



Occupational Health Challenges in a Nuclear Decommissioning

NASA Occupational Health Meeting
June 10,2010



Plum Brook Reactor Facility – circa 1999





Plum Brook Reactor Facility

- Two NRC licensed Reactors
 - 60 MW pressurized water reactor
 - 100 KW swimming pool reactor
- Performed testing in support of the nuclear rocket program
 - Neutron exposure and post irradiation test and analysis

PBRF Infrastructure

- Reactor Bldg/CV
- 7 Hot Cells
- 2 Office and Labs
- Primary Pump House
- Waste Handling Bldg
- Fan House
- Equipment Bldg
- Hot and Cold retention areas
- Emergency Retention Basin





PBRF Timeline

- 1958 – 1961 Construction (TR-3)
- 1961 – Initial Criticality
- 1963 - 1973 Operated
 - PBRF logged 98,000 MW days, equivalent to running at 50% power for full period
- 1973 – 2002 Safe, Dry Storage
 - “Possess but do not operate”
- 2002 - 2011 Decommissioning



Goal of Decommissioning

- Remove all contamination from site down to a level that would allow a family to move onto the site and live an agrarian lifestyle without receiving more than 25 mrem/yr above background dose.
 - This 'Resident Farmer' Scenario is the basis of determining the Derived Concentration Guide Lines (DCGLs) for the site
- Perform Final Status Survey (FSS) to prove we have achieved our DCGLs
- Terminate the NRC licenses
- Demolish all structures to 3' below grade
 - Backfill excavations (topsoil last 3')
 - Restore to wetland state?



Safety is top priority

- Safety of the public and environment
 - Continuous monitoring has revealed no releases from the site during decommissioning
- Safety of the workers
 - Dose actually accumulated by workers over course of decommissioning was less than 1/2 the originally budgeted amount (30 man-rem vs. 69 man-rem in the D-Plan)
 - Over 1.68 million man hours worked to date with only 2 lost day incidents (both minor – back strain and ankle sprain)
 - Project Incident Rate last quarter was 3.1, compared to BLS rate of 4.7 for heavy construction.



Occupational Health Challenges

- Radiation
 - Dose levels as high as several hundred R/hr, most areas in the single mR/hr range
- Beryllium
- Cadmium
- Asbestos
- Lead
- Cranes and rigging
- Energized Systems
- PCB
- Hot Work
- Confined Space
- Heat Stress
- Fall protection
- Scaffolding
- Heavy Construction Equipment
- Demolition



Key Elements to insuring safety

- All work is done in verbatim compliance with written, approved procedures.
- “Work Execution Package” contains
 - Step by step work instructions
 - Includes any necessary hold or signature points
 - Job Safety Analysis
 - Contains all identified hazards and how mitigated
 - Radiation Work Plan
 - Contains expected radiation fields, allowed dose, means for minimizing dose, required monitoring of workers and environment
- Crew is briefed on entire WEP before work begins, then daily on portion to be done that day



Stop Work Authority

- All workers have the **RESPONSIBILITY** (not just the right) to stop work if:
 - Work cannot proceed IAW written procedure
 - Conditions are different than expected
 - Anything doesn't look right



Training

- For unescorted access workers require:
 - General Employee Training (4 hours)
 - Radiation Worker Training (4 hours)
 - Whole Body Count
 - There is an initial and annual retest for all workers
- JSA notes what additional training workers may require (Hot Work, Crane Operator, Scaffolding, ect)
 - Each workers training quals maintained in data base at Control Point
 - Workers cannot sign in on a job without current required training
- Master records maintained by Training Lead, audited by NASA and several times by NRC



