DWPF Supplemental Data Request

1. Documents related to why security and safeguards will not be required at DWPF
    - M&O-NMM-2007-00039
    - SEO-MCA-2007-00105
    - SEO-FOM-2007-00214
2. Documents related to scope of work required to support the PDP related to CIC
    - C-SOW-S-00003
    - Att1_Sht 2 of 2
    - Att2_Sht 1 of 5
    - Att2_Sht 2 of 5
    - Att2_Sht 3 of 5
    - Att2_Sht 4 of 5
    - Att2_Sht 5 of 5
    - Att3_Equipm Matrix
    - Att1_Sht 1 of 2
3. DWPF CIC Time Motion Study
    - G-ESR-S-00019_RO
4. Original Options Study for Processing CIC's Through DWPF
    - M&O-PUD-2006-00091

**WASHINGTON SAVANNAH RIVER COMPANY**
INTEROFFICE MEMORANDUM

M&O-NMM-2007-00039

RSM Track # 10561

February 27, 2007

**TO:** J. R. LUDWICK, 703-42A

**FROM:** ERIC FITZGERALD, 717-K

## TERMINATION OF SAFEGUARDS ON VITRIFIED SPECIAL NUCLEAR MATERIAL

Ref: 1. *Bagless Transfer Rollup Analysis (U),* SEO-FOM-2007-00217, dated January 31, 2007
2. *Material Termination Security Analysis (U),* SEO-FOM-2007-00214, dated January 31, 2007

The purpose of this letter is to describe the Plutonium Disposition Project request to terminate Safeguards on approximately 21 Metric Tons of vitrified Special Nuclear Material (SNM), Attractiveness Level D material, produced by the proposed Plutonium Disposition (PuD) Facility. The formal request will be forwarded as part of the project Conceptual Design Review (CDR) submittal in June, 2007. The project proposes to terminate safeguards on each individual waste canister as it leaves the Material Balance Area (MBA) boundary within the K-Area Complex (KAC) enroute to the Defense Waste Processing Facility (DWPF). The projected dates for the transfers are from CY 2013 to 2019, with a projected transfer rate of a minimum of three canisters a week.

**Background:** The United States of America and Russia agreed to dispose of 50 Metric Tons of surplus weapons-useable Plutonium (Pu) in 1995. The Mixed Oxide Facility (MOX) facility will process 34 Metric Tons of the surplus Plutonium. Approximately 4 Metric Tons have been identified for programmatic use. Up to 13 Metric Tons of the surplus Plutonium in 3013 storage containers can not be processed by the Mixed-Oxide Fuel Facility (MOX) because of its isotopic composition and/or the type and amount of impurities. The inclusion of the impurities total up to 21 Metric Tons of material requiring vitrification. Alternative technologies were studied and vitrification at the Savannah River Site (SRS) was determined to be the most suitable disposition path for the surplus Plutonium with impurities. (Attachment 1)

**Description of Facility Process:** The PuD facility will receive Pu feeds in both metal and oxide forms. The end product is a can containing lanthanide borosilicate glass that immobilizes the weapons-useable Pu oxide and impurities. This immobilized Pu form is borosilicate glass similar to the DWPF product and should be suitable for disposition in a federal radioactive waste repository using can-in-canister technology.

Metal feeds will be oxidized prior to vitrification. The Pu oxide will be size reduced to a powder form. The glass is produced by mixing approximately 1 kilogram Pu oxide with 9 kilograms glass frit and melting the homogeneous mixture in an induction melter. The molten glass is poured into cans, allowed to cool then placed inside Bagless Transfer Cans and sealed with a mechanical weld. Bagless Transfer Cans are then loaded into magazines to facilitate loading into a DWPF canister. The baseline configuration specifies that 4 cans containing the vitrified Pu form are placed in each 87 inch long magazine, and 7 magazines are placed in each DWPF canister for a total of 28 glass cans.

After transport to the DWPF, the canister containing the immobilized Pu form is then filled with additional high-level waste borosilicate glass to complete the process and produce an assembly suitable for repository disposal.

The projected schedule for transfer of the material from the KAC to the waste organization at DWPF is a minimum of 3 canisters a week, over a period of 6 years (2013 to 2019).

The SNM concentration in each Bagless Transfer Can is approximately 1 kilogram Pu oxide and 9 kilograms glass frit (10 wt%); Category IV, Attractiveness Level D material. Since the DWPF canisters contain 28 Bagless Transfer Cans, the each canister will contain a Category II, Attractiveness Level D material. The Attractiveness Level D material received at DWPF will be transformed to Attractiveness Level E material by virtue of the DWPF process (i.e., encapsulating the Pu Vit cans in additional DWPF glass).

The amount of special nuclear material will remain within the limits for Category IV within each Bagless Transfer Can. A more detailed description of the pertinent process follows:

Each batch can contains less than 2 kg Pu oxide, validated by mass measurement, destructive and non-destructive analysis. Sample analysis provides purity data; for relatively pure Pu, then the resulting Bagless Transfer Can will contain < 950g Pu. If there are impurities, the maximum amount of Pu will be <884g, with a minimum of 750g Pu. Once the results of the sample analysis are determined to be within specification, approximately 18 kg of glass frit material is added to the batch can. The entire contents are dumped into an attritor mill, and the mix is milled down to a homogeneous mixture less than or equal to 20 microns. The feed mixture is divided into two transport hoppers; each receives another mass measurement to ensure the hoppers contain no more than 10 kg of Pu oxide/glass frit. Each Bagless Transfer Can will receive a final mass weight and Non-destructive Analysis (NDA) measurement to ensure the final product is within program specifications, and for an accountability measurement.

It is not feasible to reduce the weight % of the Pu down to the limits required for Attractiveness Level E prior to transport to the DWPF without incurring major additional costs to the Pu Disposition project, to the DWPF to establish the controls necessary to protect and store accountable nuclear material, impacting the storage capacity in both KAC and DWPF, and a multi-year extension to the current DWPF life cycle.

An analysis was conducted to determine if it is credible for the output from Bagless Transfer (Category IV, Attractiveness Level D material) to rollup to a higher Category. In *Bagless Transfer Rollup Analysis (U),* SEO-FOM-2007-00217, dated January 31, 2007, the analysts concluded that "it is not credible to rollup this Category IV "D" material to a Category II "D" quantity. (Reference 1)

Per DOE M 470.4-6 Paragraph A.I.1.q (1), Safeguards can be terminated on Attractiveness Level E material that has been determined by DOE line management to be of no programmatic value to DOE, the radiological sabotage risks have been evaluated, and the material has been transferred to the control of a waste management organization. Further, in Paragraph A.I.1.q (2), termination of safeguards for material of attractiveness level D or higher must be approved by the DOE Department Element, in this case, EM. When disposal of a SNM quantity Category II or greater is being considered, a security analysis for the theft or diversion of the material must be performed.

The required security analysis has been conducted, in which the potential for radiological sabotage and credibility for theft or diversion of material was evaluated. In *Material Termination Security Analysis (U),* SEO-FOM-2007-00214, dated January 31, 2007, the analysts concluded that "radiological sabotage is not credible and theft or diversion is not credible". (Reference 2)

The second condition for terminating safeguards (DOE M 470.4-6 Paragraph A.I.1 (q)(1)(b)) is a determination by DOE line management that the material has no programmatic value to DOE. The DOE identified the need to establish a capability to disposition Plutonium without an identified path, and Washington Savannah River Company (WSRC) was directed to commence with the Alternative Analysis/Conceptual Design phase of the project. Savannah River Operations Office letter, J. M. Allison to R. A. Pedde, Letter of Direction to Commence the Plutonium Disposition Project, dated January 17, 2006. (Attachment 2)

The third condition for terminating safeguards (DOE M 470.4-6 Paragraph A.I.1q(1)(c)) is transfer of the material to a waste management organization. After the DWPF canisters have been filled with the magazines of Bagless Transfer Cans, they will be stored within the Pu Disposition Material Balance Area (MBA). The PuD Project intent is to terminate Safeguards on each DWPF canister as each is conveyed across the MBA boundary during transport to the DWPF, a waste management organization. After additional processing, explained above, they will be stored in the DWPF glass storage facilities. The canisters are destined for eventual disposal at Yucca Mountain.

The process and material controls as briefly described in this letter will be sufficient to assure the materials are immobilized within the glass waste. There are no unacceptable risks associated with this action. Your positive endorsement of this proposal is requested to the Department of Energy – Savannah River, Office of Safeguards, Security and Emergency Services (DOE-SR OSS&ES). An early indication of your support for this discard from both your office and DOE-SR OSS&ES is needed no later than March 28, 2007.

:mla

Att.

c:
L. Davis, 717-K
J. Marshall, 105-K
W. F. Bates, 717-K
L. Carey, 730-1B
D. Eisele, 730-1B
G. Meyers, 703-45A
D. McClendis-Miller, 717-K
B. C. Patel, 730-1B
P. Plunkett, 105-K
R. H. Smith, 730-1B
R. J. Weatherby, 703-42A
D. Wolf, 703-42A
Records Administration, 773-52A

**The Deputy Secretary of Energy**
Washington, DC 20585

SEP 06 2005

MEMORANDUM FOR JAMES A. RISPOLI
ASSISTANT SECRETARY FOR ENVIRONMENTAL MANAGEMENT

FROM: CLAY SELL
DEPUTY SECRETARY

SUBJECT: Approval of Mission Need (CD-0) for a Plutonium Disposition Project.

Based on the recommendation from the Energy Systems Acquisition Advisory Board conducted on August 5, 2005, I approve the Mission Need (Critical Decision-0) for a Plutonium Disposition Project for plutonium without an identified disposition path. The approved cost range for this project is $300M-$500M with a projected completion date of 2012.

In support of Critical Decision -1, EM, in collaboration with NNSA and other Departmental stakeholders, is to develop disposition alternatives that take into consideration other ongoing or planned plutonium processing activities. The alternatives analysis should consider the modification of existing facilities as well as the use, or modification of facilities under development.

cc: Under Secretary for Energy, Science and Environment
Under Secretary for Nuclear Security/Administrator for National Nuclear Security Administration
Director, Office of Civilian Radioactive Waste Management
Director, Office of Nuclear Energy, Science and Technology

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**Department of Energy**
Washington, DC 20585

MEMORANDUM FOR CLAY SELL
DEPUTY SECRETARY

THROUGH: BRUCE M. CARNES
DIRECTOR, OFFICE OF MANAGEMENT

FROM: ROBERT L. MCMULLAN
SECRETARY, ENERGY SYSTEMS ACQUISITION ADVISORY BOARD

SUBJECT: Meeting Minutes of the Energy Systems Acquisition Advisory Board (ESAAB) for Review and Discussion of the Mission Need (Critical Decision-0) for a Plutonium Disposition Project.

BACKGROUND: On August 5, 2005, you chaired a meeting of the ESAAB to discuss Mission Need (Critical Decision-0) for the Disposition of the Department's excess Plutonium.

The National Nuclear Security Administration (NNSA) is presently pursuing a Mixed Oxide Fuel Fabrication (MOX) Facility at the Savannah River Site (SRS) to disposition 34 metric tons (MT) of excess weapons-grade plutonium controlled by NNSA, and covered by an agreement between the U.S. and Russia.

The Department of Energy (DOE) has approximately 17 MT of additional plutonium (both weapons-grade and non-weapons-grade) requiring disposition. Disposition pathways for a portion of this material have been identified and are under design/construction.

The Office of Environmental Management (EM) is proposing this mission need to acquire capability to disposition the remaining (up to 13 MT) plutonium that does not have a defined path. Some of this material is not suitable for processing in the MOX Facility as currently designed because of its isotopic composition and/or the type and amount of impurities.

A plutonium vitrification facility at SRS was identified as one technically feasible alternative. In this concept, smaller canisters of vitrified plutonium will be placed inside canisters of high level liquid

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tank waste vitrified in the Defense Waste Processing Facility (DWPF). DWPF is scheduled to begin deactivation around 2020.

The pre-conceptual design Total Project Cost range is estimated to be $300M to $500M, and is consistent with the fiscal year (FY) 2007 budget request.

DISCUSSION: The meeting opened with Charlie Anderson (EM) providing the ESAAB an overview of why a conceptual design for a facility to disposition contaminated plutonium (not suitable for processing in the MOX facility) was needed at SRS and how this Mission Need approval would give EM the ability to do that. Mr. Anderson stated that conceptual design will allow EM to perform additional analyses to determine how much material can be processed in the MOX facility as currently specified or with modifications. Also during the conceptual design, evaluations will be performed on additional alternatives.

EM was asked how it got this far in the pre-conceptual design work without an approved mission need. EM stated that some of the work to date was a re-evaluation of the alternatives identified during years of work performed by NNSA on the Plutonium Immobilization Project and by EM on the Americium/Curium Vitrification Project. In addition, the previous EM-1 directed that Savannah River perform a Feasibility Study to determine what existing Savannah River facility should be utilized if a vitrification project was to be constructed.

You asked how EM's timeline for this proposed project compares with NNSA's timeline for the MOX facility and what happens if EM does not proceed with this project at this time. EM stated that if the proposed schedule was extended by two years or more, EM will miss the 2025 site closure date and would have a resulting increase in lifecycle costs. NNSA responded that its plan is to process all its material through MOX facility by 2025. NNSA stated that they have no issues with this project as EM has been coordinating all the design studies with them. ESAAB members asked if MOX waste could be processed in DWPF. NNSA stated that it was possible with modifications, but that was not what was planned as waste from the MOX facility is going to be Low Level Waste and not High Level Waste.

You asked how confident EM is in the $300-$500M estimate. The Federal Project Director's response was 95 percent. Charlie Anderson due to yet unknown technological challenges did not agree and stated that EM needs to perform the conceptual design and accomplish a more detailed analysis to achieve that confidence level in a cost range. He

further commented that DOE should re-look at the level of cost detail required for CD-0 approvals.

ESAAB members asked why the project was not being supported within the target funding. EM stated that it will need to reevaluate its budget priorities to bring appropriate projects back within target. In the interim, EM will fund the conceptual design work on this project within the target budget for FY 2006 before setting priorities for future budget submissions.

Following the above discussion, you stated your support for approval of Mission Need (CD-0) for the Plutonium Disposition Project. You also asked that EM, in collaboration with NNSA, develop disposition alternatives that take into consideration other ongoing or planned plutonium processing activities and the modification of existing facilities.

RECOMMENDATION: OECM recommends that you sign the attached memorandum which approves the Mission Need (CD-0).

Minutes Approved: Clay Sell

Disapproved: _____

Date: 9/5/2005

RECEIVED JAN 1 7 2006

**Department of Energy**
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

JAN 1 7 2006

Mr. Robert A. Pedde, President
Washington Savannah River Company
Aiken, South Carolina 29808

Dear Mr. Pedde:

SUBJECT: Letter of Direction to Commence the Plutonium Disposition Project

On September 6, 2005, the Deputy Secretary of Energy approved the Mission Need (CD-0) for a Plutonium Disposition Project. The Department has identified the need to establish a capability to disposition Plutonium without an identified path comprised of approximately 13 Metric Tons (MT) of Plutonium or 25 MT bulk materials. Washington Savannah River Company (WSRC) is directed to commence with the Alternatives Analysis/Conceptual Design Phase of this project. Please prepare and submit a Baseline Change Proposal (BCP) prior to March 1, 2006 that, if approved, would authorize WSRC to support the Department in performing and documenting the initial alternative analysis by April 30, 2006 and authorize WSRC to prepare and submit the conceptual design (CD-1) package by December 31, 2006 in accordance with DOE Order 413.3 and DOE Guide 413.3. The expectation of the initial alternative analysis is to downselect to approximately five or less of the most probable alternatives for further evaluation. Enclosure 1 identifies the Savannah River Operations Office expectations of the work to be performed by WSRC during this Conceptual Design Phase. Additionally, the BCP shall include the Savannah River National Laboratory (SRNL) testing as identified in Enclosure 1.

There may be more than one viable option identified during the alternatives analysis, which may warrant the need for multiple conceptual designs. The funding request for the conceptual design of this project was based on a single design; therefore, if more than one viable option is identified, then WSRC shall submit a new BCP at that time to establish a new cost and schedule for the multiple designs. A copy of the CD-0 package has been provided to your staff for use in the preparation of the BCP and conceptual design package. As identified in the September 6, 2005, approval of the mission need by the Deputy Secretary of Energy, the approved cost range for this project is $300M-$500M with a projected completion date of 2012.

This letter is issued under authority of the Changes Clause (DEAR 970.5243-1) contained in Contract DE-AC09-96SR18500 and authorizes WSRC to establish a project team, initiate the alternatives analysis, and prepare and submit a Contract Performance BCP for approval of Conceptual Design phase work scope. WSRC is limited to $2M for this work until approval of the BCP.

If you have any questions, please contact me or have your staff contact Sachiko W. McAlhany at 208-3972.

Sincerely,

Jeffrey M. Allison
Manager

NMPD-06-0001

cc w/encl:
H. T. Conner, Jr., WSRC, 730-1B 342
L. H. Sain, WSRC, 766-H 2407
G. H. Clare, WSRC, 730-1B
L. J. Simmons, WSRC, 730-1B 135
G. T. Wright, WSRC, 773-A A-221

ENCLOSURE: Letter Allison to Pedde
SUBJECT: Letter of Direction for the Plutonium Disposition Project 12/5/05

JAN 1 7 2006

Enclosure 1
Required Work during Conceptual Design of the Plutonium Disposition Project

The Requirements of DOE Order 413.3 and DOE Manual 413.3 applies to this project. Guidance for Critical Decision 1 activities are as follows:

- Establish existing facilities baseline
- Establish initial funding budgets
  Evaluate design alternatives and site locations
- Establish technical and functional requirements
- Conduct safety and operability development (engineering and process development)
- Verify performance criteria
- Establish the Design estimate
- Establish the Preliminary cost and schedule ranges
- Establish project cost and schedule ranges
- Perform life cycle cost analysis
- Identify and assess risks and prepare project Risk Management Plan
  Identify and control interfaces
- Prepare Conceptual Design Report
- Provide data to SR for the preparation of the Acquisition Strategy
- Assist in the preparation of the Project Data Sheets
- Develop the Preliminary Hazard Analysis Report, fire analysis and develop the Safety Strategy
  Perform security vulnerability analysis based on the 2004 Design Basis Threat Guidance
- Assist SR in the preparation of the Preliminary Project Execution Plan
- Develop the Systems Engineering Management Plan
- Assist in NEPA actions

Additionally, the following additional testing is required through the Conceptual Design Phase of this project:

Continued testing to Support Repository License Application and Waste Form Qualification

- Durability testing and analysis
- Glass Formulation, ie alternative frit compositions
- Review existing data for the chemical composition of the feed material and identify the uncertainties to establish bounding compositions
- Develop and issue the Waste Acceptance Documentation building off of existing data and above identified testing

- The following additional testing shall commence in FY 06 pending the outcome of the alternatives analysis; however, the scope may be modified via a BCP if multiple designs are required.
  - Verify operating parameters of the melter system
  - Minimum verification or proof of principal of the attritor mill equipment
  - Identify those plutonium streams that may be challenging to oxidize and perform small-scale testing to gain insight into the oxidation behavior of the troublesome components
  - Bagless transfer system modifications will be determined and design specifications assembled
  - Identify methods and measurement instruments to demonstrate compliance with the Chemical Reporting Specification, Radionuclide Inventory Reporting Specification, and IAEA Safeguards Reporting of the vitrified material
  - Validate and update if necessary the flowsheet and process models for vitrification
  - Establish the operating life of the melter systems and the number of melters required for the plan life cycle

SEO-MCA-2007-00105

April 2, 2007

TO: Eric V. Fitzgerald

FROM: J.R. Ludwick

**APPROVAL OF PROPOSAL TO TERMINATE SAFEGUARDS ON VITRIFIED SPECIAL NUCLEAR MATERIAL**

Ref: 1. Termination of Safeguards on Vitrified Special Nuclear Material, M&O-NMM-2007-00039, dated February 27, 2007

This letter serves as approval in theory to terminate safeguards on the 21 metric tons of vitrified special nuclear materials described in the Plutonium Disposition Project. It is understood that the PuD facility will receive Pu materials in the form of metal (to be oxidized prior to vitrification) and oxide (size reduced to a powder form) and mix these materials with lanthanide borosilicate glass to immobilize the weapons useable Pu oxides and impurities. This immobilized Pu form will be in similar state to that of DWPF product which should be suitable for disposition in a federal radioactive waste repository that utilizes can-in-canister technology.

It is further understood that the molten glass is poured into cans, allowed to cool for a period of time and placed inside a Bagless Transfer Can where the can is mechanically welded. The transfer cans are loaded into magazines in a configuration of four cans per magazine and seven magazines per DWPF canister for a total of 28 glass cans. After transport to the DWPF the canisters will be filled with additional high level waste borosilicate glass to complete the process that produces an assembly for repository disposal.

Following discussions with the facility and the DOE-SESTD, Site MC&A agrees that the material at the concentrations identified in the above referenced document will meet the requirement of Attractiveness Level "D". Further, Site MC&A and the DOE agree in theory to the process and methodology to be followed in the Plutonium Disposition Project and therefore endorse this proposal. However, attractiveness level D materials can only be terminated following the approval of the DOE Departmental Element which in this case is EM-1. Please note that the formal request for termination is scheduled to be submitted in June 2007 in the project Conceptual Design Review (CDR), and that termination of safeguards on the 21 metric tons of material will be based on the CDR approval by EM-1.

Should you have any further questions please contact George Meyers of my staff at 5-5420.

| | | |
|---|---|---|
| cc: | L.R. Bauer, | 705-K |
| | J. Marshall, | 105-K |
| | C.G. Reynolds, | 703-45A |
| | W.F. Bates, | 717-K |
| | D. Eisele, | 730-1B |
| | P. Plunkett, | 105-K |
| | G.T. Meyers, | 703-45A |
| | D. McClendis-Miller, | 717-K |
| | M.L. Adams, | 717-K |
| | R.E. Lynn, | 703-45A |
| | F.G. Armstrong, | 703-42A |

# SCOPE OF WORK

# BLDG 221-S
# PU VIT CAN-IN-CANISTERS
# DWPF PROCESS & STRUCTURAL MODIFICATIONS

## C-SOW-S-00003
## REVISION 0

ENGINEERING DOC. CONTROL-SRS
00864967

# APPROVALS

Prepared by: _____ Date: 3/27/07
– Design Engineer

Reviewed by: Steven Melvin Date: 3/27/07
– Design Engineering Lead

Approved by: _____ Date: 3/27/07
– Design Authority

Approved by: _____ Date: ~~4/2/07~~ 3/27/07
– Project Engineer

| Revision | Date | Section No. | Description of Revision |
|---|---|---|---|
| 0 | 03/27/07 | NA | Prepare for Conceptual Design Report |
| | | | |
| | | | |
| | | | |

**1.0 Project/ Task Scope**

The CIC (Can-In-Canisters) has been designated to be integrated into the DWPF production process whenever the Plutonium Disposition Project (PUD) becomes fully operational. As a result, modifications will be required to DWPF in order to receive and inspect the CIC's when they arrive and to also provide additional storage space in the Canyon in the event of a process shutdown or interruption. This task scope provides for the following:

1) Structurally evaluate and modify as required the DWPF Shielded Canister Transporter (SCT) storage area (currently covered by grating) such that it will be able to support a CIC loaded KAC shielded canister transporter with (2) CIC's. **(Ref. Baseline Document #3, Deliverable #1)**

2) Provide (2) two new CIC storage space racks to accommodate any process interruptions or shutdowns in the Canister Decontamination Cell (CDC). New storage racks shall be similar in design to the canister clean and dirty storage racks currently in use (Reference W764890 and W764891). **(Ref. Baseline Document #3, Deliverable #2)**

3) Provide Modifications to the major Canister handling components in Bldg 221-S that are most likely to be negatively impacted by the additional weight (i.e., 1100 lbs) associated with CIC's filled with DWF glass. **(Ref. Baseline Document #3, Deliverable #3)**

**2.0 Baseline:**

This section provides references to the following baseline documents:

1) DWPF Can-In-Canister Handling SDD, G-SYD-S-0081, Rev. B
2) Functional Classification: Production Support
3) Technical Task Request No. HLW-DWPF-TTR-2007-0012, R/0
4) Preliminary Consolidated Hazards Analysis (PCHA), WSRC-TR-2007-00084
5) DWPF Facility Design Description, G-FDD-S-0001, R/3
6) GWSB #2 Facility Design Description, G-FDD-S-00005, R/5

**3.0 Process Description:**

The overall function of the DWPF CIC Handling System is to transport "Empty" CICs containing vitrified plutonium to and through the DWPF process, to fill with high level waste glass to form vitrified plutonium waste forms (VPWF). The filled CICs will ultimately be disposed of in a geological repository. The DWPF CIC Handling System consists of the following subsystems and corresponding operations:

1. CIC Receipt – Receive "Empty" CICs from the PUV into the GWSBs or Canister Load-out Area utilizing the CIC transport trailer provided by the PUV. The CIC transport trailer will be used to unload the "Empty" CIC utilizing onboard equipment.

