

Innovative Graded Approach to D&D Configuration Management—9393

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ABSTRACT

CH2MHill Plateau Remediation Contract personnel have developed and implemented an innovative, graded approach to Configuration Management for use in the Decontamination and Decommissioning (D&D) of Nuclear Facilities. The Work Package Configuration Management (WPCM) (1) process is a change management process that inserts engineering rigor into a work package to ensure safe modification to a Structure, System, or Component (SSC). Sketches, historical drawings, or other tools may be used within the process.

Traditional configuration management requires that design documentation be prepared, reviewed, approved, and placed into a stand alone data management system. Following of approval for construction/modification, the design package is placed into a work package. The work package adds installation instructions and proceeds through a separate review and approval prior to being placed into a second data management system. The practice allows for the separate tracking and retrieval of design and maintenance/construction information.

During D&D of a facility where the equipment is being 100% removed and/or the facility is being reduced to “slab-on-grade”, there is minimal value in maintaining a stand alone design history that simply shows a blank drawing where a SSC, or facility used to be. As a way of streamlining the D&D process, the design media is included as a part of the work package that authorizes the work process. Instead of two separate reviews and documentation of information in two separate databases, the design media is reviewed/approved once as a part of the work package process.

As an additional means of streamlining the D&D process, the design may include Computer Aided Design (CAD) 3-Dimensional (3-D) multiple diagrams that show the progressive states of equipment removal/facility demolition rather than a single simple ‘before and after’ diagram. The added graphics flexibility allows field staff to track progress and can be used as a tool to show the expected order of SSC removal.

A simple screening checklist is used to determine if the WPCM process can be used in lieu of traditional, formal drawing management. The WPCM process retains the technical rigor of traditional processes by requiring engineering approval of the work package, but eliminates the requirement to obtain duplicate signatures for work management and engineering documentation and eliminates the need to update drawings for equipment /buildings that are being removed. The use of the process has enabled the expedited D&D of multiple SSCs and buildings on the Hanford Site.

INTRODUCTION

The Department of Energy (DOE) Hanford Site Mission has changed over the past twenty years. The Site has transitioned from being a key component of the Nuclear Weapons production complex to being an Environmental clean-up site. Throughout most of this transition period, the configuration procedures and policies remained essentially unchanged. Attempts at implementing a graded approach, streamlined approach were met with resistance due to the D&D activities still being a relatively small portion of the overall Hanford mission.

Traditional configuration management requires that design documentation be prepared, reviewed, approved, and placed into a standalone data management system (1, 2). Following approval for construction/modification, the design package is placed into a Work Package. The work package adds installation instructions and proceeds through a separate review and approval prior to being placed into a second data management system. The practice allows for the separate tracking and retrieval of design and maintenance/construction information.

Engineers at one of the projects piloted a non-traditional approach to configuration management that used an approved work package as the base component for documenting, approving, and controlling change. As a way of streamlining the D&D process, the design media was included as a part of the work package that authorized the work process. Instead of 2 separate reviews and documentation of information in 2 separate databases, the design media was reviewed/approved once as a part of the Work Package process. The pilot approach proved successful and has been adopted for wider application.

A simple screening checklist (Figure 1) is used to determine if the WPCM process can be used in lieu of traditional, formal drawing management. The WPCM process retains the technical rigor of traditional processes by requiring engineering approval of the Work Package, but eliminates the requirement to obtain duplicate signatures for work management and engineering documentation and eliminates the need to update drawings for equipment /buildings that are being removed.

As an additional means of streamlining the D&D process, the design may include CAD/3-D multiple diagrams that show the progressive states of equipment removal/facility demolition rather than a single simple “before and after diagram.” The added graphics flexibility allows field staff to track progress and can be used as a tool to show the expected order of SSC removal.

