



71-9285

GE Nuclear Energy

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October 2, 1998

Mr. Cass R. Chappell
Package Certification Section
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Chappell,

Subject: Revision to 8/4/98 Application - Model SRP-1 Package

Reference: Application, S.P. Murray to C.R. Chappell, 8/4/98

GE's Nuclear Energy Production facility in Wilmington, N. C. hereby submits the attached revised pages to the above referenced application. The changes identify the maximum gross weight of the package as 825 lbs. This weight is conservatively based upon the lowest gross weight of the three drums tested.

GE drawing 0025E98 has been revised (Revision 1) to reflect the maximum gross weight of 825 lbs. in Note number 7.

Changes are indicated with a vertical line in the right hand column of each page, and the date of this revision is at the top of each page.

Seven (7) copies of this application are being provided for your use.

Please contact Rick Foleck (910) 675-6299 or me (910) 675-5950 if you have any questions or would like to discuss this matter further.

Sincerely,

GE NUCLEAR ENERGY

S. P. Murray, Manager
Facility Licensing

Attachment

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Mr. Cass R. Chappell
October 2, 1998
Page 1 of 1

Explanation of Changes by Page

Pages

Explanation of Changes

1-1, 1-2, 2-1, 2-5, 2-10,
2-14, and 7-1

Revisions have been made to change the maximum gross weight from 882 lbs. to 825 lbs. and to change the net weight from 832 lbs. to 775 lbs. These weight changes are conservatively based upon the lowest gross weight of the three drums tested.

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 825 pounds, when the maximum weight of authorized contents (775 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 would 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	825 lbs.
Contents	Uranium contaminated solid residue
Enrichment (max.)	Up to 5.00 wt. % U ₂₃₅
maximum fissile mass per package	104 gU ₂₃₅ in solid UO ₂ form max. per package.
SNM distribution	U ₂₃₅ must not be capable of concentrating or redistributing during transport
maximum fissile density	0.5 gU ₂₃₅ /liter waste per package
maximum fissile mass per conveyance	8.736 kgs U ₂₃₅
minimum package volume	55-gallons (nominal, minimum)
maximum package stack height	one single layer (no stacking)
maximum number of containers per shipment	84

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 825 pounds. This includes a maximum payload weight of 775 pounds with a limit of 104 grams of U235 material. The weight of the empty drum and its components is nominally 50 pounds.

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 maximum shipping weight of the package is 825 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

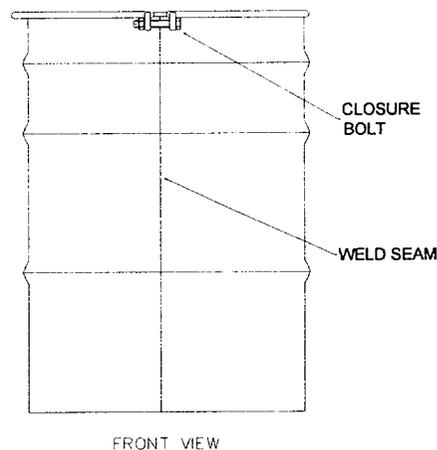
Thermal testing is not applicable for the SRP-1 because no credit is taken for the package in the event of an accident.

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. (The weights for drums #1 & #2 used in the drop test were 855 lbs. and 885 lbs. respectively. The weight for drum #3 used in the compression test was 825 lbs.)
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.

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 825 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.

7.0 OPERATING PROCEDURES

The URE-1 will carry a maximum payload of 775 lbs. (825 lbs. gross) 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

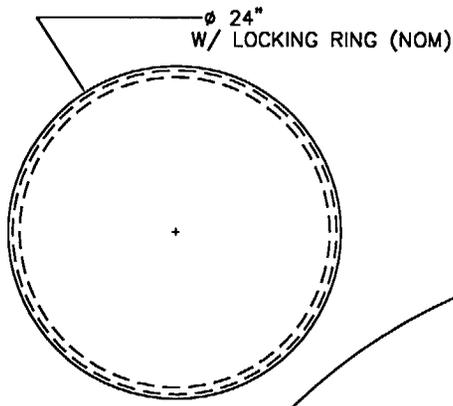
1. Each container is to be inspected prior to loading, by qualified personnel to verify that the containers are UN 1A2/X400/S containers, and do not possess any defects such as cracks, holes, voids or other non-compliant conditions that reduce the effectiveness of the package.
2. Visually insure gaskets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

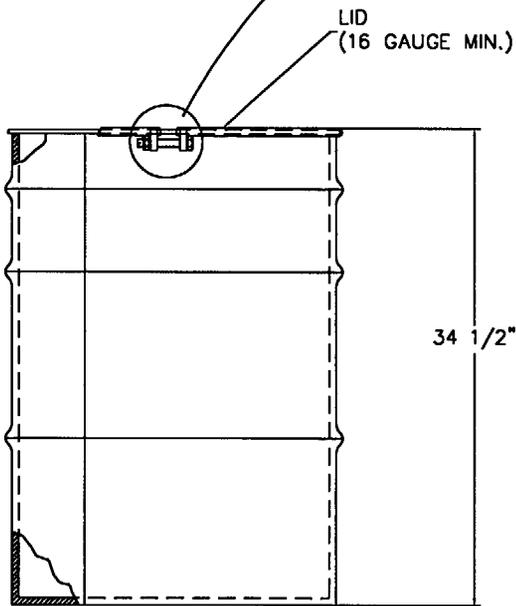
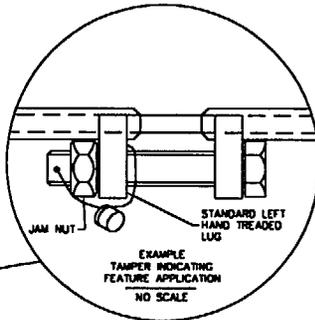
Not applicable. The containers and their contents will be buried as a unit.

7.3 Preparation of Empty Package for Transport

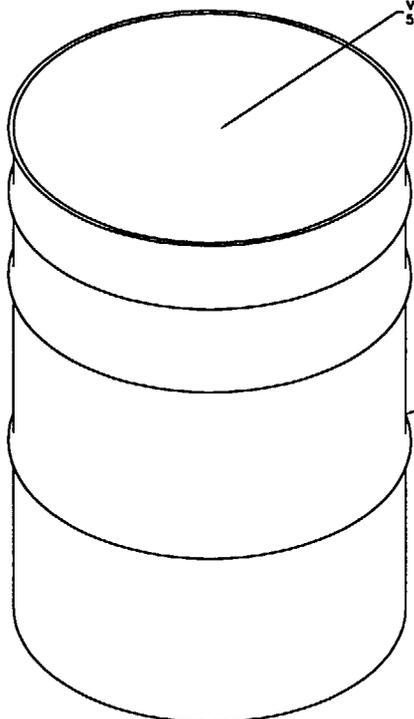
Not applicable.



TOP VIEW



FRONT VIEW



ISO VIEW

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 825 LBS.
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	CHKD	APPROVAL	DATE
1	PECN 843	CSF			
0	SRP-1 SHIPPING CONTAINER	CSF			

SIGNATURES		REVISIONS	
DESIGN	C. FORMASICO	DATE	REV
CHIEF	R. STRONG		

SCALE		UNLESS OTHERWISE SPECIFIED	
TOLERANCES ON:	2 PLACE DECIMALS	FRACIONS	3/8"
	3 PLACE DECIMALS	INCHES	1/16"

GENERAL ELECTRIC COMPANY	
SRP-1 SHIPPING CONTAINER (55 GALLON CAPACITY)	
GENE	0025E98