2. CIC Retrieval – Retrieval of "Empty" CICs from the GWSB vault by the SCT and deliver to the Canister Load-Out Area.

3. CIC Transfer- Transfer of "Empty" CICs through the Canister Load-Out Area, WTC, CDC and into MC.

4. CIC Staging – Staging "Empty" CICs in the MC in preparation for glass pouring including removal of the temporary plug.

5. CIC Processing- Processing of "Empty" CICs by filling with high level waste glass to produce VPWF and transferring filled CICs through the CDC, WTC and out to the GWSB utilizing normal DWPF processing.

The subsystems CIC Receipt/Retrieval, CIC Transfer, and CIC Staging essentially introduce a CIC into the DWPF process by transporting the CIC in reverse of normal DWPF operations. A CIC is retrieved from the Glass Waste Storage Building (GWSB) using the SCT or received directly from K-Area and transferred to the 221-S Building Canister Load-out Area where it will be unloaded using the crane located on the CIC transport trailer. It is then transported through the Weld Test Cell, Canister Decontamination Cell, and into the Melt Cell using existing equipment in each cell. Within the Melt Cell, the CIC is placed on the canister turntable and readied for normal DWPF processing via the CIC Processing subsystem, including removal of temporary plug.

After the CIC is filled with high level waste (HLW) glass, the CIC is processed through the normal DWPF canister route from the Melt Cell through the Canister Decontamination Cell, Weld Test Cell, and Canister Load-out Area for pickup by the DWPF SCT for storage in the GWSB.

The DWPF CIC Handling System utilizes areas and equipment already existing and operational within the DWPF. These systems allow the receipt of CICs from the Plutonium Vitrification Facility (PUV) (located in K-Area Complex (KAC)) into the DWPF, and transfer of the CICs to, and through, the DWPF process for high level waste glass filling.

**4.0 Detailed Engineering Scope**

1) Provide design modifications to the Wash Pit Grating Area (Ref Dwg W762423) for the purpose of supporting the moving weight of the new CIC loaded KAC shielded canister transporter (See Attachment No 1).
2) Provide for the design and qualification of (2) new CIC storage racks (See Attachment No. 2).
3) Revise (10) existing facility / structural drawings via DCN's
4) Issue D & R Work instructions and sketches (as required)
5) Review and revise existing SDD's & FDD's (See Attachment #3, Item 20)
6) Provide Modifications to Process Equipment identified in Attachment #3.

**5.0 Construction Support Services**

1) Procurement, Fabrication and Installation of design modifications associated with the SCT Decon and Maintenance Area (also known as the Wash Pit Grating Area).
2) Procure and Fabricate (2) new CIC storage racks (Installation by Operations).
3) "As Built" of Items A & B
4) D & R of existing facility as required per Engineering issued DCP
5) Procure, Fabricate and Install equipment / process modifications as identified in Attachment No. 3

**6.0 Man-Hour Estimate**

(Not Included in this Document)

**7.0 Scope Exclusions/ Assumptions**

1) All information relative to the new Canister Trailer is made available prior to the commencement of any analysis / design. Information relative to maximum trailer weight, trailer configuration (trailer width, length and height, # of axles, tire size, etc) is required.
2) Storage for the grating associated with the SCT Decon and Maintenance Area shall be located to the immediate south of said area, similar to the storage area now being used. Grating when removed shall be stored on the floor of said area. Design of a separate storage facility is not part of this scope.
3) Production and Processes are clearly defined and does not significantly differ from the Process description as described per Section 2.0 of this document.
4) Multiple DCP's to be issued (via AIM) for this work.
5) Work scope is limited to the modification / reinforcement of the SCT Decon Maintenance Area and the design of two new canister storage racks. Existing storage racks to be D&R'd. Material of new storage rack to be stainless steel. Cost of material disposal not included in this scope.
6) The filled CIC has a maximum weight of 6120 lbs each.
7) Providing a means for camera coverage is not part of this scope and not included in the scope estimate.
8) The design of the (2) new storage racks shall be based on the following: Rack No.1 and Rack No. 2 shall be designed for 8 and 5 canisters respectively and all positions shall be accessible to the CDC crane.
9) Modification to the existing overhead crane / monorail is not anticipated and is not part of this scope of work (See Attachment 3 for justification). A path forward will be generated to justify a 125% load test operation during the unlikely recovery scenario.
10) All safety concerns including access limitations are resolved prior to the commencement of task.
11) This scope does not include any additional radiation monitoring instruments, CC TV's and redesign for temp plug retrieval and storage in Melt Cell. It also does not include modification to any radiation equipment such as equipment shielding. A design study / analysis to be performed (By Others) to justify the acceptance of the existing Radiation Shielding Windows.
12) Revision to the existing procedures and training is not included in this scope.
13) Obtaining of Site Permits is not included in this scope.

14) Existing SCT does not require any modification.
15) Existing lifting Yokes located in the Vitrification Bldg shall be used for the lifting of the (2) new storage racks. Design and analysis of new lifting yokes is not anticipated and is not included in this scope.
16) See Attachment #3 for additional assumptions and scope exclusions associated with modifications to existing DWPF equipment and systems.

## 8.0 Drawing List

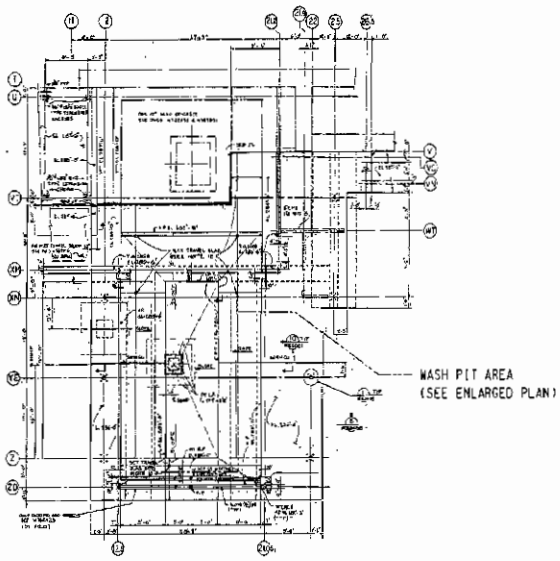
| | |
|---|---|
| W762423 | VIT Bldg Area 19 – Wash Pit S.S. Grating Plan, Sections and Details |
| W762436 | VIT Bldg SCT Decon & Maintenance Area 19, Arrangement Plans and Sections |
| W762437 | VIT Bldg SCT Decon & Maintenance Area 19, Fdn & Ground Floor Plan |
| W762438 | VIT Bldg SCT Decon & Maintenance Area 19, Sections & Details – Sh. 1 of 2 |
| W762439 | VIT Bldg SCT Decon & Maintenance Area 19, Sections & Details – Sh. 2 of 2 |
| M762437 | VIT Bldg SCT Decon & Maintenance Area 19, Reinforcing Plans |
| M762438 | VIT Bldg SCT Decon & Maintenance Area 19, Sections & Details |
| M762439 | VIT Bldg SCT Decon & Maintenance Area 19, Plan, Sections & Details |
| W762001 | Typical Detail Concrete #1 |
| 13239-MH-29122-16(1)-5 | Kaiser Steel, Lifting Yokes – 65 Tons, (For Equip No. S-325-031-006-00-R, Yoke No. 6) |
| 13239-MH-29122-5(1)-7 | Kaiser Steel, Lifting Yokes – 30 Tons, (For Equip No. S-325-010-00-12, Yoke No.10) |
| W755102 | Equipment Location Dwg. |
| W755115 | Equipment Location Dwg., Section C |
| W757161 | Equipment Location Dwg., Section H |
| W757162 | Equipment Location Dwg., Section J |
| W757928 | Scroll Piping & Equipment Arrangement CDC #2 |
| W757927 | Scroll Piping & Equipment Arrangement CDC #1 |
| W764890 | Clean Canister Storage Rack, CDC Area |
| W764891 | CDC "Dirty" Canister Storage Rack |
| ** | ** See Attachment #3 for additional Dwg references. |

## 9.0 Attachments

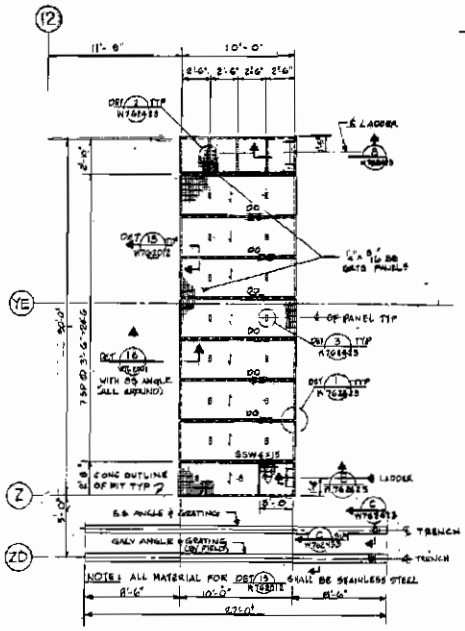
Attachment No.1 (2 Sheets), "SCT Decon & Maintenance Area, Grtg and Framing Plan @ Wash Pit"
Attachment No.2 (5 Sheets), "Plutonium Disposition Study & Canister Storage Rack #1 & #2"
Attachment No.3 (9 Sheets), "Assessment of Canister Handling Equipment for CIC"

C-5000-S-00003, Rev 0

BEFORE




CST MAINTENANCE AREA
FOUNDATION & GROUND FLOOR PLAN




ENLARGED PLAN
WASH PIT GRATING AREA

# ATTACHMENT NO. 1
(1 OF 2)

SCT DECON & MAINT AREA
GRATING & FRAMING PLAN @ WASH PIT

| TITLE | ENLARGED PLAN - WASH PIT GRATING AREA | | |
|---|---|---|---|
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. N/A | SHEET NO. OF | SHEET REV. |

Scale shown on this drawing is only applicable when plotted on 11"x17" (actual drawing size)

W.S.

TYPE 2C (11 x 17)

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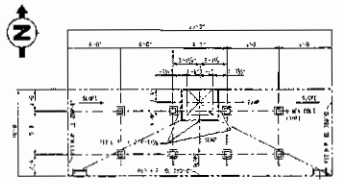
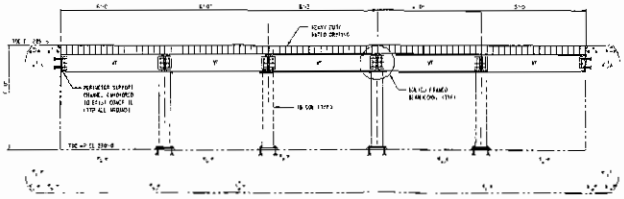
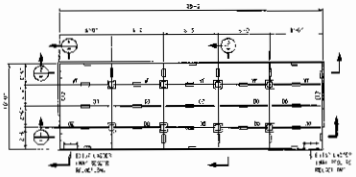
Rev 0



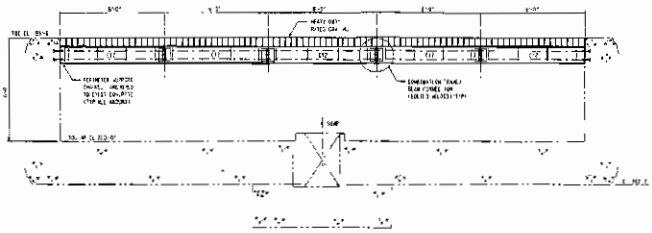
SCT DECON & MAINTENANCE AREA
PARTIAL PLAN AT BOTTOM OF WASH PIT



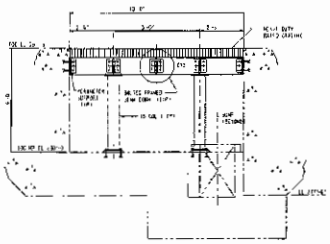
SECTION 1
½" = 1'-0"



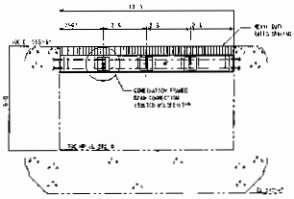
WASH PIT GRATING COVER
FRAMING PLAN AT ELEVATION 285'-6"



SECTION 2
½" = 1'-0"



SECTION 3
½" = 1'-0"



SECTION 4
½" = 1'-0"

## GENERAL NOTES

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

## REFERENCE DRAWINGS

[illegible]

AFTER

STEEL FLOOR FRAMING (BOLTED) WITHIN PIT WALLS SUPPORTED BY COLUMNS AND PERIMETER CHANNEL ANCHORED TO WALLS. ACCESS HATCH AND LADDER MODIFICATIONS (LATER)

# ATTACHMENT NO. 1
## (2 OF 2)

SCT DECON & MAINT AREA
GRATING & FRAMING PLAN @ WASH PIT

| TITLE | | | |
|---|---|---|---|
| WASH PIT GRATING COVER - FRAMING PLAN, EL 285'-6 | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. N/A | SHEET NO. OF | SHEET REV. |
| Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size) | W.S. | | |

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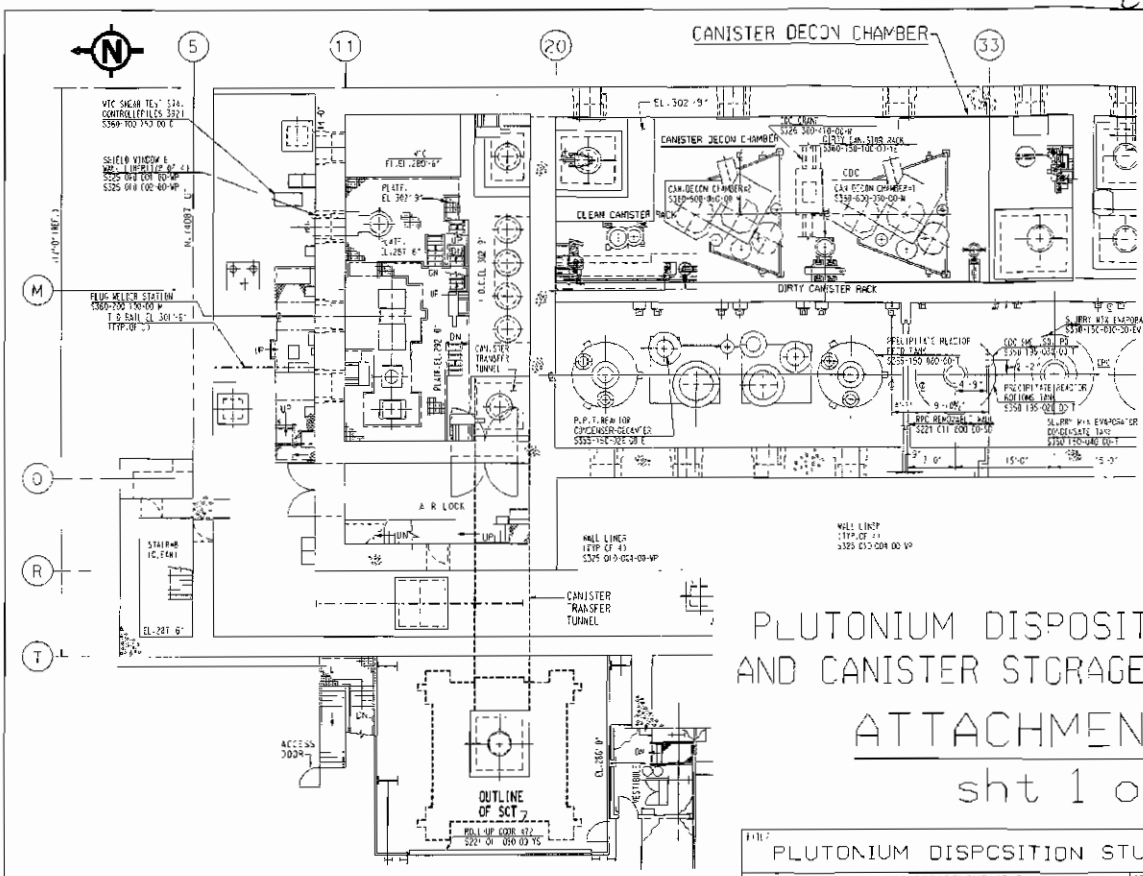


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TYPE 2C (11 x 17)

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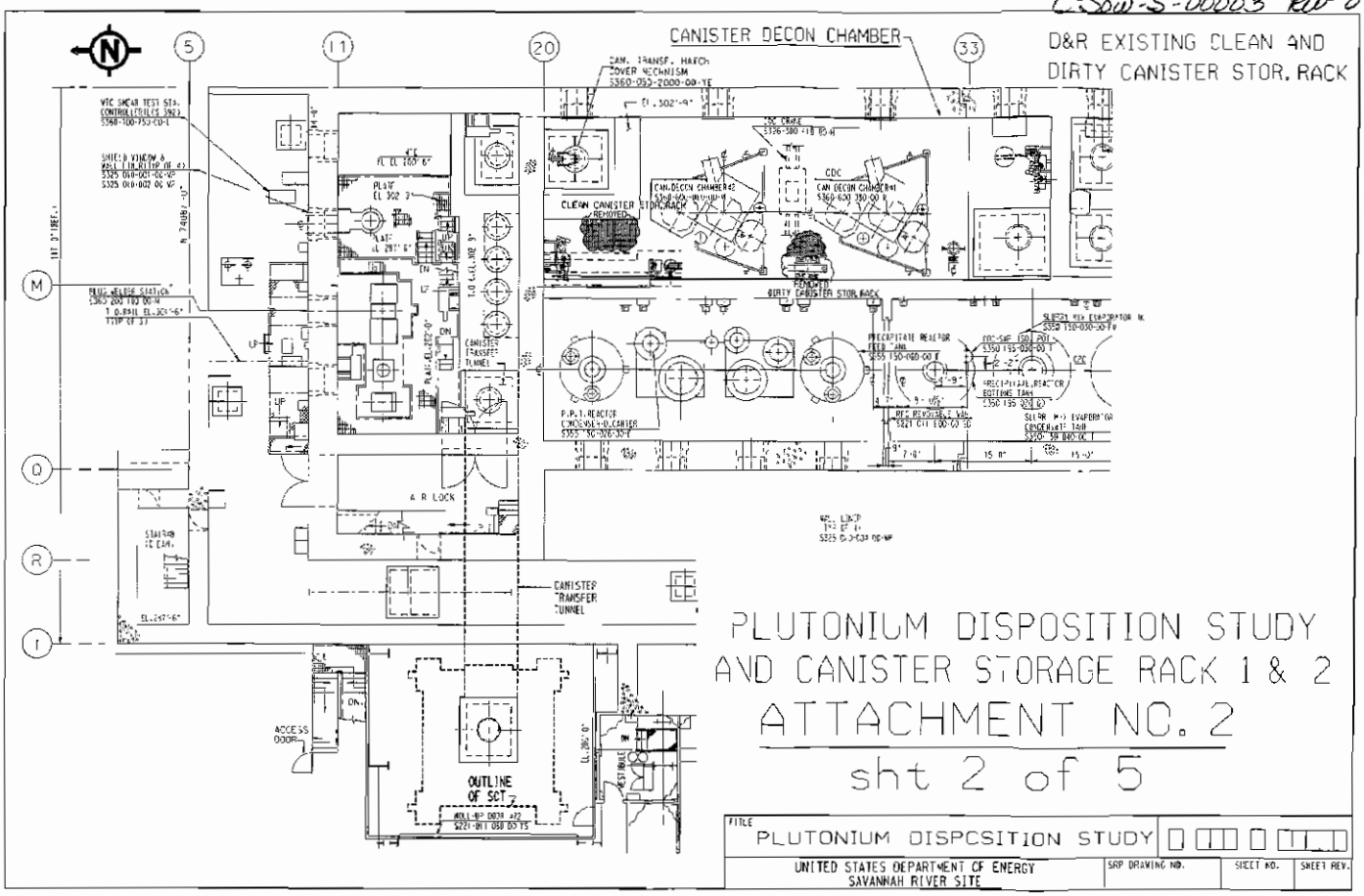


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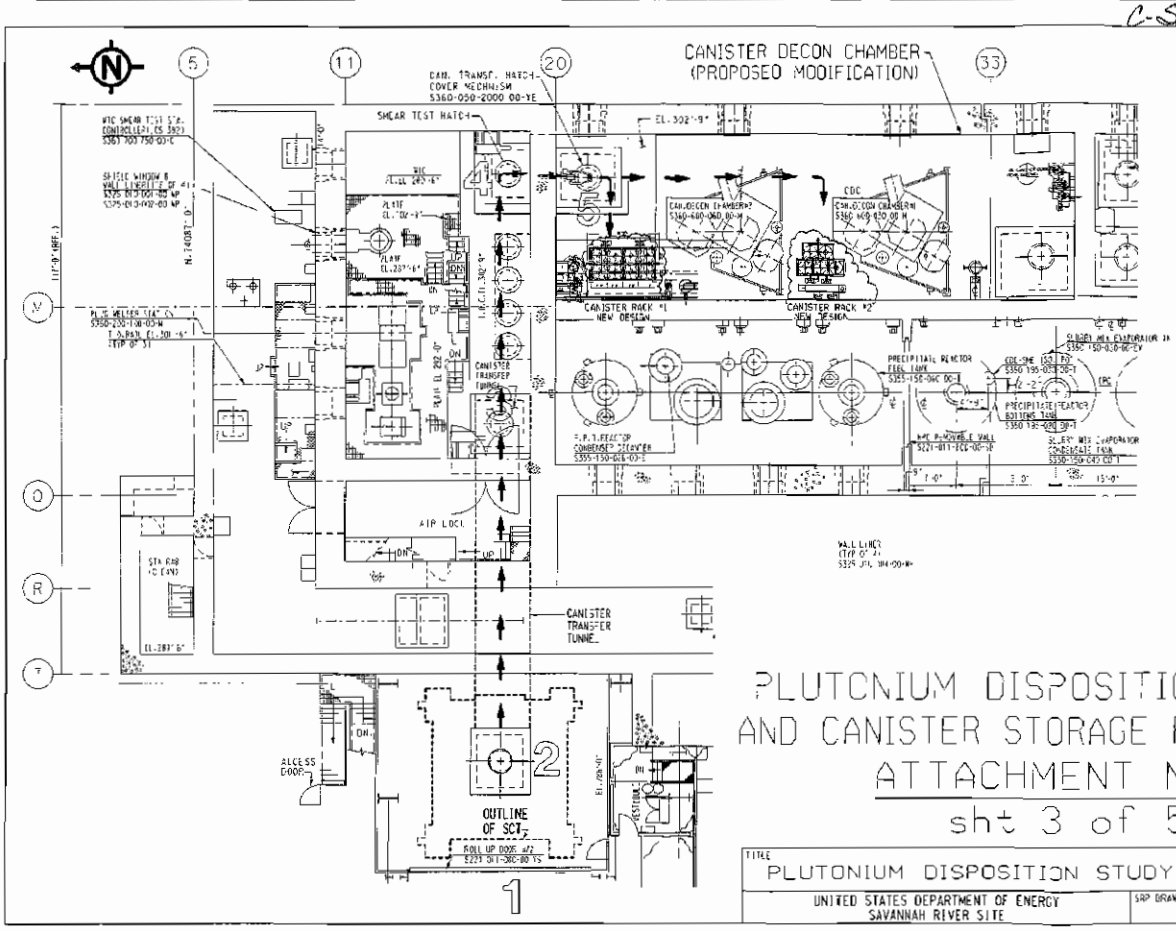


# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 3 of 5

| TITLE | | | |
|---|---|---|---|
| PLUTONIUM DISPOSITION STUDY | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. | SHEET NO | SHEET REV. |

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TYPE 3C (41 x 17)

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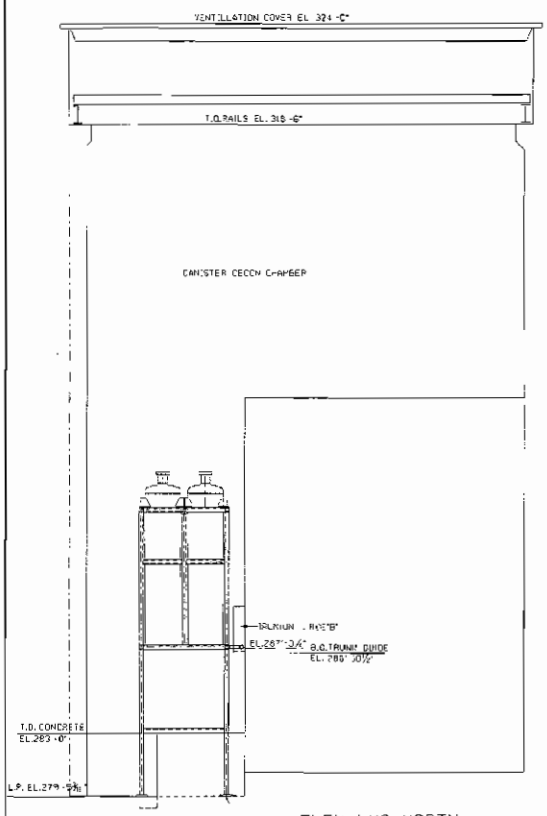
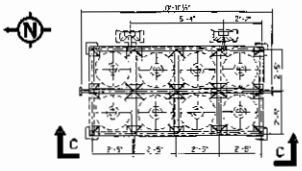
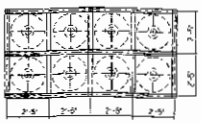
Rev. 0



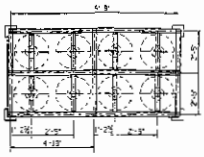

ELEV. LKG. NORTH



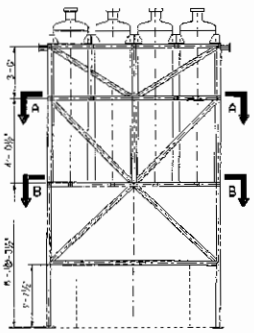

PLAN



SECTION A-A



SECTION B-B




SECTION C-C

NOTES

1. ALL DIMENSIONS ARE PRELIMINARY AND SUBJECT TO CHANGE DURING DETAILED DESIGN.
2. TOKS TOOLS SHOULD BE UTILIZED/INCORPORATED INTO THE DESIGN FOR LIFTING STORAGE RACK
3. CRANE TRAVEL HAS ADEQUATE CLEARANCE FOR INSTALLING AND REMOVING THE STORAGE RACK INCLUDING TOKS
4. 100% LOAD TEST OF A 125% DESIGN LOAD IS REQUIRED FOR THE LIFT TRUNNIONS.

# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 4 of 5

| TITLE | | | |
|---|---|---|---|
| CANISTERS STORAGE RACK NO. 1 | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. | SHEET NO. | SHEET REV. |

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TYPE 2C (1 x 17)

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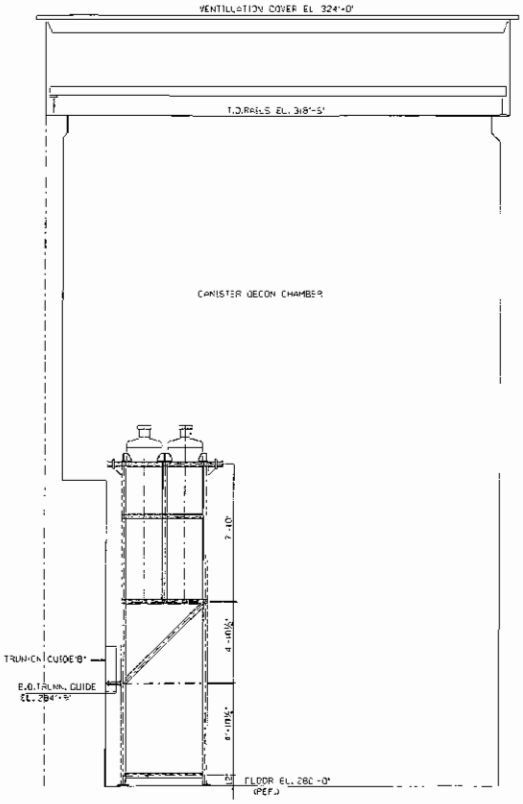
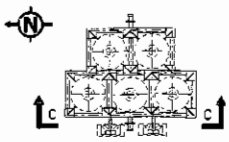
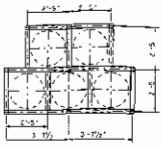
Rev. 0



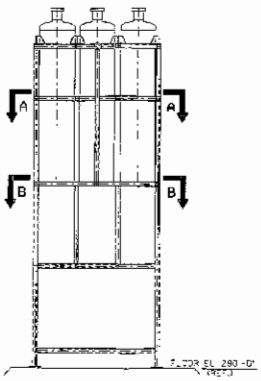

ELEV. LKG. NORTH



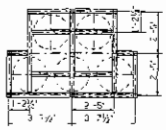

PLAN



SECTION A-A




SECTION C-C



SECTION B-B

NOTES:

1. ALL DIMENSIONS ARE PRELIMINARY AND SUBJECT TO CHANGE DURING DETAILED DESIGN.
2. YOKE NO. 2 SHOULD BE UTILIZED/INCORPORATED INTO THE DESIGN FOR LIFTING STORAGE RACK.
3. CRANE TRAVEL HAS ADEQUATE CLEARANCE FOR INSTALLING AND REMOVING OF STORAGE RACK INCLUDING YOKE.
4. 150% LOAD TEST OF A 150% DESIGN LOAD IS REQUIRED FOR THE LIFT TRUNNIONS

# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 5 of 5

| TITLE CANISTERS STORAGE RACK NO. 2 | | | |
|---|---|---|---|
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. | SHEET NO. | SHEET REV. |

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TYPE 2C (13 x 17)

# ASSESSMENT OF CANISTER HANDLING EQUIPMENT FOR CIC

The equipment and structures in the DWPF building, GSWB #1 and GWSB #2 were evaluated to determine the necessary DWPF modifications and other tasks, to allow the receipt and processing of Can-In-Canister (CIC) assemblies from the Plutonium Vitrification (PUV) Facility. The filled CIC weighs approximately 6120 lbs, 1100 lbs heavier than the DWPF canister. Attachment 3, pages 5 through 8, shows the results of this evaluation.

The following engineering design work, equipment and structure modifications are required for the existing DWPF canister handling components and structures in order to support handling the filled CIC. Note that only items with required actions are listed.

## 1. Master Slave Manipulator

Evaluation for tooling required to allow removal of CIC temporary plug to be done by others (DA).

## 2. Canister Pour Turntable

Assumption: Based on the assessment, the pour turntable drives are adequate to handle CIC. The pour turntable is structurally adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Revise 3 vendor drawings, MH-20930-1(1), MH-20930-1(1) and MH-20930-1(1).
- Generate new calculation for canister positioning arm.

## 3. Inner Canister Closure (ICC) Station

Assumption: The ICC station is structurally adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Structural Statement of Work:

- Generate new calculation to demonstrate adequacy of the ICC station to handle the CIC weight of 6120 lbs.

## 5. Canister Grapple

Assumption: Based on the assessment, the canister grapple is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Generate new calculation for canister grapple.
- Search and review canister grapple test reports.

**6. Transfer Cars**

Assumption: Based on the assessment, the transfer cars are adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Generate new calculation for 1/2 HP drive units.
- Generate new calculation for 1/2 HP transfer car retrieval drive unit.
- Search and review transfer car test reports.

B. Structural Statement of Work:

- Search for documentation or generate new calculation for the structural capacity of the transfer cars.

**7. CDC Station**

Assumption: Based on the assessment, the CMM, CMM grapple, CMM lifting fixture and CDC nozzle cage are adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Generate new calculation for the 3 HP translation motor drive unit.
- Generate new calculation for the 2 HP rotation motor drive unit.
- Generate new calculation for the CMM grapple jaws.
- Generate new calculation for the CMM lifting fixture.
- Generate new calculation to justify acceptability of the CMM load test.
- Search and review test reports for CMM, CMM grapple hook, CMM lifting fixture and CDC nozzle cage.

B. Structural Statement of Work:

- Generate new calculation for adequacy of the CMM to handle the CIC weight of 6120 lbs.
- Generate new calculation for adequacy of the CDC nozzle base to support the CIC weight of 6120 lbs.

**8. CDC Smear Test Station**

Assumption: Based on the assessment, the CDC smear test station is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Generate new calculation for the CDC STS turntable rotating drive unit.
- Generate new calculation for the CDC STS turntable lifting drive unit.
- Generate new calculation for the CDC STS trolley rotating drive unit.
- Generate new calculation for the CDC STS trolley transverse drive unit.
- Generate new calculation for the CDC STS trolley lifting drive unit.
- Search and review test reports for the CDC STS turntable and the CDC STS trolley.

B. Structural Statement of Work:

- Search document or generate new calculation for structural capacity of the CDC STS turntable to handle the CIC weight of 6120 lbs.
- Search document or generate new calculation for structural capacity of the CDC STS trolley to handle the CIC weight of 6120 lbs.

**10. WTC Smear Test Station**

Assumption: Based on the assessment, the WTC smear test station is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Mechanical Statement of Work:

- Generate new calculation for the WTC STS turntable rotating drive units.
- Search and review test reports for the WTC STS turntable.

B. Structural Statement of Work:

- Search document or generate new calculation for structural capacity of the WTC STS trolley to handle the CIC weight of 6120 lbs.

**12. WTC Upper Crane**

Assumption: During recovery of the WTC lower crane, the WTC upper crane loading would exceed its rated capacity of 26000 lbs by 1073 lbs. Assume that it is acceptable to consider this emergency recovery as a 125 % load test.

A. Structural Statement of Work:

- Generate calculation and perform other tasks for documenting review and approval to consider this emergency recovery as a load test.

**13. ICC Press/Plug Welder Trolley**

Assumption: Based on the assessment, the structural capacity of the trolley and accessories and the trolley emergency retrieval system are adequate to handle the CIC weight of 6120 lbs. The existing pneumatic cylinder needs to be replaced with a large unit. There is adequate space in the trolley, the ICC press and the plug welder for installing the larger replacement pneumatic cylinder.

A. Mechanical Statement of Work:

- Generate new calculation for the trolley high speed drive.
- Generate new calculation for the trolley low speed drive.
- Search and review documents to confirm adequacy of the trolley drives.
- Generate new calculation and select a larger pneumatic cylinder.
- Modify trolley to replace the existing pneumatic cylinder with a larger unit.

B. Structural Statement of Work:

- Search document or generate new calculation for structural capacity of the WTC STS trolley to handle the CIC weight of 6120 lbs.

**15. Racks in the WTC/CDC/MC**

Assumption: Based on the assessment, the structural capacity of each rack is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Structural Statement of Work:

- Generate new calculation to define the allowable loading for the insulated canister storage rack.
- Generate new calculation to define the allowable loading for the MC equipment storage rack.

**18. Racks in GWSB # 1**

Assumption: Based on the assessment, the structural capacity of the GWSB # 1 rack is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Structural Statement of Work:

- Generate new calculation to document adequacy to handle the CIC weight of 6120 lbs.

**19. Racks in GWSB # 2**

Assumption: Based on the assessment, the structural capacity of the GWSB # 2 rack is adequate to handle the CIC weight of 6120 lbs. No modifications are required.

A. Structural Statement of Work:

- Generate new calculation to document adequacy to handle the CIC weight of 6120 lbs.

**20. MPC Crane**

Assumption: During recovery of the WTC upper and lower cranes, the loading of the MPC crane 13 ton hook would exceed its rated capacity of 26000 lbs by 848 lbs. Assume that it is acceptable to consider this emergency recovery as a 125 % load test.

A. Structural Statement of Work:

- Generate calculation and perform other tasks for documenting review and approval to consider this emergency recovery as load test.

**21. System Design Description**

Action: Revise the following system design descriptions to incorporate CIC handling:

| | |
|---|---|
| G-FDD-S-00001 | G-FDD-S-00005 |
| G-SYD-S-00033 | G-SYD-S-00035 |
| G-SYD-S-00062 | G-SYD-S-00063 |
| G-SYD-S-00064 | G-SYD-S-00065 |
| G-SYD-S-00066 | G-SYD-S-00067 |
| G-SYD-S-00068 | G-SYD-S-00070 |
| G-SYD-S-00077 | |

**ASSESSMENT OF CANISTER HANDLING EQUIPMENT FOR CIC**

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| 1 | MASTER SLAVE MANIPULATOR | REMOVE AND DISPOSE CIC TEMPORARY PLUG | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | EVALUATION TO BE DONE BY OTHERS (DA). ASSUMPTION NO MODIFICATION REQUIRED TO EQUIPMENT AND FACILITY. |
| 2 | CANISTER POUR TURN TABLE (PTT) | | | | | |
| | CART DRIVE | PTT TRANSVERSE MOVEMENT | REVIEW/BECHTEL REVISION MH-20930-2(1) | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT OF 6120 LBS, DRIVE MOTOR HAS ADEQUATE SAFETY FACTOR DRIVE MOTOR ALSO HAS SERVICE FACTOR OF 2 |
| | SPIDER DRIVE | PTT ROTATION | REVIEW/BECHTEL REVISION MH-20930-1(1) | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT OF 6120 LBS, DRIVE MOTOR HAS SAFETY FACTOR OF 1.7 |
| | CLUTCH/BRAKE/SHAFT/COUPLING | CONTROL OF PTT MOTOR | REVIEW/BECHTEL REVISION MH-20930-415(1) | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT. OF 6120 LBS, EXISTING COMPONENTS ARE ADEQUATE |
| | CANISTER POSITIONING ARM | CANISTER ROTATION | NEW CALCULATION FOR CANISTER POSITIONING ARM | NO ACTION REQUIRED | NO ACTION REQUIRED | OLD BNI (1/93) CALC INDICATES HP REQUIREMENT ADEQUATE FOR CIC WEIGHT |
| | LOAD CELLS | MONITOR CANISTER WEIGHT | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | LOAD CELLS ARE ADJUSTABLE FROM 0 TO 10000 LBS AND ARE ADEQUATE FOR CIC WEIGHT. ASSUME STRUCTURAL CAPACITY OF POUR TURNTABLE STRUCTURE IS AT LEAST EQUAL TO LOAD CELL CAPACITY |
| 3 | INNER CANISTER CLOSURE STATION | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF THE ICC STATION TO HANDLE CIC. | MH-20676-2(1) IS A PROOF LOAD TEST PROCEDURE FOR THE ICC STATION ASSUME THE STRUCTURAL CAPACITY OF THE ICC STATION IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120 LBS |
| 4 | MC CRANE | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M 2-2, THE MC CRANE HAS A MAIN HOIST RATED 10000 LBS WITH 8.75 HP/1800 RPM DRIVE, AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE TROLLEY DRIVE IS 1/3 HP/1200 RPM BRIDGE DRIVE IS 1/2 HP/1200 RPM THE MC CRANE IS ADEQUATE TO HANDLE THE CIC (6120 LBS.) PLUS THE GRAPPLE WEIGHT (925 LBS.) ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS CORBELS, ETC IS AT LEAST EQUAL TO HOIST CAPACITY |
| 5 | CANISTER GRAPPLE | REMOVE /TRANSFER CIC FROM/TO TRANSFER CARS IN THE MC, CDC & WTC | REVIEW TEST REPORTS OR GENERATE NEW CALCULATION. | NO ACTION REQUIRED | NO ACTION REQUIRED | THE GRAPPLE IS RATED 15000 LBS. PER MH-20921-1(1), THE GRAPPLE IS TESTED FOR NORMAL AND EMERGENCY CONDITIONS TO SUPPORT 18,750 LB LOAD. CYCLIC TESTING IS PERFORMED AT 15,000 LB LOAD FOR 800 CYCLES BASED ON THIS FUNCTIONAL TEST IT IS ANTICIPATED THAT THE GRAPPLE IS ADEQUATE FOR CIC HANDLING. |
| 6 | TRANSFER CARS | | | | | |
| | EXIT TRANSFER CAR, MC/CDC TRANSFER CAR | MOVE CANISTER BETWEEN CELLS | SEARCH FOR SPECIFICATION, TEST PROCEDURE, TEST REPORT TO DOCUMENT CANISTER DESIGN LOAD OF 6300 LB NEW CALCULATION FOR 1/2 HP DRIVE UNIT | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | G-SYD-S-C0082, PAGE 11 AND PROCESS HAZARDS REVIEW PHR-07 INDICATE THAT THE TRANSFER CARS ARE DESIGNED TO SUPPORT CANISTER WEIGHT OF 6300 LBS NOTE THAT THERE ARE NO VENDOR CALCULATIONS, SPECIFICATION OR PERFORMANCE TESTS. |
| | EMERGENCY RETRIEVAL MECHANISM | RETRIEVES TRANSFER CAR ON FAILURE OF DRIVE UNITS | NEW CALCULATION FOR 1/2 HP CAR RETRIEVAL DRIVE UNIT | | | NO CALCULATION FOR CAR RETRIEVAL DRIVE HP |
| 7 | CDC STATION | | | | | |
| | CANISTER MANIPULATING MECHANISM (CMM) | CANISTER DECONTAMINATION | NEW CALCULATION FOR THE 3 HP TRANSLATION MOTOR NEW CALCULATION FOR THE 2 HP ROTATION MOTOR SEARCH FOR LOAD AND OTHER TEST REPORTS NEW CALCULATION TO JUSTIFY THE CMM LOAD TEST | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF CMM TO HANDLE CIC. | A CALCULATION FOR SIZING GEARBOXES AND MOTORS FOR THE EXPERIMENTAL CANISTER PRIT BLASTER (ECPB) CAN APPLY TO THE DWPF CDC CMM. IT IS ASSUMED THAT THE CMM DRIVES ARE ADEQUATE TO HANDLE THE CIC WEIGHING 6120 LBS. THE CMM EQUIPMENT WAS TESTED FOR 15850 LB LOAD FOR HANDLING CIC THE CMM SHOULD BE LOAD TESTED FOR AT LEAST 16245 LBS (150% OF 6750 LBS ESTIMATED WEIGHT OF THE CMM + 6120 LBS WEIGHT OF THE CIC). |
| | CMM GRAPPLE HOOK | SUPPORTS CANISTER | NEW CALCULATION FOR GRAPPLE HOOK CAPACITY. SEARCH FOR LOAD TEST REPORTS | NO ACTION REQUIRED | NO ACTION REQUIRED | A CALCULATION DETERMINED THAT ONE OF THREE GRAPPLE JAWS CAN SUPPORT 5000 LBS THEORETICALLY, THREE JAWS CAN SUPPORT 15000 ANOTHER CALCULATION INDICATES THAT THE STRENGTH OF THE GRAPPLE JAWS IS SATISFACTORY FOR A DESIGN LOAD OF 15000 LBS IT IS ASSUMED THAT THE GRAPPLE CAN SUPPORT THE CIC WEIGHING 6120 LBS |
| | CMM LIFTING FIXTURE | PICK UP CMM AND CANISTER | SEARCH FOR TEST REPORTS OR GENERATE NEW CALCULATION. | NO ACTION REQUIRED | NO ACTION REQUIRED | PER M-R1-S-0012 REV 0 THE LIFTING FIXTURE HAS A CAPACITY OF 7.5 TONS AND LOAD TESTED FOR 11.25 TONS THIS EXCEEDS THE REQUIRED LOAD TEST FOR CIC HANDLING OF 18250 LBS (1.5 X 6750 + 6120). 6750 IS THE ESTIMATED WEIGHT OF CMM AND 6120 IS THE WEIGHT OF THE CIC |
| | CDC NOZZLE CAGE | NOZZLE CAGE BASE SUPPORTS CANISTER | SEARCH FOR TEST REPORTS | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF NOZZLE BASE TO SUPPORT CIC. | NOZZLE CAGE BASE MUST BE ABLE TO SUPPORT THE CIC WEIGHT OF 6120 LBS |
| | CDC TEMPERATURE STAND | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME STRUCTURAL CAPACITY OF THE CDC TEMPERATURE STAND IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120LBS |
| 8 | CDC SMEAR TEST STATION | | | | | |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| | TURNTABLE ASSEMBLY & LIFTING MECHANISM | ROTATE AND LIFT CANISTER FOR SMEAR TESTING | NEW CALCULATION FOR TURNTABLE ROTATING DRIVE.<br>NEW CALCULATION FOR TURNTABLE LIFTING DRIVE<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | MH-20975-99(1) PT-33 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE CDC TURNTABLE AND LIFTING MECHANISM. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE CDC TROLLEY |
| | TROLLEY AND ACCESSORIES | MOVE CANISTER BETWEEN STATIONS | NEW CALCULATION FOR TROLLEY ROTATING DRIVE.<br>NEW CALCULATION FOR TROLLEY TRANSVERSE DRIVE.<br>NEW CALCULATION FOR TROLLEY LIFTING DRIVE<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION | MH-20975-99(1) PT-34 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE CDC TROLLEY. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE CDC TROLLEY |
| | CDC - STS TROLLEY EMERGENCY RETRIEVAL WINCH | RETRIEVES TROLLEY ON FAILURE OF TROLLEY DRIVE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME GEAR BOX, SHEAVES, CHAIN, SHAFTS AND OTHER ACCESSORIES ARE ADEQUATE TO HANDLE THE INCREASED LOAD OF 1100 LBS |
| | CDC - STS EXIT PEDESTAL | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME STRUCTURAL CAPACITY OF THE CDC-STS EXIT PEDESTAL IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120LBS. |
| 9 | CDC CRANE | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-3, THE CDC CRANE HAS A MAIN HOIST RATED 10000 LBS WITH 5.75 HP/1800 RPM DRIVE. AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE CDC CRANE IS ADEQUATE TO HANDLE THE CIC WEIGHT (6120 LBS) PLUS THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY |
| | CANISTER GRAPPLE | | | | | THIS EQUIPMENT IS THE SAME AS THE GRAPPLE IN ITEM 4 |
| 10 | WTC SMEAR TEST STATION | | | | | |
| | WTC TURNTABLE ASSEMBLY | ROTATE CANISTER FOR SMEAR TESTING | NEW CALCULATION FOR TURNTABLE DRIVES.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION | MH-20975-99(1) PT-35 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE WTC SMEAR TEST STATION. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE WTC SMEAR TEST STATION |
| 11 | WTC LOWER CRANE | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-5, THE WTC LOWER CRANE HAS A MAIN HOIST RATED 15000 LBS WITH 12.5HP/1800 RPM DRIVE. AUXILIARY HOIST RATED 1000LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE WTC LOWER CRANE IS ADEQUATE TO HANDLE THE CIC (6120 LBS) PLUS THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY |
| 12 | WTC UPPER CRANE | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE, PLUS THE WTC LOWER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-4, THE WTC UPPER CRANE HAS A MAIN HOIST RATED 16000 LBS WITH 12.5 HP/1800 RPM DRIVE. AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE WTC UPPER CRANE IS ADEQUATE TO HANDLE THE CIC WEIGHT (6120 LBS) AND THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY |
| | | RESCUE WTC LOWER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ESTIMATED LOAD TO RESCUE WTC LOWER CRANE TROLLEY IS 16073 LBS (9428 WTC LOWER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC). THE ESTIMATED LOAD EXCEEDS WTC UPPER CRANE CAPACITY OF 15000 LBS BY 1073 LBS. IT IS ASSUMED THAT FOR EMERGENCY RECOVERY PURPOSES, IT IS ACCEPTABLE TO INFRINGE ON THE SAFETY FACTOR (THE WTC UPPER CRANE IS LOAD TESTED AT 125% OF ITS CAPACITY OR 18750 LBS). |
| 13 | ICC PRESS/PLUG WELDER TROLLEY | MOVES CANISTER INTO AND OUT OF ICC PRESS AND PLUG WELDER | NEW CALCULATION FOR HIGH SPEED DRIVE. NEW CALCULATION FOR LOW SPEED DRIVE.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF THE MOTOR DRIVE<br>MODIFY THE TROLLEY TO REPLACE THE EXISTING PNEUMATIC CYLINDER WITH A LARGER CYLINDER | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION | TROLLEY IS DRIVEN BY TWO REVERSIBLE ELECTRIC MOTORS ONE FOR LOW SPEED OPERATION (5.4 FT/MIN) AND THE OTHER FOR HIGH SPEED (18.3 FT/MIN). IT IS ASSUMED THAT THESE DRIVES ARE ADEQUATELY SIZED. IT IS ALSO ASSUMED THAT THIS TROLLEY IS DESIGNED FOR AT LEAST 6300 LBS SINCE THE TRANSFER CARS ARE DESIGNED FOR THIS LOAD |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| | | | | | | THE NEED FOR A LARGER PNEUMATIC CYLINDER WILL REQUIRE A MAJOR MODIFICATION OF THE ICC PRESS/PLUG WELDER TROLLEY. IT IS ASSUMED THAT THERE IS ADEQUATE SPACE FOR THE LARGER CYLINDER. |
| | ICC PRESS/PLUG WELDER PNEUMATIC CYLINDER | RAISES OR LOWERS CANISTER | NEW CALCULATION TO SELECT PNEUMATIC CYLINDER. | NO ACTION REQUIRED | NO ACTION REQUIRED | THE TROLLEY IS EQUIPPED WITH AN 8" DIA. MILLER CYLINDER (PISTON AREA = 50.265 SQ INCHES, AND A PUSH FORCE OF 12566 LBS USING 250 PSIG OPERATING MEDIUM). HOWEVER, OPERATIONS IS EXPERIENCING PROBLEMS WITH THE PNEUMATIC CYLINDER. THEY HAVE TO RAISE N2 PRESSURE ABOVE THE 250 PSIG DESIGN PRESSURE TO RAISE THE EXISTING 5100 LBS DWPF CANISTER. |
| | | | | | | WITH THE CIC LOADING OF 6120 LBS, IT IS ANTICIPATED THAT THE EXISTING PNEUMATIC CYLINDER NEED TO BE REPLACED WITH A LARGER CYLINDER. A 10" DIA MILLER CYLINDER (PISTON AREA = 78.54 SQ INCHES) USING THE SAME OPERATING MEDIUM USED TO RAISE THE 5100 LBS DWPF CANISTER SHOULD BE ABLE TO RAISE 7969 LBS LOAD (5100 X 78.54 /50.265) |
| | TROLLEY EMERGENCY RETRIEVAL SYSTEM | MOVES CANISTER TROLLEY ON FAILURE OF TROLLEY DRIVES | NEW CALCULATION FOR DRIVE MOTOR SIZE AND COMPARE TO EXISTING MOTOR DRIVE | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION | NO CALCULATIONS OR DATA SHEET FOUND. ASSUME MOTOR DRIVE IS ADEQUATE TO RETRIEVE TROLLEY |
| | ICC PRESS SUPPORT STAND | SUPPORTS CANISTER FLANGE AGAINST HYDRAULIC RAM FORCE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE ADDITIONAL LOAD TO BE HANDLED FOR PROCESSING THE CIC (1120 LBS) IS NEGLIGIBLE COMPARED TO THE 200,000 LBS ICC PRESS HYDRAULIC RAM FORCE. THE EQUIPMENT IS ADEQUATE TO HANDLE THE CIC |
| 14 | PLUG WELDER ELECTRODE | SUPPORTS CANISTER FLANGE AGAINST HYDRAULIC RAM FORCE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE ADDITIONAL LOAD TO BE HANDLED FOR PROCESSING THE CIC (1120 LBS) IS NEGLIGIBLE COMPARED TO THE 80,000 LBS PLUG WELDER HYDRAULIC RAM FORCE. THE EQUIPMENT IS ADEQUATE TO HANDLE THE CIC |
| 15 | RACKS IN WTC/CDC/MC | | | | | |
| | INSULATED CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR FOUR NORMAL CANISTERS | NO ACTION REQUIRED | NO ACTION REQUIRED | GENERATE A NEW CALCULATION TO DEFINE THE ALLOWABLE LOADING FOR THE EXISTING RACK. | BNI CALCULATION S350-18 IS BASED ON FILLED CANISTER WEIGHT = 5000 LBS. A LIMIT MAY NEED TO BE PLACED ON THE NUMBER OF CIC CANISTERS IN THE RACK. |
| | MC EQUIPMENT STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR THREE NORMAL AND TWO OVERPACK CANISTERS PLUS OTHER COMPONENTS | NO ACTION REQUIRED | NO ACTION REQUIRED | VERIFY RACK LOADING AND DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | BNI CALCULATION S350-17 IS BASED ON FOUR FILLED CANISTERS, WEIGHT = 5000 LBS. NOTE THIS LOADING CONDITION IS NOT CONSISTENT WITH THE DESCRIPTION IN G-SYD-S-00082. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT |
| | DIRTY CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR ONE NORMAL CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | BNI CALCULATION S350-11 IS BASED ON FILLED CANISTER WEIGHT = 5000 LBS. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT. LIFTING LUG LOAD TEST WAS NOT SUFFICIENT FOR CIC CANISTER WEIGHT. THIS ITEM WILL BE REPLACED WITH A NEW RACK. |
| | CLEAN CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR ONE NORMAL CANISTER AND ONE OVERPACK CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | BNI CALCULATION S350-1 IS BASED ON 5000LB NORMAL CANISTER WEIGHT PLUS 6000LB OVERPACK CANISTER WEIGHT. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT. LIFTING LUG LOAD TEST WAS NOT SUFFICIENT FOR CIC CANISTER WEIGHT OR OVERPACK CANISTER WEIGHT. THIS ITEM WILL BE REPLACED WITH A NEW RACK |
| 16 | CANISTER LOAD OUT AREA | | NO ACTION REQUIRED | NO ACTION REQUIRED | REPLACE EXISTING GRATING | |
| 17 | SCT | RETRIEVE "EMPTY" CIC FROM THE GWSB OR TRANSFER FILLED CIC TO THE GWSB | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE SCT HOIST CAPACITY (4T) IS ADEQUATE TO HANDLE A CIC CANISTER. ASSUME STRUCTURAL CAPACITY OF REMAINDER OF THE CRANE/TROLLEY STRUCTURE IS AT LEAST EQUAL TO HOIST CAPACITY. ASSUME NO ADDITIONAL SHIELDING IS REQUIRED FOR THE SCT. |
| 18 | RACKS IN GWSB #1 | RESTRAIN CANISTERS IN GWSB #1 | NO ACTION REQUIRED | NO ACTION REQUIRED | NO MODIFICATIONS REQUIRED - GENERATE CALCULATION TO DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | CALCULATION T-CLC-S-00164 EVALUATES THE GWSB #1 CANISTER STORAGE RACKS FOR FILLED CANISTER WEIGHT = 5600LBS. THIS CALCULATION REMOVES CONSERVATISM IN BNI CALCULATION S250-552, RESULTING IN REDUCED SEISMIC ACCELERATIONS. THE RACKS CAN BE SHOWN TO BE ADEQUATE FOR THE ADDITIONAL WEIGHT OF THE CIC CANISTERS WHEN THE REDUCED ACCELERATIONS ARE APPLIED. |
| 19 | RACKS IN GWSB #2 | RESTRAIN CANISTERS IN GWSB #2 | NO ACTION REQUIRED | NO ACTION REQUIRED | NO MODIFICATIONS REQUIRED - GENERATE CALCULATION TO DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | GWSB #2 RACKS ARE SAME AS GWSB #1 - ASSUME RACKS ARE ADEQUATE FOR CIC CANISTERS BY COMPARISON. RACK ANCHORAGE IS DIFFERENT BETWEEN GWSB #1 & GWSB #2. PARSONS CALCULATION C-CLC-S-00170 IS BASED ON FILLED CANISTER WEIGHT = 5500 LBS. CIC CANISTER RESULTS IN 11% INCREASE IN RACK LOADS; BENDING STRESS IN EMBED PLATE FOR CANISTER SUPPORTS @ 93% OF ALLOWABLE |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| 20 | MPC CRANE | SERVICE THE DIFFERENT INCELL CRANES | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO SERVICE THE CANISTER HANDLING AREAS |
| | | RESCUE WTC UPPER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE WTC UPPER CRANE TROLLEY. ESTIMATED LOAD IS 17420 LBS (10775 WTC UPPER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC) |
| | | RESCUE WTC UPPER AND LOWER CRANE TROLLEYS | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ESTIMATED LOAD TO RESCUE WTC UPPER AND LOWER CRANE TROLLEY IS 26848 LBS (9426 WTC LOWER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC + 10775 WTC UPPER CRANE TROLLEY). THE ESTIMATED LOAD EXCEEDS MPC 13 TON HOOK CAPACITY OF 26000 LBS BY ONLY 848 LBS. IT IS ASSUMED THAT FOR EMERGENCY RECOVERY PURPOSES, IT IS ACCEPTABLE TO INFRINGE ON THE SAFETY FACTOR (THE MPC 13 TON HOOK WAS LOAD TESTED AT 125% OF ITS CAPACITY OR 32500 LBS). |
| | | RESCUE CDC CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE TROLLEY OF THE 5 TON CDC CRANE SINCE THE SAME HOOK CAN RESCUE BOTH THE WTC UPPER AND LOWER CRANES AT THE SAME TIME. EACH WTC CRANE IS RATED 7 1/2 TONS. |
| | | RESCUE MC CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE TROLLEY OF THE 5 TON MC CRANE SINCE THE SAME HOOK CAN RESCUE BOTH THE WTC UPPER AND LOWER CRANES AT THE SAME TIME. EACH WTC CRANE IS RATED 7 1/2 TONS |
| 21 | SYSTEM DESIGN DESCRIPTIONS | | | | | |
| | G-FDD-S-00001 | DWPF FACILITY DESIGN DESCRIPTION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-FDD-S-00005 | GWSB #2 FACILITY DESIGN DESCRIPTION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00033 | VITRIFICATION FACILITY | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00035 | REMOTE OPERATION AND MAINTENANCE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00062 | CANISTER HANDLING SUPPORT SYSTEM | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00063 | CANISTER TURNTABLES | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00064 | CANISTER DECONTAMINATION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00065 | SMEAR TEST STATION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00066 | INNER CANISTER CLOSURE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00067 | FINAL CANISTER CLOSURE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00068 | GLASS WASTE STORAGE BUILDING | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00070 | SHIELDED CANISTER TRANSPORTER | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00077 | GLASS WASTE STORAGE BUILDING # 2 | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |

