Project Management Actions
Demolition of a Research Facility
Building 431

W. L. Collins

September 9, 2005

Project Management Actions, Demolition of a Research Facility
Monterey, CA, United States
September 12, 2005 through September 15, 2005
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Project Management Actions
Demolition of a Research Facility
Building 431

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Lawrence Livermore National Laboratory

Tri-Laboratory Engineering Conference
September 12-15, 2005
Overview

• Facility disposition in support of strategic objectives
• Space Action Team (SAT) concepts and tools for D&D
• Mission need and goals
• Scope
• Management systems
• Acquisition strategy
• Cost and funding
• Schedule
• Risk management
• Environment, Safety & Health
• Field execution
• Summary
• Constructed early 50’s
• Materials Test Accelerator program
• Mirror Fusion Testing Facility
• ETA-II, a non-nuclear facility, will remain operational
Facility disposition in support of strategic objectives

LLNL Operates One Integrated Program Responsible for both Institutional Surveillance & Maintenance and D&D

1. Provide facility management for buildings that are surplus or excess to Program needs.
   - Manage the process to transition facilities from an operating condition into an inactive status

2. Plan and execute facility disposition in support of strategic objectives.
   - The Space Action Team (SAT) is an integrated multi-disciplinary, multi-directorate, cross-trained team with diverse talents and skills dedicated to execute facility projects

3. This integrated Facility and Disposition Management approach increases flexibility and value
   - Supports programs through relief of unneeded facilities
   - Provides flexibility in establishing project priorities
   - Utilizes S&M as a precursor to disposition
   - Establishes a balance to institutionally optimize utilization of surplus facilities
   - Schedule is maintained on discovery of previously unknown/undocumented contaminants
   - Risk reduction
The Laboratory’s flexible approach to manage its disposition program begins with the end in mind.

- Eliminate Legacy
- Reduce Hazards
- Eliminate Maintenance
- Reduce S&M

RTI

Goal is met…

Goal is met…

Deactivate → Reassign
Decommission → Redeploy
Decontaminate → Revitalize
Demolish → Land Reuse
Reassign
Redeploy
Revitalize
Land Reuse

Goal is met…
The Decommissioning basic D&D Elements

**Decommissioning:** An activity - The actions taken at the end of the life (or function) of a building to retire it from (or re-deploy back into) service with adequate regard for the health and safety of workers, the public, and protection of the environment.

**Deactivation:** An action - process of placing a building in a safe and stable condition by removing accessible hazardous and radioactive materials to minimize the long-term cost of a surveillance and maintenance program that is protective of workers, the public, and the environment.

**Decontamination:** An action - The removal or reduction of residual radioactive and hazardous materials by mechanical, chemical, or other techniques to achieve a stated objective or end condition.

**Demolition:** An action - The removal of any structure, system, or component during the decommissioning phase.

**Disposition:** A goal - viewpoint, outlook, attitude, future,
Stabilizing & Removing Excess/Surplus Facilities is a Key Element to Strategic Facility Planning

- Single program responsibility supports “Dual Purpose” planning
- Provides a framework for decision making and priority setting
- Supports “End Point Planning” starting at initiation of transfer
- B431 is a good example of this efficiency

166 Real Property Structures
~ 410k GSF (+ 90k SF yard space)
~ 500k GSF to completion...

Institution “owns” 11 buildings,
~350K SF excess/surplus space.

Recycle stats:
Concrete – 22,000 Tons
Metal – 2,400 Tons
Freon – 1,300 lbs
Wood – 180 CY
Space Action Team (SAT) concepts and tools for D&D

• Standard project management principals
  — Scope and requirements
  — WBS and dictionary
  — Deliverables & Milestones
  — Resource loaded schedule and budget
  — Change control
  — Reviews
  — Integrated Project Team
    • ETA, Security, UTEL, Computer Facility, Archive Facility, ES&H Team, Plant Eng.
  — System engineering approach

