

Hanford Site Beryllium Program: Past, Present, and Future -12428

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ABSTRACT

The U.S. Department of Energy (DOE) has a long history of beryllium use because of the element's broad application to many nuclear operations and processes. At the Hanford Site beryllium alloy was used to fabricate parts for reactors, including fuel rods for the N-Reactor during plutonium production. Because of continued confirmed cases of chronic beryllium disease (CBD), and data suggesting CBD occurs at exposures to low-level concentrations, the DOE decided to issue a rule to further protect federal and contractor workers from hazards associated with exposure to beryllium.

When the beryllium rule was issued in 1999, each of the Hanford Site contractors developed a Chronic Beryllium Disease Prevention Program (CBDPP) and initial site wide beryllium inventories. A new site-wide CBDPP, applicable to all Hanford contractors, was issued in May, 2009. In the spring of 2010 the DOE-Headquarters Office of Health, Safety, and Security (HSS) conducted an independent inspection to evaluate the status of implementation of the Hanford Site Chronic Beryllium Disease Prevention Program (CBDPP). The report identified four Findings and 12 cross-cutting Opportunities for Improvement (OFIs).

A corrective action plan (CAP) was developed to address the Findings and cross-cutting OFIs. The DOE directed affected site contractors to identify dedicated resources to participate in development of the CAP, along with involving stakeholders. The CAP included general and contractor-specific recommendations.

Following initiation of actions to implement the approved CAP, it became apparent that additional definition of product deliverables was necessary to assure that expectations were adequately addressed and CAP actions could be closed. Consequently, a supplement to the original CAP was prepared and transmitted to DOE-HQ for approval.

Development of the supplemental CAP was an eight month effort. From the

onset a core group of CAP development members were identified to develop a mechanism for assuring that consensus was achieved on products developed as part of the CAP and the closure process.

The original CAP was developed based on a large number of actions developed from the HSS report. This was essentially a “bottoms up” approach. The revised CAP development team concluded that a more holistic, process-based approach was appropriate to assure that the resulting deliverable resulted in a best-in-class product. Consequently, issues and recommendations contained in the HSS report were grouped into 11 program areas, specific product deliverables were identified within each of the program areas, and a work breakdown structure (WBS) was logically applied to number the groupings. While the revised approach to product development utilizes a more holistic, “top down” approach, the intent was still to incorporate specific recommendations and address specific issues contained in the HSS report.

Through implementation of this new approach, a collaborative team has been established that works together using a consensus process for ensuring product completion. Benefits of the new approach include building a level of trust amongst all parties, quality of the products have improved, and acceptance by all parties of what action will truly meet the intent of the deficiency and make the beryllium program stronger. Open dialogue occurs amongst the core Be CAP team members, Hanford contractors, and DOE. It has been a learning process and will continue to be one, but everyone shares the common goal of reducing worker exposure to beryllium.

INTRODUCTION

The U.S. Department of Energy (DOE) has a long history of beryllium use because of the element's broad application to many nuclear operations and processes. At the Hanford Site beryllium alloy was used to fabricate parts for reactors, including fuel rods for the N-Reactor during plutonium production. This use occurred from about 1960 until 1986. Beryllium was also present in some facilities due to past usage, particularly in fume hoods, exhaust ducts, and similar spaces.

During fabrication and research, the release of beryllium dust, fumes, and salts resulted in some workers being exposed. In buildings in which these activities took place there is continued potential for beryllium contamination. Beryllium contamination was potentially also spread to other facilities when items (e.g., tools or equipment) were moved from one contaminated area to another area. In addition to past beryllium use for reactors and research activities, beryllium is present in non-sparking tools and certain installed hardware, including electrical switchgear and overhead crane components used at Hanford.

Inhalation of beryllium dust or particles can cause the body's immune system to react, resulting in an allergic-type response called sensitization. "Studies have shown that on average, 1-6% of exposed workers develop sensitivity, although the rates can be as high as 16% in workers with the highest exposures, such as beryllium machinists. Most workers who are going to develop an allergy to beryllium tend to do so early on, but follow-up testing over the years continues to identify workers with beryllium sensitization" (National Jewish Health, May 2011).

