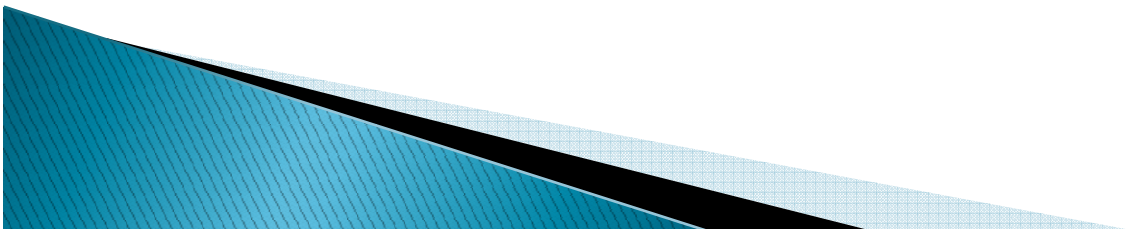
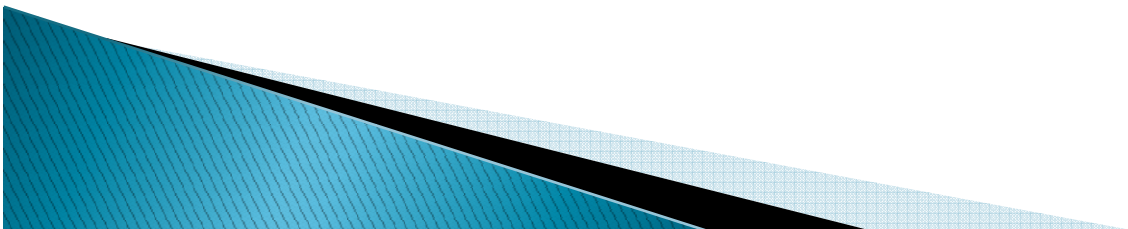


Management of Radioactive Sources at Sandia National Laboratory



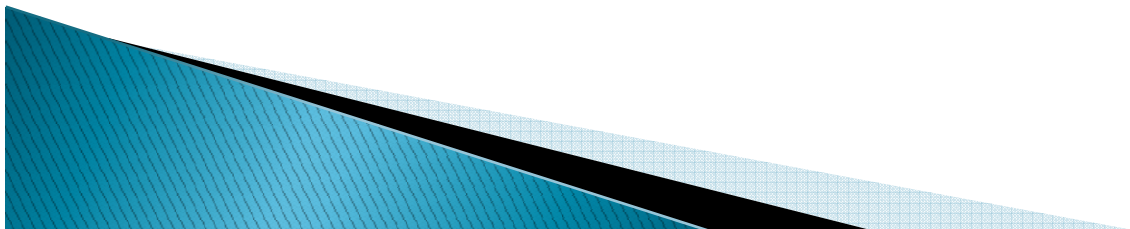
Project Scope

Design/License/Build/Use a source insert in the 10-160B package to transport radioactive sources from SNL to NNSS



Waste Characteristics

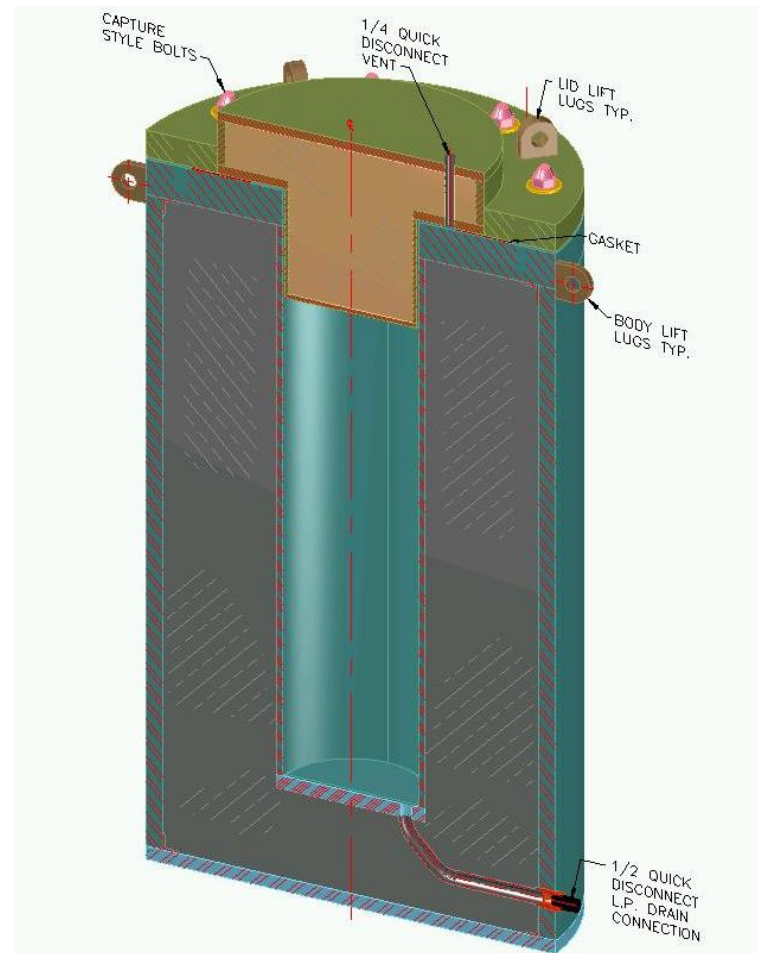
- ▶ Physical Form/Properties
 - Stainless Steel Encapsulated Co-60 Sources
 - No Liquids
 - < 125 lbs
 - No Transuranics
 - No fissile material



