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NUCLEAR CONTAINERS, INC.
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NUCLEAR CONTAINERS, INC.
OVERALL QUALITY ASSURANCE MANUAL NO. QA-3
FOR PROTECTIVE SHIPPING PACKAGES

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INTRODUCTION

This manual describes the overall Quality Assurance Program of Nuclear Containers, Inc. and delineates QA Requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of packaging and packaging components used in the transportation of Radioactive Nuclear Fuels. Individual Quality Assurance Plans are established in accordance with this manual for each type of packaging manufactured by NCI. The overall QA Program described herein has been established by NCI to meet the specific requirements of 10CFR71, Article 71.51 and Appendix E, and it applies to all packages which are manufactured, modified, or refurbished by Nuclear Containers, Inc.

NCI is primarily a manufacturer of Type B Protective Shipping Packages for nuclear fuels including UF_6, UO_2, PuO_2, and solutions of uranium and/or plutonium. NCI also has package design capabilities and engages in the refurbishing of used packages. NCI is not a licensee and does not handle any radioactive materials.

Since NCI is a small company with only 10 to 25 employees, the means of exercising close administrative control over the manufacture and the quality of Type-B packages and the implementation of QA requirements rests solely with the General Manager and the Production Manager. These two owner/managers have had extensive experience in the fabrication of shipping containers for the nuclear industry giving them appreciation for, and a good understanding of, the necessity for compliance to regulations and to specifications.

INTRODUCTION - Cont'd.

NCI, because of its small size, does not have a separate QA organization. The General Manager is responsible for all administrative, procurement, engineering, and quality assurance functions including all inspections and tests and the preparation and maintenance of QA/QC records. The Production Manager is responsible for all receiving, shipping, and manufacturing operations. Design functions are the joint responsibility of both managers.

Quality assurance and production responsibilities are handled by separate and distinct individuals. The Production Manager is responsible for manufacturing products in accordance with specification and drawing requirements while the General Manager sees that overall quality assurance is maintained. The Production Manager reports to the General Manager. This QA Manual makes allowance for a Quality Assurance Supervisor who would be responsible for incoming material inspections, daily inspections, gage calibrations, testing, QA reports, etc. However, company growth and previous requirements have not made it necessary to add a person in this capacity.

The General Manager serves as the inspector for all required tests and inspections, sometimes using a member of the hourly work force as a helper. The helper is never allowed to perform any inspections himself nor to document any. Welding training and procedure qualification and testing are handled by the Production Manager who is also a qualified welder and works in that capacity when needed.

INTRODUCTION - Cont'd.

Starting with the initial bid invitation and continuing through the award of an order, each manager individually reviews and concurs in approval of all drawings, specifications, and cost estimates. Upon receipt of a formal purchase order or contract, a job number is assigned to each order for cost center accounting and administrative control throughout the job. After becoming completely familiar with the specifications, tolerances and test requirements at the initiation of each job, the major objective of each manager is to direct his efforts on a daily basis to the expeditious manufacture of a finished product exhibiting not only good workmanship, but meeting all specifications and test requirements. Since only a few jobs can be processed in the shop at a time, maximum attention can be given to these jobs by the respective managers.

1.0 ORGANIZATION

1.1 Responsibility

This Quality Assurance Program has been established by Nuclear Containers, Inc. who is solely responsible for its execution. The establishment, revision, or execution of new or existing parts of the program may be delegated outside NCI to others, such as sub-contractors, agents. or consultants, but NCI must retain full responsibility as exercised by the General Manager. The authority and duties of persons and organizations performing such delegated QA functions must be contractually established and delineated in writing by NCI Purchase Order such that all elements of this manual, applicable QA Plans, and of 10CFR71, Appendix E will be implemented. Because of its small size, NCI does not have a separate QA organization.

1.2 NCI Management Philosophy

The basic management philosophy of Nuclear Containers, Inc. is that product quality must never be compromised but must be assured through strict adherence to applicable drawings, specifications, procedures, and QA Plans as required by the QA Program described herein. QA functions are the responsibility of the General Manager and all QA personnel report directly or through chain-of-command to the General Manager.

The Production Manager is responsible for manufacturing quality products in accordance with specifications and drawing requirements, but QA personnel never

1.0 ORGANIZATION - cont'd.

1.2 NCI Management Philosophy - Cont'd.

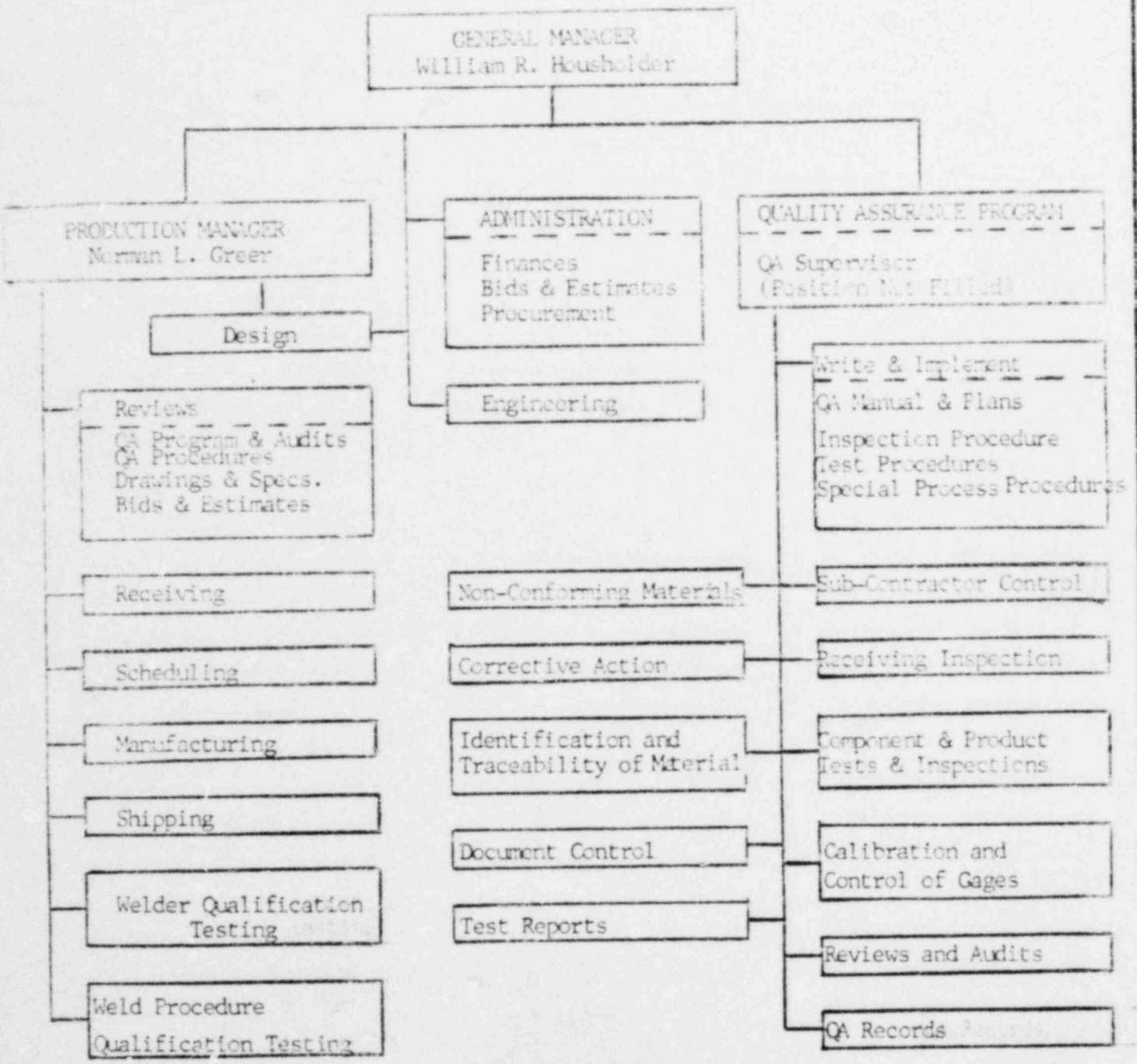
report to the Production Manager either directly or through chain-of-command.

If it should be necessary at some later date to establish a QA Supervisor to be responsible for some or all of the QA Program, that person will report directly to the General Manager and will have the responsibility and authority to stop unsatisfactory work and control further processing, delivery, or installation of non-conforming material just as the General Manager obviously has now.

All QA requirements are communicated to NCI's sub-contractors in writing by purchase order, and continued laison is maintained by the General Manager.

1.0 ORGANIZATION - Cont'd.

1.3 Organization Chart



NUCLEAR CONTAINERS, INC. ELIZABETHTOWN, TENN.		
ORGANIZATION CHART		
DECIMAL TOL.	SCALE	REVISION (DATE)
FRACTIONAL TOL.	DATE 2/4/81	DRAWING NO.

1.0 ORGANIZATION - Cont'd.

1.4 Management Personnel and Duties

The qualification, responsibilities and duties for each manager on the NCI Staff are presented below:

1.4.1 General Manager — William R. Housholder is responsible for the overall management of Nuclear Containers, Inc., and he is personally responsible for implementing the QA Program including QC inspections and testing. Mr. Houshoulder is a Registered Professional Engineer holding a B.S. Degree in Chemical Engineering with three years graduate study in Nuclear Engineering. Mr. Housholder formerly worked six years for Nuclear Fuel Services in Erwin, TN, where as Technical Director, he was responsible for all analytical and development laboratories, quality assurance, and nuclear safety and licensing.

As General Manager at NCI since 1971, Mr. Housholder is responsible for:

(a) Administrative and Financial control.

(b) Overall management and procurement including final approval of all Purchase Orders.

(c) Overall review of cost estimates and bids.

(d) Final approval of all designs, engineering drawings and reports.

(e) Final approval of all phases of the Quality Assurance Program including Quality Assurance Plans and Procedures.

1.0 ORGANIZATION - cont'd.

1.4 Management Personnel and Duties - cont'd.

1.4.1 General Manager - cont'd.

(f) Implementation of the QA Program including:

(1) Inspection and release of incoming materials.

