Gamma Irradiation Facility (GIF) ^{60}Co Source Pin Transfer Operation

Hazard Analysis Solutions

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LEADING NUCLEAR TECHNOLOGIES

GIF Pin Transfer

Introduction

- Background
- Facility Description
- Operational Description
- Cask Insert
- Source Transfer Tool
- Conclusion

Background

GIF Pin Transfer

GIF Mission

Category 3 Non- Reactor Nuclear Facility.

Provides gamma irradiation from a capability of 1.5 MCi of sealed Co-60 source pins.

Used to irradiate:

- **nuclear weapons components to threat levels.**
- **inorganic and organic materials.**

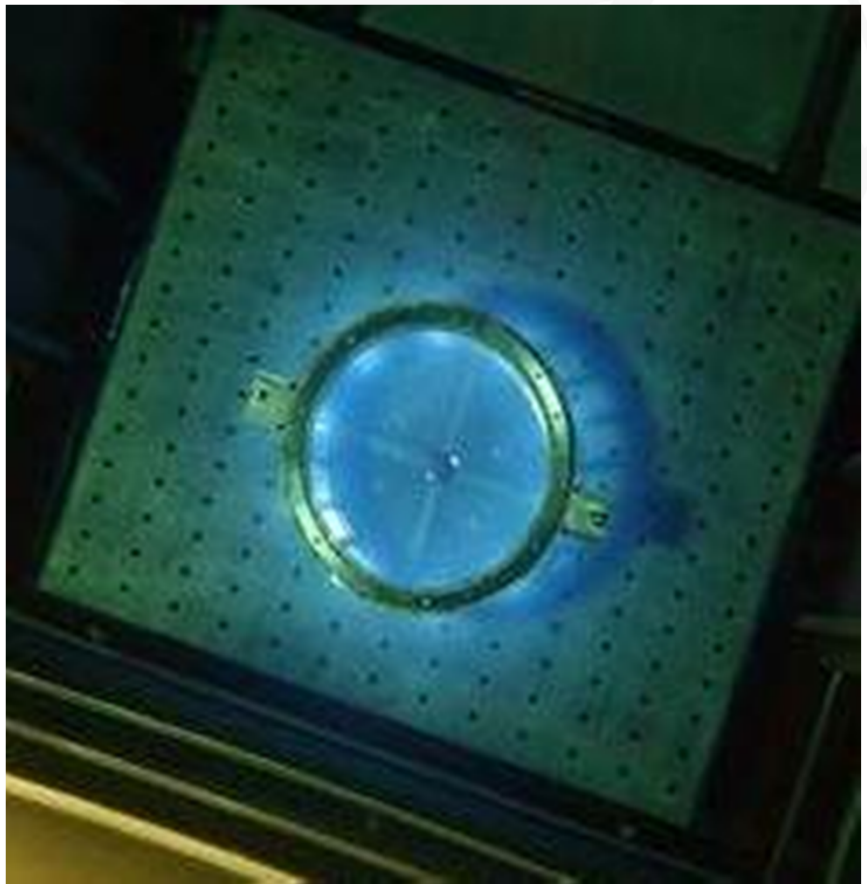
GIF Pin Transfer

Source Pins

Co-60 source pins are great source for high intensity gamma radiation.

Source pins are stored in arrays were the dose rate can reach 800 Rads/sec in center.

Various configuration allow for flexibility in experiments.



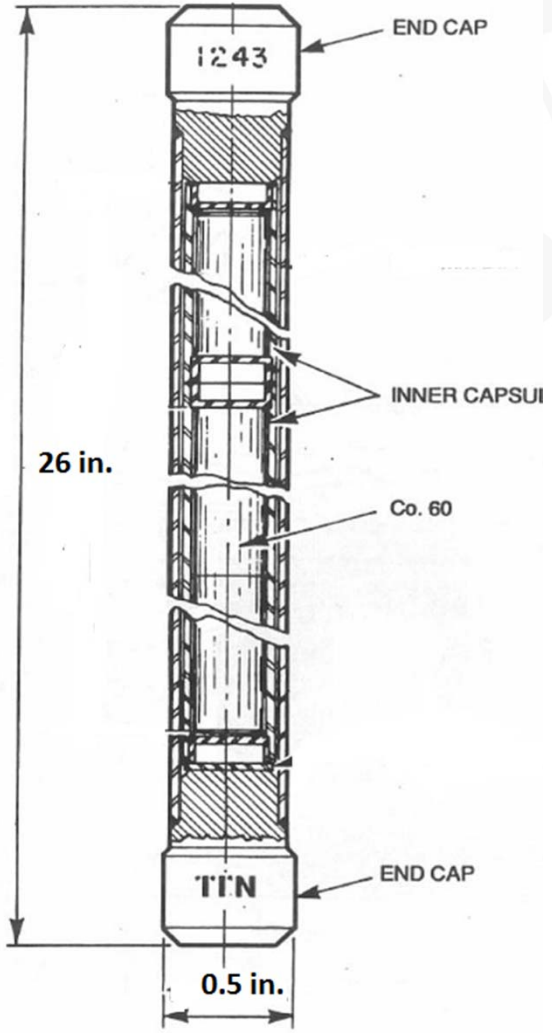
GIF Pin Transfer

Source Pins

There are 48 uncertified source pins that make up the 10 kCi of Cobalt 60 that is the reason for HazCat 3 categorization.

