The Development of a Package for the Salvage and Transport of Dangerous Goods Meeting Limits for LSA-II/SCO-II (LSA-III When Transported Under Exclusive Use) in Compliance With the IAEA Regulations for the Safe Transport of Radioactive Material, 1985 Edition (as Amended 1990)

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INTRODUCTION

As part of Nuclear Electric's overall waste strategy, a requirement was identified for an Industrial Package Type 2, to transport single drums of low level radioactive waste for assay at the Her Majesty's Inspectorate of Pollution (HMIP) facility at Winfrith. This package, in order to be of general use, was also to be suitable for transporting other contents subject to satisfying the limits for LSA-II/SCO-II and LSA-III when transported under Exclusive Use.

An extensive market search was conducted and a suitable package identified with the potential for satisfying the necessary criterion.

DESCRIPTION OF THE PACKAGE

The package identified was a Recovery Drum manufactured under licence within the United Kingdom and commonly used by the Fire Service for the recovery of hazardous materials. The payload is contained within a stainless steel outer drum having a removable upper section which includes the drum top face and approximately one third of the upper drum body. Sealing is provided by an O-ring positioned between the upper and lower sections of the drum body and clamped by a two-piece clamping band secured by 4 x M12 socket head cap screws.

Provision is made for additional security by drilling a hole in the head of the clamping band screws to enable adjacent screws to be secured together, utilising a suitable sealing device. A stacking ring is located on the drum top chimb to enable the vertical stacking of identical packages. The overall dimensions of the package are 1000mm long x 710mm diameter and it has a maximum permissible gross weight for transport of 450kg.

Whilst the Recovery Drum is accredited to UN/1A2/X450/S, meeting the requirements for packaging groups I, II and II for a solid payload of mass 400kg or a liquid payload of volume up to 220 litres, suitably packaged, its use as a package for the transport of radioactive materials required further detailed assessment.

ASSESSMENT OF THE PACKAGE

In order to gain package approval to the IAEA Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As Amended 1990), it was necessary to consider the contents of the various relevant regulations and documents and how they apply to the package identified.

An assessment was conducted, resulting in the preparation of the Design Safety Submission, against the corresponding IAEA Regulations which considered all those aspects forming an integral part of the licensing function including quality assurance, traceability, and suitability of the manufacturer's specification to meet the IAEA requirements.

The assessment considered compliance with a number of paragraphs, notably Paragraphs 105, 407, 505-514 inclusive and 519. In addition, consideration was given to the testing requirements; the package being subjected to drop tests from 2.7m with both solid and liquid payloads of package gross masses of 450 kg and 290 kg respectively. To further enhance compliance with the IAEA Regulations, the package was subjected to a leakproofness test with an internal pressure of 30kPa gauge being applied with no apparent leakage and was demonstrated to withstand an internal pressure of 600 kPa.

As no leakage is permitted by the United Nations Recommendations for the Transport of Dangerous Goods (UNRTDG), it was considered that the Recovery Drum comfortably meets the requirements of an Industrial Package Type 2 (IP-2) as required by the IAEA Transport Regulations Safety Series No 6, Paragraph 519.

OPERATIONAL AND MAINTENANCE REQUIREMENTS

In compliance with Paragraph 209 of the IAEA Transport Regulations, quality assurance programmes were established for the design, manufacture, testing, documentation, use, maintenance and inspection, transport, and in-transit storage of the package. Specific operational requirements were developed which included such aspects as handling and transport systems utilising a pallet and lashing system, details of which are included as an attachment to this paper.

Periodic maintenance schedules were also established in support of the continued use of the package, and these included aspects such as tool lists, reference documents and procedures, maintenance frequency and instructions, and completing actions.

SUMMARY

The Recovery Drum, having been assessed and proven as being suitable, is certified for use in accordance with the "Standard Procedure for the Certification of Package Designs which do not require Competent Authority Approval". The Recovery Drum, Design No 2043, complies with the IP-2 package requirements of the IAEA Regulations for the Safe Transport of Radioactive Material as specified in Safety Series No.6, 1985 (As Amended 1990), and is certified for the transport of contents satisfying the limits for LSA-II/SCO-II, and LSA-III when transported under Exclusive Use.

A package meeting these requirements is suitable provided that the standards, instructions, and quality assurance procedures specified are fully implemented, subject to any further requirements as specified on the Certificate of Regulatory Compliance.