Radioactive Content

	Activity
Isotope	Ci
Co-60	10,000

SNL Source Insert



Approval Process

- Submit stand-alone addendum to the SAR with the Sandia sources in the source insert as contents
- Show structural, thermal, shielding, operations, and fabrication acceptance requirements are satisfied
- Refer to the base SAR for the containment, criticality, and maintenance requirements

Project Schedule

- Submit SAR Addendum – September 2011
- Issue revised CoC – December 2011
- Start Fabrication – December 2011
- Deliver Insert to Sandia– March 2012
- Load Insert – March 2012
- Ship Loaded Insert to NNSS – March 2012

Addendum Content

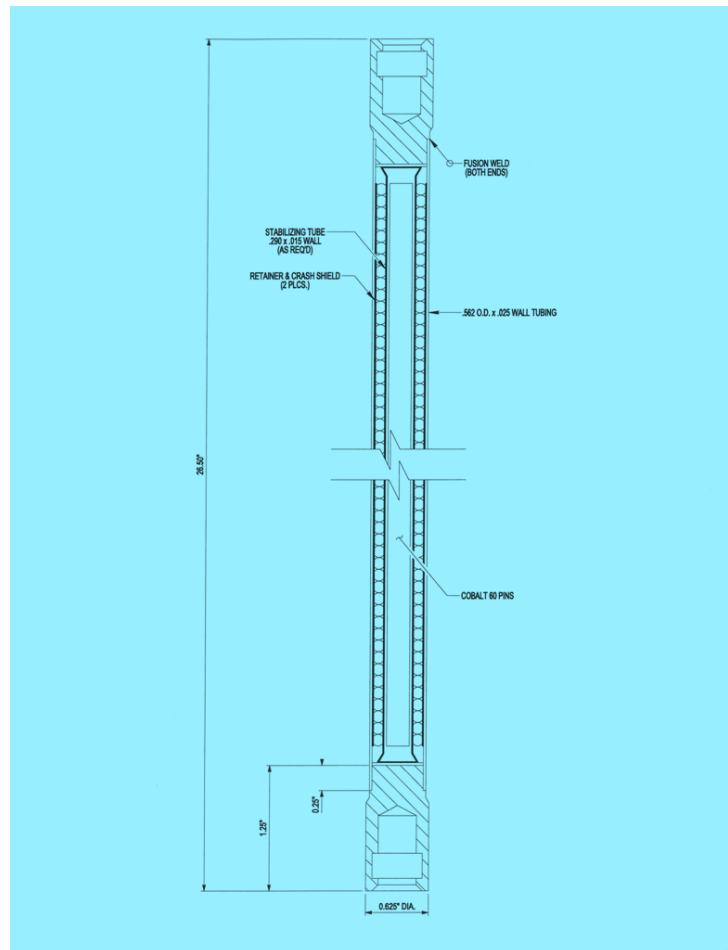
- Chapter 1 – Source Insert Description and Sandia Sources
- Chapter 2 – Structural Analysis of Source Insert
- Chapter 3 – Thermal Analysis and Gas Generation Analysis
- Chapter 4 – Containment : Bounded by SAR
- Chapter 5 – Shielding Analysis
- Chapter 6 – Criticality : Not Applicable
- Chapter 7 – Operations
- Chapter 8 – Acceptance Testing

