PROJECT PLAN
RASCHIG RING REMOVAL CERIUM TECHNOLOGY DEMONSTRATION (RCTD)

"371 Tanks "

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1. PLAN OVERVIEW

This document provides the Project Plan developed for the Raschig Ring Removal Cerium Decontamination Technology Deployment (RCTD).

This Plan provides the detailed description and work process flow for development of Integrated Work Control Packages (IWCP) and Integrated Safety Management Systems (ISMS) for the RCTD:

- Tank fogging
- Removal of Raschig rings
- Internal tank decontamination using cerium nitrate
- Design, build, and operate Cerium decontamination Cold Mock-up facility

An integrated activity screen was performed on the major activities as described above. The activity screen classified RCTD as a high planning effort with a score of 42. The screen is provided in Appendix 2.

1.1 RCTD OBJECTIVES

RCTD will be executed on a test set of six Raschig ring tanks in building 371. There are three objectives in this Project:

- Remove and disposition Special Nuclear Material (SNM) holdup by removing Raschig rings and sludge from tanks
- Test the applicability of cerium nitrate as a decontaminating agent to reduce internal tank contamination to SCO-2 levels
- Provide the Disposition Path forward for the remaining Raschig ring tanks in Building 371

1.2 SCHEDULE AND BUDGET

A detailed schedule was developed based on the WBS provided in Appendix 12.1. A key schedule milestone is to develop IWCPs to support Raschig ring removal of the first tanks to begin in the fourth quarter FY 00.

1.3 PROCESS FLOW DIAGRAMS

Detailed Process Flow Diagrams are presented in Section 2, *"Process Flow Diagrams":*

- Raschig Ring Removal/Cerium Decon: Standard work package/engineering design package process flow
- Cerium Decon Cold Mockup work package and EDP process flow
- Raschig Ring removal work package and EDP process flow
- Basis of Estimate and major activity structure

The Flow Diagrams presented in Section 2 generated a three level Work Breakdown Structure (WBS) that was incorporated into the Basis of Estimate (BOE). The WBS is presented in Appendix 1, *"RCTD WBS".* It provides the detailed line by line Process Flow including many of the specific work steps supporting each block in the Process Flow Diagrams. The WBS is an important tool in understanding the scope and breadth of this project.

1.4 BENEFIT RISK ANALYSIS

At the conclusion of this deployment, a Benefit Risk Determination will be performed on:

- The use of the cerium process for decontaminating the balance of the tanks in the Building. If the cost benefit of cerium decontamination is positive, a set of protocols will be developed defining

cerium concentrations/dilution strengths and the interface with the Caustic Waste Treatment System (CWTS).

- The use of fog as an initial decontaminating agent to reduce internal tank Derived Air Concentration (DAC), permitting a reduction in Personnel Protective Equipment (PPE) requirements.

Qualitative factors included in the Benefit Risk Analysis are described below:

A. Radiological Control: Validate the effectiveness of fogging; identify the prerequisites and the PPE requirements to perform work with soft sided containment and Positive Air Purifying Respirators (PAPRS); and without the use of breathing air or tents

B. Holdup: Validate historical holdup scan data against as found/as left conditions

C. RCRA: Determine RCRA constituency of sludge and any down stream treatment requirements

D. SCO: Determine whether decontamination technology is successful in reducing contamination levels on tanks and rings to Surface Contamination Only (SCO)

E. Encapsulation: Validate the effectiveness of instacoat/fire for internal tank decontamination

F. Tank Isolation: Determine optimum processes to physically isolate tanks/associated piping after completion of SNM and contamination removal, so that they do not have to be cleaned again prior to tank decommissioning.

1.5 ENDPOINTS

Deactivation Endpoints will be developed in the work package at three points in the Process Flow:

- Completion of Raschig ring removal
- Completion of sludge removal
- Completion of internal tank decontamination

The Endpoints for this Project will be set to the standards provided in the Building 371/374 Complex MAA/PA Closure Plan.

1.6 CWTS INTERFACE

The CWTS will be used to process spent decontamination liquids, including cerium, nitric acid, and water, and to provide thermal stabilization of sludge, as needed.

1.7 EM-50 FUNDING

EM-50 funding is supporting the decontamination (cerium and fog) elements of the RCTD. The EM 50 funding supports DOE's complex wide effort to develop transferable decontamination technologies that could reduce the cost of waste disposition.

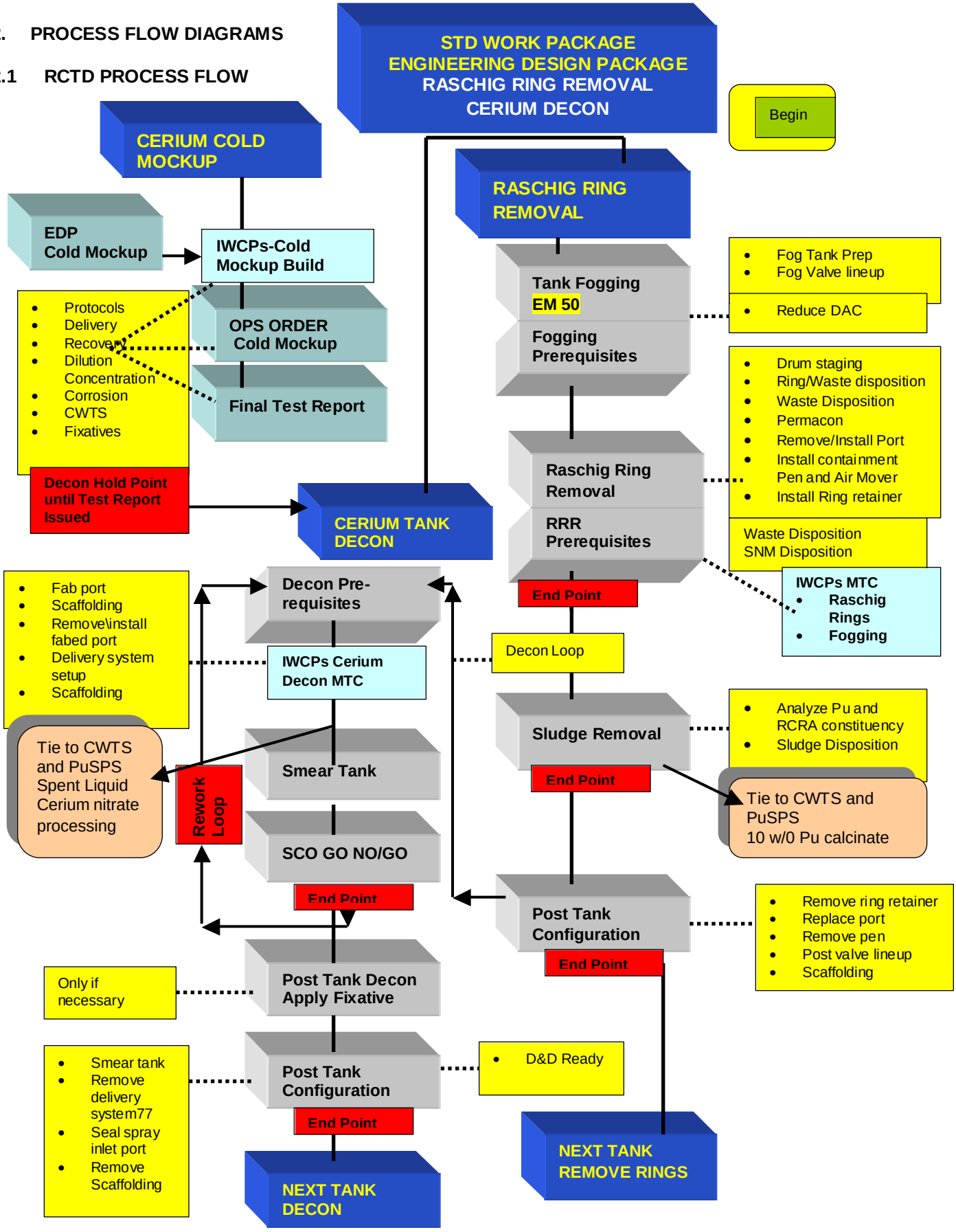
1.8 READINESS/NUCLEAR ACTIVITY TECHNICAL DATA SHEET