• Environment, Safety & Health
  — Concerns are similar to development projects plus hidden energy sources, hazardous materials and structural instability
  — OSHA, BAAQMD, ISMS, Subcontractor H&S Plans
• Constructed 1950
• Material Test Accelerator program
• Mirror Fusion Test Facility
• ETA-II, a non-nuclear facility, remains operational
basement pit to be backfilled

Facility remains
Project Execution Plan

1. Mission Need and Project Goals
2. Technical Scope
3. Management Systems, Controls, and Planning
4. Acquisition Strategy
5. Stakeholder involvement
6. Cost Estimates and Funding
7. Risk and Contingency Management
8. Schedule
9. Environment, Safety, and Health
Mission Need and Project Goals

Mission Need
1. Supports NNSA Infrastructure Plan goal to “demolish excess facilities as early as possible”
2. Square footage banked allows continued application of advanced science and nuclear technology to the Nation’s defense
3. Helps in maintaining and enhancing the safety, security, and reliability of the weapons stockpile

Project Goals
1. Eliminate 93,763 (+/- 5%) gross square feet of excess facility space
2. Eliminate $4.3 million maintenance backlog
3. Eliminate $841K annual Surveillance & Maintenance costs
4. Improve security of LLNL’s Superblock area
Technical scope

• Isolation and reroute of utilities to minimize neighborhood impact
  — Temporary re-routing of 13.8 KV circuit and removal inside pit
  — Replace transformer and re-route main feeders to ETA
  — Reroute low voltage circuits feeding B439 and piping to B432
• Remove concrete shield block (70,000 lbs) Depleted Uranium target wall
• Abate Asbestos Containing Material (e.g., exterior siding, flooring, lead paint, thermal system insulation, etc.)
• Remove and dispose of interior and exterior equipment
• Demolish steel structure – 100’ hibay roof, 50T crane, 4 story structure
• Demolish North concrete shield wall and foundation to grade level
• Backfill pit
• Rebuild and weatherproof South roof and siding in areas affected by the project demo
Technical scope (cont.)

- Three alternatives were evaluated as part of the critical decision process:
  - Demolition as described above with the inclusion of the ETA II wing
  - Reuse of the facility rather than demolition at this time
  - Indefinitely deferring demolition

- SAT utilizes various review processes throughout the life of a project to ensure that conflicting objectives do not arise. They include:
  - LLNL Design Process
  - LLNL Environmental, Safety, and Health Manual
  - SAT Operational Safety Plan and Procedures
  - SAT Activity Level Quality Assurance Plan
Management systems, controls and planning

• Once Authorized, the Integrated Project Team plans, manages and controls the project using a tailored approach of DOE Order 413.3 and the Project Management Manual, DOE M413.3-1.

• The LLNL Space Action Team has management responsibility for the day-to-day work execution

• Implementing documents
  — NNSA FIRP(1) Program Execution Plan
  — LLNL FIRP Program Management Plan
  — LLNL ISMS Implementation Plan
  — Building 431 Project Execution Plan

• Special project reviews
  — Independent Project Review at Critical Decision 0
  — External Independent Review at Critical Decision 1/2/3
  — Value Engineering “Red Team” led by a certified Project Management Professional (PMP)

• Resource loaded schedule used to track work scheduled and performed, and compared to actual costs to establish monthly earned value

• Monthly schedule and cost performance is tracked at Division Level (WBS Level 2) and reported externally to NNSA at Level 1

(1) FIRP – Facilities & Infrastructure Recapitalization Program (managed with NNSA’s “what and how” philosophy and the DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets).
### Project monthly performance reporting

**Data Thru ACWP ($k) BCWS ($k) BCWP ($k) CV ($k) CV (%) CPI SV ($k) SV (%)**

<table>
<thead>
<tr>
<th>Date</th>
<th>ACWP ($k)</th>
<th>BCWS ($k)</th>
<th>BCWP ($k)</th>
<th>CV ($k)</th>
<th>CV (%)</th>
<th>CPI</th>
<th>SV ($k)</th>
<th>SV (%)</th>
<th>SPI</th>
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<td>3,821</td>
<td>3,830</td>
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<td>6/25/2005</td>
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<td>3,284</td>
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<td>1.020</td>
<td>101</td>
<td>3.18%</td>
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**Project Start: 8/4/03**  
**Project End: 7/21/06**