The use of the process has enabled the expedited D&D of multiple SSCs and buildings on the Hanford Site with significant configuration management cost savings. Specific examples highlighted are the removal of process equipment from a glovebox in the Plutonium Finishing Plant (PFP) and the demolition of the 100 K East support building superstructure. The PFP is a Category 2 former nuclear materials separations, purification, and fabrication facility that operated from the early 1950’s to the late 1980’s, with some “stabilization” operations continuing through 2005. The majority of the purification and fabrication operations were conducted in “gloveboxes,” where operations were a combination hands-on and remote. The 100 K Area consists of 2 identical reactors (KE and KW) and their accompanying support facilities. Fuel was removed from both storage basins earlier this decade. The past several years have been spent collecting and consolidating miscellaneous scrap materials and “sludge.” The demolition of the 100 KE above grade support facility superstructure was completed in 2008 and the work on removal of the below grade fuel storage basin continues in 2009.

TRADITIONAL PROCESS

Traditional configuration management processes utilize engineering drawings and rigorous reviews throughout the process. During original design, the drawings are reviewed and approved by multiple engineering disciplines prior to being released for construction. Once construction is complete, the drawings are as-built to reflect field conditions prior to turnover to the client. During the operating life of a facility, a core set of key drawings are maintained as a part of the facility Configuration Baseline. For Department of Energy (DOE) facilities, these drawings are categorized as Essential, Support and General Service. Essential Drawings are those drawings that depict SSCs needed to ensure the safety of personnel and compliance with laws and regulations. The Essential drawing list is typically a small subset of the total drawing population (e.g., electrical one-line diagrams). Because of the rigor assigned to maintaining the configuration of Essential Drawings, they can be relied on for use in the field to make emergency

response decisions. Support Drawings are maintained at the same level of accuracy as Essential Drawings, but modifications to the SSCs depicted on Support Drawings are not required to be incorporated onto the drawings in as timely a manner as for Essential Drawings. Drawings that depict “processes” and are used for making production decisions are typically categorized as Support Drawings (e.g. Piping and Instrumentation Diagrams or Process Flow Diagrams). Drawings that are not relied on to make decisions are categorized as General Service and are less rigorously maintained. The cost of maintaining configuration of drawings is lowest for General Service Drawings, becoming greater for Support and Essential Drawings. Maintenance cost for the different categories of drawings is directly proportional to the expected level of accuracy. i.e. the more accurate the drawing category, the higher the cost to configuration manage the drawing.

In the traditional process, changes to Essential Drawings in an operating facility require the preparation of a formal Configuration Management document. For CHPRC facilities, the change process is called the Facility Modification Package (FMP) process (3). The process is initiated with a design request. The design request is accepted by the responsible Engineering Manager and assigned to an Engineer/Design Authority (DA). The DA completes a preliminary evaluation to determine if the proposed modification is viable/cost-effective. If deemed viable, the Conceptual phase of the design is initiated. During the Conceptual phase, the functions, requirements, and acceptance criteria are developed. The modification then moves to the Design phase. During the Design phase, the design is prepared. The design includes any needed calculations and drawing changes. All changes receive independent design verification prior to entering the formal review process. Formal reviewers are determined based on the scope and breadth of the change; the number of reviewers may be as few as the DA and DA Manager for simple changes or may include upwards of 10-15 reviewers for complex changes to safety systems. For designs that require field modification to SSCs, the design package is placed into a Work Package. Often, the list of personnel required to approve the Work Package are similar to the review list that approved the FMP; in some situations, the number of Work Package reviewers can be even greater than for the FMP.

Work Package Configuration Management Package Process

The Work Package Configuration Management (WPCM) process (1) is a change management process that inserts engineering rigor into a work package to ensure safe modification to an SSC. Sketches, historical drawings, or other tools may be used within the process. For facilities, or portions of facilities, that have entered into the D&D process, the WPCM process offers an opportunity to streamline costs by eliminating some of the steps in a traditional CM process. The work package process uses the rigor of control of a work package to ensure safe modification to an SSC. Sketches, historical drawings, or other tools may be used within the work package process. A screening checklist (Figure 1) is used to determine that the formal rigor of a traditional configuration management process is not needed (i.e., a review is completed that evaluates the life-cycle status of the SSCs and evaluates the safety significance of the SSC being changed).

