

LESSONS LEARNED IN CONTAMINATION CONTROL, SIZE REDUCTION OF OVERSIZED ITEMS, AND WASTE PACKAGING AT THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

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ABSTRACT

Several decommissioning projects have been completed at the Rocky Flats Environmental Technology Site (RFETS) in the past years. The purpose of this paper is to summarize Lessons Learned from completed decommissioning projects, identifying the challenges the projects have encountered, and then discussing the Areas of Success as well as the Areas of Improvements. The decommissioning projects performed at RFETS are performed per the Rocky Flats Cleanup Agreement (RFCA). The tasks include safe work practices developed, contamination control, size reduction, and waste packaging

INTRODUCTION

The United State Department of Energy (DOE) Rocky flats Environmental Technology Site in Golden, CO is a major decontamination and decommissioning project. Over 400 facilities are involved in the decontamination and dismantlement of the former weapons complex site, ranging from staff office trailers to major radioactive processing facilities of up to 800,000 square feet. Included in the decommissioning tasks, is the control and decontamination of contaminated areas, cleanup and removal of oversized equipment used in the processing and fabricating of plutonium, uranium, and beryllium, and the waste packaging methods to achieve waste minimization goals.

Within these facilities, there are numerous contaminated vertical and horizontal surfaces, and several hundred over-sized pieces of contaminated equipment requiring decontamination, size reduction, contamination control, facility protection during demolition, and cost efficient waste packaging. The Site is tasked with removing all equipment and structures in a safe, expedient, and cost-effective manner. Packaging this waste presents challenges of safe industrial and radiological work practices. Past practices of decontamination and size reduction are sometimes costly, time consuming, and have presented numerous safety hazards to site personnel. It is important to develop alternative methods, which minimize the risks to the D&D workers while performing decontamination and size reduction activities. Improving work efficiencies to support Site safety goals, reducing costs, and improving on the final Site closure schedule is the milestone of each contractor.

Preliminary schedules indicated that the typical D&D methods used would not allow the site to achieve completion of the project by the closure date. This paper will discuss the methods that have been successfully used, and those methods not that successful at RFETS in performing D&D activities. Specific methods used in the decommissioning of several facilities will be discussed, and the evolution of current D&D practices.

A cooperative effort between the Project Team, Waste Operations, the subcontractors, and other vendors resulted in the development of new and innovative practices. By developing new D&D practices, the Project Management Team improved in their methods concerning Regulatory Compliance, Waste Management, Hazard Identification, Radiological Controls, Risk Management, and Cost and Schedule Control.

The projects have experienced setbacks initially with the new methods, but soon realized significant reduction to worker risk, and improved safety practices. This paper presents the activities, issues encountered, safety enhancements to the workers, and other Lessons Learned in the development and successful implementation of new D&D work practices.

BACKGROUND –CHALLENGES

Planning for decommissioning of the facilities at RFETS began as early as 1996 with the Building 889 project. Reconnaissance characterization of the facilities was/is performed as the initial task in assisting in defining the total scope of the project identifying the known risks associated with the project as early in the planning phase as possible.

The next tasks are the engineering documents needed to isolate the facility, from all energy sources until a Cold and Dark status is reached. Evacuation of the facility, removal and strip-out of furnishings, equipment, and/or excess materials can be performed in parallel with the generation of the engineering and work documents.

The goal of decommissioning projects is the safe execution of work tasks, correctly identifying potential risks, developing contingency plans, work-arounds for unknown or discovery conditions, and to complete the project on schedule and on budget.

The areas presenting challenges to the projects are:

- The relocation of tenants and the removal of all “loose” furniture, equipment, excess materials, and temporary structures.
- The accurate characterization for hazards and potential contamination
- Strip out of equipment and building structures which are contaminated with radioactivity, hazardous wastes and materials (asbestos, beryllium, RCRA items)
- Dismantlement, Size Reduction of oversized objects.
- Decontamination of facility surfaces of contamination
- Completion of Final Radiological and Industrial Surveys
- Demolition of the facility



FIX applied to
annular tank, B886

OBSERVATIONS AND ENHANCEMENTS

Contamination Control

There are several tasks for which projects need to plan sufficient time. Characterization and preliminary surveys are areas of high importance. Contamination control starts in planning to manage contamination not only in areas of known issues, but to prepare to handle unknown areas in the work plans when contamination is encountered.

Observation

Project characterization must be clearly defined, investigated, concise, and complete before the final project budget, schedule, waste management plan, and field work plans are established. If a project is unable to complete the needed scoping surveys and investigations for contamination characterization because of limited access, or due to other mitigating circumstances, state the limitations and assumptions in the project planning documents.

