

# Decommissioning Case Studies

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State University of New York at Buffalo

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# University at Buffalo

- Large Public Research University ( 29,000 students)
- Part of the State University of New York system (SUNY)
- 3 main campuses
- Reactor located in the northern part of the city of Buffalo, surrounded by residential homes
- The DOE 's West Valley Demonstration Project is located about 45 miles south of the city
- Strong undergraduate and graduate programs in Engineering and Basic Sciences.
- Many professional schools Medical and Law Schools , Dental, and Large College of Arts and Sciences

# BMRC Construction





## History

1959

- ✓ Initial construction commenced, as part of the Eisenhower's "Atoms for Peace" initiative
- ✓ AEC Construction Permit No. CPRR-39
  - ✓ built by American Machine and Foundry (AMF, a company more commonly known as a manufacturer of bowling equipment)
- ✓ AEC License # R-77; 1 MWt; MTR Fuel
- ✓ Licensee name: The Western New York

1961

- ✓ Nuclear Research Center
- ✓ Initial criticality: March 24 at 2051 hours

1961

- ✓ Full power first achieved: June 1 at 1220 hours



# History (2 of 3)

1964

- ✓ Reactor mods to PULSTAR fuel (LEU 6%); 2 MWt
- ✓ Used MTR fuel transferred to McMaster University in Ontario, Canada in April

1973

- ✓ Nuclear Science and Technology Center
  - ✓ High operating temp through 70's and 80's – 24 hrs/day 5 days/wk

1978, 1989

- Small coolant system leaks

1989-1991

- ✓ Liner Leak and repair (water collected in waste system)
- ✓ Reactor and Primary Coolant System mods

1993

- ✓ Heat Exchanger Leak

# History (3 of 3)

1994

- ✓ Heat Exchanger replaced by spool piece
- ✓ Reactor activities suspended June 23 at 0600

1997

- ✓ NRC License R-77 amended to Possession Only Status

1998

- ✓ Unused PULSTAR fuel shipped to North Carolina State University in July

2005

- ✓ Used fuel shipped to Idaho National Engineering and Environmental Laboratory

# Uses and Applications

- Irradiated Materials Testing (Charpy, metal coupons, etc.) for Naval Research Lab
- Radiation Detector Calibrations
- Neutron Activation Analysis
- Reactor Operator Training
- Gemstone irradiations
- Looked at Boron Neutron Capture Therapy
- University Faculty research projects
- The University shut down its Nuclear Engineering Degree Programs in 1982
  - Much of the faculty tie in to the reactor facility was thus lost
  - Facility was run by a private company under contract from 1983 until 1993