(2) Review, approval, and oversight of sub-contractors QA Programs.

(3) Document Control.

(4) Calibration of gages and test equipment.

(5) Testing and inspection of components, parts, assemblies, and finished products.

(6) Preparation of test and material certification reports.

(7) Maintenance of Quality Assurance Records.

(8) Training of QA Personnel.

1.4.2 Production Manager -- N. L. Greer has been Production Manager at NCI since 1971 and is responsible for all manufacturing operations. Mr. Greer was formerly the Shop Superintendent at HGS Technical Associates and was a Foreman with Daniels Contruction Company for thirteen years.

As Production Manager, Mr. Greer is responsible for:

(a) Direct supervision of workers.

(b) Production Scheduling.

(c) Manpower Scheduling.

(d) Shipping and Receiving.

1.0 ORGANIZATION - cont'd.

1.4 Management Personnel and Duties - cont'd.

1.4.2 Production Manager - cont'd.

(e) Reviewing cost estimates and bid specifications.

(f) Shop fabrication and welding procedures.

(g) Testing welding operators and procedures.

(h) Procurement of shop supplies.

(i) Reviewing all designs and engineering drawings.

(j) Reviewing Quality Assurance Manual and Quality Assurance Plans.

1.4.3 Quality Assurance Supervisor -- When one is needed, the Quality Assurance Supervisor shall be qualified for the job by virture of his experience and education and shall be responsible for implementation of the Quality Assurance Program as follows:

(a) Inspection and release of incoming materials for fabrication.

(b) Daily inspection of detail parts for:

(1) Verification of dimensional tolerances

(2) Surface finish

(3) Weld integrity

(c) Calibration of gages and test equipment.

(d) Testing and inspection of finished product.

(e) Preparation of test and material certification reports.

1.0 ORGANIZATION - Cont'd.

1.4 Management Personnel and Duties - Cont'd.

1.4.3 Quality Assurance Supervisor - Cont'd.

(f) Maintenance of QA Records.

(g) Training additional QA personnel as needed.

1.5 Basis of Management Control

By virtue of the fact that NCI is a small company, administrative control and quality assurance are easily maintained on a job by job basis. Direct managment and control is maintained by the principal owners whose extensive experience in the nuclear industry enables them to understand and appreciate the customer's end use of the product and the necessity for compliance to specifications. The responsibilities of each manager (as defined above) are not delegated to sub-tier supervisors except as provided in this manual. Should further delegations of administrative control and/or quality assurance responsibilities become necessary due to company growth, this manual must be revised to define such responsibilities.

Starting with the initial bid invitation and continuing through the award of an order, each manager individually reviews and concurs in approval of all drawings, specifications, and cost estimates. Upon receipt of a formal purchase order or contract, a job

1.0 ORGANIZATION - Cont'd.

1.5 Basis of Management Control - Cont'd.

number is assigned to each order for cost center accounting and administrative control throughout the job. After becoming completely familar with the specifications, tolerances and test requirements at the initiation of each job, the major objective of each manager is to direct his efforts on a daily basis to the expeditious manufacture of a finished product exhibiting not only good workmanship but meeting all specifications and test requirements. Since only a few jobs can be processed in the shop at a time, maximum attention can be given to these jobs by the respective managers.

2.0 OVERALL QUALITY ASSURANCE PROGRAM

2.1 Policies and Objectives

The basic management philosophy of NCI is that product quality shall not be compromised, that compliance with all applicable specifications, drawings, and procedures must be assured, and that the Quality Assurance Program shall meet all requirements and criteria of 10CFR71, Appendix E.

The objective of this QA Program is to define company organization, philosophy, managment responsibilities, elements of the overall QA Program, required elements of individual QA Plans and Procedures, control of sub-contractors, and especially to comply with the 18 QA elements specified in 10CFR71, Appendix E.

2.2 Application

The Quality Assurance Program as described in this manual is generally applicable to all manufacturing operations at Nuclear Containers, Inc.; it is specifically applicable and enfored without exception for the manufacture of nuclear shipping packages, and it is especially intended to satisfy the requirements of 10CFR71, Article 71.51 and Appendix E.

2.3 RESPONSIBILITIES

The General Manager is responsible for establishing and maintaining the Quality Assurance Program and for writing this manual and all revisions thereto. He is also responsible for advising the Production Manager and other pertinent NCI Personnel which QA policies, manuals, plans, and procedures apply to which packages or jobs.

2.0 OVERALL QUALITY ASSURANCE PROGRAM - Cont'd.

2.3 Responsibilities - Cont'd.

The General Manager is responsible for resolving all internal disputes involving quality; obtaining interpretations from outside authorities such as NRC, DOE, the customer, etc. is often required and is a part of this responsibility.

2.4 Program Approval and Audits

The Quality Assurance Manual and all revisions thereto shall be approved and distributed by the General Manager (See Section 6.0). No other person has the authority to grant approval of a new or different QA Program or to any deviation to this manual as revised. The General Manager shall be responsible for assuring that the QA Program and all QA Plans thereto are regularly assessed as to scope, status, implementation, and effectiveness to assure that the Program is adequate and complies with 10CFR71, Appendix E criteria (See Section 18.0).

2.5 Quality Assurance Plans

2.5.1 Application

A specific Quality Assurance Plan shall be written for each type of package to be manufactured, modified, or refurbished by NCI; also whenever required by ordering data or when deemed necessary by the management staff during the review of a new contract or job. The QA Plan shall provide for all inspection and testing procedures as well as procedures for special manufacturing operations, handling and storage of materials, and storage and handling of finished product. The QA Plan shall provide control over activities affecting the quality of identified materials and components to an extent consistent with their importance to safety and as necessary to assure conformance to the approved design of each package. No portion of the QA Plan shall be at variance with the applicable specifications, contract, ordering data, or 10CFR71, Appendix E.

2.5.2 Safety Related Items

All safety related materials and components shall be identified in the QA Plan, and all QA requirements and procedures shall be based on the complexity and proposed use of the package and its components including:

(1) The importance of malfunction or failure of the item to safety.

(2) The design and fabrication complexity or uniqueness of the item.

2.5 Quality Assurance Plans - Cont'd.

2.5.2 Safety Related Items - Cont'd.

(3) The need for special controls and surveillance over processes and equipment.

(4) The degree to which functional compliance can be demonstrated by inspection or test.

(5) The quality, history, and degree of standardization of the item.

Specific attention shall be focused on 10CFR 71 requirements regarding criticality physics, radiation shielding, stress, thermal, hydraulic, and accident analyses, compatibility of materials, accessibility for inservice inspection, maintenance and repair, features to facilitate decontamination, and delineation of acceptance criteria for inspections and tests.

2.5.3 Intermediate Release Points

The QA Plan shall specify all mandatory intermediate release points and shall state acceptance/rejection criteria.

2.5.4 Inspections

The QA Plan shall specify all required material, components, and specification requirements and shall state the acceptance/rejection criteria and list testing and inspection procedures to be used.

2.5 Quality Assurance Plans - Cont'd.

2.5.5 Identification of Non-Conforming Materials and Products

The QA Plan shall provide for immediate identification of all non-conforming materials including incoming materials, intermediate parts or assemblies, and finished products. Identification shall be by some positive means such as marking, tagging, labeling, etc. (See Section 15.0)

2.5.6 Corrective Action

The QA Plan shall provide for the disposition of non-conforming material and shall stipulate the responsible person(s) for making corrective action decisions. Although the assistance of production personnel should be sought in determining the feasibility of rework procedures, corrective action decisions shall be the responsibility of the General Manager (Quality Assurance Supervisor). Delegation of this responsibility shall be limited to Quality Assurance personnel and shall be specifically stipulated in the QA Plan.

Incomirg materials which are rejected should be prepared for return shipment as soon as practical. Non-conforming intermediate parts and assemblies and finished products should be corrected or rejected and disposed of promptly. Rework is covered in Sections 2.5.7 and 2.5.8.

2.5 Quality Assurance Plans - Cont'd.

2.5.6 Corrective Action - Cont'd.

Approval to deviate from specification requirements is covered in Section 2.5.9. The QA Plan should anticipate and provide for the various methods of disposing of non-conforming materials. (See Section 16.0)

2.5.7 Rework Criteria

The QA Plan shall specify all rework criteria including what types of rework are and are not allowed. Procedures and methods for identifying and handling non-conforming parts before and after rework shall be specified.

2.5.8 Rework Acceptance/Rejection Criteria

The QA Plan shall specify acceptance/rejection criteria for reworked materials and parts and shall list the testing and inspection procedures to be used. The acceptance criteria for reworked items shall be no less stringent than that for originally conforming items.

2.5.9 Deviations from Specifications

Deviations from specifications are not generally acceptable and can be authorized by the General Manager (Quality Assurance Supervisor) only upon approval by the customer. The QA Plan shall specify procedures to be followed in obtaining authorization to deviate from the specifications. No deviations shall be acceptable where safety related items are adversely affected.

2.5 Quality Assurance Plans - Cont'd.

2.5.10 Quality Requirements on Drawings

The QA Plan shall specify what specification requirements must be stated on drawings. Drawings should generally specify or reference specifications for tolerances, material type and specifications, special test requirements, welding and fabrication instructions.

2.5.11 Review and Audit of Suppliers and Sub-Conctractors

The QA Plan shall provide for documented review and audit of suppliers and sub-contractors as contracturally required and as required to assure agreement of the sub-contractors QA Program regarding the implementation of provisions of 10CFR71, Appendix E.

2.5.12 Sub-Contractor Control

The QA Plan shall provide for all reviews, inspections, audits, and any other controls of sub-contractors as required by the contract, specifications, and/or ordering data or as deemed necessary by the management staff. The General Manager shall assure that only trained and qualified NCI personnel are assigned to determine that functions delegated to outside ccntractors are being properly accomplished.