Appendix 3, Readiness/Nuclear Activity Technical Data Sheet (TDS), provides this screen. The information contained in TDS screen is derived from this document.

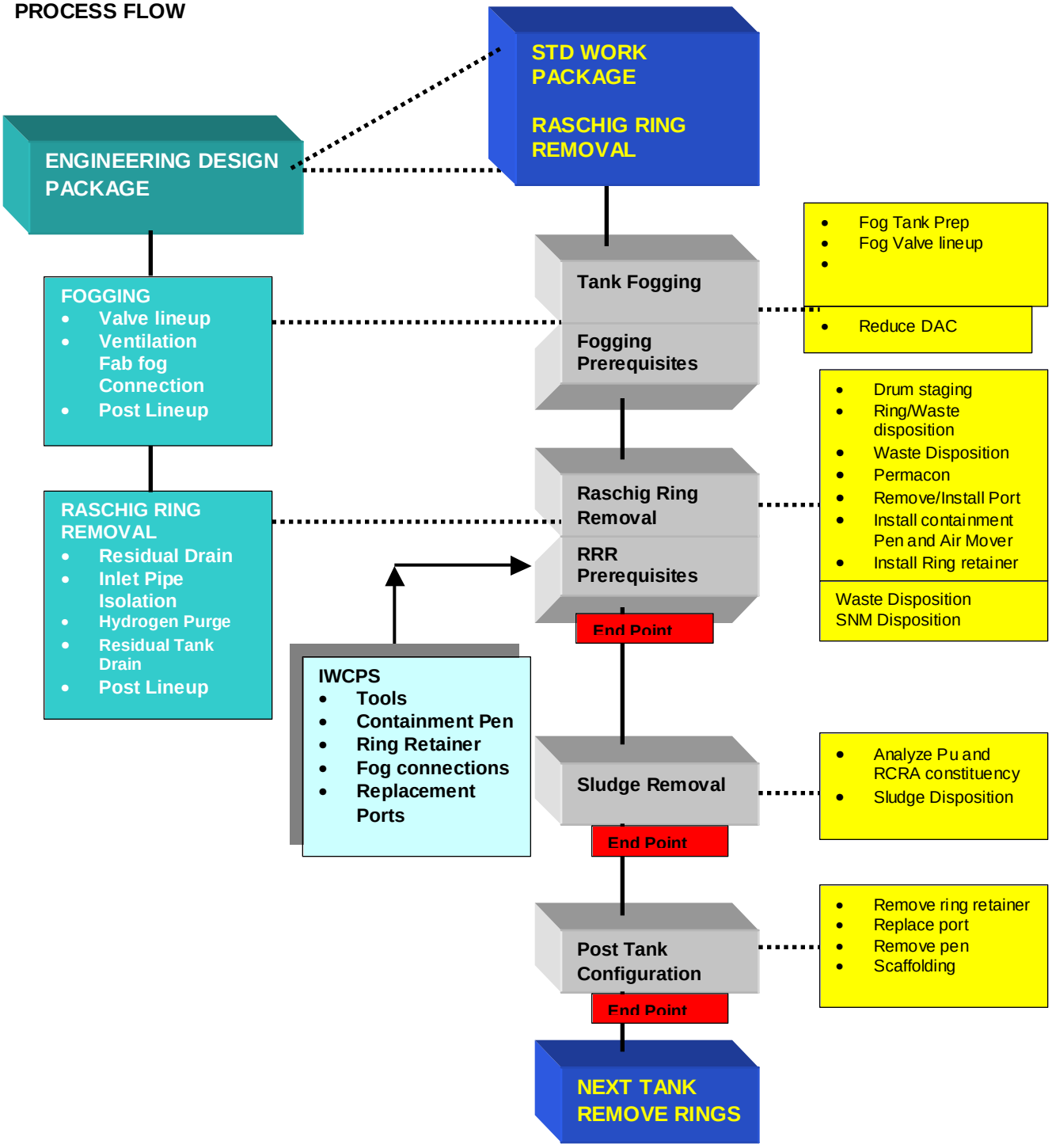
This project was screened against the current building Authorization Basis (AB), as documented in a letter dated May 30, 2000, from J. Kohler to B. Barbero ,*"Nuclear Activity Technical Description Sheet (TDS), Raschig Ring Removal- Cerium Decontamination".* This letter provides the justification for Authorization Basis with no changes required. Work will be performed within the programmatic requirements of the IWCP and is below the threshold of a Readiness Determination.