Beryllium sensitization may result in chronic beryllium disease (CBD), which can affect lung function. Not everyone exposed to beryllium develops problems; however, National Jewish Health (NJH) estimates that 40 to 60 percent of workers with beryllium sensitization will develop CBD. The effects of beryllium are still somewhat unknown as the latency period can extend to more than 30 years, in some cases with no apparent symptoms.

Between the 1970s and 1984, there appeared to be a significant reduction in the incidence rate of CBD. This, coupled with the long latency period for the disease, led to the assumption that CBD was occurring only among workers who had been exposed to high levels of beryllium decades earlier. Since that time, confirmed cases of CBD continue to be identified with data suggesting occurrence of CBD among workers with low-level exposures. In December 1999, in response to this data, the U. S. Department of Energy (DOE) issued 10 CFR 850, *Chronic Beryllium Disease Prevention Program*, to establish more aggressive workplace controls to minimize exposure to beryllium.

HANFORD SITE BERYLLIUM PROGRAM

DOE's 10 CFR 850 Final Rule set forth an aggressive, two-pronged exposure reduction and minimization program to reduce the number of workers currently exposed to beryllium at DOE facilities managed by DOE or its contractors, minimize the levels of, and potential for, exposure to beryllium, establish medical surveillance requirements to ensure early detection of disease, and improve the state of information regarding CBD and beryllium sensitization. The Rule also requires contractors and any covered DOE employers to establish in their Chronic Beryllium Disease Prevention Programs (CBDPP) exposure reduction and minimization measures designed to reduce potential exposure to levels below the action level. In response to the 1999 rule, each of the Hanford Site contractors developed their own CBDPP and conducted an initial site-wide baseline beryllium inventory.

The DOE Field Offices (Richland Operations Office and Office of River Protection) and various stakeholders recognized that different contractor approaches and protective measures (e.g. postings, training, and work practices) could be a problem at the site, where it is not unusual for employees of one contractor to perform work at facilities managed by another. As a result, a multi-contractor, union, and stakeholder CBDPP committee was formed to develop a single Hanford site-wide CBDPP that would apply to all site contractors, with oversight from the DOE Field Offices. This committee developed a single Hanford Site CBDPP document that established consistent requirements in May 2009.

Development of the site-wide CBDPP was a significant effort. Achieving agreement among the multiple contractors involved extensive discussions and sustained management attention. Although this was a positive step toward implementing a fully effective program, stakeholder concerns were expressed regarding the consistency of implementation and the continued diagnosis of beryllium-affected individuals. These concerns resulted in the DOE Office of Health, Safety, and Security (HSS) conducting an inspection of the site-wide CBDPP.

HEALTH, SAFETY, AND SECURITY INSPECTION REPORT

The HSS review was an independent inspection of the status of the CBDPP and issues that were raised by stakeholders, such as the Hanford Advisory Board (HAB) and the Beryllium Awareness Group (BAG). The HAB is an independent representative body whose mission is to provide informed recommendations and advice to DOE on selected major policy issues related to the cleanup of the Hanford Site. The BAG is a worker advocacy group comprised of current and former Hanford employees affected by beryllium exposure (e.g., beryllium sensitivity, CBD, or beryllium-related interstitial lung disease).

The HSS inspection scope included:

- Facility re-baseline assessments and characterization;
- Work controls;
- Training and qualification;
- Medical surveillance;
- Employee communications;
- Contractor feedback improvement activities; and
- DOE direction and oversight.

Four (4) Hanford operating contractors were evaluated as part of the inspection, in addition to the occupational medical provider, as well as elements of the analytical laboratory. The review concluded the contractors were still in various stages of performing the actions needed to declare full implementation of the CBDPP.