2.5 Quality Assurance Plans - Cont'd.

2.5.13 Material Traceability Requirements

The QA Plan shall include provisions for maintaining the traceability of materials by purchase order, job number, lot number, heat number, etc. as required by the contract, specifications, or ordering data. Such provisions should include maintenance of routing cards, data sheets, intermediate marking, tagging, or labeling, and other such records. (See Section 8.0)

2.5.14 Quality-Affecting Activities

Activities affecting the quality of the package and especially the quality of safety-related items and components (See 2.5.2) shall be identified in the QA Plan. Qualification requirements for personnel performing such quality-affecting activities shall be documented in the QA Plan and implemented per 2.5.15 below. Such activities include but are not limited to:

(a) welding

(b) heat treating

(c) foaming

(d) all QA tests and inspections including:

(1) dimensional inspections

(2) liquid penetrant testing

(3) weld inspections

(4) hydrostatic testing

(5) leak testing

(6) radiography

(e) equipment and gage calibration

2.5 Quality Assurance Plans - Cont'd.

2.5.14 Quality-Affecting Activities - Cont'd.

The QA Plan shall also specify any special personnel training requirements (See Section 2.7).

2.5.15 Qualification Procedures and Records

The QA Plan shall specify all personnel, procedure, and equipment qualification procedures and records required by the contract, specification, and/or ordering data. All such qualifications shall be recorded and those records filed and maintained for a specified period of time. Records and/or certifications of such qualifications shall be submitted to the customer as contractually required.

2.6 Procedures for Handling Incoming Purchase Orders or Contracts

Incoming purchase orders or contracts are handled in the following manner at Nuclear Containers, Inc..

2.6.1 Customer's purchase order or contract is assigned an NCI Job Numer and recorded in the ledger.

2.6.2 Specifications and drawings accompanying the purchase order are reviewed by the management staff and all safety related structures, systems, and components are identified and provisions are made in the QA Plan (See Section 2.5) to assure conformance with 10CFR71.

2.6.3 Approval drawings are prepared and submitted to the customer if required.

2.6.4 Upon receipt of approval drawings from the customer, the necessary shop drawings and specifications are prepared.

2.6.5 General Manager (or Engineering Staff) prepares detail materials take-off with complete specifications.

2.6.6 Requests for quotation and/or purchase orders are then prepared by the General Manager in accordance with Section 4.0. The applicable specifications and drawings are made an integral part of such purchase orders. Requirements for materials certifications and/or test reports are also made an integral part of the purchase order; such requirements shall be in direct compliance with the customers ordering data and/or applicable specifications.

2.6 Procedures for Handling Incoming Purchase Orders or Contracts

2.6.7 The job is released to the Production Manager with the attached information:

(a) Customer and/or shop drawings with specifications.

(b) Copies of all material purchase orders.

(c) Quality Assurance Plan if required. Jobs not related to nuclear shipping packages may not require QA Plans.

(d) Inspection and test procedures.

(e) List of Qualified Personnel for all Quality-Related activities.

2.6.8 The Production Manager then reviews all jobs and schedules them accordingly.

2.6.9 The Production Manager then prepares production procedures as may be required.

2.6.10 The General Manager reviews and approves all procedures prior to the initiation of manufacturing operations.

2.7 Personnel Training

2.7.1 Activities

Personnel responsible for performing most quality-affecting activities are given on-the-job training regarding the principles and techniques of the activity being preformed. Qualification tests are administred and documented for each person and activity as required by the QA Plans. Manufacturing and welder instructions and testing are administered by the Production Manager. Instructions and testing of QA Personnel is administered by the General Manager (QA Supervisor).

2.7.2 Qualifications

Qualifications Records are maintained by the General Manager. A log is maintained for all personnel who have passed qualification test(s) showing what qualifications each man has and the expiration date(s) for such qualifications.

2.7.3 Welder Qualifications and Identifications

Training and certification of manufacturing personnel for quality-affecting activities is limited by current need at NCI to welders. Each welder is assigned a number stamp with which he identifies all welds he makes. All welding on nuclear fuel shipping packages and components is done by welders who are qualified for the type of weld and material being welded in accordance with Section IX,

2.7 Personnel Training - cont'd.

2.7.3 Welder Qualifications and Identifications - cont'd.

ASME Boiler and Pressure Vessel Code. Qualification tests are guided bend test performed at NCI in accordance with Section IX. Weld tests and manufacturing welds are performed in accordance with procedures which have also been qualified per Section IX. Records of all welder and procedure qualifications are maintained on file utilizing ASME forms QW-484 for personnel qualifications and QW-483 for procedure qualifications. Qualified procedure specifications are also maintained utilizing ASME forms QW-482. A listing of QW-482 and QW-483 records are attached as Appendix 2.8.

2.7.4 Training and Certification of Inspectors

Training and certification of NCI Inspectors for special processes is limited by current need to Dye Penetrant Inspection and Dimensional Inspections which are accomplished by the General Manager with the help of helpers form the work force. Such helpers are not allowed to perform or document the actual inspections.

If needed, additional NCI Inspection Personnel will be hired on the basis of experience and must demonstrate proficiency in the classification for which they are selected.

2.8 Listing of QA Plans and Procedures

A list of all NCI QA Plans and Procedures is maintained and up-dated as needed; this list is made a part of the QA Manual and is attached as Appendix 2.8.

3.0 DESIGN CONTROL

3.1 Responsibilities

Designs of new shipping packages for the transportation of radioactive nucler fuels are the joint responsibility of the General Manager and the Production Manager. All designs must receive final approval of the General Manager before application for approval of the Nuclear Regulatory Commission is requested. The General Manager is thus responsible for assuring that the design meets all regulatory requirements as specified in 10CFR71.

3.2 Coordination with Outside Organizations

Most new package designs at NCI evolve from a specific need by one or more of NCI customers who are generally licensees of the Nuclear Regulatory Commission. Often NCI works in conjunction with its customer(s) in developing a package design, in evaluating a package design for compliance with 10CFR71 requirements, in verifying such compliance, and in the preparation and/or submittal of Safety Analysis Reports and requests for NRC approvals.

Where NCI is contracted by its customer for package design work, it is the responsibility of the General Manager to administer the contract and provide laison with the customer.

3.0 DESIGN CONTROL - cont'd.

3.2 Coordination with Outside Organizations - Cont'd.

All outside services provided to NCI in conjunction with package design and evaluation shall be authorized and fully described by NCI purchase order (See Section 4.0). Such services may include computer analyses, drop tests, fire tests, material tests, etc.

Whenever NCI has responsibility for the safety analysis of a package design, the General Manager shall assure that all regulatory requirements as stipulated in 10CFR71 are met as described below. Written procedures must be established to provide for the review, approval, release, distribution, and revision of documents involving design interfaces among the participating design groups. Such procedures must comply with the QA Programs of the organizations concerned.

3.3 Design Evaluation Procedure

3.3.1 Design Concept — Each package design concept shall be evaluated to assure that appropriate quality standards are included in design drawings and specifications and that deviations from such standards are controlled. Also, each design concept shall be reviewed as to the suitability of application of materials, parts, equipment, and processes that are essential to the safety related functions of the

3.0 DESIGN CONTROL - cont'd

3.3.1 Design Concept - Cont'd

materials, parts, and components of the packaging. Valid industry standards such as "Cask Designer's Guide" are used in such evaluations. Materials, parts, and equipment which are standard, commercial (off the shelf) or which have been previously approved for a different application are reviewed for suitability prior to selection.

3.3.2 Safety-Related Items

Each design concept shall be evaluated to assure proper identification of all safety-related functions including: criticality physics, radiation shielding, stress, thermal, hydraulic, and accident analyses, compability of materials, accessibility for inservice inspection, maintenance and repair features to facilitate decontamination, and delineation of acceptance criteria for inspections and tests.

3.3.3 Design Control Checklist

A design control checklist shall be established to assure that the above safety-related functions are fully evaluated regarding the regulatory requirements per 10CFR71 as delineated in NRC Regulatory Guide 7.9.

3.0 DESIGN CONTROL - Cont'd.

3.3.4 Verification Procedures

Designs are reviewed to assure that (1) design characteristics can be controlled, inspected, and tested and (2) inspection and test criteria are identified.

Methods of verifying the adequacy of each design shall be established; these methods may be by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of suitable testing. Where a test program is used to verify the adequacy of a specific design or design feature in lieu of other verifying processes, it shall include suitable qualification testing of a prototype or sample unit under the most adverse design conditions. Worst case conditions shall be defined or the method(s) for determining worst case conditions shall be established.

3.3.5 Design Changes

The General Manager is responsible for assuring that design changes are documented in the design drawings and specifications (See 3.4). After a package design has been approved by NRC, no changes can be made without approval by NRC. All design changes must be fully evaluated for their effects on safety-related functions (See 3.3.2) and are subject to the same design

3.0 DESIGN CONTROL - Cont'd.

3.3.5 Design Changes - Cont'd.

controls and approvals that were applicable to the original design unless the applic[illegible]esignates another qualified responsible organization.

3.3.6 Maintenance and Operating Procedures

Maintenance and operating procedures shall be established as required to assure continued adequacy of all safety-related functions of the package design.

3.3.7 Corrective Action

It is the responsibility of the General Manager to document errors and deficiencies in the design, including the design process, that could adversely affect safety-related structures, systems, and components are documented, and to assure that corrective action is taken to preclude repetition.

3.4 Drawings & Specifications

It is the responsibility of the General Manager to assure the package design, materials, and components are correctly described in drawings and specifications. All applicable regulatory requirements as well as requirements for materials, parts, components, special processes, qualifications, inspections, tests, tolerances, and verification testing per 3.3.4 above shall be included in the drawings and specifications. Applicable QA Plans and procedures shall be referenced in the drawings and specifications.

3.5 QA Plans

A QA Plan shall be established for the manufacture of each newly designed package. Such QA Plan shall comply with the requirements of the QA Program as described herein and with 10CFR71, Appendix E.

3.6 Safety Analysis Report

A safety analysis report (SAR) shall be prepared for each new package design or modification. The SAR shall evaluate the design with respect to all requirements of 10CFR71 and shall be written in accordance with and account for all items covered in Regulatory Guide 7.9.

The SAR shall be submitted to the U.S. Nuclear Regulatory Commission in request for a Certificate of Compliance. No new package design shall be placed in operation for the transportation of radioactive nuclear fuels without such NRC approval.

