NON-PROPRIETARY

TOPICAL REPORT

No. TP-02-NP-A, Rev. 0

COVERING

NUCLEAR PACKAGING, INC.

DEWATERING SYSTEM

Submitted to:

Nuclear Regulatory Commission

under

Procedure for Review of

Topical Reports on Solidification Agents

and High Integrity Containers

dated April 1982

By

NUCLEAR PACKAGING, INC.

1010 South 336th Street

Federal Way, Washington 98003

August 3, 1984

NUCLEAR PACKAGING
A Pacific Nuclear Company

File: 680-14
Ref: 1812

August 6, 1984

Mr. Tim Johnson
Low-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington D. C. 20555

Subject: Affidavit to withhold from public disclosure Proprietary information on Nuclear Packaging Dewatering System.

Reference: Nuclear Packaging Topical Report No. TP-02-P, dated August 3, 1984.

Dear Mr. Johnson:

In accordance with the requirements of 10 CFR 2.790 for the withholding of proprietary information from public disclosure, Nuclear Packaging, Inc. has prepared the enclosed affidavit identifying the information withheld and the reasons for which it is claimed that this information should be withheld from public disclosure.

We welcome your questions and are prepared to submit whatever additional information you deem necessary to justify our request to withhold propreitary information.

Sincerely,

NUCLEAR PACKAGING, INC.

R. T. Haelsig

Richard T. Haelsig
President

RTH/bmh

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 6, 1985

Mr. Richard T. Haelsig, President
Nuclear Packaging, Inc.
1010 South 336th Street
Federal Way, Washington 98003

RECEIVED
SEP 16 1985

Dear Mr. Haelsig:

SUBJECT: ACCEPTANCE FOR REFERENCING OF LICENSING TOPICAL REPORT TP-02-P REVISION 1, "NUCLEAR PACKAGING, INC. DEWATERING SYSTEM"

We have completed our review of the subject topical report submitted by Nuclear Packaging, Inc. by letter dated August 6, 1984. We find the report to be acceptable for referencing in light water reactor license applications to the extent specified and under the limitations delineated in the report and the associated NRC evaluation, which is enclosed. The evaluation defines the basis for acceptance of the report. We will require that applicants or licensees who reference this topical report develop their own program for classifying waste in accordance with 10 CFR Part 61, Section 61.55.

We do not intend to repeat our review of the matters described in the report and found acceptable when the report appears as a reference in license applications, except to assure that the material presented is applicable to the specific plant involved. Our acceptance applies only to the matters described in the report.

In accordance with procedures established in NUREG-0390, it is requested that Nuclear Packaging, Inc. publish accepted versions of this report, proprietary and non-proprietary, within three months of receipt of this letter. The accepted versions shall incorporate this letter and the enclosed evaluation between the title page and the abstract. The accepted versions shall include an -A (designating accepted) following the report identification symbol.

Should our criteria or regulations change such that our conclusions as to the acceptability of the report are invalidated, Nuclear Packaging, Inc. and/or the applicants referencing the topical report will be expected to revise and resubmit their respective documentation, or submit justification for the continued effective applicability of the topical report without revision of their respective documentation.

Sincerely,

Cecil O. Thomas

Cecil O. Thomas, Chief
Standardization and Special
Projects Branch
Division of Licensing

Enclosure:
As stated

ENCLOSURE

SAFETY EVALUATION REPORT

Report Number: TP-02-P, Rev. 1

Report Title: Nuclear Packaging Dewatering System

Originating Organization: Nuclear Packaging, Inc., Federal Way, WA

Reviewed by: Meteorology and Effluent Treatment Branch, DSI, NRR

1.0 INTRODUCTION

The Nuclear Packaging Dewatering System (the NUPAC System) utilizes dewatering equipment and disposable waste containers to dewater radioactive spent bead and powdered resins, and filter precoats. The dewatering process uses an air-driven positive displacement pump to obtain a continuous suction on a waste container to remove the bulk of free water. Then, the air blower recirculates air through the waste container and water separator to facilitate drying of the resin. These processes remove pumpable liquid from the waste container to a predetermined end point in accordance with the NUPAC process control program to meet the free standing liquid criteria set forth in Section 61, 56(a)(3) of 10 CFR Part 61. Vacuum gauges are provided at each waste outlet connection and manifold. The water removed from a waste container is returned to the user's liquid radwaste system.

The review of the NUPAC System, which was conducted in accordance with Section 11.4 of the Standard Review Plan (SRP), included the waste container internal design drawings, descriptive information on the dewatering operation,

equipment description, process control program, and qualtiy assurance program. The dewatering process treats "wet" radioactive waste to meet requirements in NRC Branch Technical Position, ETSB 11-3, Revision 2 in SRP Section 11.4. The process is not intended to meet the waste stability form or classification requirements in 10 CFR Part 61.

Nuclear Packaging submitted separate topical reports on High Integrity Containers for NRC review and approval. In these reviews by the NMSS staff, the structural integrity of the NUPAC containers is being evaluated to ensure long-term isolation of low-level radioactive waste from the soil environment.

2.0 EVALUATION

The design and operation of the NUPAC System are described in detail in the NUPAC Topical Report, TP-02-P, Rev. 0 and Rev. 1 dated August 6, 1984 and June 28, 1985 respectively. In the staff's evaluation of the NUPAC System, the staff considered:

(1) The process control program to assure complete dewatering of "wet" solid radwaste.

(2) Design provisions incorporated in the equipment and system design to reduce leakage and control and monitor releases of radioactive effluents to the environment.

(3) The quality assurance program for the design, fabrication and testing of the system.

(4) Typical interfaces with the reactor plant.

(5) Waste container internal design.

(6) Provisions to control potential exothermic reaction in dewatering ion exchange resin.

(7) Radiation protection design features.

The NUPAC System consists of a dewatering waste container, a dewatering pump, an off-gas vent unit, a container level indicator, a waste fill head, a water separator with water chiller unit, an air blower, a relative humidity instrument, a control panel, and interconnecting piping and valves.

After "wet" radwaste from the user's plant is charged into a NUPAC waste container, dewatering is achieved with continuous suction on a waste container provided by the dewatering pump. The residual free water in the waste container is removed by recirculation of drying air provided by the air blower. Various types and numbers of filters are used within the waste container in different configurations to retain spent resin and filter precoat materials. Water removed from the waste container is returned to the user's liquid radwaste system.

The dewatering pump is operated for given time intervals in accordance with the NUPAC process control program. The pumping time may range from eight to

sixteen hours depending upon type of wastes and waste containers. After most of the free water in the waste container has been removed, drying air is continuously recirculated in a loop from the air blower to the waste container through the water separator to remove any residual free water in the waste container. The NUPAC System is provided with temperature instrumentation which is interlocked to automatically shut down the dewatering process on high air temperature due to potential exothermic reaction in dewatering ion exchange resin.

The waste container is considered dewatered when the volume of collectable liquid and relative humidity in the recirculating drying air meet the acceptance criteria specified in the NUPAC process control program. A relative humidity instrument and monitor are provided to remotely and continuously monitor the waste container outlet air. This instrument is used to establish positive end point to the dewatering process.

The topical report describes NUPAC generic Process Control Programs (PCPs) for dewatering spent bead resin and filter precoats for dewatering to ensure that the dewatered waste containers meet the free standing liquid criteria set forth in Section 61.56(a)(3) of 10 CFR Part 61. The PCPs are developed based on the actual test results on drainable liquid obtained from dewatering waste containers and from the subsequent road tests on dewatered waste containers.

The staff reviewed the NUPAC dewatering test procedures and its results, detailed dewatering operating and maintenance procedures, and acceptance criteria described in the topical report. The staff finds the NUPAC acceptance criteria and dewatering test results meet the free standing liquid criteria in 10 CFR Part 61 and NRC Branch Technical Position ETSB 11-3, Rev. 2 and therefore, the staff finds the NUPAC PCPs to be acceptable.