Description and Contents

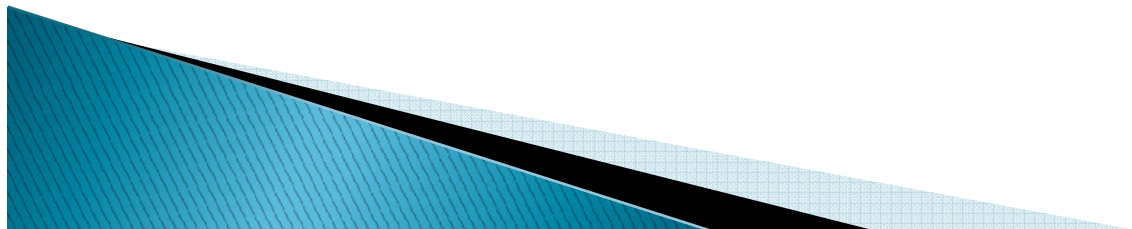
For this Addendum,

- The type and form of waste material will include:
 - 1) Co-60 sources
 - 2) RAM is contained in a shield insert
- Maximum quantity material per package:
 - 1) 10,000 Ci of Co-60
- The source package description will include:
 - 1) dimensions
 - 2) materials

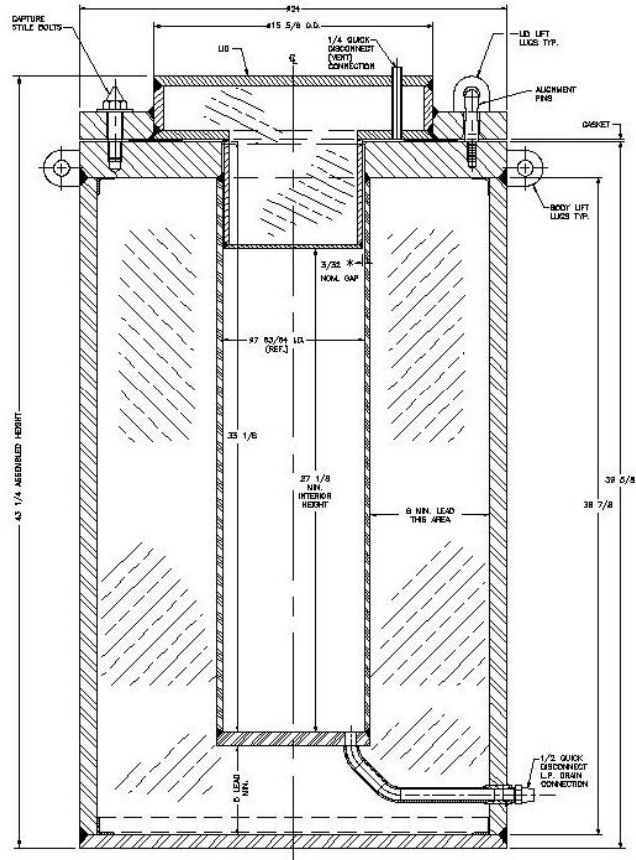
Description and Contents



Structural Evaluation



SNL Source Package - Dimensions



SECTIONAL VIEW
GAMMA SHIELDED SOURCE CONTAINER

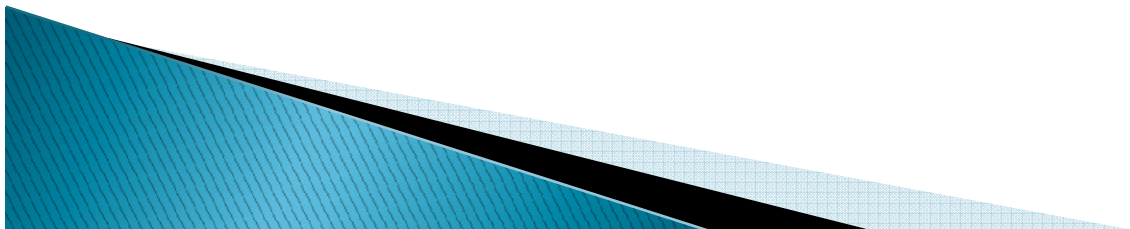
PRELIMINARY FOR
REFERENCE ONLY!