3.6 Safety Analysis Report - Cont'd.

Preparation of the SAR and all laison with NRC are the responsibility of the General Manager.

3.7 NRC Approval Requirements

Upon receipt of NRC approval of a package design, a final review shall be made to assure that all NRC approval requirements are correctly defined in the drawings, specifications, manufacturing processes, QA procedures, and operating and maintenance procedures. This final review is the responsibility of the General Manager.

4.0 PROCUREMENT DOCUMENT CONTROL

4.1 Procurement Procedures

The requirements for materials, components, and/or outside services are established for each job as prescribed in Section 2.6 above. The General Manager is responsible for obtaining quotations and for issuing purchase orders. Purchase orders are numbered in sequence and a log is maintained for all purchase orders. Written purchase orders, utilizing the 5-part form attached as Appendix 4.1, are required for all materials and components used in the manufacture of nuclear fuel shipping packages as well as for spare or replacement parts. Such written purchase orders are generally not issured for routine shop supplies such as grinding wheels, welding supplies, drill bits, etc. except as required by specification and/or the pertinent QA Plan. Written purchase orders are reviewed and approved by both the Production Manager and the General Manager. Both Managers sign the original copy to indicate their approval.

4.0 PROCUREMENT DOCUMENT CONTROL - Cont'd.

4.2 Procurement Files

The original and acknowledgement copies of the purchase order are sent to the supplier. One yellow copy is filed in the "Job" file. One yellow copy is filed in a "Cron" file by P.O. number. One yellow copy if filed in the "Procurement" files by supplier. When returned, the acknowledgement copy is also filed in the "Procurement" files by supplier with the yellow copy.

4.3 QA Provisions

It is the responsibility of the General Manager to assure that written purchase orders for materials, parts, components, and/or sub-contracted items and services adequately provide for QA requirements by determining the following:

4.3.1 Quality requirements are correctly stated, inspectable, and controllable; there are adequate acceptance and rejection criteria; and the procurement document has been prepared, reviewed, and approved in accordance with QA program requirements.

4.3.2 That the purchase order identifies the applicable 10CFR Part 71, Appendix E requirements which must be complied with and described in the supplier's QA program which shall be reviewed and concurred with by the General Manager prior to initiation of activities affected by the program.

4.0 PROCUREMENT DOCUMENT CONTROL - Cont'd.

4.3 QA Provisions - Cont'd.

4.3.3 That the purchase order contains or references the design basis technical requirements including the applicable regulatory requirements, material and component identification requirements, drawings, specifications, codes and industrial standards, test and inspection requirements, and special process instructions as required by the QA Plan.

4.3.4 That the purchase order identifies the documentation (e.g., drawings, specifications, procedures, inspection and fabrication plans, inspection and test records, personnel and procedure qualifications, and chemical and physical test results of material) to be prepared, maintained, and submitted to the purchaser for review and approval.

4.3.5 That the purchase order identifies those records to be retained, controlled, and maintained by the supplier, and those delivered to the purchaser prior to use or installation of the hardware.

4.3.6 That the purchase order contains the procuring agency's right of access to supplier's facilities and records for source inspection and audit.

4.0 PROCUREMENT DOCUMENT CONTROL - Cont'd.

4.4 Changes and Revisions

Changes and revisions to written purchase orders must be issued using the same 5-part form and following the same review and approval procedures as described above in Sections 4.1, 4.2, and 4.3.

5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

5.1 General Requirements

Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. These shall include appropriate quantitative or quanitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Of particular concern are procedures for special processes such as welding, heat treating, and non-destructive testing as described in Section 9.0; all inspections as described in Section 10.0; and all tests as described in Section 11.0.

5.2 Sequence

Provisions are established which clearly delineate the sequence of actions to be accomplished in the preparation, review, approval, and control of instructions, procedures, and drawings.

5.3 10CFR71, Appendix E Requirements

Methods for complying with each of the 18 criteria of 10 CFR Part 71, Appendix E are specified in instructions, procedures, and drawings.

5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS - Cont'd.

5.4 Acceptance Criteria

Instructions, procedures, and drawings include quantitative (such as dimensions, tolerances, and operating limits) and qualitative (such as workmanship samples) acceptance criteria to verify that important activities have been satisfactorily accomplished.

5.5 Reviews and Approvals

The Production Manager reviews and the General Manager (QA Supervisor) reviews and approves all inspection plans, test, calibration, and special process procedures, drawings and specifications, and changes thereto or acceptable alternatives.

6.0 DOCUMENT CONTROL

6.1 Responsible Person

Control of documents, including distribution, copying, storage, and recall shall be the responsibility of the General Manager. Documents requiring such control shall include all specifications, procedures, drawings, QA Plans, and other QA/QC Records.

6.2 Documents Approvals and Distribution

The General Manager is responsible for review and final approval of all plans, procedures, specifications, and drawings and all revisions thereto. Approval shall be by signature. All documents are assigned an identifying number and are recorded in the document ledger

Distribution of all such documents is made by the General Manager and is limited internally to two copies - one office copy and one shop copy. All other distribution is controlled and recorded in a distribution ledger. Damaged copies can be replaced only upon receipt of the damaged copy which must be properly destroyed. The use of all copy machines is under the control of the General Manager.

The General Manager shall assure that the appropriate documents are available at the location where the activity will be performed prior to beginning the work.

6.0 DOCUMENT CONTROL - Cont'd.

6.3 Changes in Documents

Changes in documents must be of a permanent nature and must be noted by a revision number and date which is marked on the document and recorded in the document ledger. Distribution of document revisions is made in the controlled manner described above and obsolete revisions are recalled as described in Section 6.4.

Temporary changes in documents, especially drawings, are sometimes expedient or necessary and may be done only if authorized by the General Manager (or Quality Assurance Supervior) by signature. Such temporary changes must be made to all copies promptly and permanent revisions must be effected as soon as possible. Note that such temporary changes are to be discouraged.

6.4 Recall of Documents

When revised documents are distributed, the obsolete copies are to be siumltaneously recalled and either stamped "OBSOLETE" or immediately destroyed. When a job is completed all documents must be recalled or accounted for and lost copies noted in the document ledger.

6.0 DOCUMENT CONTROL - Cont'd.

6.5 Quality Assurance Records

Quality Assurance Records shall consist of receiving tickets, material certification reports, inspection reports, test reports, and any other records required for the certification that the finished product conforms with the requirements set forth in the customer's ordering data and/or specifications. All such records shall be maintained as long as contracturally required or as required by the QA Plan.

6.6 Safety Analysis Report Listing

The documents that are controlled under this subsection are identified in the Package Safety Analysis Report. As a minimum this should include:

(a) Design specifications

(b) Design, manufacturing, construction, and installation drawings.

(c) Procurement documents.

(d) QA manuals and plans.

(e) PSAR and related design criteria documents.

(f) Manufacturing, inspection, and testing instructions.

(g) Test procedures.

(h) Design change requests.

(i) Nonconformance reports.

7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

7.1 Procedure for Receipt and Storage of Materials

Fabrication materials and supplies are received and stored in the following manner.

7.1.1 Using a copy of the purchase order, the Production Manager is responsible for verifying the quantity received on a piece count or weight basis.

7.1.2 Tag or mark materials with the job number; also Production Manager's responsibility.

7.1.3 The General Manager is responsible for all required receiving inspections and tests. Machined parts and pieces are checked against dimensional tolerances. Fabrication feed stock materials are inspected for grade, type, heat treat number and cross referenced to accompanying material certification reports and customer's specifications. Receiving inspection shall be performed to assure that:

(a) The material, component, or equipment is properly identified and corresponds with the identification on receiving documentation.

(b) Material, components, equipment, and acceptance records are inspected and judged acceptable in accordance with predetermined inspection instructions, prior to installation or use.

7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES - Cont'd.

7.1 Procedure for Receipt and Storage of Materials - Cont'd.

7.1.3 - Cont'd.

(c) Inspection records or certificates of conformance attesting to the acceptance of material, components, and equipment are available prior to installation or use.

(d) Items accepted and released are identified as to their inspection status prior to forwarding them to a controlled storage area or releasing them for installation or further work.

7.1.4 Isolate and store materials by job number; Production Manager's responsibility.

Note: Material certifications and test reports are requested in the provisions of NCI's initial purchase order and will be in direct compliance with the customer's ordering data and/or applicable specifications.

7.2 Supplier and Sub-Contractor Control

7.2.1 The Production Manager and the General Manager shall be responsible for evaluating the supplier's capability of providing quality services and products, especially critical components; such evaluation shall be made prior to the award of a purchase order or contract.

7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES - Cont'd.

7.2 Supplier and Sub-Contractor Control - Cont'd.

7.2.2 The evaluation of suppliers is based on one or more of the following:

(a) The supplier's capability to comply with the elements of 10CFR Part 50, Appendix B that are applicable to the type of material, equipment, or service being procured.

(b) A review of previous records and performance of suppliers who have provided similar articles of the type being procured.

(c) A survey of the supplier's facilities and QA program to determine his capability to supply a product which meets the design, manufacturing, and quality requirements.

7.2.3 The results of supplier evaluations are documented and filed.

7.2.4 Surveillance of suppliers during fabrication, inspection, testing, and shipment of materials, equipment, and components is planned and performed in accordance with the QA Plan to assure conformance to the purchase order requirements by providing for:

7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES - Cont'd.

7.2 Supplier and Sub-Contractor Control - Cont'd.

7.2.4 - Cont'd.

(a) Instructions that specify the characteristics or processes to be witnessed, inspected, or vertified, and accepted, the method of surveillance and the extent of documentation required, and those responsible for implementing these instructions.

(b) Audits and surveillance which assure that the supplier complies with the quality requirements. Surveillance is performed on those items where vertification of procurement requirements cannot be determined upon receipt.

7.2.5 As a minimum the QA Plan shall require that the supplier furnish the following records:

(a) Documentation that identifies the purchased material or equipment and the specific procurement requirements (e.g. codes, standards, and specifications) met by the item.

(b) Documentation that identifies any procurement requirements which have not been met together with a description of those nonconformances dispositioned "accept as is" or "repair".