In the WPCM process, that rigor is shifted from the traditional design process to the Work Package process. The primary concern is to determine the safest and most cost-effective means of removing the SSC. Because safety is always the number one priority in performing any modification, the engineering rigor included in a traditional configuration management process must be maintained. Calculations, drawings, sketches, and photographs, that would normally be included as a part of the stand alone design package for inclusion in a Work Package are now placed directly into the Work Package. Modifications made during the D&D (deconstruction) process still require the rigor of an engineering review to ensure that structural, electrical, physical, and chemical safety parameters are recognized and managed. As a minimum, a peer review and one over manager review are required; additional review approvals for the overall work package are determined based on the scope of the work being done. Ie. Radiological affecting, safety affecting, quality affecting, environmental documentation affecting, ...

The documentation to depict the changes on traditional hard copy and CAD drawings, however, is not needed for SSCs that will no longer exist once the work has been completed. Once an SSC has been determined to no longer be needed and has been placed into “D&D” status, there is little value in maintaining a record of the configuration in a standard, stand alone engineering drawing database. At this point in the facility life-cycle the drawings may be “downgraded” from Essential or Support to General Service and removed from the formal configuration baseline.

The one disadvantage of the WPCM process is that an engineer performing future database searches for the design information will not be able to locate the configuration management data in the traditional engineering database and must know the Work Package information to locate the information within the Work Package database. The CHPRC believes that the cost/time savings gained by eliminating duplicate reviews and maintaining duplicate information outweigh this disadvantage. Note that the configuration management information is available through the Work Package process, but that it might be more difficult and time consuming to locate for an engineer more familiar with the Engineering database system than the Work Package database system.

APPENDIX E

Example Work Package CM Process Checklist

All of the following criteria must be met in order to utilize the Work Package CM Process.

- ___ The Facility/ SSC being proposed for modification:
 - a. Has been designated for Deactivation and Decommissioning and/or
 - b. Is General Service (GS) and is neither within a Nuclear Facility nor does it affect design baseline documentation.

- ___ The proposed change does not affect a Configuration Baseline drawing (e.g., Essential or Support drawing).

- ___ The proposed change does not modify an active hazardous energy boundary (e.g., Substation, MCC Panel, main panel breaker, steam isolation valve).

- ___ The proposed modification does not change, implement, or require a specific regulatory permit (e.g. State of Washington Department of Health or Ecology Permit). Categorical permits with broad applications across projects, such as the PTRAEU NOC and Closed Container NOC for D&D work, for example, do not apply to this criteria.

Design Authority (Print/Sign)

Date

Figure 1. Work Package CM Process Screening Checklist

It has been estimated that the cost of preparing and issuing an FMP ranges from \$1000 to \$5000, depending on the complexity of the design. The design is then placed into a Work Package for field implementation. It is believed that about half the design preparation and approval costs can be saved when the WPCM process is used due to the costs saved by eliminating duplicate reviews and not requiring the update of the hard copy and/or CAD drawings. The cost savings for the Plutonium Finishing Plant Glovebox 227-S Process Equipment Removal (20 FMPs projected) was estimated at \$25,000, while the cost savings for the KE Superstructure removal (200 FMPs projected) was estimated at \$250,000.

Use of CAD/3D CAD Drawings in D&D

The inclusion of CAD/3D CAD and photographic images has enabled workers in the field to have a visual representation of the SSCs/facilities that they are assigned to remove. In many situations, the visual representations are being used in lieu of traditional drawings. The original construction drawings are often hard copy vellum/mylar hand drawn drawings that are in poor condition, both from an accuracy and readability perspective. These original construction drawings were not updated as a part of the core suite of drawings used to operate and maintain the processes within the facilities so they may not accurately reflect the current field conditions. The ability of the designers to quickly capture the 3-D images and place them into a Work Package has enabled the use of the WPCM process. By being able to quickly and cost-effectively produce visual images that are placed into a Work Package, the need to update drawings is eliminated and the need for multiple documents reviews that would be required for design changes in a traditional configuration management process are eliminated. Because the images show current and future configurations, they can be used for planning purposes as well as performance tracking/reporting purposes. Examples are provided in Figures 2 and 3.

