Revision 1
30 September 1981

NORTH CAROLINA STATE UNIVERSITY
Nuclear Engineering Department
Quality Assurance Program

for

Shipping Radioactive Material

Introduction

This document establishes the quality assurance program (QAP) of the Nuclear Engineering Department (NED), North Carolina State University (NCSU) at Raleigh, for the procurement, use, handling and returning of shipping containers for radioactive material (RAM) in accordance with Title 10, Code of Federal Regulations, Part 71, Appendix E, effective August 1, 1980. Each paragraph of Appendix E is addressed, if only to specifically exclude those topics where the NED does not anticipate any activity relating thereto.

As defined in Appendix E," 'Quality assurance' comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control which comprises those quality assurance actions related to the control of the physical characteristics and quality of the material or component to predetermined requirement." The University personnel; the Nuclear Reactor Program (NRP) staff, the QA/QC staff and the personnel assisting in each shipment of RAM, are determined to see that all shipments from NCSU Nuclear Engineering Department facilities are made in a safe manner and comply fully with existing regulations.

The shipment of radioactive materials are categorized as; exempt, Type A, Type B and large quantities. This QA program is specifically concerned with the Type B, large quantity shipments and shipment of spent fuel assemblies.

Safety control will be commensurate with the radioactivity and the form of the material being shipped. The likely materials to be shipped by the NED in increasing order of QA requirements are:

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a. Fresh fuel (unirradiated)

b. Type B quantities

c. Large quantities of activity, and spent fuel assemblies.

This QAP is applicable to containers owned by another party and for which NCSU is registered as an authorized user. The graded approach to safety control will be applied to each container and shipment through special procedure checklists, other necessary documents and training to the degree required to be certain the shipment will be accomplished safely.

Organization

The North Carolina State University (NCSU), through its Nuclear Engineering Department (NED), shall retain and exercise responsiblity for the quality assurance program (QAP) applicable to the containers in which RAM will be shipped.

The QA Program Manager shall have a Bachelor of Science degree in Health Physics, Nuclear Engineering or related science field, two years' experience in positions requiring a working knowledge of NRC and DOT packaging and shipping regulations, and have experience in the planning, preparation and shipment of radioactive materials other than Type A quantities, or an equivalent combination of education and experience. The Reactor Health Physicist (RHP) is designated as the NCSU QA Program Manager (QAPM). The QAPM is authorized to prepare the QAP, prepare changes, additions or modifications as necessary and to submit the QAP and/or changes, etc., to the NCSU Radiation Protection Council for review and approval. The QAPM is authorized to prepare supporting documents to the QAP, such as procedures, checklists, etc. These supporting documents shall be reviewed by the NED staff, and when coordinated, shall be approved by the QAPM. The QAPM shall supervise the operations performed under this plan. The QAPM shall report to the Head, Nuclear Engineering Department. 1

The personnel performing the QA/QC functions under this QAP shall not participate in either the actual physical receipt and inspection of the cask, or loading and preparation for shipment.

The Director, NRP, has overall responsibility for the Nuclear Reactor Program. Qualifications for this position include reactor operations and reactor management experience. In this capacity, the Director will exercise overall supervision of the work perfromed in accordance with this QAP. 1

Qualifications of the personnel to inspect the shipping container, or to conduct pre-utilization tests of the container, are: Bachelor of Science degree in an engineering discipline or Health Physics with one-year's experience in the nuclear or health physics fields, or, satisfactory training and a tour of nuclear duty in the U. S. Navy; or, a licensed PULSTAR reactor operator with at least one year's operating experience, or equivalent experience on the operating staff of a nuclear power plant. 1

The NCSU Radiation Protection Council (RPC) shall review and approve this QAP as well as any subsequent changes or modifications there to and shall appoint an audit committee to review the application of this QAP to shipments of RAM from NCSU.