Committees

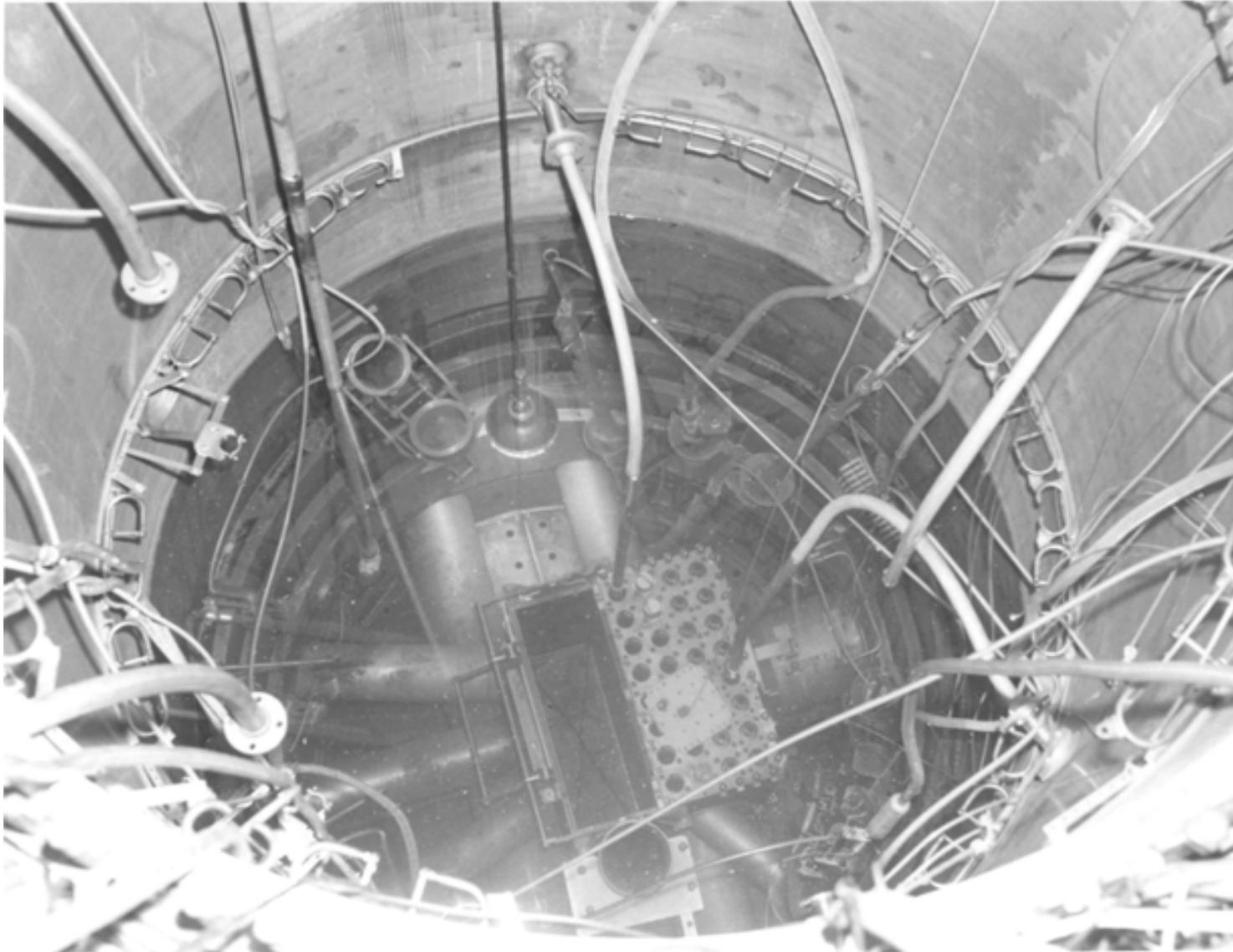
- **Project Safety Committee**
 - Working level group, members from Govt and contractor
 - Responsible to review and approve all procedures and WEPS
- **ALARA Committee**
 - Reviews RWPs in event dose level meets certain levels
 - Reviews quarterly recorded dose
 - Responsible to keep worker dose ALARA
- **Decommissioning Safety Committee**
 - Mid to upper level managers from GRC
 - Act for Center Director (NRC License signatory) to insure license is complied with, and that safety goals are being met



Safety Functional Team

- Members are safety professionals from the government and all contractor organizations
- Team meets weekly to work together to:
 - Identify what is going right
 - Identify where a new or improved approach is needed, and what that might be
 - Looking ahead to new work, challenges presented, and how it interfaces with ongoing work
- This is a team of equals. Though the government retains the oversight role, the TEAM is held responsible for the results. Management's job is to get them the tools and resources they need.