The review and acceptance of these documents shall be described in the QA Plan.

7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES - Cont'd.

7.2 Supplier and Sub-Contractor Control - Cont'd.

7.2.6 Supplier's certificates of conformance are periodically evaluated by audits, independent inspections, or tests to assure they are valid.

7.3 Audits of Supplier and Sub-Contractor Control

The QA Plans shall require the assessment of the effectiveness of the control of suppliers at intervals consistent with the importance, complexity, and quantity of the item.

8.0 IDENTIFICATION AND CONTROL OF MATERIAL, PARTS, AND COMPONENTS

8.1 Job Number

All materials, parts, and components are marked with the appropriate job number upon receipt and prior to storage and/or use. All packages and package components manufactured at NCI are assigned a job number even when they are being producted for stock.

8.2 Drawing Identification

Components or materials to be used specifically for certain components are further identified by referencing the item number from the assembly drawing. This marking follows the job number, e.g., component 15 on job number 78-269 would be marked 78-269-15.

8.3 Safety Related Items

Safety related structures, systems, and components are further marked so as to provide traceability to appropriate documentation such as drawings, specifications, purchase orders, manufacturing and inspection documents, deviation reports, and physical and chemical mill test reports.

Suppliers shall be required by provisions in the purchase order to mark materials, parts, and components of safety-related items as required for such traceability; marking with heat numbers is always required where applicable.

8.0 IDENTIFICATION AND CONTROL OF MATERIAL, PARTS, AND COMPONENTS - cont'd.

8.4 QA Plan Requirements

The QA Plan shall provide for the following:

8.4.1 Identification requirements are determined during generation of specifications and design drawings.

8.4.2 The identification and control procedures assure that identification is maintained either on the item or on records traceable to the item to preclude use of incorrect or defective items.

8.4.3 The location and the method of identification do not affect the fit, function, or quality of the item being identified.

8.4.4 Correct identification of material, parts, and components is verified and documented prior to release for fabrication, assembling, shipping, and installation.

8.4.5 Marking required of suppliers shall be predetermined and requirements for purchase order provisions (See Section 8.3) shall be documented in the QA Plan.

9.0 CONTROL OF SPECIAL PROCESSES

9.1 Responsible Person

The General Manager (Quality Assurance Supervisor) shall be responsible for writing all Special Process Procedures.

9.2 Approvals and Revisions

The General Manager must approve all procedures. Changes must be documented and approved by the General Manager, and all changes must be in accordance with drawing and specification requirements.

9.3 Specific Procedures

A detailed written procedure shall be established for each special process such as welding, heat treating, nondestructive testing, cleaning, etc. Procedures shall be sequencially numbered (See Procedure Log, Appendix 2.8). Nondestructive testing procedures shall be written in the format given in Section 11.4. Welding and weld qualification procedures may be documented utilizing ASME Boiler and Pressure Vessel Code forms QW-482 and QW-483 respectively.

9.4 Qualifications

Procedures, equipment, and personnel connected with special processes shall be qualified in accordance with applicable codes, standards, and specifications. All such qualifications are documented, filed with permanent QA records, and kept current.

9.0 CONTROL OF SPECIAL PROCESSES - Cont'd.

9.4 Qualifications - Cont'd.

Welder, weld procedures, and weld inspection (liquid penetrant inspection, etc.) qualifications for all Type B Packages manufactured at NCI are in accordance with Section IX, ASME Boiler and Pressure Vessel Code and are documented using ASME forms QW-483 and QW-484.

9.5 QA Plan Requirements

The QA Plan shall stiuplate qualification requirements for all special processes involved with a given package. Included shall be methods of verification that all special processes are performed by qualified personnel. All welders are assigned identification stamps with which to identify all thier welds. It is the General Manager's (QA Supervisor's) responsibility to assure and document that all such personnel are qualified for the process performed.

9.6 Acceptance and Rejection Criteria

Each test procedure must include acceptance/rejection criteria. If the procedure is not for a specific order but for a standard product then the acceptance/rejection criteria should reflect the general product specification with provisions to impose altered criteria for a specific job to be in accordance with contractural requirements.

10.0 INSPECTION

10.1 QA Plan

The QA Plan (See Section 2.5) for each Type B Package manufactured at NCI specifies the inspection program required to verify conformance of quality-affecting activities with drawing and specification requirements and lists all required Inspection Procedures. The QA Plan also establishes:

10.1.1 Drawings and specifications to be used with inspection procedures or instructions.

10.1.2 Personnel and procedure qualifications required. Such qualifications should be in accordance with applicable codes, standards, and company training program.

10.1.3 Provisions are established that identify mandatory inspection hold points for witness by an inspector including customer requirements for witness by their inspector.

10.1.4 Provisions for indirect control by monitoring processing methods, equipment, and personnel if direct inspection is not possible.

10.0 INSPECTION - Cont'd.

10.2 Inspection Procedures

The General Manager (QA Supervisor) shall be responsible for establishing written Inspection Procedures, Check Lists, or Instructions as required by the QA Plan. Procedures shall be written in the format prescribed in Section 11.4. Provisions shall be made for:

(a) Indentification of characteristics and activities to be inspected.

(b) Identification of the individuals or groups responsible for performing the inspection operation.

(c) Acceptance and rejection criteria

(d) A description of the method of inspection.

(e) Recording evidence of completing and verifying a manufacturing, inspection, or test operation.

(f) Recording inspector or data recorder and the results of the inspection operation.

10.3 Inspection Personnel

Inspection personnel shall be qualified as required above (Section 10.1.2) and shall answer to the General Manager (QA Supervisor) only.

11.0 TEST CONTROL

A test program for each radioactive nuclear fuel (Type B) package manufactured, modified, or refurbished at NCI is established in the QA Plan for that package. All tests are performed and documented in accordance with written procedures as required by the QA Plan. Modifications, repairs, and replacements are tested in accordance with the original designs and testing requirements or acceptable alternates which must be approved by the General Manager and which must meet Regulatory requirements.

11.1 Responsible Person

The General Manager (QA Supervisor) is responsible for writing all testing and inspection procedures.

11.2 Approvals and Revisions

The General Manager must approve all procedures. Changes in a testing or inspection procedure must be written in ink and such changes are to be made only by the General Manager (QA Supervisor) and must be approved by the General Manager. All changes must be in accordance with contractural requirements and must be incorporated in a revised procedure per Section 6.3 as soon as practical.

11.0 TEST CONTROL - Cont'd.

11.3 Specific Procedures

A detailed procedure shall be written for each test, inspection, qualification and calibration required to insure conformance to contractural specifications. Each inspection procedure will be numbered in numerical sequence, dated, and shall incorporate or reference the following:

(a) The requirements and acceptance limits contained in applicable design and procurement documents.

(b) Instructions for performing the test

(c) Test prerequisites such as:

. Calibrated instrumentation.

. Adequate and appropriate equipment.

. Trained, qualified, and licensed or certified personnel.

. Completness of item to be tested.

. Suitable and controlled environmental conditions.

. Provisions for data collection and storage.

(d) Mandatory inspection hold points for witness by owner, contractor, or inspector.

(e) Acceptance and rejection criteria.

(f) Methods of documenting or recording test data and results.

11.0 TEST CONTROL - Cont'd.

11.4 Procedure Format

Test procedures shall be written in the following format:

(a) Scope

(b) Summary

(c) Precision and accuracy

(d) Safety

(e) Apparatus

(f) Materials

(g) Equipment, Procedure, and Personnel Qualifications

(h) Detail Method

(i) Calculations

(j) Comments (including any environmental requirements)

(k) References

11.5 Equipment, Apparatus, and Environmental Requirements

The test or inspection procedure shall list and describe all equipment and apparatus required to perform the procedure. A simple schematic or pictorial drawing should be included whenever an assembly of equipment is required for the procedure such as required in the hydrostatic testing of a pressure vessel. The description should include the manufacurer, model or type number, serial number, drawings, if necessary, and tolerance capabilities.

11.0 TEST CONTROL - Cont'd.

11.5 Equipment, Apparatus, and Environmental Requirements - cont'd.

Any requirements for controlled environmental conditions shall be delineated in the procedure. Of general concern for many tests and test equipment are such environmental conditions as temperature, cleanliness, air movement, barometric pressure, background levels, etc. Adequate controls shall be required in the procedure to assure that equipment requirements are met per manufacturer's recommendations and to assure the required precision and accuracy of the test or inspection (See Section 11.6).

11.6 Precision and Accuracy

Each gage or test instrument must be compared with the specification tolerance and resulting tolerance requirements as specified below in 11.6.1 or 11.6.2. Unless otherwise required or approved by the customer, determinations shall be made with equipment whose precision and accuracy meets the following requirements:

11.6.1 Limits specified as a tolerance (e.g., 20.500 ± .005 inches)

(a) Decimal Numbers - use a device which accurately measures in units no greater than 10% of the specified tolerance range.

11.0 TEST CONTROL - Cont'd.

11.6 Precision and Accuracy - Cont'd.

11.6.1 - Cont'd.

Examples: Tolerance = ± .001 check to nearest .0002

Tolerance = + .001 -0 check to nearest .0001

(b) Fractional Numbers - Use a device which accurately measures in units no greater than one eighth of the specified tolerance range, but no smaller than 1/64 inch.

Examples: Tolerance = ± 1/4 check to nearest ± 1/16 inch

Tolerance = ± 1/32 check to nearest ± 1/64 inch

11.6.2 Limits specified as a "min." or "max."

(a) Decimal Numbers - use a device which accurately measures to within 20% of the last decimal place specified.

Examples: Limit x.xx max. = check to nearest .002

Limit x.xx min. = check to nearest .002

(b) Fractional Numbers- use a device which accurately measures within the following limits:

Specified Max. or Min.	Measure to Nearest
Under 36 inches	1/64 inch
36 through 71 inches	1/32 inch
72 inches through 143 inches	1/16 inch
144 and over inches	1/8 inch

11.0 TEST CONTROLS - Cont'd.

11.7 Acceptance and Rejection Criteria

The test or inspection procedure must include acceptance/rejection criteria. If the procedure is not for a specific order but for a standard product then the acceptance/rejection criteria should reflect the general product specification with provisions to impose altered criteria for a specific job to be in accordance with specification and/or contractural requirements.