2. PROCESS FLOW DIAGRAMS

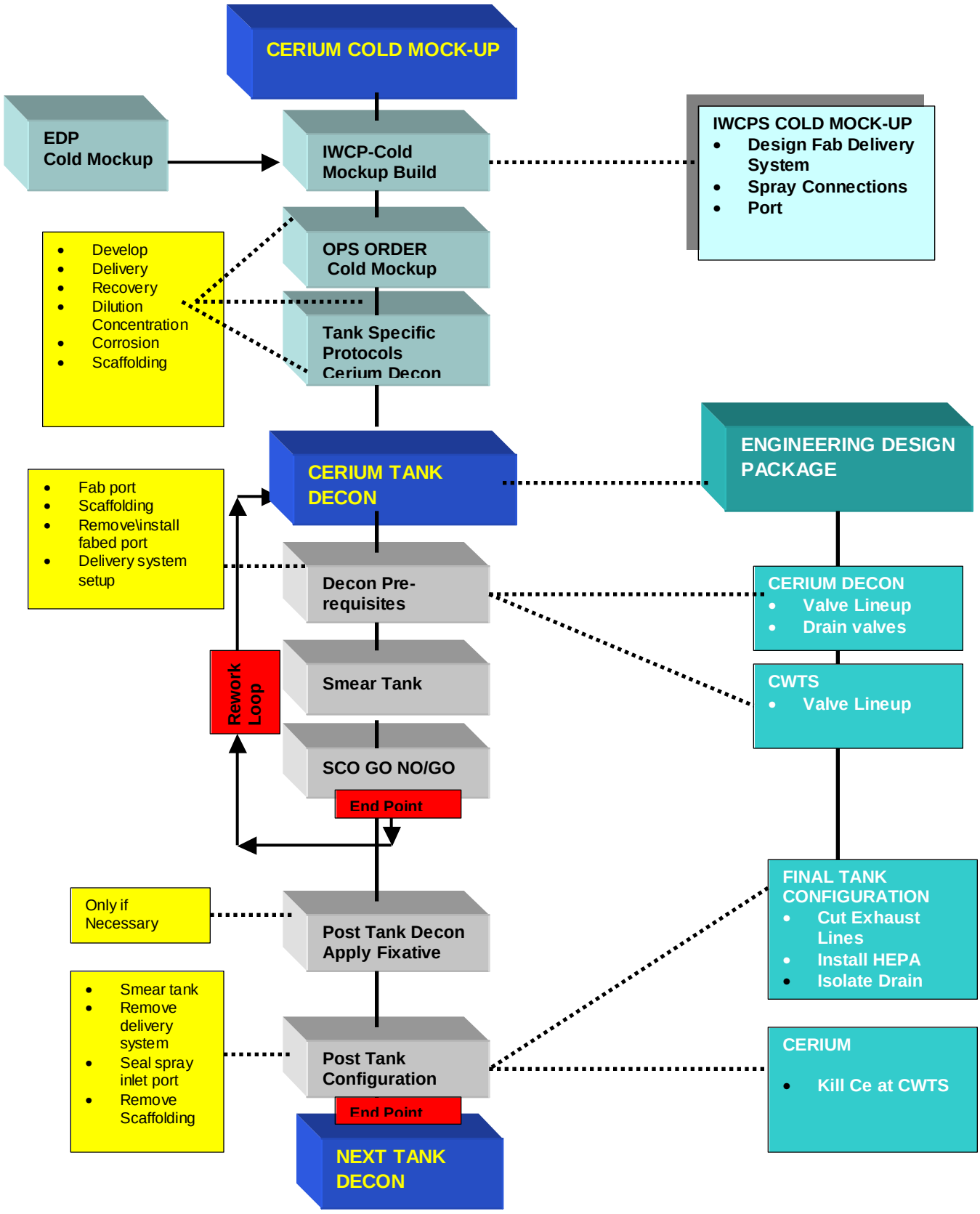
2.1 RCTD PROCESS FLOW



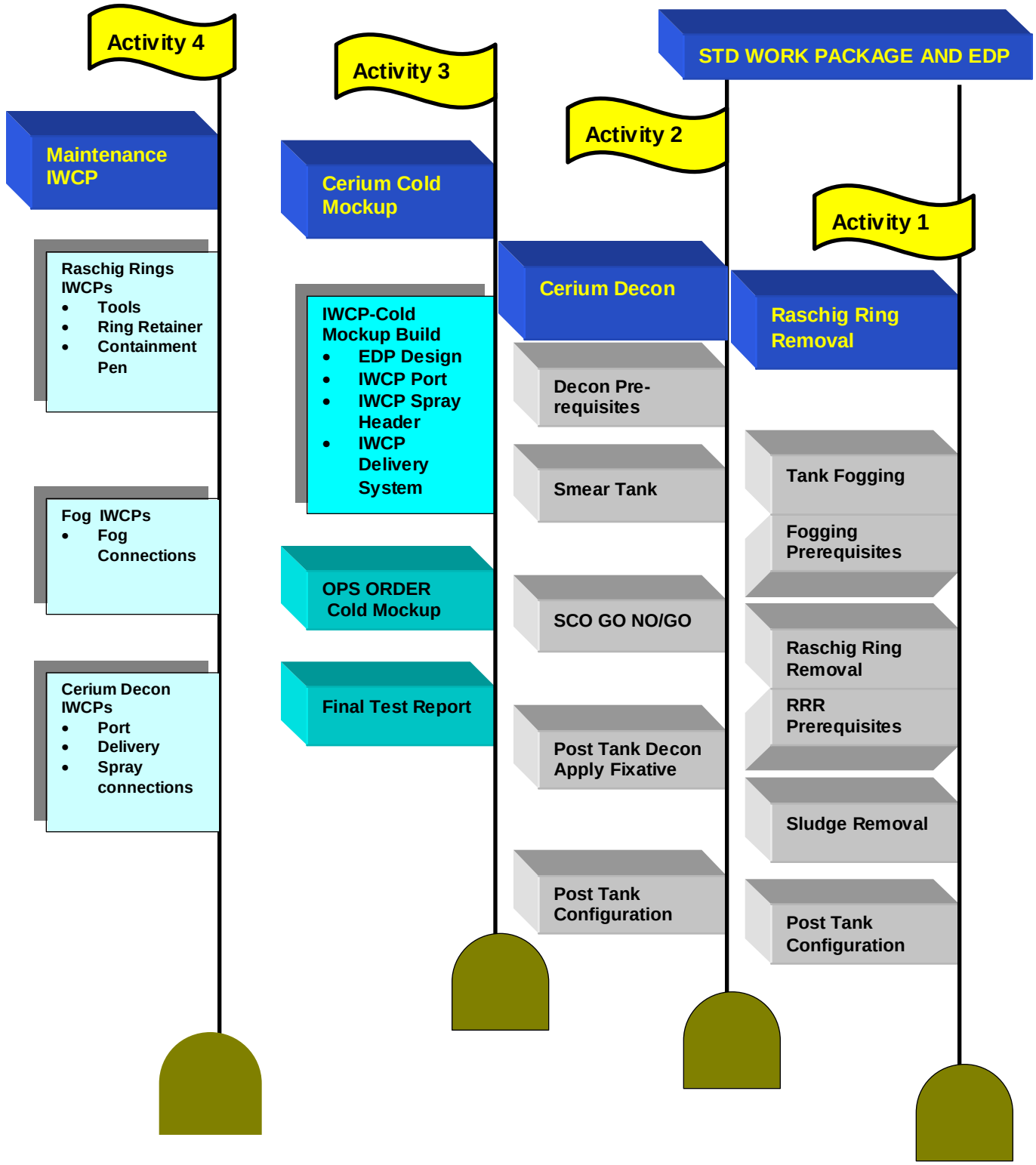
2.2 RASCHIG RING WORK PACKAGE/EDP PROCESS FLOW