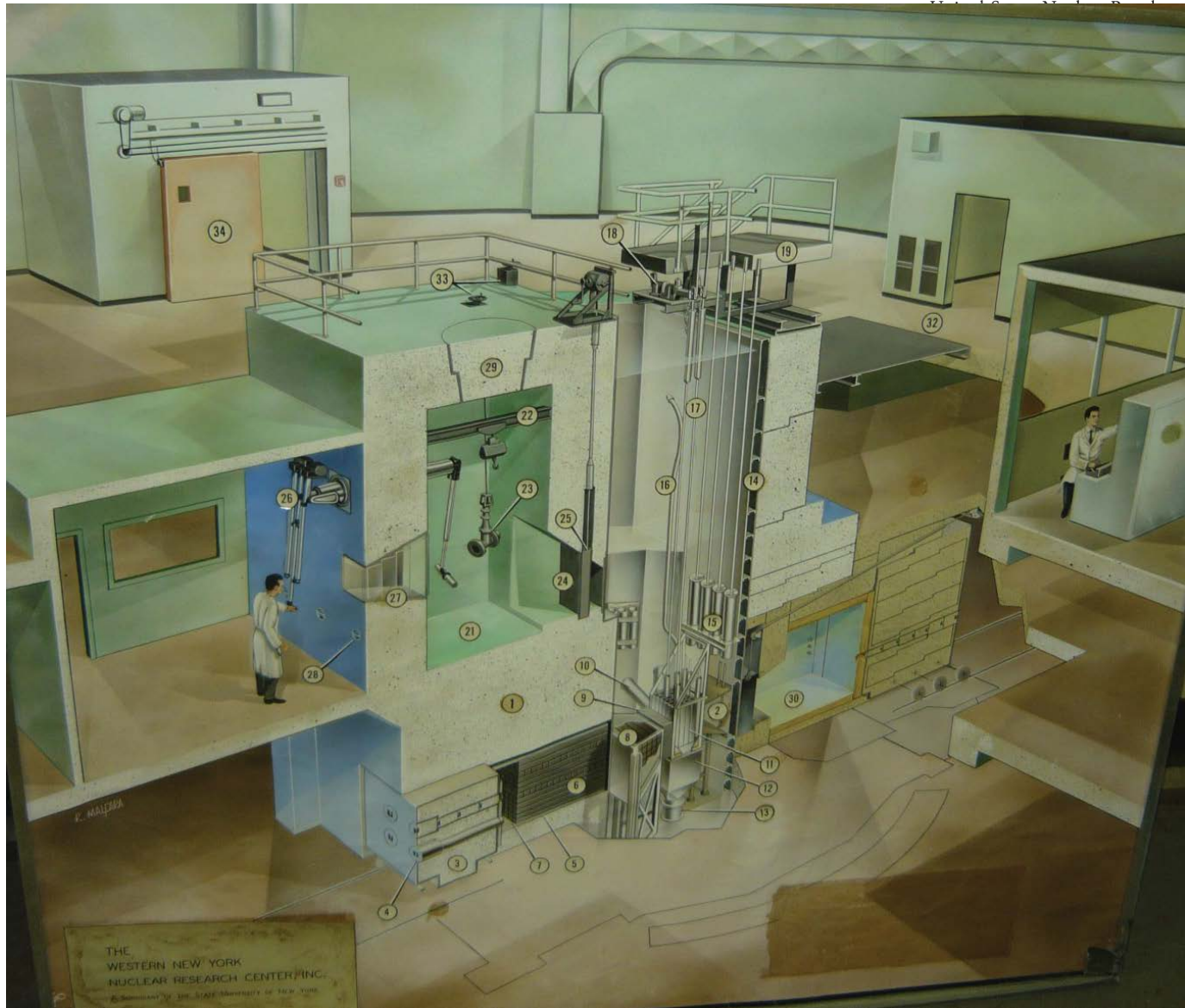


# BMRC circa 2012



# The Reactor Facility

- Access to core for experiment irradiation facilities
- Original Design - Thermal Column and Dry Chamber facilities surrounding core
- Secondary System recirculating cooling and small cooling tower
- Low enrichment uranium fuel (24 fuel elements)
- Two radioactive Liquid Waste Tank systems (one underground and one in a vault aboveground)





# The Core



# Licenses and Regulatory Framework



- **NRC License R-77 - Reactor possession and operation**
- **New York State Health Department (DOH) - By-product material license**
- **NRC Special Nuclear Materials License (SNM -273)**
- **Effluents under jurisdiction of NRC**
  - However, upon decommissioning NYS D.E.C. assumed responsibility for overseeing disposal within the State.
- **Buffalo Sewer Authority – Water Effluents in City of Buffalo**
- **NRC Inspectors, Region 1**
- **NRC Project Management, HQ**

# Post - Operating

- **1994 decision based on under utilization of facility by University faculty and economic considerations**
- **Fuel must be returned to the Department of Energy (whenever they fit you into the queue)**
- **At time of shutdown, the expectation was that fuel would be shipped off site in 1996-97.**
  - This date then proceeded to change many times
- **Several key staff from contractor and university were retained (absorbed into the rest of the University)**
- **all required Surveillance's and maintenance continued as long as licenses remain**

