

***Industrial Nuclear Company, Inc.  
OP-100 Package Amendment  
Docket No. 71-9185***

***A Presentation to the  
US Nuclear Regulatory Commission***

***January 30, 2018***



# Agenda

- ▶ ***Introduction***
- ▶ ***Meeting Objectives***
- ▶ ***OP-100 Package***
- ▶ ***Payload Descriptions***
- ▶ ***Free Drop Tests to Address RAls***
- ▶ ***Summary***



# Meeting Objectives

- ▶ ***Present OP-100 Package Design***
- ▶ ***Discuss OP-100 Payloads***
  - ▶ ***Currently authorized***
  - ▶ ***Additional payload to be added***
  - ▶ ***Modification of radioactive content***
- ▶ ***Approach to Respond to NRC RAIs***
- ▶ ***Obtain NRC Input for Planned RAI Responses***
- ▶ ***Summary***

# OP-100 Package

## ▶ 10-gal Carbon Steel Standard Drum Overpack

- **Two Drum Versions**

- *Ø14.0 inch × 17½ inch high, DOT/UN 1A2/X150/S (Steel IAW Obsolete ASTM A366 Standard)*
- *Ø14.0 inch × 18.9 inch high, DOT/UN 1A2/X120/S (Steel IAW Current ASTM A1008/A1008M Standard)*

## ▶ Payload Support Structures

- **3/4-inch Thick Plywood Interlocking Panels & 2 × 4 Wood Insert Supports (Original)**
- **4 lb/ft<sup>3</sup> Polyurethane Foam Surround (Amendment)**



## OP-100 Package (con't)

- ▶ **Two Support Structures: Foam (Left), Plywood (Right)**



## OP-100 Package (con't)

### ► *View of IR-100 Installed in Support Structures*



# Payload Descriptions

## ▶ **Currently Authorized Payloads**

- ***IR-100 Exposure Device***
- ***IR-50 Source Changer***

## ▶ **Additional Payload**

- ***IR-100ST Exposure Device***
- ***Modified IR-100 Exposure Device Fitted w/ Tracking Device as Recommended by NNSA/GTRI Task Force***

## ▶ **Special Form Radioactive Material Limit**

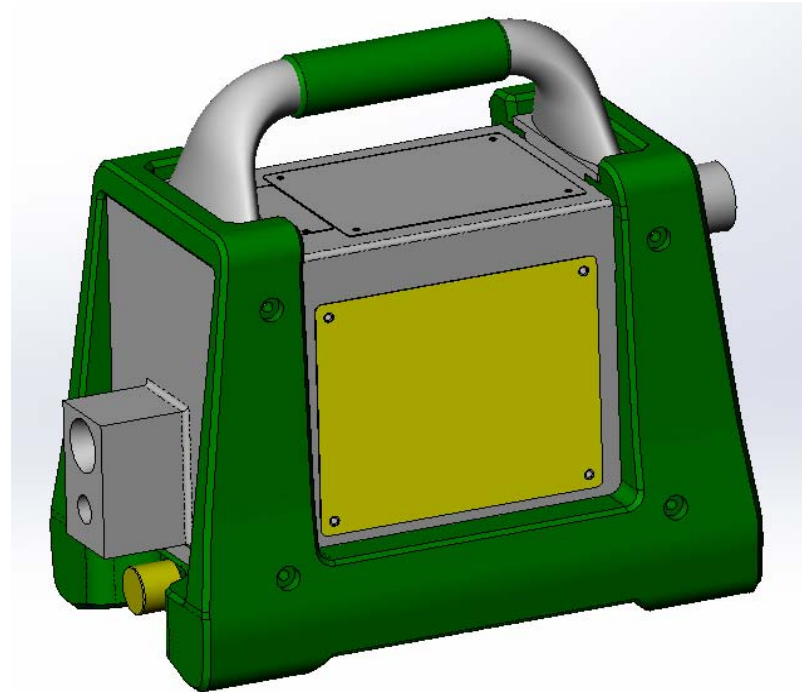
- ***Currently Authorized for 120 Ci Ir-192 or Se-75***
- ***Increase to 145 Ci Ir-192 or Se-75***
- ***Limited by 200 mrem/hr regulatory surface dose rate limit***