No airborne or liquid radwastes are released to the environment from the NUPAC dewatering operation. The dewatered liquid radwastes are routed to the user's liquid radwaste system and resin drying air is vented to the user's off-gas system. The NUPAC System is designed to prevent uncontrolled releases of radioactive materials by monitoring liquid levels in the waste container by a level indicator. During the waste filling operation, the operator is required to be stationed near the control panel and visually monitor the waste transfer process observing the video monitor and the radiation monitor provided. Curbs or other means to contain inadvertent spills and overflows will be provide[illegible] the user with floor drains routed to the user's liquid radwaste collection systems.

The consequences of a waste dewatering container failure releasing radioactive materials to a potable water supply is site dependent and will be evaluated for individual license applications. The staff finds the NUPAC dewatering process and waste container design meet the requirement of Section 20.106 of 10 CFR Part 20, Section 50.34a of 10 CFR Part 50, and General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50.

The design, procurement, fabrication, testing and operation of the NUPAC System is accomplished under prescribed quality assurance requirements which conform, to the extent practicable, with the guidelines provided in Regulatory Guide 1.143 "Design Guidance for Radioactive Waste Management Systems, Structures and Components Installed in Light-Water-Cooled Nuclear Power Plants." The quality assurance program defines and controls those elements of NUPAC and their suppliers' performance which affect the quality of the NUPAC System.

The design and arrangement of the NUPAC System components are based on maintaining the operator radiation exposure as low as is reasonably achievable. The topical report provides a list of specific design and operating features which were incorporated to minimize personnel radiation exposure. All active components are located so they can be easily accessed for maintenance. All pumps, valves and piping can be flushed prior to inspection and maintenance.

The staff also finds that NUPAC has adequately identified interface information and requirements which users should provide.

Upon completion of the staff review by NMSS of the NUPAC topical reports on High Integrity Containers, a separate Safety Evaluation Report will be provided to supplement this evaluation.

3.0 CONCLUSION

Based on the foregoing evaluation, the staff finds the NUPAC Topical Report, TP-02-P, Rev. 1, to be acceptable.

The bases for our acceptance is our conclusion that the NUPAC Dewatering System is designed and can be operated in accordance with current guidance of applicable regulatory guides, standard review plans, branch technical positions, and Federal regulations.

The capability of the plant radioactive waste treatment systems to meet the requirements of Appendix I to 10 CFR Part 50 with the NUPAC System in operation is site dependent and will be evaluated for individual license applications. In addition, the packaging and shipping of all processed wastes including waste classification in accordance with the applicable sections of 10 CFR Parts 61 and 71, and 49 CFR Parts 170-178, will be determined for individual license applications. The consequences of a potential waste container failure releasing radioactive materials to a potable water supply is also site dependent and will be evaluated for individual license applications.

The staff concludes that the NUPAC Topical Report is acceptable for reference in future license applications for light water reactors. Any application incorporating this report by reference should include the following information:

(1) Any exceptions or deviations from the NUPAC Topical Report, Rev. 1, dated June 1985.

(2) Interfaces between the plant and the NUPAC System.

(3) Location and arrangement drawings of the NUPAC System in the plant including curbs or other means to contain inadvertent spills and overflows.

(4) The waste classification program to demonstrate that the solid waste product is classified in accordance with 10 CFR Part 61, Section 61.55 and NRC Branch Technical Position on Waste Classification.

(5) Description of the solid waste product container to be used.

(6) The capability of the plant radioactive waste treatment system to meet the requirements of Appendix I to CFR Part 50 with the NUPAC System in operation.

(7) The plant site information on potable water supply.

ABSTRACT

Nuclear Packaging, Inc. has developed a dewatering system which meets the nuclear industries need for a system which can assure compliance with the free standing water requirements for shipping and disposal of their waste materials.

The waste characteristics which affect dewatering have been determined and a normal operating range for the system set. A Process Control Program has been established. Integrated into this program are methods for detecting 'abnormal' wastes prior to processing.

This system has been extensively analyzed and tested. The analytical techniques used accurately predict actual system performance and are the result of extensive research, engineering and testing.

It has been demonstrated in this report that this system, when operated in accordance with the procedures and the Process Control Program presented, will meet or exceed all established free standing water requirements for shipment and disposal of dewatered ion exchange and filter media.

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1.0 INTRODUCTION

The Nuclear Packaging dewatering system has been designed and tested to consistantly meet the free standing water requirements of 10 CFR Part 61 for ion exchange resins and filter media. Current dewatering systems do not consistantly meet these requirements.

NuPac has combined a process design and experimentation approach. The initial equipment design was based on an engineered approach to the process. Tests were conducted with specific objectives. Equipment modifications were made in response to test results, based on engineering fundamentals and an understanding of the physical phenomena. This has resulted in predictable performance over the broad spectrum of waste characteristics possible with ion exchange resins. A Process Control Program has been developed in conjunction with this equipment to isolate 'abnormal' waste materials prior to processing.

We believe that this report will demonstrate the capability of this system to meet or exceed all established free standing water criteria for shipment and disposal of these materials.

2.0 REFERENCES

2.1 10 CFR Part 61

2.2 ANSI/ANS - 55.1 - 1979

2.3 United States Nuclear Regulatory Commission, 'Tec
Waste Form', Dated May 1983.

2.4 Criteria for High Integrity Containers Washingtor
Control Program, August 25, 1983.

2.5 Information to be submitted in Support of a High In
approval by the South Carolina Department of Health
Control Bureau of Radiological Health.

2.6 Nuclear Packaging, Inc. Quality Assurance Progra
Approval No. 0192).

2.7 State of South Carolina Barnwell Site License.

2.8 State of Washington Hanford Site License

2.9 U. S. Nuclear Regulatory Commission, Regulatory Guid
October 1979.

3.0 PAST EXPERIENCE

The vast majority of dewatered waste materials has been, and still is, bead type ion exchange resins. Powdered ion exchange resins were predominantly solidified, or dewatered in drums, until 1981 when the first large scale dewatering containers were placed in service. Small amounts of activated carbon are found in radwaste treatment systems and inorganic zeolites are not frequently used in the commercial reactors. Powdered and bead type ion exchange resins average 3800 cubic feet per year per commercial plant. They represent nearly half of the total wet wastes generated by the utilities.

It is expected that the use of resin dewatering will increase over the next five years due to a number of reasons. Many plants are finding it is more cost effective to not evaporate the regenerant from their deep bed condensate polishers and directly dispose of the resins after one use. This results in a significant increase in bead resin volumes but a lower total waste volume from the plant. Bead resin volumes are also increasing due to the use of portable demineralizers in place of evaporators. Even existing portable demineralizers are being converted to sluice their resins from the processing tanks to the large disposal containers. The use of powdered resins is increasing due to closer attention to water chemistry. Powdered ion exchange resins are increasingly being mixed with fibrous filter aids to help alleviate resin intrusion into the reactor cooling water.

The driving factor behind the use of waste dewatering is economics. The waste does not have to undergo waste volume expansion due to solidification. Additionally, the dewatering process requires less plant floor space, capital investment and no chemicals that may be dusty, corrosive, and hazardous. The main mitigating circumstances against waste dewatering are changing regulations and operational uncertainty regarding the residual free standing water. Also solidification is argued to alleviate the

isotopic leaching in the buried state. In view of the research and development conducted by Nuclear Packaging, the past uncertainties associated with dewatering have been alleviated while the same uncertainties remain with solidification.

