspectors identified nonconformances, having minor safety significance, regarding 10 CFR 71.111, "Instructions, procedures, and drawings." This section states: "The licensee shall prescribe activities affecting quality by documented instructions, procedures, or drawings and shall require that these instructions, procedures, and drawings be followed." Likewise, NAC Procedure No. QAM 04.1, "Procurement of Products and Services," states that Quality Assurance shall review all Purchase Requests for products and services. The inspectors identified instances where QA review was unacceptable.
- A. Two Purchase Order (PO) Requests were not signed by the QA Manager and a service was not identified as safety-related. Specifically, PO Nos. 96-00418, dated August 7, 1996, and 96-0050, dated January 19, 1996, were issued for safety related services. However, the PO Requests were not signed by the QA Manager. The QA Manager is responsible for determining if a procured item or service is safety related and must so indicate on the PO Request. Because the QA Manager did not review and sign the PO Request related to PO No. 96-00418, the associated test activity was not identified as safety related.
  - B. The Receiving Inspection Report for torque wrench Serial No. 01347 was not signed by the QA Manager. However, the torque wrench was used in maintenance activities.
- 4.5.2 The inspectors identified nonconformances, having minor safety significance, regarding 10 CFR 71.135, "Quality assurance records." This section states: "The licensee shall maintain sufficient written records to describe the activities

affecting quality." The inspectors identified instances where QA records were unacceptable.

- A. The Equipment History Card for torque wrench Serial No. 01347 was not updated to reflect the calibration performed as directed by PO No. 96-0050.
- B. The Calibration Certificate for torque wrench Serial No. 01347, which was calibrated as directed by PO No. 96-0050, was not available to the inspectors.

#### 4.6 Tools and Equipment

##### Inspection Scope

The inspectors reviewed maintenance requirements to ensure that appropriate maintenance tools and equipment were identified, calibrated, and controlled. The scope of the inspection of maintenance tools and equipment included the inspection of maintenance records to ensure that maintenance tools and associated equipment are identified, calibrated, and controlled. Tool and test equipment documentation is reviewed to ensure the rated measuring ranges and sensitivities are acceptable for the activities performed.

##### Observations and Findings

The inspectors identified a significant nonconformance regarding 10 CFR 71.115, "Control of purchased material, equipment, and services." This section states: "The licensee shall establish measures to assure that purchased material, equipment, and services . . . conform to the procurement documents. These measures must include provisions . . . for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery." Likewise, NAC Procedure QAM 04.1, "Procurement of Products and Services," and Document No. 310, "Procurement Procedure," state all procurement will be made only from NAC-approved suppliers based on their past history, preaward and/or postaward surveys. The inspectors identified an instance of unacceptable control of purchased material, equipment, and services.

An unapproved vendor was used to perform a safety-related service. Specifically, PO No. 96-0050, dated January 19, 1996, was issued for calibration of a 50 - 400 lb. torque wrench -- Serial No. 01247 -- which was used during annual maintenance of NAC transportation packagings. However, the calibration vendor was not on the NAC Approved Vendor List.

##### Conclusions in Maintenance Controls

The inspectors determined that required periodic maintenance of transportation packagings was not performed in accordance with the requirements of the COCs. The

inspectors identified instances where leak tests were not performed, replacement parts from unqualified vendors were used, identification and disposition of nonconforming items were not controlled, uncalibrated equipment was used, and uncertified personnel performed maintenance activities.

**4.7 Followup Inspection of Cask Maintenance and Testing****Inspection Scope**

The inspectors found that the packaging leak test was deleted from the NAC-LWT SAR and the Annual Maintenance Procedure, Document No. 315-P-03, as described in Paragraph 3.2.2.A of this Inspection Report. As part of NAC's Action Plan presented in its letter dated October 7, 1996, NAC committed to "Reconfirm the adequacy of the maintenance for each transportation cask prior to its next use."

On October 30-31, 1996, an inspection was performed of the annual maintenance and pre-use testing of the NAC-LWTs. The inspection was performed at the Alaron Corporation in Wampum, Pennsylvania, where five NAC-LWTs were stored. The activities involved helium leak testing, visual inspection, chemical testing for boron concentration, and maintenance activities such as O-ring replacement.