# *OP-100 Package IR-100ST Exposure Device*

- ▶ *Existing IR-100 Handle Removed*
- ▶ *Tracking Sensor Attaches to Body*





# **OP-100 Package**

## **Approach to Respond to NRC RAIs**

### **► RAI 2-1, Material Properties**

- **Clarify Referenced ASTM Material Standards in SAR**
  - *ASTM A366, which was obsoleted in August 2000, applies to older existing drums currently in use*
  - *ASTM A1008, which replaced A366, applies to new drums*
  - *ASTM A568, which is a standard for steel mill production and has no material properties, to be removed.*
- *Drum manufacturer selects material grade CRCQ carbon steel per ASTM A1008 that meets their self-certified DOT/UN rating, i.e., DOT/UN 1A2/X120/S*
- *Drum utilized for OP-100 package specified by DOT/UN rating only*



# **OP-100 Package**

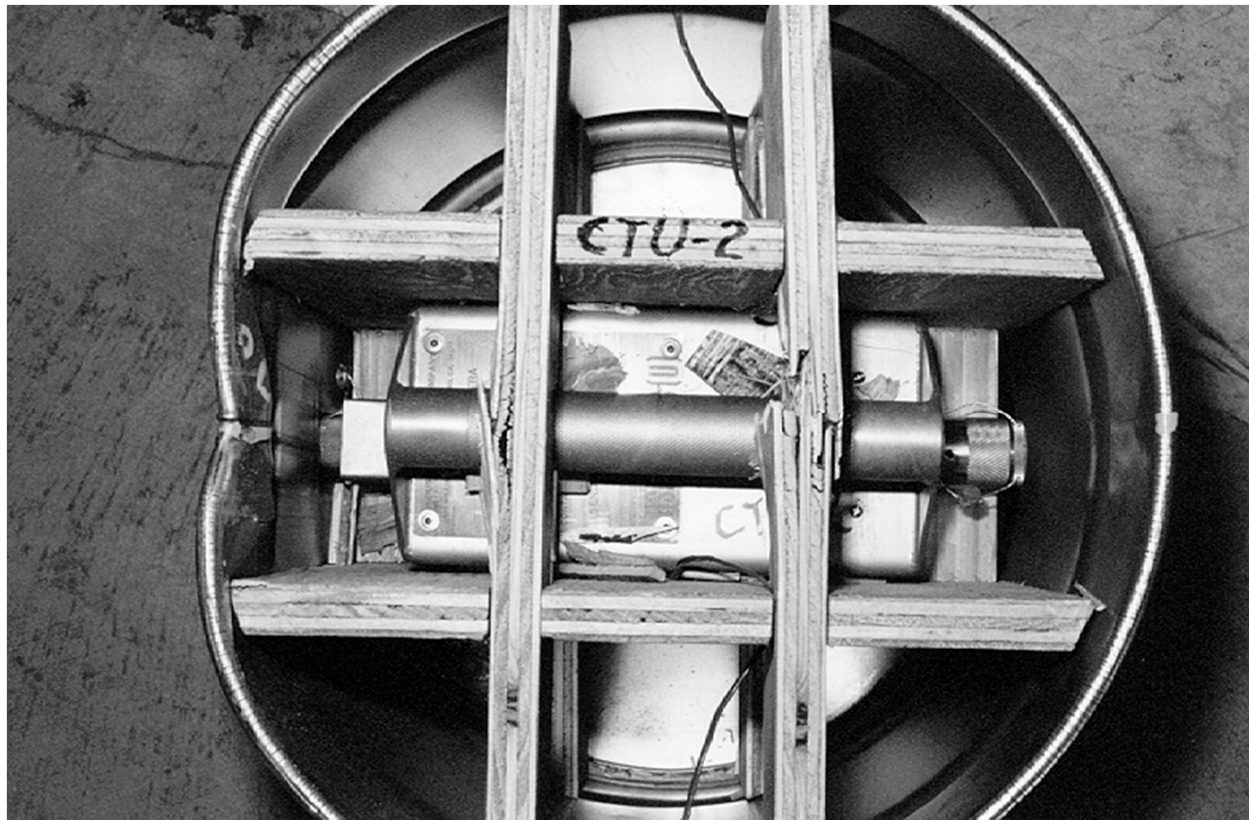
## **Approach to Respond to NRC RAIs (con't)**