Results of inspection identified four findings and 12 opportunities for improvement (OFIs). Specific findings included:

- DOE field offices had not ensured the contractor baseline beryllium inventory and hazard assessments had been completed, as required per 10 CFR 850 and the Hanford Site CBDPP;
- DOE field offices had not ensured several categories of workers at the Hanford Site were receiving the minimum beryllium-related training per 10 CFR 850;
- The site occupational medical provider had not consistently analyzed medical, job, and exposure data for employees diagnosed as sensitized or having CBD, and thus not collected information needed to identify workers at risk for exposure, understood beryllium health risks, or identified appropriate actions to improve the Hanford site CBDPP as required in 10 CFR 850; and
- Hanford site contractors had not ensured their work planning and control processes and implementation of those processes in beryllium-controlled facilities and areas were sufficient to fully ensure protection of workers, co-located employees, and transient personnel in accordance with 10 CFR 850 and the Hanford Site CBDPP.

The OFIs included directing operating contractors to identify and prioritize identified deficiencies and, where warranted, develop timely corrective actions and/or interim protective measures.

In response to the HSS inspection report DOE directed a Corrective Action Plan (CAP) be developed to address the Findings and OFIs. CAP development included participation of site contractors, and stakeholder representatives [e.g., BAG, Hanford Atomic Metals Trade Council (HAMTC), and Central Washington Building and Construction Trades Council (CWBCTC)]. The HAMTC is an

umbrella labor organization comprised of fifteen (15) local unions and is the sole collective bargaining representative pertaining to wages, hours, and working conditions for approximately 3,500 bargaining unit personnel on the Hanford Site. The CWBCTC is an umbrella labor organization comprised of fourteen local unions and is the sole collective bargaining representative pertaining to wages, hours, and working conditions for approximately 2,000 bargaining unit personnel performing work under the Hanford Site Stabilization Agreement.

CORRECTIVE ACTION PLAN IN RESPONSE TO THE OFFICE OF HEALTH, SAFETY, AND SECURITY BERYLLIUM INSPECTION AT THE HANFORD SITE

The DOE field offices (RL and ORP) developed plan contained approximately 250 corrective actions in response to HSS report. In August 2010, the Corrective Action Plan (CAP) was submitted to DOE-HQ for approval and subsequently incorporated into the contracts of the site operating contractors.