**Building 431**

<table>
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<tr>
<th>Date</th>
<th>Baseline Cost (BCWS)</th>
<th>Actual Cost (ACWP)</th>
<th>Earned Value (BCWP)</th>
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<td>10/6/2003</td>
<td>$8256</td>
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**Schedule Variance Recovery Plan:**

None required.

**Highlights and Lowlights:**

- **Safety Minute:** Deactivation of all mechanical and electrical systems complete (except Life Safety) in preparation for demo. Some final color coding still needs worked by H&ST and Construction Inspector.

**Key Milestones:**

- **Utility Deactivation Start:** Jan-05  
- **Award Demolition Contract Start:** May-05
- **Abatement Start:** Jul-05
- **Demolition Start:** Sep-05

**Overall Summary:**

- Completed ETA shutdown, installation of new transformer/switchgear and restart of electrical systems. Demolition subcontractor mobilized and abatement activities started.
NNSA Livermore Site Office (LSO) oversight

- Annual LLNL Appraisal
- Semi-Annual FIRP & RTBF [???] Reviews by HQ
- Quarterly Line Item Project Briefings to NA-10/NA-11
- Monthly Joint LSO/LLNL Project Briefings
- Weekly Project Progress Meetings by LSO PDs
- Weekly Project Site Walkthroughs by LSO PDs
- LSO Senior Management Conduct Periodic Operational Awareness Reviews
- LSO Maintenance Manager Conducts Periodic Site Inspections to Confirm LLNL Maintenance Implementation Plan
Acquisition Strategy

• The acquisition strategy finalized after CD-0 and submitted per DOE M 413.3-1
• The acquisition strategy is a combination of LLNL staff and competitive fixed-price procurements awarded by the University of California. Assumptions:
  — LLNL staff handles preparatory work, sampling, hazardous waste disposal, ES&H oversight and PM
  — LLNL Labor-only contractor (Davis-Bacon) performs utility isolation and re-routing
  — Design-build subcontract will be awarded for weatherproofing and repair/rebuild of the remaining roofing and siding.
• Detailed demolition specifications and detailed utility deactivation drawings and procedures prepared
• Design-demo subcontract strategy resulted in 4 different demolition approaches – best value bid uses method not originally considered
• Best value evaluation: license & certifications, security, vibration, traffic, salvage value, schedule, safety history (ERR & TRR), shield wall demo, similar projects, references and price.
Stakeholder involvement

- ETA-II, a non-nuclear facility, will remain operational and continue experiments
- Computations server facility and Archive records management facility B439
- High voltage routing through existing building
- Machine shop services facility B432
- Operational Security Plan due to the proximity to high security area
  - Vehicle and personnel access
  - Staging of material and equipment
  - Restrictions on crane size, placement, accessibility and relocation
  - Security related work stoppages may impact the project
- ES&H Teams
- Representative personnel are on the project review team
Cost estimate and funding

• The estimated cost range for the project ($9.5M to $12.0M) based on:
  — Subject matter expert input
  — Parametric estimates from similar projects
  — Order of magnitude quantities

• A detailed estimate was prepared once the final alternative was selected and authorization received to progress to the next critical decision.