Figure 2 represents the removal of process equipment from the PFP HC-227S glovebox. Glass tanks in the glovebox were used for the final blending of product grade plutonium nitrate solution prior to the solution being loaded into Product Receiver tanks and placed into storage. The images are a sampling of the complete set that was used to plan and track the actual removal of the tanks. For planning purposes, the images provided a step-by-step depiction of the tanks, the order the tanks would be removed, and “real-size” indication of what was needed to dismantle and remove the tanks and supporting equipment.

Figure 3 represents the 100 KE Reactor support facility superstructure that was removed. Similar to Figure 2, the images served were used for both planning and tracking purposes. Additionally, the images allowed the engineers to highlight key structural “bearing walls” that ensured personnel performing facility walkdowns as the D&D progressed were not being placed at risk. A similar process is now being used for the removal of the below grade fuel storage basin substructure.

WPCM Process Unique to the PRC

The WPCM process is unique to the PRC. The WPCM process has been presented to the Energy Facilities Contractors Group (EFCOG) Engineer Practices Working Group (EPWOG) Configuration Management (CM) Sub Group. The CM SubGroup is currently working to integrate the WPCM process into a series of CM Best Practices for use in various life-cycle phases of a facility. Processes utilized for the D&D of the Rocky Flats and Fernald sites followed more traditional CM processes until late in the

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life of the site. As information is shared through EFCOG/EPWOG, other sites that enter D&D activities will have access to information needed to implement the WPCM process on their site.