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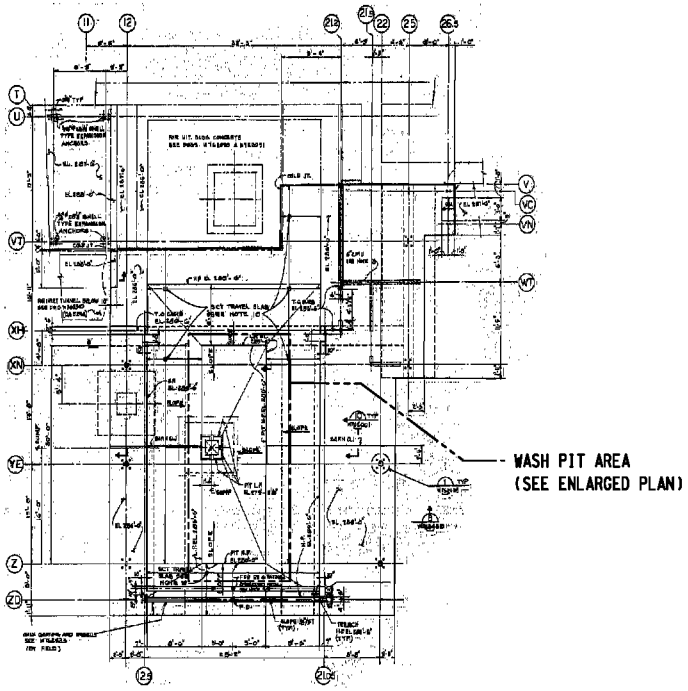
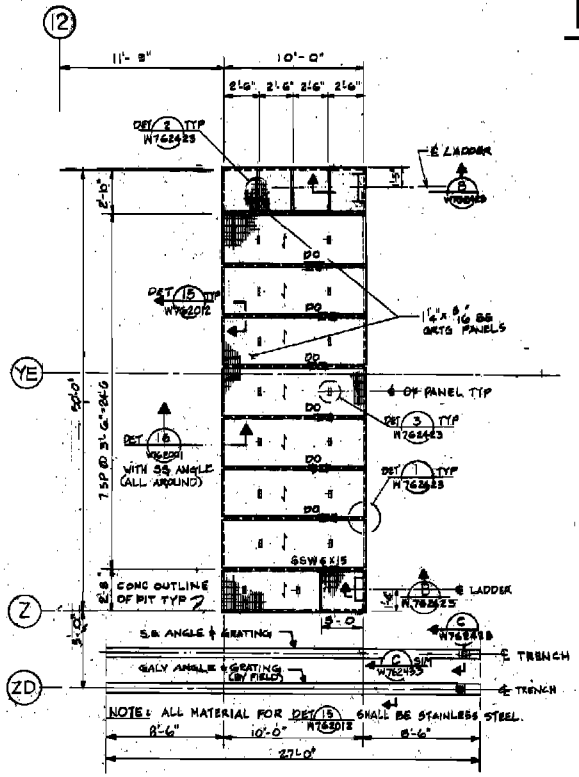
BEFORE




CST MAINTENANCE AREA
FOUNDATION & GROUND FLOOR PLAN
NTS




ENLARGED PLAN
WASH PIT GRATING AREA
NTS

# ATTACHMENT NO. 1
## (1 OF 2)

SCT DECON & MAINT AREA
GRATING & FRAMING PLAN @ WASH PIT

| TITLE | | | |
|---|---|---|---|
| ENLARGED PLAN - WASH PIT GRATING AREA | | | |
| UNITED STATES DEPARTMENT OF ENERGY<br>SAVANNAH RIVER SITE | SRP DRAWING NO.<br>N/A | SHEET NO.<br>OF | SHEET REV. |

TYPE 2C (11 x 17)

Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size)

W.S. [ ] .

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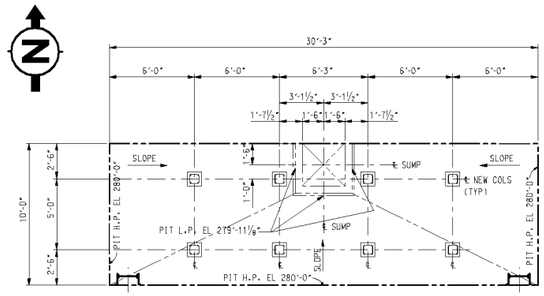
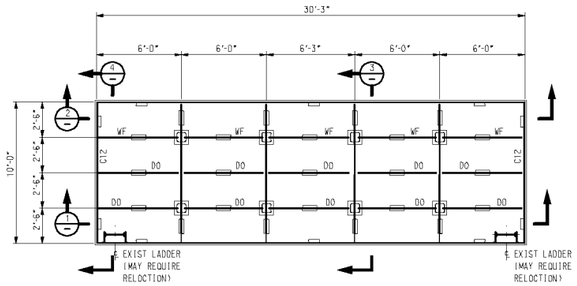


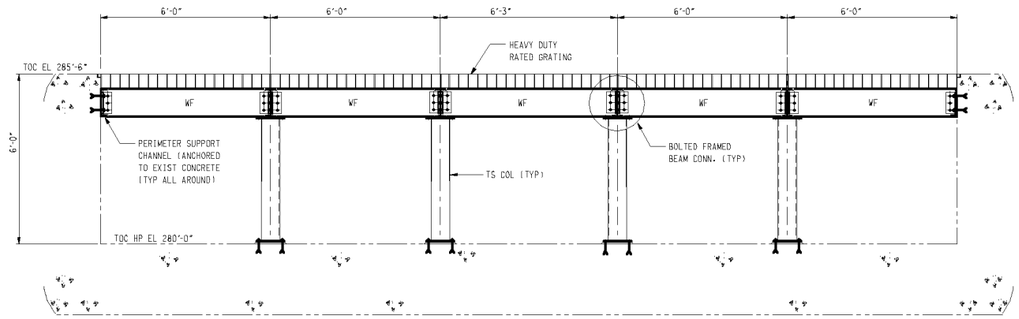

## SCT DECON & MAINTENANCE AREA PARTIAL PLAN AT BOTTOM OF WASH PIT

¼" = 1'-0"



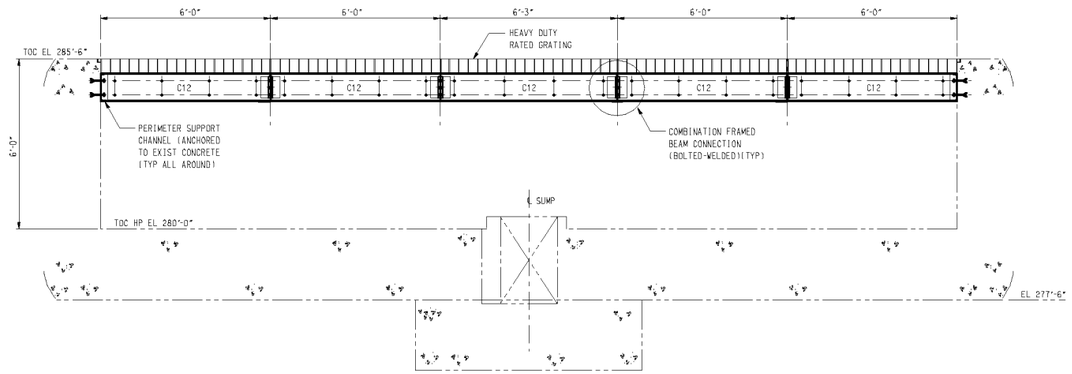

## WASH PIT GRATING COVER FRAMING PLAN AT ELEVATION 285'-6"

¼" = 1'-0"
TOS EL = -6" L L = XXX PSF



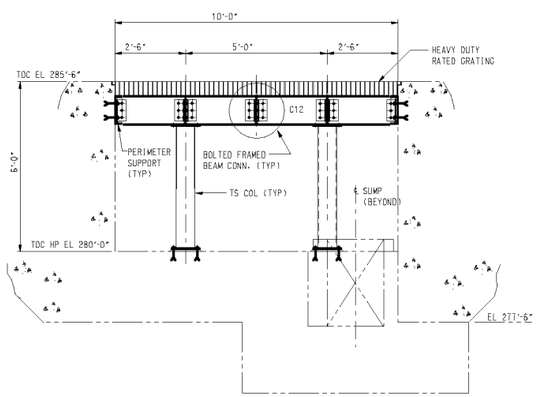

## SECTION 1

½" = 1'-0"



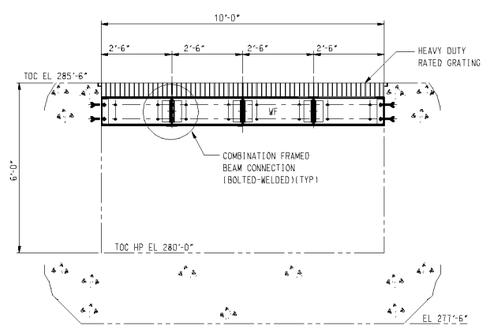

## SECTION 2

½" = 1'-0"




## SECTION 3

½" = 1'-0"




## SECTION 4

½" = 1'-0"

## GENERAL NOTES

1. PLATES, ANGLES AND BARS SHALL BE ASTM A36 GALVANIZED. TUBE STEEL SHALL BE ASTM A500 GR B GALVANIZED. W SHAPES SHALL BE ASTM A992 GALVANIZED.
2. WELDING SHALL BE IN ACCORDANCE WITH ENGINEERING STANDARD 05057 AND AWS D1.1 FOR STATICALLY LOADED STRUCTURES.
3. FIELD TO VERIFY ALL APPLICABLE DIMENSIONS AND CLEARANCES PRIOR TO INSTALLATION OF SUPPORT AND FRAMING MEMBERS.
4. DRILLCO MAXIBOLTS SHALL BE CARBON STEEL UNO. INSTALLATION OF ANCHOR BOLTS SHALL BE IN ACCORDANCE WITH SRS ENGINEERING GUIDE 03252-G.

## REFERENCE DRAWINGS

| | |
|---|---|
| W762423 | VIT BLDG AREA 19 - WASH PIT S.S. GRATING PLAN, SECTIONS AND DETAILS |
| W762436 | VIT BLDG SCT DECON & MAINT AREA 19 - ARRANGEMENT PLANS AND SECTIONS |
| W762437 | VIT BLDG SCT DECON & MAINT AREA 19 - FND & GROUND FLOOR PLAN |
| W762438 | VIT BLDG SCT DECON & MAINT AREA 19 - SECTIONS & DETAILS-SH. 1 OF 2 |
| W762439 | VIT BLDG SCT DECON & MAINT AREA 19 - SECTIONS & DETAILS-SH. 2 OF 2 |
| M762437 | VITBLDG SCT DECON & MAINT AREA 19 - REINFORCING PLANS |
| M762438 | VIT BLDG SCT DECON & MAINT AREA 19 - SECTIONS & DETAILS |
| M762439 | VIT BLDG SCT DECON & MAINT AREA 19 - PLAN SECTIONS & DETAILS |
| W762001 | TYPICAL DETAIL CONCRETE # 1 |

# AFTER

STEEL FLOOR FRAMING (BOLTED) WITHIN PIT WALLS SUPPORTED BY COLUMNS AND PERIMETER CHANNEL ANCHORED TO WALLS. ACCESS HATCH AND LADDER MODIFICATIONS (LATER)

# ATTACHMENT NO. 1
# (2 OF 2)

## SCT DECON & MAINT AREA GRATING & FRAMING PLAN @ WASH PIT

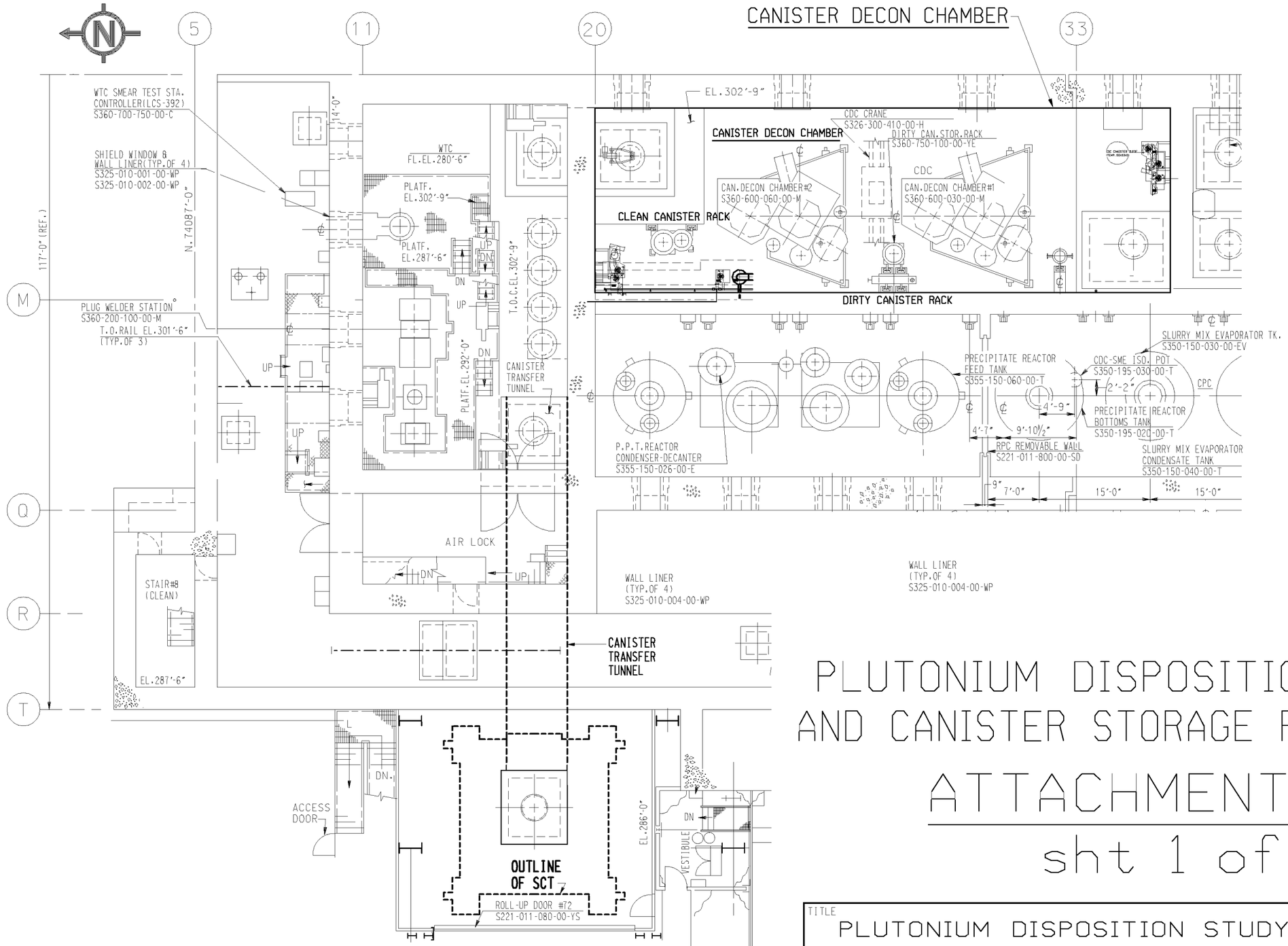
| TITLE | | | |
|---|---|---|---|
| WASH PIT GRATING COVER - FRAMING PLAN, EL 285'-6 | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. N/A | SHEET NO. OF | SHEET REV. |

TYPE 2C (11 x 17)

Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size)

W.S. [ ] .

THIS DRAWING HAS BEEN FURNISHED BY THE SAVANNAH RIVER SITE. THE INFORMATION AND KNOW HOW THEREON MAY NOT BE USED NOR THE DRAWING REPRODUCED WITHOUT WRITTEN PERMISSION OF THE PRIME CONTRACTOR. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING VENDOR'S SHOP DRAWINGS, SHALL BEAR OR REFER TO THIS STAMP.




# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 1 of 5

| TITLE | | | |
|---|---|---|---|
| PLUTONIUM DISPOSITION STUDY | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. N/A | SHEET NO. OF | SHEET REV. |

TYPE 2C (11 x 17)

Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size)

W.S. [ ] .

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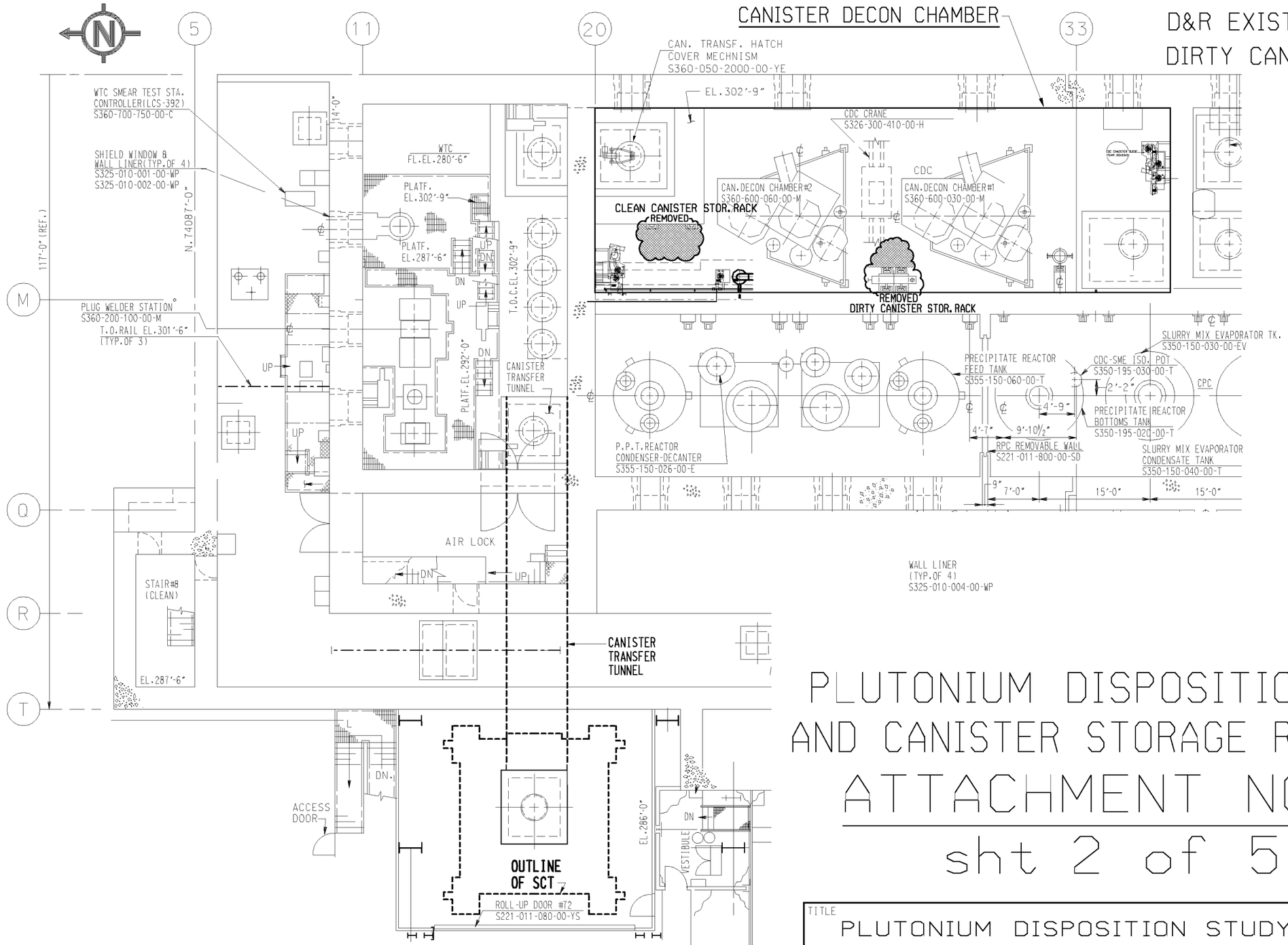


# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

# ATTACHMENT NO. 2

## sht 2 of 5

| TITLE | | | |
|---|---|---|---|
| PLUTONIUM DISPOSITION STUDY | | | |
| UNITED STATES DEPARTMENT OF ENERGY SAVANNAH RIVER SITE | SRP DRAWING NO. N/A | SHEET NO. OF | SHEET REV. |

TYPE 2C (11 x 17)

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W.S. [ ] .

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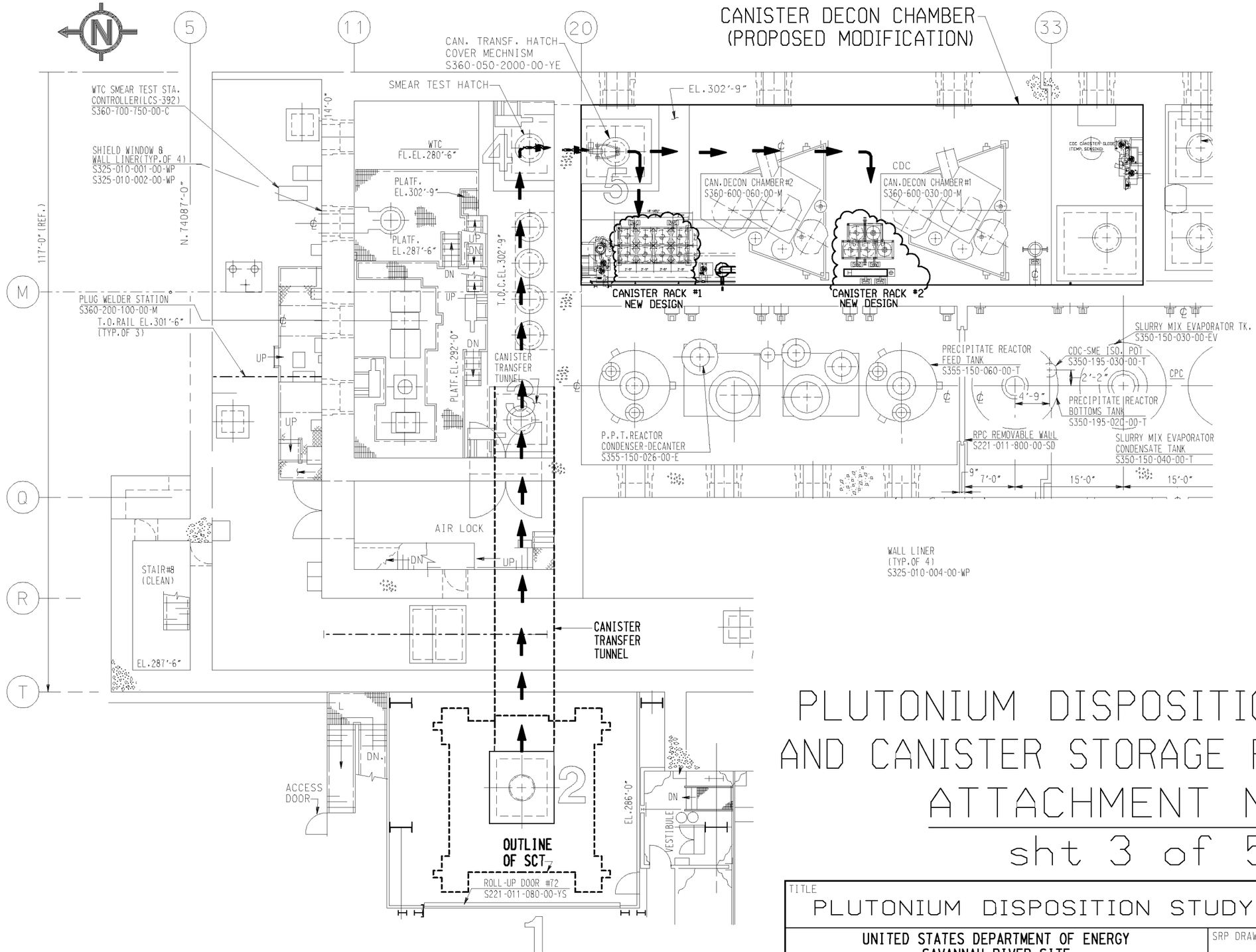
# AFTER




# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 3 of 5

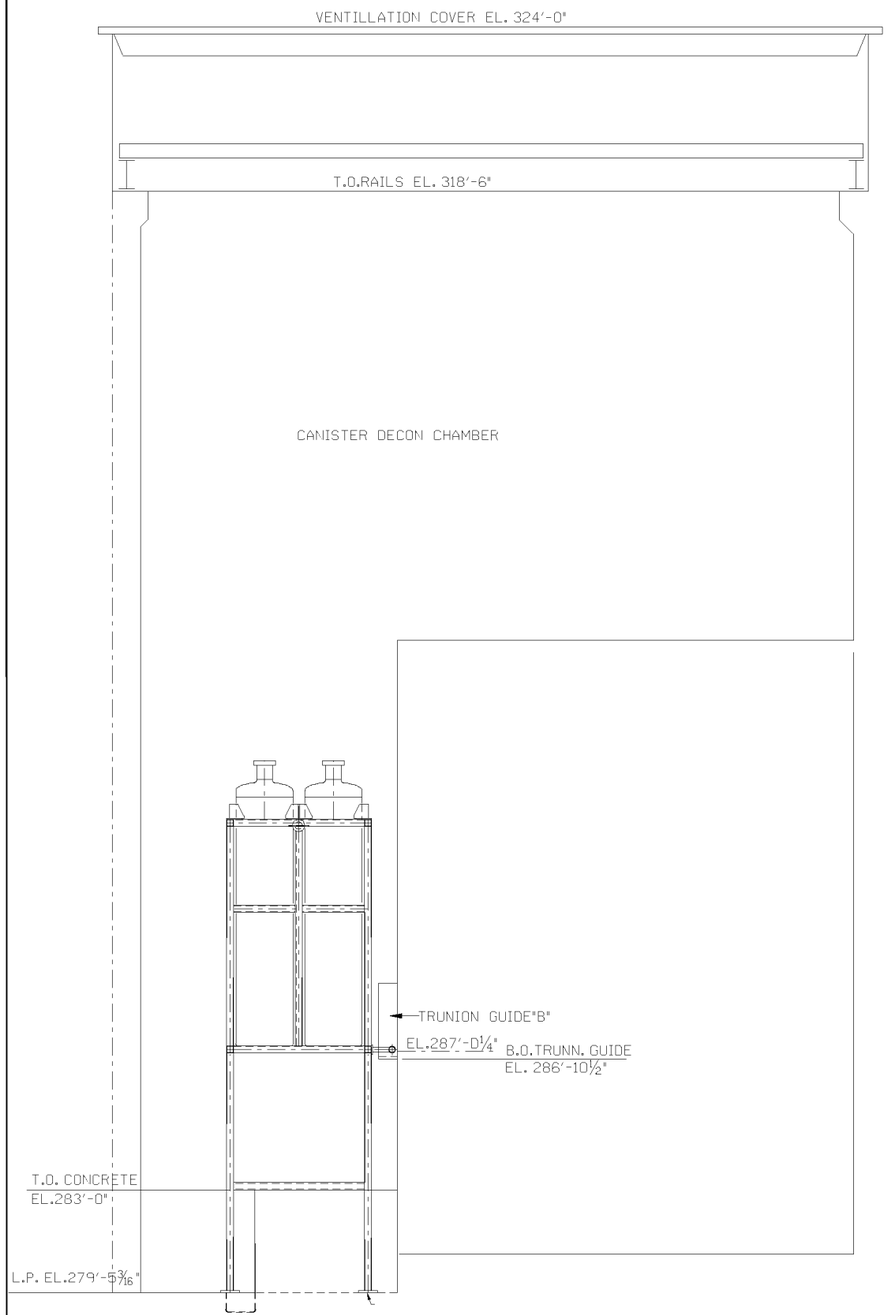
| TITLE | | | |
|---|---|---|---|
| PLUTONIUM DISPOSITION STUDY | | | |
| UNITED STATES DEPARTMENT OF ENERGY<br>SAVANNAH RIVER SITE | SRP DRAWING NO.<br>N/A | SHEET NO.<br>OF | SHEET REV. |

TYPE 2C (11 x 17)

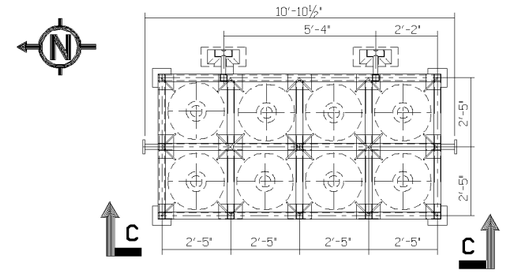
Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size)

W.S. [ ] .

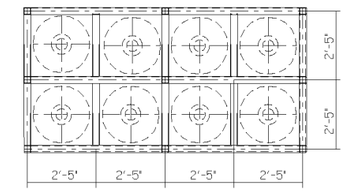
THIS DRAWING HAS BEEN FURNISHED BY THE SAVANNAH RIVER SITE. THE INFORMATION AND KNOW HOW THEREON MAY NOT BE USED NOR THE DRAWING REPRODUCED WITHOUT WRITTEN PERMISSION OF THE PRIME CONTRACTOR. ALL REPRODUCTIONS IN WHOLE OR IN PART, INCLUDING VENDOR'S SHOP DRAWINGS, SHALL BEAR OR REFER TO THIS STAMP.



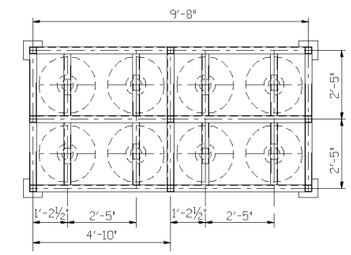

ELEV. LKG. NORTH



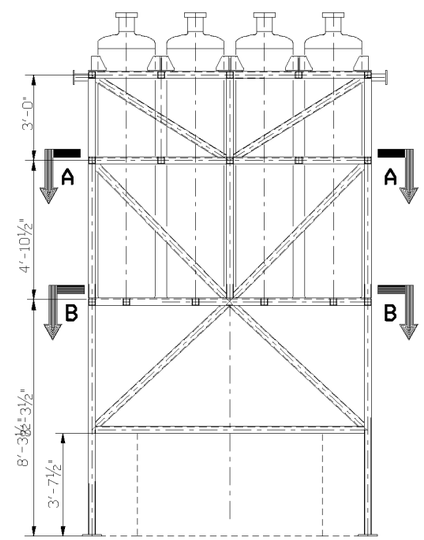

PLAN




SECTION A-A




SECTION B-B




SECTION C-C

NOTES:

1. ALL DIMENSIONS ARE PRELIMINARY AND SUBJECT TO CHANGE DURING DETAILED DESIGN.
2. YOKE NO. 6 SHOULD BE UTILIZED/INCORPORATED INTO THE DESIGN FOR LIFTING STORAGE RACK.
3. CRANE TRAVEL HAS ADEQUATE CLEARANCE FOR INSTALLING AND REMOVING OF STORAGE RACK INCLUDING YOKE.
4. 150% LOAD TEST OF A 150% DESIGN LOAD IS REQUIRED FOR THE LIFT TRUNNIONS.

# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 4 of 5

| TITLE | | | |
|---|---|---|---|
| CANISTERS STORAGE RACK NO. 1 | | | |
| UNITED STATES DEPARTMENT OF ENERGY<br>SAVANNAH RIVER SITE | SRP DRAWING NO.<br>N/A | SHEET NO.<br>OF | SHEET REV. |

TYPE 2C (11 x 17)

Scale shown on this drawing is only applicable when plotted at 11"x17" (actual drawing size)

W.S. [ ] .

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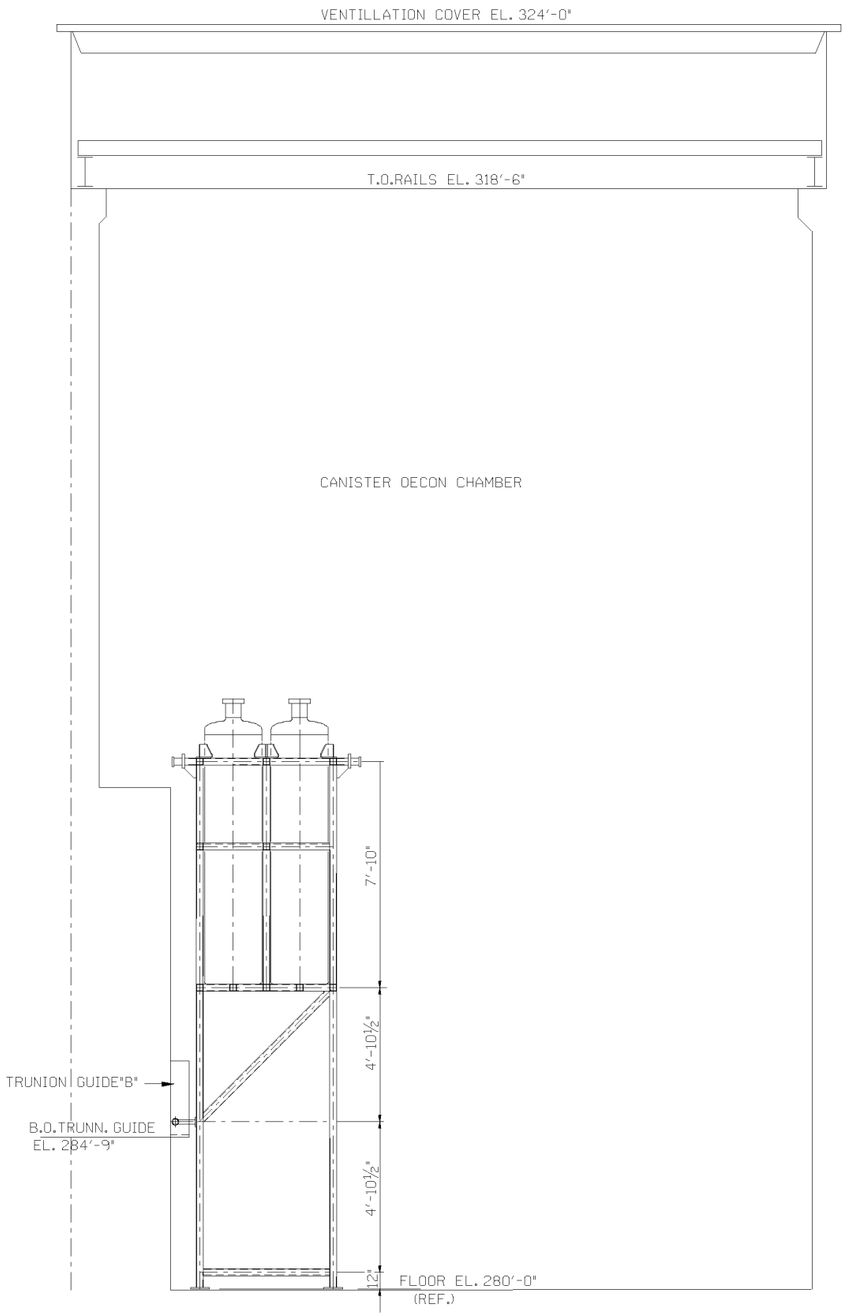
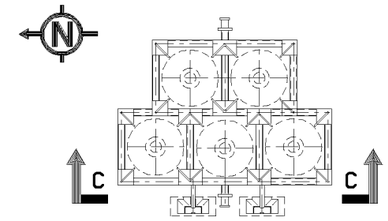
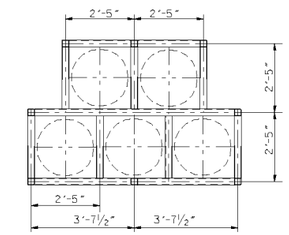


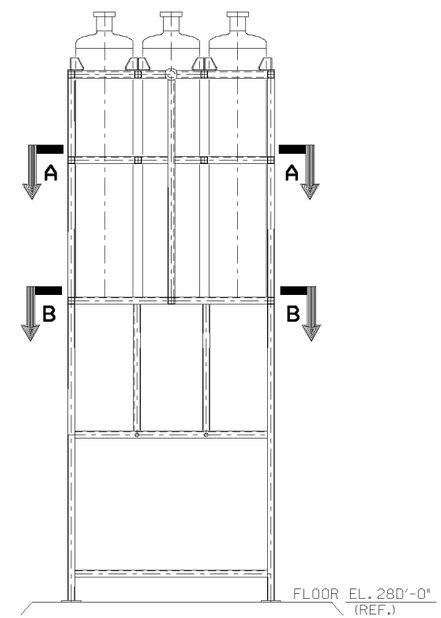

ELEV. LKG. NORTH



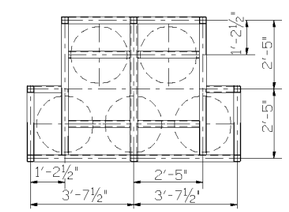

PLAN




SECTION A-A




SECTION C-C




SECTION B-B

NOTES:

1. ALL DIMENSIONS ARE PRELIMINARY AND SUBJECT TO CHANGE DURING DETAILED DESIGN.
2. YOKE NO. 10 SHOULD BE UTILIZED/INCORPORATED INTO THE DESIGN FOR LIFTING STORAGE RACK.
3. CRANE TRAVEL HAS ADEQUATE CLEARANCE FOR INSTALLING AND REMOVING OF STORAGE RACK INCLUDING YOKE.
4. 150% LOAD TEST OF A 150% DESIGN LOAD IS REQUIRED FOR THE LIFT TRUNNIONS.