Reactor Segmentation





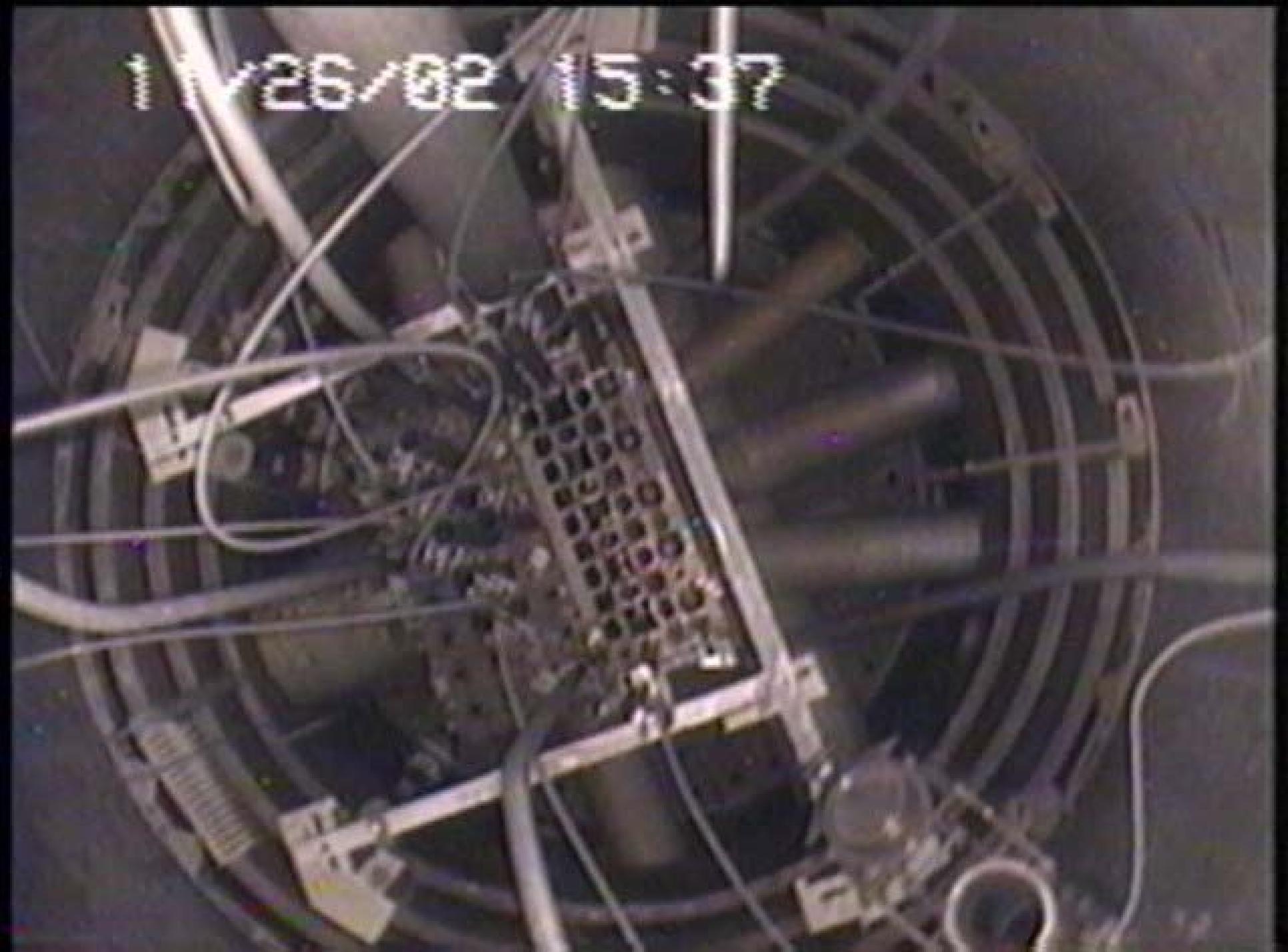








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2/19/04

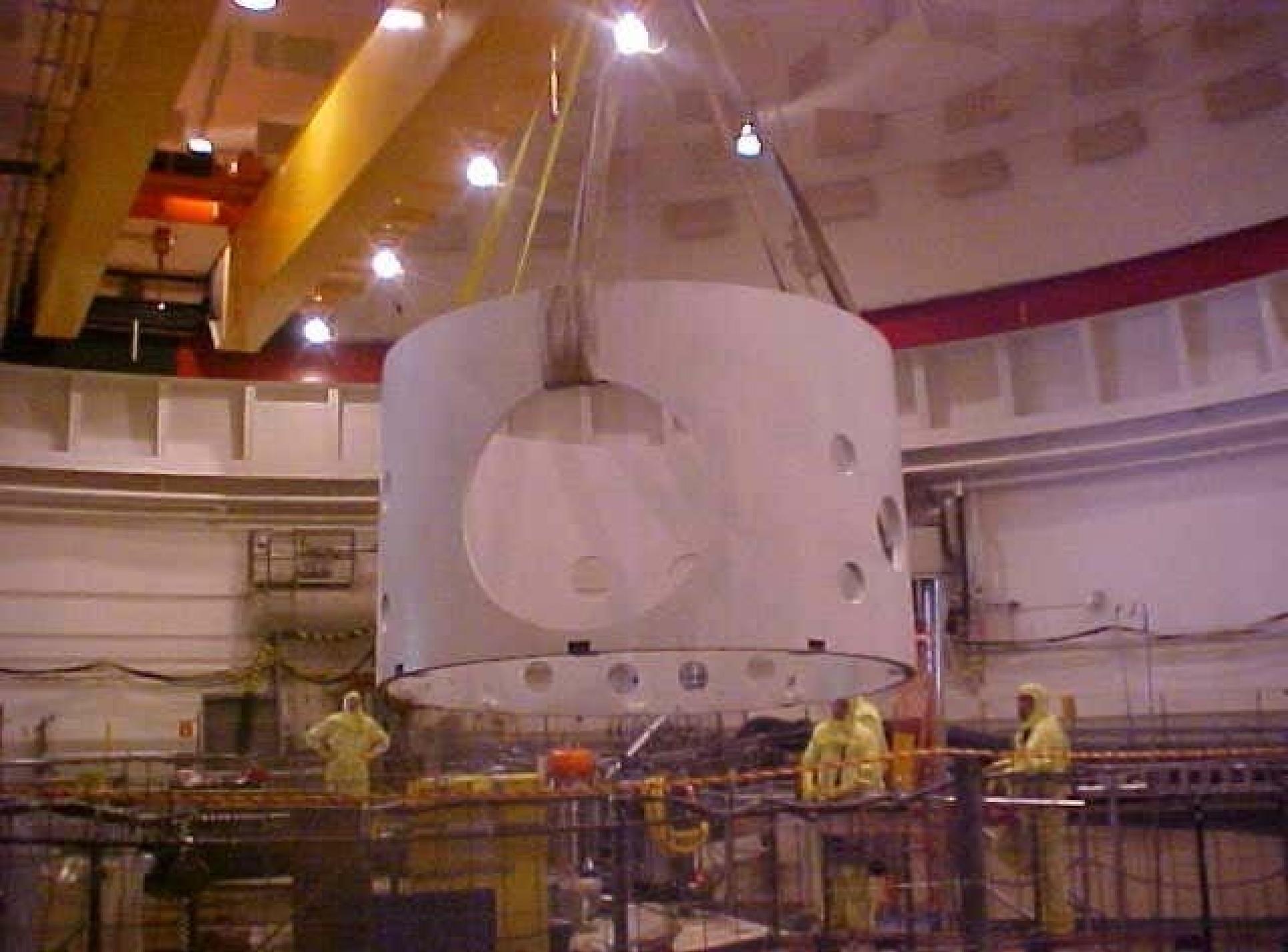


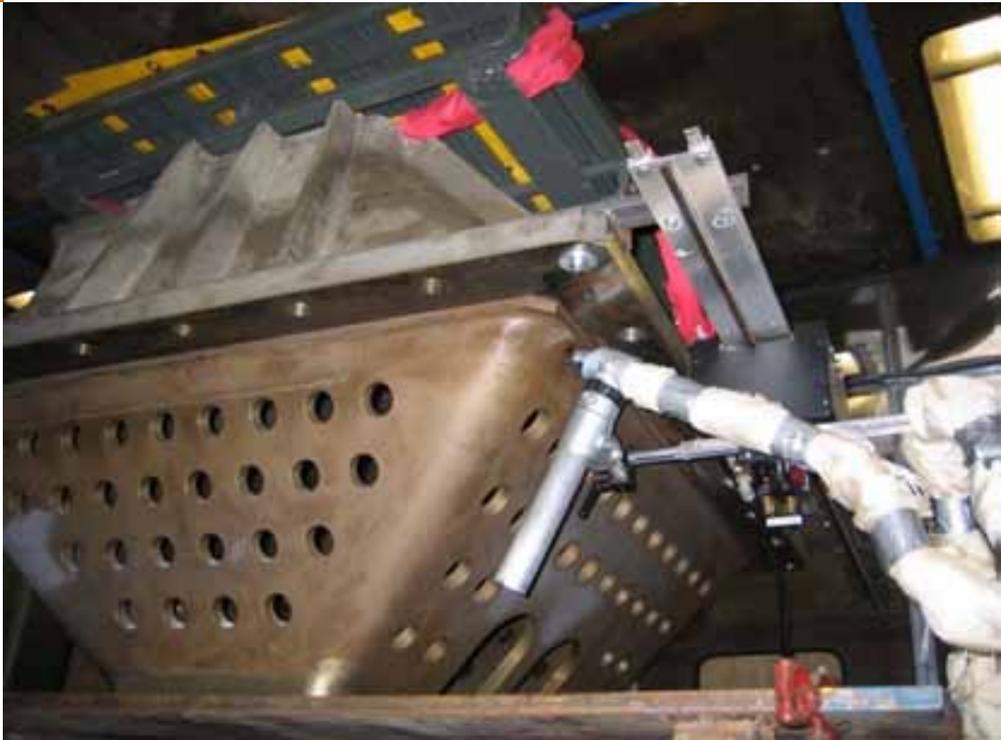


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Mock Up Reactor

 NASA
C-2001-1203









Hot Cells

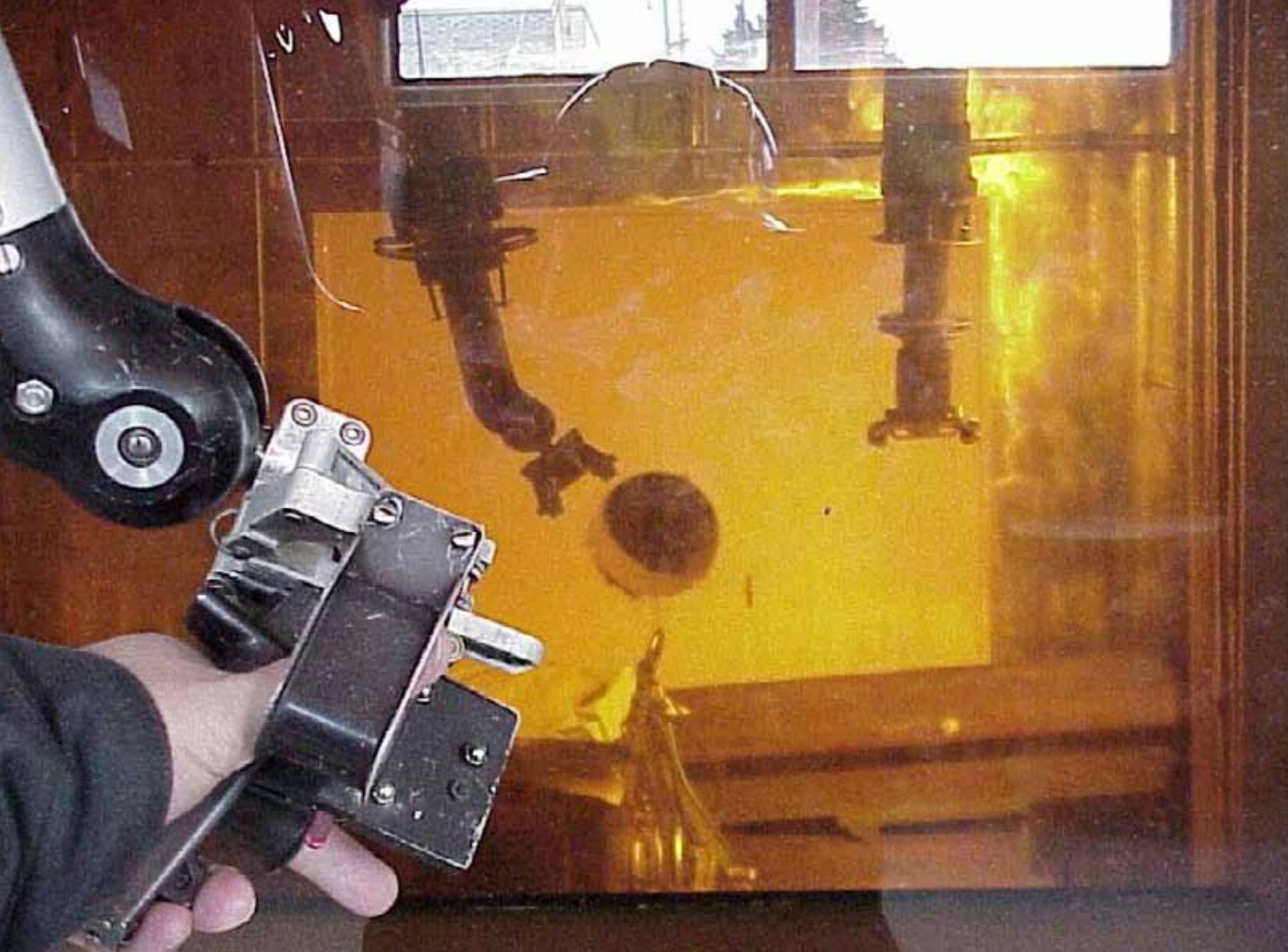




