Transferring theses source pins out of the GIF will allow the GIF to be re-categorized as a radiological facility.

Still have 180K Ci of certified Co-60 sources.



GIF Pin Transfer

Cask Insert

DOT cask in DSA not big enough for non-certified sources.

Had to design cask for sources that was cost effective and would meet design requirements.

Facility Description

GIF Pin Transfer

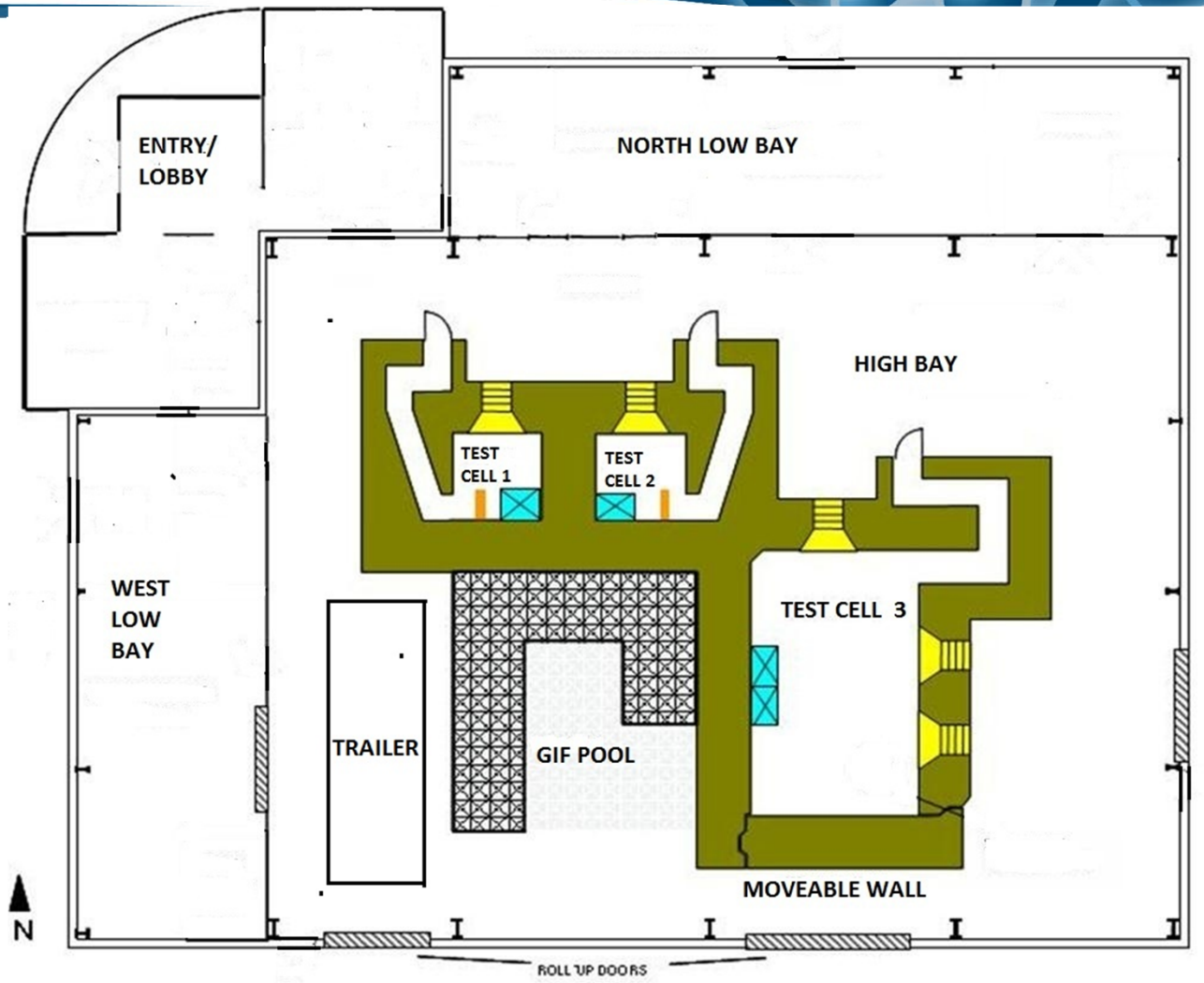
Facility Description

External View

GIF Pin Transfer

Facility Description

Floor Plan



GIF Pin Transfer

Facility Description

High bay area looking from the roll-up door toward the pool and Cells 1 and 2.