# PLUTONIUM DISPOSITION STUDY AND CANISTER STORAGE RACK 1 & 2

## ATTACHMENT NO. 2

sht 5 of 5

| TITLE CANISTERS STORAGE RACK NO. 2 | | | |
|---|---|---|---|
| UNITED STATES DEPARTMENT OF ENERGY<br>SAVANNAH RIVER SITE | SRP DRAWING NO. | SHEET NO. | SHEET REV. |

TYPE 2C (11 x 17)

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| 1 | **MASTER SLAVE MANIPULATOR** | REMOVE AND DISPOSE CIC TEMPORARY PLUG | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | EVALUATION TO BE DONE BY OTHERS (DA).<br>ASSUMPTION: NO MODIFICATION REQUIRED TO EQUIPMENT AND FACILITY. |
| 2 | **CANISTER POUR TURN TABLE (PTT)** | | | | | |
| | CART DRIVE | PTT TRANSVERSE MOVEMENT | REVIEW/BECHTEL REVISION MH-20930-2(1). | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT. OF 6120 LBS, DRIVE MOTOR HAS ADEQUATE SAFETY FACTOR. DRIVE MOTOR ALSO HAS SERVICE FACTOR OF 2. |
| | SPIDER DRIVE | PTT ROTATION | REVIEW/BECHTEL REVISION MH-20930-1(1). | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT. OF 6120 LBS, DRIVE MOTOR HAS SAFETY FACTOR OF 1.7 |
| | CLUTCH/BRAKE/SHAFT/COUPLING | CONTROL OF PTT MOTOR | REVIEW/BECHTEL REVISION MH-20930-415(1). | NO ACTION REQUIRED | NO ACTION REQUIRED | BASED ON CIC WT. OF 6120 LBS, EXISTING COMPONENTS ARE ADEQUATE. |
| | CANISTER POSITIONING ARM | CANISTER ROTATION | NEW CALCULATION FOR CANISTER POSITIONING ARM. | NO ACTION REQUIRED | NO ACTION REQUIRED | OLD BNI (1/83) CALC. INDICATES HP REQUIREMENT ADEQUATE FOR CIC WEIGHT. |
| | LOAD CELLS | MONITOR CANISTER WEIGHT | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | LOAD CELLS ARE ADJUSTABLE FROM 0 TO 10000 LBS AND ARE ADEQUATE FOR CIC WEIGHT.<br>ASSUME STRUCTURAL CAPACITY OF POUR TURNTABLE STRUCTURE IS AT LEAST EQUAL TO LOAD CELL CAPACITY. |
| 3 | **INNER CANISTER CLOSURE STATION** | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF THE ICC STATION TO HANDLE CIC. | MH-20976-12(1) IS A PROOF LOAD TEST PROCEDURE FOR THE ICC STATION. ASSUME THE STRUCTURAL CAPACITY OF THE ICC STATION IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120 LBS. |
| 4 | **MC CRANE** | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-2, THE MC CRANE HAS A MAIN HOIST RATED 10000 LBS WITH 8.75 HP/1800 RPM DRIVE; AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE MC CRANE IS ADEQUATE TO HANDLE THE CIC (6120 LBS.) PLUS THE GRAPPLE WEIGHT (525 LBS.).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY. |
| 5 | **CANISTER GRAPPLE** | REMOVE /TRANSFER CIC FROM/TO TRANSFER CARS IN THE MC, CDC, & WTC | REVIEW TEST REPORTS OR GENERATE NEW CALCULATION. | NO ACTION REQUIRED | NO ACTION REQUIRED | THE GRAPPLE IS RATED 15000 LBS. PER MH-20921-10(1), THE GRAPPLE IS TESTED FOR NORMAL AND EMERGENCY CONDITIONS TO SUPPORT 18,750 LB LOAD. CYCLIC TESTING IS PERFORMED AT 15,000 LB LOAD FOR 500 CYCLES. BASED ON THIS FUNCTIONAL TEST, IT IS ANTICIPATED THAT THE GRAPPLE IS ADEQUATE FOR CIC HANDLING. |
| 6 | **TRANSFER CARS** | | | | | |
| | EXIT TRANSFER CAR,<br>MC/CDC TRANSFER CAR | MOVE CANISTER BETWEEN CELLS | SEARCH FOR SPECIFICATION, TEST PROCEDURE, TEST REPORT TO DOCUMENT CANISTER DESIGN LOAD OF 6300 LB.<br>NEW CALCULATION FOR 1/2 HP DRIVE UNIT. | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | G-SYD-S-00062, PAGE 11 AND PROCESS HAZARDS REVIEW PHR-07 INDICATE THAT THE TRANSFER CARS ARE DESIGNED TO SUPPORT CANISTER WEIGHT OF 6300 LBS.<br>NOTE THAT THERE ARE NO VENDOR CALCULATIONS, SPECIFICATION OR PERFORMANCE TESTS. |
| | EMERGENCY RETRIEVAL MECHANISM | RETRIEVES TRANSFER CAR ON FAILURE OF DRIVE UNITS | NEW CALCULATION FOR 1/2 HP CAR RETRIEVAL DRIVE UNIT. | | | NO CALCULATION FOR CAR RETRIEVAL DRIVE HP. |
| 7 | **CDC STATION** | | | | | |
| | CANISTER MANIPULATING MECHANISM (CMM) | CANISTER DECONTAMINATION | NEW CALCULATION FOR THE 3 HP TRANSLATION MOTOR.<br>NEW CALCULATION FOR THE 2 HP ROTATION MOTOR.<br>SEARCH FOR LOAD AND OTHER TEST REPORTS.<br>NEW CALCULATION TO JUSTIFY THE CMM LOAD TEST | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF CMM TO HANDLE CIC. | A CALCULATION FOR SIZING GEARBOXES AND MOTORS FOR THE EXPERIMENTAL CANISTER FRIT BLASTER (ECFB) CAN APPLY TO THE DWPF CDC CMM. IT IS ASSUMED THAT THE CMM DRIVES ARE ADEQUATE TO HANDLE THE CIC WEIGHING 6120 LBS. THE CMM EQUIPMENT WAS TESTED FOR 15850 LB LOAD. FOR HANDLING CIC, THE CMM SHOULD BE LOAD TESTED FOR AT LEAST 16245 LBS (150% OF 6750 LBS ESTIMATED WEIGHT OF THE CMM + 6120 LBS WEIGHT OF THE CIC). |
| | CMM GRAPPLE HOOK | SUPPORTS CANISTER | NEW CALCULATION FOR GRAPPLE HOOK CAPACITY.<br>SEARCH FOR LOAD TEST REPORTS | NO ACTION REQUIRED | NO ACTION REQUIRED | A CALCULATION DETERMINED THAT ONE OF THREE GRAPPLE JAWS CAN SUPPORT 5000 LBS. THEORETICALLY, THREE JAWS CAN SUPPORT 15000. ANOTHER CALCULATION INDICATES THAT THE STRENGTH OF THE GRAPPLE JAWS IS SATISFACTORY FOR A DESIGN LOAD OF 15000 LBS. IT IS ASSUMED THAT THE GRAPPLE CAN SUPPORT THE CIC WEIGHING 6120 LBS. |
| | CMM LIFTING FIXTURE | PICK UP CMM AND CANISTER | SEARCH FOR TEST REPORTS OR GENERATE NEW CALCULATION. | NO ACTION REQUIRED | NO ACTION REQUIRED | PER M-R1-S-0012, REV. 0, THE LIFTING FIXTURE HAS A CAPACITY OF 7.5 TONS AND LOAD TESTED FOR 11.25 TONS. THIS EXCEEDS THE REQUIRED LOAD TEST FOR CIC HANDLING OF 16250 LBS (1.5 X 6750 + 6120). 6750 IS THE ESTIMATED WEIGHT OF CMM AND 6120 IS THE WEIGHT OF THE CIC. |
| | CDC NOZZLE CAGE | NOZZLE CAGE BASE SUPPORTS CANISTER | SEARCH FOR TEST REPORTS. | NO ACTION REQUIRED | GENERATE CALCULATION TO DEMONSTRATE ADEQUACY OF NOZZLE BASE TO SUPPORT CIC. | NOZZLE CAGE BASE MUST BE ABLE TO SUPPORT THE CIC WEIGHT OF 6120 LBS. |
| | CDC TEMPERATURE STAND | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME STRUCTURAL CAPACITY OF THE CDC TEMPERATURE STAND IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120LBS. |
| 8 | **CDC SMEAR TEST STATION** | | | | | |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| | TURNTABLE ASSEMBLY & LIFTING MECHANISM | ROTATE AND LIFT CANISTER FOR SMEAR TESTING | NEW CALCULATION FOR TURNTABLE ROTATING DRIVE.<br>NEW CALCULATION FOR TURNTABLE LIFTING DRIVE.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT. | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | MH-20975-99(1), PT-33 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE CDC TURNTABLE AND LIFTING MECHANISM. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE CDC TROLLEY. |
| | TROLLEY AND ACCESSORIES | MOVE CANISTER BETWEEN STATIONS | NEW CALCULATION FOR TROLLEY ROTATING DRIVE.<br>NEW CALCULATION FOR TROLLEY TRANSVERSE DRIVE.<br>NEW CALCULATION FOR TROLLEY LIFTING DRIVE.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT. | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | MH-20975-92(1), PT-34 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE CDC TROLLEY. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE CDC TROLLEY. |
| | CDC - STS TROLLEY EMERGENCY RETRIEVAL WINCH | RETRIEVES TROLLEY ON FAILURE OF TROLLEY DRIVE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME GEAR BOX, SHEAVES, CHAIN, SHAFTS AND OTHER ACCESSORIES ARE ADEQUATE TO HANDLE THE INCREASED LOAD OF 1100 LBS. |
| | CDC - STS EXIT PEDESTAL | SUPPORTS CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME STRUCTURAL CAPACITY OF THE CDC-STS EXIT PEDESTAL IS ADEQUATE TO SUPPORT THE CIC WEIGHING 6120LBS. |
| **9** | **CDC CRANE** | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-3, THE CDC CRANE HAS A MAIN HOIST RATED 10000 LBS WITH 8.75 HP/1800 RPM DRIVE; AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE CDC CRANE IS ADEQUATE TO HANDLE THE CIC WEIGHT (6120 LBS) PLUS THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY. |
| | CANISTER GRAPPLE | | | | | THIS EQUIPMENT IS THE SAME AS THE GRAPPLE IN ITEM 4. |
| **10** | **WTC SMEAR TEST STATION** | | | | | |
| | WTC TURNTABLE ASSEMBLY | ROTATE CANISTER FOR SMEAR TESTING | NEW CALCULATION FOR TURNTABLE DRIVES.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF EQUIPMENT | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | MH-20975-93(1), PT-35 IS A SHOP/PRELIMINARY OPERATIONAL TEST FOR THE WTC SMEAR TEST STATION. IT IS REQUIRED TO TEST THE EQUIPMENT BASED ON CANISTER DESIGN LOAD OF 7000 LBS AND TEST LOAD OF 10500 LBS. THE PERFORMANCE TEST REPORT CAN BE USED TO DOCUMENT ADEQUACY OF THE WTC SMEAR TEST STATION. |
| **11** | **WTC LOWER CRANE** | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-5, THE WTC LOWER CRANE HAS A MAIN HOIST RATED 15000 LBS WITH 12.5HP/1800 RPM DRIVE; AUXILIARY HOIST RATED 1000LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE WTC LOWER CRANE IS ADEQUATE TO HANDLE THE CIC (6120 LBS) PLUS THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY. |
| **12** | **WTC UPPER CRANE** | TRANSPORT EMPTY AND FILLED CANISTERS USING GRAPPLE, PLUS THE WTC LOWER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | PER DATA SHEET DS-M-2-4, THE WTC UPPER CRANE HAS A MAIN HOIST RATED 15000 LBS WITH 12.5 HP/1800 RPM DRIVE; AUXILIARY HOIST RATED 1000 LBS WITH 1.5 HP/900 RPM DRIVE. TROLLEY DRIVE IS 1/3 HP/1200 RPM. BRIDGE DRIVE IS 1/2 HP/1200 RPM. THE WTC UPPER CRANE IS ADEQUATE TO HANDLE THE CIC WEIGHT (6120 LBS) AND THE GRAPPLE WEIGHT (525 LBS).<br>ASSUME STRUCTURAL CAPACITY OF CRANE/TROLLEY STRUCTURES, RAILS, CORBELS, ETC. IS AT LEAST EQUAL TO HOIST CAPACITY. |
| | | RESCUE WTC LOWER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ESTIMATED LOAD TO RESCUE WTC LOWER CRANE TROLLEY IS 16073 LBS (9428 WTC LOWER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC). THE ESTIMATED LOAD EXCEEDS WTC UPPER CRANE CAPACITY OF 15000 LBS BY 1073 LBS. IT IS ASSUMED THAT FOR EMERGENCY RECOVERY PURPOSES, IT IS ACCEPTABLE TO INFRINGE ON THE SAFETY FACTOR (THE WTC UPPER CRANE IS LOAD TESTED AT 125% OF ITS CAPACITY OR 18750 LBS). |
| **13** | **ICC PRESS/PLUG WELDER TROLLEY** | MOVES CANISTER INTO AND OUT OF ICC PRESS AND PLUG WELDER | NEW CALCULATION FOR HIGH SPEED DRIVE. NEW CALCULATION FOR LOW SPEED DRIVE.<br>SEARCH FOR PERFORMANCE TEST REPORTS TO DOCUMENT ADEQUACY OF THE MOTOR DRIVE.<br>MODIFY THE TROLLEY TO REPLACE THE EXISTING PNEUMATIC CYLINDER WITH A LARGER CYLINDER. | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | TROLLEY IS DRIVEN BY TWO REVERSIBLE ELECTRIC MOTORS ONE FOR LOW SPEED OPERATION (5.4 FT/MIN) AND THE OTHER FOR HIGH SPEED (16.3 FT/MIN). IT IS ASSUMED THAT THESE DRIVES ARE ADEQUATELY SIZED. IT IS ALSO ASSUMED THAT THIS TROLLEY IS DESIGNED FOR AT LEAST 6300 LBS SINCE THE TRANSFER CARS ARE DESIGNED FOR THIS LOAD. |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| | | | | | | THE NEED FOR A LARGER PNEUMATIC CYLINDER WILL REQUIRE A MAJOR MODIFICATION OF THE ICC PRESS/PLUG WELDER TROLLEY. IT IS ASSUMED THAT THERE IS ADEQUATE SPACE FOR THE LARGER CYLINDER. |
| | **ICC PRESS/PLUG WELDER PNEUMATIC CYLINDER** | RAISES OR LOWERS CANISTER | NEW CALCULATION TO SELECT PNEUMATIC CYLINDER. | NO ACTION REQUIRED | NO ACTION REQUIRED | THE TROLLEY IS EQUIPPED WITH AN 8" DIA. MILLER CYLINDER (PISTON AREA = 50.265 SQ INCHES, AND A PUSH FORCE OF 12566 LBS USING 250 PSIG OPERATING MEDIUM). HOWEVER, OPERATIONS IS EXPERIENCING PROBLEMS WITH THE PNEUMATIC CYLINDER. THEY HAVE TO RAISE N2 PRESSURE ABOVE THE 250 PSIG DESIGN PRESSURE TO RAISE THE EXISTING 5100 LBS DWPF CANISTER. |
| | | | | | | WITH THE CIC LOADING OF 6120 LBS, IT IS ANTICIPATED THAT THE EXISTING PNEUMATIC CYLINDER NEED TO BE REPLACED WITH A LARGER CYLINDER. A 10" DIA MILLER CYLINDER (PISTON AREA = 78.54 SQ INCHES) USING THE SAME OPERATING MEDIUM USED TO RAISE THE 5100 LBS. DWPF CANISTER SHOULD BE ABLE TO RAISE 7969 LBS. LOAD (5100 X 78.54 /50.265). |
| | **TROLLEY EMERGENCY RETRIEVAL SYSTEM** | MOVES CANISTER TROLLEY ON FAILURE OF TROLLEY DRIVES | NEW CALCULATION FOR DRIVE MOTOR SIZE AND COMPARE TO EXISTING MOTOR DRIVE. | NO ACTION REQUIRED | SEARCH FOR DOCUMENTATION OF STRUCTURAL CAPACITY OR PREPARE NEW CALCULATION. | NO CALCULATIONS OR DATA SHEET FOUND. ASSUME MOTOR DRIVE IS ADEQUATE TO RETRIEVE TROLLEY. |
| | **ICC PRESS SUPPORT STAND** | SUPPORTS CANISTER FLANGE AGAINST HYDRAULIC RAM FORCE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE ADDITIONAL LOAD TO BE HANDLED FOR PROCESSING THE CIC (1120 LBS) IS NEGLIGIBLE COMPARED TO THE 200,000 LBS ICC PRESS HYDRAULIC RAM FORCE. THE EQUIPMENT IS ADEQUATE TO HANDLE THE CIC. |
| **14** | **PLUG WELDER ELECTRODE** | SUPPORTS CANISTER FLANGE AGAINST HYDRAULIC RAM FORCE | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE ADDITIONAL LOAD TO BE HANDLED FOR PROCESSING THE CIC (1120 LBS) IS NEGLIGIBLE COMPARED TO THE 80,000 LBS PLUG WELDER HYDRAULIC RAM FORCE. THE EQUIPMENT IS ADEQUATE TO HANDLE THE CIC. |
| **15** | **RACKS IN WTC/CDC/MC** | | | | | |
| | INSULATED CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR FOUR NORMAL CANISTERS | NO ACTION REQUIRED | NO ACTION REQUIRED | GENERATE A NEW CALCULATION TO DEFINE THE ALLOWABLE LOADING FOR THE EXISTING RACK. | BNI CALCULATION S350-16 IS BASED ON FILLED CANISTER WEIGHT = 5000 LBS. A LIMIT MAY NEED TO BE PLACED ON THE NUMBER OF CIC CANISTERS IN THE RACK. |
| | MC EQUIPMENT STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR THREE NORMAL AND TWO OVERPACK CANISTERS PLUS OTHER COMPONENTS | NO ACTION REQUIRED | NO ACTION REQUIRED | VERIFY RACK LOADING AND DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | BNI CALCULATION S350-17 IS BASED ON FOUR FILLED CANISTERS, WEIGHT = 5000 LBS. NOTE THIS LOADING CONDITION IS NOT CONSISTENT WITH THE DESCRIPTION IN G-SYD-S-00062. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT. |
| | DIRTY CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR ONE NORMAL CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | BNI CALCULATION S360-11 IS BASED ON FILLED CANISTER WEIGHT = 5000 LBS. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT.<br>LIFTING LUG LOAD TEST WAS NOT SUFFICIENT FOR CIC CANISTER WEIGHT. THIS ITEM WILL BE REPLACED WITH A NEW RACK. |
| | CLEAN CANISTER STORAGE RACK | TEMPORARY HOLDING STRUCTURE FOR ONE NORMAL CANISTER AND ONE OVERPACK CANISTER | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | BNI CALCULATION S360-11 IS BASED ON 5000LB NORMAL CANISTER WEIGHT PLUS 6000LB OVERPACK CANISTER WEIGHT. MARGIN BETWEEN CALCULATED AND ALLOWABLE STRESS IS SUFFICIENT FOR ADDITIONAL CIC WEIGHT.<br>LIFTING LUG LOAD TEST WAS NOT SUFFICIENT FOR CIC CANISTER WEIGHT OR OVERPACK CANISTER WEIGHT.<br>THIS ITEM WILL BE REPLACED WITH A NEW RACK. |
| **16** | **CANISTER LOAD OUT AREA** | | NO ACTION REQUIRED | NO ACTION REQUIRED | REPLACE EXISTING GRATING. | |
| **17** | **SCT** | RETRIEVE "EMPTY" CIC FROM THE GWSB OR TRANSFER FILLED CIC TO THE GWSB | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | THE SCT HOIST CAPACITY (4T) IS ADEQUATE TO HANDLE A CIC CANISTER. ASSUME STRUCTURAL CAPACITY OF REMAINDER OF THE CRANE/TROLLEY STRUCTURE IS AT LEAST EQUAL TO HOIST CAPACITY.<br>ASSUME NO ADDITIONAL SHIELDING IS REQUIRED FOR THE SCT. |
| **18** | **RACKS IN GWSB #1** | RESTRAIN CANISTERS IN GWSB #1 | NO ACTION REQUIRED | NO ACTION REQUIRED | NO MODIFICATIONS REQUIRED - GENERATE CALCULATION TO DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | CALCULATION T-CLC-S-00184 EVALUATES THE GWSB #1 CANISTER STORAGE RACKS FOR FILLED CANISTER WEIGHT = 5600LBS. THIS CALCULATION REMOVES CONSERVATISM IN BNI CALCULATION S250-552, RESULTING IN REDUCED SEISMIC ACCELERATIONS. THE RACKS CAN BE SHOWN TO BE ADEQUATE FOR THE ADDITIONAL WEIGHT OF THE CIC CANISTERS WHEN THE REDUCED ACCELERATIONS ARE APPLIED. |
| **19** | **RACKS IN GWSB #2** | RESTRAIN CANISTERS IN GWSB #2 | NO ACTION REQUIRED | NO ACTION REQUIRED | NO MODIFICATIONS REQUIRED - GENERATE CALCULATION TO DOCUMENT STRUCTURAL ADEQUACY FOR ADDITIONAL CIC WEIGHT. | GWSB #2 RACKS ARE SAME AS GWSB #1 - ASSUME RACKS ARE ADEQUATE FOR CIC CANISTERS BY COMPARISON.<br>RACK ANCHORAGE IS DIFFERENT BETWEEN GWSB #1 & GWSB #2. PARSONS CALCULATION C-CLC-S-00170 IS BASED ON FILLED CANISTER WEIGHT = 5500 LBS. CIC CANISTER RESULTS IN 11% INCREASE IN RACK LOADS; BENDING STRESS IN EMBED PLATE FOR CANISTER SUPPORTS IS 93% OF ALLOWABLE. |

| ITEM | EQUIPMENT | FUNCTION | MECHANICAL | ELECTRICAL | STRUCTURAL | REMARKS |
|---|---|---|---|---|---|---|
| **20** | **MPC CRANE** | SERVICE THE DIFFERENT INCELL CRANES | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO SERVICE THE CANISTER HANDLING AREAS. |
| | | RESCUE WTC UPPER CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE WTC UPPER CRANE TROLLEY. ESTIMATED LOAD IS 17420 LBS (10775 WTC UPPER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC). |
| | | RESCUE WTC UPPER AND LOWER CRANE TROLLEYS | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ESTIMATED LOAD TO RESCUE WTC UPPER AND LOWER CRANE TROLLEY IS 26848 LBS (9428 WTC LOWER CRANE TROLLEY + 525 GRAPPLE + 6120 CIC + 10775 WTC UPPER CRANE TROLLEY). THE ESTIMATED LOAD EXCEEDS MPC 13 TON HOOK CAPACITY OF 26000 LBS BY ONLY 848 LBS. IT IS ASSUMED THAT FOR EMERGENCY RECOVERY PURPOSES, IT IS ACCEPTABLE TO INFRINGE ON THE SAFETY FACTOR (THE MPC 13 TON HOOK WAS LOAD TESTED AT 125% OF ITS CAPACITY OR 32500 LBS). |
| | | RESCUE CDC CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE TROLLEY OF THE 5 TON CDC CRANE SINCE THE SAME HOOK CAN RESCUE BOTH THE WTC UPPER AND LOWER CRANES AT THE SAME TIME. EACH WTC CRANE IS RATED 7 1/2 TONS. |
| | | RESCUE MC CRANE TROLLEY | NO ACTION REQUIRED | NO ACTION REQUIRED | NO ACTION REQUIRED | ASSUME THE MPC CRANE 13 TON HOOK IS ADEQUATE TO RESCUE THE TROLLEY OF THE 5 TON MC CRANE SINCE THE SAME HOOK CAN RESCUE BOTH THE WTC UPPER AND LOWER CRANES AT THE SAME TIME. EACH WTC CRANE IS RATED 7 1/2 TONS. |
| **21** | **SYSTEM DESIGN DESCRIPTIONS** | | | | | |
| | G-FDD-S-00001 | DWPF FACILITY DESIGN DESCRIPTION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-FDD-S-00005 | GWSB # 2 FACILITY DESIGN DESCRIPTION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00033 | VITRIFICATION FACILITY | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00035 | REMOTE OPERATION AND MAINTENANCE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00062 | CANISTER HANDLING SUPPORT SYSTEM | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00063 | CANISTER TURNTABLES | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00064 | CANISTER DECONTAMINATION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00065 | SMEAR TEST STATION | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00066 | INNER CANISTER CLOSURE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00067 | FINAL CANISTER CLOSURE | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00068 | GLASS WASTE STORAGE BUILDING | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00070 | SHIELDED CANISTER TRANSPORTER | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
| | G-SYD-S-00077 | GLASS WASTE STORAGE BUILDING # 2 | REVIEW AND REVISE TO INCORPORATE CIC HANDLING | NO ACTION REQUIRED | NO ACTION REQUIRED | |
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# Time and Motion Study For

# Integration of Can-in-Canister (CIC's) into the Defense Waste Processing Facility (DWPF) Vitrification Process

## G-ESR-S-00019

**Revision 0**
**June 2007**

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# TABLE OF CONTENTS

**SECTION PAGE**

**APPROVALS** ..... **3**

**LIST OF ACRONYMS** ..... **6**

**EXECUTIVE SUMMARY** ..... **6**

**1.0 INTRODUCTION** ..... **8**

**2.0 MODELING PROCESS DESCRIPTION** ..... **11**

**3.0 DISCUSSION** ..... **12**

3.1 Assumptions ..... 12

3.2 Case Descriptions and Results ..... 14

**4.0 CONCLUSION** ..... **17**

**5.0 REFERENCES** ..... **19**

**6.0 APPENDICES** ..... **20**

# LIST OF ACRONYMS

| Acronym | Description |
|---|---|
| CDC | Canister Decontamination Cell |
| CIC | Can-in-Canister |
| DOE-EM | Department of Energy – Environmental Management |
| DWPF | Defense Waste Processing Facility |
| FTE | Full Time Equivalent |
| GWSB | Glass Waste Storage Building |
| HLW | High Level Waste |
| KAC | K Area Complex |
| LaBS | lanthanide borosilicate |
| LWO CORESim | The application used to develop the simulation model by the Vitech Corporation |
| MC | Melt Cell |
| MFFF | Mixed Oxide Fuel Fabrication Facility |
| MOX | Mixed Oxide |
| MT | Metric Ton |
| MTTR | Mean Time to Repair |
| PDCF | Pit Disassembly and Conversion Facility |
| PDP | Plutonium Disposition Project |
| PIP | Plutonium Immobilization Program |
| PTT | Pour Turntable |
| Pu | Plutonium |
| SCT | Shielded Canister Transporter |
| SE&I | Systems Engineering & Integration |
| SME | Slurry Mix Evaporator |
| STS | Smear Test Station |
| VPWF | Vitrified Plutonium Waste Form |
| VIT | Vitrification |
| WTC | Weld Test Cell |

## EXECUTIVE SUMMARY

The mission of the Plutonium Disposition Project (PDP) is to dispose of up to 13 metric tons of excess non-MOX plutonium to be vitrified in a glass matrix at the KAC. The cans produced in the vitrification process at KAC will be loaded into magazines and the magazines will be placed into a rack pre-installed in a DWPF canister. The loaded canister, referred as a can-in-canister (CIC), will be transported from K Area to S Area. The CIC will then be unloaded and transported to the DWPF Melt Cell where HLW glass will be poured into the CIC. The CIC will then be processed as a standard DWPF canister and placed in interim storage in a GWSB awaiting final disposition in a federal repository.

