U.S. Department of Energy
Office of Civilian Radioactive Waste Management

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SURFACE FACILITY DESIGN

Presented to:
Nuclear Waste Technical Review Board (NWTRB)
Board Fall Meeting

Presented by:
John Orchard and James Low
Office of the Chief Engineer

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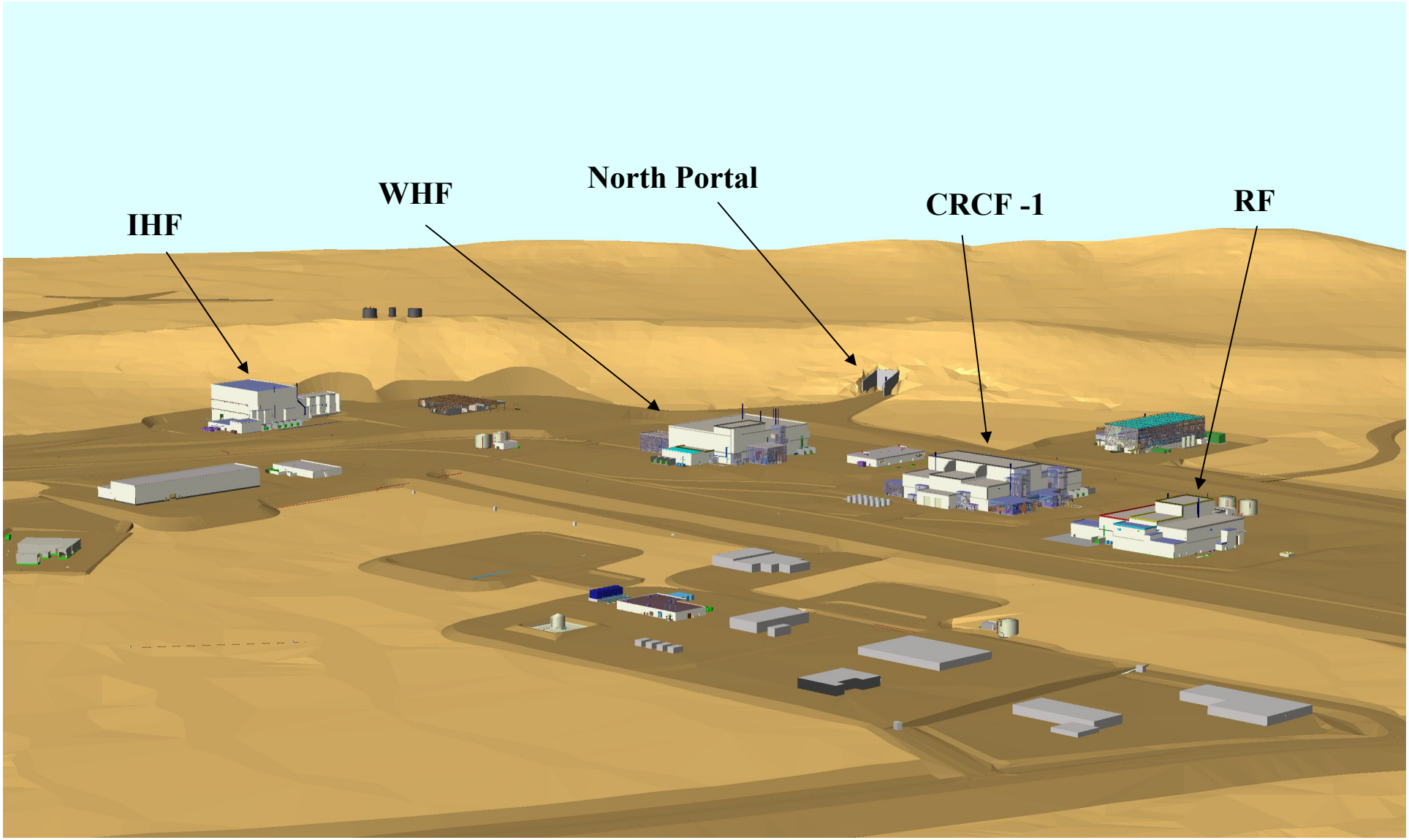
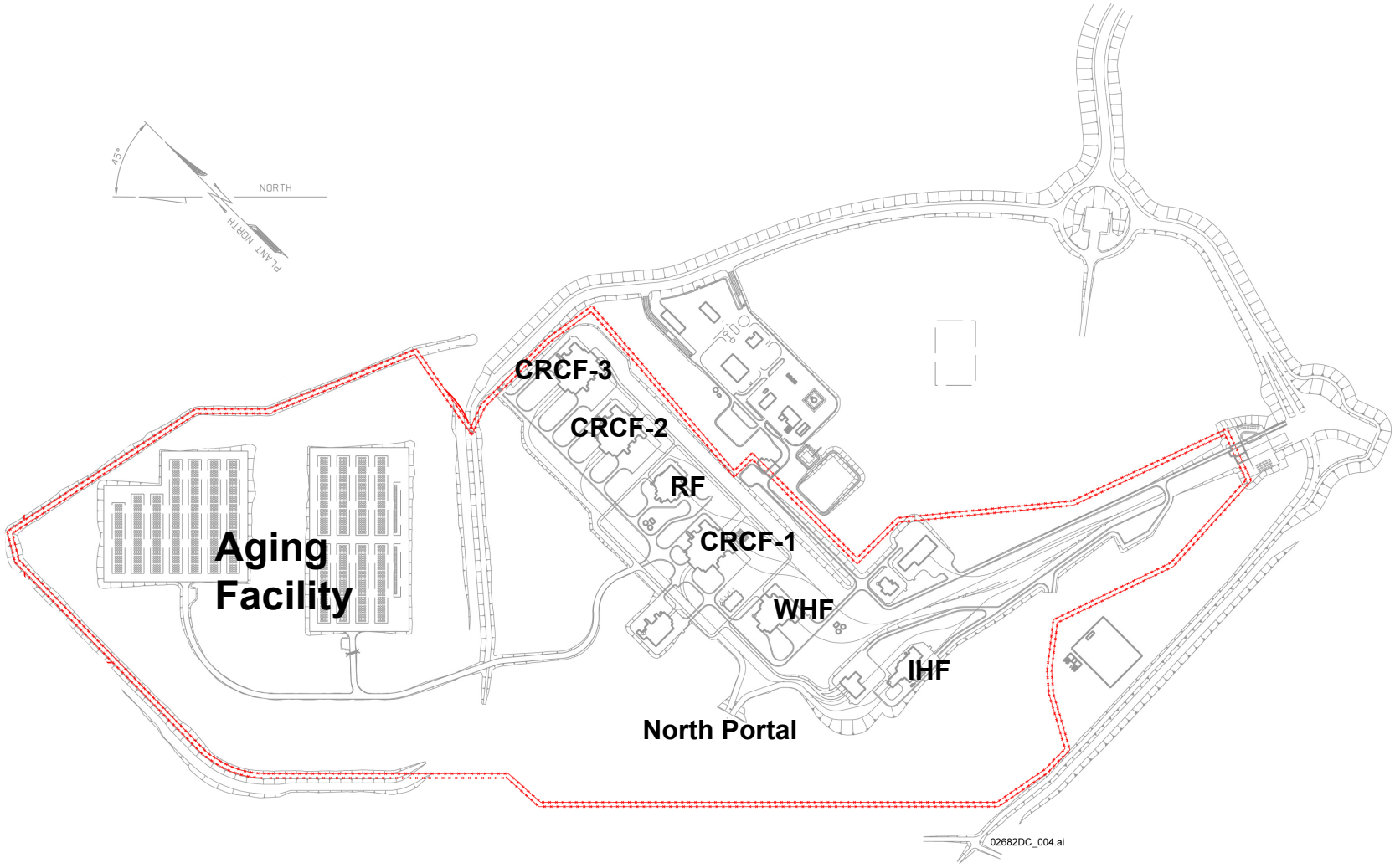
Acronyms

