SAFKEG LS and SAFKEG HS Type B(U) packages

Croft/MURR NRC Pre-Application Meeting

White Flint, MD, USA

13th November 2006

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Overview

- **Objectives**
- **Licensee**
- **Package Designs**
- **Licensing Issues**
- **NRC Approval Process**
- **QA Issues**

Objectives

- **Approval of SAFKEG LS as a Type B(U) package**
  - **Designed to replace 6M used by MURR**
  - **Supply to other shippers in the US a second priority**
- **Approval of SAFKEG HS as a Type B(U) package**
  - **Designed to replace 20WC used by MURR**
  - **Supply to other shippers in the US a second priority**
- **Approval schedule to fit with DOT extension of use of MURR 6M and 20WC from 1st Oct 2008**

Licensee

- **Applicant**
  - **Croft**
- **Licensee**
  - **Croft**
- **Principal user**
  - **MURR**
- **Other users**
  - **Will be offered to all US shippers**

Package Designs

Item	Details	Comments
Package name	**SAFKEG LS**	Lightly shielded package
Usage	Essentially a 6M replacement of limited capacity.	
Outline design	Option 1 - drawing 0C-5637 Option 2 - drawing 0C-5638	Screw ring CV closure Flange CV closure
Outer container	Keg with bolted closure	
Inner container	CV having EPM O-rings	
Insulation / shock absorber	Resin bonded cork	
Maximum weight	150 lbs	
Materials of construction	Austenitic stainless steel to ASME II, Part D	
Shielding inserts in CV	Lead and or tungsten	
Design standard for outer container	ASME VIII	
Design standard for inner container	ASME III CV body machined frm solid (no welds)	
Design pressure	7 bar gauge	
MNOP	< 2 bar gauge	
Maximum contents heating	10 W	

Item	Details	Comments
Contents	~ 50 radionuclides	
Material forms	Solid or liquid	
Product containers	Quartz vials, welded aluminum capsules	
Containment	CV provides main containment EPM O-rings Product containers provide retention of contents within the shielding. Liquids to be carried in sealed product container. Product containers tested by bubble immersion leakage test	
Provision of variable shielding	Lead shielding pot fits CV cavity Cavity of various dimensions Tungsten or lead inserts optional	

Item	Details	Comments
Package name	**SAFKEG HS**	Heavily shielded package
Usage	Essentially a 20WC replacement of limited capacity.	
Outline design	Drawing 0C-5642	
Outer container	Keg with bolted closure	Same as for SAFKEG LS
Inner container	Shielding pot fabricated from stainless steel which encases DU shielding and has a closure fitted with EPM O-rings	
Insulation / shock absorber	Resin bonded cork with Aluminum inner spacer adjacent to the shielding pot	
Weight	Nominally 250 lbs	
Materials of construction	Austenitic stainless steel to ASME II, Part D	
Shielding inserts in shielding pot	Lead and or tungsten	
Design standard for outer container	ASME VIII	
Design standard for inner container	ASME III Shielding pot containment boundary machined from solid (no welds)	
Design pressure	7 bar gauge	
MNOP	< 2 bar gauge	
Maximum contents heating	25 W	

Item	Details	Comments
Contents	~ 50 radionuclides	Includes ~ 5kCi Ir 192
Material forms	Solid or liquid	
Product containers	Quartz vials, welded aluminum capsules	
Containment	Main containment provided by inner vessel of the shielding pot, closure flange and EPM O-rings. Retention of contents within the shielding to be provided either by product containers or “cavity O-ring”. If “cavity O-ring” not fitted, solids and liquids to be carried in sealed product container. Product containers tested by bubble immersion leakage test.	
Provision of variable shielding	Optional tungsten or lead inserts of various dimensions to fit shielding pot cavity.	

Licensing Issues

Item	Details	Comments
SARP format	Reg Guide 7.9	
SARP drawings	Manufacturing drawings or specifying drawings	
Supporting documentation	Specifications, test reports, calculations to go in appendices to each chapter.	
Test prototype	As final design but having extra holes for thermocouples for thermal testing and leakage testing.	
Drop testing	Test attitudes - side, top, CofG over top ring	
	Pressure in cavity - ambient or MNOP	
	Temperature for test - ambient or -40 ^{o}C	
	Number of packages	
800 ^{o}C 30 mins thermal test	Min keg surface temperature in furnace test	
Thermal assessment	Steady state test with heater in cavity max CV fitted with temperature indicators for thermal test Insolation effect determined by FEA benchmarked to steady state and thermal test.	
Shielding assessment	Calculated using Microshield	
Pressure testing	1.5 x design pressure	

Item	Details	Comments
Stress analysis	NCT - CV closure stresses by analysis based on design pressure assuming impact stresses are negligible. ACT - CV closure stresses by analysis based on assessed accelerations Criteria as NUREG 6007, Reg Guide 7.8 and ASME III.	Not required for keg. FEA deemed unnecessary Testing confirms analysis [no plastic deformation and leaktight after tests]
Lifting attachments	Failure of the device under excessive load issue re keg top ring.	

NRC Approval Process

- **Pre-submittal meetings**
  - **Preliminary meeting - 13 November 2006**
  - **Finalized design stage meeting - ?**
- **Approval Process**
  - **Mechanics**
  - **Timescale**
  - **Costs**

QA Issues

- **Croft**
  - **QA Program Approval - # 0856 (reissue pending)**
  - **Other?**
  - **Costs**
- **MURR**
  - **Register as user**

10CFR71

71.45 Lifting and tie-down standards for all packages.

(a) Any lifting attachment that is a structural part of a package must be designed with a minimum safety factor of three against yielding when used to lift the package in the intended manner, and it must be designed so that failure of any lifting device under excessive load would not impair the ability of the package to meet other requirements of this subpart. Any other structural part of the package that could be used to lift the package must be capable of being rendered inoperable for lifting the package during transport, or must be designed with strength equivalent to that required for lifting attachments.

(b) Tie-down devices:

(1) If there is a system of tie-down devices that is a structural part of the package, the system must be capable of withstanding, without generating stress in any material of the package in excess of its yield strength, a static force applied to the center of gravity of the package having a vertical component of 2 times the weight of the package with its contents, a horizontal component along the direction in which the vehicle travels of 10 times the weight of the package with its contents, and a horizontal component in the transverse direction of 5 times the weight of the package with its contents.

(2) Any other structural part of the package that could be used to tie down the package must be capable of being rendered inoperable for tying down the package during transport, or must be designed with strength equivalent to that required for tiedown devices.

(3) Each tie-down device that is a structural part of a package must be designed so that failure of the device under excessive load would not impair the ability of the package to meet other requirements of this part.