The CIC external dose rate makes it necessary for DWPF to handle the receipt of the CIC's differently from the way conventional canisters are processed into the facility. Four options were considered for integrating the CIC's into the DWPF production process. The preferred option is to receive CIC's through the Canister Exit Tunnel and transfer them backwards through the DWPF facility to the Melt Cell. This preferred option is also referred to as the "Back Door" Option. A Time and Motion Study was requested to determine the feasibility of the back door option and to ensure there were no significant impediments for meeting established canister production goals while utilizing this route for introduction of the CICs into the DWPF,

Systems Engineering was tasked to develop a Time and Motion Study computer model of the CIC Vitrification process to be deployed at DWPF. The primary objective of the CIC model is to assist the DWPF team with understanding the interacting systems/processes associated with the receipt of CIC canisters into the DWPF facility counter to the normal flow of processed canisters in the facility.

The model validated the planned DWPF operating strategy of receipt of CIC canisters via the "backdoor option". The model was used to confirm several proposed operating strategy improvement opportunities.

The following conclusions can be drawn from the study:

- The "Back Door" Option is technically feasible but does have canister handling and process implications.

- At a glass pour rate equivalent to 260 regular canisters (292 CICs due to CIC canisters having 12% less glass volume) per year:
    - the lowest CIC canister rate (canisters exiting the building) was 226 CIC canisters per year using conservative process assumptions (SCT availability) with no canister storage modifications to the facility.
    - the addition of extra storage spaces in the CDC with the same conservative process assumptions increases the CIC canister rate (canisters exiting the building) to 241 CIC canisters per year.
    - the addition of extra storage spaces in the CDC with more favorable process assumptions increases the CIC canister rate (canisters exiting the building) to 250 CIC canisters per year.
- At a glass pour rate equivalent to 280 regular canisters (314 CIC canisters) per year using conservative process assumptions, the combined availability from various equipments will begin to constrain canisters exiting the facility.
- At a glass pour rate equivalent to 300 regular canisters (336 CIC canisters) per year using conservative process assumptions, the combined availability from various equipments will become a bottleneck to processing canisters through the facility.
- SCT availability as low as 50% has negligible impact while processing regular canisters through the facility.
- SCT availability as low as 50% has a measurable (but acceptable) impact while processing CIC canisters through the facility.

# 1.0 INTRODUCTION

In April 2002, the Department of Energy (DOE) decided to cancel a Plutonium Immobilization Project (PIP) and continue with plans to construct and operate a Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF). As a result of this decision, the DOE Office of Environmental Management (DOE-EM) has approximately 13 MT of Pu without any defined disposition path. An established disposition path is critical to meet the DOE's strategic goal of providing a responsible resolution to the permanent disposal of the nation's excess high-level radioactive materials and waste.

The mission of the Plutonium Disposition Project (PDP) is to disposition approximately 13 MT of non-MOXable plutonium (Pu) materials managed by DOE-EM. The DOE has approved the mission need and selected a preferred technology. The new process is to be located at SRS in the K Area Complex, and the technology preference is Can-in-Canister (CIC) Vitrification.

The Pu Vitrification Facility in K Area will utilize a process to vitrify plutonium into a lanthanide borosilicate (LaBS) glass matrix. This glass will be packaged into bagless transfer cans and placed inside a DWPF type canister. The canister will then be transported to DWPF and filled with High Level Waste (HLW) glass.

The functions of the Defense Waste Processing Facility (DWPF) CIC Project is to transport empty CICs containing vitrified plutonium to and through the DWPF process to be filled with high level waste glass to form a Vitrified Plutonium Waste Form (VPWF). The filled CICs would be stored at SRS until Yucca Mountain in Nevada opens as a permanent storage facility.

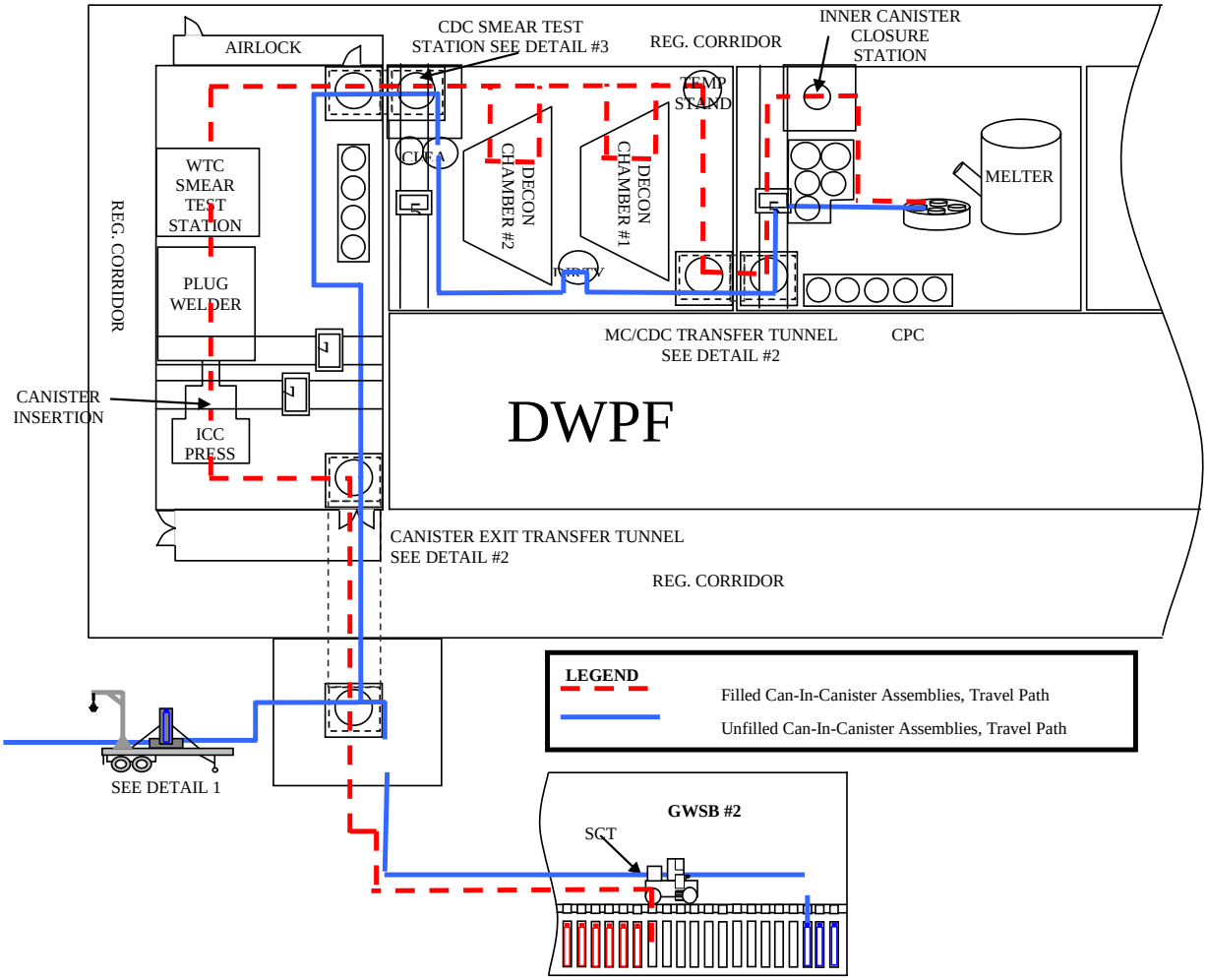
The CICs differ from normal empty DWPF canisters due to a neutron dose rate and greater weight. Specifically, the CICs received at DWPF will have a neutron dose rate and weigh up to 1,020 lbs more than an empty design basis DWPF canister. The DWPF CIC Handling System will be designed to process a total of about 790 CICs in an approximate six (6) year period. Approximately 132 CIC's will be processed annually when the PDP is operating at full capacity (~2013).

The DWPF tasked Systems Engineering & Integration (SE&I) develop a Time and Motion Study computer model of the integration of Pu disposition CICs into the DWPF process. The primary objective of the process model was to assist the DWPF in understanding the interacting systems/processes/interfaces in the proposed CIC processing path at DWPF. The model will validate the planned DWPF operating strategy based on the conceptual design provided. The model will be used to identify operating strategy improvement opportunities and will help to determine the means to meet target throughput goals. The output of the model will be used to identify bottlenecks, optimize process operations, support alternative studies, validate operating resources required to achieve throughput requirements, increase the confidence level in projecting and meeting milestones, and analyze what-if scenarios. This study modified the Integrated LWO CORESim model by incorporating the CIC Back Door steps.

The travel paths of unfilled CIC's and filled CIC's through the DWPF Vitrification Building are given in Figure 1.

The PDP CIC COREsim Model has been classified as Level E software application per Manual 1Q, Procedure 20-1, Rev. 8 (Reference 3). Refer to Appendix B for Software Classification Document.

**Figure 1 CIC Canisters Travel Path**



## 2.0 MODELING PROCESS DESCRIPTION

SE&I developed the model process flowsheets in conjunction with DWPF personnel and various subject matter experts. Comprehensive input is vital to ensure the resulting model accurately represents the process. The modeling effort was conducted as follows:

- ***Define high level functions and requirements***

  High level functions summarize the basic functions of the process. When placed in the proper logical sequence, high level functions provide a representation of the operating process. High level requirements are associated with each high level function. These requirements include inputs that enable the function, outputs produced by the function, conditions that constrain the function, and resources that perform the function. The high level functions and requirements provide the framework for organizing the model.

- ***Define sub-functions***

  High level functions are further defined by sub-functions. Sub-functions provide the level of detail needed to define how each high level function is accomplished. These sub-functions typically address normal operations and upset conditions. Several layers of sub-functions may be utilized depending on the model objectives. Details defined for each sub-function include the type/number of resources utilized and time duration.

- ***Develop Assumptions***

  Assumptions capture facility limitations that bound the operating process. These limitations typically include shift schedules, facility/equipment availability, safety bases, and resource productivity. Assumptions are incorporated into the definition of each related function/sub-function.

- ***Develop model***

  Simulation software is used to create the model logic. The application used to develop the simulation model is the Vitech Corporation COREsim® application. COREsim Process allows the user to define functions, resources and their logical relationships. The resulting model simulates the operating process.

- ***Perform model validation and verification***

  A detailed review of the developed model logic and associated assumptions is conducted

with the customer. This verification review seeks acceptance from the customer that the model and assumptions are representative of the process. The model is validated when the programmed logic executes satisfactorily. Further, the resulting data may be verified with available process flowsheets data.

- ***Perform simulations***

  Process scenarios to be evaluated are specified by the customer. Simulations of the specified process scenarios are conducted and resultant data is evaluated for bottlenecks and opportunities for process optimizations. Multiple simulations of each process scenario are conducted in an effort to achieve its average system performance. A complete set of simulation results includes data for the original process scenarios and additional optimization scenarios.

The integration of CICs into the DWPF vitrification model will be used to gain a better understanding of the planned operating strategy, validate planned operating resources, and suggest potential process improvements for consideration. This model's failure to perform as intended will not adversely affect the safety or reliability of the Pu Vitrification Facility operations, and will not result in losses exceeding $2 million or six months of lost program capabilities. Therefore, the model application is classified as a Level E software application. This is documented in the Software Classification Document (Reference 3).

# 3.0 DISCUSSION

## 3.1 Assumptions

Assumptions are the limitations that constrain the modeled process. Examples of assumptions are resource availability, facility availability, equipment capacities, system processing times and batch size limitations. The assumptions imposed on the model, for the Baseline Case, are provided in Appendix A.

Major assumptions are given in Table 1 below.

Table 1: Major Assumptions for CIC model

Note: In general, conservative process modeling assumptions were used. Although significant time saving options were identified, they were not incorporated into the model.

| CIC Canisters | Crane | Transfer Carts | Inspection cycle times | CIC campaign |
|---|---|---|---|---|
| ◻Regular canister contains 4000 lb glass and CIC can fills 3520 lb glass.<br>◻Pu cans + racks + magazines = 1500 lb.<br>◻Filled CIC canister is ~1020 lb heavier than a regular canister.<br>◻DWPF existing equipments will be able to handle the additional weight. | ◻95% availability per demand<br>◻90%MTTR = 24 hr; 10% MTTR = 168hr.<br>◻The wrench time to move a can across a cell to entrance of a tunnel is 30 minutes. | ◻95% availability per demand<br>◻90%MTTR = 24 hr; 10% MTTR = 168hr.<br>◻The wrench time to move a can across a tunnel is 30 minutes. | ◻Add 30 minutes for cap removal and CIC inspection in MC.<br>◻Add potential 30 minutes inspection time in WTC. | ◻To be processed in a campaign mode<br>◻All CIC's to be stored in GWSB building after arrival from KAC. |

| CIC Cans Supply Space available | CIC Loading & Unloading | Melter Pour Time | SCT Availability |
|---|---|---|---|
| ◻No GWSB Space limit<br>◻CIC Supply to DWPF is not a limiting factor<br>◻Interim Storage Space inside Vit Building: Melter Cell=11; CDC = 3; WTC = 3<br>◻What-if Cases: Additional 10 storage space in CDC. | ◻Assume 12 hr unload time to place both CIC's from shielded transportation trailer into GWSB.<br>◻It would take 1 hr to prepare and load one CIC onto SCT and would take 2 hr to transfer from GWSB to Exit Tunnel | ◻Used demonstrated canister production rates to ensure model results are conservative<br>◻Regular cans: 260 cans/yr (Baseline Case 1J)<br>◻Regular cans: 280 cans/yr (What-if case)<br>◻Regular cans: 300 cans/yr (What-if case)<br>◻Sludge only (all cases) | ◻For campaign during hot season, SCT per demand availability is 50% of time with MTTR = 12 hr. (Baseline)<br>◻SCT random failure rate is 5% with MTTR = 168hr. (all cases)<br>◻For campaign during cold season, SCT per demand availability is 90% of time with MTTR = 12 hr. (What-if cases) |

## 3.2 Case Descriptions and Results

Operating scenarios evaluated by this study are defined as cases. Table 2 identifies each case by number and description. For the cases, operations are constrained as follows:

- Back Door Option - CICs are received through the Canister Exit Tunnel and transported backwards through the canyon to the Melt Cell (see Assumption #1)
- Only one full view canister at any given time inside the WTC (see Assumption #9)
- No CIC movement through CDC while decon is taking place (see Assumption #24)
- MTTR for SCT, Cranes, and Transfer Carts (See Assumptions #11, #13 and #25)
- 'CDC Storage Space' capacity is 3 or 13

Case 1J is the Baseline Case. This is the case that shows the "Back Door" operating strategy. This strategy is captured in the assumptions located in Appendix A. The baseline case is used to validate the planned operating strategy.

<u>Case 1N</u>

After the CIC model logic was incorporated into the DWPF model, Case 1N was run for the current DWPF process to ensure DWPF canister throughput could be reproduced (i.e., the DWPF operation was modeled correctly). A 260 canister per year glass pour rate was utilized for Case 1N. Ideally, multiple runs of Case 1N should predict an average result of 260 canisters per year exiting the facility. However, actual results for Case 1N averaged 255.4 canisters per year, a difference of 2%. This result adequately demonstrates that the DWPF throughput is reproducible by the model.

<u>Case 1P</u>

Case 1P examines the impact on DWPF throughput when the SCT availability is lowered to 50%. SCT availability is the only discriminating parameter between Case 1N and Case 1P. Case 1P predicted an average 250.7 canisters per year exiting the facility. The Case 1P result differed from that of Case 1N by 2%. Therefore, it is concluded that SCT availability has negligible impact on DWPF throughput while processing regular canisters.

<u>Cases 1J</u>

Case 1J results indicate that the Back Door Option is technically feasible. This case further

predicts a canister rate of 226 canisters per year exiting the facility.

Cases 1K

Case 1K modifies the baseline case CDC storage space capacity to 13. The results from Case 1K predict a rate of 241 canisters per year exiting the facility. This represents a 6.6% increase as compared to the baseline case (Case 1J). Therefore, the increase is directly attributed to the increase in CDC storage space capacity.

Case 3J

Case 3J modifies the baseline case (Case 1J) DWPF glass pour rate to 280 regular canisters per year (a 20 regular canister / year increase from the 260 canister per year rate previously demonstrated by the facility). The results of Case 3J predict a CIC canister rate of 236.8 per year exiting the facility. This represents a 5% increase as compared to the baseline case (Case 1J). Therefore, if DWPF is able to increase the glass pour rate to 280 regular canisters per year, then the CIC rate is predicted to increase by approximately 10 canisters per year compared to the 20 expected canister increase. The run indicates, if the melter start-to-start cycle time is reduced to 27 hours, then the combined availability from various equipment, i.e., SCT, cranes, tunnel transfer carts, will begin to constrain DWPF canister production.

Case 5J

Case 5J modifies the baseline case (Case 1J) DWPF glass pour rate to 300 regular canisters per year (that is a 40 regular canisters per year increase from the 260 canisters per year rate previously demonstrated by the facility). The results of Case 5J predict a CIC canister rate of 238.9 canisters per year exiting the facility. This represents a 6% increase as compared to the baseline case (Case 1J). Therefore, if DWPF is able to increase its production rate to 300 regular canisters per year, then the CIC rate is predicted to increase by approximately 12 canisters per year. This run indicates, if the melter start-to-start cycle time is cut to 25 hours, then combined availability from various equipment, i.e., SCT, cranes, tunnel transfer carts, will become the bottleneck for DWPF canister production.

Case 1L

Case 1L is the same as Case 1K except the CIC processing campaign to take place during colder seasons permitting an assumed higher availability for the SCT (90%). The results of Case 1L predict a CIC throughput of 250 canisters per year exiting the facility. This represents a 4%

increase in throughput as compared to Case 1K. Therefore, if the CIC campaign is to take place during colder seasons versus hot seasons, then the CIC rate is predicted to increase by approximately 9 canisters per year exiting the facility.

Case 1Q

Compared to Case 1J, Case 1Q modifies the CIC campaign time from hot seasons to cold seasons. The results of Case 1Q predict a CIC throughput of 237 canisters per year exiting the facility. This represents a 5% increase in throughput as compared to Case 1J. Therefore, if the facility is to run CIC campaigns in colder seasons, then the CIC rate is predicted to increase by approximately 11 canisters per year exiting the facility.

**Table 2. Case Results – Average DWPF Throughput**

| Case Number | Glass Pour Rate Canisters/ Year | SCT Availability | CDC Canister Storage Space | Regular Can or CIC | Canisters Exiting the Facility / year |
|---|---|---|---|---|---|
| Case 1N | Regular 260 CIC 292 | Per demand = 90% | 3 | Regular | 255.4 |
| Case 1 P | Regular 260 CIC 292 | Per demand = 50% | 3 | Regular | 250.7 |
| Case 1 J | Regular 260 CIC 292 | Per demand = 50% | 3 | CIC | 225.6 |
| Case 3 J | Regular 280 CIC 314 | Per demand = 50% | 3 | CIC | 236.8 |
| Case 5 J | Regular 300 CIC 336 | Per demand = 50% | 3 | CIC | 238.9 |
| Case 1 K | Regular 260 CIC 292 | Per demand = 50% | 13 | CIC | 240.9 |
| Case 1 L | Regular 260 CIC 292 | Per demand = 90% | 13 | CIC | 250.0 |
| Case 1 Q | Regular 260 CIC 292 | Per demand = 90% | 3 | CIC | 237.0 |

# CONCLUSION

### Back Door Option Feasibility and Manpower Analysis

Resources (based on 132 CIC's processed annually) were identified to accomplish these additional functions. Based on the desired CIC throughput of 132 canisters per year, Case 1J results indicate that the Back Door Option is feasible. That is, Case 1J results in a predicted CIC throughput of 225.6 canisters per year.

The study evaluated additional resources required for Operations and Maintenance crews due to implementation of the Back Door Option. Tasks were added to the model to represent the Back Door Option. These additional tasks were related to the following:

- Unload CIC Trailer to GWSB
- Load CIC to Exit Tunnel
- Crane
- Transfer Tunnel Cart
- Remove Cap & inspect CIC Can
- Additional Waste Disposal
- Estimated additional can-hiding movement
- Transition between campaigns
- The following resources (based processing 132 CIC canisters annually) were required to accomplish these additional tasks*:*
  Vit Building Operator: 1.2 FTE
  Fire Watch Op: 0.5 FTE
  Maintenance: 0.5 FTE
- Model did not account for non-routine upsets, therefore it did not predict the impact of non-routine outages on canister handling.

### Canister Production Rate Analysis

Three cases (1J, 3J and 5J) are used to analyze the impact of glass pour rate on CIC throughput. The glass pour rate was the only discriminating parameter in the three cases. An 11 canister per year increase in CIC throughput was predicted when the glass pour rate increases from 260

regular canisters per year (Case 1J) to 280 regular canisters per year (Case 3J). The predicted CIC throughput for a glass pour rate of 300 regular canisters per year (Case 5J) was nearly the same as that predicted at 280 regular canisters per year. Therefore, it is concluded that no significant CIC throughput is achieved by increasing the glass pour rate beyond 280 regular canisters per year because the combined availability from various equipment, i.e., SCT, cranes, tunnel transfer carts, will become the bottleneck for DWPF canister production.

**SCT Availability Analysis**

SCT Availability is modeled for the current assumption of 50% and the proposed assumption of 90% for conduct of CIC campaigns during colder seasons only. Cases 1J and 1Q are used to analyze the impact of SCT Availability on CIC throughput. At 50% SCT Availability, the model predicts a CIC throughput of 225.6 canisters per year (Case 1J). At 90% SCT Availability, the model predicts a CIC throughput of 237 canisters per year (Case 1Q).

**CDC Storage Capacity Analysis**

CDC storage capacity is modeled as 3 or 13. By increasing CDC lag storage space to 13, it will result in an increase of 15 CIC canisters a year exiting the facility at a glass pour rate equivalent to 260 regular canisters per year.

In conclusion, the model shows that in order to meet the required throughput of about 790 CIC canisters during about 6 years of processing at DWPF:

- The Back Door Option is technically feasible.
- For Baseline Case, expected can production rate = 226 canisters/yr. The Baseline Case is based on CIC campaign at hot seasons.
- To minimize the complexity for DWPF operations, the best way to process CIC's is through campaign mode.
- The bottleneck caused by low availability of SCT can be overcome by (1) increasing lag storage space inside Vitrification Building, (2) campaigning during cold seasons, and (3) increasing availability of SCT.
- Installing additional storage space in the CDC will increase the production rate to 241 canisters/yr exiting the facility.
- CIC campaign during colder seasons alone, can production rate = 237 canisters/yr.

Combination of campaign during colder seasons and additional CDC space produces the best result: 250 canisters/yr.

## 5.0 REFERENCES

1) "Plutonium Disposition Alternative Analysis", Y-AES-G-00001, Rev. 0.
2) "Option Evaluation for the Integration of Plutonium Disposition Can-in-Canisters (CIC's) into the DWPF Production Process" M&O-PUD-2006-0091
3) "Software Classification Document for Pu-Vit CIC COREsim Model", Y-SWCD-S-00001, Rev. 0.

