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Benefits of a Dedicated Decommissioning Team for the B300 Project at Whiteshell Laboratories – 14368

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ABSTRACT

Whiteshell Laboratories (WL) is a nuclear research site in Canada that was commissioned in 1964 by Atomic Energy of Canada Limited. It covers a total area of approximately 4,375 hectares (10,800 acres) and includes the main campus site, the Waste Management Area (WMA) and outer areas of land identified as not used for or impacted by nuclear development or operations. Site activities included the operation of a 60 MW organic liquid-cooled research reactor from 1965 to 1985, and various research programs including reactor safety research, small reactor development, fuel development, biophysics and radiation applications, as well as work under the Canadian Nuclear Fuel Waste Management Program.

A major project at WL is the decommissioning of the Building 300 (B300) Research and Development (R&D) Laboratory complex. This 17,000 m^2 building contains radioactive laboratories and offices. The project scope includes decontamination and decommissioning of rooms, drain lines, ventilation systems and the crawlspace. The work is progressing in stages with current efforts focused on 50% of the building while the remaining sections continue to operate.

Decommissioning and Operational objectives occasionally compete, which can impact the schedule for the decommissioning project. Often the same resources are working on operational and decommissioning activities. These include Operations, Trades, Radiation Protection, Waste Processing and Engineering resources. In order to meet project schedule commitments, a dedicated resource team was established to ensure a core team is always available to perform the decommissioning. The team consists of front-line execution resources and project management staff. The front-line team includes Surveyors, Decontamination Monitors, Electricians, Pipefitters, Sheet Metal Workers, Millwrights, Project Leaders and a Foreman. The extended project team includes a project manager, project control coordinator, and administrative support. The front-line workers were transferred to the decommissioning team from their normal resource centers with an internal contract; essentially a secondment.

There have been significant productivity gains as a result of the dedicated resources. A team culture has developed that has reduced strife on union jurisdiction. Schedules for the various resources have been aligned, which allows work to begin more quickly each morning. The culture has grown around safety and execution. The team works together to ensure commitments are met. Many of the productivity gains came directly from the team, which is encouraging, and was recently recognized with an AECL award. Overall, the project has progressed well and the dedicated team has proven to be an optimal model for large project execution. Several good lessons learned have come out of the team model, which are being applied as we move forward to complete this project and move to the next major decommissioning challenge. The decommissioning activities, the application of the team approach, and the overall benefits to safety and project performance will be highlighted in this presentation.

BACKGROUND

Whiteshell Laboratories (WL) is a nuclear research site in Canada that was commissioned in 1964 by Atomic Energy of Canada Limited. It is located near the city of Winnipeg in the Province of Manitoba. The WL site is being fully decommissioning. Currently there is a mix of decommissioning, new infrastructure and regular operations being performed on the site. The work is funded through the Government of Canada's Nuclear Legacy Liabilities Program (NLLP).

The B300 R&D laboratory complex is the main laboratory facility at the WL site (Figure 1). Currently, approximately half the building is undergoing decommissioning, and the other half remains operational. This 17,000 m^2 building contained laboratories, offices and major experimental facilities that supported fuel development, waste management, and other nuclear research programs.