2.3 CERIUM DECON WORK PACKAGE/EDP PROCESS FLOW



2.4 BOE ACTIVITY STRUCTURE



3. ORGANIZATION/TEAM CREDENTIALS

RCTD is managed as a major project within the Building 371 Facility Disposition Group. A core team of Subject Matter Experts (SMEs) reporting to the Manager, Building 371 Facility Disposition manages RCTD.

3.1 CORE TEAM

Table 1
RCTD Core Team

Name	Title/SME	Team Credentials
Joel Kohler	RCTD Project Lead	Credentials commensurate with KH requirements and responsibilities for Project Lead
Larry Martella	RCTD Project Engineer	Credentials commensurate with KH requirements and responsibilities for Project Engineer
John Wrapp	Responsible Manager/IWCP Building 371 Facility Disposition Operations	Credentials commensurate with KH requirements and responsibilities for Responsible Manager
Jeffry Bruner	Building 371 Radiation Protection	Meets current RFETS requirements for Radiation Protection
Marc Danna	Building 371 Nuclear Safety Analyst	Meets current RFETS requirements for Nuclear Safety Analyst
Warren Grant	Building 371 Maintenance	Meets current RFETS requirements for IWCP/SME
Ken Gillespie	Building 371 Industrial Hygiene and Safety	Meets current RFETS requirements for Industrial Hygiene and Safety
Scott Hofstetter	Building 371 Shift Manager	Meets current RFETS requirements for Shift Manager
Rick Moore	Building 371 Criticality Safety Officer	Meets current RFETS requirements for a Criticality Safety Officer
Clemente Alvarado Cheryl Rucker Mark Vogt	Foreman Building 371	Meets current RFETS requirements for Foreman
Will St. Jacques	Building 371 Work Planner	Meets current RFETS requirements for Work Package Planner
Sharon Usselman	Building 371 Material Stewardship	Meets current RFETS requirements for Nuclear Material Handling and Packaging
Mark Wiebe	Environmental SME	Meets current RFETS requirements for Environmental Protection

3.2 TRAINING

Operations will be performed by Rocky Flats Environmental Technology Site (RFETS) employees qualified as Process Specialists and Forman.

Cerium training will be conducted through operation of the Cold Mock Up facility.

Raschig Ring removal is considered within the skill of the craft. Lessons Learned training will supplement basic craft skill.

4. ACTIVITY SCOPE

The scope of the RCTD includes the following elements. Refer to Section 6, *"Process Flow Narratives"*, for detailed descriptions.

4.1 RCTD TANKS

RCTD TANKS										
Tank No	**Tank ID**	**Room No**	**PID**	**Size**	**Set**	**Scan Value**	**Gallons Rings**	**Tanks Material Composition**	**Tank Process**	**Drums**
1	D55A	3559	25151 -038	36"x 8'	2	moderate	75	SS 304	High level	5
2	D55B		25151 -038	36"x 8'		Negative	155		High level	5
3	D56		25151 -042	24"x 7'		Low	59		Low Level	2
4	D69A		25151 -047	30"x 6'		No data	81		Unknown	3
5	D69B		25151-047	30"x 6'		No data	81		Unknown	3
6	D69C		25151-047	30"x 6'		High	81		High holdup	3

All the tanks are located in room 3559. These tanks were selected for the following reasons:

- D&D: Room 3559 is a room that has an early tie to the D&D schedule. Finishing this room first permits D&D to have the room at the earliest possible date.
- Fogging: Campaigning all the tanks in one room reduces the amount of setup and removal time for fogging and room preparation.
- Draining: The drain team wants early access to this room.
- Cerium Decon: Campaigning all the tanks in one room facilitates reduces the amount of setup and removal of cerium decontamination equipment.
- The room provides a test bed for both high and low hold up tanks

4.2 FOGGING

A special fog designed to encapsulate contamination and reduce DAC levels will be used prior to removal of the access port.

4.3 RASCHIG RING REMOVAL

Ring removal will result in residual SNM removal and will proceed in accordance with its own criticality limits, material handling provisions, and waste generation instructions.

4.4 SLUDGE REMOVAL

Sludge removal will result in residual SNM removal and will proceed in accordance with its own criticality limits, material handling provisions, and waste generation instructions.

4.5 TANK DECONTAMINATION

In situ tank decontamination using cerium nitrate will be deployed to reduce the internal tank contamination level to SCO-2 after ring and sludge removal enabling the physical tank to be programmed for low level waste disposition.

4.6 SNM REMOVAL

Tank scans indicate the presence of residual SNM adhering to the rings and sludge. Ring and sludge removal will proceed in substantially the same manner as ring removal in accordance with criticality limits, material handling provisions, and waste generation instructions.

