MODEL SRP-1

SAFETY ANALYSIS REPORT

APPLICATION FOR NRC CERTIFICATE OF COMPLIANCE

AUGUST 4, 1998

GE NUCLEAR ENERGY PRODUCTION
WILMINGTON, N. C.

CONTAINS ORIGINAL LETTER

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GE DRAWING 0025E98

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1.0 GENERAL INFORMATION

1.1 Introduction

The Model designation for this package is SRP-1. This package will be used for the transport of uranium contaminated solid residues containing enrichments of U-235 up to 5%. The residues are highly insoluble due to their chemical and physical form, therefore concentration or other redistribution during transport is not credible. Transport is for disposal of this material.

The maximum allowable number of packages is 84 per shipment. Contents are limited to 104 grams U235 per package and a maximum of 8.736 kilograms U235 per conveyance.

The drum functions as a confinement barrier for the package contents during the normal conditions of transport. Under accident conditions the package is not relied on to provide any function and is assumed to be totally absent. Based on the contents and use of the package, it is not required to be a pressure retaining vessel.

1.2 Packages Description

1.2.1 Packaging

The SRP-1 package consists of a 55 gallon DOT UN 1A2/X400/S Specification drum meeting the requirements in Table 1.1 and the Appendix to this section. The drum is constructed of carbon steel. The maximum gross weight of the SRP-1 package is 882 pounds, when the maximum weight of authorized contents (832 pounds) is loaded.

1.2.2 Operational Features

The use of the SRP-1 packaging is typical of drum type packaging. The 55 gallon drum is sealed with a rubber gasket and a lid secured by a closure ring with a 5/8 inch bolt and nut through drop forged closure ring lugs. Required torque for the bolt and nut is 85 ft. lb.. Loading is accomplished as described in Section 7.0 of this report.

1.2.3 Contents of the Package

The package is to be used to transport solid uranium contaminated residues (i.e., uranium residues) from waste treatment of process liquids and residues at a LEU fuel fabrication plant. The solid uranium residue consists principally of calcium-bearing lime slurry precipitate.

Similarly, the uranium oxide contained in calcium fluoride (CaF2) soil waste consists of lime compounds. Scanning Electron Microscopy/Energy Dispersive Spectroscopy (SEM/EDS) has shown that a majority of the uranium found in the CaF2 soil is UO2(OH)2-H2O. Present also are CaF2, Ca(OH)2, CaCO3, UO2, soil and ceramic-like residue from incineration. Most of the material consists of sub-micron particles generally in the range of 0.2 to 0.05 microns. Some agglomerates are around 5 to 10 microns.

The density of the mixed material uranium-residue and CaF2 soil product ranges from approximately 75 lb/ft3 to 100 lb/ft3. At 100 lb/ft3 the package could only be loaded to 750 pounds which is significantly lower than the rating of the 1A2/X400/S (882 lbs.). The density of uranium was taken as that of theoretical UO2 at 10.96 g/cc. The uranium isotopic distribution is presented in Chapter 6.0.

The SNM contents are limited to 104 grams U235 per package at a maximum enrichment of 5.00 wt. % U235.

Redistribution of the uranium during transport is highly unlikely. The uranium in the material has been shown to be so chemically and physically bound, that separation of the uranium during normal or accident conditions of transport is nearly impossible. A summary of the SRP-1 package attributes is presented in Table 1.1.

Table 1.1 SRP-1 Package Attributes

Attribute	Description
Package	55-gallon steel drum (see Appx. 1.3)
Model No.	SRP-1
Package ID	1A2/X400/S
Maximum total package weight	400 kgs (882 lbs)
Contents	Uranium contaminated solid residue
Enrichment (max.)	Up to 5.00 wt. % U235
maximum fissile mass per package	104 gU235 in solid UO2 form max. per package.
SNM distribution	U235 must not be capable of concentrating or redistributing during transport
maximum fissile density	0.5 gU235/liter waste per package
maximum fissile mass per conveyance	8.736 kgs U235
minimum package volume	55-gallons (nominal, minimum)
maximum package stack height	one single layer (no stacking)
maximum number of containers per shipment	84

1.3 General Package Information

1.3.1 Requirements for Drum Fabrication

A. The drum shall have a rated capacity of 55-gallons.

B. The drums shall have removable heads.

C. The body and head of the drum shall be manufactured from steel.

D. Body seams shall be welded

E. The drum shall have three rolled or swaged-in rolling hoops.

F. The drum shall have convex (crowned) heads.

G. Closure devices must provide secure closure.

H. Gaskets shall be used on all drums.

I. The package shall bear the performance code 1A2/X400/S as a minimum

2.0 STRUCTURAL EVALUATION

2.1 Structural Design

2.1.1 Discussion

The SRP-1 packaging maintains the waste material under normal conditions of transport. The package consists of a 55-gallon steel drum that functions as the containment boundary for the package contents under normal conditions of transport. Leakage of material from the closed package during normal transport is prevented by a rubber gasket.

The approach used in the structural analysis section is to compare these packages to similar packages that have a historical basis for use as shipping packages for radioactive material and current shipping packages in use. In addition, normal condition compression and drop tests were performed.

A standard 1A2/X400/S steel drum with a capacity of 55-gallons is utilized as the packaging. This type of drum has a history of successful in-service use in similar applications. In this application, it functions as a structural containment during normal handling and transport. There are no attachments for lifting or tie-down devices.

There is no inner container or spacing. The contents are packed tightly against the walls of the packaging. The rigid properties of the contents absorbs the impact energy during loading and handling during normal conditions of transport and storage. While the package may deform slightly, the package prevents any significant loss of its contents during normal operations. Under hypothetical accident conditions, the packaging will not maintain the contents.

2.1.2 Design Criteria

The SRP-1 package design is that of a 55-gallon carbon steel drum. Performance standards of 55-gallon carbon steel drums form the basis of the design criteria for the SRP-1

2.2 Weights and Center of Gravity

Loaded for shipment, the SRP-1 shipping package has a maximum gross weight of 882 pounds. This includes a maximum payload weight of 832 pounds with a limit of 104 grams of U235 material. The weight of the empty drum and it's components is nominally 50 pounds.

The package is nearly symmetrical. When full, the center of gravity of the package is very near its geometric center - mid-height on the drum centerline.

2.3 Mechanical Properties of Materials

Standard commercial carbon steel is used in the construction of the shipping packagings.

2.4 General Standards for all Packages

The information in this section demonstrates that the SRP-1 packaging complies with the general standards applicable to all packaging as specified in 10 CFR 71.43.

2.4.1 Minimum Package Size

The smallest overall dimension of the SRP-1 is its diameter (22 1/2 inches, 57.15 cm).

2.4.2 Tamperproof Feature

The SRP-1 will be sealed with a tamper indicating feature applied to the clamping ring bolt. Reference 10 CFR 71 43.

2.4.3 Positive Closure

A locking ring with a 5/8 inch bolt is used for this package. The 5/8 inch bolt is torqued to 85 ft.lbs. This closure cannot be unintentionally opened and withstands the normal conditions experienced of transport.

2.4.4 Chemical and Galvanic Reactions

Materials of construction (carbon steel and rubber gaskets) will exhibit no significant chemical, galvanic, or other reaction among the packaging components or between the packaging components and the package contents. This conclusion is based on operating experience with the proposed contents with similar (steel) packages.

2.5 Lifting and Tiedown Standards for All Packages

2.5.1 Lifting Devices

No lifting devices are included as a part of the packaging. Standard industry practice for lifting and handling the drums will be used.

2.5.2 Tiedown Devices

No tiedown devices, such as rings, are provided as part of the packaging. Standard industry tiedown and blocking devices will be used to secure the drum load to the transport vehicle.

2.6 Normal Conditions of Transport

The SRP-1 package subjected to the conditions and test specified in 71.71 of 10 CFR Part 71, meets the standards specified in 71.43 and 71.51 of 10 CFR Part 71. Each condition was assessed separately and a determination was made that the package design satisfied the applicable requirement.

Comparison with similar packages indicates that only minor damage is expected as the result of Normal Conditions of Transport. Based on drop tests results there will be no significant loss of contents or increase in external surface radiation levels is anticipated.

Steel drums have a long history of use for shipment of radioactive material. Some examples are the USA/9280/AF (Model UBE-1), USA/9250/B(U)F (Model 5X22), USA/9019/AF (Model BU-7) and USA/6357/AF (Model NNFD-10) NRC Certificate of Compliance packages.

2.6.1 Heat

In the heat test for normal conditions of transport per 10 CFR 71 regulations, the package is to be subject to an ambient temperature of 38C(100F). This test would result in only a modest increase in the temperature of the drum. The contents would serve to dissipate the heat from the drum. There is no internal heat source since no heat is generated by the contents. The heat would also have no effect on the contents other than to raise temperature slightly.

