

Management of Radioactive Waste Following a Nuclear Accident or Extreme Contamination Scenario



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Session 112, Lessons Learned from the Rocky Flats Infinity Room Decontamination Project

Thursday, 06 March 2014, 1:30 – 5:00 PM

Rocky Flats Closure Project, USA

- More than 800 contaminated and non-contaminated structures
- More than 21 tons of weapons-grade nuclear materials, much of it improperly stored
- More than 30,000 liters of plutonium and enriched uranium solutions in aging tanks and pipes, some leaking
- Extensive contamination across the site
- Decontaminated and demolished five major plutonium processing facilities comprising more than 1 million square feet
- Located in the “back yard” of nearly 3 million people
- Closing the site was estimated to take 70 years and cost more than \$36 billion
- Site is now a National Wildlife Refuge



Decontaminating the Rocky Flats “Infinity Rooms”

- 13 “infinity rooms” were so contaminated that radiological monitoring equipment in use in the 1960s could not measure it
- B771, Room 141 airborne radioactivity was upward of **20 million DAC** – up to 2,000 times the maximum limit for safe entry wearing supplied breathing equipment (Respiratory protection is required at 0.3 DAC)
- Workers at the time abandoned decontamination efforts and sealed the room
- Room 141 was sealed for 25 years



Decontaminating the “Infinity Rooms”

- DAC lowered to 10,000 through innovative decontamination techniques
- Airborne contaminants were reduced by remotely applying a glycerin-based fog
- After DAC was reduced, workers entered the room with SBA and packaged the room’s contents into a SWB sleeved into a tent constructed around the door
- Once all equipment was stripped-out, additional fixative was applied to “fix” the contamination to the interior surfaces



Decontaminating the “Infinity Rooms”

- The concrete structure was too highly contaminate to be further decontaminated and had to be size-reduced and dismantled using diamond-wire saws
- Large sections of the walls (weighing up to 20 tons) were rigged, lowered, size-reduced, and packaged as LLW



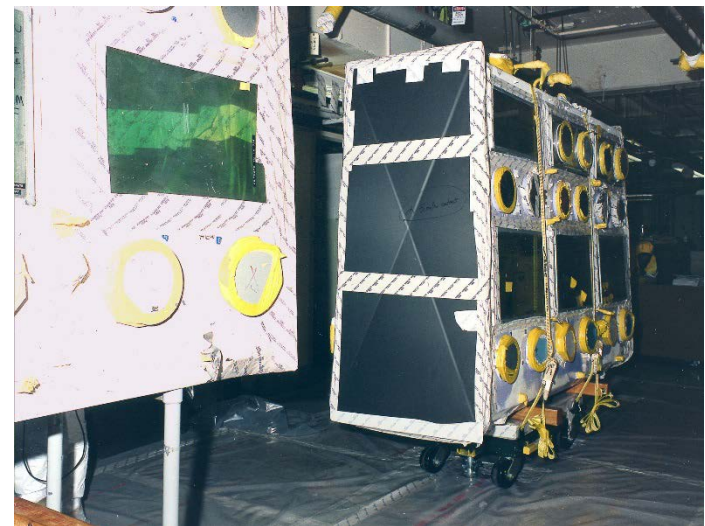
Lessons Learned:

methodical planning and engineered controls (fixatives, decontamination, ventilation, wet methods, fogging, wire saw cutting), and protective equipment may be slow but reduce risk.



Waste Strategy – Surface Contaminated Object

- **Definition** - A Surface Contaminated Object (SCO) is an object which itself is not radioactive, but has radioactive material distributed on its surface
- **Dose Rate Limit:** 1 Rem/hr at 3 m (9.9 ft) from the unshielded material or object(s) in a package



Surface Contaminated Object

SCO I Contamination Limits:

- Beta/gamma and low toxicity alpha loose contamination on accessible surface:
 - 4 Bq/cm² (1E-4 μCi/cm²)
- Beta/gamma and low toxicity alpha fixed contamination on accessible surface:
 - 4E04 Bq/cm² (1 μCi/cm²);
- Beta/gamma and low toxicity alpha total contamination on inaccessible surface:
 - 4E04 Bq/cm² (1 μCi/cm²);
- High toxicity alpha loose contamination on accessible surface:
 - 0.4 Bq/cm² (1E-5 μCi/cm²);
- High toxicity alpha fixed contamination on accessible surface:
 - 4E03 Bq/cm² (0.1 μCi/cm²);
- High toxicity alpha total contamination on inaccessible surface:
 - 4E03 Bq/cm² (0.1 μCi/cm²).