The personnel at Nuclear Packaging have previous experience in both resin dewatering and solidification. The research conducted for this report has significantly advanced the state of the art in dewatering technology, having introduced many completely new concepts. This is particularly true in relation to solidification technolgies. The certainty of meeting the disposal regulations is now greater with Nuclear Packaging's dewatering technologies than with cement solidification. Correct dewatering of treatment media does not have problems achieving structural integrity, void spaces above the solidified block in a corrodible container, waste parts that are not fully encapsulated and pasty or unsolidified materials. Nuclear Packaging has addressed, and solved the pertinent dewatering relationships between waste media shape, size, chemical reactions, full scale thermal effects and the waste media structure. These relationships remain unsolved for the solidification of the same wastes in a container over the 300 year design life.

Prior to the free standing water criteria specified by the State of South Carolina in 1980, dewatering containers were simply thin gauge carbon steel liners with some cartridge filters unscientifically placed on the bottom. The 1980 free standing water criteria quickly illustrated a lack of understanding of the dewatering mechanisms. The containers, dewatering tests and procedures changed rapidly. Bead resin containers were designed with conical bottoms and low point drains or suction configurations. Powdered resin containers were designed with several levels of cartridge filters. A diaphragm pump was used to remove free water.

Previous testing and certifications have been based on using 'representative' waste media. Methods were not employed which encompass the range of waste forms to be found in the field. When a test did not meet the vendor defined end point, the duration of the pumping cycle was simply extended until the end point was achieved. An understanding of the dewatering mechanisms, producing consistent results has not been developed. In at least one case an extrapolation of free standing water versus drainage time has been made using specific test results. This is mathematically unsound and unrepresentative of actual waste forms. There have been many new designs over the last several years but there has not been any real technical advances in dewatering during the past four years.

Some of the liners punctured at Barnwell have been found with unacceptable amounts of free water. This is because testing has not been representative of actual site and subsequent burial conditions. Compliance can not be assured with current systems. An understanding of the inter-relations between the pumps, waste characteristics and internal container piping was not developed.

4.0 SITE OPERATIONS

4.1 Introduction

The site operations play an integral part in successful waste dewatering by Nuclear Packaging's dewatering system. The same water treatment application in several different plants can result in significantly different waste forms with respect to their dewatering ability. Additionally, different waste mixtures and handling methods can contribute to differing dewatering characteristics. Nuclear Packaging's approach is to incorporate in the dewatering system's operations and process controls the appropriate parts of the site operation's design and handling methods.

4.1.1 Waste Sources

There are many waste forms suitable to Nuclear Packaging's dewatering system. The possible wastes are:

- Powdered ion exchange resins, 'Powdex'
- Filter aids, 'Celite', 'Fibra-Cel'
- Powdered mixtures of ion exchange resins, activated carbon and filter aids, 'Epifloc', 'Envirosorb' and 'Ecodex', from condensate polishers and radwaste treatment systems.
- Bead type ion exchange resins from deep bed condensate systems, radwaste treatment, borated water control, reactor water clean up, fuel pool cleaning, etc.
- Sludges from sump or pool bottoms, decon scale, abrasive cleaners, etc.

- Other liquid treatment media such as activated carbon, inorganic zeolites, filter sand, anthracite and odd forms of ion exchange resins that may occur from one time site jobs.

An overwhelming percentage of the waste currently dewatered is bead and powdered ion exchange resins. They do not significantly vary in physical characteristics when they are new. However, they can widely range in characteristics once they have been used. New resins have the following characteristics:

TABLE 1

	Bead Type	Powdered Type
Size, inches	0.01 - 0.04	0.0013 - 0.0018
Average Size, inches	0.02	0.0015
Average Shape	Nearly Spherical	Slivers
Moisture Content	42 - 55%	42 - 55%

Treatment media to be dewatered can be altered from the new condition by a number of different site operating conditions. One obvious way is the combination of the waste with another significantly different one. For example, the combination of bead type resins with powdered resins. The average effective size and shape is drastically changed with the mixture. The transfer of wastes through high fluid shear pumps, long lengths of pipe and tight fittings can each considerably reduce the medias effective size and shape because of breakage. A change in the waste hold up tank, sump or pool draw point can also change the waste characteristics. If the draw point on a waste hold tank is switched from the side to the bottom, then an accumulation of fine settled solids could significantly alter the waste's dewatering ability.

Chemical effects on the waste media can also seriously hinder the waste's dewatering characteristics. For example, a powdered or bead type ion exchange resin that has been severely decrosslinked from repeated regenerations or exposure to oxidizing decontamination solutions, has extremely reduced structural properties. A bead resin can go from bearing the weight of a person to easily being crushed with your fingers. Resin crushed under the weight of a six foot solids bed depth in a disposal container can effectively prevent water from reaching the water collection piping.

Considering the potential damaging effects due to plant operations cited above, the values in Table 1 can be significantly different. Combining a knowledge of the standard 'fines' content in new resins, an estimate of the 'fines' generation rate for normal operations and potential operating aberrations can change Table 1 for new media to a worst case as shown in Table 2.

TABLE 2

	Bead Type	Powdered Type
Size, inches	0.001 - C.04	0.0003 - 0.0018
Average Size, inches	0.01	0.001
Average Shape	Part Hemi-Shperical	Slivers
Moisture Content	48 - 65%	42 - 55%

The significance of the media characteristic changes from a new to used condition is illustrated in the calculations and qualifications sections of this report. Nuclear Packaging's unique equipment design and process control procedures are geared to meet the wide range of expected waste forms. Nuclear Packaging's analytical capabilities allow for difining the boundaries of the system's operation based on several single point test situations. The extension of that analytical capability to the field conditions, in the form of process control procedures, allows Nuclear Packaging to insure receiving and processing the proper waste in the proper manner.

4.1.2 Site Operations

The waste characteristics can change due to the plant's system design and operation. The dewatering system operator will be aware, by procedure and training, of the effects of plant design features. The operator will note if waste media is being affected by transfer through pumps and piping. He will also be aware of from which plant system the media originated. The ion exchange resin from a reactor coolant cleaning system can be in much different condition than the same type of resin from a condensate polisher. Historic traceablility of the various resin batches originating from a plant is an important quality assurance tool that will be used by Nuclear Packaging to establish dewatering parameters.

5.0 PROCESS DESIGN

5.1 Introduction

Nuclear Packaging assembled the many talents required to properly dewater waste treatment media. The problem requires expertise in many engineering disciplines. It was recognized early that the container, pumping system, waste media and container internals all affected dewatering. The ability to successfully dewater involves dozens of different factors.

Despite the apparent difficulties, Nuclear Packaging took a radical departure from past dewatering certification procedures. Full scale testing resulting in single point data and certifying it good for all field conditions was abandoned. A model of all factors was produced with testing used to verify the validity of the model. Nuclear Packaging approached the problem by requiring an understanding of each sequential step and problem encountered in the dewatering system development.

The problem was broken down to segments with respect to unknowns and the methods required to discover those unknowns. For example, some items could be computed but others had to be derived from actual testing. Since there were so many inter-related design factors, the testing items needed resolution first. The correctness of the computational models had to be confirmed by actual test data. Nuclear Packaging's test engineering approach lead to many iterations of testing, calculations and equipment modifications.

The design and testing was based on ion exchange resins since they are the primary market. However, the fundamentals also apply to other treatment media such as activated carbon and inorganic zeolites. The test techniques used on the ion exchange resins will be duplicated on other media since carbon, zeolites, et cetera have significantly different chemical composition and structure.

5.2.2 Powdered Media

Powdered media, such as 'Powdex', 'Ecodex' and 'Epifloc', have granule sizes averaging 0.00015 feet as compared to about 0.002 feet for bead type resins. Flow through a bed of powdered media is affected by the presence of fibrous material. The fiber is intended to enhance filterability of the pre-coat. The consequence in dewatering is a change from a rigid bed of solids to a spongy and compressable one.