11.8 Equipment, Procedure, and Personnel Qualifications

Test and inspection procedures shall include all necessary requirements for qualifications of equipment, procedure, and/or personnel. All required formal qualifi- [illegible] shall be documented and maintained as a permanent Quality Assurance Re[illegible]

11.9 Records and Certifications

Test and inspection procedures shall include provisions for documenting the results of each test or inspection. Report forms should be made an integral part of each procedure. All test reports, Quality Assurance Records, and certifications generated by Nuclear Containers, Inc. must be approved and signed by the General Manager (QA Supervisor).

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT

12.1 Responsible Person

The General Manager (QA Supervisor) is responsible for the calibration of all gages and test equipment. He is also responsible for writing calibration procedures and for maintaining calibration records. This does not prohibit the use of outside agencies for calibration purposes.

12.2 Calibration Schedules

All gages which are of primary concern to the production, inspection, or testing of the product for conformance to the drawing and specification requirements shall be calibrated when installed and on a regular schedule thereafter. The General Manager (QA Supervisor) shall maintain a log on all gages. This log shall reflect the following information:

(a) Type of gage

(b) Gage I.D.

(c) Frequency of calibration

(d) Procedure for calibration

(e) Date calibrated

(f) Signature of person making calibration.

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT - Cont'd.

12.3 Calibration Standards

Primary standards should be traceable to National Bureau of Standards wherever possible and must be so traceable when required by specification and/or ordering data.

12.4 Assurance of Calibration

Most gages are small and are identified by number only; calibration records for such gages are maintained in the calibration log. Larger gages shall be tagged or labeled showing last date calibrated.

12.5 Discrepant Gages

Discrepant gages must immediately be reported and tagged with an "out of order" sign until it is repaired and re-calibrated or removed from the system and turned over to the General Manager (QA Supervisor) for repair or disposal.

12.6 Records

A permanent log for all gages shall be maintained by the General Manager (QA Supervisor)

12.7 Procedure

NCI Inspection Procedure No. I-8 is used for the control and calibration of gages used in the manufacture and inspection of Nucelar Fuel Shipping Packages. See Appendix 12.7.

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT - Cont'd.

12.8 Bases for Calibration Requirement

The Calibration Program described above is established in order to assure the following requirements of 10CFR71, Appendix E:

12.8.1 Provisions, contained in procedures, describe the calibration technique and frequency, maintenance, and control of the measuring and test equipment (instruments, tools, gages, fixtures, reference and transfer standards, and non-destructive test equipment) which is used in the measurement, inspection, and monitoring of safety-related components, systems, and structures.

12.8.2 Measuring and test equipment is identified and traceable to the calibration test data.

12.8.3 Measuring and test equipment is labeled or tagged to indicate date of the next calibration.

12.8.4 Measuring and test instruments are calibrated at specific intervals based on the required accuracy, purpose, degree of usage, stability characteristics, and other conditions affecting the measurement.

12.0 CONTROL OF MEASURING AND TEST EQUIPMENT - Cont'd.

12.8 Bases for Calibration Requirements - cont'd.

12.8.5 Measures are taken and documented to determine the validity of previous inspections performed when measuring and test equipment is found to be out of calibration.

12.8.6 Calibrating standards have an uncertainty (error) requirement of no more than 1/4th of the tolerance or the equipment being calibrated. A greater uncertainty may be acceptable when limited by the "state-of-the-art."

12.8.7 The complete status of all items under the calibration system is recorded and maintained.

12.8.8 Reference and transfer standards are traceable to nationally recognized standards; or, where national standards do not exist, provisions are established to document the basis for calibration.

13.0 HANDLING, STORAGE, AND SHIPPING

13.1 Responsible Person

The Production Manger is responsible for writing any special shipping procedures which must be approved by the General Manager who is responsible for the preparation of all shipping papers and product certifications.

13.2 Handling & Storage

Procedures for handling and storage of materials, parts, and components are described in Sections 7.0 and 8.0. The QA Plan shall stipulate any special procedures required to control the cleaning, handling, storage, packaging, shipping, and preservation of materials, components, and systems in accordance with design and specification requirements to preclude damage, loss, or deterioration by enviromental conditions such as temperature or humidity.

13.3 Release for Shipment

The Production Manager advises the General Manager (QA Supervisor) when a shipment will be ready for shipment giving as much notice as possible. The General Manager (QA Supervisor) must be sure that all tests and inspections required for shipment have been made and that the product meets all specifications. He must also make sure that all required notices and certifications are sent to the customer. No shipping papers can be

13.0 HANDLING, STORAGE, AND SHIPPING - Cont'd.

13.3 Release for Shipment - Cont'd.

prepared without the written approval of the Production Manager and the General Manager (QA Supervisor).

13.4 Specific Documents

A uniform Bill of Lading must accompany every shipment. The Bill of Lading must itemize the shipment describing each item according to the National Motor Freight Tariff Association Classes and Rules. Each item should also be described by model and serial number. One copy of the original Bill of Lading is filed with the job file and another copy is filed with the accounting file.

The General Manager (QA Supervisor) is responsible for preparing all certifications and test reports as required by contract documents and/or specifications. Copies of all certifications and test reports are filed with the job file to back up each shipment.

13.5 Packaging Instructions

Special packaging instructions should be included in the QA Plan. The Production Manager and the General Manager are responsible for writing and approving special packaging instructions which should specify marking or labeling instructions.

13.0 HANDLING, STORAGE, AND SHIPPING - Cont'd.

3.6 Shipping Instructions

Shipping instructions should also be incorporated in the QA Plan and must be in accordance with contractural requirements. Routing instructions may be included in the QA Plan and must be shown on the Bill of Lading.

14.0 INSPECTION, TEST, AND OPERATING STATUS

Provisions are included in the QA Plan regarding inspection, test, and operating status to assure conformance with 10CFR71, Appendix E as follows:

14.1 Identification of the inspection, test, and operating status of structures, systems, and components is known throughout manufacturing and installation.

14.2 The application and removal of inspection and welding status indicators such as tags, markings, labels, and stamps are procedurally controlled.

14.3 Bypassing of required inspections, tests, and other critical operations is procedurally controlled under the cognizance of the General Manager (QA Supervisor).

14.4 The status of nonconforming, inoperative, or malfunctioning structures, systems, or components is identified to prevent inadvertent use (See Section 15.0).

15.0 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

15.1 QA Plan Requirements

As described in Section 2.5.5, procedures for handling nonconforming items are written into the QA Plan for each type of nuclear fuel shipping package or package component manufactured or refurbished at NCI. The QA Plan shall specifically include the following provisions in compliance with 10CFR71, Appendix E, Section 15:

15.1.1 The identification, documentation, segregation, review, disposition, and notification to affected organizations of nonconforming materials, parts, components, or services are procedurally controlled.

15.1.2 Documentation identifies the nonconforming item, describes the nonconformance, the disposition of the nonconformance, and the inspection requirements, and includes signature approval of the disposition by the General Manager (QA Supervisor).

15.1.3 Nonconforming items are segregated from acceptable items and identified as discrepant until properly dispositioned.

15.0 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS - Cont'd.

15.1 QA Plan Requirements - Cont'd.

15.1.4 Acceptability of rework or repair of materials, parts, components, systems, and structures is verified by reinspecting and retesting the item as originally inspected and tested or by a method which is at least equal to the original inspection and testing method. Inspection, testing, rework, and repair procedures are documented.

15.1.5 Nonconformance reports dispositioned "accept as is" or "repair" are made part of the inspection records and forwarded with the hardware to the customer for review and assessment.

15.2 Disposition and Approval

Only the General Manager (QA Supervisor) has the authority to approve the disposition of nonconforming items. The Production Manager is responsible for the disposition after it has been approved. All dispositions of nonconforming items must be in accordance with the QA Plan regarding any special disposition restrictions, customer approvals, specifications and drawing requirements, and regulatory requirements.

15.0 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS - Cont'd.

15.3 Reviews and Assessments

The Management Staff is responsible for periodically analysing nonconformance reports for indications of quality trends and for establishing corrective action per Section 16.0.

16.0 CORRECTIVE ACTION

16.1 QA Plan Requirements

As described in Section 2.5.6, procedures for determining the need and for taking corrective action are written into the QA Plan for each specific package. These procedures are intended to comply with the following provisions of 10CFR71, Appendix E., Section 16:

16.1.1 Evaluation of conditions adverse to quality (such as nonconformances, failures, malfunctions, deficiencies, deviations, and defective material and equipment) is conducted to determine the need for corrective action in accordance with the QA Plan.

16.1.2 Corrective action is initiated following the determination of a condition adverse to quality to preclude recurrence.

16.2 Reviews

Follow-up reviews are conducted by the Management Staff to verify proper implementation of corrective actions and to close out the corrective action documentation. Significant conditions adverse to quality, the cause of the conditions, and the corrective action taken are given special attention by the Management Staff.

17.0 QUALITY ASSURANCE RECORDS

17.1 Responsibility and Requirements

Provisions are made throughout this manual for the maintenance of QA Records especially as required in the QA Plan and in Test, Inspection, Procurement, and Qualification Procedures. The General Manager (QA Supervisor) is responsible for maintaining QA Records as required herein in a well identified and retrievable manner. The QA Plan shall delineate the requirements and responsibilities for record transmittals, retention (such as duration, location, fire protection, and assigned responsibilities), and maintenance subsequent to completion of work are consistent with applicable codes, standards, and procurement documents.

17.2 QA Records Identification

All QA Records shall be identified by Job Number and/or Package Model and Serial Numbers. Sufficient records shall be maintained to provide documentary evidence of the quality of items and the activities affecting quality.

QA Records include operating logs, results or reviews, inspections, tests, audits, and material analyses, monitoring of work performance, qualification of personnel, procedures, and equipment, and other documentation such as drawings, specifications,

17.0 QUALITY ASSURANCE RECORDS - Cont'd.

17.2 QA Records Identification - Cont'd.

procurement documents, calibration procedures and reports, nonconformance reports, and corrective action reports.