### **► RAI 2-2, Polyurethane Foam Support Structure Justification for Bounding Payload Damage**

- *Original free and puncture drop tests were not instrumented for impact forces*
- *No analytical basis can be performed to demonstrate foam structure is bounded by plywood structure*
- *Free drop tests to be performed with foam support structure*
- *Selected drop orientations based on impact damage from original free drops*

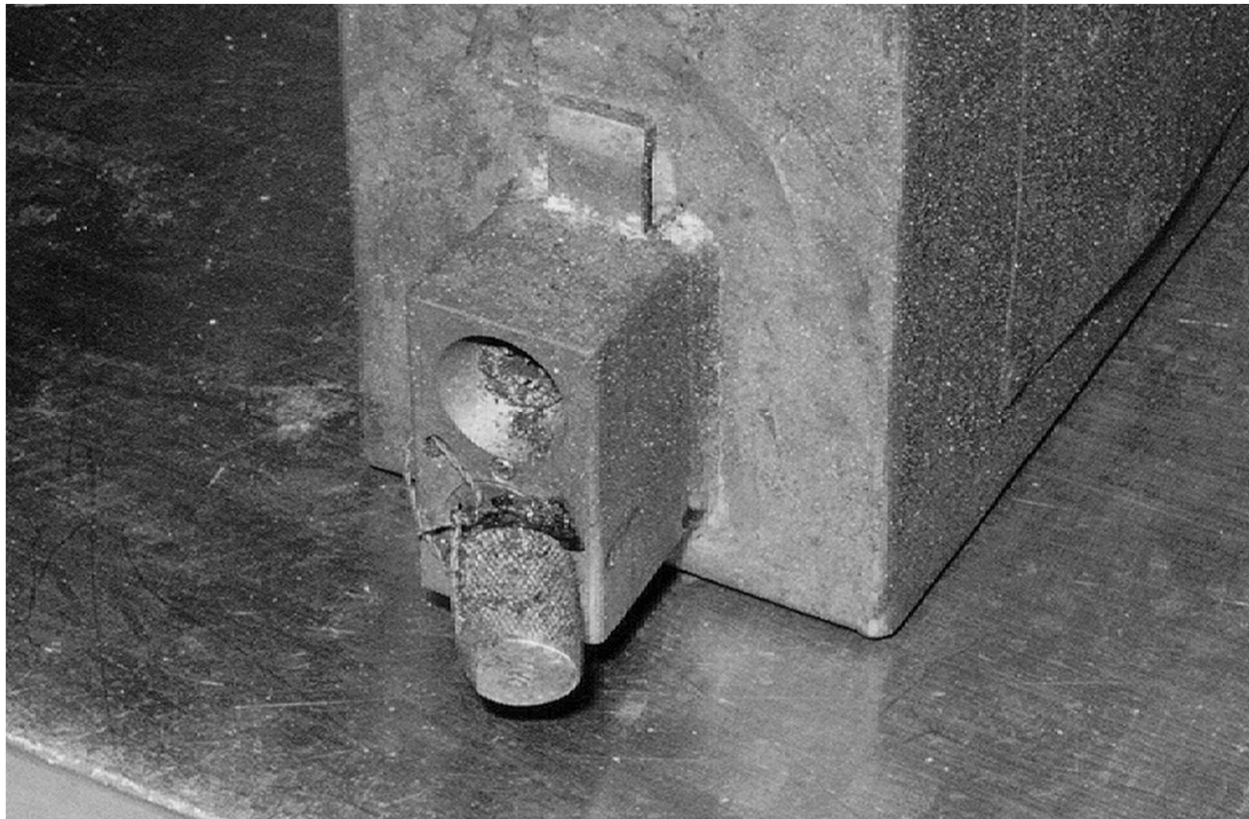
# ***OP-100 Package Approach to Respond to NRC RAIs (con't)***