5.4 Operations

Nuclear Packaging has found the plant's operations to be important in achieving ultimate confidence in resin dewatering. The Process Control Procedures (PCPs) grew out of an understanding of the waste characteristic factors. The PCPs not only cover Nuclear Packaging's equipment and process, but the plant's operations as well. This PCP concept has a very sucessful foundation in the hazardous chemical waste industry.

6.0 CALCULATIONS

Nuclear Packaging has taken an analytical approach to the design of the dewatering system. Testing has been utilized to verify the accuracy of the analytical model.

There are many veriables which affect free water removal from a bed of ion exhange resins. These variables have been assimalated into a computer program, based on empirical fluid flow calculations as well as data from preliminary testing. This computer modeling has been used to a large extent to establish the design as well as the operating parameters of the equipment.

Extensive analytical work has been conducted in addition to the computer modeling. This has enabled NuPac to predict system perfomance and to establish a positive end point to the process based on waste form. Testing has been conducted to demonstrate good co-relation to the analysis.

7.0 EQUIPMENT DESCRIPTION

The NuPac Dewatering Unit is a portable system containing all necessary equipment and controls for removing the free water from ion-exchange resins and filter media. It is designed to interface with NuPac's line of disposable containers.

These containers will be furnished with factory installed 'internals' functionally identical to those used during qualification testing. The internals will be free-standing and self-supporting, without protuberances which might, (in the case of polyethylene containers) damage the container.

The dewatering fill head serves as the interface between the dewatering equipment and the disposable container. The lower portion of the fill head has a set of doors which allow easy access for connecting to, and disconnecting from the container internals. The fill head seals to the upper portion of the neck of the container and is held in place by gravity.

The upper portion of the dewatering fill head is divided into a piping section and an enclosed electronics section. The piping section is the connection point for all hoses to and from the fillhead and includes an isolation valve for the waste line. This valve prevents any material remaining in the waste hose from spilling during movement of the fillhead to and from the container.

The electronics section is enclosed and waterproof. It houses the fillhead instrumentation and the CCTV Camera and light. It also serves to interface the control system and the container.

The control system consists of a wall hung control panel which contains all the necessary controls and interlocks for safe and efficient operation of the system plus a CCTV system used to monitor container operations and a radiation monitor with a detector probe mounted on the fillhead waste inlet line.

8.0 QUALIFICATION TESTING

Nuclear Packaging, Inc. has conducted extensive testing in order to qualify its dewatering system to the free standing water requirements of 10 CFR 61 for both bead and powdered resins.

The powdered resin portion of this test program has been largely completed. The bead resin portion is in progress and will be completed in the near future. An addendum to this report will be prepared giving the final test results on bead resins as well as addressing dewatered container transportation testing as required by the NRC Final Waste Classification and Waste Form Technical Position Papers.

The regulatory limit for free standing water in a high integrity container has been established at 1.0% of the waste volume by 10 CFR 61. 10 CFR 61 also establishes that the test methods contained in ANS 55.1 are to be used to detect the presence of free water. Nuclear Packaging has performed testing in excess of these standards, particularily in regard to the absence of free liquid over the expected chemical and physical range of the waste process. This range in properties of the resins has been considered in the testing program, the equipment design and the operating parameters for this system.

The bead resins used in the test program were selected to bound the resin properties which are expected to be encountered in the field. The equipment design and the operating parameters which have been established for this equipment were selected to preclude the presence of free water for 'normal' waste materials and to detect 'abnormal' materials prior to dewatering. In addition, in order to assure compliance with the requlatory limits with the waste stream variations which will be encountered in the field, Nuclear Packaging has imposed an acceptance criteria of 0.1% free water for the qualification tests.

The powdered resins used in the testing program are spent and of the Ecodex or Epifloc type. The fitler aid present in these materials tends to hold water more readily than the resin, making them the most difficult of the powdered resins to dewater.

The physical measurements which have been taken over the course of the testing program show good co-relation to the analytical methods which are presented in Section 6.0. Powdered resins have been successfully dewatered in our qualificational testing program having produced no visible drainage following an eight hour dewatering procedure.

Bead resins have also been successfully dewatered. Bead resins were dewatered, producing no drainage of free water following an eight hour dewatering cycle.

9.0 PROCESS CONTROL PROCEDURES

Nuclear Packaging's Process Control Procedures (PCPs) for waste dewatering are designed to insure conformance to the applicable regulations. The process control tests included in the procedures have been developed by Nuclear Packaging and result from testing, precise computations and direct experience with water treatment media. These site PCPs will apply to waste forms previously screened and approved by a Nuclear Packaging operations engineer based on actual testing, computation or previous experience.

The PCPs cover three main areas. They are, 1) the plant's design and waste handling equipment, 2) operation of the dewatering system and, 3) a quality assurance program. The procedures are intended to achieve consistent operation and catch the inevitable upsets in plant waste stream characteristics and system operations. The quality assurance program will insure attention to the procedures and find the areas in need of improvement. The result is a high degree of confidence in the complete dewatering of the radwaste.

The PCPs are organized to follow sequentialy from the initial qualification period into the operational mode. Data summary forms, check off lists and operator logs are intertwined to insure the proper steps are followed. The PCP program is actually a series of procedures that will include operating procedures.

9.1 Preliminary Screening

Traditionally, waste forms to be dewatered have been divided into broad categories without regard to the characteristics of each waste form. The interrelation between the hardware design and the waste characteristics not being considered. Nuclear Packaging has developed this relationship from testing, computations and experience. We intend to carry this level of technical understanding into site operations.

Each significantly different waste will be subject to some level of preliminary analysis and testing prior to full scale dewatering. The degree

of analysis is based on the waste form, test results to date, engineering experience and the confidence level attached to the computations. In essence, the level of preliminary screening devoted to a significantly new waste form is based mainly on the experience of a knowledgeable operations engineer. However, the guidelines setforth below and specific testing and operating procedures will form a minimum basis for the preliminary screening.

The basic philosophy of preliminary screening is to take economic advantage of previous experience and computer models. The fallout of such an approach is two fold. First and most obvious is the monetary savings of not running expensive full scale tests. Secondly, documented experience and computer models expand the scope of understanding and field operation of the many factors involved in dewatering technology. It would not be realistic of field conditions to perform a single series of tests on a single 'representive' waste volume. That is the current state of the art and it does not give a satisfactory level of confidence. The Nuclear Packaging operations engineer and operator will be aware of all the facets of dewatering presented in this topical report.

The site operator may not begin unless the operations log for that day shows the waste to be dewatered has a certificate showing resolution of the preliminary screening step.

9.1.1 Initial Site Qualifications

Each type of dewatering container accepting a significantly different waste form will be subject to an explicit initial qualifying period at the plant. The site qualifying period can occur only after approval by a Nuclear Packaging operations engineer. The operations engineer will give approval based on testing, computations and previous experience. The goals of the qualifying period are:

- Characterize the spectrum of waste media to be dewatered
- Determine any plant design items detrimental to the dewatering

system

- Define the scope of operating parameters for the dewatering system
- Prove the effectiveness of the dewatering system
- Complete all documentation, equipment and operations items specific to the site

During the start up of a dewatering system, or after a significant change in current operations, a Nuclear Packaging engineer will assist the system operator in fulfilling the system and waste qualification requirements.

Once the preliminary screening and waste characterization steps have been completed, the functional compliance step will be initiated. The first part of this step is a pre-operational visual and functional check of the equipment per the operating procedure. The last step of functional compliance is the completion of as built drawings and the modification of any procedures to incorporate site specific items.

9.1.2 Operations

The main document concerning the operation of the dewatering system is the operating procedure. The parts of the procedure pertinent to Process Control are the operator's log, check off lists, waste characterization summaries and certifications/instructions from the operations engineer. The operating documentation is designed to catch the inevitable upsets in the equipment function and the waste characteristics.