Accessible and attractive SNM will be removed in accordance with a removal process specified by Safeguards and Security whereby:

- SNM will be removed
- Material Control and Accountability steps will be performed
- Area scans will be performed
- SME concurrence will be obtained
- Rework will be performed
- SME /safeguards concurrence obtained

4.7 WASTE DISPOSITION

Disposition of all rings, sludge, and process liquids are addressed by this Plan. Liquids generated from the cerium nitrate operation will be processed by CWTS and are captured in CWTS scope and budget.

4.8 CERIUM DECONTAMINATION COLD MOCKUP

A cold mockup will be designed, built, and operated to determine the optimum cerium concentration/dilution factors, delivery/recovery systems, and corrosion rates related to nitric acid contact with stainless steel. Any schedule or cost risk associated with cerium decontamination will be reduced through operation of the cold mock up facility.

4.9 FREE LIQUIDS

Tanks included in the scope of this Plan were drained of actinide bearing liquids during the 1998 tap and drain campaign. The draining activity is covered by UAQD Number USQD-371-98.0868.

Tank draining of residual accumulated liquids after completion of Tap and Drain will be performed prior to Raschig ring removal in accordance with Tap and Drain Procedure PRO-253-TDSH-371. This procedure is included in the tap and drain USQD and is approved for use.

5. INTEGRATED SAFETY/WORK CONTROL PROGRAM

Refer to Section 6, "*Process Flow Narrative",* for detailed work scope and package descriptions.

Performing the work required to execute this Plan is managed in accordance with the principals of ISMS and reflects the high priority that DOE and RFETS place on performing work safely.

The RFETS Integrated Work Control Program Manual, Man-071–IWCP implements Integrated Safety Management System (ISMS) and provides detailed guidance on how the five steps of ISMS are to be conducted at RFETS.

The following Table provides the linkage between the five steps of ISM and RFETS IWCP.

Define the Scope	Work Control form Block A. See Appendix 2
Identify and analyze the Hazards	JHIT and JHA, See Section 7

Develop Controls	JHA See, Section 8
Perform the Work	
Feedback	Post Job Review, See Section 5

5.1 ACTIVITY SCREEN

An integrated activity screen was developed and performed on the major activities described in Section 1.1 above. The activity screen for RCTD scored 42, and RCTD is classified as a high planning effort, in accordance with the RFETS IWCP. The Activity Screen is provided in Appendix 2.

5.2 POST JOB REVIEW

In accordance with IWCP requirements for a high planning effort, a Post Job Review will be performed in order to develop Lessons Learned. A Post Job Review will be conducted each time the Standard Work Package is issued for the balance of the Raschig tanks in Building 371.

5.3 STANDARD WORK PACKAGE AND EDP

A Standard Work Package will be developed for disposition of RCTD tanks. The Standard Work Package will incorporate the four activity phases described below. An Engineering Design Package (EDP) will be developed for each room containing tanks to be included in the Raschig Ring removal campaign. The EDP will provide tank specific information for each tank in the room. The EDP will be incorporated into the Standard Work Package for the room being worked.

The Standard Work Package will be designed to uncouple Raschig ring removal activities from the cerium decontamination process. Raschig ring removal will proceed on its own schedule ahead of cerium decontamination. The Endpoint of the Raschig ring removal activity is a tank ready for cerium decontamination.

5.3.1 Fogging Activity

Included in Standard Work Package

5.3.2 Raschig Ring Removal

Included in Standard Work Package

5.3.3 Cerium Decon Tank Test

Included in Standard Work Package

5.4 IWCP COLD MOCK UP OPERATION

Separate IWCP with an EDP.

5.5 MAINTENANCE IWCPS

Individual IWCPs to support fabrication of tools, connections and ports.

6. PROCESS FLOW NARRATIVE

6.1 BACKGROUND

Building 371 contains approximately seventy large Raschig-ring filled tanks housed in multiple concrete rooms. These tanks were integral parts of the plutonium recovery operations that were conducted throughout the early ‘80s to recover impure plutonium metal, oxide, and other plutonium bearing compounds.

Plutonium recovery operations resulted in performing a series of wet and dry chemical processing steps directed at producing high purity plutonium. The tanks served as batching and staging points in the wet chemical process. In the first step, the materials were dissolved in nitric acid and kept in critically safe pencil tanks. These solutions were then pumped into or out of Raschig ring filled tanks where the

chemistry was adjusted. The Raschig ring tanks contained feed, effluent or eluate (purified plutonium stripped from the anion exchange columns with dilute nitric acid).

Liquids were then sent to anion exchange columns.

The tanks are cylindrical containers in a range of sizes from 3' – 10' in diameter and 5' – 12' in length, containing a ring volume ranging from 200 gallons to 4,000 gallons. The bulk of the tanks are stainless steel (SS304). There are several carbon steel tanks and fiber reinforced plastic (FRP) tanks.

Raschig rings are boron impregnated glass rings that have a high cross-section for absorption of thermal neutrons. Raschig rings provided criticality safety because the cylindrical tank design is not critically safe.

Raschig rings removal was conducted in Building 371 during plutonium recovery operations and recently in Buildings 776 and 886.

6.2 RASCHIG RING REMOVAL NARRATIVE

The following sequential steps summarize the major work processes:

6.2.1 Residual Tank Draining

The tanks were drained of actinide bearing liquids during the 1998 actinide liquid draining campaign and the RCTD tanks are classified as empty. Any residual liquid remaining in the tanks will be removed in accordance with approved Tap and Drain operations and processed via the CWTS. Residual liquid remaining on the rings will be absorbed with oil dry during the ring removal steps**.**

6.2.2 Hydrogen Purge/Venting

Tanks associated with this activity are vented and have remained vented since completion of actinide liquid draining. They are assumed to be free of explosive concentrations of hydrogen as the result of the actinide liquid draining process that removed liquids and entrained hydrogen**.**

However, to further address any remaining concerns about hydrogen generation, the tanks will be vented and purged through a flow path from an open isolation valve at the bottom of the tank, with vacuum supplied by an air ejector pump. During RCTD operation, the tanks will be vented through the process vent system to provide a negative pressure on the tank for contamination control and worker safety.