## **► CTU-2 (IR-100) Side Drop Damaged Lock Box**



# ***OP-100 Package Approach to Respond to NRC RAIs (con't)***

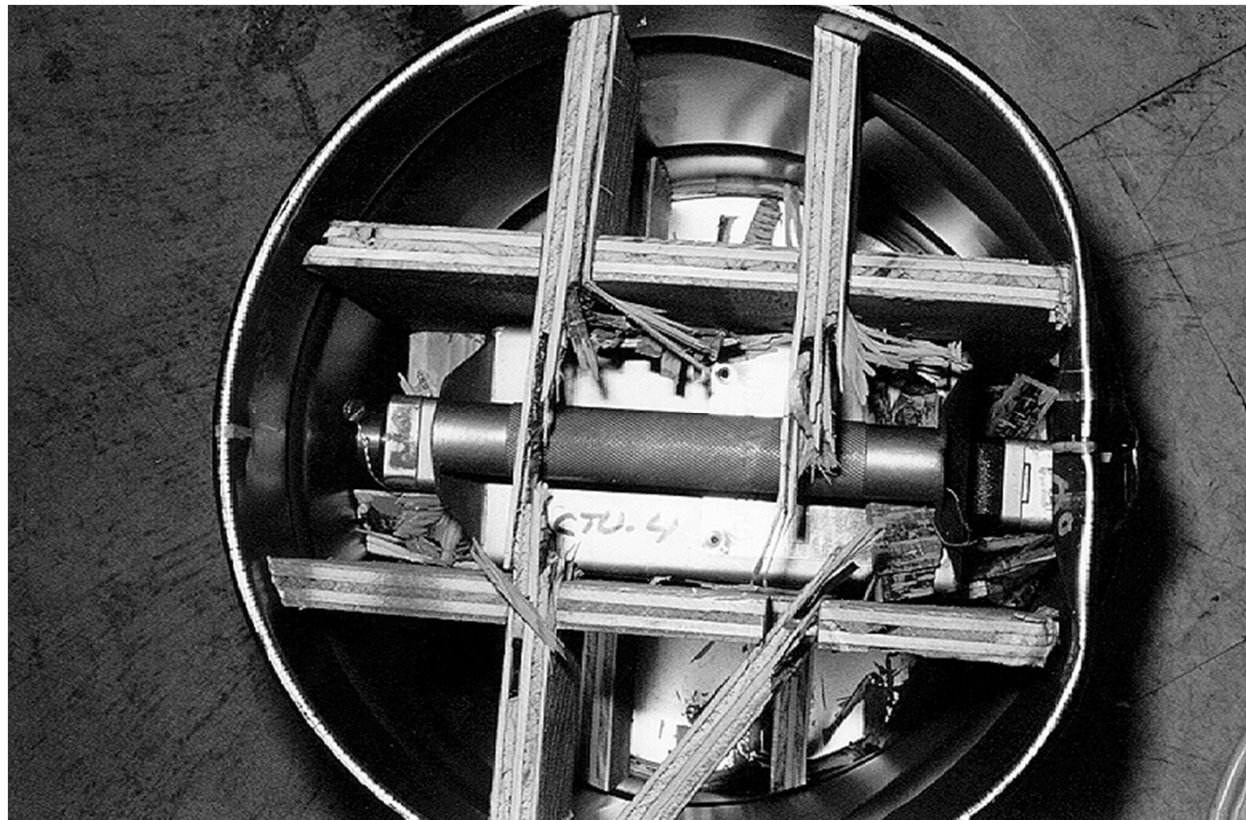
## ***► CTU-3 (IR-100) Side Drop Damaged Lock Box***





# *OP-100 Package Approach to Respond to NRC RAIs (con't)*

## **► CTU-4 (IR-50) CG-Over Corner Drop Damage**



# **OP-100 Package**

## **Approach to Respond to NRC RAIs (con't)**

### **► Conclusions from Original Free Drop Tests:**

- **Lock Box Damage May Occur When Minimum Clearance Exists Between Device and Drum Wall**
- **Maximum Deformation to Support Structure & Drum Occurs for Top Down, CG-Over-Corner Orientation**