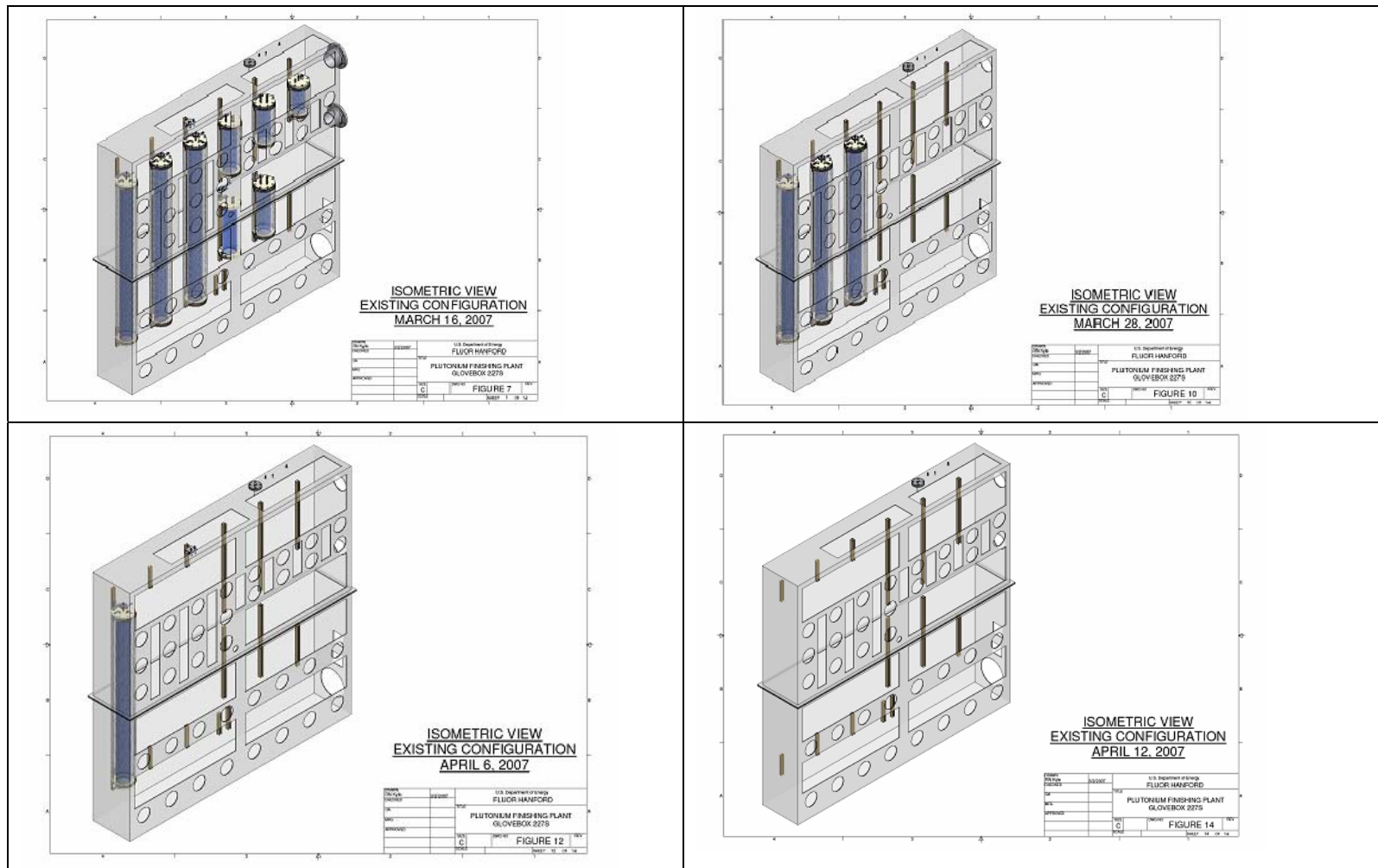
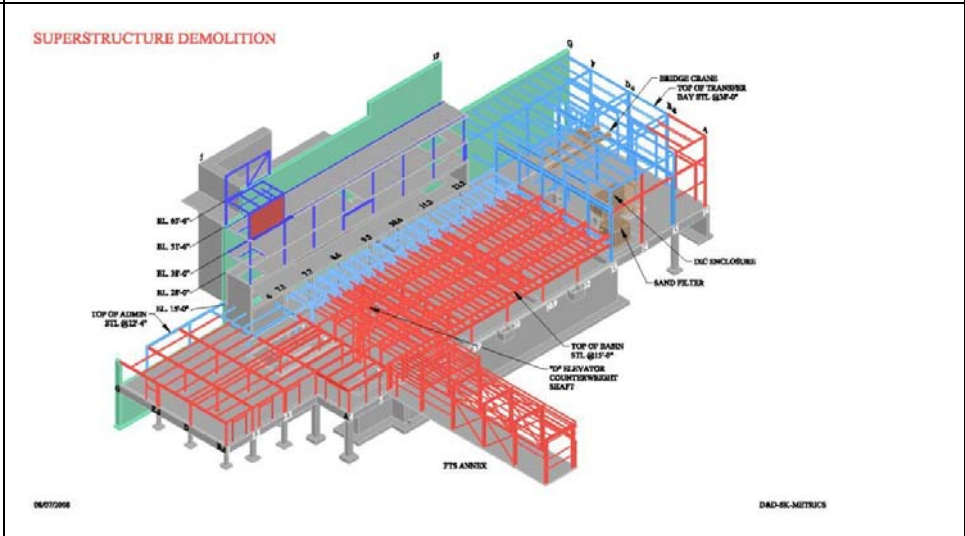
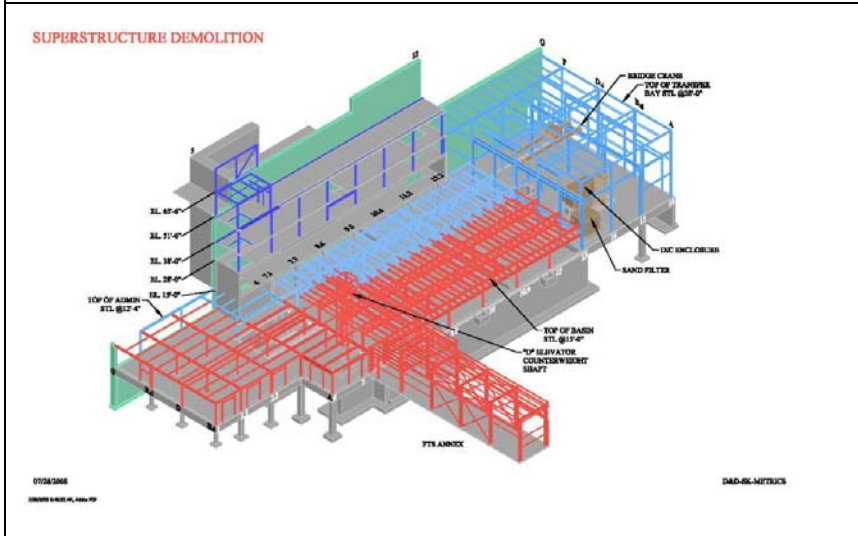