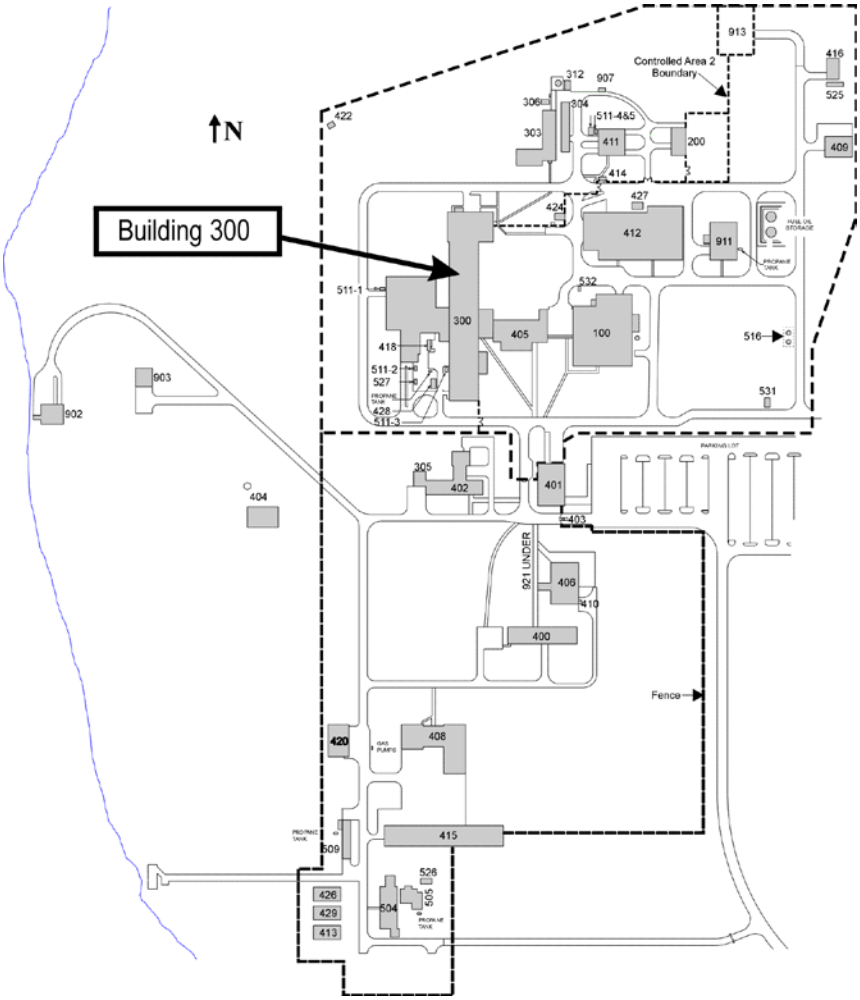

Figure 1. Whiteshell Laboratories Site Plan Showing Building 300

B300 was built in seven stages over a period of 20 years. The current decommissioning project is preparing for demolition of Stages 4 and 7 which were constructed in 1969 and 1984,

respectively. These two stages are connected and comprise the north end of the building with a footprint of approximately 2,500 m^2 (Figure 2 and 3). This area includes three floors that were occupied by offices and laboratories, penthouses that house the ventilation systems, and crawlspaces that include electrical, drainage, and water supply systems and provide access to the building foundation.