• The high range case was estimated assuming the following:
  — ETA II sustains no operational shutdowns during D&D
  — Siding and Steel require disassembly due to ACM
  — Saw cut & rig out North shield wall, leave South shield wall
  — Conservative design of roof structure over remaining wing section requires partial ACM abatement on remaining structure

• Costs for the low range case were estimated assuming the following:
  — ETA II operations curtailed during D&D
  — Siding and Steel require disassembly due to ACM
  — Aggressive demolition used on North shield wall, leave South shield wall
  — Simpler design of new roof structure without ACM abatement on remaining structure
## Cost Estimates

<table>
<thead>
<tr>
<th>WBS ELEMENT</th>
<th>Low Range ($K)</th>
<th>High Range ($K)</th>
<th>Current Baseline ($K)</th>
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<tr>
<td>1.1 Preparation</td>
<td>50</td>
<td>50</td>
<td>671</td>
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<tr>
<td>1.2 Mech./Elect. Isolation</td>
<td>1,442</td>
<td>1,442</td>
<td>2,401</td>
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<tr>
<td>1.3 Remove Internal Equipment</td>
<td>55</td>
<td>55</td>
<td>40</td>
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<tr>
<td>1.4 Abatement</td>
<td>750</td>
<td>985</td>
<td>195</td>
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<tr>
<td>1.5 Remove External Equipment</td>
<td>28</td>
<td>28</td>
<td>154</td>
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<tr>
<td>1.6 Demolition</td>
<td>2,416</td>
<td>3,961</td>
<td>2,527</td>
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<td>1.7 CES Samples</td>
<td>50</td>
<td>50</td>
<td>253</td>
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<td>1.8 WMD Support</td>
<td>112</td>
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<tr>
<td>1.9 ES&amp;H Support</td>
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<td>339</td>
<td>568</td>
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<td>1.10 Project Management</td>
<td>807</td>
<td>807</td>
<td>941</td>
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<tr>
<td>1.11 Restoration</td>
<td>950</td>
<td>950</td>
<td>1,022</td>
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<tr>
<td>1.12 CD4/Project Completion</td>
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<td>40</td>
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<td>Contingency (30%)</td>
<td>2,100</td>
<td>2,633</td>
<td>2,677</td>
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<td>Escalation</td>
<td>420</td>
<td>527</td>
<td>438</td>
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<td><strong>ESTIMATED TOTAL PROJECT COST</strong></td>
<td><strong>$9,500</strong></td>
<td><strong>$12,000</strong></td>
<td><strong>$12,038</strong></td>
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## High Level Schedule

### BUILDING 431 DEMOLITION AND RESTORATION PROJECT

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<tr>
<th>ID</th>
<th>WBS</th>
<th>Task Name</th>
<th>% Complete</th>
<th>BCWP</th>
<th>BCWS</th>
<th>Baseline Cost</th>
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<td>1</td>
<td>1</td>
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<td>2</td>
<td>1.1</td>
<td>Division 00 - Preparation</td>
<td>51%</td>
<td>$635,365.73</td>
<td>$666,860.56</td>
<td>$670,579.31</td>
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<tr>
<td>102</td>
<td>1.2</td>
<td>Division 01 - Mechanical/Electrical Isolation</td>
<td>60%</td>
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<td>$2,243,380.62</td>
<td>$2,461,053.08</td>
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<td>175</td>
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<td>Division 02 - Remove Internal Equipment</td>
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<td>100</td>
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<td>Division 03 - Abatement</td>
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<td>$90,040.81</td>
<td>$105,060.00</td>
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<td>160</td>
<td>1.5</td>
<td>Division 04 - Remove Exterior &amp; Roof Equipment</td>
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<td>104</td>
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<td>Division 05 - Demolition</td>
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<td>213</td>
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<td>Division 06 - CES Samples</td>
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<td>215</td>
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<td>221</td>
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**Critical**
- Critical Split
- Critical Progress
- Task

**Split**
- Baseline Milestone
- Project Summary

**Task Progress**
- Milestone
- Summary Progress

**Baseline**
- Summary

**Project Summary**
- Deadline
### FIRP Disposition Process vs DOE M 413.3-3 Graded Approach

#### FIRP Original Process

<table>
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<tr>
<th>FY04</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<td></td>
<td>Planning &amp; Prep</td>
<td>Final Des Doc</td>
<td>Util Constr</td>
<td>Abatement, Demo &amp; Restoration Constr (15 Mo)</td>
<td>Closeout</td>
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#### 413.3 Modified Process