Prior to recieving waste for dewatering, the operator must check off the following items:

- Preliminary screening of the waste has been completed by the operations engineer.
- Completed waste characterization forms.

- o Fixed operating parameters.
- o Pre-operational check of the equipment per the operating procedure.
- o Pre-operational entries into the operator's log book.

The different wastes will be characterized once every six months as a check against variablity of the waste. Additionaly, if there is a significant difference in the dewatering system's operating parameters, a sample of the waste in the disposal container will be obtained and characterized to determine if the waste form has varied.

9.1.3 Quality Assurance Program

Nuclear Packaging's Quality Assurance Program is outlined under Section 10.0 of this report.

Site Operations shall be audited for conformance to the procedures and standards of work at least once a year. Nonconformances in plant operation, equipment design or administrative duties will be immediately communicated to the Q.A. department. The Q.A. department shall resolve nonconformances by memo, formal report or directives depending on the seriousness of the nonconformance.

10.0 QUALITY ASSURANCE

The Nuclear Packaging Quality Assurance Program has received Nuclear Regulatory Commission (NRC) program approval number 0192. A synopsis of the program appears in Appendix B. The full program is available for review upon request to the Nuclear Packaging Quality Manager. The program fully covers the 18 quality criteria that are applicable from initial design to site operations.

The Process Control Procedures (PCPs), designed for the dewatering system by Nuclear Packaging Engineering in conjunction with the Quality Assurance, have Quality Assurance involved in the site operations. The Nuclear Packaging PCPs uniquely have as part of their content a troubleshooting and self improvement capability. Quality Assurance is involved in non-conformance reports, retains all procedures, and operating instructions, participates in the initial site qualification program and is a regular site operations auditor.

The Quality Program exists to assure a quality product and operation. The goal is to prevent discrepancies. However, they will occur. When they do, Quality Assurance's job, via the Quality Discrepancy Report is to insure complete resolution of the non-conformance. As a result of MRB dispositions it may take the form of an engineering review and resolution or a change in procedures. A copy of a Quality Discrepancy Report can be found in Appendix B. The criteria for submitting the report is contained in the operating procedures.

The centralization of procedures in the NuPac Quality Assurance System assures consistent site operations and compliance to burial and transportation regulations. The same objective is reinforced by Nuclear Packaging's pre-testing and site qualification programs and Quality Assurance's active

involvement in those programs. The NuPac Quality Assurance System is assured of staying up to date with the evolution of the dewatering systems by receiving copies of site operator instructions, pertinent memos, design changes and informal project information. Quality Assurance is involved in the procurement and acceptance of all materials pertaining to the dewatering system's construction and operation.

Nuclear Packaging's Quality Assurance Program assures complete compliance with the specified guidelines and regulations. Nuclear Packaging's goal is to fully optimize the role of the Quality Assurance's involvement in site operations. To that end, Nuclear Packaging is completing a separate modification of their existing NRC Approved Quality Assurance program as an enhanced operations oriented Quality Assurance Program. That program, when completed, can be forwarded as an addendum to this report, if requested. The specific guidelines, regulations and standards for the dewatering system are:

NRC Guidelines 8.10, 1.143,

Federal Regulations 10 CFR 20, 10 CFR 50, 10 CFR 71, 10 CFR 61,

Specific QA Programs:

RDT F2.4T
RDT F2.2
10 CFR 71, Appendix E and Subpart H
10 CFR 50, Appendix B
ANSI N45.2 and its daughter documents
ASME Code Section III, Article NCA 4000

APPENDIX A

PROPRIETARY

APPENDIX C

RECEIVED SEP 1 9 1983

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 06 1983

To: Holders of Quality Assurance
Program Approval for Radioactive
Material Packages

Gentlemen:

On August 5, 1983, the U.S. Nuclear Regulatory Commission published a final rule in the Federal Register for the packaging and transportation of radioactive material (10 CFR Part 71). Corrections to the final rule were published in the Federal Register on August 24, 1983. The revised regulations will be effective on September 6, 1983.

Enclosed is your Quality Assurance Program Approval which has been revised to reflect changes made in 10 CFR Part 71. On September 6, 1983, this Quality Assurance Program Approval will supersede your current Quality Assurance Program Approval in its entirety.

Please note the conditions included in the approval.

Sincerely,

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosure: As stated

NRC FORM 311
(6-83)

U.S. NUCLEAR REGULATORY COMMISSION

QUALITY ASSURANCE PROGRAM APPROVAL
FOR RADIOACTIVE MATERIAL PACKAGES

1. APPROVAL NUMBER: 0192

REVISION NUMBER: 1

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and Title 10, Code of Federal Regulations, Chapter 1, Part 71, and in reliance on statements and representations heretofore made in Item 5 by the person named in Item 2, the Quality Assurance Program identified in Item 5 is hereby approved. This approval is issued to satisfy the requirements of Section 71.101 of 10 CFR Part 71. This approval is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

2. NAME
Nuclear Packaging, Inc.

STREET ADDRESS
815 So. 28th Street

CITY: Tacoma | STATE: WA | ZIP CODE: 98409

3. EXPIRATION DATE
December 31, 1985

4. DOCKET NUMBER
71-0192

5. QUALITY ASSURANCE PROGRAM APPLICATION DATE(S)
July 31, 1980

6. CONDITIONS

Activities conducted under applicable criteria of Subpart H of 10 CFR Part 71 to be executed with regard to transportation packages.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

CHIEF, TRANSPORTATION CERTIFICATION BRANCH
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

SEP 06 1983

DATE

10CFR71 QUALITY ASSURANCE PROGRAM

FOR

SHIPPING PACKAGES FOR IRRADIATED FUEL,
HIGH LEVEL WASTE AND PLUTONIUM

Letter Number QA-78-1

Revision 2

Date: September 23, 1983

NUCLEAR PACKAGING, INC.
1010 South 336th Street
Federal Way, WA 98003

APPROVALS

	Approved By	Date
Initial Issue	Larry L. Jansen	8/8/78
Revisions	Joe R. Olivadoti	8-8-78
Rev 1	Joe R. Olivadoti QA	7/31/80
	[illegible]	7/[illegible]/82
Rev 2	Joe R. Olivadoti	9/23/83
	Larry L. Jansen	9/26/83

INTRODUCTION

Nuclear Packaging, Inc. (NuPac) has developed a quality system to assure traceability and control the quality of all materials and processes utilized in the production of radioactive shielding, casks, containers, and other equipment pertaining to shipping packaging for irradiated fuel, high level waste, and plutonium.

The Quality Manual delineates requirements and procedures necessary to exercise control over design, documentation, procurement, material, fabrication, inspection, inventory, shipment and quality data retention.

NuPac Quality System and implementing Quality Procedures are designed and administered to meet the 18 criteria of 10CFR71, Appendix E. Figure 1 is a matrix delineating the relationship between the 17 NuPac Quality Procedures and the 18 10CFR71, Appendix E criteria.

DESCRIPTION OF THE NUPAC 10CFR71, APPENDIX E QUALITY PROGRAM

Criterion 1, Organization

Full responsibility for the Quality Assurance (QA) Program adherence to 10CFR71, Appendix E criteria rests with NuPac. Quality Program activities include calibration of measuring equipment, NDE and materials testing. NuPac surveys and qualifies all organizations performing these services to assure adherence to the 18 criteria prior to their use. All other quality activities are performed by NuPac quality personnel. However, the responsibility of the control of quality in the other organizations continues to rest with NuPac.

NuPac's President has full authority over all functions of the company, and delegates authority and responsibility for selected functions to other personnel within the company.

The administrative function includes financial, legal, and marketing activities.

Procurement department personnel perform purchasing activities and maintain supplier performance records. The Engineering Department is responsible for research and development of shipping container technology, design of casks for licensing and fabrication and design documentation.