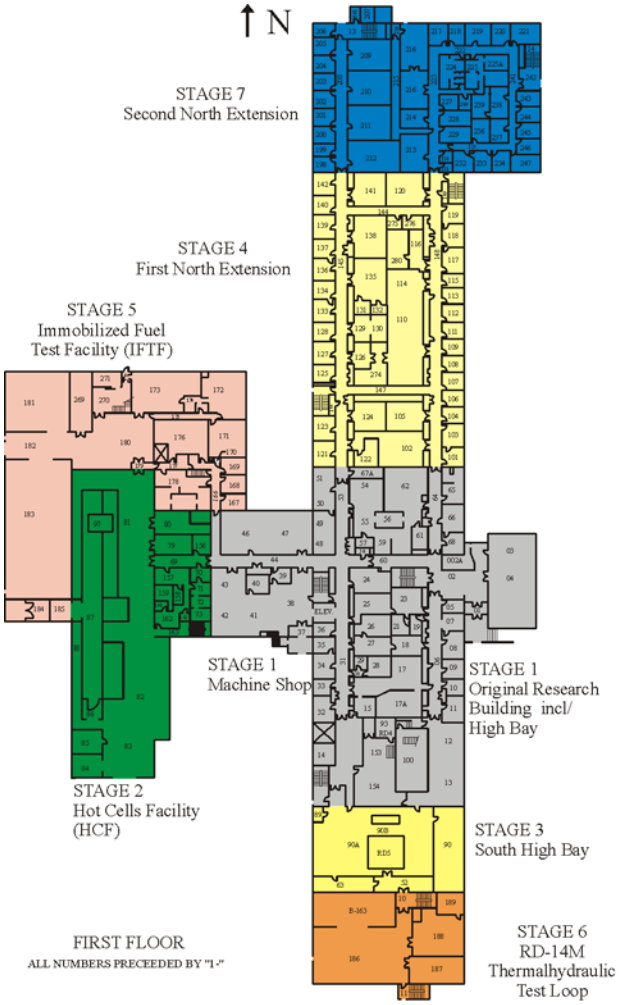

Figure 2. Building Layout of B300 Showing Construction Stages

Figure 3. View from South East of B300 Stages 4 and 7

INTRODUCTION

The B300 R&D complex was constructed to accommodate laboratories and offices which were mainly used for research and development associated with organic-cooled reactors, nuclear fuel waste management, reactor safety, advanced fuel cycles and other applications of nuclear energy. In order to proceed with building demolition, the contaminated systems inside the building have to be characterized, removed, and the waste managed.

The B300 active ventilation system was designed to manage hazardous fumes and radioactivity from ventilation devices (e.g., fume hoods, snorkels and glove boxes) and to prevent the escape of airborne hazardous material outside of the laboratory boundary in the event of an upset condition. The system included over 200 ventilation devices and 32 active exhaust fan units and high efficiency particulate air (HEPA) filters.

In preparation for demolition of B300, the active ventilation first had to be removed. This included disconnecting and removing active ventilation ductwork, filters, fans, stacks and all associated redundant components. The project was divided into three major phases. Phase 1 consisted of the removal of five ventilation systems in the B300 High Bay (Stage 3) and was completed in 2011. Phase 2 consisted of the removal of ten ventilation systems in the B300 Core Area (Stage 1) and was completed in 2012. Lessons learned during the execution of Phases 1 and 2 were incorporated into the current ventilation removal project (Phase 3). Removal of these final ventilation systems from B300 will complete the NLLP Milestone to remove the remaining ventilation systems in Stages 1, 4 and 7. Building segregation from Stage 1, the final survey, and demolition of Stages 4 and 7 will begin in late 13/14.

DISCUSSION

During the planning phase of the active ventilation removal project, it became clear that the decommissioning project team would not meet the committed Milestone date based on the current progress. The team worked together to determine solutions to accelerate the schedule and the most prevalent impact identified was consistent availability and actual tool time by the

decommissioning workers.

A number of factors that impacted the productivity were identified and the largest contributor was lack of control of the resources and the resulting loss of staff to other competing activities and projects. The team determined that the only way to achieve the Milestone was to establish dedicated resources. This concept was proposed to Management and was approved. This paper discusses the process, challenges and overall benefits to the project as a result.

The historical data showed the early ventilation removal projects were achieving only an average of 3.5 hours per day of actual tool time in an 8-hour shift. The major contributor to lost time was availability of staff due to competing activities, training, conflicting vacation schedules, rotating staff and misaligned start/stop and break times.

Whiteshell Resource Supply Model

The resource supply model at Whiteshell Laboratories is a carry-over from the multi-mission research program. Decommissioning is now the major mission, but regular operations and minor research programs also exist. All missions on site draw from common pools of resources such as skilled trades, radiation protection, engineering and common site services.

Priority models exist for some of these services and all activities are scheduled on a single site-wide system. A weekly site-wide planning meeting helps to resolve resource conflicts at a macro level. The skilled trades group meets weekly with Project Leaders to confirm availability of crews. However, resource availability for a specific project is never guaranteed due to conflicts from a higher priority such as a safety issue or emergency equipment repair. In addition, the resources are not supervised by the Project Leaders. On a daily basis, resources may not show up at project location due to vacation, illness, or training, and back-ups are generally not available.

Work Breakdown and Scheduling for the B300 Project

The core project team met to break down the project into a schedule of resource loaded activities, necessary to complete the ventilation removal work. The goal was to complete the work by March 2014 in order to achieve the Milestone and stay on schedule for final surveying and building demolition.