6.2.3 Fogging

A process called "Fogging" will be validated for in-place Tank decontamination. The rings will be fogged to affix contamination on the rings and tanks to control contamination and exposure to the workers. This will be performed as a prerequisite to ring removal.

The EDP will specify connection points for introduction of fog into the tanks. A special decontamination fog will be introduced into tanks through a specified valve lineup using technology provided by Encapsulation Technologies prior to RCTD work steps.

Fogging has been shown to dramatically reduce DAC levels in Building 371 room decontamination activities and can reduce the requirements for PPE. Fogging will be validated for in-place Tank decontamination.

Fogging will be included in the Standard Work Package and will be implemented through an Engineering Design Package (EDP) that specifies valve line-ups for introducing the fog into the tank, and provides the inlet/ outlet paths for the fog. This may include valve isolations of inlet lines and ventilation adjustment, which requires input and support from Utilities personnel.

6.2.4 Tank and Room Preparation:

This process includes the following activities.

- Erecting Permacon as an entry point for personnel and drums
- Room cleanup and bag-in and bag-out operations of trash and commodities
- Drum staging installation

- Installation of ring retainer, containment pen and port removal
- Utilities adjustment for correct tank venting
- Performance of pre-scans

6.2.5 Tank Isolation

The Tanks will be physically isolated from any supply lines that could introduce unanticipated liquids into a Tank.

6.2.6 Raschig Ring Removal

Raschig rings are boron impregnated glass rings that are introduced into fissile bearing solution tanks during previous operations. Raschig rings are designed to provide criticality safety for tanks that do not have a criticality safe geometry.

Prior to ring removal activities, all lines that could supply inadvertent liquid to the tanks will be physically isolated.

Raschig rings will be removed from Building 371 tanks of different sizes, material compositions, and process histories in accordance with approved IWCP and material and waste removal provisions. Special tools and ring retainer rings will be used. Tools and methods used for ring removal have been utilized on the site within the past six months.

Craft personnel will install a temporary flange on the bottom port of the tank enabling the rings to drop into five-gallon poly bottles. Poly bottles are used in order to eliminate the possibility of bag tears due to broken glass rings. The CSOLs and the criticality safety evaluation for this project permit five gallon bottles because the rings are contaminated but not fissile material.

Bottles will be enclosed in double bags.

Once the bag-out bag is filled to a specified level, it will be removed from the retainer ring, sealed with plastic tape, and packaged in either 30-gal or 55-gal drums and/or standard waste boxes as specified by approved waste generation instructions.

The number of Raschig rings per bag-out bag and the number of bags placed in a drum will be performed in accordance with Criticality Safety Engineering guidelines and material handling consideration addressing drum weights and gram limits.

Raschig ring removal will be included in the Standard IWCP. Tank specific requirements will be addressed in the EDP. The Standard Work Package will authorize maintenance work required, such as removing ports and level sensors, installing the ring retainer, instruction for draining residual liquid, purging of hydrogen, erecting containment pens/tents, erecting scaffolding, removing rings and sludge, sampling of sludge, ring and sludge disposition, re-installing ports, and cleanup. The room EDP will define Lock Out /Tag Out (LO/TO) of electrical systems, valve line-up for draining residual liquid and hydrogen purge, isolation of valves, and post valve configuration.

6.2.7 Sludge Removal

Sludge is the accumulated residue remaining in the bottom of a tank after the conclusion of successive drain and fill operations and material precipitation. Sludge removal will proceed in substantially the same manner as ring removal in accordance with its own criticality limits, material handling provisions, and waste generation instructions. The sludge will be contained in four liter wide mouth bottles. Prior to packaging it will be thermally stabilized if the Pu concentration is greater than 10-w/o%.

The Endpoint for Raschig ring/sludge removal is a tank that is ready for internal tank decontamination using cerium nitrate.

Sludge removal will be included in the Standard IWCP. Tank specific requirements will be addressed in the EDP.

6.3 COLD MOCKUP

A cold mockup will be constructed in Building 371 to validate deployment of cerium technology as a method to reduce tank contamination levels to Surface Contamination Only (SCO), permitting more efficient and cost effective final material disposition. The scope of this project is to define and design equipment for decontamination of tanks and provide parameters for success.

The Cold Mock-Up will address tank preparation, cerium concentrations, delivery mechanisms/rates, recovery system, CWTS processing, corrosion rates and fixatives. The output from this activity will be a set of cerium protocols and related Engineering Orders (EO) to perform cerium decontamination of RCTD tanks in Building 371.

> The cerium is an acid wash that is introduced into a tank. The acid etches contaminated material and tank surfaces, removing surface and substrate contamination.
>
> The cerium waste stream is chemically reduced then drained and sent to the Building CWTS for processing and disposition. Acid residue remaining in the tank is steam cleaned and/or water washed, drained, and sent to CWTS for processing.

The work steps incorporated into the Cerium Decontamination Protocols are designed to minimize the amount of liquid generation requiring processing by CWTS. For this reason, the tanks will not be filled with cerium solution, but rather washed under high pressure using a specially designed spray header.

The cerium decontamination process will remove residual Plutonium (Pu). Specific Criticality Safety Operating Limits (CSOLs) for the cerium process will be in effect.

The Cold Mock-Up facility will be operated under an Operations Order.

IWCPs and an EDP will be used to design and build the Cold Mock-Up facility. An Operations Order will provide instruction for cold tank testing that includes installation of equipment from design. One IWCP will be required for each of the following: 1) equipment design (nozzle and delivery system), 2) maintenance port/nozzle fabrication.

6.4 CERIUM DECONTAMINATION

This activity provides the working details to decontaminate tanks after ring removal, using a sprayed solution of cerium (IV) in nitric. The Standard IWCP will address maintenance work to remove the tank port and install a prefabricated port with a spray nozzle and delivery system. The EDP will provide instruction for erecting scaffolding, solution volume requirements (Ce and wash), valve line-up to CWTS, solution adjustment, post operating instruction for isolation of the tank from the vent system with a High Efficiency Particulate Air (HEPA) filter, cut and cap of the drain line, and sealing of the nozzle penetration.

The Endpoint of Cerium decon is a tank ready for D&D.