**Observations and Findings**

The inspector determined that the maintenance and testing were performed adequately from a technical standpoint, but that procedure compliance was lacking. NAC management consequently directed that work be stopped, procedures be revised, and personnel be retrained before maintenance and testing of the NAC-LWTs is resumed. NAC confirmed that these actions would be taken in its letter to the NRC dated October 31, 1996.

**5. Documents Referenced**

The following documents and records were identified in the inspection report. Other documents and records were reviewed by the inspectors, but are not listed.

Action Identification Resolution Plan.

Annual Maintenance Records.

Approved Vendor List.

Audit Findings 96/E-04-F-01 through 07, "Ranor, Inc.," Westminister, MA.

Cask Qualification/Training Record.

Certified Cask Operator Certification Records.

COC No. 71-9225, NAC-LWT.

Computer Resources Manual Sheet.

Design Calculation Package STC-57, "Fuel Clad Maximum Temperature," July 5, 1989.

Design Calculation Package STC-75, "Quasi-Static Limiter Design Analysis," July 13, 1989.

Design Calculation Package STC-153, "PT-71 Vibration Analysis," October 4, 1989.

Design Calculation Package STC-570, "Design and Structural Eval of Revised Outer Lid," August 28, 1992.

Design Calculation Package STC-571, "Test Plan and Equipment for 1/4 Scale Quasi-Static Test," June 22, 1992.

Design Calculation Package STC-572, "1/4 Scale Quasi-Static Test and Reports," June 22, 1992.

Document No. 190, "Training, Cask Maintenance Program," Revision 3, September 22, 1996.

Document No. 204, "Controlled Documents," Revision 5, October 27, 1992.

Document No. 215, "Procedure for Preparation of Drawings."

Document No. 260, "Design Control," Revision 5, December 10, 1992.

Document No. 262, "Computer Software Control," Revision 3, May 21, 1993.

Document No. 310, "Procurement Procedure for Goods and Services," Revision 0, December 1983.

Document No. 315-P-03, "Annual Maintenance Procedures," Revision 3, September 19, 1996.

Document No. 414, "Indoctrination and Training," Revision 0, October 15, 1991.

EA790-2211, "Analysis and Licensing Three Dimensional Structural Finite Model of the UTC Cask Body Generated Using ANSYS Revision 5.2, UMS - 1220."

Employee Training, Indoctrination Records.

Equipment History Card for Torque Wrench Serial No. 01347.

HI TECH Manufacturing Detail/Assembly Traveler, Serial No. 01749.

Letter from NAC International, Inc., to U.S. Nuclear Regulatory Commission, "Inspection Report 90-01," March 8, 1990.

Letter from NAC International, Inc., to U.S. Nuclear Regulatory Commission, "Annual Maintenance of NAC International Radioactive Material Shipping Casks," October 31, 1996.

Inspection Report

Docket Nos. 71-0018, 72-1015

Nonconformance Report No. 1100.

PO Nos. 96-0050, 96-0418.

QA Training/Reading List.

QAM 04.1, "Procurement of Products and Services," Revision 3, February 15, 1995.

RBCUBED Software Manual with Program Verification, Copy No. 1.

Receiving Inspection Reports.

SAR for the NAC-LWT.

SF 487-001, Design Calculation Package.

Software Installation and Testing Log.

Standardized Computer Analyses for Licensing Evaluation (SCALE).

UMS Design Specification.

Work Request and Report Log Nos. GRR.3, GRR.4, GRR.5, GRR.12, GRR.17, N95-12, N96-1 through -5, SF- 488-001, UMS-1007.

LIST OF ACRONYMS USED

AFL	Audit Finding Log
AFR	Audit Finding Report
CAL	Confirmatory Action Letter
COC	Certificate of Compliance
MTR	Material Test Research Reactor
NAC	NAC International, Inc.
PC	Personal Computer
PO	Purchase Order
QA	Quality Assurance
SAR	Safety Analysis Report
SCALE	Standardized Computer Analyses for Licensing Evaluation
UMS	Universal Multi-Purpose Canister System
WRR	Work Request and Report