This is were the DOT Transfer cask on the trailer will be parked.

Operational Description

GIF Pin Transfer

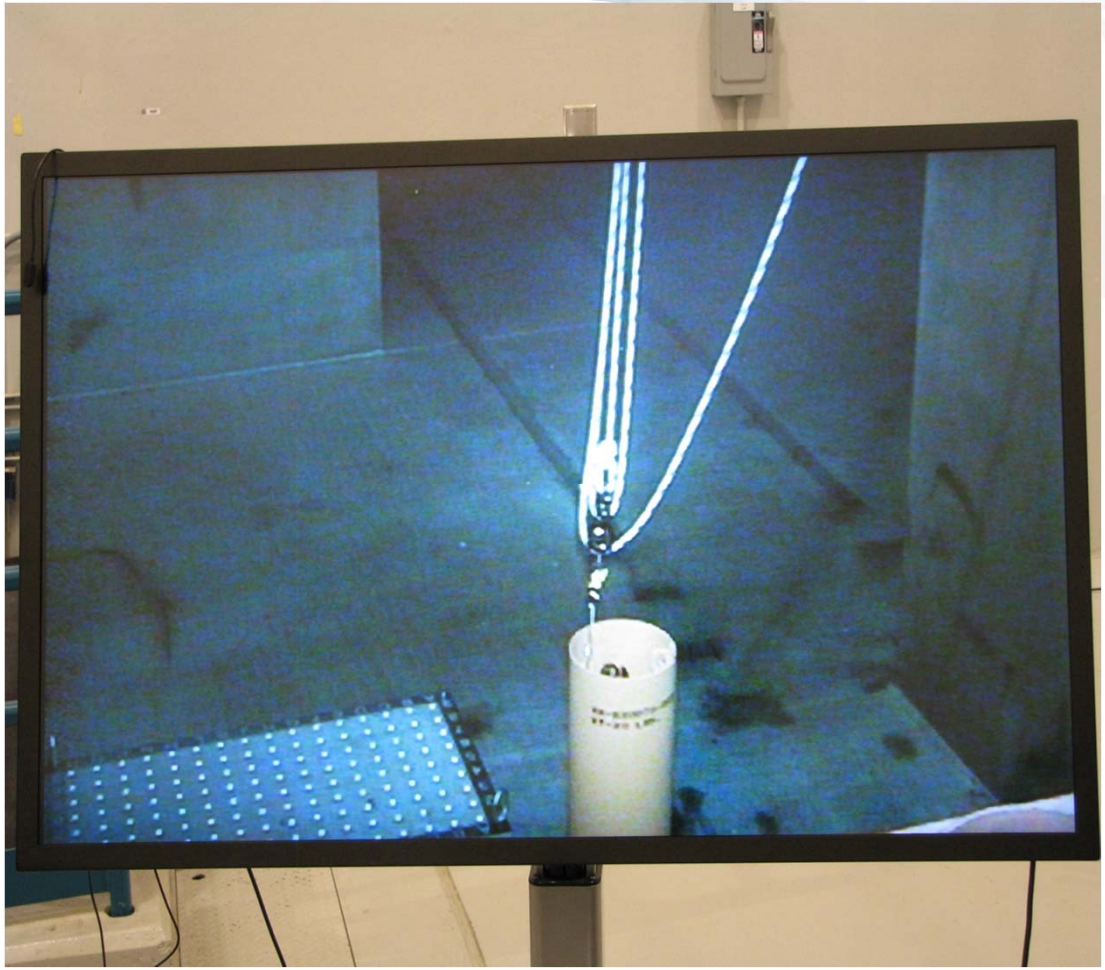
Operational Description

The GIF will receive a specifically-made source basket that is made to fit into the cask insert into which the pins will be installed.

GIF Pin Transfer

Operational Description

The source basket will be placed in GIF pool and Co-60 source pins will be inserted into the source basket.