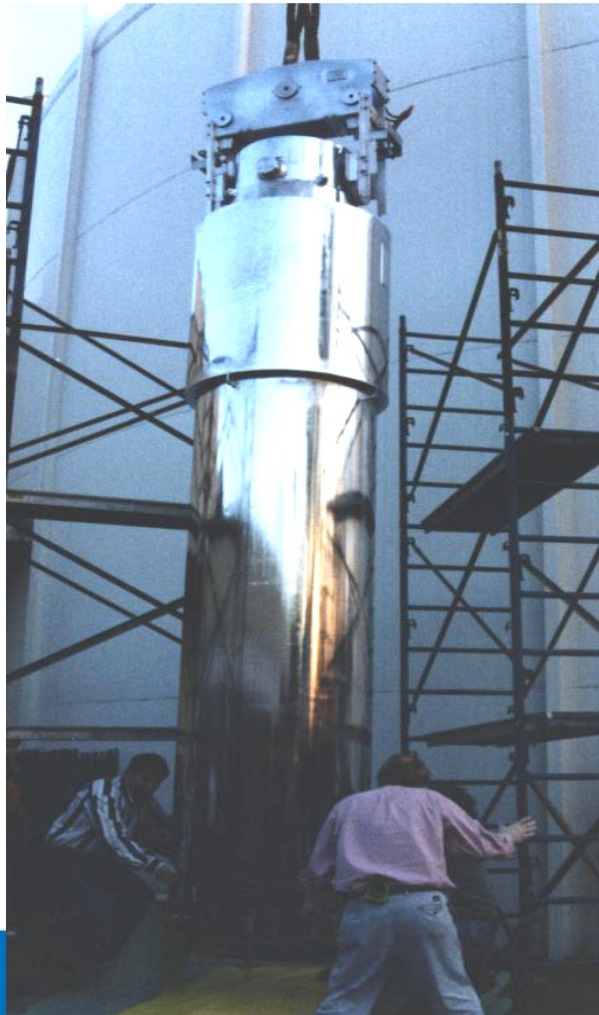




# Fuel Shipment

- **Shortly after shutdown, informed that fuel could not be accepted by DOE until 2001**
- **Promised dates then began moving back and forth several times.....1999 , back to 2001, then at one point 2019**
- **SUNY started planning for long term on site dry fuel storage**
  - At the point of going out to bid for design of dry storage, a window re-opened in the schedule and the date changed to late 2001.
- **As shipments were close to being arranged, the events of 9/11 occurred**
- **Due to more urgent fuel shipments, date moved back to 2004.**

# Fuel shipped in 2005



# Decommissioning Process

- **Site Characterization (Historical and Sampling)**
- **Develop Decommissioning Plan**
- **Submit Decommissioning Plan for approval**
- **DP approval, commence Dismantlement and Decontamination**
- **Perform Final Status Survey of site**
- **Confirmatory Surveys (ORAU)**
- **Submit Final Status Survey Report and Request License Terminations**
- **Receive License Termination**



# Decommissioning Process

- **SUNY hired a Decommissioning Project Consultant Contractor – Design and oversee work**
- **SUNY hired a Decommissioning and Dismantlement Contractor**
- **SUNY deconned, surveyed and released the building structure first (which then allowed us to dismantle the building structures)**
- **Then moved to the site work.**



# Proximate to new Pharmacy Building









# University at Buffalo

## Initial activities:

- Continued work on Facility Preparation Work Plan.
- Completed cleanout of Hot Cell.
- Installed construction fencing.
- Initiated removal of interferences on skin of bioshield.
- Draft work plan for “Reactor Component Removal” submitted for review on 12/21/12.



## Weekly Decommissioning Status Report

- January 2013 Look Ahead: See schedule below.
- Reactor component removal to begin January 14th on components with less than (60 mSv/h) (6 R/h) dose rates.
- Removal of the high activity reactor components scheduled to begin January 24<sup>th</sup>

Remove Reactor Components		45	26	19-Nov-12 A	14-Feb-13
2100	Remove Control Rod Drives and Bridge	3	3	14-Jan-13	17-Jan-13
2110	Remove Interference from Tank	4	4	17-Jan-13	24-Jan-13
2120	Remove Control Rods, Place in Container	3	3	24-Jan-13	30-Jan-13
2130	Disassemble Reactor Assembly	4	4	30-Jan-13	06-Feb-13
2140	Drain Pool, Coolant Piping, Process Water	2	2	06-Feb-13	07-Feb-13
2150	Cut into Tank, Remove Reactor Support Beam	4	4	07-Feb-13	14-Feb-13



# University at Buffalo

Date: Week ending 1/24/2013

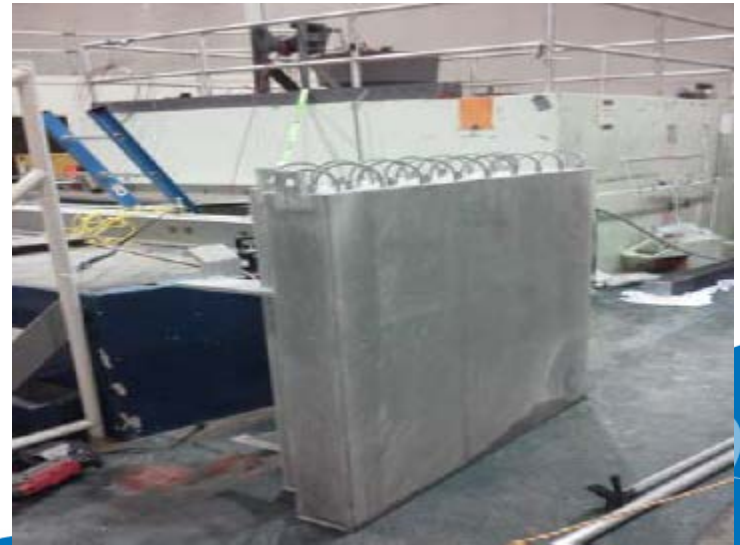
- Current in progress activities:
- Continued work on Reactor Component Removal work plan. o Packaged control blades for shipment.
- Removed interferences from the Reactor Pool.
- Placing Control Blades into shielded containers. Shielded containers lowered into shipping container.



# University at Buffalo

Date: Week ending 2/9/2013

- Current in progress activities:
- Continued work on Reactor Component Removal work plan. o Constructed shielded transfer container for grid plate.
- Transferred grid plate to shielded cave on Neutron Deck.
- Dismantled remaining portions of reactor assembly and pool contents.
- Drained remaining water from pool.