Balance of Plant















Decontamination of surfaces



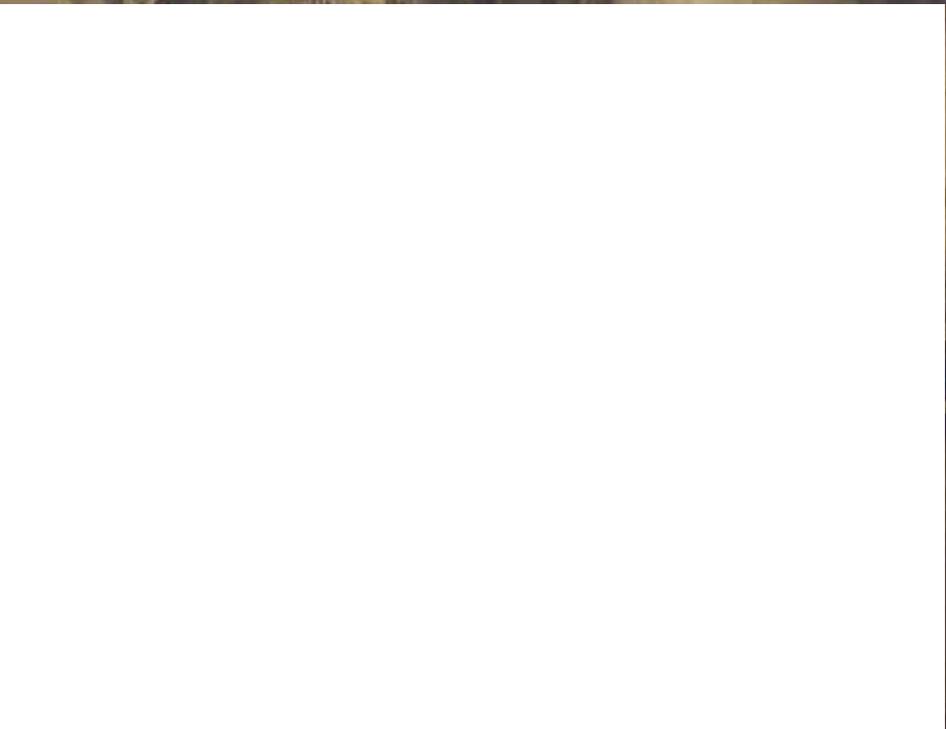
Warm Handling Room - before













NOTICE

THIS AREA MEETS THE POST-REMEDATION RADIOLOGICAL SURVEY CRITERIA FOR FINAL STATUS SURVEY

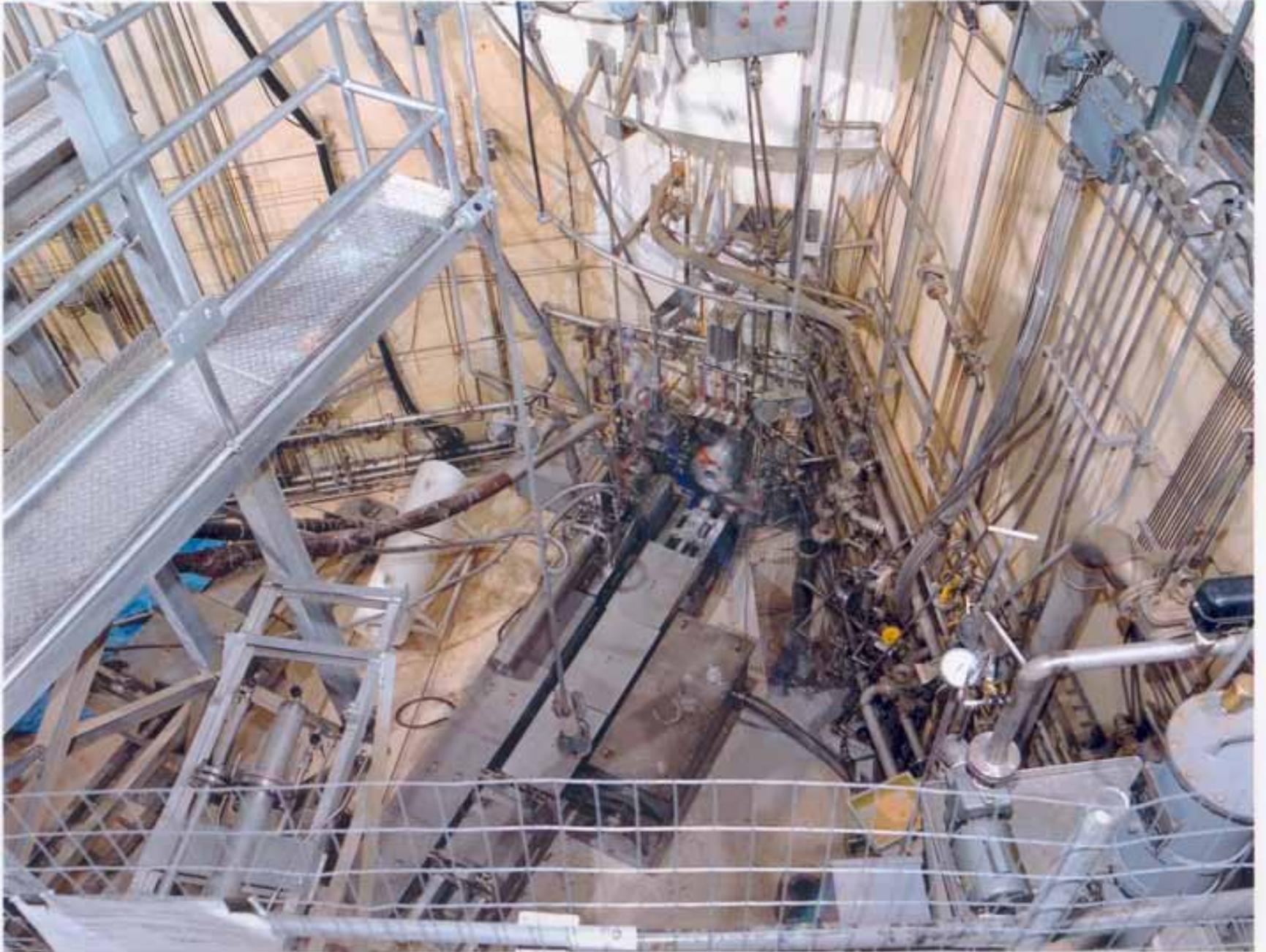
NO DECOMMISSIONING/DEMOLITION ACTIVITIES ARE TO BE PERFORMED IN THIS AREA