Enhancement

Prepare work plans with specific contingency work tasks for work around if contamination is discovered in an area not anticipated. Allow the work force to pause, re-evaluate, discuss the situation, and then possess the tools to mitigate the situation safely and continue on with the prescribed scope of work.

Observation

Risk analysis performed on the areas and levels of contamination were not sufficiently detailed. Project work documents did include general contingency plans, however, these plans were too general and did not promptly manage unknown conditions when encountered in the field. As a result, the work was stopped, and the project experienced schedule delays and cost growth.

Enhancement

Invest the time and resources estimated during the planning and characterization phase of project to perform a Formal Risk Analysis that the Project Team accepts as being complete and accurate so that correct action work plans can be written.

Observation

The project did not perform a pre-job evaluation/investigation risk analysis to allocate resources for unknown and changed site conditions. The project did not adequately plan for surprises (exterior and interior building contamination; lead paint; hidden heating, ventilation and air conditioning; ducting contaminated with unknown hazardous wastes and the complexity of the waste stream exhaust plenum assembly).

Enhancement

Develop work plans and a budget adequate to manage unknown situations until detailed characterization is complete. Develop the schedule and budget to reflect the risks associated with the unknowns. Update the plan through the life of the project. The plan should outline a remedial action for various situations, which may be encountered. This allows the worker to remediate the problem without having to shut down work.

Observation

Several rooms needing to be cleaned/stripped out had high levels of airborne concentrations of contamination and loose radioactive, beryllium, asbestos, and other harmful particulates. These loose contaminants can easily become airborne during D&D activities. This work condition has required the

increase in the required PPE to be worn by the worker. These added safety factors also increase the stress on the worker during waste stripout and packaging activities.

Enhancement

The size of the room, the type and the level of contamination along with other factors, assist in determining the selected solution to improve the work conditions. Fixatives were applied to mitigate these situations using various applications techniques. Fixatives prevent loose contamination from becoming airborne and spreading to other surfaces and areas. Fixatives permanently encapsulate all types of contamination with a manageable coating. The cure coating allows for the removal and safe waste packaging of contaminated items under less restrictive controls. Worker safety and production increased in direct relation to the reduced levels of respiratory protection, PPE, and work controls. The issue of cross-contamination was eliminated.



Suitcase mister - 10-micron size droplets



Spray Bottle applying CC Wet to Be/Uranium contaminated materials prior to removal from cabinet.

Observation

The work area was not kept in a clean, safe work condition during strip out activities of contaminated items and surfaces. Levels exceeded the action limits established for airborne contamination for beryllium and for radioactivity while performing the work, resulting in work stoppage, reviewing work procedures, and obtaining management approval prior to commencing work.

Enhancement

During strip out/removal activities, the work areas, rooms, and surfaces need to be kept in a moist state to prevent airborne contamination exceeding the ALARA established limits. Daily area cleanup and waste

packaging will resolve the problem of cross contamination. Housekeeping is more important as areas are cleaned out exposing surfaces that have been accumulating dust. Using a misting agent binds the particles preventing airborne contamination.

Summary

Any time contamination is expected or could be encountered, the use of fixatives to secure and attach to particulates is recommended. Spraying and coating equipment, walls, floors, ceilings, and any surfaces with a fixative agent prior to beginning removal activities is a practice that D&D work crews need to institute.

Size Reduction

Size reduction and dismantlement are necessary tasks in the Decommissioning Industry. The work is a high-risk activity that can negatively impact the project's safety performance, budget and schedule. The areas investigated to improve worker safety lead to the development of an innovative waste packaging system, deleting dismantlement/size reduction tasks, and eliminating high risk safety tasks to D&D workers.

Size reduction of contaminated, large, oversized items is needed when using standard waste boxes (4x4x8) and cargo containers 8x8x20 for SCOI and/or SCOII waste, for example. There are several other standard waste receptacles, but for the most part, the two previously mentioned are the most common.

Observation

When defining the scope of equipment and infrastructure removal from several buildings at RFETS, it became clear that a considerable amount of size reduction work would be needed to dispose of several large furnaces, presses, lathes, rolling mills, tanks, and other large production equipment. Old school was to start cutting the items into sizes that can be packaged into a cargo container, inner mobile, or a standard metal box. Building a custom sized, strong-tight container around an item was estimated, and is an option, but the costs were prohibitive.

Enhancement

Reduce cutting operations to size reduce large, oversized items. The site developed an alternate waste package acceptable at the receiver site and approved by the Department of Transportation (DOT). A spray on waste packaging system was developed at RFETS by Kaiser-Hill LLC using a Polyurea material that meets the definition of a Strong Tight IP-1 package.