The NuPac Quality Department has sufficient authority and organizational freedom to identify quality programs, implement corrective action and verify corrective action effectiveness.

Additionally, the Quality Department is independent from other organizations within NuPac and reports directly to the President

of NuPac. The Quality Department is headed up by the Quality Manager who is responsible for the development, implementation and administration of the entire NuPac Quality Program. He must have sufficient expertise in the entire field of Quality to enable him to direct the entire quality function in close adherence to the 18 criteria and the NuPac Quality Manual. Responsibility for development of quality acceptance requirements, inspections, and NDE activities rest with the Quality Manager. It is his responsibility to delegate and evaluate the performance of all quality related tasks for NuPac through the authority of the president.

It is delineated in writing through the Quality Manager that designated QA personnel have the authority to prevent the continued processing, fabrication, installation or delivery of unsatisfactory work.

Production responsibilities include scheduling and administration of all fabrication activities, both within NuPac and at qualified suppliers. The shipping and receiving function is also the responsibility of the Production Department.

The Quality Manager and all other quality personnel and/or organizations within, or utilized by NuPac, are fully qualified for their quality responsibilities. Qualification records are maintained in the NuPac Quality Record File.

See Figure 2, "Organization Chart, Nuclear Packaging, Inc."

Criterion 2, Quality Assurance Program

NuPac has established and implemented a QA Program for the control of quality in the design and fabrication of shipping containers for nuclear products. Training and/or evaluation of personnel qualifications are required for all QA functions in accordance with written procedures and are approved by the Quality Manager. The QA Program assures that all quality requirements, engineering specifications, and specific provisions of any package design approval are met. Those characteristics critical to safety are emphasized.

The President of NuPac regularly evaluates the NuPac QA program for adherence to the 18 criteria in scope, implementation, and effectiveness. Further, the President requires that the Quality System, including the QA Manual Policies and Procedures, be implemented and enforced on all applicable programs at NuPac.

A Material Review Board, consisting of Engineering, Procurement Production, and Quality Personnel has been established to disposition all discrepancies or disagreements pertaining to the acceptability of materials or hardware. Their dispositions are final and binding.

Criterion 3, Design Control

NuPac Quality Procedures (QP's) have been developed, approved, and implemented to control design review in such a manner to assure that the following occur:

(a) Design activity is planned, controlled, and documented.

(b) Regulatory and design requirements are correctly translated into specification, drawings, and procedures.

(c) Design documents contain quality requirements.

(d) Deviations from quality requirements are controlled.

(e) Designs are reviewed to assure adequate design verification activities, i.e., stress, thermal, accident analysis, etc., are performed and that design characteristics can be controlled, inspected and tested, and that acceptance criteria are identified.

(f) Design verification is performed by Quality Assurance personnel independent of the design activity. These verifications may include tolerance studies, alternate calculations or tests. Qualification tests are conducted in accordance with approved test programs and procedures.

(g) Interface control is established and adequate.

(h) Design and specification changes are reviewed and approved by the same organization(s) as the original issue.

(i) Design errors and deficiencies are documented and corrective action to prevent recurrence is taken.

(j) Design organization(s) and their responsibilities and authorities are delineated and controlled via written procedure.

Criterion 4, Procurement Document Control

The NuPac QA Program assures that all purchased material, components, equipment, and services adhere to design specifications.

Supplier evaluation and selection, objective evidence of supplier quality, assignment of quality requirements to procurement documents, and related design documents, and source, in-process and receiving inspection are all administered and controlled in accordance with approved NuPac QA procedures.

All procurement activity is performed in accordance with written procedures delineating requirements for preparation, review, approval, and control of procurement documentation. Particular emphasis is placed on assuring that revisions to procurement documentation are reviewed and approved by the same cognizant groups as the original.

Quality Assurance clause sheets are included with all request for quotes and purchase orders. Quality Assurance personnel assign clauses from the sheets to the procurement document referencing 10CFR Part 71, Appendix E requirements appropriate to the contract. In addition, material information including grade, type, size, special physical and chemical data requirements is included on the procurement documents. Other documentation and information such as drawings, procedures, inspection and test requirements, hold points, welding and other process qualification requirements are delineated on the procurement documents by the Quality Assurance personnel as appropriate to the contract.

The Quality Assurance personnel assure that requirements for acceptance of hardware and documentation appropriate to the contract are included in procurement documentation.

NuPac Quality Assurance personnel maintain the right of access to all supplier facilities and documentation for source inspection and/or audit activities. A statement to this effect is included on procurement documentation when it is appropriate to the contract.

Criterion 5, Instruction, Procedures and Drawings

Quality planning is developed for all activities requiring quality participation in accordance with approved NuPac QA procedures by qualified Quality Engineers (QE's) and are approved by the Quality Manager.

All design documents, i.e., drawings, specifications, special processes, etc. affecting quality are reviewed by the Quality Department and referenced in quality planning as necessary to assure adherence to package design approvals and the applicable criteria of 10CFR71, Appendix E.

All instructions, procedures, and drawings are developed, reviewed, approved, utilized and controlled in accordance with the requirements of written quality assurance procedures.

Criterion 6, Document Control

Policy and procedure for review, approval, release and change control of all controlled, quality related documents are delineated in approved NuPac QA Procedures. Provisions are provided in the QA Procedures for identification of individuals/organizations responsible for review, approval and issuance of documents. Document control responsibilities, facilities and distribution requirements are also addressed.

Controlled documents include, but are not limited to:

(a) Design specifications
(b) Design manufacturing drawings
(c) Special process specification and procedures
(d) Procurement documents
(e) QA Procedures and manuals
(f) Quality Planning for receiving, in-process and source inspection
(g) Source surveillance and evaluation reports
(h) Test procedures
(i) Audit reports

When revised documents appear in other documents as references, supplements or exhibits, appropriate revisions are made to those documents prior to the release of the basic approved change.

Documentation listings are maintained delineating the title, number and current revision for all drawings, procedures, specifications, and purchase orders.

The Quality Personnel assure that all required support documentation is available at the work area prior to the initiation of the work effort.

Criterion 7, Control of Purchased Materials, Parts and Components

Procurement documents are reviewed for acceptability of suggested suppliers based on the NuPac approved supplier lists.

In addition, and as required, supplier surveys are conducted by qualified NuPac personnel to further assure supplier acceptability. These evaluations are based on one or all of the following criteria:

(1) The supplier's capability to comply with the requirements of 10CFR Part 71, Appendix E, that are applicable to the contract.

(2) A review of previous records and performance of the supplier.

(3) 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.

Results of all supplier evaluations are recorded on Supplier Evaluation forms and are retained in the Quality Data File.

Quality requirements and standard clauses are added to procurement documents to require suppliers to identify material, provide test reports, control special processes, certify equipment and personnel, etc. Requirements to identify material and specific codes, specifications and/or design requiremetns pertaining to the fabricated items and procurement specifications not adhered to with justification for "accept-as-is" or "repair" dispositions are imposed on supplier as a minimum.

Quality planning is prepared and approved by the Quality Department for performance of all source, test, shipping and/or receiving inspections in accordance with approved design requirements, applicable 10CFR71 criteria, procurement document requirements and contract specifications.

Receiving inspection is performed to determine that the following, as appropriate to the contract, are assured:

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

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

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

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

All described activities are delineated in approved NuPac QA procedures.

Criterion 8, Identification and Control of Materials, Parts, and Components.

The identification and control of materials, parts, components and completed and in-process assemblies is administered by the Quality Department in accordance with approved NuPac QA Procedures. These procedures address quality status tags, maintenance of material identification and traceability, part identification, and related documentation. Some of the details of these procedures follow:

(1) Material identification procedures included in inspection planning and fabrication drawings require that identification of material, components, and/or hardware be maintained on the item or in traceable records to prevent use of incorrect or defective items.