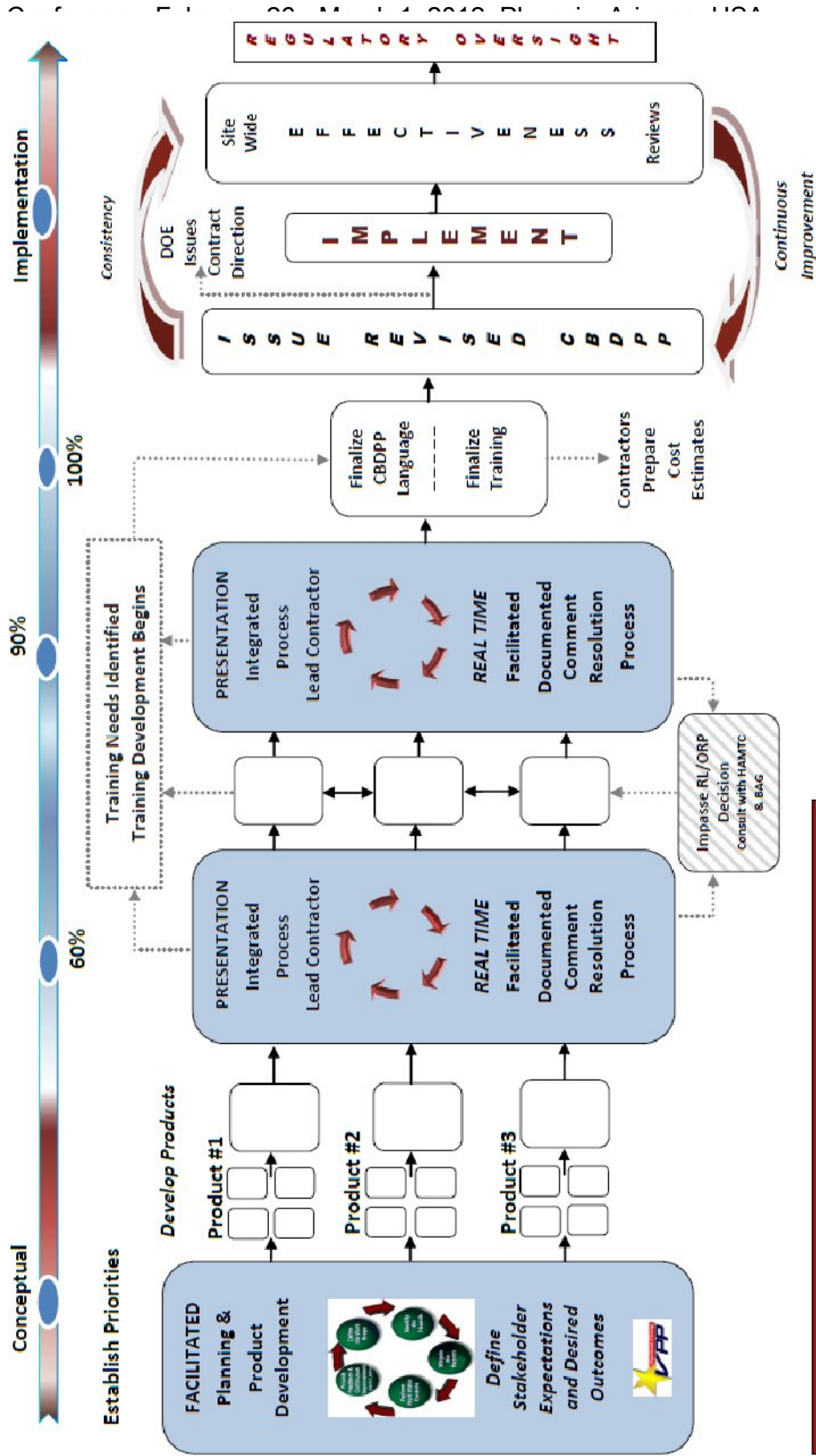
The CAP was organized by the major findings of the HSS report and identified which contractors had responsibility for completion of the identified corrective actions. In many cases corrective actions were applicable to multiple contractors; thereby, a lead contractor was identified to ensure organization and consistency amongst the contractors for completion of the action(s). Weekly status meetings were established between DOE, site contractors, BAG, and HAMTC representatives for measuring progress of completing the actions and to provide DOE-HQ an accurate status of progress.

Despite progress, stakeholder concerns continued to be expressed regarding the consistency of implementation. Historical trust and confidence issues plagued the ability to move forward. With the complexity of the issues and the large number of personnel involved in completing the corrective actions, over time it became apparent a different approach to addressing corrective actions was needed. With the assistance of an independent Facilitator from DOE's Environmental Management Consolidated Business Center, the "Systems Approach to Consensus" was created.

SUPPLEMENTAL CAP AND PROCESS DEVELOPMENT METHODOLOGY

The "Systems Approach to Consensus" (Figure 1.0) incorporates the principles and best practices of Systems Thinking, Project Management, Integrated Safety Management Systems (ISMS), the Voluntary Protection Program (VPP), Organizational Development, Alternative Dispute Resolution (ADR) and Servant Leadership. This method, created uniquely for this situation, has never used within any government agency before and was designed to engage the DOE field offices, contractors, and stakeholders on an equal level to develop a

Hanford Site Beryllium Corrective Action Process SYSTEMS APPROACH TO CONSENSUS



- SUCCESS FACTORS TO PROTECT WORKERS:**
1. Best-in-class beryllium program (quality & cost-effective)
 2. Consensus w/HAMTC, BAG & Contractors
 3. Produce beryllium CAP deliverables within schedule

supplemental CAP and to begin establishing trust and credibility. From the onset a core group of CAP development members, including representatives of the BAG, HAMTC, CWBCTC, Hanford contractors, and DOE field offices developed product descriptions that defined outcomes/end states and created a common vision and alignment among all the parties. To ensure a successful outcome, the parties developed the following success factors.

- Establish a best-in-class beryllium program;
- Consensus with the BAG, HAMTC, and contractors; and
- Produce beryllium CAP deliverables within schedule.

These success factors in different priority than previously communicated expectations. These success factors focused on *quality and consensus* while maintaining a schedule versus meeting a schedule.