6.4.1 Tank Preparation

Prerequisite activities for cerium decontamination include:

- Drum moves
- Lighting adjustment
- Installing scaffolding, if required
- Flange removal
- Spray header flange installation
- Valve lineups

6.4.2 Cerium Decontamination Performance

Cerium decontamination will be performed on a test group of six tanks that have previously been drained and Raschig rings removed. Prior to introducing cerium nitrate liquid, (a moderator) a tank scan will confirm that any residual holdup is below the threshold for criticality safety.

A rework loop is included in this step. Rework will be based on a negative SCO determination.

6.4.3 Post Tank Decontamination

After decontamination the tanks will be sampled and scanned to determine the decontamination levels achieved. Any rework will be performed in this step as described below:

- Sampling
- Smearing
- Rework
- Applying fixative

6.4.4 Post Tank Configuration

The final steps will put the tank in a post decontamination configuration that will be decommissioning ready. These steps will include:

- Installing a HEPA vent, if required
- Tank isolation of vent and drain lines
- Final scans and safeguards concurrence

6.5 MAINTENANCE IWCPS

Approximately ten individual IWCPs will be developed for the design and fabrication of tools, fittings, ports and connections.

7. HAZARDS ANALYSIS

The performance and completion of the proposed activity will not alter or affect the performance of, or automatic control function of, any safety system or component credited in any accident analysis.

As a starting point in the hazard assessment performed for the RCTD, the nuclear safety screen for the Raschig ring removal job performed in Building 776 was reviewed. The operations manager and an SME familiar with their job were also interviewed. When screened against RCTD, it was determined that the hazards associated with the Building 371 Raschig ring/sludge removal campaign are the same as those encountered in Building 776.

The hazards are grouped into the following categories:

- Radiation dose
- Release of free liquids
- Lifting
- Pinching or cutting hands/fingers
- Fire
- Criticality

7.1 PERSONNEL CONTAMNATION/MATERIALREALEASE

Performance of the proposed activity is one that presents a potential for personnel contamination. The most significant job hazard is skin contamination due to cut gloves, and skin cuts from broken glass rings.

This hazard will be mitigated through the use of five-gallon ploy bottles. The poly bottles will be the primary containment glass rings prior to insertion into bag out bag.

Contamination controls will be implemented as part of the work process to minimize this risk and provide a reasonable level of control. Skin contamination will be addressed through specific work steps prohibiting, without prior approval of the job site supervisor, reaching into the tank with gloved hands to remove rings.

Rings and sludge will be contained in poly bottles prior to bag containment to minimize problems with cut gloves. Rings will be handled with log and short handled tools.

Consequences, both direct and indirect, could lead to the possible release and/or spread of contamination. Proper performance of radiological surveys and compliance to the specific detailed instructions and procedural controls within the Work Package will address immediate worker hazards associated with the performance of the proposed activity.

7.2 JOB HAZARDS ANALYIS

A cross-functional team of SMEs will assess Job Hazards. Appropriate controls will be incorporated into the Work Packages and pre-evolution briefings that are required by IWCP.

Batching and delivery of cerium nitrate involves the handling of nitric acid. Raschig rings will also have residual nitric and caustic on them. Nitric acid presents an industrial hazard to the worker. Because nitric acid is used throughout the building, hazards are well understood and will be addressed in specific work steps in the Work Package.

Ventilation on the tanks will be adjusted to produce a negative pressure inside the tank with respect to room pressure. Upon removal of the port, hands and arms could be sucked into the open tank port if the differential pressure is too high. This hazard will be addressed with specific work steps, precautions and limitations.

7.2.1 ALARA

ALARA issues will be addressed through three specific measures:

- Room and tank differential pressure adjustment
- Fogging of the tank to reduce DAC prior to port removal
- Use of PPEs. The expectation is that airborne concentrations in the room will be significantly reduced from prior fogging to permit the use of PAPRs rather than supplied air.

7.3 MATERIAL AT RISK DISCUSSION

The maximum amount of material that could be at risk during the proposed deactivation activity is estimated to be less than two Kgs of material across all tanks. This value will be cross checked against final scan data and removed material will be controlled through the Building Material Control and Accountability Program. Previous scans indicate that many of the tanks have little or no holdup.

7.4 RASCHIG RING/SLUDGE REMOVAL

The ring/sludge removal process requires handling fissile material. Sludge and rings will have specific CSOLs established by Criticality Engineering. Written limits of all operations involving fissile material will be obtained from Criticality Engineering prior to startup. Current limits will be obtained and posted in the work area by line supervision. A Criticality Safety Engineer will audit each area or operation in which fissile material is handled, stored, or transported. All fissionable material will be handled/packaged in accordance with approved CSOLs, and previously reviewed, evaluated, and approved procedures, requirements, and Technical Safety Requirements (TSRs).

Tanks in the RCTD were drained of actinide bearing liquids during the 1998 tap and drain campaign. Since that time the tanks have remained vented and isolated to all liquid sources. The contents of the tanks are Raschig rings and a plutonium bearing sludge layer.

Because no plutonium solutions are present, the rings in the tank are not necessary to provide criticality safety and can be removed. Removal of the rings will be controlled under a separate CSOL. Rings will be removed and contained in 5-liter poly-bottles prior to insertion into standard 55-gallon drums.

No organic chemical concerns associated with the ring/sludge removal are anticipated because the tanks never received organic solutions.

Non-Destructive Assay (NDA) will be incorporated into the work process prior to loading a drum with the contents of an RCTD tank that had a scan value greater than 200 grams.

7.5 HYDROGEN

Tanks associated with this activity are vented and have remained vented since completion of actinide liquid draining. They are assumed to be free of explosive concentrations of hydrogen as the result of the actinide liquid draining process, which removed liquids and entrained hydrogen. However, to further address any remaining concerns about hydrogen generation, the tanks will be vented and purged through a flow path from an open isolation valve at the bottom of the tank, with vacuum supplied by the process vent system. During Tank/SNM removal, the tanks will be vented through the process vent system to provide a negative pressure on the tank for contamination control and worker safety.

Upon completion of the Tank/ SNM removal process, the tanks will be configured for cerium decontamination.

7.6 FREE LIQUIDS

Free liquids were drained from the tanks during the tap and drain campaign. However, free liquids will be reintroduced into tanks during subsequent SNM/Tank removal activities through draining reagent lines, acid, and process water lines that are plumbed into certain tanks.

Acid/Reagent/Water line draining will be accomplished under a separate IWCP covering draining of non-actinide liquid lines within the Tap and Drain campaign.