The first round of planning estimated one crew consisting of two sheet metal workers, a radiation surveyor and two decontamination workers. The schedule revealed that it was impossible to meet the commitment date based on this one crew, working at the historical pace. The team added a second crew to cut the time in half, but still the Milestone schedule could not be achieved. Due to competing site activities, we also could not confirm the availability of an appropriate number of sheet metal workers to complete the work. There certainly were not enough trades resources to staff a third team, so the project looked at efficiencies, coming up with the dedicated team model.

Building the Dedicated Team

The project team determined the only way to complete the work on time, was to guarantee that two work crews were dedicated fully to the project. The only competing activities would be vacation leave, sick leave, and mandatory company training.

The project team held meetings with resource stakeholders to develop the appropriate team and mechanisms for the dedicated team model. The main resources of the team came from three different departments: Trades, Radiation Protection, and Projects. This meant different lines of supervision. It was determined that a single, dedicated Foreman was required to provide direct supervision of the team. It was also agreed that the team would be formed from a cross-section of site workers, not taking only best or worst performers, but a blend. Internal agreement contracts were signed, effectively transferring the team to the new group for a period of one year. It was agreed to evaluate some transfers at the six-month period to give staff opportunities for experience in other areas of the site.

The team was formed to complete the ventilation work as well as other final projects such as the segregation of services in Stages 4 and 7 from Stage 1 to allow demolition to proceed without impacting the remaining, operational stages of B300. The team consists of 4 Sheet Metal Workers, 2 Pipefitters, 2 Electricians, 1 Millwright, 2 Carpenters, 1 Lagger, 5 Decontamination Workers, 4 Radiation Surveyors, 2 Health Physicists, 1 Laborer, 1 Supervisor (Foreman), 1 Project Manager, and 2 Project Field Coordinators.

Other key project support staff that was not fully assigned to the dedicated team includes an Operations Representative, Engineering, Analytical Chemist and other supporting Radiation Protection and Trades staff.

Trade Line Barriers

Early in the project, there was inefficiency due to employee perception about trade line barriers. The culture was that each skilled trade respected the other's work scope, with no cross-over. For example, the Electricians were reluctant to remove a metal panel on the fume hoods to disconnect the power. The Millwrights did not think they should remove a knob that controlled a gas valve, preventing the movement of a disconnected fume hood through a door, even though the gas line was disconnected. This culture of "my work versus your work" resulted in slow progress as the Project Leaders struggled to get the right resources coordinated.

A meeting was held with Management, Union Representatives and Staff Supervisors to discuss the issue. The Trades Manager described the core competency of each skilled trade and demonstrated the overlap of skills between them. The bubble model in Figure 4 was used to convey this to union leaders and staff, showing how a Sheet Metal worker has overlap with a Welder, a Millwright and a Heat and Frost Insulator. This overlap area (common to all three) includes work such as the demolition and removal of redundant active ventilation equipment such as duct and filter housings. Figure 5 shows a team of mixed skilled trades and radiation protection workers preparing to begin demolition of an active ventilation HEPA filter bank.