(2) When appropriate, due to contractural or safety related requirements, Quality Assurance personnel assure that identification of materials, components, and/or hardware is traceable to applicable drawings, specifications, procurement documentations, manufacturing, and inspection records, discrepancy reports, and material test data.

(3) Quality Assurance personnel assure, via drawings and inspection planning requirements, that identification locations do not affect the fitment, interfacing capability, performance or overall quality of the finished product. Identification, in accordance with drawings and inspection planning requirements, is verified prior to releasing the item for further processing or delivery.

Criterion 9, Control of Special Processes

NuPac approved QA Procedures delineate the policies and procedures established to control such special processes as: welding heat treating, lead pouring, non-destructive examination, etc. in accordance with applicable codes, standards, specifications, 10CFR71 criteria and other requirements. Special processes developed by NuPac suppliers and by NuPac are documented.

All procedures for special processes and the personnel required to perform them are qualified under the cognizance of the Quality Department in accordance with applicable codes, standards, specifications and contract requirements.

All qualification records and support data are retained in the Quality Data file, and are maintained in a current status by Quality Assurance personnel.

These documents are controlled as delineated in Criterion 6 of this Quality System description.

Criterion 10, Inspection

All receiving, source and in-process inspection activities are performed in accordance with approved NuPac QA procedures. All inspection personnel and/or organization qualifications are reviewed and accepted by the Quality Manager prior to inspection activity. The inspection activity is performed in strict accordance with approved quality planning prepared by qualified QA personnel (See also Criterion 5 discussion).

Quality Inspection personnel are independent from all other organizations within NuPac and report directly to the Quality Manager.

Inspection personnel qualifications are based on their capability to perform the required inspection functions in accordance with applicable codes, standards, professional society programs such as the ASQC quality technician certification and NuPac training programs. Qualification reviews are performed periodically to maintain personnel proficiency and assure current qualification.

Mandatory hold points, inspection equipment requirements, accept-reject criteria, personnel requirements, characteristics to inspect, variables/attributes recording instructions, reference documentation and other requirements are included in the inspection planning.

The Quality Assurance department assures that any replacements, modifications, or repairs performed after final acceptance of material, components or hardware are inspected in accordance with the original inspection planning or new planning prepared as appropriate.

Criterion 11, Test Control

A test control program, as it applies to quality, is addressed in approved NuPac QA Procedures and assures, via required planning, that all required testing, such as proof and acceptance tests, are identified and performed in accordance with test

procedures, design requirements, and limitations. Prerequisities, accept/reject criteria, data recording criteria, instrumentation calibration, environmental conditions, documentation and evaluation requirements, etc. are delineated in the test procedures. Changes to the test procedures are required to be reviewed/approved by the same organization(s) as the original issue.

Whenever equipment, components, and/or assemblies require modification, repairs, or replacement which would result in requirements for re-test or additional testing, Quality Assurance personnel assure that original or new test inspection planning is prepared and adhered to as appropriate.

In any case, test results are documented, evaluated and accepted by qualified personnel as required by the test inspection plan prepared for the test under the cognizance of Quality Assurance personnel.

Criterion 12, Control of Measuring and Test Equipment

Administration of the calibration of measuring equipment and instrumentation is performed by the Quality Department in accordance with approved NuPac QA Procedures. The calibration system assures that all standard measuring instruments (SMI) used in the acceptance of material, equipment, and assemblies are calibrated and properly adjusted at specified intervals to maintain accuracy within pre-determined limits. Calibration is performed using equipment traceable to national standards. All calibrated equipment is identified and is traceable to the calibration test data.

Whenever SMI are found to be out of calibration during or immediately after use, all items inspected during that period are rejected by inspection and are submitted to review action for possible re-inspection or other appropriate corrective action.

Criterion 13, Handling, Storage, and Shipping

NuPac approved QA Procedures require that handling, storage, and shipping requirements adherence verification criteria be included in quality planning. These requirements are designed to prevent damage or deterioration of material and equipment. Information pertaining to shelf life, environment, packaging, temperature, cleaning, handling, preservation, etc., is included as required to meet design, NRC package approval and/or U. S. Department of Transportation shipping requirements.

Shipping documentation preparation, departure, and arrival time and destination data recording is also addressed in the planning, when applicable. The requirements in quality planning pertaining to shipping must be met prior to release for shipment.

Criterion 14, Inspection, Test and Operating Status

The use of inspection status tags, quality inspection stamps, and other means to indicate inspection and test status at, or for, NuPac are delineated in approved NuPac QA Procedures.

The clarity of the status indication, prevention of inspection, and/or test step by-passing, and prohibition of removal or modification of status indications, except with Quality Department approval/Material Review disposition is assured via these procedures. The Quality Assurance Department assures via Quality Procedure, interoffice memoranda, training sessions, and audit that all NuPac personnel are aware of and understand the meaning and use of status tags on all hardware, material, and test setups. (See also Criterion 15 discussion.)

Criterion 15, Non-conforming Material, Parts or Components

NuPac approved QA Procedures require that material, components, and equipment that do not conform to requirements are controlled to prevent their inadvertent use. Identification, segregation, discrepancy reporting, disposition of non-conformances by authorized individuals and re-inspection activities are performed and controlled in strict accordance with these procedures.

Quality Discrepancy Reports (QDR) are utilized by the NuPac quality department to identify discrepant items, describe the discrepancy, provide disposition and re-inspection requirements. The signatures of authorized cognizant personnel are placed on the QDR to signify approval of the disposition. These personnel must be approved by the Quality Manager and President and must be from the same groups approving the original design. In conjunction with repair or rework dispositions, quality assurance personnel provide supplimental inspection planning to verify proper implimentation of the QDR disposition. This assures that the item is retested and/or reinspected to a degree at least equal to the original acceptance activity.

Criterion 16, Corrective Action

Failures, malfunctions, and deficiencies in material, components, equipment and services are identified and reported to the Quality Manager and the President. The cause of the condition and corrective action necessary to prevent recurrence is identified, implemented and then followed up to verify corrective action effectiveness. Detail requirements for this activity are delineated in approved NuPac QA Procedures.

Criterion 17, Quality Assurance Records

A quality records system is in effect at NuPac and is administered in accordance with approved NuPac QA procedures. The purpose of the quality record system is to assure that documented evidence pertaining to quality related activities is maintained and available for use by NuPac, its customers,and/or regulatory agencies as applicable. Quality Records include, but are not limited to, inspection and test records, audit reports, quality personnel qualifications, design reviews, quality related procurement data, supplier evaluation reports, etc. All records are identified by work order number, part number, contract number, or drawing number as appropriate to the record type. A complete list of all quality records is maintained and provides cross reference between the different identity methods described above and pinpoints the record location.

Design related records such as calculations, drawings, research and development test reports, etc., are retained in the Quality Assurance records system for the life of the shipping package. All other quality related records are retained for a minimum of two years, but no more than five years unless otherwise specified by contract.

Inspection records retained in the Quality Assurance records system provide the following data when applicable:

(1) Inspection type, i.e., in-process, test, receiving, and shipping.

(2) Evidence of completion and verification of manufacturing, inspection, or test operation.

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

(4) Information related to noted discrepancies.

(5) Inspector or data recorder identification.

(6) Evidence of acceptance.

Criterion 18, Audits

Quality program audits are performed on a periodic, scheduled basis by personnel without direct responsibilities in the areas being audited. Audit personnel are certified quality assurance lead auditors who have met all requirements of ANSI N 45.2.23. Written planning sheets and check lists are utilized. Audit results and corrective action activity are reported to management, in writing, and are retained in the quality assurance record file. Responsible management personnel are required to respond to audit findings with the necessary action to correct the noted deficiences. Current NuPac practice is to audit all quality functions on an annual basis. Areas found deficient during audits are reaudited on a first priority basis to verify corrective action implimentation and effectiveness. Details of the NuPac Audit System are delineated in approved NuPac QA Procedures.