Any residual liquid remaining in the tanks will be removed per approved tap and drain operations and processed via the CWTS. Residual liquid remaining on the rings will be absorbed with oil dry during the ring removal steps.

7.7 CERIUM NITRATE DECONTAMINATION

Cerium IV is a heavy metal and will generate Resource Conservation and Recovery Act (RCRA) regulated waste. There are no criticality safety issues associated with using cerium other than moderation of residual SNM in the tank remaining after ring/sludge removal.

Cerium nitrate decontaminate will not be introduced until all rings and sludge are removed for the tank. Once the rings and sludge are removed, there are no remaining criticality safety issues, except from the presence of any residual material remaining in the tank.

Because cerium nitrate is a liquid, it could provide moderation of any residual neutron population if it were introduced before the Pu bearing sludge layer is removed.

CSOLs will control the introduction of cerium nitrate into an empty Raschig ring/sludge tank. Delivery of the cerium nitrate solution will be based on confirmatory scans that indicate that residual tank activity is below the threshold for criticality safety

Nitric acid is corrosive to metal and produces hydrogen. The concentration of nitric acid used in the decontamination process will etch several mills of metal surface material. Because the tanks and drain lines are composed of thick walled steel, no safety hazard is envisioned. Any hydrogen generation will be continuously vented off.

7.8 FIRE

No hot work is planned and no grinding is expected.

7.9 WASTE GENERATION

Waste generated during performance of the proposed activity will be packaged and transported in accordance with existing approved RFETS regulations and procedures.

8. SAFETY SCREENS

8.1 AUTHORIZATION BASIS-USQD

No changes are anticipated. However, an Un-reviewed Safety Question Determination (USQD) on this activity for the work packages developed will be performed against the Building 371 Basis of Interim Operations (BIO) as listed in the Authorization Basis (AB) Documents list prior to performing the activity to ensure that it is properly bounded. Any changes to the BIO that are required will be incorporated through immediate page changes, annual updates, or other approved means.

A page change will be requested to include Raschig ring removal and cerium decontamination as an identified activity.

8.2 READINESS SCREEN –NUCLEAR ACTIVITY TDS

This Project was screened against the current building AB, as documented in a letter dated May 20, 2000, from J Kohler to B. Barbero, *"Nuclear Activity Technical Description Sheet (TDS), Raschig Ring Removal-Cerium Decontamination".* This letter provides the justification for authorization basis with no changes required. Work will be performed within the programmatic requirements of the IWCP and is below the threshold for a Readiness Determination.

8.3 RADIATION PROTECTION

A key part of the planning for this project is that DAC will be reduced from fogging to permit use of PAPRS rather than supplied air. If breathing air is required, the job will require significant revision and the schedule will push out.

Radiological Engineering will develop the following work control documents:

- RWP for Raschig ring and cerium decontamination
- ALARA job review for each room containing Raschig ring tanks
- Personnel Protection Equipment (PPEs)
- Room ventilation requirements and initial conditions

8.4 JOB HAZARD ANALYSIS

Industrial Hygiene and Safety (IH&S) will develop the Job Hazards Analysis (JHA) using the Job Hazards Integrated Tool. The results will be to incorporate provisions into work control steps.

8.5 ENVIRONMENTAL CHECKLIST

The SME for Environment will develop the environmental checklist. The results will be to incorporate provisions into work control steps.

9. MATERIAL HANDLING

Material generation and waste removal generally conforms to Transuranic (TRU) Waste and will be programmed for disposition at the Waste Isolation Pilot Plant (WIPP). Handling rings and sludge involves routine bag out operations, NDA, and drum packaging in accordance with approved waste generation instructions.

9.1 ITEM DESCRIPTION CODES (IDCS)

- Rings IDC 443
- Sludge IDC 533

- Contaminated Light Metals IDC 480
- Line Generated Dry Combustibles IDC 330
- Plastic IDC 337
- Line Generated Wet Combustibles IDC 336

9.2 MATERIAL PROCESS STEPS

9.2.1 Work steps

See WBS Appendix 1.

9.2.2 Waste Generation Instructions (WGIs)

WGIs will be developed for each IDC within the project scope. Material removed from the tanks will be packaged in accordance with WGIs developed for each IDC.

9.2.3 Material Accountability

NDA will be required for each container of rings and sludge from any tank that has an initial scan value greater than 200 grams.

Full drums will be counted prior to disposition.

Material Data Sheets (MDSs) will record the values of all scans.

9.2.4 Thermal Stabilization

SNM greater than 10 w/o Pu content will be transported to CWTS for thermal stabilization prior to transfer to the Plutonium Stabilization and Packaging System (PuSPS).

10. CRITICALITY EVALUATIONS

TANK	EVALUATION	REAGENT DRAINING	CONTAMINATION FIX, RING AND SLUDGE REMOVAL	STATUS (10/18/99)
D55A/B	BSM-590 R1	Yes	Yes	In Place
D56	BSM-590 R1	Yes	Yes	In Place
D69A/B	BSM-590 R1	Yes	Yes	In Place
D69C	RAR-03	No	Yes	In Place
2M HNO_3/ Ce +4,	NMSL-00-044	Yes	Yes	In Place

11. PROGRAM INTERFACES AND REFERENCES

SAFETY MANAGEMENT	PROCEDURES PROGRAMS AND CONTROLS
Raschig Ring Removal, Building 371.	PRO-707-RRR-371, *Raschig Ring Removal, Building 371 incorporated into the standard work package*.
Tap and Drain Procedure	PRO-253-TOSH-371
CWTS Operation	4-U84-CO-6090
Fogging Procedure	PRO-715-FOG-371
	HSP 31.11, *"Transfer and storage of Plutonium for Fire Safety",*

Fire Protection	
SNM Accountability	Plan to Close Building 371/374 Complex MAA/PA
Glovebox Operability	4-V45-GLBX-SURV
	4-97-GLB-MTCE

12. APPENDICES

12.1 APPENDIX 1 RCTD WBS

12.2 APPENDIX 2 WORK CONTROL FORM AND ACTIVITY SCREENING FORM

12.3 APPENDIX 3 READINESS SCREEN (TECHNICAL DATA SHEET

12.4 APPENDIX 4 COMMODITIES LISTS

12.5 APPENDIX 5 CERIUM NITRATE VOLUME ESTIMATES