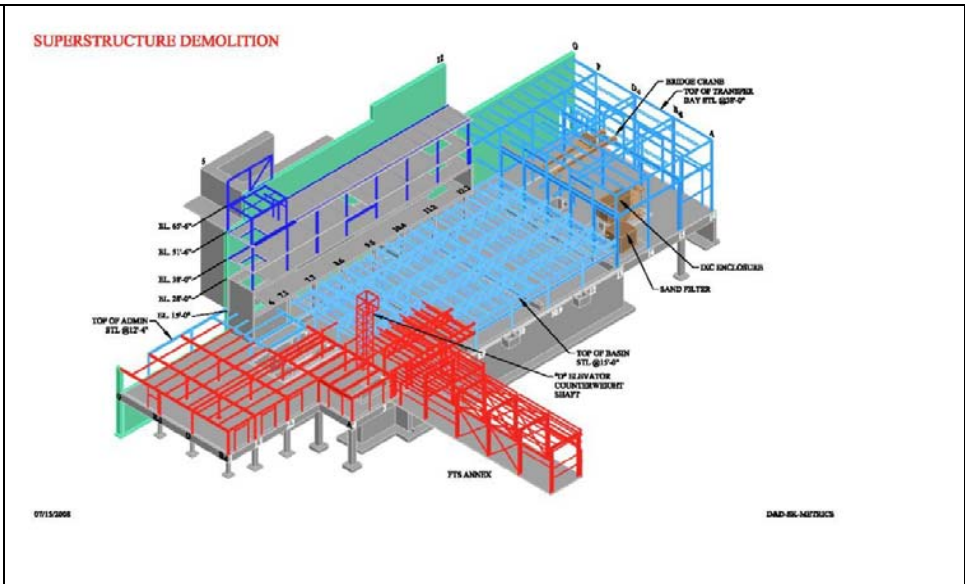
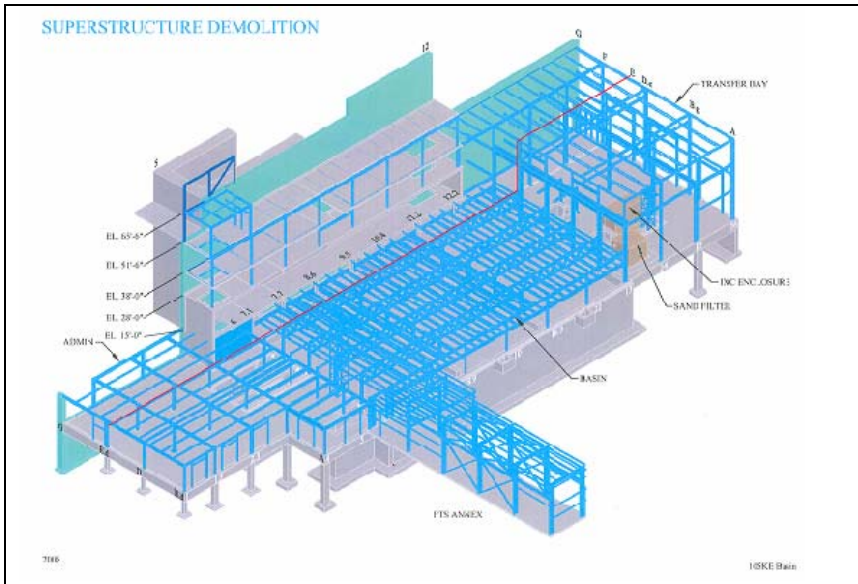