GIF Pin Transfer

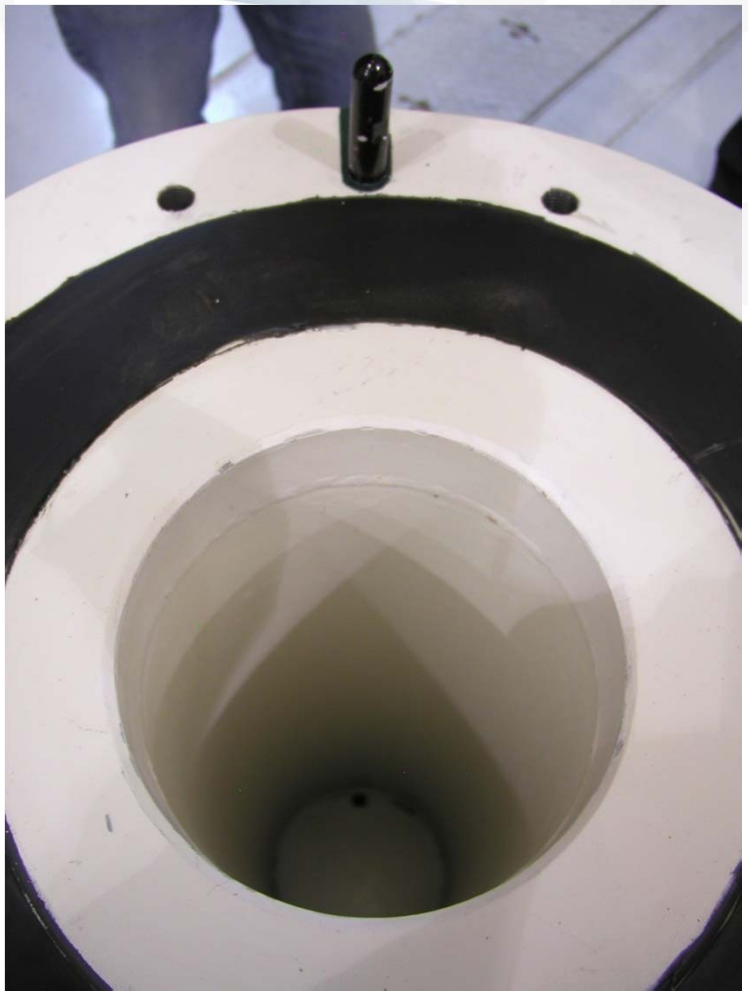
Operational Description

The cask insert is received from the vendor And the lid is removed.

GIF Pin Transfer

Operational Description

The gasket and the shield cavity are then visually inspected and the lid reinstalled



GIF Pin Transfer

Operational Description

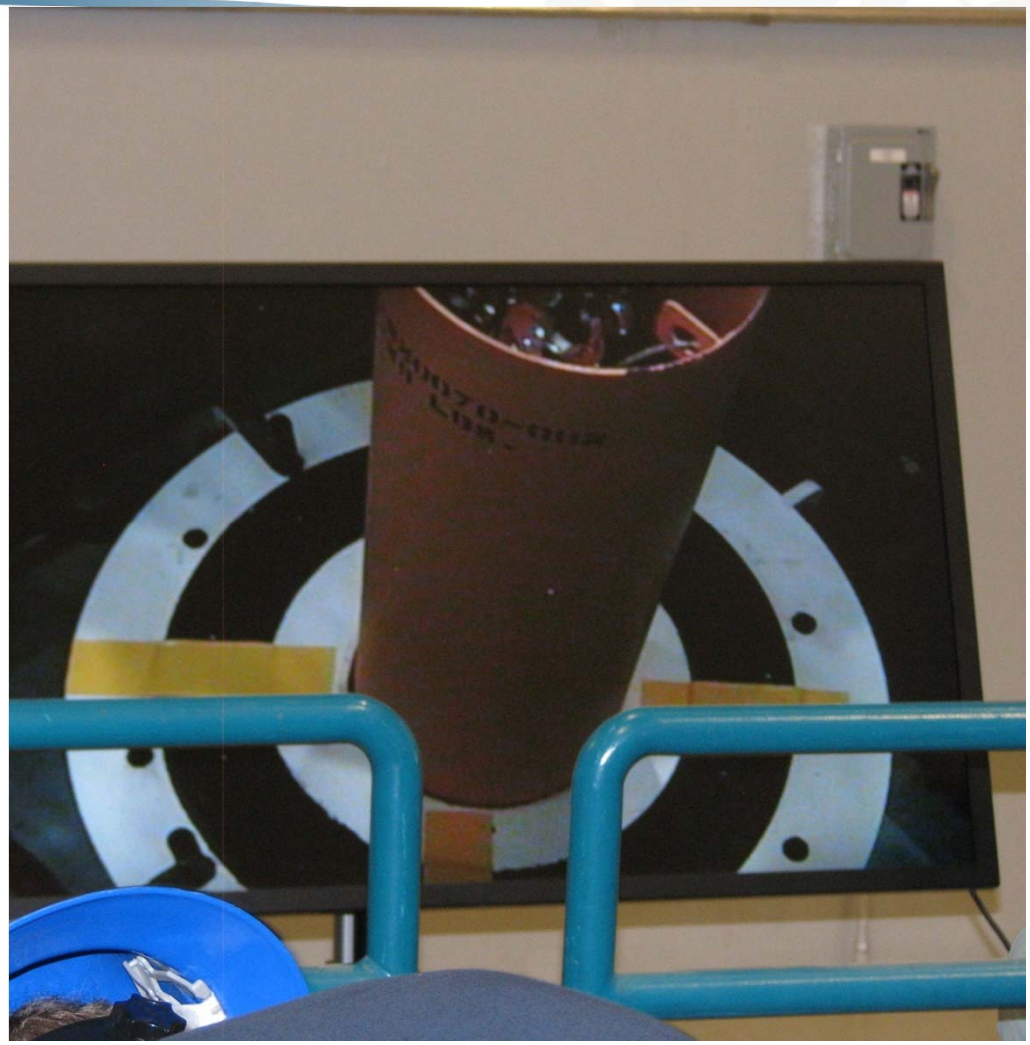
The cask insert will be placed into the pool.