17.3 Inspection and Test Records

Inspection and test records shall contain the following where applicable.

(a) A description of the type of observation.

(b) Evidence of completing and verifying a manufacturing, inspection, or test operation.

(c) The date and results of the inspection or test.

(d) Information related to conditions adverse to quality.

(e) Inspector or data recorder identification.

(f) Evidence as to the acceptability of the results.

17.4 Storage Facilities

It is the responsibility of the General Manager to assure that record storage facilities are constructed, located, and secured to prevent destruction of the records by fire, flooding, theft, and deterioration by environmental conditions such as temperature or humidity. This is primarily accomplished by storing QA Records in fire resistant filing cabinets and by requiring that completed records are returned to such filing cabinets and the cabinets locked at the end of each day. An acceptable alternative to this is the storage in approved outside storage such as bank safety deposit drawers.

18.0 AUDITS

18.1 QA Program Audits

The Quality Assurance Program shall be reviewed prior to the initiation of each job for which it is specifically required, and it shall be audited at least once each year. Reviews and audits of the Quality Assurance Manual shall be by the Management Staff only.

18.2 QA Plans & Procedures Audits

All procedures and plans covered by the Quality Assurance Manual shall also be reviewed prior to initiation of each job for which they are specifically required, and they shall be audited at least once each year. Reviews and audits of Quality Assurance procedures and plans shall be by qualified persons appointed by the General Manager.

18.3 Records

All audits shall be recorded by written report and these records shall be maintained by the General Manager.

18.4 10CFR71 Requirements

It is the intent of this Audit Program to provide for the following requirements of 10CFR71, Appendix E, Section 18:

18.4.1 Audits are performed in accordance with pre-established written procedures or check lists and conducted by trained personnel not having direct recponsibilities in the areas being audited.

18.0 AUDITS - Cont'd

18.4 10CFR71 Requirements - Cont'd.

18.4.2 Audit results are documented and then reviewed with the Management Staff.

18.4.3 The Management Staff takes the necessary action to correct the deficiencies revealed by the audit.

18.4.4 Deficient areas are reaudited on a timely basis to verify implementation of corrective actions which minimize recurrence of deficiencies.

18.4.5 Audits include an objective evaluation of quality-related practices, procedures, and instructions and the effectiveness of implementation.

18.4.6 Audits include the objective evaluation of work areas, activities, processes, and items, and the review of documents and records.

18.4.7 Audits to assure that procedures and activities are meaningful and comply with the overall QA program are performed by:

(a) The General Manager (QA Supervisor) to provide a comprehensive independent verification and evaluation of quality-related procedures and activities.

18.0 AUDITS - Cont'd

18.4 10CFR71 Requirements - Cont'd

18.4.7 - Cont'd.

(b) NCI and its principal contractors, to verify and evaluate their suppliers' QA programs, procedures, and activities.

18.4.8 Audits are regularly scheduled on the basis of the status and safety importance of the activities being performed and are initiated early enough to assure effective quality assurance during the design, procurement, and contracting activities.

18.4.9 The Management Staff reviews and assesses audit data and reports for indications of quality trends and the effectiveness of the QA Program.

APPENDIX 2.8

LISTING OF QA PLANS & PROCEDURES

QA MANUALS

QA-1	NCI Q.A. Manual
QA-2	Q. A. Manual for Paducah Tigers
QA-3	Overall Q.A. Program for Protective Shipping Packages

QA/QC PLANS

QC-1	QC Plan for Model FL-10-1 PSP's
QC-2	Welder Qualification Procedure for SS Pressure Vessels.
QC-3	QC Plan for Model SL-10-1 PSP's
QC-4	QC Plan for Rockwell Hanford Operations Neptunium Shipping Containers
QC-5	QC Plan for Rockwell H.O. Model AL-M6 PSP's
QC-6	QC Plan for Paducah Tigers (See UCND QC Plan No. 526)
QC-7	QC Plan for Model 30A PSP's
QC-8	QC Plan for Model 5A, 8A, and 12A PSP's
QC-9	Design Plan for Model 48-14 and 48-10 PSP's
QC-10	QC Plan for Model 48-14 and 48-10 PSP's

Appendix 2.8 - Cont'd.

SPECIAL PROCESS PROCEDURES

SP-1	Stress Relieving Procedure for Hanford Model AL-M6 Inner Container

MANUFACTURING PLANS AND OUTLINES

M-1	Manufacturing Outline for Paducah Tigers
M-2	Manufacturing Outline for 48-14 and 48-10 PSP's

INSPECTION & TEST PROCEDURES

1-1	Hydrostatic Test Procedure for Model FL-10-1 P.V.
1-2	Procedure for assembling and testing the FL-10-1 P.V.
1-3	Halogen Leak Test Procedure for Hanford Model AL-M6 Inner Container
1-4	Dye Penetrant Testing of Welds by Color Contrast Method
1-5	Hydrostatic Test Procedure for containment vessels in Hanford Neptunium Shipping Container.
1-6	Halogen Leak Test Procedure for NCI Model FL-10-1 P.V.
1-7	Dye Penetrant Testing of Welds in Paducah Tiger PSP's
	Gage Control and Calibration
1-9	Wood Inspection Procedure for 48-14 and 48-10 PSP's

Appendix 2.8 - Cont'd.

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PQR-1	GTAW Manual - 5" Sch. 40 Pipe - 304L SS
PQR-2	GTAW Manual - 6" Sch. 80 Pipe - A106 CS
PQR-3	GTAW Manual - 3/8" Plate - A36 CS
PQR-4	GMAW Manual - 3/8" Plate - A36 CS
PQR-5	SMAW Manual - 3/8" Plate - A36 CS
PQR-6	GTAW Manual - 3/8" Plate - A36 CS to 304 SS
PQR-7	SMAW Manual - ½" Plate - A36 CS
PQR-8	GMAW Manual - 3/8" Plate - 304 SS
PQR-9	GTAW Manual - ½" Plate - 17-4 PH SS

Appendix 2.8 - Cont'd.

QW-482 WELDING PROCEDURE SPECIFICATIONS (WPS)

WPS-1 GTAW Manual - P-8 SS - 1/16" to 1/2" - 1/16" Filler
Single or Multiple Pass V-Groove

WPS-2 GTAW Manual - P-8 SS - 1/16" to 1/2" - 3/32" Filler
Single or Multiple V-Groove

WPS-3 GTAW Manual - P-8 SS - 1/16" to 1/2" - 1/8" Filler
Single or Multiple Pass V-Groove

WPS-4 GTAW Manual - P-8 SS - 1/16" to 1/2" - 3/32" Filler
Single or Multiple Pass V-Groove

WPS-5 GTAW Manual - P-8 SS - 1/16" to 1/2" - 1/16" Filler
Single or Multiple Pass Fillet

WPS-6 GTAW Manual - P-8 SS - 1/16" to 1/2" - 3/32" Filler
Single or Multiple Pass Fillet

WPS-7 GTAW Manual - P-8 SS - 1/16" to 1/2" - 1/8" Filler
Single or Multiple Pass Fillet

WPS-8 GTAW Manual - P-1 CS - 3/16" to 0.864" - 3/32" & 1/8"
Filler - Single or Multiple Pass V-Groove

WPS-9 GTAW Manual - P-1 CS - 3/16" to 0.864" - 3/32" & 1/8"
Filler - Single or Multiple Pass Fillet

WPS-10 GTAW Manual - P-1 CS - 1/16" to 3/4" - 3/32" & 1/8"
Filler - Single or Multiple Pass V-Groove

WPS-11 GTAW Manual - P-1 CS - 1/16" to 3/4" - 3/32" & 1/8"
Filler - Single or Multiple Pass Fillet

WELDING PROCEDURE SPECIFICATIONS - Cont'd.

WPS-12 GMAW Manual - P-1 CS - 1/16" to 3/4" - .035" Filler - Single or Multiple Pass V-Groove

WPS-13 GMAW Manual - P-1 CS - 1/16" to 3/4" - 0/035" Filler - Single or Multiple Pass Fillet

WPS-14 SMAW Manual - P-1 CS - 1/16" to 3/4" - 3/32" & 1/8" Electrode - Single or Multiple Pass V-Groove

WPS-16 GTAW Manual - P-1 CS to P-8 SS - 1/16" to 3/4" 3/32" & 1.8" Filler - Single or Multiple Pass V-Groove

WPS-17 GTAW Manual - P-1 CS to P-8 SS - 1/16" to 3/4" 3/32" & 1/8" Filler - Single or Multiple Pass Fillet

WPS-18 SMAW Manual - P-1 CS - 3/16" to 1" - 3/32" & 1/8" & 5/32" Electrode - Single or Multiple Pass V-Groove

WPS-19 SMAW Manual - P-1 CS - 3/16" to 1" - 3/32" & 1/8" & 5/32" Electrode - Single or Multiple Pass Fillet

WPS-20 GMAW Manual - P-8 SS - 1/16" to 3/4" 0.035 to 1/16" Filler - Single or Multiple Pass V-Groove

WPS-21 GMAW Manual - P-8 SS - 1/16" to 3/4" 0.035 to 1/16" Filler - Single or Multiple Pass Fillet

Appendix 2.8 - Cont'd.

WELDING PROCEDURES SPECIFICATIONS - Cont'd

WPS-22 GTAW Manual - 17-4PH SS - 3/16" to 1" 3/32" to 1/8" Filler - Single or Multiple Pass V-Groove

WPS-23 GTAW Manual - 17-4PH SS 3 3/16" to 1" 3/32" to 1/8" Filler-Single or Multiple Pass Fillet

APPENDIX 4.1

INTERSTATE GRAPHICS, INC.
JOHNSON CITY, TENNESSEE

QA-3, Ref. O
2/4/81

PURCHASE ORDER

NUCLEAR CONTAINERS, INC.

Chemical & Nuclear - Engineering and Equipment Fabrication

P. O. Box 1080, Watauga River Industrial Park, Elizabethton, Tennessee 37643
Telephone 615/543-4211

P.O. No. _____

Page _____ of _____ pages.