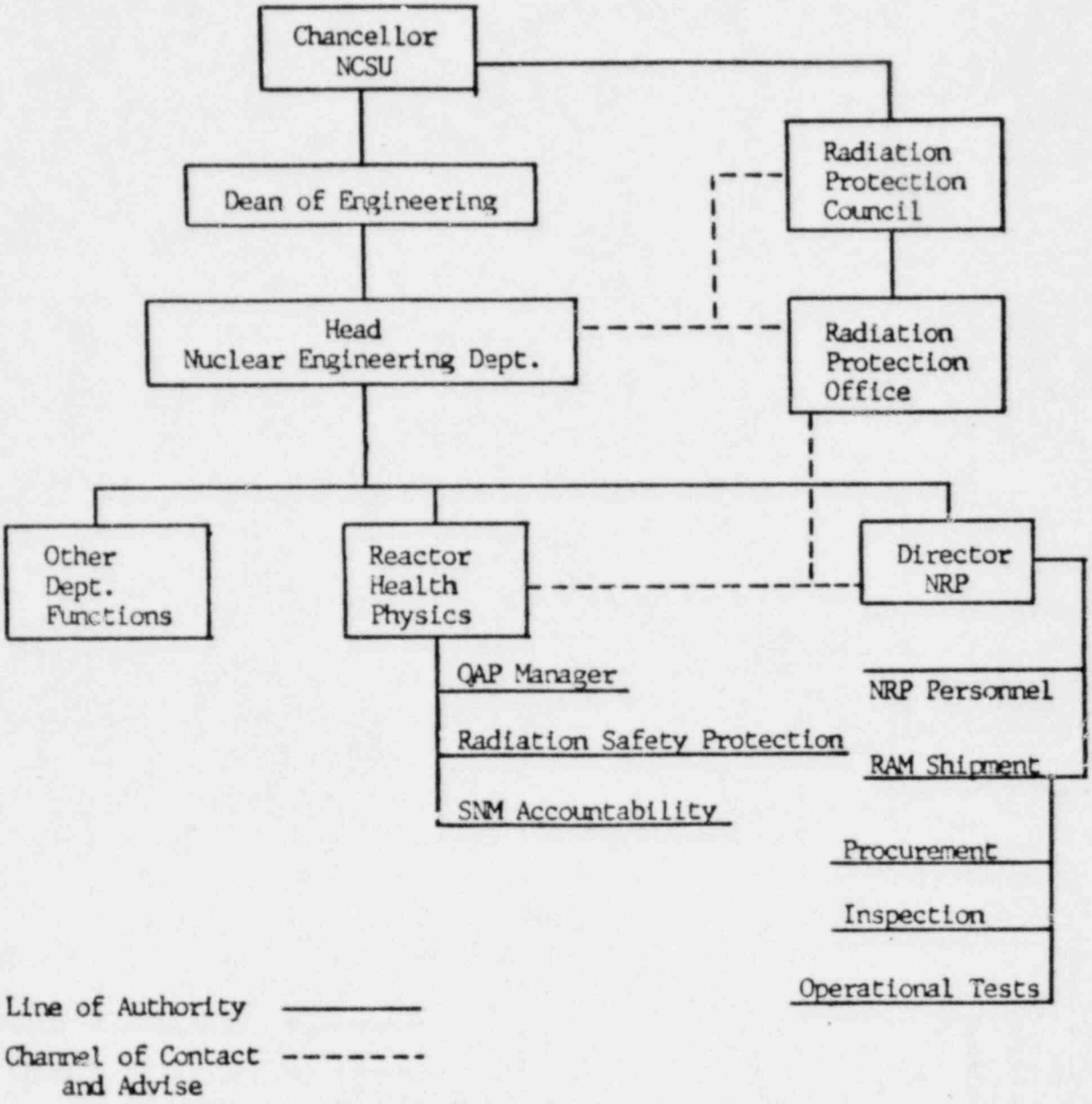
The position of the above mentioned individuals and organization within the University structure is shown in Figure 1.

The QAP and implementing procedures will be reviewed by the QAPM prior to each shipment. Changes to procedures, checklists, etc., consistent with the degree of safety control applicable to the imminent shipment will be made as necessary, reviewed internally, and submitted to the QAPM for approval prior to actual use. The QAPM, during actual container loading operations, will resolve any QA and/or safety questions raised by any member of the loading crew. The QAPM has the authority to cease operational functions whenever there is justifiable cause. Once an operation under this QAP has been interrupted for cause, only the QAP, or his representative may direct continuance of the operation and then only after resolving the cause for the cessation of activities.

The NRP personnel may question any point of the QAP and refer this topic to the QAPM for resolution. The NRP personnel actually performing quality assurance functions whenever they perceive an act or omission they believe to be, or is improper, or unsafe, have the authority to halt the immediate operation and refer the matter to the QAPM for resolution. The NRP personnel, as well as the QAPM, may suggest possible solution(s) to problems. Only the QAPM or his designated representative may approve a procedural change.

2. Quality Assurance Program

This program includes the procurement (of another owner's cask), handling and use, operational testing prior to use, housekeeping, and return to owner. The NED does not, now, anticipate the undertaking of container design,



NCSU QUALITY ASSURANCE PERSONNEL ORGANIZATION

Figure 1

fabrication, assembly, and proof of design testing. If in the future it becomes prudent for the NED to undertake any or all of these QA functions now excluded, it will be necessary to amend this QAP accordingly.