The Systems Approach to Consensus was structured to provide for Team and Management briefings in facilitated, documented sessions in which any identified issues is either resolved via consensus, or elevated to DOE senior leadership for timely resolution. To ensure schedule remained at the forefront, Product Teams briefed the core BeCAP Committee on progress at 60 and 90 percent development stages of product development.

The methodology included team building exercises to establish good working relationships among team members and to establish behavioral commitments for conduct during CAP development activities. The intent of the Approach was to create a positive, constructive work environment where individual differences enhance rather than detract from the process. Through use of the Systems Approach Consensus, a balance of power was maintained amongst all parties and promoted effective communication.

The original CAP was created based on a large number of actions developed from the HSS report, using a traditional “bottoms up” approach. The revised CAP development team utilizes a “top down” approach, which is more holistic and process-based to assure the deliverable results in a best-in-class product that incorporates specific HSS findings and recommendations.

Issues and recommendations contained in the HSS report were grouped into 11 program areas that focus on the development of products instead of specific findings and OFIs. Product deliverables were identified within each of the program areas, and a work breakdown structure (WBS) was logically applied to number the groupings. Actions from the original CAP were assigned under the appropriate WBS and a cross-walk was developed to assure all items from the original CAP were included.

A set of criteria and expectations was then developed for each deliverable to identify the specific attributes each deliverable would need to contain to be acceptable to the BAG, HAMTC, site contractors, and DOE.

The core BeCAP Committee prioritized products which were deemed to contribute most directly to worker safety and would be developed during the initial phase of product development. Products were organized into three Product Phases based on the potential impacts on worker safety:

- Phase I: Processes associated with Beryllium Work Permits, Building Assessment and Characterization, Postings, Exposure Monitoring including affected workers, Work Control, Medical Clearance, and Medical Referrals and Evaluations.
- Phases II and III: Processes associated with Communications, Performance Feedback, Outreach activities, Assessments, Worker Benefits, and performance of an Epidemiological Study.

The supplemental CAP, which provided deliverable dates for the Phase 1 products, was submitted to DOE-HQ in August 2011 and subsequently approved. A revised supplemental CAP, which provided deliverable dates for Phase II and III products, was submitted to DOE-HQ for approval in January 2012. While awaiting approval, the Be CAP team continues to make significant progress on completion of Phase I products. As of January 2012, the Beryllium Work Permit product was ready for implementation, and the Assessment and Characterization for Facilities, Postings, Medical Clearance, and Medical Referrals and Evaluations products were approved at the 90 percent review level.

CONCLUSIONS

Since issuance of the beryllium rule in 1999, the DOE has made significant advances towards protecting federal and contractor personnel from continued over exposure to the hazardous contaminant. Although measures originally established to meet regulatory requirements resulted in a positive step towards reducing exposure to the contaminant, implementation of the established processes was less than adequate. Consequently, HSS identified a number of Findings and OFIs that needed to be corrected.

A CAP was written that addressed the four Findings and 12 OFIs; however, due to the large number of contractors and stakeholders involved in the CAP, it became apparent a different approach for managing personnel and corrective actions was needed to ensure actions were appropriately closed and resolved original deficiency. A new model, the Systems Approach to Consensus, was developed for achieving consensus amongst all stakeholders.

Through implementation of the Systems Approach to Consensus, a collaborative team representing Federal, contractor and stakeholder groups was established

that works together using a consensus process to ensure product completion. Open dialogue occurs amongst the core Beryllium CAP committee members, Hanford contractors, and DOE and a healthy balance of power is shared amongst all stakeholders with significant improvement in trust.

The benefits of the new approach included: a common vision and alignment around end states and outcomes, the development of best-in-class products, and the mending of long-standing trust issues. The “Systems Approach to Consensus” process enables the DOE and Hanford site contractors, in consensus with stakeholders, to develop and implement actions to address identified deficiencies and strengthen the beryllium program at Hanford as well as the Department. The beryllium program at Hanford has been a learning process and will continue to be as all parties share the common goal of reducing worker exposure to beryllium.

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