GIF Pin Transfer

Operational Description

The basket with the Co-60 pins will then be placed into the cavity of the cask insert.

The cask insert lid will then be replaced and secured.



GIF Pin Transfer

Operational Description

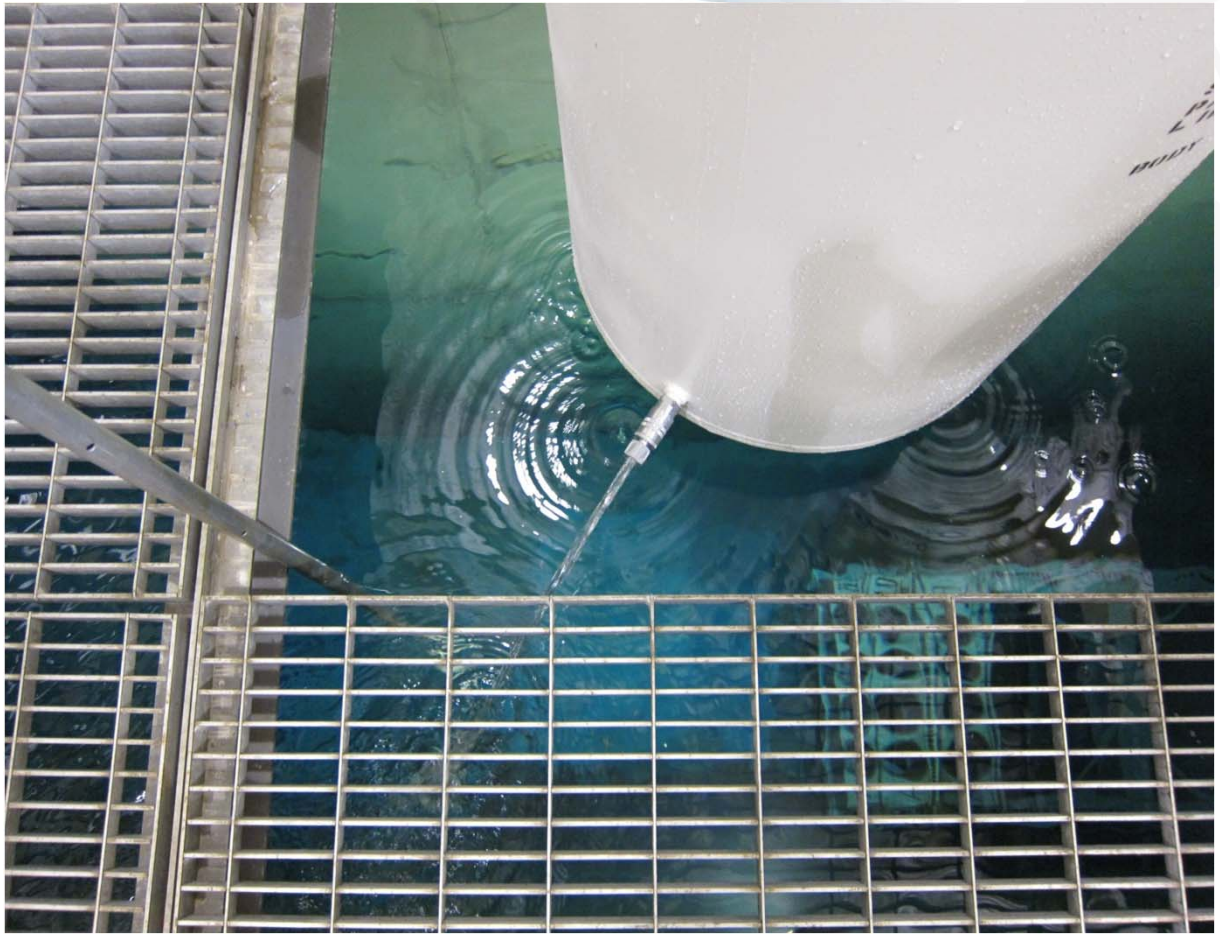
The DOT transfer cask arrives and is moved into the GIF and will stay on trailer.

The DOT transfer cask lid will then be removed.

GIF Pin Transfer

Operational Description

The cask insert will be removed from the GIF pool, and the water drained, and the lid bolts torqued.