# University at Buffalo

- Date: Week ending 2/9/2013
- Current in progress activities:
- Completed work on Reactor Component Removal work plan.
- Packaged waste for Monday's shipment to Studsvik.
- Removed graphite from Thermal Column.



# University at Buffalo

Date: Week ending 3/1/2013

- Current in progress activities:
- Continue work on Bioshield Wire Saw Cutting Plan.
- Opened 10+ ton Patient Room Door.

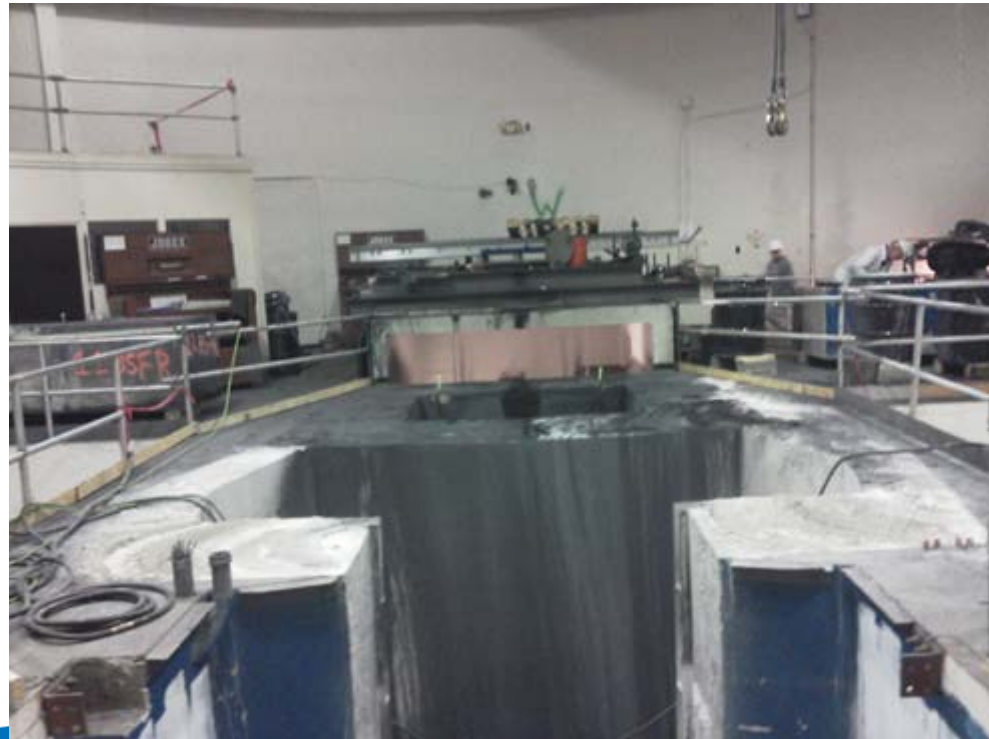




# University at Buffalo

Date: Week ending 3/8/2013

- Current in progress activities:
- Continued work on the Bioshield Wire Saw Cutting Plan.
- Removing Hot Cell Roof





# University at Buffalo

Date: Week ending 3/29/2013

- Current in progress activities:
- Continued work on the Bioshield Wire Saw Cutting Plan.
- Commenced work on Reactor Coolant and Demineralizer Systems Removal Work Plan
- View from Control Deck near airlock.
- N-16 Delay tank dismantlement.



# University at Buffalo

Date: Week ending 4/5/2013

- Current in progress activities:
- Continued work on the Bioshield Wire Saw Cutting Plan.
- Commenced work on Reactor Coolant and Demineralizer Systems Removal Work Plan.



# University at Buffalo

Date: Week ending 4/19/2013

- Current in progress activities:
- Continued work on the Bioshield Wire Saw Cutting Plan. Completed Gamma Deck and setup containment on Neutron Deck.
- Continued work on Reactor Coolant and Demineralizer Systems Removal Work Plan.

View from Control Deck near airlock.



Primary coolant pump removal.