No significant temperature gradients exist in the SRP-1 package as a result of the elevated temperature conditions. The large surface area and thin wall construction of the drum precludes any build-up of a temperature gradient and associated differential expansion stresses that could affect the integrity of the outer shell.

2.6.2 Cold

Regulations require the package to be evaluated at -40F. The package body is fabricated from mild steel. Since this material does not undergo a ductile-to-brittle transition in the temperature range of interest (down to -40F), it is not effected by brittle fracture .

2.6.3 Reduced External Pressure

As stated in the regulations, the package must be evaluated as to the effect of subjecting the package to a reduced external pressure of 3.5 psi absolute. This value translates into a bursting pressure of 11.2 psig. For the SRP-1 packages, the drum is tightly filled with its contents and will offer no pressure differential.

2.6.4 Increased External Pressure

The package must be evaluated as to the effect of subjecting the package to an increased external pressure of 20.0 psi absolute. This value translates into a crushing pressure of 5.3 psig. The SRP-1 package, filled with its contents, will offer resistance to external pressure and at this order of magnitude no damage will result.

2.6.5 Vibration

The effects of vibration normally associated with transport conditions are considered to be negligible with respect to the SRP-1 package. This conclusion is based on the geometry of the package design and the damping action provided by the contents. Any induced stress would be of very low magnitude and would not be detrimental to the normal operation of the package. The drums are standard commercial products with a long history of successful in-service operation. Packages of this type have been used routinely for shipments with no noticeable effect from vibration.

2.6.6 Water Spray

Due to the nature of the carbon steel materials utilized in the drum and the gasketed lid, the water spray test requirements would have no effect on the SRP-1 package. Packages of similar designs have been left exposed for extended periods of time in heavy rains on the order of 3 inches per hour with no detectable moisture ingress or degradation of the packaging integrity.

2.6.7 Free Drop

The regulations require a package of less than 11,000 pounds (5,000 Kg) to be subjected to a free drop from a height of 4 feet (1.2 meters) onto a flat unyielding surface. Normal condition free drop requirements of 10 CFR 71 have a negligible effect on the overall structural performance of the package. Two drums were dropped from a height of 4 feet. One drum was dropped at a 57 degree angle with the impact directly on the bolt closure. The other drum was dropped from a horizontal position with the impact on the bolt side and weld seam of the package. Some local deformation at the points of impact was

observed for the drums. This type of minor deformation of the drum is not detrimental to the integrity of the package. See the Test Report Appendix 2.1.0.

2.6.8 Corner Drop

This test applies only to fiberboard or wood cylindrical packages not exceeding 100 kg (220 pounds). The SRP-1 is a carbon steel package and the expected shipping weight of the package is 882 pounds. This requirement is not applicable to the SRP-1 package.

2.6.9 Compression

Compression tests using 2,000 kg (4,410 pounds) of weight were performed and produced no adverse affects to the package.

2.6.10 Penetration

The penetration test specified as part of the normal conditions of transport will not have a significant effect on the effectiveness of the SRP-1 package due to the strength of the drum.

2.7 Hypothetical Accident Conditions

During accident conditions the SRP-1 package is not relied on for containment, and this has been included in the overall safety evaluation. Numerous tests and evaluations have been performed over the years on SRP-1 type packages. The results from these efforts have provided the basis for NRC certification of these packages. Hypothetical Accident tests were not performed on the SRP-1 package. Comparison with similar packages indicates that some degree of damage is expected as the result of this type of testing.

2.7.1 Free Drop

The 30 ft. drop test is not applicable because containment of the material is not assumed.

2.7.2 Puncture

A puncture test for the SRP-1 package is not applicable because no credit is assumed for the packaging in the accident case.

2.7.3 Thermal

Thermal testing is not applicable for the SRP-1 because no credit is taken for the package in the event of an accident.

2.7.4 Immersion - Fissile Packages

An immersion test under a 3 foot (.9 meters) head of water is required for all packages where water in-leakage is not assumed. Water in-leakage is assumed for the accident cases for the SRP-1 package, therefore, this test is not applicable..

2.7.5 Immersion - All Packages

Regulations require that an undamaged package be subjected to water pressure equivalent to immersion under a head of water of at least 50 feet (15 meters) for a period of not less than eight hours. An external pressure of 21 psi (147 kilopascal) is considered equivalent to the immersion test.

No immersion testing was performed on the SRP-1 package. The package is not leak-tight, therefore, the water is assumed to saturate the contents. Not applicable.

2.8 Special Form

The requirements for special form are not applicable to the SRP-1 package.

2.9 Fuel Rods

This requirement is not applicable to the SRP-1 package. The package contains no fuel rods.

2.10

SRP-1 Test Report

Test Performed by:

GE Nuclear Energy

May 1998

Introduction

This report documents the tests that were performed on the SRP-1 container. Two four foot free drop tests were performed along with a stacking compression test. Different drums were used for each test. One drum was dropped at a 57 degree angle, while another was dropped in a horizontal position. GE utilized Container Products Corporation's test pad for the testing. The target is used is roughly 10' x 10' x 10' reinforced concrete slab which provided an unyielding surface. A videotape of the two drop tests was recorded.

For the compression test, a loaded container was subjected to five times the loaded weight of the container (2,000 kg or 4,410 lbs.) per 10 CFR 71 (71.c.9).

Acceptance criteria for the tests included:

- The drum lid and locking ring must always stay attached to the drum.
- The lid must not separate from the drum at any point.
- No holes or cracks appear due to the deformation caused by the drop.

NOTE: Deformation was not considered for acceptance because the criticality analysis assumes no spacing.

Packaging Description

Containers were purchased under GE Nuclear's 10 CFR 71 QA Program. The containers purchased were DOT performance containers with a designation of UN 1A2/X400/S/.... 1A2 indicates an open head steel drum. The X indicates the drum was tested to Packing Group I standards. The 400 indicates the gross weight the package was tested for. The "S" indicates that the package is intended for solids.

Packing Group I drums must pass:

- A 5.9 foot drop test onto a rigid, non-resilient, flat, horizontal surface.
- A leakproofness test at 4 psi
- A hydrostatic pressure test at a min. of 36 psi for 5 minutes
- A stacking test

The container was filled with a dirt and sand mixture to a minimum of 755 lbs. and the locking ring bolt was torqued to 85 ft.lbs. The material mixture closely resembles the material mixture that will be shipped in this container, relative to weight and physical characteristics. The mixture also would be easy to identify if there were a breech of the package during testing.

Test Plan for SRP-1 Drop Test

GE Activities:

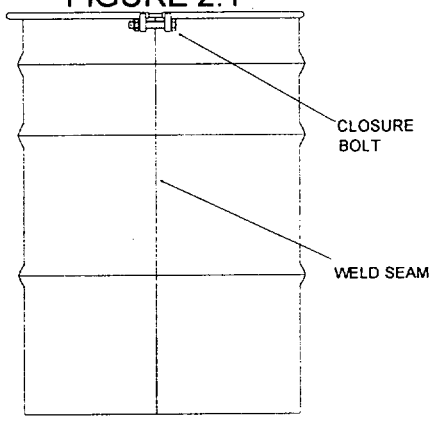
1. Collect 3 SRP-1 containers (UN Spec. Design 1A2/X400/S 55-gallon drum). Inspect drums to verify they comply with SAR Maintenance requirements (Chapter 8 of SAR).

2. Drums must be filled to a minimum of 755 lb. of dirt in each container. Additional metal or other solid material may be added to the contents to achieve the desired weight. (Photograph)

3. Weigh each drum and photograph the scale display. Each drum must weigh a minimum of 805 lb. If a drum weighs less, add more material until the container weighs 805 lb.

4. Replace lid and bolt ring. NOTE: Closure ring bolt must be located directly in line with weld seam on side of container. See Figure 1.

FIGURE 2.1



1. Close containers with closure bolt. Use a calibrated torque wrench (i.e., powder pack wrench) to verify the bolt is fastened at a minimum of 85 ft-lb.

2. Mark each drum test sample 1 through 3 with a marker (for identification purposes) and mark "Contains Dirt - Test Container".

Containers are to be delivered to Container Products Co.

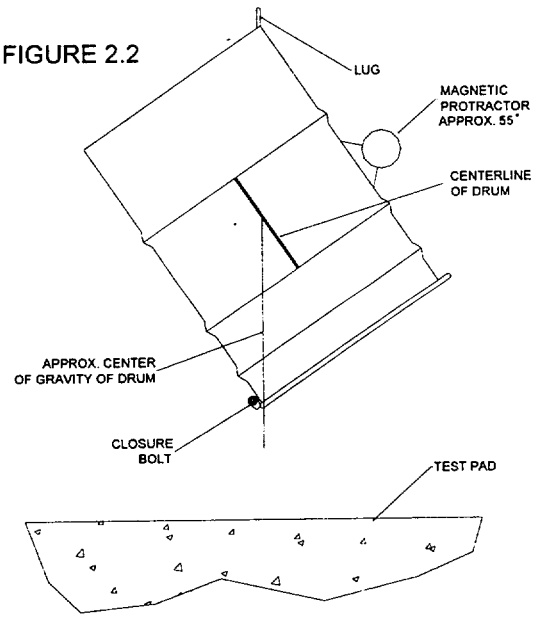
NOTE: Containers are to be re-inspected at CPC to verify that no damage has occurred in transit to CPC.