As a part of the procurement action, the container owner will be requested to advise the NRP staff on such matters as special tools (specific sizes), equipment, spare parts, special instructions and whether or not the owner's checklists would be made available. Further, the cask owner would be required to furnish the documentation required by 10CFR71 relative to the container.

Based upon the information received from the cask owner, implementing procedures, checklists, pre-load testing, loading procedures, pre-shipping checklists, instructions for truck driver, and housekeeping actions will be prepared. These documents will reflect the safety sensitivity of these topics commensurate with the activity and form of the RAM to be contained in the shipment.

The RPC will be requested to appoint an audit committee to oversee and review the QAP. The records to be made of the shipment will be identified. These records and other documents pertaining to the shipment shall be filed for retention and retrieval as required by 10CFR71.

Shipment of RAM as a regular routine event is not anticipated. Therefore, each shipment shall be treated as a "new or not previously accomplished" task by the NRP staff. Hence, the personnel to perform cask receipt, inspection, operational testing, handling, loading, and the audit functions will be selected for each shipment, and trained to accomplish the specific shipment in accordance with this QAP and its supporting documents prior to the receipt of the shipping container. This training program will include instructions on the purpose of the QAP, its scope, its implementing documents, a dry run of the loading procedures, a review of the auditing procedures, and a discussion of the graded approach to safety. 1

3. Design Control

This QA function is not included in the NCSU QAP at this time. If, in the future, this activity is to be undertaken, an amendment to this QAP will be prepared and approved through the channels described elsewhere.

4. Procurement Document Control

"Procurement" as used in this QAP means the arranging/rental to use the container owned by another party. In this sense, the container owner will be

required to furnish evidence of compliance with 10CFR71, Appendix E, that he provide the necessary documents required by Part 71 and/or the Certification of Compliance for the container, and to provide information on tools, equipment, checklists, etc., that would facilitate the safe handling and use of the cask. The container owner shall be requested to state the time period to which the cask was designed, fabricated, etc. If the container has been fabricated after 1 January 1979, the owner shall be requested to furnish satisfactory evidence that the cask was designed, fabricated, tested, etc., in accordance with an approved QAP. The requests and receipts will be documented. 1

5. Instruction, Procedures and Drawings

Instructions, procedures and drawings will be prepared and documented for actions affecting quality. These procedures will be in sufficient detail in describing the sequence of events essential to achieving the desired quality objective. These instructions, procedures, etc., will be reviewed prior to the time of intended usage to insure their applicability. Requisite changes shall be made so that these procedures shall conform and be consistent with the degree of safety control commensurate with the RAM to be shipped.

Prior to the actual loading function, the personnel to be involved shall review and receive instructions in the procedures to be followed. This instruction shall include personal health physics safety and actions to be taken in the event of an (undesired) unanticipated occurrance. These individuals, also, shall have undertaken one or more dry runs to become proficient under these loading procedures.

In arranging for the transportation of the shipping container, a transportation organization shall be selected who is experienced in this phase of the transportation business and is recognized as such by possessing an NRC approved transportation security plan in compliance with 10CFR 70.20a(d). This plan shall be verified as fulfilling the specific requirements of the shipment RAM for which the transport concern is hired to carry. In particular, for the shipment of irradiated spent fuel assemblies, special attention shall be given to the planning for the transportation of the shipment, including the provisions for security guards, communications, and training as stated in 10CFR 73. 1

The unloading procedures shall be the responsiblity of the consignee.

6. Document Control

This QAP and the documents, instructions, procedures, etc., relating thereto shall be controlled to prevent unwarranted changes being made. Changes to the QAP shall be approved by the NCSU Radiation Protection Council. The QAPM is authorized to review and change the instructions, procedures, checklists, etc., implementing the QAP.

The QAPM shall maintain a current master list of applicable documents. Upon completion of the review of procedures for a specific shipment, the QAPM shall identify the applicable documents to be used; thereby preventing an unauthorized document being inadvertently used.

7. Control of Purchased Material, Equipment and Services

This paragraph is not APPLICABLE TO THE QAP.

8. Identification and Control Materials, Parts, and Components

This paragraph is not applicable to the QAP.

9. Control of Special Processes

This paragraph is not applicable to the QAP.

10. Inspection

Inspections as applied to the design, fabrication, assembly, and proof testing is not a part of this QAP.

Procedures for the conduct of inspections to verify compliance with this QAP and its supporting documents shall prepared. Personnel conducting these inspections will not be the same personnel performing the quality assurance actions.