SNL Source Package - Estimated Weight

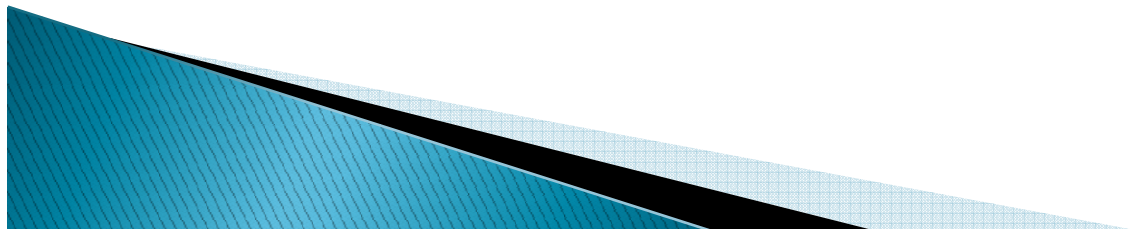
Gamma Shield		7,000 lb
Body	6,500 lb	
Lid	500 lb	

SNL Source Package - Structural Analyses

- Perform the lifting analysis of the source insert using ANSI N14.6
- Show that the insert lid will remain attached to the body under HAC
- Show that the insert will not damage the cask under HAC

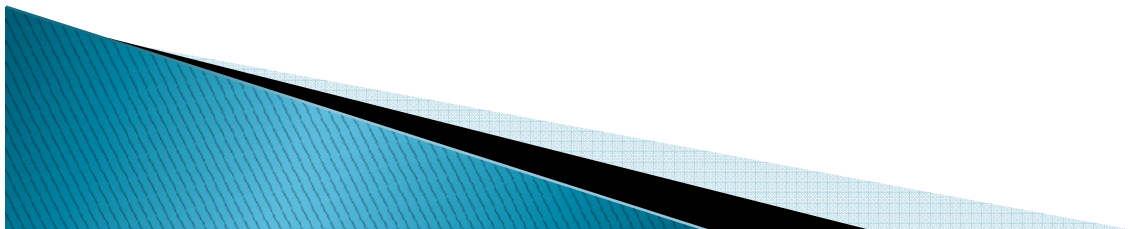


Thermal Evaluation



SNL Source Package - Thermal Analyses

- Perform the thermal analyses for the NCT and HAC fire using 2-d axisymmetric ANSYS FEM
- Use the same boundary conditions on the 10-160B cask body as those in the NRC approved SAR
- Ignore the shoring material inside the cask in the analyses. Use the radiation between the insert, and conduction through the interstitial air, as the only means of heat transfer between the insert and the cask

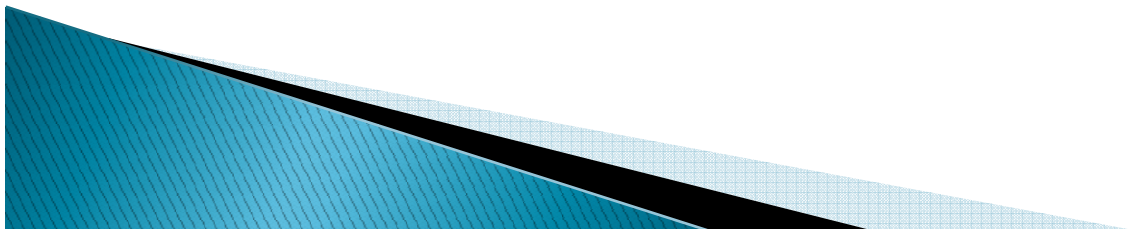


SNL Source Package - Thermal Analyses Results

- Details of the FEM will be provided
- Temperature distribution in the cask body and SNL source insert under NCT loading will be provided
- HAC fire test time-history of temperature results at various locations will be provided
- Tables 3-1 and 3-2 of the SAR will be updated for the SNL source and provided in the addendum
- Comparison of the maximum versus the allowable temperature for the insert seal will be provide