CPC Drop Test

Specimen 1: Corner Drop

1. The drum must be dropped on CPC's Hanford Test Pad.
2. Drum shall be oriented so that the closure bolt makes the initial impact on the pad in line with the center of gravity. CPC will weld a lug to the drum bottom to lift the container, and position it.
3. Turn drum upside down. And raise with a strap through the lifting lug. Container should line up along the center of gravity directly above closure. To verify this use the following method:
    a. On a level area of the test pad, use a level and mark a vertical line in line with the lift lug. (See Figure 2.2)
    b. Attach the magnetic protractor and verify that the drum is at approximately 55 degrees to the centerline (+/- 5 degrees). (See Figure 2.2).

FIGURE 2.2



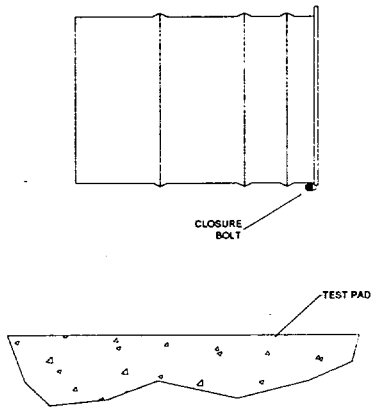
4. Raise the container to a minimum height of 4 feet, and a maximum of 4 feet 6 inches. (GE verify with a tape measure and Photograph.)
5. Drop the container on the pad with care being taken not to cause the drum to become mis-aligned.

6. GE Engineer is to inspect the drum for damage and record any findings. (Photograph Damage)

Specimen 2: Flat Drop

1. The drum must be dropped on CPC's Hanford Test Pad.
2. Drum shall be oriented so that the closure bolt and side weld seam make the initial impact on the pad.
   Orientation:
   a. Lay the drum on it's side. (See Figure 2.3)
   b. Sling the drum in two places.

FIGURE 2.3



   c. Raise the container to a minimum height of 4 feet, and a maximum of 4 feet 6 inches. (GE verify with a tape measure and Photograph.).
   d. At proper drop height, use the magnetic protractor to assure drum is level. (Photograph)
   e. Release drum onto pad making a flat contact with the pad.

3. GE Engineer is to inspect the drum for damage and record any findings. (Photograph Damage)

NOTE: Photographs are for the purpose of documentation for the SAR. Lack of photographic evidence, (e.g., picture does not develop properly) does not constitute a violation of this procedure.

Drop Test Results

The following describes the results of both the closure drop test, and the side drop test for the SRP-1 container.

See Photos 1-3 for test preparation

Closure Drop Test Results

Drum number 1 was dropped from a distance of 4 feet in an orientation of approximately 57 degrees. This orientation provided maximum impact on the closure bolt assembly with the center of gravity of the container directly in line with the closure mechanism.

Minor deformation was observed on the top chime of the container.

No leakage of material was noted.

The lid remained attached to the drum, and the locking ring remained securely attached to the package. There was no loss of contents and the package integrity was maintained.

See Photographs 4 - 8

Side Drop Test Results

Drum number 2 was dropped from a distance of 4 feet in an orientation horizontal to the drop pad. This orientation provided maximum impact on the closure bolt assembly and side weld seam of the container.

Minor deformation was observed along the length of the container.

No leakage of material was noted.

The lid remained attached to the drum, and the locking ring remained securely attached to the package. There was no loss of contents and the package integrity was maintained.

See Photographs 9 - 11

Compression Test

Location: Shipping and Traffic Shipping Bay. Flat surface.

1. Collect 1 Drum of UN Spec. Design (1A2/X400/S). Inspect drum to verify it complies with SAR Maintenance requirements.

2. Pack with dunnage material to a weight of approximately 882 pounds. Replace lid and bolt ring.

3. Close containers with closure bolt. Use a calibrated torque wrench (e.g., powder pack wrench) to verify the bolt is fastened at a minimum of 85 ft-lb.

4. Stack a minimum of 4,410 pounds of calibrated weight on the lid of the container. If the weight does not contact all of the top ring surface of the container, place sheet of metal between the weight and top of the container. (Photograph container and stacked weight).

5. Place a barrier around stack and affix a sign to the stack stating (Test In Progress - DO NOT MOVE).

6. Let contents stand for a minimum of 24 hours.

7. After 24 hours, packaging engineer must inspect container for damage. If any damage occurs, information must be recorded and photographed.

Required Materials	QTY
SRP-1 container and closure material	1
Steel Plate, 25" x 25" min.	1
Calibrated Weight	4,410 lb.

Test Results

A specimen drum was prepared according to the outlined test plan. A weight of 2,000 Kgs (4410 lbs.) was placed on a 25" square steel plate approximately ¼" thick. The load was left in place for 24 hours. After the 24 hour period, the load was removed and the container was inspected. Results showed no damage to the container. There was no observed deformation of the container. The container was intact, and there was no evidence of leakage.

Photo 1: Drum Packing

Photo 2: Drum Closure

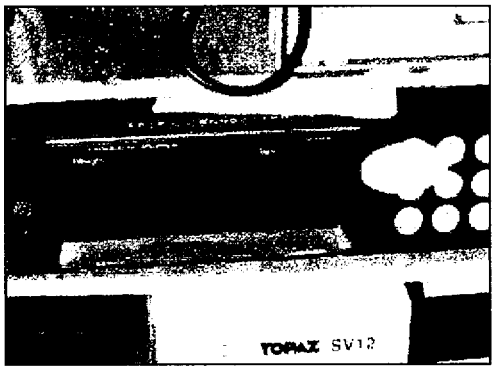


Photo 3: Drum Weight

Photo 4: Angle Drop

Photo 5: Angle Indicator

Photo 6: Four Foot Measurement

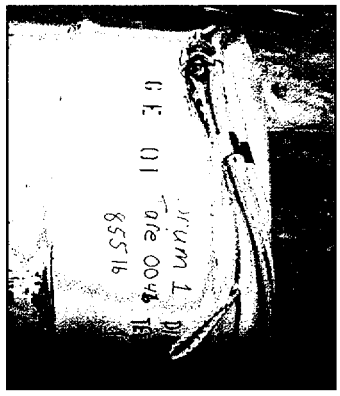


Photo 7: Angle Drop Damage

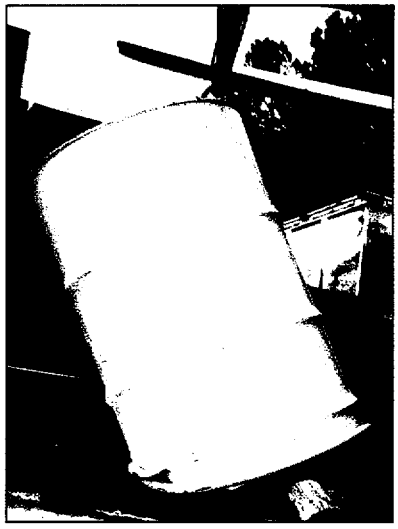


Photo 8: Angle Drop Damage

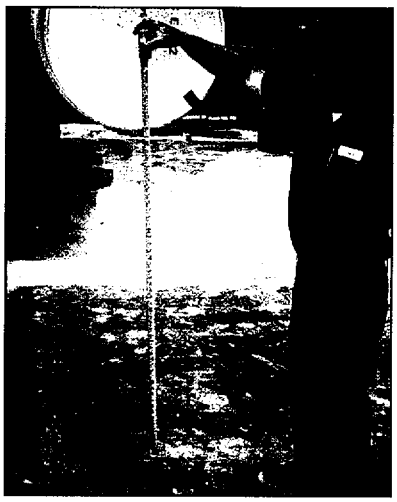


Photo 9: Horizontal Drop Measurement

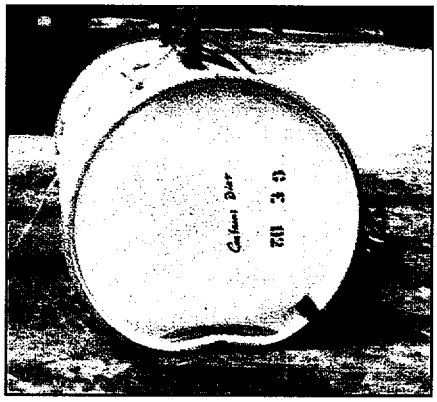


Photo 10: Horizontal Drop Damage

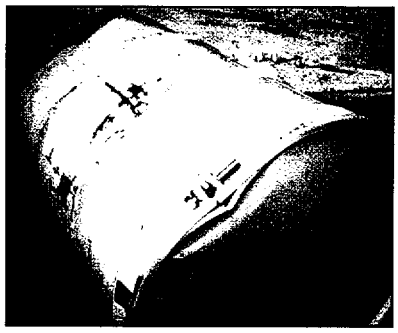


Photo 11: Horizontal Drop Damage

3.0 THERMAL EVALUATION

3.1 Discussion

The design and operating requirements for the SRP-1 do not dictate that there are any significant thermal demands required for the package. The package contains the material during normal handling of transport, but is not required to contain material during hypothetical accident conditions.