Observation

While dismantling several pieces of contaminated production equipment, the D/D workers were required to stop work in order to allow for the safety rigging inspection on the parts to be lifted, isolated, removed and then placed into a standard cargo container. The schedule was constantly delayed and costs increased as the inspections were required in order to obtain final sign off for the bracing. The items needed to be reduced in size to fit into the containers.

Enhancement

The D/D workers were tasked with only removing the utilities to the equipment isolating the item, and to separate the unit from the base allowing for the item to be lifted into a prepared waste packaging base. No size reduction or Dismantlement tasks were performed. The item was then removed from the work area and handed off to the waste packaging crew for final packaging. The D/D crew then could return to their removal tasks and work in parallel with the waste packaging crew.

Summary

Eliminating and or educing the risky and timely task of size reduction increases the safety performance, reduces costs, and save valuable worker time. There may be several ways to improve on the task of size reduction and equipment Dismantlement, but removing the high risk work, and efficiently packaging oversized waste items is a primary goal for our project.

Waste Packaging

Safety of the D&D worker is the number one priority of the contractor. Finding ways to reduce recordables, first aid cases, and time off due to injury impacts a project in several positive ways. Worker morale increases as safety incidents decrease, and the projects budget and schedule realize positive trends.

Our projects experienced several safety cases when performing waste packaging activities. It did not matter if the workers were packing waste into a waste box, or loading a cargo containers. Improvements were needed to stop the rising incident rate of first aid cases.

Observation

During strip-out activities of removing equipment and materials, the rate of hand injuries, cuts, strained backs, and "close calls" was increasing. The workers were loading dollies, buggies, and carts with waste items from remote areas, then hand transporting the waste to the staged waste receptacle. The workers would then unload the transport vehicle and return the empty cart to the work area for the next load.

Enhancement

The project designed and constructed an inexpensive one time use wood waste box that would fit into a cargo container wall-to-wall, and high enough to stack two of these boxes. The boxes were built so that there was one-inch clearance on either side, and when stacked, there would be two inches of clearance. Twenty boxes would fit into a standard cargo container.

Constructing these boxes out of standard lumber, sometimes old pallets were used as the base, allowed the boxes to be located in the strip out area next to the worker. The waste boxes were loaded and then a fork truck was used to move the box out of the work area and loaded into the cargo container. The waste items are now handled only one time.

The next evolution of the box was a heavy cardboard walled box. These were ordered in mass quantity to reduce the costs. Depending on the items to be wasted, determined which box to use. Using these boxes removed the task of handling the waste by hand from two times to one. The number of first aid cases of hand cuts, pinched fingers, and cuts to forearms was dramatically reduced. One project went from two to three first aid cases a week to working over one million hours before having a first aid case.

Observation

Carpenters are entering cargo containers in Level C Personal Protective Equipment (PPE) to block and brace large pieces of contaminated projection equipment with wood. Large pieces of equipment are loaded into cargo containers for waste disposal that require a designed blocking and bracing plan to stabilize the load. The project investigated to see if there was not a safer way to stabilize a large item other than entering a small work area and crawling around a contaminated item in PPE.



Enhancement

The project selected the use of a medium density foam that is approved by the NTS to use as a blocking and bracing component. The foam also fills all voids inside a cargo container creating a monolithic block stabilizing and securing all loose waste items inside of the cargo container.



Since the start of the use of foam to block and brace, the time to load waste into cargo containers has reduced. Using foam allows the workers to “free load” waste items in lieu of blocking and bracing as a cargo is loaded. Foaming is now being used for several other Decommissioning applications.



Summary

Some of the more efficient enhancements have been the simplest innovations and developments. Continued discussions and debriefings with the D/D workers have led to the successful implementation of these safety enhancements. Thereby reducing schedule in the support of the completion of the waste packaging tasks of oversized items. Establishing a safety award program of submitting work task improvements has improved worker safety, worker efficiency, and the result is a positive trend in the moral of the project team.

CONCLUSION

The decommissioning projects completed to date at RFETS have all been accomplished without serious personnel injuries or environmental impact, but projects have experienced unknown site conditions, which have impacted the budget and schedule.

Contamination control and management starts with the planning process and the controls must be as dynamic as the contamination encountered. Fixatives, foam, epoxy, and other innovative solutions to preventing contamination are key to keeping the D&D worker safe.

Size reduction is a high risk, costly decommissioning task that can offer a project an area to improve on worker safety and save the project budget and schedule. Reducing and/or eliminating the task of size reducing oversized objects by using innovative approaches has increased worker safety while saving significant dollars and time.

The last topic discussing Lessons Learned from completed project is the area of waste packaging. There are several ways to package waste safely and economically. Having alternative methods to secure waste allows the project the flexibility to mitigate any waste situation that arises. Foaming small, compact, heavy objects placed into cargo containers has proven to be a very safe and timely process allowing the D&D workers to support other tasks.