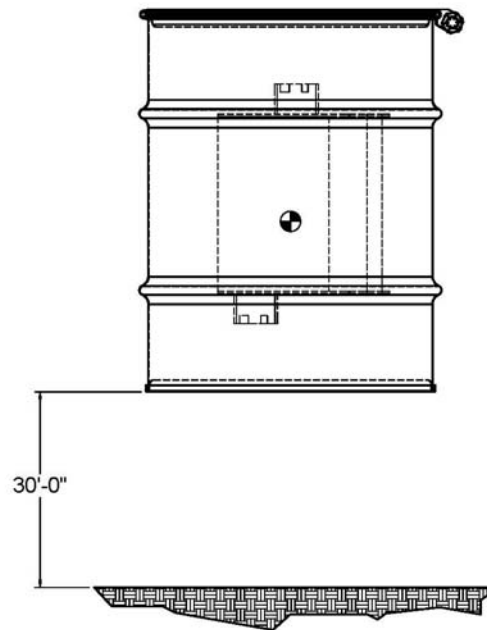
### **► Polyurethane Foam Support Structure**

- **Minimum Clearance is 2.7 Inches with IR-50 Device**
- **Selected Orientations for Free Drops**
  - **Bottom Down w/ IR-50 Source Changer**
  - **Top Down, CG-Over-Corner w/ IR-50 Source Changer**
- **Single CTU to be tested at ~100 °F (NCT Hot Condition) to Maximize Deformation**



# OP-100 Package Approach to Respond to NRC RAIs (con't)

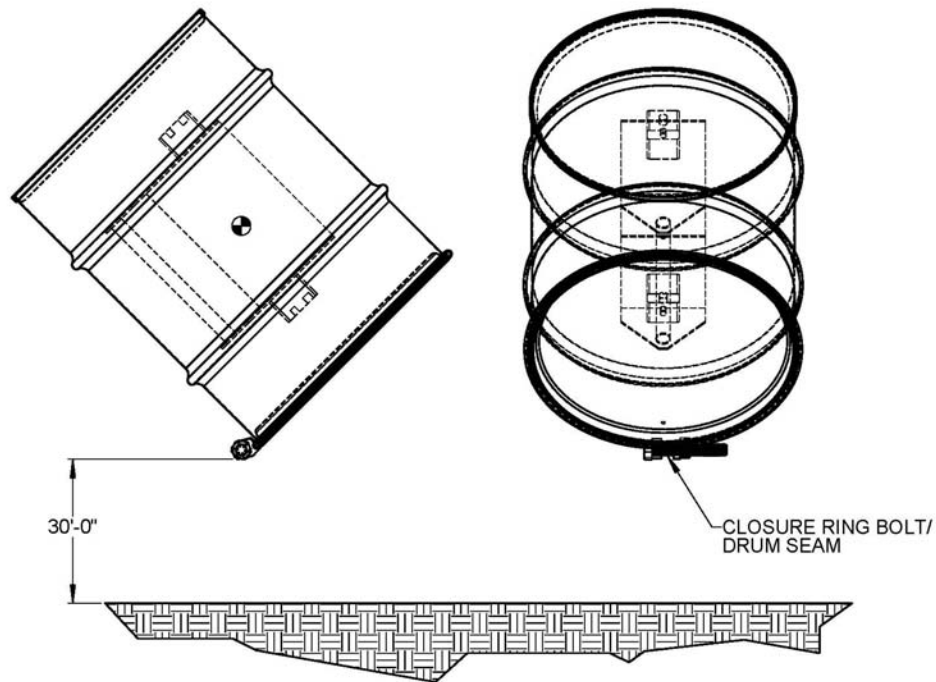
## ► Bottom Down Free Drop





# OP-100 Package Approach to Respond to NRC RAIs (con't)

## ► Top Down, CG-Over Corner Free Drop



# ***OP-100 Package***

## **► Summary**