3.2 Summary of Thermal Properties of Materials

The SRP-1 Shipping Packaging is constructed using standard materials used in container construction. There are no special thermal demands placed on the components of the package.

3.3 Technical Specifications of Contents

The contents of the SRP-1 is basically soil and other residues containing uranium most likely as UO2/U3O8/Other highly complex chemical forms. The compounds do not generate heat nor are they heat sensitive.

3.4 Thermal Evaluation for Normal Conditions of Transport

The SRP-1 shipping package meets the requirements for normal transport conditions.

3.4.1 Thermal Model

There is no thermal model for the SRP-1 package. This is not applicable.

3.4.2 Maximum Temperatures

There is no significant temperature increase above ambient (100F) for normal conditions of transport.

3.4.3 Minimum Temperatures

The minimum temperature will be the ambient temperature specified in 10 CFR 71.

3.4.4 Maximum Internal Pressures

Not applicable. The SRP-1 packages are not pressurized. The containers are tightly loaded. For normal conditions of transport, no significant pressure is generated.

3.4.5 Maximum Thermal Stresses

Not applicable. Thermal stresses within the range of normal condition of transport and fabrication do not result in any limiting thermal gradient and isothermal stresses.

3.4.6 Evaluation of Package Performance for Normal Conditions of Transport

Based on experiences with similar containers, the thermal stresses as a result of normal operations are negligible.

Using the test results of similar packages, the following evaluation of the SRP-1 can be derived. The test would result in only a modest increase in the temperature of the drum exposed to the heat input. No significant temperature gradients would exist in the package as a result of heat conditions. The large surface area and thin wall construction of the drum precludes any build-up of a temperature gradient and associated differential expansion stresses that could affect the integrity of the container.

3.5 Hypothetical Accident Thermal Evaluation

No effects of hypothetical accident thermal conditions on the package are evaluated. There is no required package performance during hypothetical accident conditions.

3.5.1 Thermal Model

Not applicable.

3.5.2 Package Conditions and Environment

Not applicable.

3.5.3 Package Temperatures

Not applicable

3.5.4 Maximum Internal Pressures

Not applicable

3.5.5 Maximum Thermal Stresses

Not applicable

4.0 CONTAINMENT

4.1 Containment Boundary

The 55-gallon drum provides the confinement boundary for the package contents during normal conditions of transport. No containment is considered for the hypothetical accident conditions.

4.1.1 Containment Vessel

The SRP-1 package is a UN 1A2/X400/S DOT Specification package. .

4.1.2 Containment Penetrations

There are no penetrations in the containment.

4.1.3 Seals and Welds

The bottom is welded to the cylindrical drum.

4.1.4 Closure

The 55-gallon drum is sealed with a rubber gasket and a lid secured by a closure ring with a 5/8 inch bolt and nut through drop forged closure ring lugs. The bolt is torqued to 85 ft.lbs.

4.2 Requirements for Normal Conditions of Transport

For normal operating conditions, the possibility of leakage is very limited. The container is not pressurized as part of the operation procedures and there is very little driving force for leakage due to the thermal expansion of the air inside the containers. The quantity of air available inside the container to carry the particulate is limited (95% to 100% of the cavity volume is taken up by the contents).

4.2.1 Release of Radioactive Material

Vessel contains the material under normal conditions of transport.

4.2.2 Pressurization of Containment Vessel

Not Applicable

4.2.3 Coolant Contaminates

Not Applicable

4.2.4 Coolant Loss

Not Applicable

4.3 Containment Requirements for Hypothetical Accident Conditions

Containment during the hypothetical accident conditions is not required for the package and is not applicable.

4.3.1 Fission Gas Products

Not applicable.

4.3.2 Containment of Radioactive Material

Not applicable.

4.3.3 Containment Criterion

Not applicable.

4.4 Special Requirements

Not applicable.

5.0 SHIELDING EVALUATION

5.1 Discussion and Results

There are no design features for the SRP-1 that are specifically included for the purpose of radiation shielding. The package only contains unirradiated low enriched uranium (LEU) and the associated uranium daughters. Measured (and anticipated) dose rates are well below the U.S. Nuclear Regulatory Commission's limits given in 10 CFR 71.47(a). These limit the package to 200 mrem per hour at any point on the external surface of the package and a transport index of 10 (10 mrem per hour at 1 meter).

Considering measurements from over 349 of the proposed package design, it is anticipated that the dose rate at any point on the external surface of the package will not exceed about 2.0 mrem per hour. The radiation dose rate at a distance of 1 meter will likely be less than 0.05 mrem per hour. Therefore, the transport index defined in 10 CFR 71.4 is determined by criticality controls rather than radiation dose rate as presented in the next chapter.

5.2 Source Specification

Not Applicable

5.3 Model Specification

Not Applicable

5.4 Shielding Evaluation

Not Applicable

6.0 CRITICALITY SAFETY EVALUATION

6.1 GENERAL DESCRIPTION

The SRP-1 transport package uses a 55-gallon 1A2/X400/S DOT Specification steel drum (22-½ " inside diameter x 34-5/16" inner height, nominal dimensions). The drum body and bottom are fabricated from a 18-gauge (0.0495", nominal) carbon steel sheet. The drum lid is fabricated from a 16-gauge (0.0625", nominal) carbon steel sheet. The removable head is closed by means of a bolt-locking ring.

6.2 PACKAGE DESCRIPTION

6.2.1 CONTENTS

The package shall be used to transport uranium in solid uranium in various chemical forms contained within solid residue waste. The source of the uranium is the feed material to conversion which meet the requirements for Enriched Commercial Grade Uranium defined in ASTM C996-96. The uranium isotopic uranium distribution is shown in Table 6.1.

Table 6.1 Uranium Isotopic Distribution

Isotope	expected wt %	modeled wt %
^{234}U	0.0054 - 0.0500	0.0000
^{235}U	0.7110 - 5.0000	5.0000
^{236}U	0.0000 - 0.0250	0.0000
^{238}U	99.2836 - 94.9250	95.00

The density of solid residue waste typically ranges from 1.25 - 1.52 g/cc (78.04 - 94.89 lb/ft^3). Using 100 lb/ft^3 as a conservative upper limit on solid residue waste, the maximum expected weight of the SRP-1 drum is 750 lb.

6.2.2 PACKAGING

The packaging consists only of a containment drum (GE drawing number 0025E98). This packaging is a 55-gallon 1A2/X400/S DOT Specification steel drum. The composition and atom densities of the steel drum is given in Table 6.2. The nominal dimensions are 22-1/2" inner diameter by 34-5/16" inner height. The drum body and bottom are fabricated from a 18-gauge (0.0495", nominal) carbon steel sheet. The drum lid is fabricated from a 16-gauge (0.0625", nominal) carbon steel sheet.

Table 6.2 Material Specifications

Material	Density (g/cm^3)	Constituent	Atomic density (atoms/b-cm)
Carbon steel	7.82	C	3.92100E-03
		Fe	8.34910E-02

6.3 CRITICALITY SAFETY ANALYSIS MODELS

6.3.1 GENERAL MODEL

6.3.1.1 Dimensions

Figure 6.1 represents the vertical elevations of the single package models as seen along the vertical centerline of the package. A radial cross section at the midpoint is also displayed in Figure 6.2. The figures' dimensions were used in the package calculations.