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<th>FY05</th>
<th>Jul</th>
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<th>Oct</th>
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<td>Planning &amp; Prep</td>
<td>Approach hold</td>
<td>Final Des Doc</td>
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<td>Abatement, Demo &amp; Restoration Constr (15 Mo)</td>
<td></td>
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</table>

- **FY04**: PDS/Baseline Appvd.
- **FY05**: Decision CD-0/1, 2/3, 4, EIR Appvd., CD-0 Appvd., CD-1/2/3/4 Appvd., Decision CD-0, 1, 2, 3, 4 ea., Des/Demo Re-baseline
- **FY06**: Closeout

- **CD-0/1 Submittal**
- **CD-1/2a/3a, 2/3, 4**

**Impact**: 9 Mo less 4 Mo hold = 5 Mo Impact
Risk and Contingency Management

• Risk Management Plan developed, risk assessment completed and a risk mitigation strategy prepared.
• The activities with the highest risks are Electrical & Mechanical Isolation, shield wall removal and Renovation.
• The high risk factors include:
  — Encountering stored energy
  — ETA II sensitivity to vibration
  — Difficulty with demolition of the shield wall due to its size
  — Schedule uncertainty due to uniqueness of shield wall demolition, potential weather delays, and impacts to nearby operational facilities from the required outages
Environmental, Safety and Health

- Environmental, Safety and Health incorporated into the planning
- Historical operational background reviews and surveys to determine likely hazards and contamination levels
- NEPA review performed and the project granted a categorically exclusion
- NHPA review performed and the building determined to be of no historical significance to the State of California.
- Confirmatory sampling performed for ACM in order to better bound the scope of abatement
- Integrated Safety Management System – DOE Seven Guiding Principles and Five Core Functions
  - Integrated Worksheet (IWS) defining scope, hazards, controls, training and authorizing the work
  - Subcontractor Site specific Health & Safety Plan and Corporate Injury & Illness Prevention Program
Utility safety is best served by integrating historical information and active measurements.

Nondestructive excavation

GPR/GPS and Acoustic Listening Device

Marker balls

Radio frequency device traces line

RECONCILE COLOR KEY

GREEN: MAP/LOCATOR CONCUR
PURPLE: MAP/LOCATOR CONCUR - UTILITY TYPE DISCREPANCY
ORANGE: HISTORICAL MAP ID/LOCATOR CANNOT FIND
RED: LOCATOR FOUND/NOT IN HISTORICAL MAPS
LLNL Space Action Team - Color Coding

Best Practice

Problem: Decommissioning systems potentially containing stored energy (gas, power, etc) or other contaminants is a communication challenge. Tracking materials from sample through resolution, protective of workers and the environment requires constant verification and documentation to properly control from decommissioning through release.

Solution: SAT utilizes a color code to identify the status of all Structures, Sub-systems, and Components (SSCs) during decommissioning through disposition.

Green: Free release no issue.
Red: Applied when a known hazard exists on or inside a SSC.
Yellow: Applied to SSCs denoting caution.
Blue: Applied indicating controlled disposal to the Municipal Landfill
Black: Editorials and instructions
Field Execution

- Completed
  - Deactivation and reroute of utilities
  - Interior abatement
  - Start of demolition
Field Execution

- Working
  - Abatement of Galbestos siding
  - Structural demo
  - Specs for Restoration design-build
Project Plan Summary

• The Demolition of B431 is required to achieve the mission of LLNL and the NNSA FIRP objectives by:
  1. Supporting the NNSA Infrastructure Plan goal to “demolish excess facilities as early as possible”
  2. Banking square footage that allows continued application of advanced science and nuclear technology to the Nation’s defense
  3. Helping maintain and enhance the safety, security, and reliability of the weapons stockpile

• A significant effort has been put into the demolition concept in order to ensure that it is well thought out and represents best-value to the government for the money

The integrated project team is executing the scope in accordance with DOE and LLNL requirements.