REFERENCES

IAEA Safety Standards, Safety Series No.6, Regulations for the Safe Transport of Radioactive Material, 1985 Edition (As Amended 1990).

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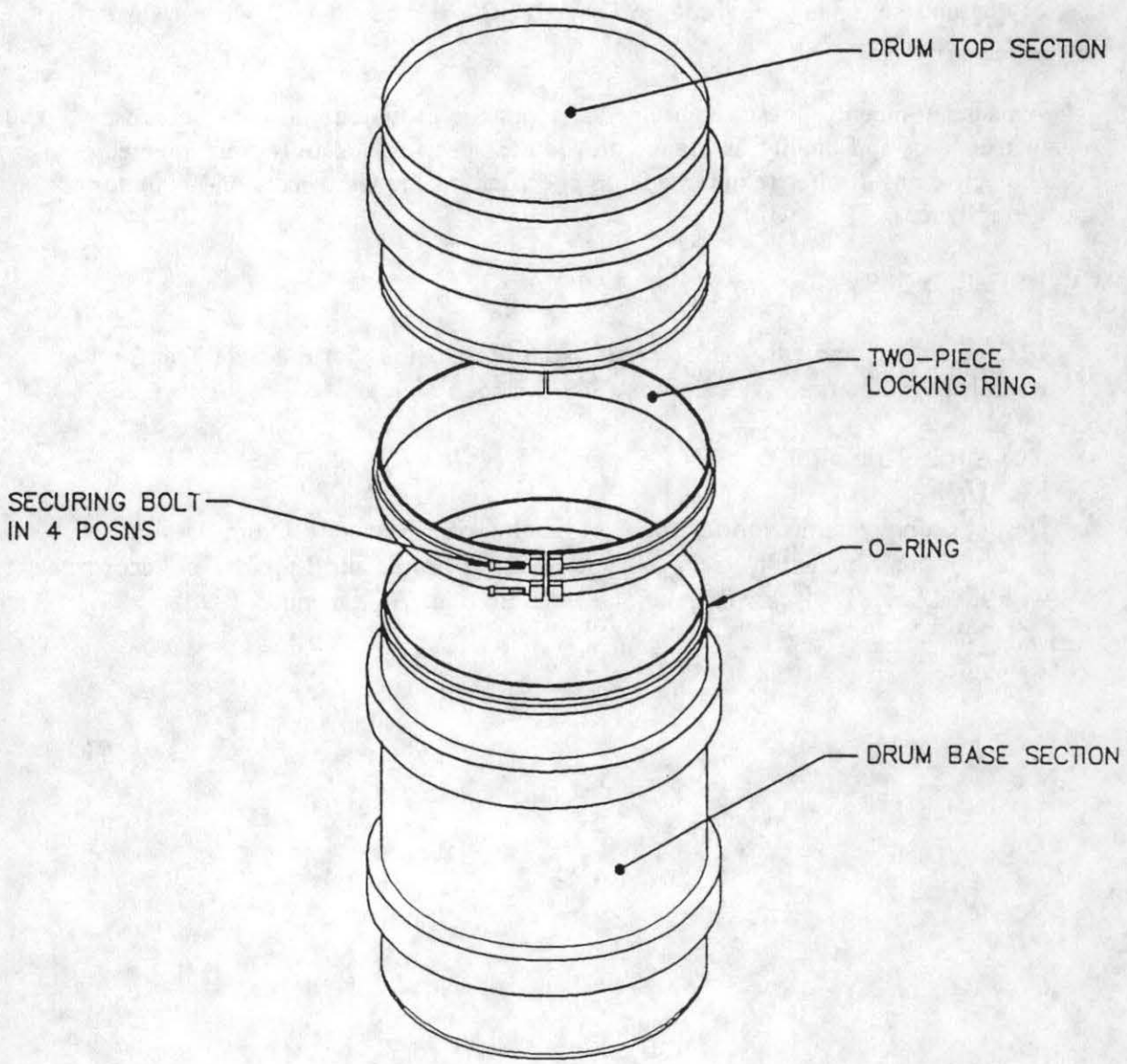