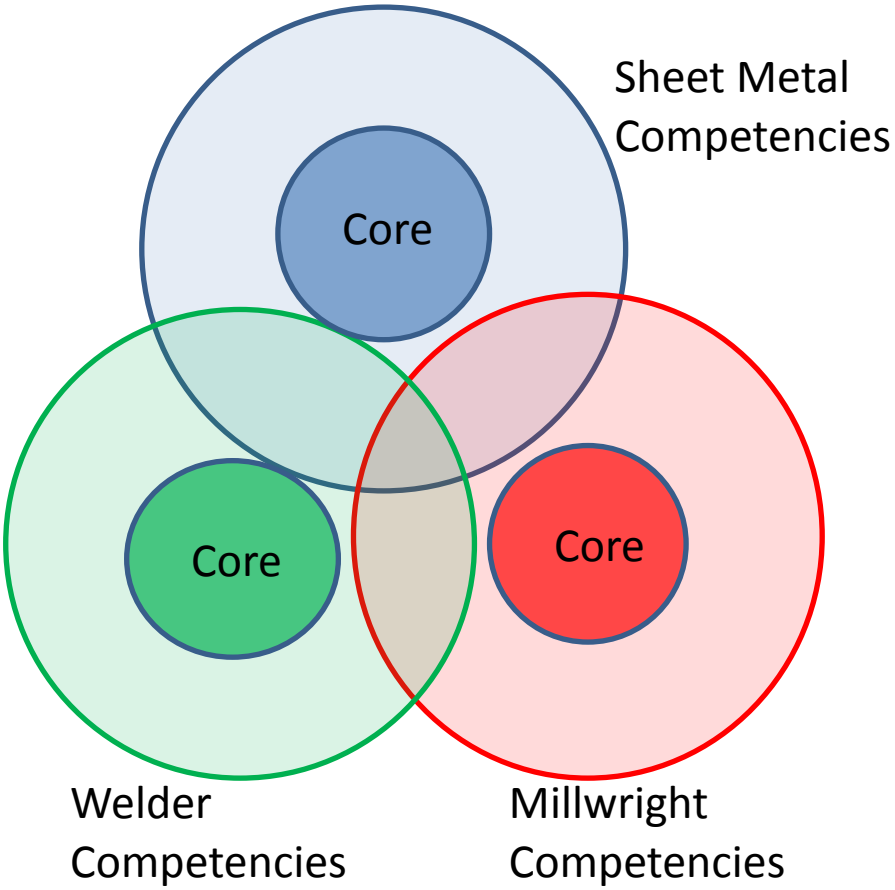

Figure 4. Core Competencies and Common Skills of Trades Workers

In the meetings, it was emphasized that there is plenty of work for all staff. The philosophy of "protect their work" was counter-productive; essentially causing significant slow-downs as different skilled trades performed serial execution of parts of one job. Performance to schedule is the biggest metric of value to our client. The message to our skilled workers was "show us how you can perform and this will help secure your job". The culture responded and the teams began to work together, driving improved performance.

Figure 5. Mixed Trades and RP Preparing to Disassemble HEPA Filter Bank

Work Schedule Inefficiencies

Another historical inefficiency is the start/stop and break times of the various worker groups. The skilled trades begin at 7:30, have lunch for 30 minutes at 11:30 and finish their shift at 16:00. The radiation surveyors start at various times between 7:30 and 8:15, and have lunch for 45 minutes at 12:00. The misaligned lunches often resulted in very poor efficiency between 11:30 and 13:00 as not all workers were present at the work site.

Part of the solution was to align all break times on the WL site. All workers begin lunch at 11:30. The skilled trade workers have a 30 minute break and return at 12:00. Other site employees have a 45 minute break and return to work at 12:15. Although only 15 minutes, this difference in lunch break times still produced a measurable negative impact on daily tool time. The dedicated team members suggested a resolution to management, where the surveyors would start 15 minutes earlier each day and take only 30 minutes lunch. They were compensated with an additional 30

minutes of pay each day. The return on investment was valuable, increasing morale and getting the entire team working quickly in the morning and after lunch break each day. The alignment of schedules increased tool time by 0.5 hours per day.

Team Morale, Goals and Objectives

A significant result of forming the dedicated team was the very noticeable increase in team morale and buy-in to the project objectives. A number of small changes are credited with this valuable improvement. Likely the most important impact on morale and performance was the consistency of the team itself. By dedicating specific workers to the project, we eliminated a fairly constant revolving door of workers from the site pool of skilled trades and radiation projection workers. The workers became a real team.

Management nurtured the B300 Dedicated Team identity by awarding them an AECL Voyageur Award. The Voyageur Award recognized each individual on the team for embracing and personifying the attributes of the Voyageur Program through outstanding commitment to create a “best in class” work environment by excelling in safety, execution and innovation.

The team leaders set clear goals and objectives for each major project. The workers were challenged to meet a difficult schedule. Early in the project, the team realized they were not recovering enough time to meet the committed project goals and schedule. They rallied together and formulated a “get well plan”. The team came up with several innovations and demonstrated an excellent work ethic. They scheduled several weekend over time sessions to recover some lost schedule. They identified tools and techniques that provided faster and safer execution of work, including mechanical lifting aids for large duct pieces and improved cutting tools. The team embraced the model of a multi-discipline Trades team and created three distinct work crews. Two attacked the active ventilation duct system and one focused on fume hood removal. A healthy competition was borne and the team saw big improvements in productivity. The original schedule was recovered and cost efficiencies were realized.