# 6.0 APPENDICES

Appendix A –Assumptions and Inputs for PDP Can-in-Canister Time and Motion Study
Appendix B – Pu-Vit CIC COREsim Model Software Classification Document

**Appendix A –Assumptions and Inputs for PDP Can-in-Canister Time and Motion Study**

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 1 | Preferred CIC Alternative | Receive CIC through the Canister Exit Tunnel and transport them backwards through the canyon to the Melt Cell. | Option 3 of M&O-PUD-2006-00091. | G. Cauthen | M&O-PUD-2006-00091 |
| 2 | PDP project | 132 CICs will be processed and delivered to DWPF annually when PDP is operating at full capacity around 2013. | Approximately 800 CICs produced during the expected six year life of the project. | G. Cauthen | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 3 | Interim Storage Space inside Vitrification Building | Melt Cell = 13<br>CDC = 5<br>Weld Test Cell = 3<br>Weld Station/Smear Test Station = 0<br><br>Total Canister Space within Vit Building during CIC campaign = 21. | *Melt Cell = 13 [ICC rack (5), insulated rack (4), PTT (4)]<br>*CDC/Smear Test Station (clean) = 0 [STS pedestal is not available)<br>*CDC = 5 [dirty rack (1), clean rack (2), CDC chambers (2)]<br>*Temperature Rack is needed for CIC movement to change out grapples.<br>*WTC = 3 [shielded racks (3); Weld Station/Smear Test Station = 0] (The WTC/STS will be needed for CIC when transfer tunnel plugs are removed or replaced.) (One shielded rack must always be empty if crane fails). | D. Hutsell | |
| 4 | Storage of Unfilled Can-in-Canister in DWPF | All CIC's come from KAC will be stored in GWSB before processing in DWPF. | No plan for Just-In-Time delivery. | G. Cauthen | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 5 | K-Area Storage Space | PDP project will have storage space to store 6 to 8 CIC canisters at KAC. Able to store 4 months worth of cans in KAC. | KAC will be able to store 4 months worth of cans if there is a DWPF Melter outage. | G. Cauthen | |
| 6 | CIC Operations Mode | CIC canisters will be processed in one campaign every year. | Due to weight difference, it is expected CIC canisters will be processed through campaigns. | G. Cauthen | |
| 7 | Impact of CIC Weight Increase | Filled CIC canister is about 1020lbs heavier than a regular canister. (There is about 1500lbs of Pu, cans, magazines, racks inside the empty CIC. This replaces about 12% of the 4000lbs of glass or 480lbs of glass is replaced. So, 1500-480 = 1020lbs. | Weight difference will impact canister pouring, Welder trolley operation, and SCT operation. Assume modifications have been made and no additional time needed to switch between regular and CIC. | J. Owen; D. Hutsell | |
| 8 | Canister Fill Data | Each CIC holds 3520 lb glass. | Expected fill height is 100” | J. Owen; D. Hutsell | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 9 | WTC Ops | WTC is a direct contact maintenance area. There is a limitation to allow only one full view canister at any given time inside WTC cell. | If there are problems, full-view canister will be moved to shielded rack. The step takes 30 minutes.<br>Allow 60 minutes to move CIC through WTC to account for potential can inspection. | J. Owen | |
| 10 | CIC unfilled can movement | It would take 30 minutes to move one unfilled CIC can from tunnel to the next tunnel by crane. | | | |
| 11 | Availability: Canister Transfer Cart (CTC) inside tunnel | On each demand, the CTC is available 95% of time. The average downtime are 90% of time 24 hr and 10% of time = 168 hr. | | D. Hutsell | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 12 | CIC Canister Operations | Unfilled CIC will be transferred (in reverse path), with cap on, to Melt Cell. CIC will be set at PTT and cap and plug removed. Caps and plugs will be disposed as waste. CIC will then be inspected by a camera to ensure integrity of cans and magazines.<br>Once a CIC is in CDC, the next CIC can then be transferred into exit tunnel. | • The cycle time to remove cap and for camera inspection will take 30 minutes.<br>• Melt Cell has adequate waste storage space for additional caps. Solid wastes removal from Melt Cell will not impact Melter normal operations.<br>• All CIC's are expected to pass inspection. | J. Owen<br>D. Hutsell | |
| 13 | Crane Availability: | For CIC model, assume on each demand, crane is available 95% of time. The average downtime are 90% of time 24 hr and 10% of time = 168 hr. | The current model for Regular canisters does not have separate crane availability. All crane availabilities are lumped into system availability (e.g., WTC, CDC, etc.) | J. Owen<br>D. Hutsell | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 14 | CIC transfer schedule | CIC trailers should arrive 1 to 2 times per week. | The model is to assume all arriving CIC's will be stored in GWSB first. Therefore, due to the decoupling between KAC and DWPF, the model is to assume CIC canisters will be available during CIC campaign. | | |
| 15 | Campaign Transition | Don't have to wait until regular canisters are out of process before bringing in CIC's. | Assume minimal time (4 hrs) to transition between campaigns. | | |
| 16 | CIC Unloading Ops | Don't include trailer unloading details in the model. | Assume 12 hours unloading time to place both CIC's into GWSB. | G. Cauthen | |
| 17 | CIC transportation Trailer | There will be 1 or 2 trailers. | Model is to assume CIC supply to DWPF is not a limiting factor. | G. Cauthen | |
| 18 | Glass Chemistry | DWPF has produced ~260 cans per year. However, for the batch #4 sludge, due to high alumina content, the can production is expected to drop to ~180 cans/yr. | The CIC model is to assume sludge batch is not "high in alumina". Will run model for 260, 280, 300 regular canisters. | J. Owen | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 19 | GWSB Storage Space | How much GWSB space will be allocated to the CIC campaign? | Assume no GWSB space limit. | J. Owen | |
| 20 | Resource Constraints | Are there any simultaneous operations that can't happen due to resource constraints incurred by CIC campaign? | Can't move filled canisters and empty CIC's at the same time in any transfer tunnels, with in-cell cranes, and with SCT. Can't move CIC in WTC when welding or smearing a canister in the WTC. | J. Owen<br>D. Hutsell | |
| 21 | Personnel | It is to assume additional canister operations personnel will be available to support additional tasks for moving CICs. | | G. Cauthen | |
| 22 | CIC Loading from GWSB to Exit Tunnel | It would take 1 hr to prep and load one CIC onto SCT, 2 hrs to Exit Tunnel. | The same cycle times are used for regular canisters. | | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 23 | SCT Availability (*Refer to #25*) | The current (sludge only) assumption for SCT (regular cans): upon request, SCT is 90% of time available.<br>Random failure: 3% failure rate. Average Downtime = 24 hr Normal Distribution with Stdv = 5.<br>Per demand failure: 7% failure rate. Average downtime = 8 to 12 hr. | To use Assumption 25 for SCT Availability. | J. Owen | |
| 24 | CDC Ops Constraint | No unfilled CIC may be stored in CDC and unfilled CIC's can't be moved through the CDC when CDC is in decon operation (spraying water). | | S. Wilkerson | |
| 25 | SCT Availability | It is to assume SCT availability is 50% to simulate summer time operation when the SCT only operates at night because of the overheating limitation. | SCT, per demand, is expected to be down 50% of time. Average MTTR is 11 to 13 hours. (emulate Summer Ops)<br>5% of random failure rate, average downtime = 168 normal distribution with Stdv = 33.6. | S. Wilkerson | |

| No. | System | Assumption | Note | Owner | Source Document |
|---|---|---|---|---|---|
| 26 | Proposed CIC movement through CDC | CIC would move from the CDC/STS to the temperature stand. Then the MC/CDC transfer tunnel plug would be removed and the CIC would move to the MC/CDC tunnel. So the filled canister from the MC would move to the dirty rack for cooling, then could move to the temperature stand if the temperature needed to be checked, before moving to the decon chamber. | If there is a canister at CDC Smear Test Station, then unfilled can't move through. | D. Hutsell | |
| 27 | WTC Welder System Availability | WTC Average outage = 11 days a year. (Health Report)<br>Each yr produce 260 can. Each down time = 3 days. Average failure rate per demand = 3.7 time/260=1.4%. (04/04/07) | | S. Wilkerson | |
| 28 | Can to GWSB | Accumulate 3 canisters in WTC cell then move canisters to GSWB. | | S. Wilkerson | |
| 29 | CDC Ops | "Re-Install PVV Vacuum Relief Plug" cycle time has been changed from 0.5 hr constant to 0.1- 0.5 hr uniform distribution. | To account for sometimes it may not require this step. | D. Hutsell | |

# APPENDIX B – Software Classification Document for Pu-Vit CIC COREsim Model

OSR 19-137# (Rev 7-3-2003)

## Software Classification Document

| (1) Classification Document No. | (2) Rev. No. | (3) |
|---|---|---|
| Y-SWCD-S-00001 | 0 | Page 1 of 1 |

(4) Facility/Project Name
Pu-Vit CIC COREsim Model

(5) Software Name/ID No.
COREsim

(6) Design Authority
DWPF Engineering

(7) Design Agency (Optional)
Systems Engineering

(8) Methodology

(1) Per E7, Procedure 5.05 (flowchart). Determine if software is part of an SSC with a functional classification.
Software is not part of an SSC with a functional classification.

(2) Per E7, Procedure 5.05 (flowchart), classify software per 1Q, QAP 20-1, Rev. 8
As software is not part of an SSC with a functional classification, CTF (Norato) will classify software using the "A through E" designation. Based on guidance in "Attachment 1" to QAP 20-1, Rev. 8, WSRC Manual 1Q and task clarification in Technical Task Request HLW/DWPF/TTR-03-0013, Rev. 1, the software is not classified Level A, B, C, or D. Therefore, it is classified Level E.

(3) If usage changes, the DA (Norato) will reevaluate this classification in accordance with E7, 5.05, and 1Q, QAP 20-1.

(9) Discussion

The task description described in TTR HLW/DWPF/TTR-03-0013 reads, in part, as follows, "DWPF Engineering and Operations desire a modeling tool to develop a better understanding of interacting systems/processes in DWPF to support safe mission essentia goals by identifying improvement opportunities and determine means to meet target throughput goals. The output of the model will be used to identify bottlenecks and design deficiencies, optimize processes, provide worker dose exposure rate, support alternative studies, determine resources required to achieve throughput requirements, increase the confidence level in projecting and meeting milestones, analyze what-ifs, and evaluate planned equipment modifications."
The Pu-Vit Can-in-Canister (CIC) COREsim is just extension of the original DWPF COREsim Model.

As described above, the COREsim DWPF model will be used to gain better process understanding and suggest potential process improvements for design authority consideration, it's output will not be the sole source supporting any facility design input. COREsim's failure to perform as intended will not adversely affect the safety or reliability of DWPF operations and will not result in losses exceeding $2 million or six months of lost program capabilities.

Therefore, the COREsim DWPF process simulation is classified as a Level E software application per 20-1, Rev. 8, 1Q.

(10) References

(11) Software Level Assigned (Check One)
☐ A ☐ B ☐ C ☐ D ☒ E

| (12) Design Authority Name | Design Authority Signature | Date |
|---|---|---|
| Gary L. Chuthen | [signature] | 28 MARCH 07 |
| (13) Cognizant Quality Function (CQF) Name | CQF Signature | Date |
| C. D. Castle | [signature] | 3/28/07 |

☐ Acknowledged (A, B, C, D) ☒ Approved (E)

| (14) Independent Reviewer Name | (15) Independent Reviewer Signature | Date |
|---|---|---|
| Jeff W. Ray | [signature] | 3/29/07 |

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November 16, 2006 M&O-PUD-2006-00091

To: Steve W. Wilkerson, 704-S

From: S. David Burke, 704-S
Prepared By: Gary L. Cauthen, 704-24S

**Option Evaluation for the Integration of Plutonium Disposition Can-in-Canisters (CIC's) into the DWPF Production Process**

## Introduction

The Nuclear Materials Management (NMM) Area Project is in the process of developing a line item critical decision package to dispose of 13 metric tons of excess plutonium (Pu). Vitrification of the Pu, which was selected[1] as the preferred means for stabilizing this material, will be performed at the K-Area Complex (KAC) as part of the Plutonium Disposition Project (PDP). The disposition concept involves a Can-In-Canister (CIC) approach whereby small containers of vitrified Pu are installed into DWPF canisters at KAC. These canisters, in turn, are transported to DWPF to be filled with glass.

This document presents the evaluation results and recommendation for the best alternative to receive and process Pu disposition CIC's at DWPF. This information will be used by the DWPF Project team as the basis to further evaluate all of the facility impacts, risks and opportunities and develop a conceptual design for inclusion into NMM's Pu Disposition Project's CD-1.

## Summary

A team representing DWPF Operations, Engineering, Liquid Waste Projects, and Planning Integration and Technology (PIT) evaluated four options identified in an earlier study[2] to transport, receive, and fill Pu disposition CIC's. About 132 of these CIC's will be processed annually when the PDP is operating at full capacity (~ 2013) with approximately 800 CIC's produced during the expected six year life of the project. It was determined that:

- Receiving the CIC's through the canister exit tunnel air lock and using the existing in-cell cranes and transfer carts to move them to the melt cell (opposite to the normal flow for glass filled canisters) is the most attractive option.
- DWPF will allocate space within the DWPF complex to accommodate "lag storage" of the CIC's arriving from KAC as a means of managing how they will be further integrated into the facility's production process.

## Background

Up to 13 MT of non-MOX plutonium will be vitrified in a lanthanide borosilicate (LaBS) glass matrix at KAC as part of the PDP. The cans produced in the vitrification process at KAC will be loaded into magazines and the magazines placed into a rack pre-installed in a DWPF canister. The loaded canister, referred to as a can-in-canister (CIC), will be transported from K Area to S Area. The CIC will be

[1] Refer to Y-AES-G-00001 (*Plutonium Disposition Alternatives Analysis*), Rev 0; May 25, 2006
[2] These same options were considered as part of the Plutonium Immobilization Program (PIP). Refer to PDP-PIP-2001-00038 (*DWPF Receipt and Handling Suspension Closeout Report*), Rev. A; May 9, 2001.

unloaded and transported to the DWPF Melt Cell where HLW glass will be poured into the CIC and treated as stabilized waste material. Subsequently, the CIC will be processed as a standard DWPF canister.

DWPF was asked to characterize the necessary work scope (e.g., required modifications, operations, exposure, etc.) to support the CIC operations. This work scope will then be appropriately budgeted into the PDP.

The primary hazard of the proposed DWPF operations will be direct radiation dose. The process at KAC blends Pu oxide feed with LaBS frit, which results in high neutron dose rates being generated due to the (alpha, n) reaction with boron. Preliminary dose calculations have indicated that engineering controls will be required in both KAC and S Area to lower the neutron rate, which is expected to be the dominant source of radiation for CIC's leaving KAC. Interpretation of the preliminary data indicates that the neutron dose rate on surface contact with a CIC could be in the range of 5 to 9 rem/hour.[3]

A team consisting of representatives from Operations, Engineering, Liquid Waste Projects, and PIT was formed to evaluate the options available for processing the CIC's into and through the facility in an operationally and radiologically safe manner. The team convened on September 11, 2006 to discuss four possible options and detail the positive and negative attributes of each with respect to their impacts on safety, operation, and facility design; if implemented. A second meeting was held on October 17th to establish the selection criteria and begin the down-select process. Subsequent break-out discussions were held to reconcile technical issues and operational concerns.

The paragraphs that follow present a discussion of the options evaluated and the bases for the recommendations made.

**Discussion**

The CIC high external dose rate makes it necessary for DWPF to handle receipt of the CIC's differently from the way conventional canisters are processed into the facility. Four options were considered for integrating the CIC's into the DWPF production process. Two of the options failed "go/no-go" tests and were rejected without further discussion:

1. **Receipt of CIC's through the Rail Road Well Air Lock and using the Main Process Cell (MPC) Crane to transport the CIC to the Melt Cell** – This option was considered to have a significant negative impact on operations as a result of the efforts required to control the spread of contamination. In addition, the primary function of the MPC crane is for maintenance support. It was not designed to perform canister movement from the RR Well to the Melt Cell.
2. **Receive the CIC's at the 221-S South East Loading Dock Air Lock and transporting them to the Melt Cell air lock by way of the operation's corridor** – This option was discarded due to height restrictions at the air lock door and structural steel in the corridor that could not be modified.

[3] A report from W. Farrell to D. Eisele (M&O-NMM-2006-0089, Table 1) shows that the dose rate on contact with a stainless steel can containing a 1kg source of vitrified Pu, with 1% Am, would be 564 mrem/hr. CIC's will contain 16 kg of Pu. Conservatively, this would imply that the on-contact dose rate could be as high as 9 rem/hr, when extrapolating the data using a simple Pu mass ratio of 16:1 kg. Similarly, data from a Lawrence Livermore report (UCRL-ID-12315, Figure 6.5.6) indicated that a canister having 21 kg Pu would have a dose rate of 500 mrem/hr at one foot. Again, using a simple ratio of 16:21, the dose rate would be approximately 5 rem/hour at less than an inch from the canister's surface.

This option would require bringing the CIC's into the building at an angle of greater than 45-degrees from vertical. Given that the CIC magazine is designed to use gravity to hold the Pu cans in place, there is a concern that the cans could fall out of the magazine racks and into the bottom of the canister, if tilted. Subsequently, this could have a negative impact on the ability to properly fill the canister when pouring DWPF glass.

The two remaining options have advantages and disadvantages that make each nearly equal in their attractiveness as a process integration alternative, but for diametrically opposed reasons. That is, one heavily impacts the way current facility operations are conducted but, with substantially fewer modifications required for implementation. The other option requires substantially more modifications but has less impact on the conduct of operations.

3. **Receive CIC's through the Canister Exit Tunnel and run them backwards through the canyon to the Melt Cell. (i.e. "Back Door" Option)**
   Key Advantages: There are two.
   - First and foremost is that the radiological concern, associated with the CIC high neutron dose rate, is resolved. The CIC will be passed directly from a shielded trailer to a DWPF canister transfer car located under the exit tunnel air lock plug.
   - The second advantage is that there will be fewer modifications (and consequently minimal design costs) necessary for this option. A structural evaluation will have to be performed for the grating over the service pit at the entrance to the Shielded Canister Transporter (SCT) maintenance area because the KAC shielded trailer is expected to have a smaller foot print than that of the SCT. Additional canister storage capacity in selected process cells may be desirable to accommodate potential process upsets. It is also desirable to have the capability to perform one last internal inspection of the CIC's before glass is added at the melt cell. However, no changes to the facility infrastructure appear to be major in scope and should be manageable during a routinely scheduled DWPF outage.

   Key Disadvantage: Although canisters have been transferred from the exit tunnel to other process cells in the past, the process has never been done on a production scale and is significantly different from the way Operations has been trained to process canisters. This "dual route" technique for getting canisters to the Melt Cell Pour Turn Table (PTT) by way of the 210-S empty canister air lock for standard canisters and through the exit tunnel plug for CIC's will require significant procedural changes, training, and attention to detail by the operators. Implementing this approach may also require additional operators and result in higher maintenance costs due to the increased use burden placed on canyon equipment. A time motion study will have to be performed to work out the details (including the need for additional operators) and to ensure that there are no impediments to meeting established canister production goals.

4. **Process CIC's through the 210-S Canister Warehouse, mimicking the flow of production currently used to process empty canisters. (i.e., "Front Door" option)**
   Key Advantage: Operators are familiar with this process path. Once the CIC is placed in the Melt Cell, the production process from that point to the exit tunnel remains the same as that currently performed with standard canisters. Therefore no major changes will be required to either procedures or operator training for that segment of the process. However, operator training will have to be performed for receiving and handling the CIC's as they arrive on the KAC shielded trailer and for processing them through the 210-S empty canister air lock.

Key Disadvantages: There are two.

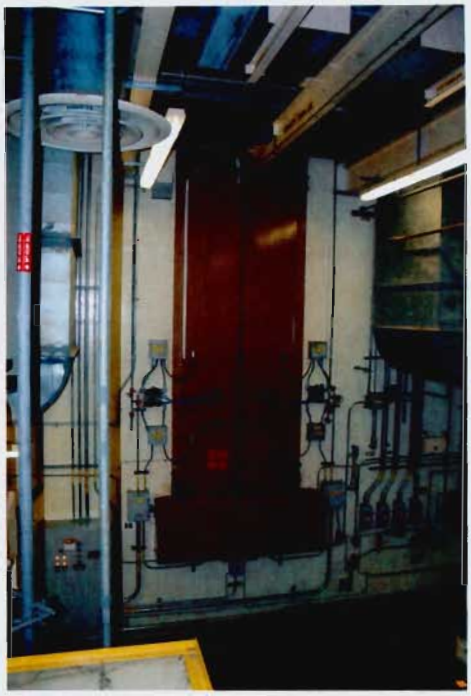
- First, the need to take compensatory measures to overcome the radiological concerns associated with the CIC high neutron dose rate is a major cause for concern. At minimum this would include:
  - Initiatives taken to protect workers handling the CIC's as the canisters arrive from KAC and until they are safely deposited into the empty canister air lock. These initiatives must also protect personnel located in the control room and offices adjacent to the canister warehouse in the event of a process upset. One proposed method is to house the CIC in a shielded shroud while transporting it through 210-S to the air lock.
  - Abnormal Operating Procedures (AOPs) will have to be developed and trained upon to recover dropped CIC's and recover CIC's stranded on a failed monorail/hoist.
- The second disadvantage is that there are significant facility design and modification costs associated with implementing this option, in addition to that of the shielded shroud discussed above. Some of the major modifications are discussed below.

The CIC's arriving from KAC will weigh in excess of a ton.[4] As such, it has been proposed that a crane or gantry be added to the canister loading dock (pictured left) in order to safely and efficiently lift the CIC's from the KAC transporter, given the volume of canisters expected to be handled each year.

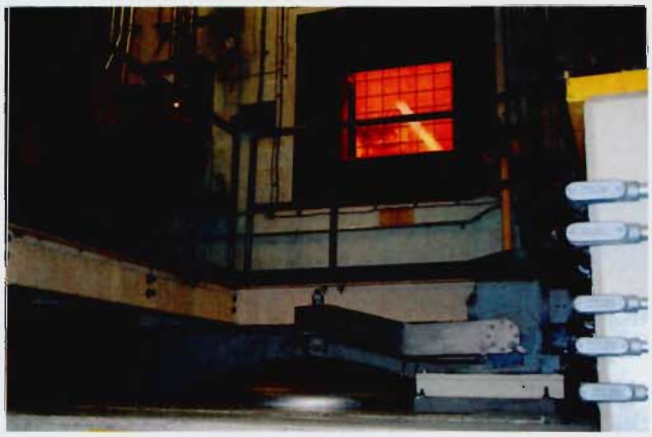
Modifications to the 210-S air lock (pictured left) and canister handling equipment will have to be made in order to:

- provide radiological protection to the operator when the CIC is removed from the shroud,
- handle the added weight imposed upon the monorail (center-top of picture) by the CIC,
- provide a means of canister recovery in the event the grapple (beneath the monorail) fails with a suspended canister and,
- provide radiological shielding to protect workers passing through the hallway next to the air lock (see doorway to right of picture).

[4] An empty canister weighs approximately 1000 pounds. The additional mass of vitrified Pu and magazines will add slightly more than another 1000 pounds. The shielded shroud needed to protect workers as the CIC is transported through 210-S will add to the weight to be handled. However, that weight is not known because shielding calculations are not complete and the design of the shroud is dependent upon the receipt of that data.



It is anticipated that a costly modification will be required to modify the 221-S air lock doorway (pictured left). Moving a canister from the 210-S air lock to the melt cell requires closing the 210-S air lock door and opening the 221-S air lock door. The canister must be lifted to a height such that it can clear a threshold (bottom-center of picture), which is part of the seismically qualified wall separating the 210-S and 221-S buildings. The threshold is approximately 6 feet high. There is only a 2-inch clearance between the bottom of a standard canister and the top of the threshold as the canister is moved from the 210-S air lock to the melt cell air lock. There is doubt that a shielded canister would be able to clear the 2-inch differential and hence will require modification. The uncertainty is due to the fact that calculations have not yet been done to determine the extent of shielding. However, one estimate indicates a minimum of 7-inches will be required (see footnote on page 2 for references).



Modifications may also be required to provide radiological protection to the operator as the CIC is transferred from the 210-S air lock to the Melt Cell air lock (bottom-center of picture). The operator typically stands on the platform above and to the right of the air lock hatch. As such, either the controls will have to be moved or a shielded operating station will need to be provided. Corridor access will also have to be restricted in the vicinity of the Melt Cell while CIC transfers are in progress due to the radiological conditions.

**Key Assumptions**

The following are assumptions considered during the evaluations of the options above:

1. There are no Safeguards and Security requirements for CIC operations in DWPF.
2. The time-motion study needed to implement Option 3 will not reveal technical or operational issues significant enough to result in having to reconsider this option as the preferred strategy for integrating he CIC's into the DWPF production process.
3. Additional Operators will be required. The time-motion study will determine to what extent.
4. There will be increased maintenance costs due to the higher use burden placed on canyon equipment.
5. DWPF will use designated or allocated "lag storage" space to integrate KAC's delivery of up to 3 CIC's per week into the DWPF production process.
6. DWPF will not store new CIC's designated for KAC's use in the 210-S Building.

7. The CIC cannot remain shielded once it arrives at the 210-S air lock. As discussed in the key disadvantages associated with Option 4 above, the tight clearance (i.e., 2-inches) between a canister and the top of the 221-S air lock door threshold may prevent a shielded canister from passing through the air lock. Hence, the shield/shroud would either have to be removed from the canister before attempting to negotiate it through the air lock or the air lock would have to be modified.
8. The shielded trailer used to transport the CIC's from KAC to DWPF will be designed not only to deposit canisters into the 221-S exit tunnel, but also to deposit and retrieve unfilled CIC's (i.e., containing no high level waste glass) canisters from the Glass Waste Storage Buildings (GWSBs).
9. DWPF's Shield Canister Transporter (SCT) will be available to retrieve CIC's deposited into the GWSBs as part of managing the lag storage strategy.
10. The rate of CIC's processed through DWPF will be 132 per year when KAC begins full production (circa 2013) with 800 CIC's being produced during the expected six year life of the project.

**Conclusion**

Options available to DWPF for integrating PDP CIC's into its production process were evaluated with careful consideration given to the impacts each could have on personnel safety; project schedule; personnel, material, and funding resources; operations and operational protocol; and the safety basis. It is recommended that the facility proceed with plans to integrate these unique canisters into the DWPF production process by receiving them through the SCT exit tunnel (i.e. as discussed in Option 3 above).

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