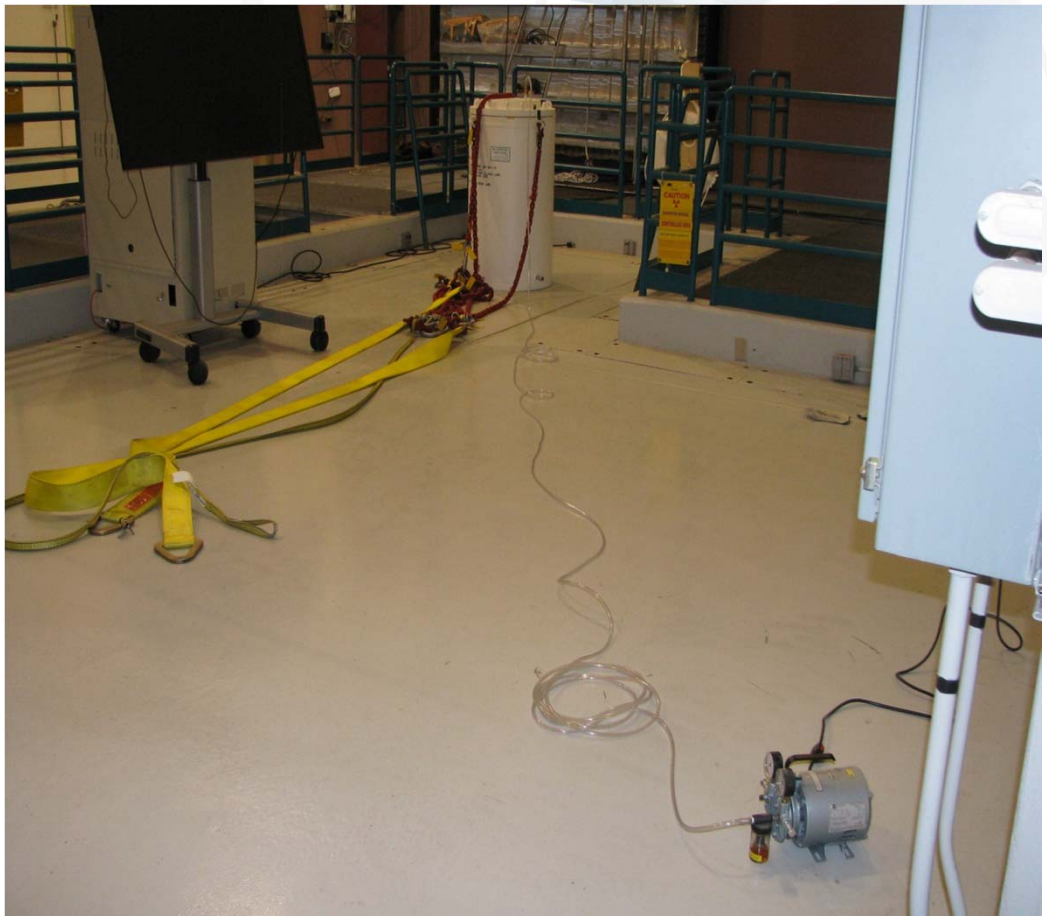


GIF Pin Transfer

Operational Description

The cask insert cavity will then be vacuumed dry.

The drain port will then be closed.