Fig. 2. 3D CAD images used as a part of the removal of Plutonium Finishing Plant Glovebox 227-S Process Equipment.



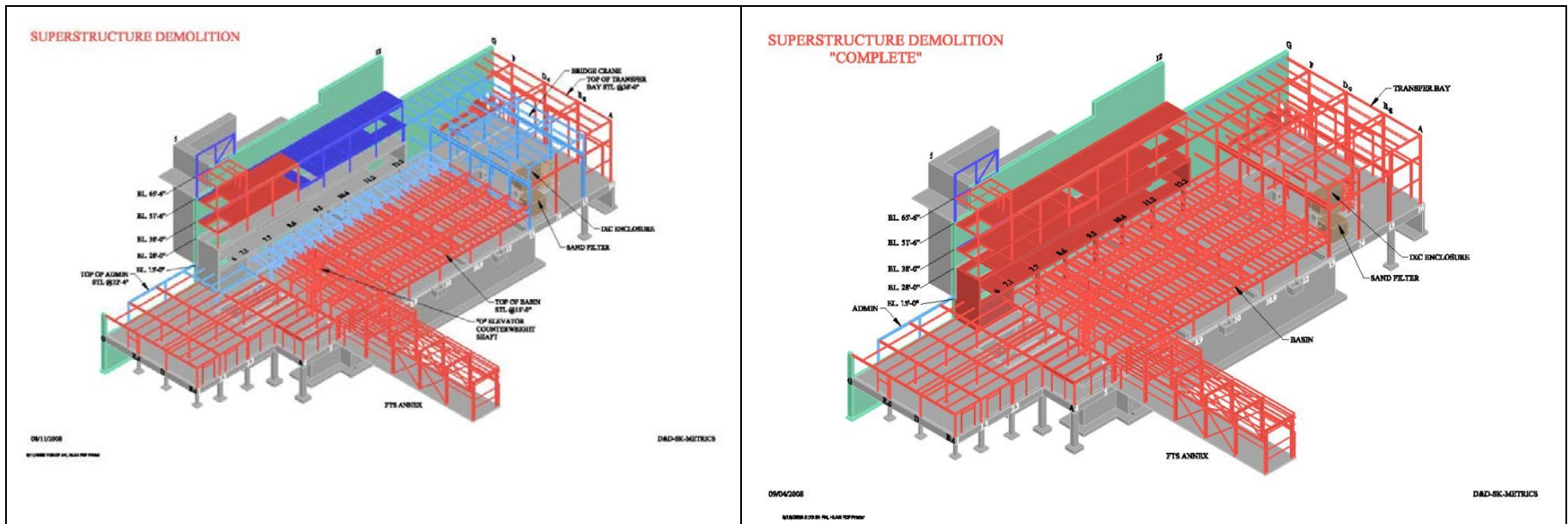


Figure 3. 3-D CAD Images used as a part of the KE Basin Superstructure Demolition process.

SUMMARY

The use of the Work Package Configuration Management Process in combination with 3-D CAD has allowed the CHPRC to accelerate the demolition of Category 2 nuclear facilities and components within these facilities. The tools are simple, readily available and easy to implement.

The WPCM process allows for the streamlining of documentation by eliminating redundant documentation/signatures. The process also allows for the early downgrade/removal of engineering drawings from the formal configuration baseline database, thus reducing the costs for maintaining/updating drawings for SSCs being D&D'd.

Three dimensional CAD models present D&D planners, engineers, and workers with scale level information about the SSCs being removed and provide a close to real-time metric that can be used for presentation to internal customers, senior managers, and clients.

REFERENCES

1. CH2MHill Plateau Remediation Contract Procedure PRC-PRO-EN-20050, *CHPRC Engineering Configuration Management*.
2. CH2MHill Plateau Remediation Contract Procedure PRC-RD-EN-1819, *CHPRC Engineering Requirements*.
3. CH2MHill Plateau Remediation Contract Procedure PRC-PRO-EN-2001, *Facility Modification Package Process*.