Surface Contaminated Object

SCO II Contamination Limits:

- Beta/gamma and low toxicity alpha loose contamination on accessible surface:
 - 400 Bq/cm² (1E-2 μCi/cm²)
- Beta/gamma and low toxicity alpha fixed contamination on accessible surface:
 - 8E05 Bq/cm² (20 μCi/cm²)
- Beta/gamma and low toxicity alpha total contamination on inaccessible surface:
 - 8E05 Bq/cm² (20 μCi/cm²)
- High toxicity alpha loose contamination on accessible surface:
 - 40 Bq/cm² (1E-3 μCi/cm²)
- High toxicity alpha fixed contamination on accessible surface:
 - 8E04 Bq/cm² (2 μCi/cm²)
- High toxicity alpha total contamination on inaccessible surface:
 - 8E04 Bq/cm² (2 μCi/cm²)

Surface Contaminated Object

- Advantage to shipping waste as SCO is the relief from some packaging requirements:
 - Under certain conditions, may ship SCO I as unpackaged.
 - Less than A2 quantity may use IP-1 or IP-2 packaging
 - Greater than A2 quantity only requires Type A packaging

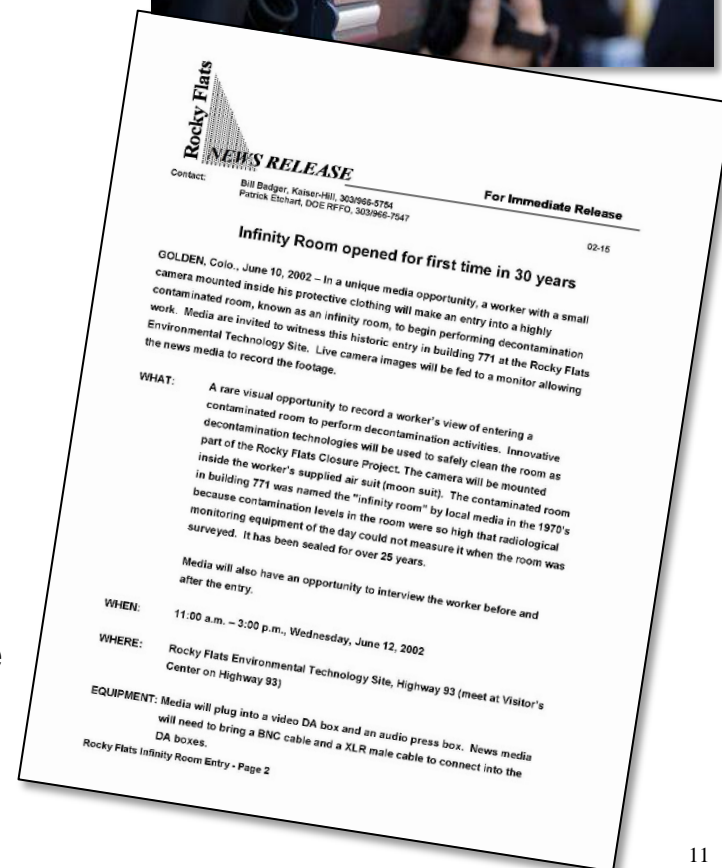


Emergency Planning



Public Relations

- Site Public Relations Activities:
 - Developed working relationship with DOE to improve stakeholder relations at nuclear sites with a history of turmoil and public distrust
 - Educated the stakeholders and public on the basics of radioactivity, radioactive dose, contamination, and decontamination and remediation approaches
 - Risk communications and proactive media relations campaign
- Infinity Room Media Event:
 - Invited media to witness the first entry in the Building 771, Room 141 in more than 30 years
 - Live camera images fed to a monitor allowing the news media to record the footage
 - Worker interviews



Discussion