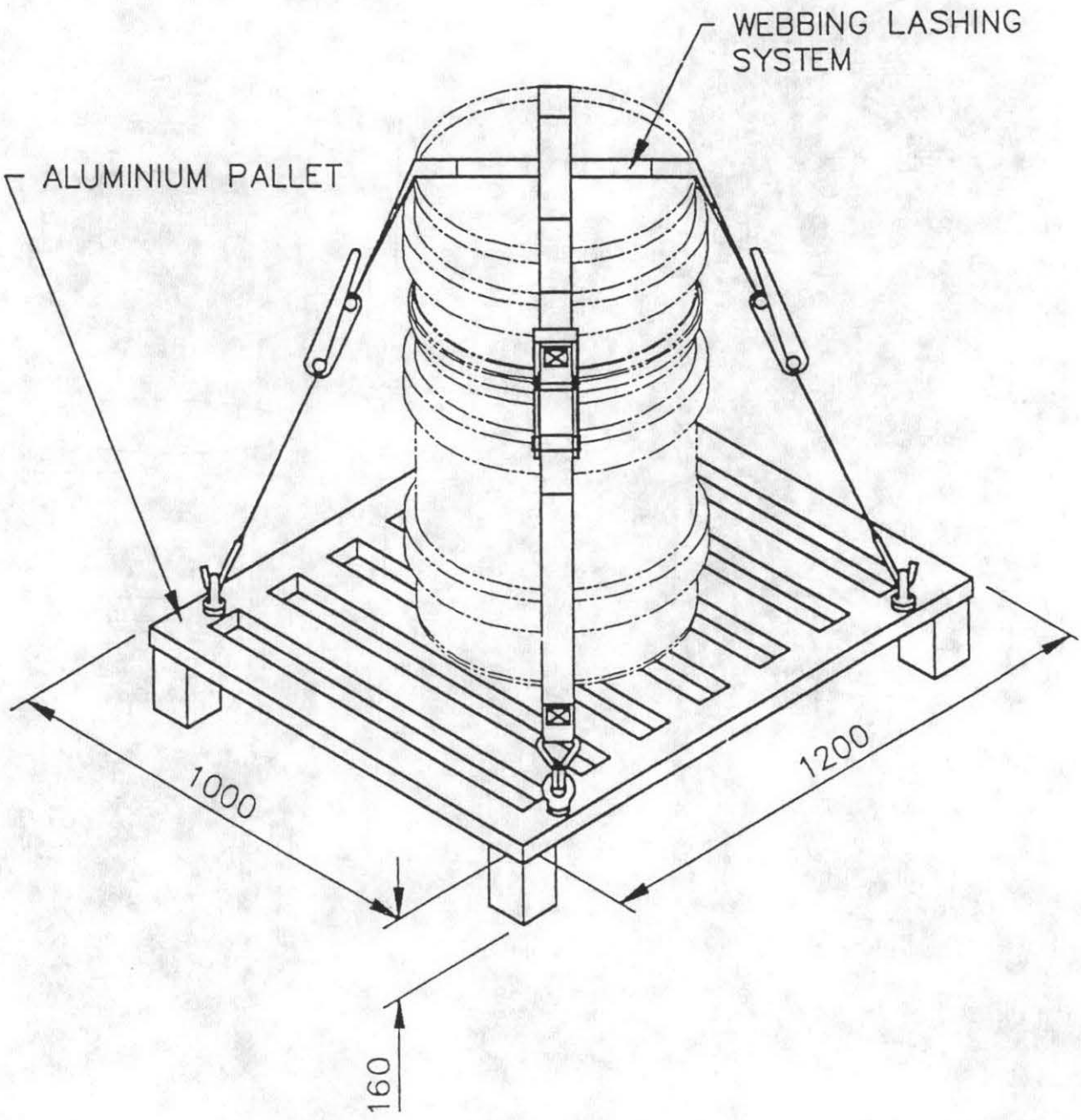
Design Safety Submission for the Certification of a Recovery Drum, Design No.2043 as an Industrial Package Type IP-2, for Solids and Liquids, in Accordance with the IAEA Transport Regulations 1985 Edition (As Amended 1990)