11. Test Control

Testing of containers at NCSU shall be limited to that necessary to be certain the cask will function satisfactorily while loaded with the RAM being shipped from NCSU. Procedures specifying the tests to be undertaken and the acceptance criteria shall be prepared in advance of testing. In the preparation of these test procedures, the pertinent requirements of the package approval will be followed. These procedures identify any testing equipment needed, provide for vertification of calibration, and conclude with a statement of test results obtained. These test results shall be reviewed and accepted prior to utilization of the shipping container. The documentation of this testing and the results obtained shall be included in the file pertaining to the shipment of the RAM.

The operational testing stated or implied herein shall not replace or

negate the testing required to obtain NRC/DOT certification of the shipping container.

12. Control of Measuring and Test Equipment

Measuring and testing under this program shall be limited to that necessary to verify the container is ready and safe for use; e.g. the drain line is open (not plugged), the pressure relief valve is functional, etc. Those items of equipment necessary in the pre-operational testing of a container will be identified and the calibration maintained to the required accuracy, purpose, stability and other conditions affecting the measurement.

Measuring and test equipment are calibrated at regular specified intervals. Upon completion of calibration, each item carries a label indicating the date on which calibration was accomplished, and that recalibration is due on/or before the stated date. The NCSU organization performing the calibration function maintains the records of the calibrations accomplished and when the next calibration is due. 1

The radiological portable survey instrumentation is calibrated against a radioactive source, the activity of which is traceable to a NBS standard. These instruments are routinely calibrated at three-month intervals.

13. Handling, Storage, and Shipping

Information on special handling, storage and cleaning will be requested of the container owner. Upon receipt of this information, procedures will be prepared on these topics, on the loading of the cask and on shipping requirements. Particular attention will be given to advance agreement on the receipt of the RAM, and on advance notification of the actual shipment. These procedures will include steps of coordination with local and State officials as necessary. These procedures will identify the shipping papers and special notices, if any, to be placed thereon, and a reference to pertinent NRC and DOT shipping regulations.

14. Inspection, Test and Operational Status

Markings, tags, labels, etc., affixed to the container by its owner to show evidence of satisfactory testing and operational status will not be removed or obliterated.

Markings, tags, labels, etc., required by tests accomplished by the NRP staff shall be attached in accordance with NED procedures. The QAPM has the authority to omit tests of components that are not required by the RAM being shipped. For example, shipment of a subcritical amount of unused (fresh) fuel

assemblies would not require a viable pressure gage, but would require a check on the neutron absorber between elements. Therefore, the pressure gage need not be tested, whereas the presence of the neutron absorbers must be verified.

15. Non-Conforming Materials, Parts or Components

Procedures will be prepared, as necessary, for the identification, documentation, tagging and segregation, and notification of the container owner of the non-conforming materials, parts and/or components. The maintenance of the shipping container shall remain the responsibility of the cask owner. 1

16. Corrective Action

The QAPM has the authority to cease operations and/or institute corrective actions whenever he deems the working conditions are adverse or inimical to the achievement of the requisite safety controls applicable to the current shipment.

Necessary corrective action shall be accomplished prior to the use of any container and/or prior to the continuance of procedure during which a deficiency, deviation, etc., is recognized. The deficiency, etc., and the requisite corrective action shall be documented.

17. Quality Assurance Records

All QA records shall be retained and readily retrievable to provide documentary evidence of compliance with NRC and DOT regulations relative to the shipment of RAM. These records shall include this QAP, implementing procedures, checklists, results of tests, copies of shipping papers, results of inspections and audits with deficiencies noted and corrective actions taken, procurement actions, and non-conformance reports.

After all corrections have been made and the final audit is completed, the records for each shipment will be assembled in one file location by the QAPM for storage retention. Prior to final storage, this file shall be reproduced and forwarded to the shipping container owner to complete his records pertaining to the use of his cask. 1

Audits

It is now contemplated that shipment of RAM from this facility will be very infrequent and spaced in time. Accordingly, the audit function for this situation will be somewhat different from one in which shipments are more routine.

Audits of the NCSU QAP will occur prior to and shortly after the shipment. Beforehand, the audit will be concerned with the preparation and planning for the shipment to be certain the appropriate degree of safety control has been identified and adequately considered; that the necessary documents, procedures, checklists have been properly completed on a timely basis. After the shipment, the audit objective will be to make certain the records have been properly completed, assembled and prepared for storage.

Personnel to accomplish these audits will not be selected from the individuals who performed the safety-related functions.

Written procedures and/or checklists will be prepared to assure a thorough checking and verification of the actions being audited. The results of the audits will be given to the Head, Nuclear Engineering Department, and the Director, NRP, and the QAPM.

Deficiencies will be corrected before proceeding with the loading operation or the storage of records.