GIF Pin Transfer

Operational Description

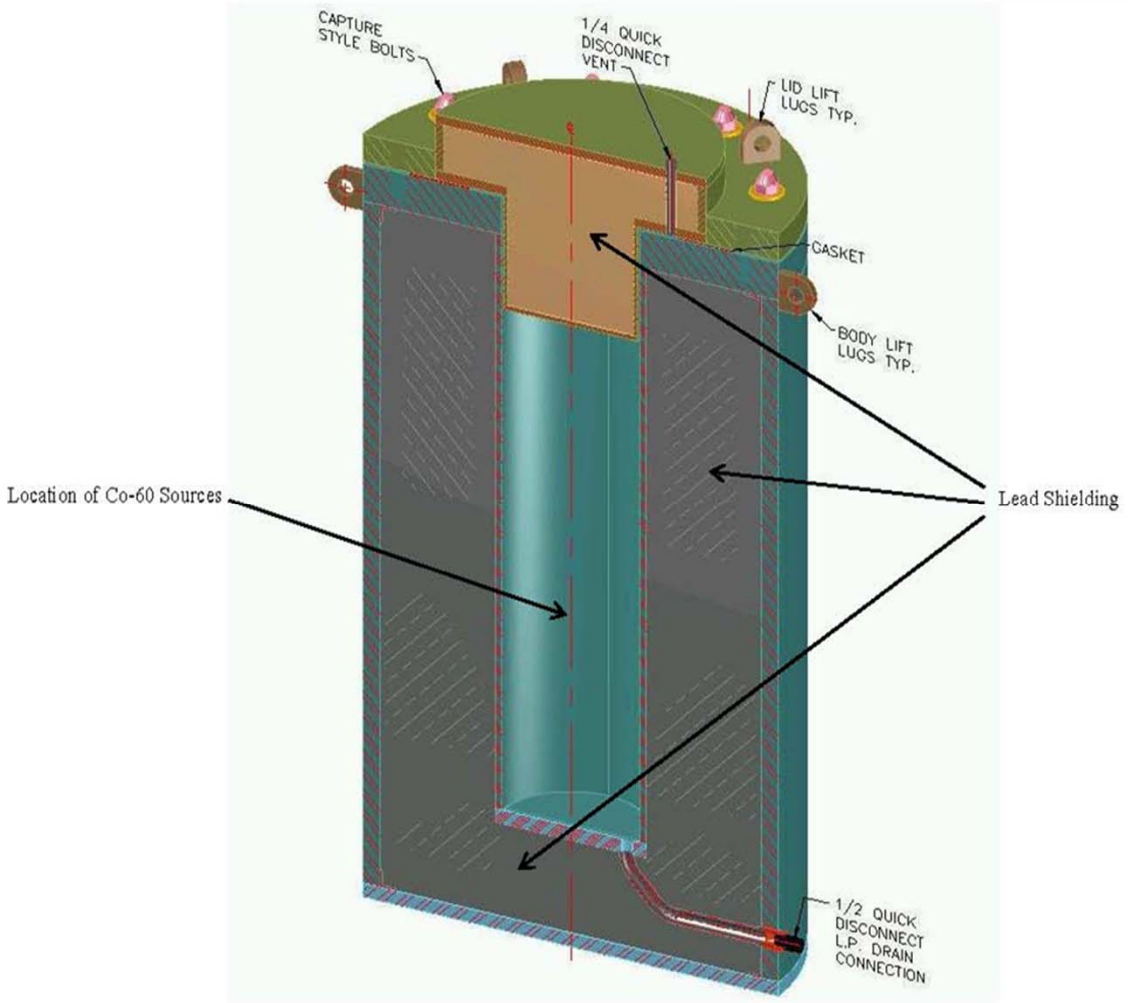
- The cask insert will then be placed inside the DOT transfer cask and the lid of the DOT transfer installed.
- The trailer with the DOT transfer cask will then be moved out of the GIF.
- The DOT transfer cask with the cask insert will be transported to Nevada National Security Site for final disposal.
- We assume the cask insert will be removed and buried since it is a one time use cask.

Cask Insert

GIF Pin Transfer

Cask Insert

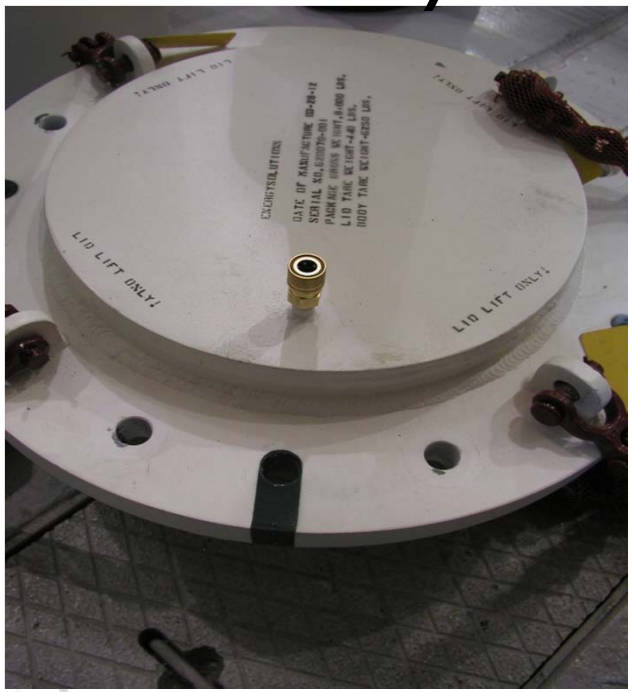
The cask insert is of robust design (6” of lead shielding) and can attenuate the radiation field to approximately 5 R/hr on contact.



GIF Pin Transfer

Cask Insert

The cask insert vent and drain lines are quick connects and require limited operator contact (30 sec to 90 sec) for vacuuming to complete the drying.



GIF Pin Transfer

Cask Insert

- **Loss of power or other equipment failure during the operation can be managed with access controls.**
- **Consequence and frequency of drops, fires, impacts are consistent with the current DSA except when it is related to the cask insert.**
- **However, the cask insert does not meet the requirements of 10 CFR 71.73 as required by the current DSA for a DOT transfer cask.**

GIF Pin Transfer

Cask Insert

Radiation Attenuation: 10 rem/hr on contact.

Impacts: Does not meet 10 CFR 71.73 requirements for impact.

Fires: Does not meet 10 CFR 71.73 requirements for fires.

Secure Lid during hoisting/transfer operations.