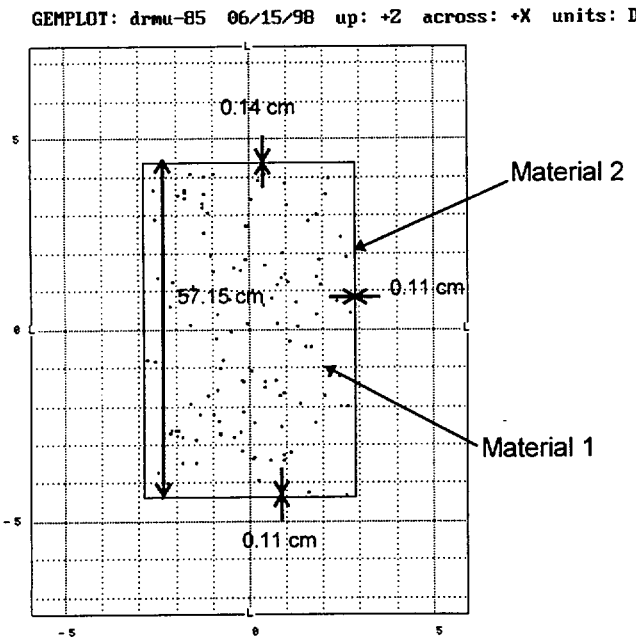


Figure 6.1 Axial Cross Section of SRP-1 Package

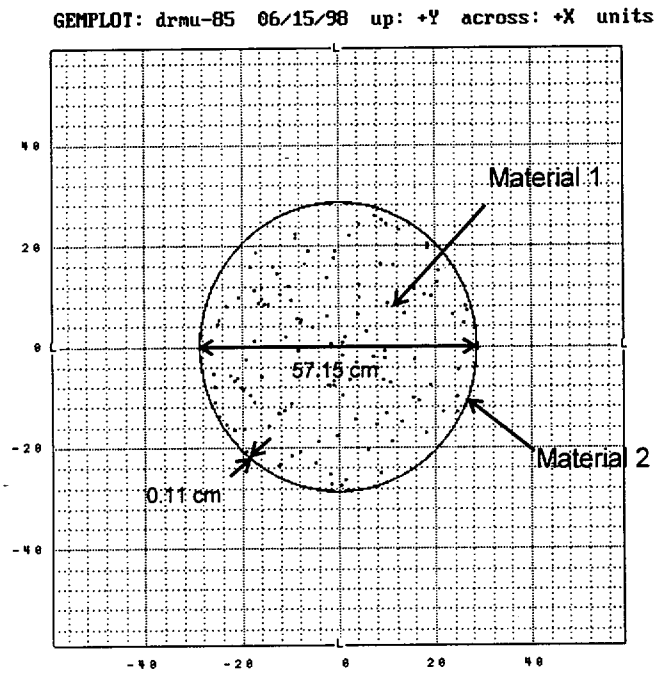


Figure 6.2 Radial Cross Section of SRP-1 Package

6.3.1.2 Materials

Figures 6.1 and 6.2 show cross section of the single-package model use in the analysis. Table 6.3 identifies the region materials, material densities, and masses as used in the calculations, and the actual masses typical of the package.

Table 6.3 Material Specifications

Material No.	Material	Density (g/cm3)	Model mass (kg)	Actual mass (kg)
1	UO_2+ H_2O	0.020 U	4.16 U	0.0 - 2.08 U
2	Carbon steel	7.82	18.02	22.7
3	Solid residue waste	1.25 -1.52	0.0	340

6.3.1.3 Models - Actual Package Differences

The single package model of the 55-gallon drum differs from the actual drum in the quantity of uranium, solid residue waste, and carbon steel The mass of uranium in the model for each package is two times the maximum mass of uranium actually loaded in a drum. This factor allows for uncertainty in the measurement of uranium mass and process capability to mix uranium uniformly into the solid residue waste. Solid residue waste is modeled as void space in the model. The nominal 1A2/X400/S drum dimensions are use to model the geometry of the drum. In the model, the drum wall is a straight wall cylinder without the rolling hoops. The drum model also does not include the top and bottom drum inset into the drum wall, bolts, and locking rings. The carbon steel drum wall, bottom, and lid have also been reduced by 12.5% to allow for manufacturing tolerance on gauge thickness. Both reducing amount carbon steel and eliminating the solid residue waste from the model are conservative because there is less material to compete with the uranium for neutron absorption reactions.

6.3.2 CONTENTS MODEL

Figure 6.1 and 6.2 show the package contents configured for the normal transport condition single-package and package array calculations. The drum physically restricts the contents to approximately 340 kg of solid residue waste.

6.3.3 SINGLE PACKAGES

A model of the single package considers moderating the contents and close water reflection. The package was subjected to the tests specified in 10 CFR 71.71, Normal conditions of transport, and, as reported in Chapters 2 and 3, the geometric form of the package was not substantially altered, no water leakage into the containment occurred, and no substantial reduction in the effectiveness of the packaging was observed. The damage incurred will not affect the technical evaluation, and the package contents under normal conditions of transport will be less reactive than the contents under the aforementioned general requirements requiring no further analysis.

The single package was not subjected to the hypothetical accident condition test, but the entire contents of the packages is assumed to be released from the package. The packaging material is not included in the single damaged package model. To address the requirement of 10 CFR 71.55(e), Hypothetical Accident Conditions, the contents of a single package was analyzed in a sphere geometry with optimum internal moderation, surrounded by a 30.48 cm water reflector. The sphere with a radius of about 37 cm is equivalent to the contents volume of the 55-gallon drum.

6.3.4 PACKAGE ARRAYS

Two array model types are included in this evaluation . The first model type consists of 448 close packed, triangular-pitch, undamaged packages consistent with the normal conditions of transport. From 10 CFR 71.59, standards for arrays of fissile material packages, undamaged package arrays are evaluated with void between the packages, and fully reflected. The packages are arranged in a near cubic 8 x 8 x 7 array to minimize neutron leakage and surrounded by 30.48 cm of full density water. The second model type consists of a single sphere of containing of the contents of 168 single-packages. As required by 10 CFR 71.59, the damaged packages are evaluated as if each package was subjected to the tests specified in 10 CFR 71.73, Hypothetical Accident Conditions, with optimum interspersed moderation, and full water reflection. Since no hypothetical accident condition tests were performed, the packaging is eliminated and the contents is evaluated as a sphere geometry which is the most reactive arrangement. The sphere radius that describes the contents of 168 packages is about 203 cm, surrounded by a 30.48 cm full density water reflector.

6.4 METHOD OF ANALYSIS

GEMER, a proprietary General Electric company standard criticality analysis computer codes was used in the analysis of these computational models. All calculations were performed using Pentium processors running under Windows 95 or Windows NT.

6.4.1 COMPUTER CODE SYSTEM

GEMER is a Monte Carlo program which solves the neutron transport equation as an eigenvalue or a fixed source problem including the neutron shielding problem. GEMER adds an advanced geometry input package to the problem solving capability of the Monte Carlo code which is very similar to KENO.

6.4.2 CROSS-SECTIONS AND CROSS-SECTION PROCESSING

GEMER uses cross sections processed from the ENDF/B-IV library tapes. These cross section are prepared in 190 group format and those in the resonance region may have the form of the resonance parameters or Doppler broadened multigroup cross section. Thermal scattering of hydrogen in water is represented by the $S(\alpha,\beta)$ data in the ENDF/B-IV library. The types of reactions considered in the Monte Carlo calculation are fission, elastic, inelastic, and (n,2n) reactions; the absorption is implicitly treated by reducing the neutron weight by the non-absorption probability on each collision.

6.4.3 CODE INPUT

All problems were started with a flat initial neutron distribution over the fissile material regions only. Calculations were nominally run with 110 generations at 1000 neutrons each, skipping the first 10 generations before starting the statistical output processing, for a total of 100,000 histories.

Figures 6.3(a) - 6.3(d) contain sample input files. The files shown in figures 6.3(a) and 6.3(b) correspond to cases describing a single-package, and figures 6.3(c) and 6.3(d) correspond to cases describing package arrays.

```
98.0135,CYL572,UO2,5.00%,WTFR=0.85,,001,,M,CE
/*ECHO
/*TITLE
  110 1000   10    0    0    1    0    0
    0  293    0    0
\CSXSEC\UO2\GUO2-50.85 0.1307
\CSXSEC\NOU\GNOU-0.CS
\CSXSEC\NOU\GNOU-0.WAT
KENO GEOM
    0  /* # OF REGIONS OR ZERO
    0  /* # OF BOX TYPES OR ZERO
    1  /* # OF BOXES IN X DIRECTION
    1  /* # OF BOXES IN Y DIRECTION
    1  /* # OF BOXES IN Z DIRECTION
    1  /* BOUNDARY CONDITION OPTION
    1  /* STARTING SOURCE OPTION
    1  /* COMPLEX EMBEDDED OPTION
    0  /* # OF PRINT PLOTS
      0.0       0.0       0.0       0.0       0.0
BOX TYPE     1  /* SINGLE UNIT - NORMAL CONDITION
CYLINDER     1  28.5750  43.5770 -43.577                              16*.5
CYLINDER     2  28.6850  43.7170 -43.687                              16*.5
BOX TYPE     2  /*  GLOBAL UNIT: SINGLE PACKAGE, FULL REFLECTION
CUBOID       3  28.6850  -28.6850 28.6850 -28.6850 43.7170 -43.6870  16*.5
CUBOID       3  59.1650  -59.1650 59.1650 -59.1650 74.1970 -74.1670  16*.5
  2    1  1  1    1  1  1    1  1  1   1
BEGIN COMPLEX
COMPLEX   2  1  0.00000  0.00000 0.0000   1   1   1  0.0   0.0   0.0
END GEOM
DEFAULTS=YES
END GEMER
```