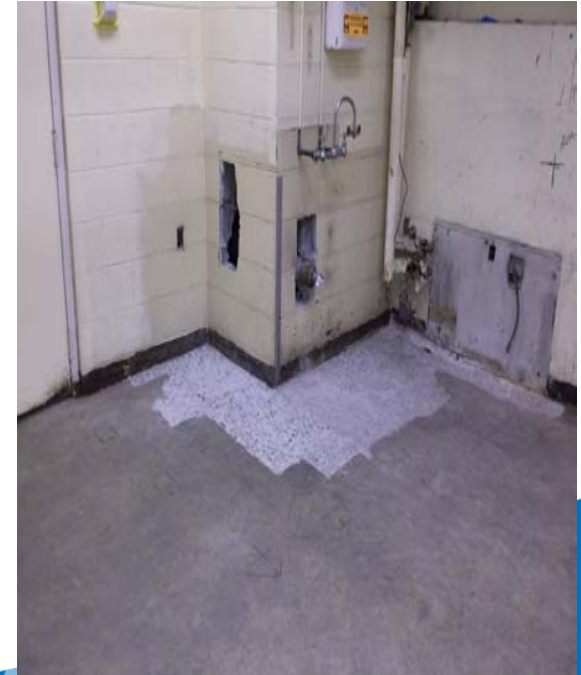
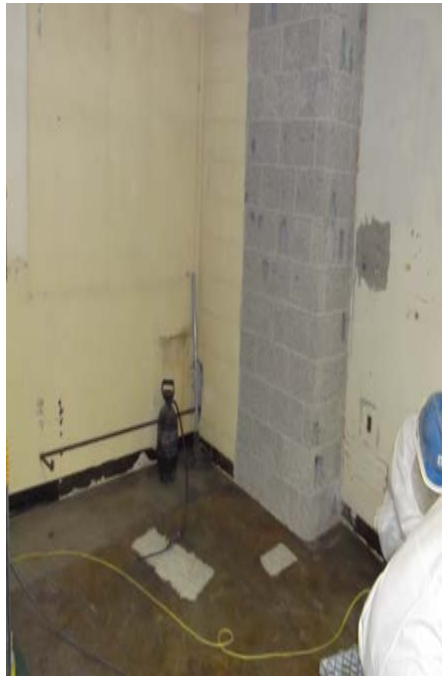




# University at Buffalo

Date: Week ending 5/10/2013

- Current in progress activities:
- Continued work on the Bioshield Wire Saw Cutting Plan.
- Completed work on Neutron Deck Ventilation Removal Plan.
- Performed decontamination work on surface contamination areas in Rooms 202 and 115.



# University at Buffalo

Date: Week ending 5/31/2013

- Current activities in progress:
- Completed Bioshield Wire Saw Cutting and demobilized crew.
- Commenced moving and weighing bioshield blocks to stage for disposal at Clive, UT.
- Completed decontamination work in P-Chem Laboratory Room 202.





# University at Buffalo

Date: Week ending 6/20/2013

- Current in progress activities
- Removed two 250 Gallon Tanks from Tank Farm.



# University at Buffalo

Date: Week ending 7/19/2013

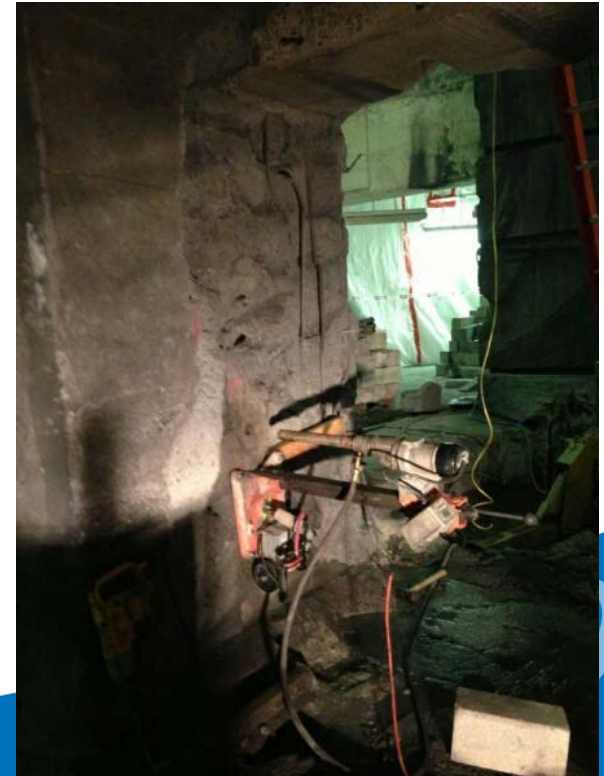
- Current in progress activities:
  - o Completed emergency ACM removal 7/18/13.
  - o Continued to Brokk the area under the Reactor Tank.
  - o Shipped two intermodal containers of LLRW to Clive, UT. (40K lbs combined wt).
  - o Lowered 10K horizontal tank to Neutron Deck for decontamination and dismantlement.