SCHEMATIC LAYOUT OF THE RECOVERY DRUM
DESIGN NO.2043



LAYOUT OF THE RECOVERY DRUM
DESIGN NO.2043
PREPARED FOR TRANSPORT

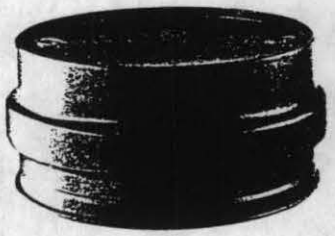


Note: All dimensions in mm

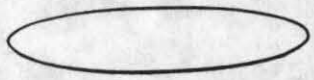
TECHNICAL SPECIFICATION

Stacking ring:
St. 12.03 electroplated, permanently fitted as a part of the drum top section

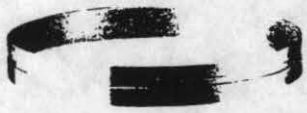
Drum top section:
St. 12.03 or stainless steel
1,5 / 1,25 mm gauge, reinforced
St. 12.03 exterior orange / interior beige enamel coatings



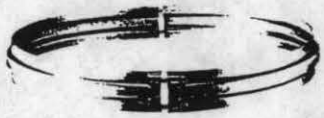
Tri-sure:
Bungs in St. 12.03 zinc-plated or stainless steel



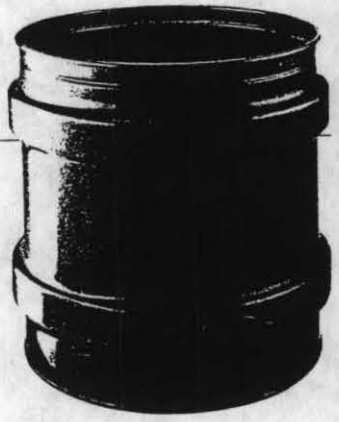
Seal:
O-ring EPDM



Support ring:
St. 37 electroplated or stainless steel



Locking ring:
St. 12.03 electroplated in a rigid design to ensure maximum protection
4 recessed hexagonal screws keep the locking ring in position



Drum base section:
as per drum top section

Dimensions:
outside diameter: 710 mm
height: 1000 mm
Total weight:
stainless steel version: approx. 50 kg
mild steel version: approx. 54 kg
Nominal volume:
drum base section: 220 litres
drum top section: 87 litres
total drum: 307 litres

APPROVALS

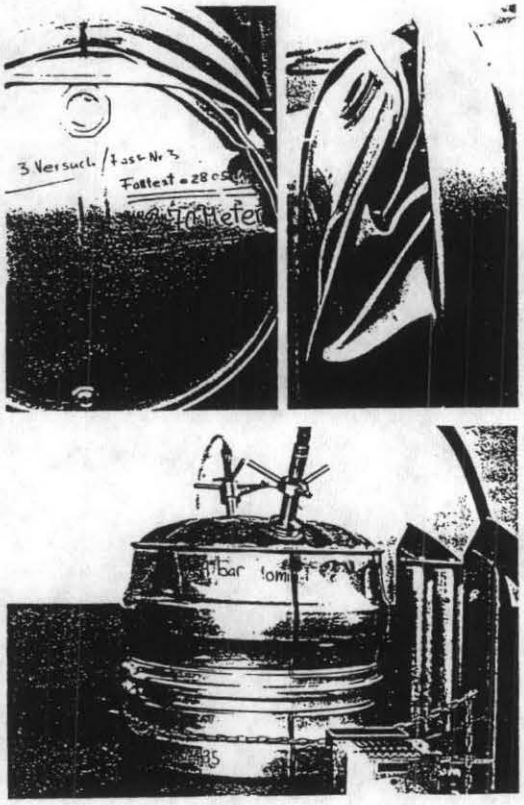
The recovery drum is built according to UN-recommendations and tested and approved by SVDB/EG1*. The drum complies with all international requirements in respect of recovery drums and achieved the following test values:

Drop test	2.7 m	Stacking test	13.5 kN
Hydraulic test	600 kPa	Leakage test	30 kPa

The test prototypes complied with the regulations set out by RID, ADR, IMDG-Code, IATA/ICAO and thereby allows each recovery drum to carry the following embossed marks: UN / 1 A2 / X 450 / S / ... and UN / 1 A2 / X 1.8 / 600

FOR SOLIDS
A maximum gross weight of 450 kg

FOR LIQUIDS
A maximum density of 1.8kg / litre by 216.5 litres. Should the drum be filled with the maximum 307 litres a density of 1.2 kg/litre is permitted.



Photographs:
Top: Prototype after the drop test Bottom: Prototype after the hydraulic test

* Swiss Association for Pressure Vessels Control / Federal Inspectorate of Dangerous Goods

Packaging Technology