Figure 6.3(a) Single-Package, Normal Condition of Transport (drmu-85.in)

```
98.0135,SPH,UO2,5.00%,WTFR=0.80,,,M,CE
/*ECHO
/*TITLE
  110 1000   10    0    0    1    0    0
    0  293    0    0
\CSXSEC\UO2\GUO2-50.80 0.0928
\CSXSEC\NOU\GNOU-0.WAT
KENO GEOM
    0  /* # OF REGIONS OR ZERO
    0  /* # OF BOX TYPES OR ZERO
    1  /* # OF BOXES IN X DIRECTION
    1  /* # OF BOXES IN Y DIRECTION
    1  /* # OF BOXES IN Z DIRECTION
    1  /* BOUNDARY CONDITION OPTION
    1  /* STARTING SOURCE OPTION
```

```
    0  /* COMPLEX EMBEDDED OPTION
    0  /* # OF PRINT PLOTS
      -1.0       -1.0       -1.0       -1.0       -1.0       -1.0
BOX TYPE      1  /*  NO CONTAINMENT - DAMAGED SINGLE UNIT
SPHERE        1  36.767                                                    16*.5
SPHERE        2  67.247                                                    16*.5
CUBOID        0  67.2470 -67.2470 67.2470 -67.2470 67.2470 -67.2470  16*.5
END GEOM
DEFAULTS=YES
END GEMER
```

Figure 6.3(b) Single-Package, Hypothetical Accident Condition (sphu-80.in)

```
98.0135,CYL572,UO2,5.00%,WTFR=0.80,000,,M,CE
/*ECHO
/*TITLE
  110 1000   10    0    0    1    0    0
    0  293    0    0
\CSXSEC\UO2\GUO2-50.80 0.0928
\CSXSEC\NOU\GNOU-0.WAT 0.000001
\CSXSEC\NOU\GNOU-0.CS
\CSXSEC\NOU\GNOU-0.WAT
KENO GEOM
    0  /* # OF REGIONS OR ZERO
    0  /* # OF BOX TYPES OR ZERO
    1  /* # OF BOXES IN X DIRECTION
    1  /* # OF BOXES IN Y DIRECTION
    1  /* # OF BOXES IN Z DIRECTION
    1  /* BOUNDARY CONDITION OPTION
    1  /* STARTING SOURCE OPTION
    1  /* COMPLEX EMBEDDED OPTION
    0  /* # OF PRINT PLOTS
      -1.0       -1.0       -1.0       -1.0       -1.0       -1.0
BOX TYPE      1  /*  SINGLE 1A2/X400/S PACKAGE
CYLINDER      1  28.5750  87.1540   0.0000                              16*.5
CYLINDER      3  28.6850  87.2940  -0.1100                              16*.5
BOX TYPE      2  /*  8x8 CUBOID
CUBOID        2  258.165 -229.480 227.4220 -177.7366 87.2940  -0.1100  16*.5
BOX TYPE      3  /*  GLOBAL UNIT: 8x8x7 CUBOID, FULLY REFLECTED
CUBOID        2  258.165 -229.480 227.4220 -177.7366 611.828  -0.1100  16*.5
CUBOID        4  288.645 -259.960 257.9020 -208.2166 642.308  -30.590  16*.5
  3    1  1  1    1  1  1    1  1  1  1
BEGIN COMPLEX
/* embed single drum layer 1
COMPLEX   2  1 -200.795  0.00000  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -172.110  49.6840  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -172.110 -49.6840  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -200.795  99.3680  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -200.795 -99.3680  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -172.110  149.053  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -172.110 -149.053  0.00000   8   1   1  57.3700  0.0   0.0
COMPLEX   2  1 -200.795  198.737  0.00000   8   1   1  57.3700  0.0   0.0
/* embed 8x8x7 close packed "5N" array
COMPLEX   3  2    0.0000  0.0000  0.0000    1   1   7   0.0   0.0  87.404
END GEOM
DEFAULTS=YES
END GEMER
```

Figure 6.3(c) Package Array (8 x 8 x 7), Normal Condition of Transport (drmun-80.in)

```
98.0135,SPH,UO2,5.00%,WTFR=0.80,,,M,CE
/*ECHO
/*TITLE
  110 1000   10    0    0    1    0    0
    0  293    0    0
\CSXSEC\UO2\GUO2-50.80 0.0928
\CSXSEC\NOU\GNOU-0.WAT
KENO GEOM
    0  /* # OF REGIONS OR ZERO
    0  /* # OF BOX TYPES OR ZERO
    1  /* # OF BOXES IN X DIRECTION
    1  /* # OF BOXES IN Y DIRECTION
    1  /* # OF BOXES IN Z DIRECTION
    1  /* BOUNDARY CONDITION OPTION
    1  /* STARTING SOURCE OPTION
    0  /* COMPLEX EMBEDDED OPTION
    0  /* # OF PRINT PLOTS
      -1.0      -1.0      -1.0      -1.0      -1.0      -1.0
BOX TYPE      1  /*  NO-CONTAIMENT - SPHERE SYSTEM
SPHERE        1  202.88                                                  16*.5
SPHERE        2  233.36                                                  16*.5
CUBOID        0  233.360 -233.360 233.360 -233.360 233.360 -233.360  16*.5
END GEOM
DEFAULTS=YES
END GEMER
```

Figure 6.3(d) Package Array, Contents of 168 Packages (sphr1-80.in)

6.4.4 CONVERGENCE OF CALCULATION

Problem convergence was determined by examining plots of k_{eff} by generation run and skipped, as well as the final keff edit tables. No abnormal trends were observed to indicate non-convergence of the eigenvalue solution. A sample convergence plot for the single package model sphr1-80.in is provide in Figure 6.4, and is representative of the convergence evaluations.

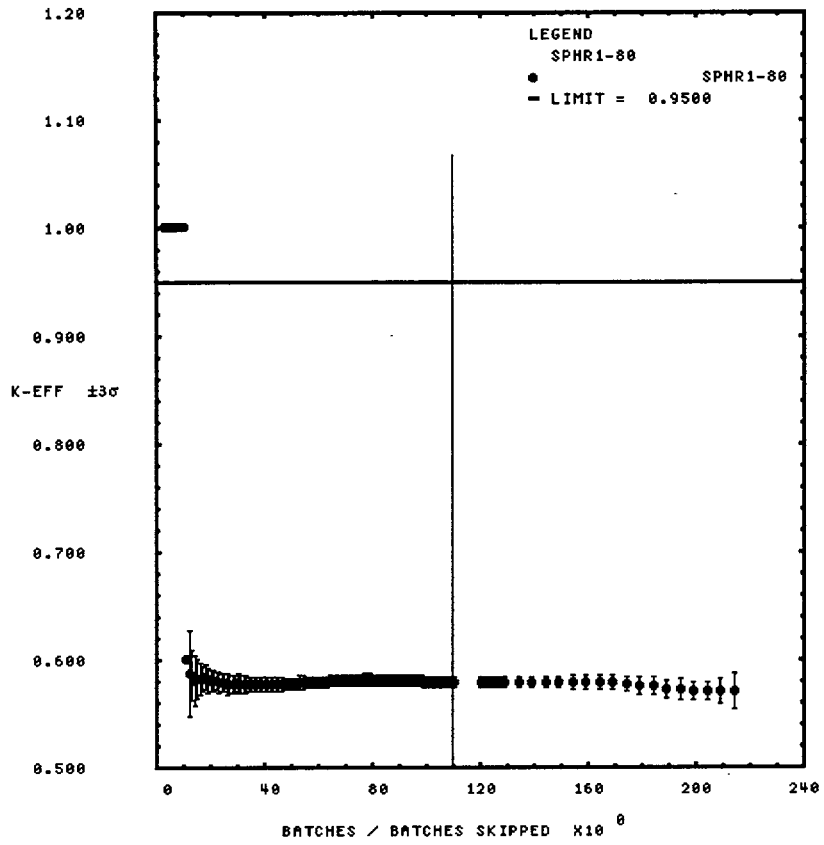


Figure 6.4 Sample k_{eff} Convergence Plot - sphr1-80.in

6.5 VALIDATION

Validation of GEMER consists of performing calculation of benchmark experiments including the area of applicable to the uranium oxides. Bias for GEMER and the ENDF/B-IV library has been established for the area of applicability for the SRP-1 package. The bias determined is no greater than 0.009 (Δk_u - β) at a 99% confidence level. The area of applicability for the benchmark calculations are enrichment ranges from 1.29 to 9.83 weight percent U-235 and H/U-235 ratio 41 to 866.