REFERENCES

(1) 10CFR71, Appendix E, Criteria 1-18 & Sub part H dated August 24, 1983, "Quality Assurance Criteria for Shipping Packages for Radioactive Material."

(2) NuPac Quality Manual, dated May 1, 1978.

ATTACHMENTS

Figure 1: "Quality Requirements Matrix - 10CFR71, Appendix E, Criteria 1-18 vs. NuPac Quality Procedure Numbers 1-17".

Figure 2: "Organization Chart, Nuclear Packaging, Inc."

QUALITY REQUIREMENTS MATRIX

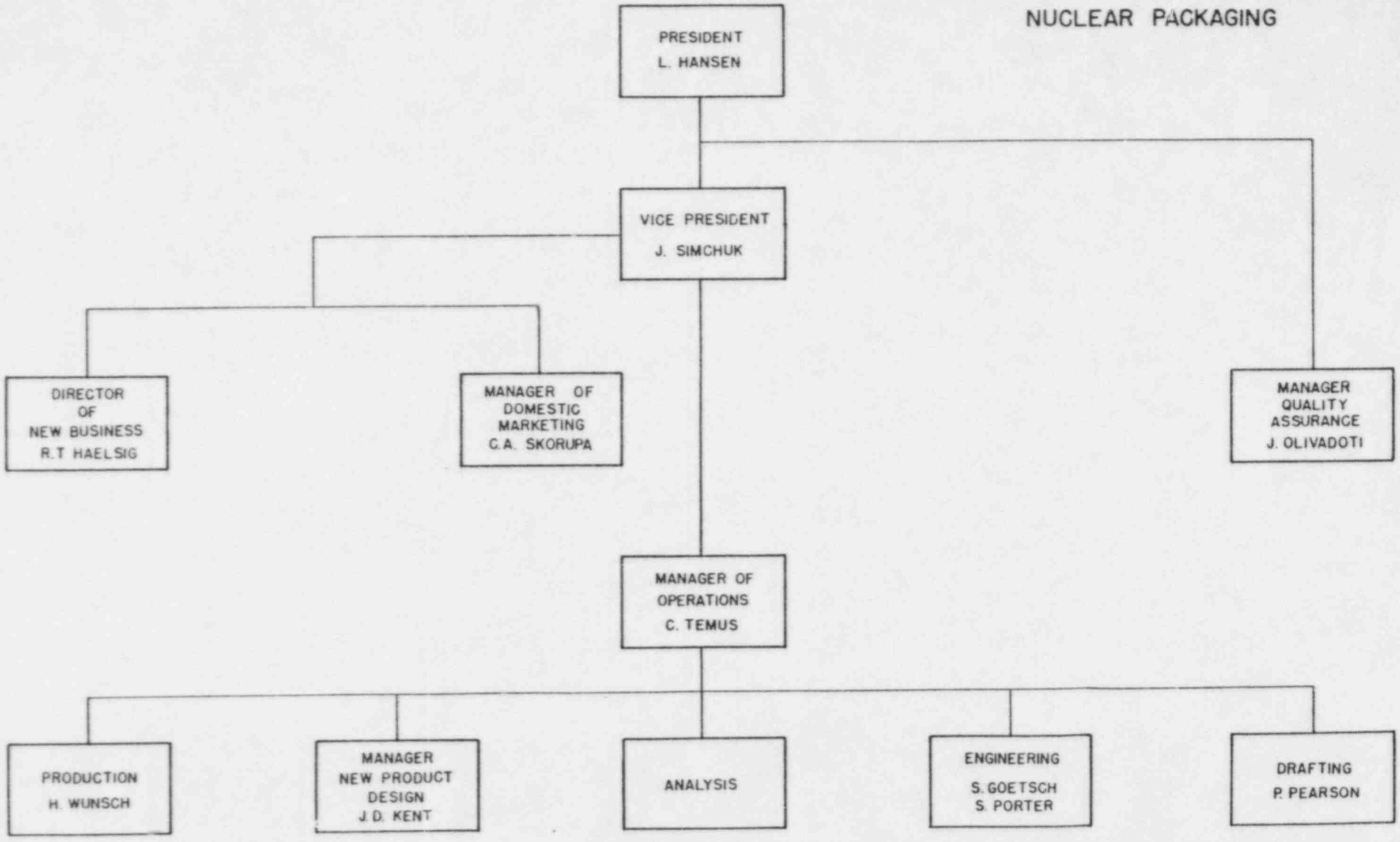
10 CFR VS NuPac

10CFR50, Appendix B 10CFR71, Appendix E	NuPac Quality Manual
I. Organization	Quality Program & Organization Chart QP 1 - Quality Control Manual QP 14 - Quality Assurance Training
II. Quality Assurance Program	Same As Above
III. Design Control	QP 2 - Design Review QP 15 - Engineering Holds QP 17 - Design Control
IV. Procurement Document Control	QP 4 - Procurement Control QP 15 - Engineering Holds
V. Instructions, Procedures and Drawings	QP 3 - Document Control QP 5 - Quality Planning QP 15 - Engineering Holds
VI. Document Control	QP 3 - Document Control QP 15 - Engineering Holds
VII. Control of Purchased Material, Equipment and Services	QP 4 - Procurement Control QP 12 - Material Control
VIII. Identification and Control of Materials, Parts and Components	QP 3 - Document Control QP 12 - Material Control

IX. Control of Special Process	QP 4 - Procurement Control QP 5 - Quality Planning QP 6 - Inspection and Verification QP 16 - Special Process Qualifications and Control
X. Inspection	QP 6 - Inspection and Verification
XI. Test Control	QP 5 - Quality Planning QP 6 - Inspection and Verification QP 15 - Engineering Holds
XII. Control of Measuring and Test Equipment	QP 11 - Calibration Control
XIII. Handling, Storage and Shipping	QP 12 - Material Control
XIV. Inspection, Test and Operating Status	QP 6 - Inspection and Verification
XV. Nonconforming Materials, Parts, or Components	QP 7 - Discrepancy Reporting and Control
XVI. Correction Action	QP 8 - Corrective Action
XVII. Quality Assurance Records	QP 1 - Quality Control Manual QP 9 - Quality Records QP 10 - Quality Forms Control
XVIII. Audits	QP 13 - Audits

ORGANIZATION CHART

NUCLEAR PACKAGING



JULY 1983

NRC FORM 311
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION

QUALITY ASSURANCE PROGRAM APPROVAL
FOR RADIOACTIVE MATERIAL PACKAGES

1. APPROVAL NUMBER: 0192

REVISION NUMBER: 1

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and Title 10, Code of Federal Regulations, Chapter 1, Part 71, and in reliance on statements and representations heretofore made in Item 5 by the person named in Item 2, the Quality Assurance Program identified in Item 5 is hereby approved. This approval is issued to satisfy the requirements of Section 71.101 of 10 CFR Part 71. This approval is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

2. NAME
Nuclear Packaging, Inc.

STREET ADDRESS
815 So. 28th Street

CITY: Tacoma | STATE: WA | ZIP CODE: 98409

3. EXPIRATION DATE
December 31, 1985

4. DOCKET NUMBER
71-0192

5. QUALITY ASSURANCE PROGRAM APPLICATION DATE(S)
July 31, 1980

6. CONDITIONS

Activities conducted under applicable criteria of Subpart H of 10 CFR Part 71 to be executed with regard to transportation packages.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald

CHIEF, TRANSPORTATION CERTIFICATION BRANCH
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

SEP 06 1983

DATE

APPENDIX C

PROPRIETARY

APPENDIX D

PROPRIETARY

APPENDIX E

PROPRIETARY