# University at Buffalo

Date: Weeks ending 8/16/2013 and 8/23/2013

- Current in progress activities:
- ACM abatement inside the containment building
- Demolition of the 10K vertical tank
- Removal of contaminated soil from tank farm excavation
- Shipment of radioactive waste to Clive Utah
- Remove activated concrete from neutron deck

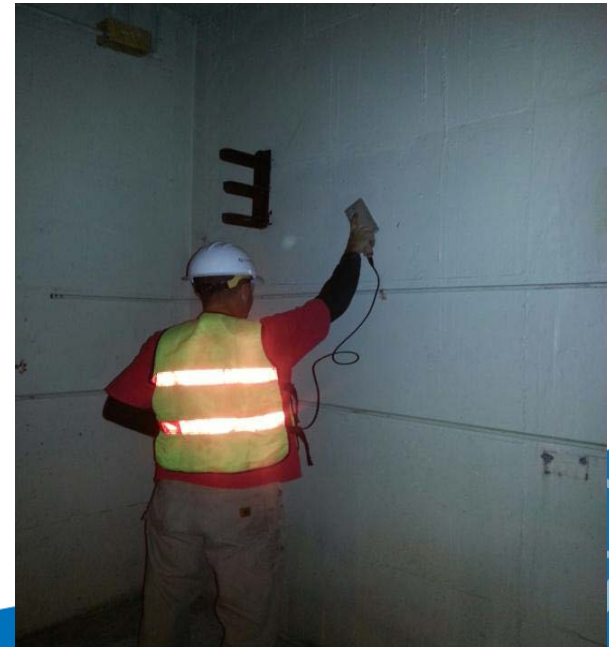




# University of Buffalo

Date: Week ending 9/26/2013

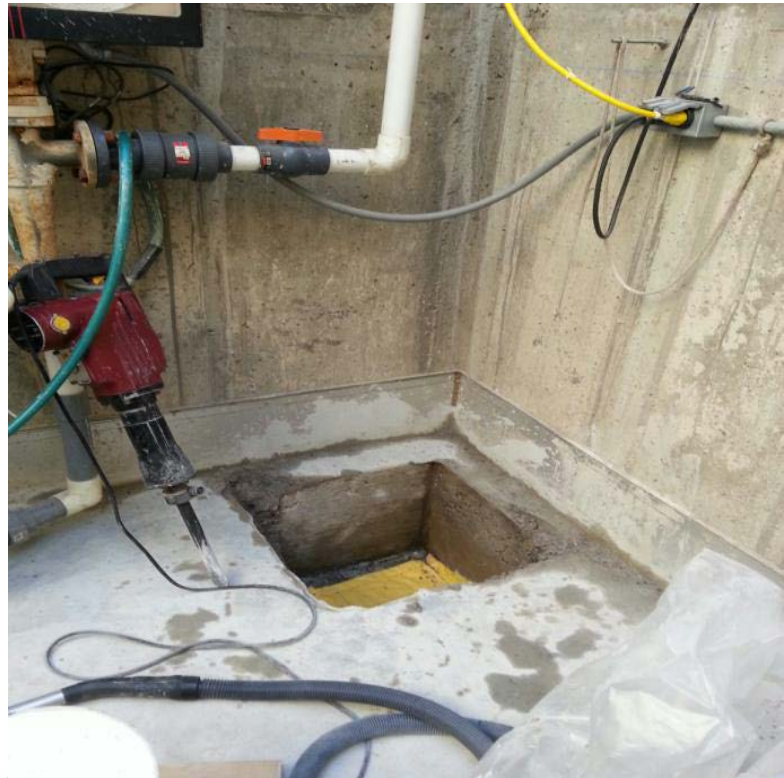
- Current in progress activities:
- Building release surveys
- Universal waste removal
- Shipping of LLRW for disposal
- Decontamination of vertical 10K tank room



# University of Buffalo

Date: Week ending 10/03/2013

- Current in progress activities:
- Building release surveys
- Sump remediation
- Shipping of LLRW for disposal