Using a general equation for the upper safety limit (USL) and requirements of 10 CFR 71, calculations are considered subcritical, if the following condition is satisfied:

$$k_{eff} + 2\sigma \leq 0.95 - \Delta k_u + \beta$$
$$k_{eff} + 2\sigma \leq 0.94$$

6.6 CRITICALITY CALCULATIONS AND RESULTS

This evaluation demonstrates the subcriticality of a single package (Section 6.6.1) and an array of packages (Section 6.6.2) during normal conditions of transport and hypothetical accident conditions. The determined transport index (TI) for criticality control of damaged and undamaged shipment is given in Section 6.6.3.

6.6.1 SINGLE PACKAGE

Calculations show that a single package remains subcritical under general requirements for fissile material packages, under normal conditions of transport, and under hypothetical accident conditions. To meet the general requirements for fissile material packages, 10 CFR 71.55, a package must be designed and its contents so limited that it would be subcritical under the most reactive configuration of material, optimum moderation, and close reflection of the containment system by water on all sides or surrounding materials of the packaging. Case drmu-95 of Table 6.4 represents the optimally moderated containment model. The case of reflection of the container by surrounding materials of packaging is not applicable because there is no packaging other than the containment provided by the drum. Full density water in the void fraction of the contents results in the maximum reactivity as shown in Figure 6.6, because the uranium density is low and the thermal utilization is low. The reactivity of the single package system depends on the effectiveness of the fuel in competing with other materials, such as the carbon steel or water reflector, for absorption of thermal neutrons.

Case sphu-95 in Table 6.4 is the result for a single damaged package and 30 cm of water reflection. As with the undamaged case, the reported keff is less than the established USL of 0.94.

All calculations were performed at the maximum allowable U235 enrichment (5.00 wt %) to ensure maximum reactivity and eliminate the need for calculations at lower possible enrichments.

Table 6.4 SRP-1 Single Package Summary

Case	Description	keff ± σ
drmu-90	Maximum moderation, reflected undamaged drum	0.13938 ± 0.00063
drmu-95	Maximum moderation, reflected undamaged drum	0.16098 ± 0.00053
drmu-97	Maximum moderation, reflected undamaged drum	0.14172 ± 0.00040
sphu-90	Maximum moderation, reflected contents	0.16132 ± 0.00065
sphu-95	Maximum moderation, reflected contents	0.16973 ± 0.00049
sphu-97	Maximum moderation, reflected contents	0.14491 ± 0.00040

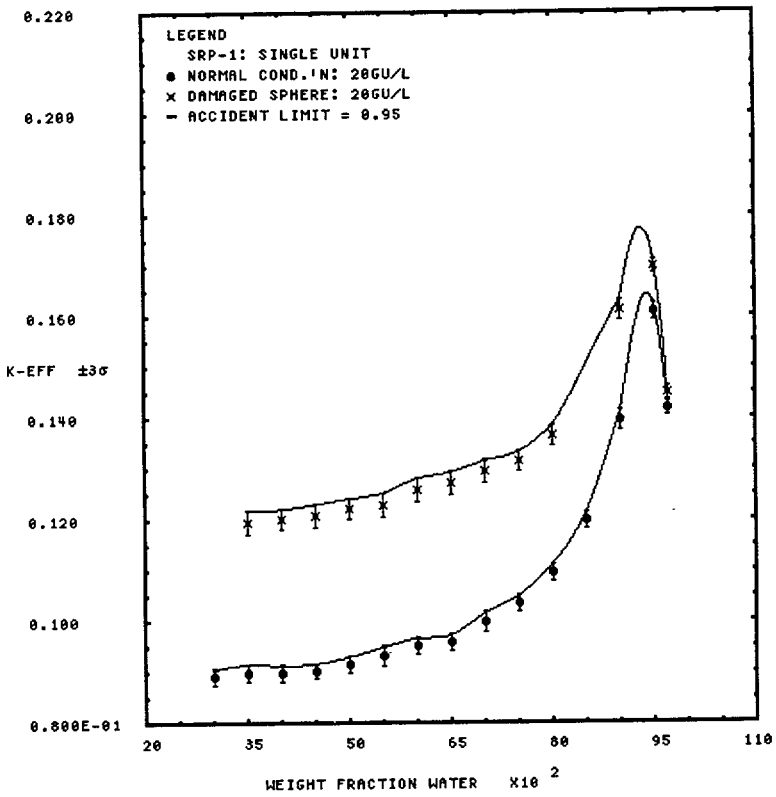


Figure 6.5 Single Package k*eff* vs. Moderation

6.6.2 PACKAGE ARRAYS

The calculational results of Table 6.5 show that a finite array of packages is subcritical under normal conditions of transport. Case drmun-85, an 8 x 8 x 7, triangular-pitch array of fully moderated under normal conditions, calculates a k_{eff} of 0.4340 ± 0.0008. Case sphr1-80 represents the contents of 168 packages in a sphere geometry, optimum moderation. The k_{eff} for case sphr1-80 is 0.5795 ± 0.0013, which is subcritical because 0.5795 + 2 (0.0013) = 0.5821 is less than the USL of 0.94.

Table 6.5 Results for Package Array Calculations

Case	Interspersed H2O density (g/cm3)	Description	keff ± σ
drmun-85	0	8 x 8 x 7 array, normal conditions of transport	0.43401 ± 0.00076
sphr1-40	0.015	Contents of 168 packages, sphere, hypothetical accident conditions	0.40659 ± 0.00176
sphr1-50	0.023	Contents of 168 packages, sphere, hypothetical accident conditions	0.43990 ± 0.00174
sphr1-60	0.034	Contents of 168 packages, sphere, hypothetical accident conditions	0.48628 ± 0.00163
sphr1-65	0.042	Contents of 168 packages, sphere, hypothetical accident conditions	0.51627 ± 0.00162
sphr1-70	0.053	Contents of 168 packages, sphere, hypothetical accident conditions	0.54545 ± 0.00199
sphr1-75	0.068	Contents of 168 packages, sphere, hypothetical accident conditions	0.57171 ± 0.00160
sphr1-80	0.091	Contents of 168 packages, sphere, hypothetical accident conditions	0.57949 ± 0.00125
sphr1-85	0.129	Contents of 168 packages, sphere, hypothetical accident conditions	0.55570 ± 0.00109

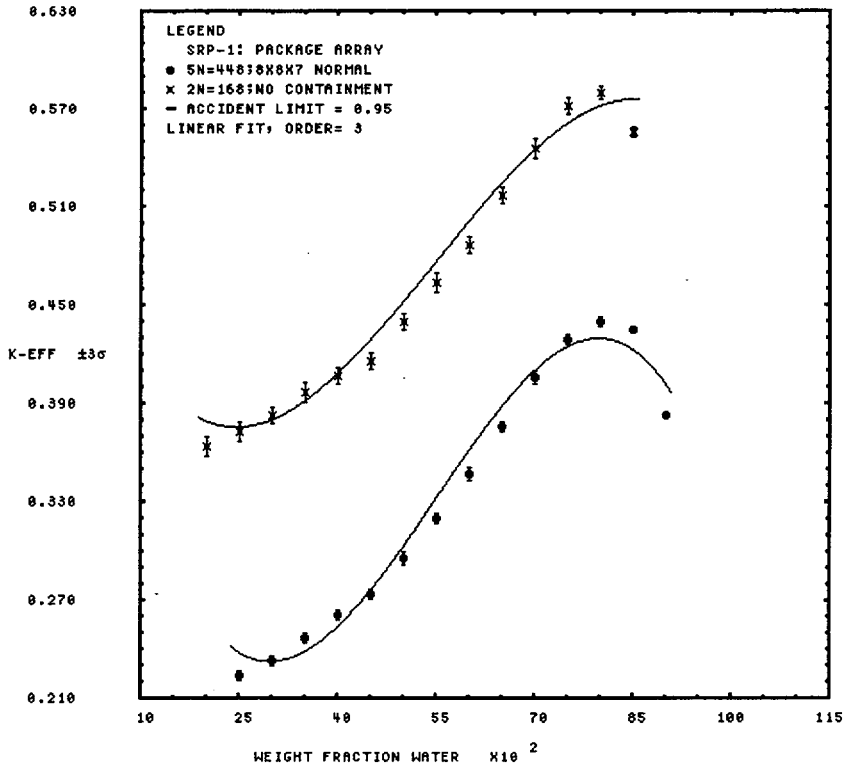


Figure 6.6 Package Array k_{eff} vs. Moderation

6.6.3 TRANSPORTATION INDEX

The transportation index (TI) for criticality control is determined by the number of packages that remain below the upper safety limit. For normal conditions of transport, a finite array of 5N=448 packages is subcritical, and under hypothetical accident conditions, the contents of 2N=168 packages would remain subcritical. Thus a maximum of N=84 packages may be shipped for a nonexclusive shipment, and the TI = 50/84 = 0.6.