Administrative Advantages

A dedicated team produced some administrative advantages that benefited the project. The normal work planning process at WL is to submit paper/electronic service requests to the Trades Department for each job. This mechanism was used to assign workers and track cost data. In the case of the B300 team, the service request process was abandoned as all the workers’ time is covered under a single work account code. Time sheets became much easier to manage. This change did not have an effect on the worker productivity, but it did provide administrative efficiencies.

Another major advantage of the dedicated team, supervised by a single Foreman, was the coordination of vacation leave. Leave approvals reflect the operational needs of the project. The Foreman can coordinate specific staff leave; avoiding situations where entire crews were impacted. For example, without adequate Radiation Surveyors, an entire ventilation removal crew can be out of commission for an entire day.

LESSONS LEARNED

Several important lessons learned have been recognized. Some have been incorporated into the project for continuous improvement. However, a dedicated team does not work for all projects and in all circumstances. Two lessons learned are discussed below.

Work Permit Authorization

The work control system at WL includes a work permit system for all non-routine work. This means all work done by the B300 team requires an approved work permit and daily pre-job brief for all workers. The custodian of the work permit system is the Facilities organization. A facility Work Permit Authorizer must approve all permits before work can begin, and most permits are required daily for decommissioning work. The Work Permit Authorizer faces the daily task of approving as many as twenty-five permits each morning, including decommissioning and maintenance work, as well as changes to any permits throughout the day.

A more efficient approach for large projects with a dedicated team is to include the Work Permit Authorizer on the team. Their sole focus would be to ensure safe work is approved through permits exclusively for the project. The Work Permit Authorizer and the project team would not compete with other maintenance activities. However, it is critical that all work within the same facility is coordinated and understood by the Facility Representatives to ensure safe work. A system would be needed to clearly communicate between two Work Permit Authorizers in the same building/facility. This approach has not yet been adopted at WL.

Dedicated Teams Don’t Work For Every Project

The benefits of the dedicated team model were recognized by other projects at the WL site. This prompted many Project Managers to request dedicated teams for their project. They sought the control achieved by avoiding the regular work planning process. However, Management needs to be careful when assigning dedicated teams as it does not work for the majority of projects.

Dedicated teams work for large, multi-disciplinary projects with durations of at least 6 months. The team should also be large enough to require a dedicated Supervisor and be able to commit to paying for 100% of each team member for the duration of the project.

An effective work prioritization and planning system eliminates the need for dedicated teams for all but large projects. Proper up-front planning with a fully resourced site wide schedule will allow the effective assignment of resources to many parallel projects. Even projects with dedicated teams normally use the work planning system to acquire resources for specialty work (example asbestos abatement) or to supplement the team for critical activities.

CONCLUSION

Nuclear decommissioning is still in its formative years in Canada. The WL is the first major decommissioning project of a nuclear research establishment. The decommissioning of the WL site is in full execution with multiple decommissioning, infrastructure and environmental projects occurring in parallel. This parallel execution can strain resource assignment in the absence of a

very effective work planning system. The B300 decommissioning project schedule was suffering as a result of resource availability and team execution. A project “get well plan” recommended the establishment of a dedicated team of resources. The team was implemented in 2012 October and the result has been dramatic in terms of project performance and team morale.

A team of twenty-seven staff comprised of radiation protection workers, skilled trades, project management and a supervisor was created with the goal of improving productivity and recovering major schedule slippage.

Overall the dedicated team has produced impressive results. Daily tool time; the amount of time workers are actually doing physical work, has increased from 3.5 to 5.5 hours per day. This is an increase of 157%. In addition, the project schedule has been recovered, due to better productivity and innovative ideas from the team. Team morale is at an all time high, making for very few employee issues. The team is viewed by many staff as a reward assignment.

Not all projects within a decommissioning site can benefit from a dedicated resource team, but this should be considered for projects that require teams greater than fifteen staff and schedules in excess of six months.

ACKNOWLEDGMENTS

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