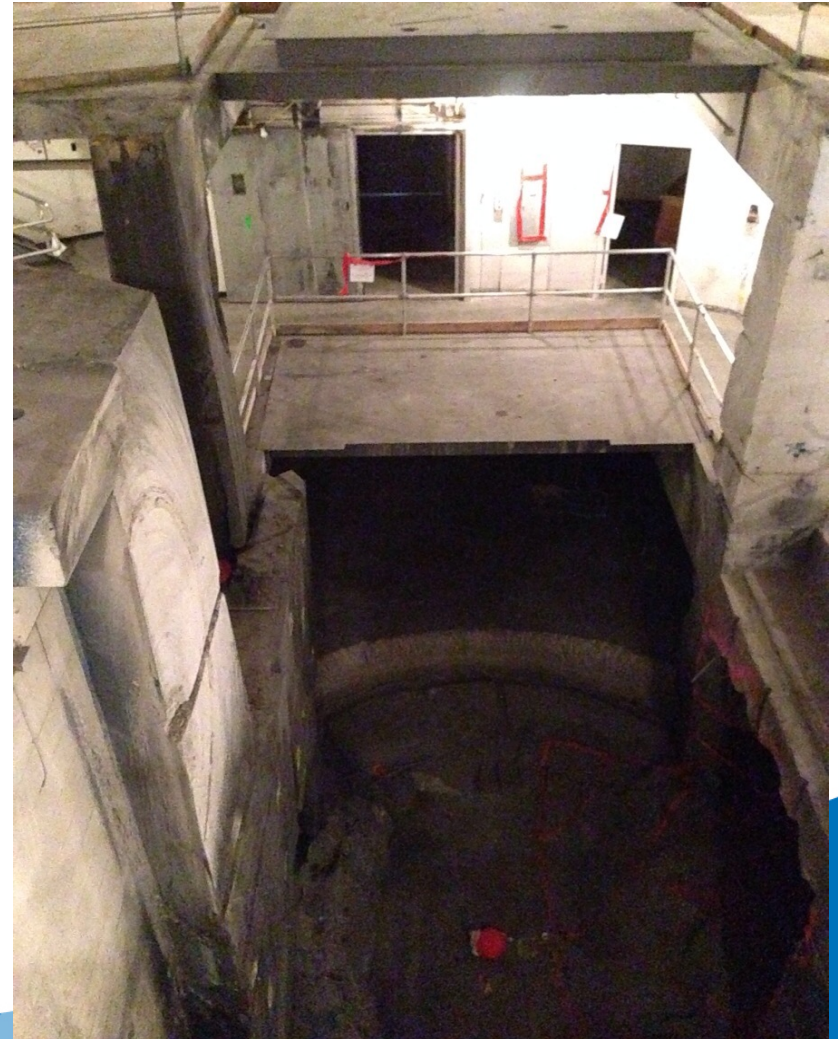


# University at Buffalo

## NRC Confirmatory Surveys for Building Demolition



# University of Buffalo Before and After





# University of Buffalo Neutron Lab Before and After





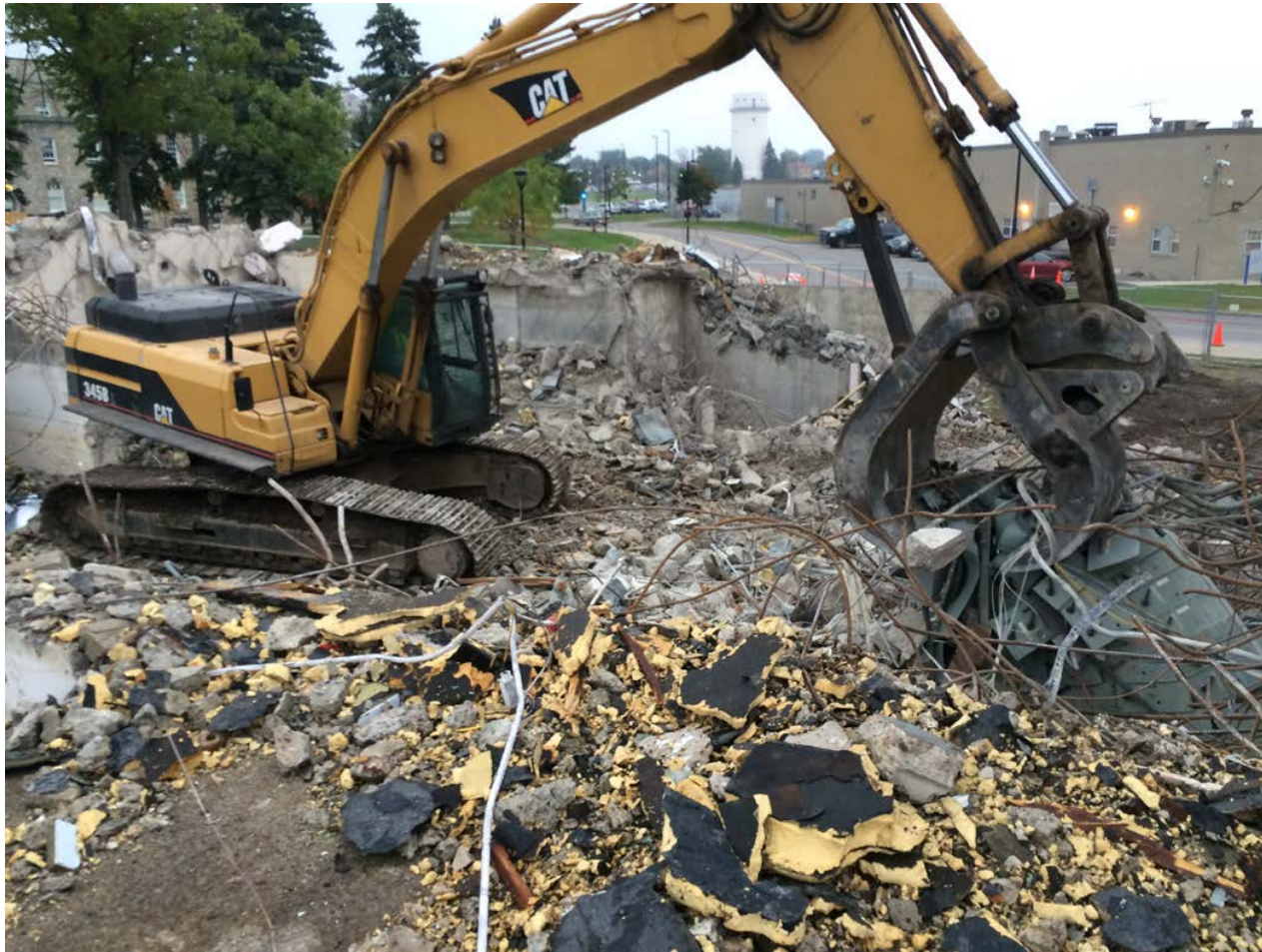
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# SUNY at Buffalo - October 1, 2014







