7.0 OPERATING PROCEDURES

The URE-1 will carry a maximum payload of 832 pounds consisting of uranium contaminated solid residues with enrichments up to 5% U235. No free standing liquids will be included in this package. The detailed loading and unloading procedures are given below and are in compliance with subpart G of 10 CFR 71.

7.1 Procedure for Loading the Package

1. Each container is to be inspected prior to loading, by qualified personnel to verify that the containers are UN 1A2/X400/S containers, and do not possess any defects such as cracks, holes, voids or other non-compliant conditions that reduce the effectiveness of the package.

2. Visually insure gaskets are in place, in good condition, and properly installed. Damaged or defective gaskets will be replaced.

3. All drum locking rings shall be tightened to 85 ft.lb.

4. A tamper indicating feature shall be applied to the closure of the package.

5. Notify Radiation Protection to conduct radiation surveys in accordance with 49 CFR 173.441 and 49 CFR 173.443. The survey results shall be recorded.

6. The containers shall be braced to prevent shifting of the load during normal transportation conditions.

7.2 Procedures for Unloading the Package

Not applicable. The containers and their contents will be buried as a unit.

7.3 Preparation of Empty Package for Transport

Not applicable.

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

8.1 Acceptance Tests

8.1.1 Visual Inspections

- No holes in the drum and no dents in excess of one half inch deep
- Lid lip and top drum curl are not damaged to the extent that the closure ring will not fit the drum.
- Verification of the UN 1A2/X400/S performance code on the package.
- Verify Package ID.

8.1.2 Structural and Pressure Tests

Not applicable.

8.1.3 Leak Tests

Not applicable.

8.1.4 Component Tests

Not applicable.

8.1.5 Tests for Shielding Integrity

Not applicable.

8.1.6 Thermal Acceptance Tests

Not applicable.

8.2 Maintenance Program

The SRP-1 Shipping Container is not a pressure vessel, employs no shielding materials, and does not require a cooling system or other thermal mechanism for dissipation of heat.

Materials of construction are commonplace, durable, and readily available. The container has no systems of subsystems such as valves, rupture disks, or other moving components. Since the container is a single trip container, maintenance is not required.

8.2.1 Structural and Pressure Tests

Not applicable.

8.2.2 Leak Tests

Not applicable.

8.2.3 Subsystem Maintenance

Not applicable

8.2.4 Valves, Rupture Discs, and Gaskets on Containment Vessel

Not applicable.

8.2.5 Shielding

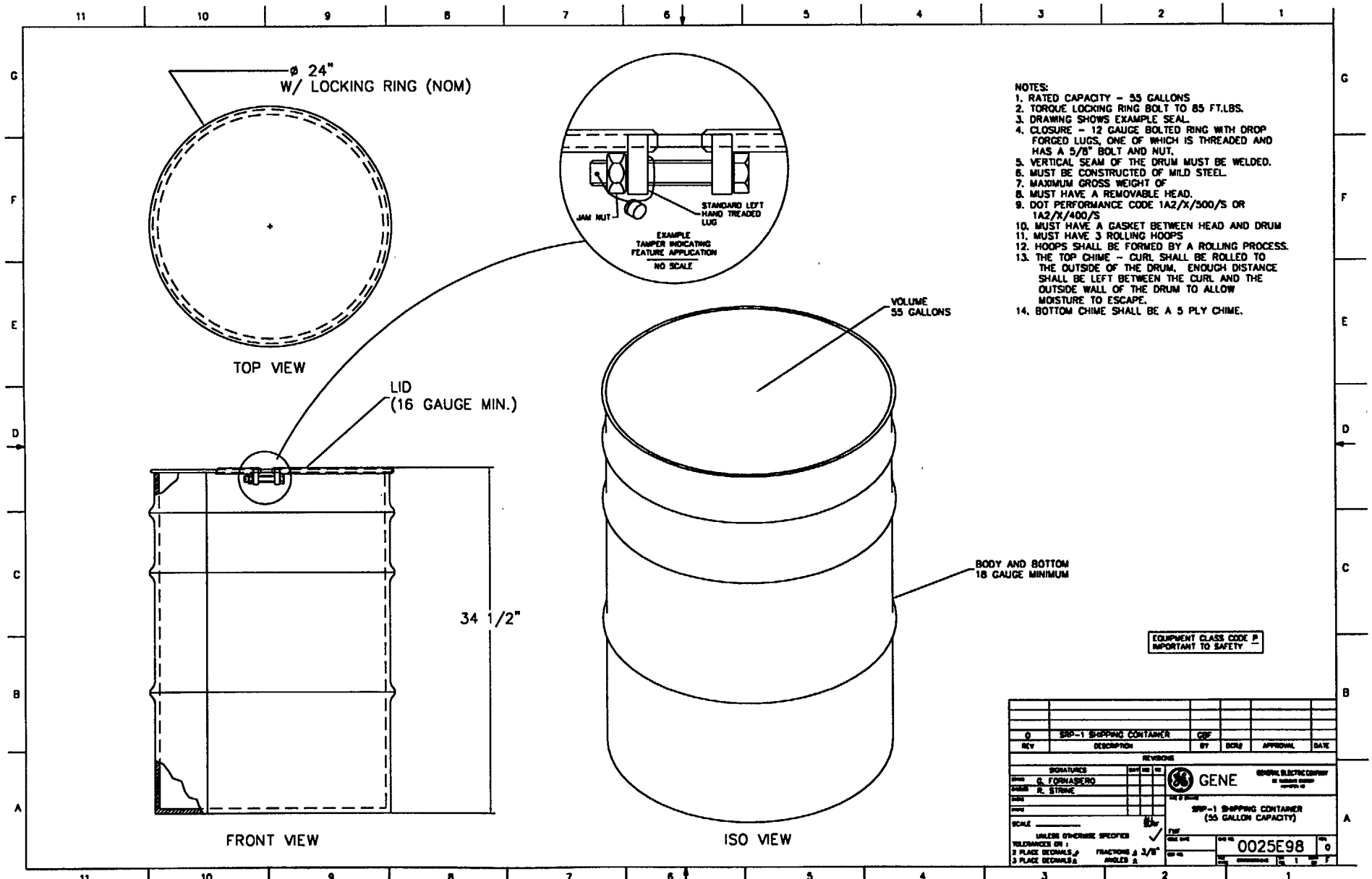
Not applicable.

8.2.6 Thermal

Not applicable.

8.2.7 Miscellaneous

Not applicable.



NOTES:
1. RATED CAPACITY – 55 GALLONS
2. TORQUE LOCKING RING BOLT TO 85 FT.LBS.
3. DRAWING SHOWS EXAMPLE SEAL.
4. CLOSURE – 12 GAUGE BOLTED RING WITH DROP FORGED LUGS, ONE OF WHICH IS THREADED AND HAS A 5/8" BOLT AND NUT.
5. VERTICAL SEAM OF THE DRUM MUST BE WELDED.
6. MUST BE CONSTRUCTED OF MILD STEEL.
7. MAXIMUM GROSS WEIGHT OF
8. MUST HAVE A REMOVABLE HEAD.
9. DOT PERFORMANCE CODE 1A2/X/500/S OR 1A2/X/400/S
10. MUST HAVE A GASKET BETWEEN HEAD AND DRUM
11. MUST HAVE 3 ROLLING HOOPS
12. HOOPS SHALL BE FORMED BY A ROLLING PROCESS.
13. THE TOP CHIME – CURL SHALL BE ROLLED TO THE OUTSIDE OF THE DRUM. ENOUGH DISTANCE SHALL BE LEFT BETWEEN THE CURL AND THE OUTSIDE WALL OF THE DRUM TO ALLOW MOISTURE TO ESCAPE.
14. BOTTOM CHIME SHALL BE A 5 PLY CHIME.

EQUIPMENT CLASS CODE P
IMPORTANT TO SAFETY

REV	DESCRIPTION	BY	DCN#	APPROVAL	DATE
0	SRP-1 SHIPPING CONTAINER	GBF			

REVISIONS

SIGNATURES
DRAWN G. FORNASERO
CHECKED R. STRINE

UNLESS OTHERWISE SPECIFIED
TOLERANCES ON :
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
FRACTIONS ± 1/8"
ANGLES ±

GENERAL ELECTRIC COMPANY

GENE

SRP-1 SHIPPING CONTAINER
(55 GALLON CAPACITY)

DWG NO. 0025E98 REV 0

SCALE