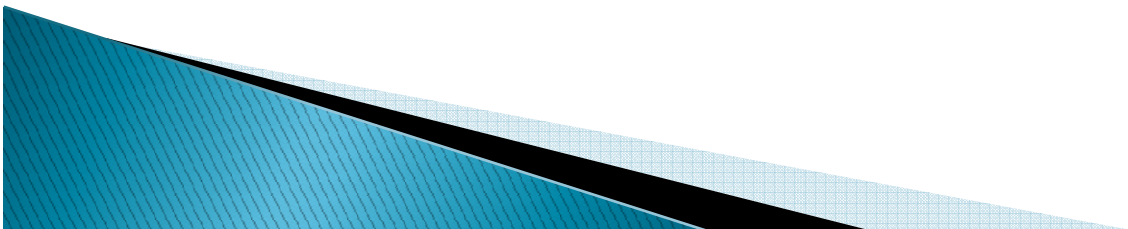
SNL Source Package – Gas Generation and Internal Pressure

- No gas generation from radiolysis
- Insert cavity will be vacuum dried
- Maximum Normal Operating Pressure will be evaluated for decay heat of sources
- Maximum HAC pressure will be calculated



Containment Evaluation

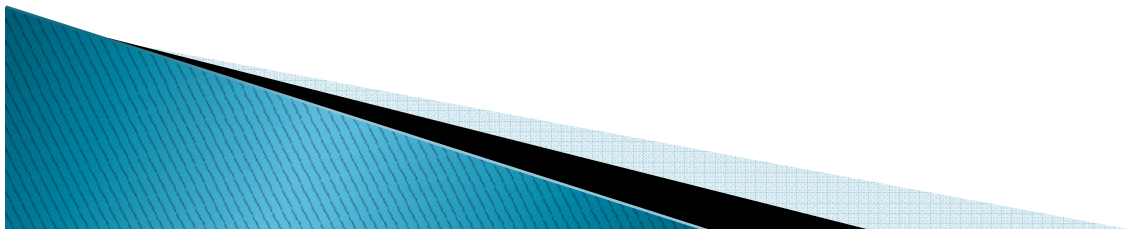
- ▶ Co-60 < 1000 A₂
- ▶ Bounded by current SAR (3000 A₂)



Shielding Evaluation

▶ Assumptions:

- RAM distributed in cavity for NCT, as point source for HAC
- ANSI-1977 flux-to-dose rate conversion factors used
- Source insert moves under HAC
- Ignore impact limiters for HAC



Preliminary Shielding Results (MCNP)

<u>Condition</u>	<u>Cask Surface</u>			<u>1 m from Surface</u>			<u>2m from 8' trailer</u>
	<u>Side</u>	<u>Top</u>	<u>Bottom</u>	<u>Side</u>	<u>Top</u>	<u>Bottom</u>	
NCT							
Gamma Source	1	0.4	3.6	N.A.	N.A.	N.A.	0.08
Allowable	200	200	200	N.A.	N.A.	N.A.	10
HAC							
Gamma Source	N.A.	N.A.	N.A.	0.2	13.2	5.4	N.A.
Allowable	N.A.	N.A.	N.A.	1000	1000	1000	N.A.

Operations

- ▶ Place source insert in SNL pool
- ▶ Load sources into insert
- ▶ Install insert lid
- ▶ Drain insert cavity
- ▶ Vacuum dry insert cavity (1 torr for 30 minutes)
- ▶ Load insert into 10-160B
- ▶ Assemble cask
- ▶ Perform pre-shipment leak test
- ▶ Transport to NNS

Fabrication and Acceptance

- ▶ Procurement Controls per *EnergySolutions* Quality Assurance Program
- ▶ Source Insert is Quality Level II (Category B) – following guidance of NUREG/CR-6407
- ▶ Shielding material (lead) will be procured as commercial items and will be upgraded to Quality Level II

Fabrication and Acceptance

- ▶ Gamma scan of completed Source Insert
- ▶ Welds inspected by MT – acceptance criteria per ASME Code Sec III, Div I, Subsection NF–5340
- ▶ Lift components load tested per ANSI N14.6
- ▶ No leak test of the Source Insert

QA Program

- ▶ *EnergySolutions*, LLC has an established and fully implemented quality program for all aspects of design and fabrication. Our Quality Assurance (QA) Program meets the requirements of ASME NQA-1, 10 CFR Part 71, Subpart H and 10 CFR Part 50 Appendix B. *EnergySolutions* has extensive experience in managing, performing, and supporting projects in accordance with our QA Program and other quality consensus standards.
- ▶ The Quality Assurance Program has been evaluated and approved by the US Nuclear Regulatory Commission (USNRC). The implementation of *EnergySolutions* QA Program has been audited by the USNRC in 2009.