# University at Buffalo

- Building Surveys Completed Summer 2014
- Demolition in Progress September 2014
- Final Status Surveys in October 2014
- Final Status Survey Report in ~~Dec 2014~~ ???
- License Termination in ~~2015~~ → 2017?



# SUNY Challenges

- **Getting Clean Rubble disposed of in a C and D Landfill considerations. Long hard work with the New York State Department of Environmental Conservation.**
- **Difference between MARSSIM (site levels) and material release levels**
- **New York State contract bidding requirements (timeframes)**
- **Educating academic administrators ( accept the cost and timeframes)**
- **People like to “collect” things when you are operating that can become a challenge to dispose of at the end.**

# Waste Streams and Disposal

- Fission Plate (HEU) and other SNM removed - DOE Contractor
- Prior to DP approval, performed a Loose Materials Building Clean out (Interference Removal for Site Characterization). Significant amount of LLRW removed.
- Asbestos and Lead Abatement performed (BSFR Waste sent to Studsvik Processing Facility)
- Waste Tank Sludge and Control Blades - sent to NNSS in Nevada. Had
- Sealed Sources (Cs-137, Sr-90, Co-60, H-3) sent to Andrews, TX via Oak Ridge
- 27, 480 pounds of Contaminated Lead went to Clive, Utah
- 19,300 pounds of Depleted Uranium went to Oak Ridge
- Everything else went to Clive, Utah





# SUNY Lessons Learned

- **The process will be longer than you think, it will cost more than you think, and it will be extremely frustrating at times.**
- **Waste Disposal Options need to be fully explored**
- **Waste is the primary driver of costs**
- **Public Information sessions (many)**
- **Active and regular communication to Regulators**
- **Educating your Project Managers (this is a process they often have little understanding of)**



# **Lessons Learned**

- **No matter how well you know your facility and its history, there are still going to be surprises.**
- **Special Waste Disposal Considerations**
- **Plan for WEATHER!**
- **Emergency Planning (help the responders to understand that the risk is mostly as a heavy construction site. Very little radioactivity involved.**
- **Funding.....**





# **SUNY Recommendations**

- **Find ways to maintain institutional (historical knowledge).**
  - Invaluable to have people who understand the systems and how they were used.
- **Get rid material, if possible, before characterization (Interference Removal)**
- **Understand what your regulators need and work toward that.**
- **Use rigid Contracting Documents and hold your contractor to them**
- **Stay true to and use your formal review structures.**
  - Very useful for documentation purposes.

# SUNY Recommendations

- **Active communications**
  - Status Updates, Conference Calls
- **Get everyone to accept that the Regulators have the power .**
  - You need to satisfy them and the regulations.
- **Contractors must be made to understand that there are no shortcuts in this process and all rules and work processes must be followed**
- **Documentation**
  - Document everything your contractor is doing
  - Document everything that regulators do when they are on site
- **Clearly Identify Roles and Responsibilities ....and stick to them**
- **Don't forget the non radiological safety hazards and compliance**
  - Radiological hazards are reduced very quickly in the process
- **Reach out to the Public, other interested parties, surrounding businesses**



# SUNY Recommendations

- Public Information – sessions and written communications.
- Broadly define who your public is and who may consider themselves stakeholders
- Brief local politicians, including surrounding communities
- Held sessions with the neighborhood residents (arranged by local political office holders)
- Meet with local emergency response community, welcome them onto site at all times,
  - maintain this relationship through-out.
- Held sessions with faculty, staff, and students. Let them know what to expect and more importantly what they could expect to see at various points.
- The campus people's biggest concerns ended up being noise, traffic disruptions, and not portraying a poor image to prospective students and faculty. Coordinated with their academic calendar so that we were not working at certain key times.

# Thank You!

## Questions???



# Challenges Faced by SUNY

- Balancing all the regulators and communicating with them
- Satisfying Federal and New York State requirements
- Managing and supervising multiple contractors
- Little experience within NYS at research reactor decommissioning
- The Cintichem experience
- Getting funding