THE USE, MOVEMENT OR STORAGE OF RADIOACTIVE MATERIALS IS PROHIBITED IN THIS AREA

ENTRY OF PERSONNEL IN THIS AREA IS PROHIBITED WITHOUT THE AUTHORIZATION OF THE FINAL STATUS SURVEY/CHARACTERIZATION MANAGER AND/OR DESIGNEE

CONTACT: _____

EXTENSION: _____





























Progress to date

- Both reactors gone
 - Greater than 99% of source term gone
 - 10,033 Ci, mostly tritium found in Be reflector plates
- All loose and 98% of fixed equipment gone
 - 10,000,000 lbs LLRW shipped
 - 20,000,000 lbs of soil shipped
 - 160,000,000 lbs of soil assayed to stay on site
 - 1.5 M lbs of steel recycled
 - .5 M lbs of concrete recycled
 - 80,000 lbs of lead recycled
- All but 3 buildings deconned and FSS complete
- 7 major buildings and structures demolished



What remains to be done?

- Remove HRA Underground Storage Tanks
- Decontamination and FSS of Reactor Bldg
- Spot cleanup along Plum Brook (summer 2010)
- FSS of open land areas
- NRC license termination (2011)
- Demolition of remaining structures, site backfill and restoration to an open, green field



For Further Information

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