DOT Shipping Cask

Radiation Attenuation: 0.2 rem/hr on contact.

Impacts: Shall meet 10 CFR 71.73 requirements for impact.

Fires: Shall meet 10 CFR 71.73 requirements for fires.

Secure Lid during hoisting/transfer operations.

GIF Pin Transfer

Cask Insert

- **Cask insert does not meet the functional requirement laid out in the DSA, the hazard analysis documents the residual risk and was submitted to SSO for approval.**
- **Additional operational controls mitigate the residual risk:**
  - **In-Service Inspection of the cask insert to ensure lid is secured prior to hoisting/transfer operations with Co-60 pins inside the insert.**
  - **Access controls on cask insert during draining and drying operations, and if the cask insert must remain in the high bay due to outages or equipment failure.**

Source Transfer Tool

GIF Pin Transfer

Source Transfer Tool

The tools are made of light metal, usually aluminum, and some are intended to reach the bottom of the GIF pool (at least 18 feet long).

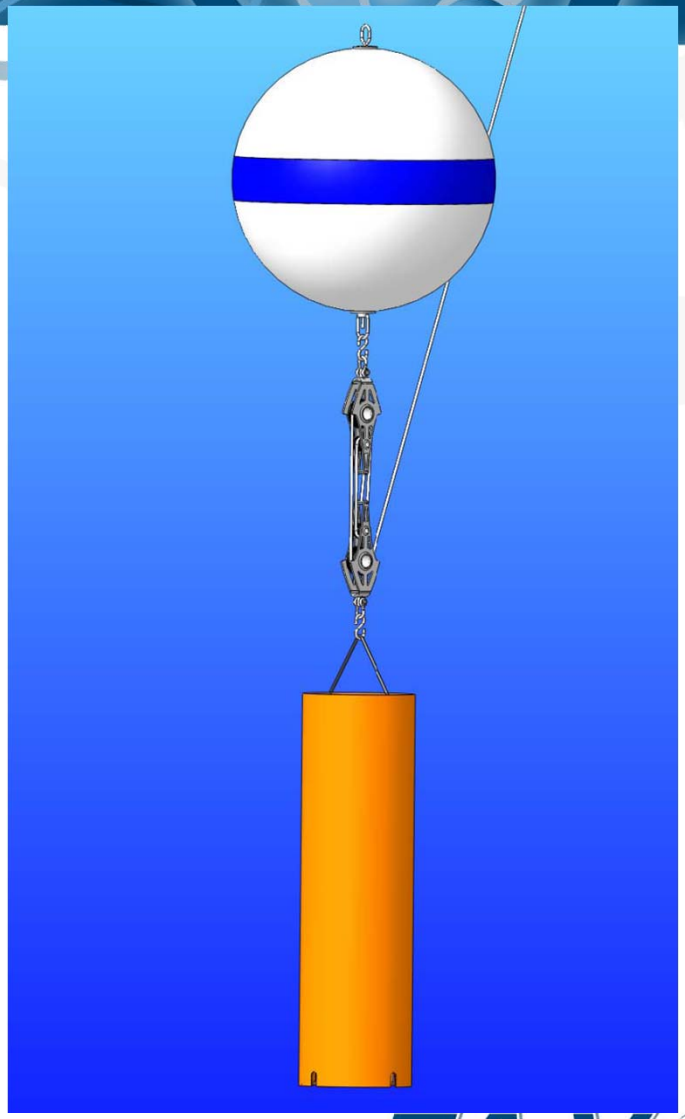
The tools are either solid or have flooding holes to prevent a voided tube that could result in radiation streaming to the top of the pool.

GIF Pin Transfer

Source Transfer Tool

Found out that the sources in the basket were too heavy to pick up by hand using the standard source transfer tool.

Developed a rope and pulley system with a buoy to lift the source basket into the cask insert.



GIF Pin Transfer

Source Transfer Tool

Met the requirements that are required by the TSRs.

Rope and Pulley System

GIF Pin Transfer

Source Transfer Tool

Was able to lift source basket and place in cask insert during operational dry-runs.

Rope and Pulley System

Conclusion

GIF Pin Transfer

Status

- A new hypothetical accident condition was identified.
- The NRC has administratively placed the 10-160B transfer cask out of service.
- A meeting is schedule with NRC and energy solution mid-May to discuss.
- GIF pin transfer has been placed on hold until further notice

GIF Pin Transfer

Benefits

- **The GIF will be re-categorized from a Hazard Category 3 facility to radiological facility**
- **10k Ci of non-certified Co-60 source pins will be removed from the facility**
- **The nuclear foot print at SNL will be reduced.**
- **Once removed, the Cost benefit of not having to maintain Documented Safety Analysis, Technical Safety Requirements, Unreviewed Safety Questions, Annual Updates, etc. will be realized.**

GIF Pin Transfer

Questions?