Date _____

The above number and code number must appear on all Invoices, Packing Lists, Cases and Correspondence.

ISSUED TO

TENNESSEE SALES TAX

☐ Charge Tennessee Sales Tax at the rate of 6%.

☐ Do not charge Tennessee Sales Tax.
Resale Certificate on file--No. 100-773-03400

☐ Liability for sales or use tax on items on this purchase order is assumed by the purchaser. This is authorized by the Tennessee Department of Revenue Industrial Machinery Authorization Number M. _____ Expires _____

DATE TO SHIP	VIA	F.O.B.	TERMS

CODE*	QUANTITY	MATERIAL	PRICE

***OUR PURCHASE ORDER NUMBER AND CODE NUMBER MUST APPEAR ON ALL CASES, PACKING LISTS AND SHIPPING PAPERS. NOTICE OF SHIPMENT IS TO BE SENT AT ONCE TO ORIGINATING OFFICE AND DESTINATION GIVING CAR NUMBER AND ROUTING.**

NUCLEAR CONTAINERS, INC.
ELIZABETHTON, TENNESSEE

THIS ORDER IS SUBJECT TO TERMS AND CONDITIONS APPEARING ON THE REVERSE SIDE HEREOF

1. Acknowledge immediately and give definite shipping date.
2. When shipment is made send notice at once to above address, showing car number, routing or other means of transportation.
3. Mail all invoices in duplicate and original bill of lading to above address.
4. Make no change in price, terms, quantity or delivery without our consent.
5. Packing list must accompany each shipment.

AUTHORIZED BY:

_____
Norman L. Greer, Production Manager

_____
William R. Householder, General Manager

APPENDIX 12.7

QA-3 Revision 0
2/4/81

NCI INSPECTION PROCEDURE NO. I-8

I-8 Revision 0
6/4/79

GAGE CONTROL AND CALIBRATION

1.0 SCOPE AND PURPOSE

This procedure is for the maintenance and calibration of measuring and testing epuipment and outlines control record requirements.

2.0 CALIBRATION SCHEDULES

All gages which are of primary concern to the production, inspection, or testing of the product for conformance to the contractural or specification requirements shall be calibrated when installed and on a regular schedule thereafter as follows:

2.1 At the time of initial inspection of gages, including personally owned equipment, a gage record card shall be initiated for each piece of epuipment. The cards shall be used to record all subsequent inspections and maintenance of the gages.

2.2 Gages requiring an outside calibration shall be sent to a laboratory whose standards are traceable to the National Bureau of Standards; certifications supplied with such calibrations shall be evidence of calibration. Micrometers and vernier calipers may be calibrated in house using certified gage blocks.

2.3 Inspection periods are for periods during which gages are being used and shall not exceed the following:

2.3.1	Gage Blocks	5 years
2.3.2	Surface Plates	5 years
2.3.3	All Master Gages	12 months
2.3.4	Micrometers	3 months
2.3.5	Vernier Calipers	3 monthe
2.3.6	Depth Gages	3 months
2.3.7	Height Gages	3 months
2.3.8	Thread & Ring Gages	3 months
2.3.9	Plug Gages	3 months
2.3.10	Pressure Gages	3 months

3.0 ASSURANCE OF CALIBRATION

Small gages are identified by number only, and calibration records maintained on the gage record cards shall be proof of calibration. Larger gages shall be tagged or labelled showing last date calibrated, date next calibration is due, and inspectors initials or stamp; records of calibration for larger gages shall also be maintained on gage record cards. All gage record cards shall be maintained in a file or notebook.

4.0 DISCREPANT GAGES

Discrepant gages must immediately be removed from the system and tagged with an "out of order" or "reject" sign until it is repaired and recalibrated or scrapped.

5.0 RECORDS

A permanent log (Gage Record Card) shall be maintained for each Gage.

6.0 INSPECTION PROCEDURE FOR MICROMETERS

6.1 Equipment and Materials Required.

6.1.1 Gage Blocks.
6.1.2 Stoddard Solvent or equivalent.
6.1.3 Instrument Oil.

6.2 Maintenance Instructions.

6.2.1 Examine Micrometer spindle for nicks and burrs. If nicks or burrs exist, remove by stoning.
6.2.2 Remove spindle from barrel (anvil) portion.
6.2.3 Clean with Stoddard Solvent (or equivalent) and air dry.
6.2.4 Apply instrument oil (light) to spindle and barrel threads and assemble.
6.2.5 Check for axial looseness; if necessary, adjust by tightening the nut on the spindle thread. Do not overtighten; micrometer must remain free and run smoothly throughout its range.

6.3 Accuracies.

6.3.1 Micrometers must be free of binds and run smoothly throughout their ranges.
6.3.2 The measuring faces of the anvil and spindle shall be flat and parallel within 0.0001 inch as determined in 6.4 below.
6.3.3 The error indicated in calibration measurements shall not exceed those values stated below:

Micrometer Size	Maximum Error Allowed
1" and 2"	± 0.0001 inch
3" thru 7"	± 0.0002 inch
8" thru 12"	± 0.0003 inch
Over 12"	± 0.0005 inch

6.4 Calibration.

6.4.1 Adjust micrometer to zero per manufacturers instructions.
6.4.2 Check indicated measurement error using each of the following gage blocks: 0.0625"; 0.100"; 0.125"; 0.250"; 0.500"; and 1.000". One inch build up will be necessary for each subsequently larger micrometer.

6.4.3 A difference in the indicated errors at 0.0625" and 0.100" indicates measuring faces not flat and parallel. Such a difference in excess of 0.0001" is unacceptable and shall be cause for rejection.
6.4.4 Any indicated error in excess of that listed in 6.3.3 shall be cause for rejection.
6.4.5 If the micrometer does not meet the accuracy requirements of 6.3 after rechecking and recalibrating per 6.2 and 6.4, it shall be removed from the system and repaired or scrapped.

7.0 INSPECTION PROCEDURE FOR DEPTH MICROMETERS

7.1 Visual inspection for damage, dirt, and corrosion (includes base flatness, bent rods, etc.).

7.2 Three readings shall be taken at 0.000"; 0.250"; and 0.900" with the 0 to one-inch rod. Gage blocks and surface table shall be used for these three readings.

7.2.1 One reading for each of the remaining rods may be taken. Satisfactory readings and cleaning determine acceptance or rejection.

8.0 INSPECTION PROCEDURE FOR INSIDE MICROMETERS

8.1 Visual inspection for damage, dirt, and corrosion (includes bent rods, etc.).

8.2 Three readings for each head shall be taken using gage blocks and indicator.

8.3 All extention rods may be checked to indicate accuracy.

8.4 Satisfactory results of inspections described above shall determine acceptance.

9.0 INSPECTION PROCEDURE FOR PLAIN PLUG GAGES

9.1 Visual inspection for damage, dirt, and corrosion.

9.2 Go and No Go member diameters shall be checked with a micrometer and gage blocks.

9.3 Upon completion and acceptance, plugs shall be sealed to prevent corrosion and damage.

10.0 INSPECTION PROCEDURE FOR DRILL BLANKS

10.1 Visual inspection for damage, dirt, and corrosion.

10.2 Acceptance ascertained by measuring all diameters at a minimum of 4 places using a micrometer and gage blocks.

11.0 INSPECTION PROCEDURE FOR GAGE, TOOL SETTING

11.1 Tool setting gages shall include the following:

11.1.1 Telescoping gages.
11.1.2 Small hole gages.
11.1.3 Adjustable parallels.
11.1.4 Height transfer.

11.2 These instruments shall require rigid visual inspection only for damage, dirt, corrosion, and function.

12.0 INSPECTION PROCEDURE FOR STEEL TAPES

12.1 Visual inspection for damage, dirt, and corrosion (includes crimps, dents, breaks, etc.).

12.2 Comparison checking with approved standards including micrometers and calipers at the short range of the tape.

13.0 INSPECTION PROCEDURE FOR VERNIER PROTRACTORS

13.1 Visual inspection for damage, dirt, and corrosion.

13.2 Verify three readings with standards of known angles.

14.0 INSPECTION PROCEDURE FOR DIAL INDICATORS

14.1 Visual inspection for damage, dirt, corrosion, and function.

14.2 A gage block step system shall be used to determine accuracy of all indicators.

14.2.1 Dial indicator finger shall assume proper attitude to minimize potential error.

14.2.2 Travel shall be checked in both directions where applicable.

15.0 INSPECTION PROCEDURE FOR VERNIER CALIPERS

15.1 Clean the calipers with approved solvent, and inspect to ensure that the instrument is free of all burrs and corrosion and operates smoothly.

15.2 Zero the instrument per manufacturers instructions.

15.3 Measure a 0.250"; a 0.500"; a 1.000"; and a 2.000" gage block with the outside measuring system.

15.3.1 The measurements should be made at least 1/8 inch from the tips of the jaws.

15.3.2 The vernier may be adjusted for minor discrepancies if an adjustable calipers is being calibrated.

Appendix 12.7 Cont'd.

15.4 For calibrating the inside measuring system, use a micrometer and gage blocks; take measurements at 1.000 inch and at any other indications of interest.

15.5 For calibrating the depth indicator on the calipers, place a carefully stacked 2" assembly of gage blocks along side a 2" gage block on a surface table and measure the depth of the gap between them by resting the end of the calipers on the blocks and running the depth probe down between them.

15.6 The vernier may be adjusted for minor discrepancies if an adjustable calipers is being calibrated.

15.7 Any calipers giving an indicated error of more than ± 0.001 inch shall be rejected. If the calipers are rejected again after rechecking and recalibrating as described above, they shall be removed from the system for repair or disposal.

16.0 INSPECTION PROCEDURE FOR PRECISION GAGE BLOCKS

16.1 Certification and calibration shall be accomplished by an approved laboratory.

16.2 Gage blocks shall be removed from the system if at any time any damage or corrosion is noted.

16.3 Gage blocks must be kept perfectly clean at all times and should be stored with a thin film of instrument oil on all surfaces.

16.4 Handling of the precision faces must be avoided; finger prints on these surfaces must be removed at once.

16.5 The precision faces must be clean, bright and shinning at all times.