AO	Aging Overpack
ASME	American Society of Mechanical Engineers
CRCF	Canister Receipt and Closure Facility
CSNF	Commercial spent nuclear fuel
DPC	Dual Purpose Canister
HAM	Horizontal Aging Module
HLW	High-level radioactive waste
IHF	Initial Handling Facility
ITS	Important to safety
PCSA	Preclosure Safety Analysis
RF	Receipt Facility
SNF	Spent Nuclear Fuel
STC	Shielded Transfer Cask
TAD	Transportation, Aging and Disposal
TC	Transportation Cask
TEV	Transportation and Emplacement Vehicle
WHF	Wet Handling Facility
WP	Waste Package



Site Plan looking West

Site Plan


NORTH
PLANT NORTH
45°
CRCF-3
CRCF-2
RF
CRCF-1
WHF
IHF
Aging Facility
North Portal
02682DC_004.ai

Design Status

- **Design to support the PCSA and the License Application is complete**

- **Design to support procurement and construction is continuing**

Mechanical Handling Equipment Principal Design Codes

- **Cask handling cranes, the spent fuel transfer machine, canister transfer machines, site transporters, TAD closure equipment, and DPC cutting equipment are similar to equipment currently in use at commercial nuclear plants and will be designed to the consensus codes and standards for the type of equipment. For example, the cask handling cranes, spent fuel transfer machine, and canister transfer machines will be designed to ASME NOG-1 "Rules for Construction of Overhead and Gantry Cranes"**

Mechanical Handling Equipment Principal Design Codes

- **The cask transfer trolley and the waste package transfer trolley do not have a consensus design code and therefore will be designed to the applicable portions of ASME NOG-1**
- **The transport and emplacement vehicle does not have a consensus design code and therefore will be designed to the applicable portions of ASME NOG-1**

Waste Form & Facilities

Waste Forms		Facilities				
		Aging Facility	Canister Receipt and Closure Facility (CRCF)	Wet Handling Facility (WHF)	Receipt Facility (RF)	Initial Handling Facility (IHF)
HLW	Canister		X			X
Naval SNF	Canister					X
DOE SNF	Canister		X			
CSNF	Uncanistered			X		
CSNF	TAD	X	X	X	X	

Common Facility Waste Handling Equipment

	Facilities			
	Initial Handling Facility (IHF)	Canister Receipt & Closure Facility (CRCF)	Wet Handling Facility (WHF)	Receipt Facility (RF)
Mechanical Handling Equipment				
Cask Handling Crane	X	X	X	X
Cask Transfer Trolley	X	X	X	X
Canister Transfer Machine	X	X	X	X
Waste Package Closure System	X	X		
Waste Package Transfer Trolley	X	X		
Transport and Emplacement Vehicle	X	X		
Site Transporter		X	X	X
Spent Fuel Transfer Machine			X	
TAD Closure			X	
DPC Cutting			X	

Canister Receipt and Closure Facility (CRCF)

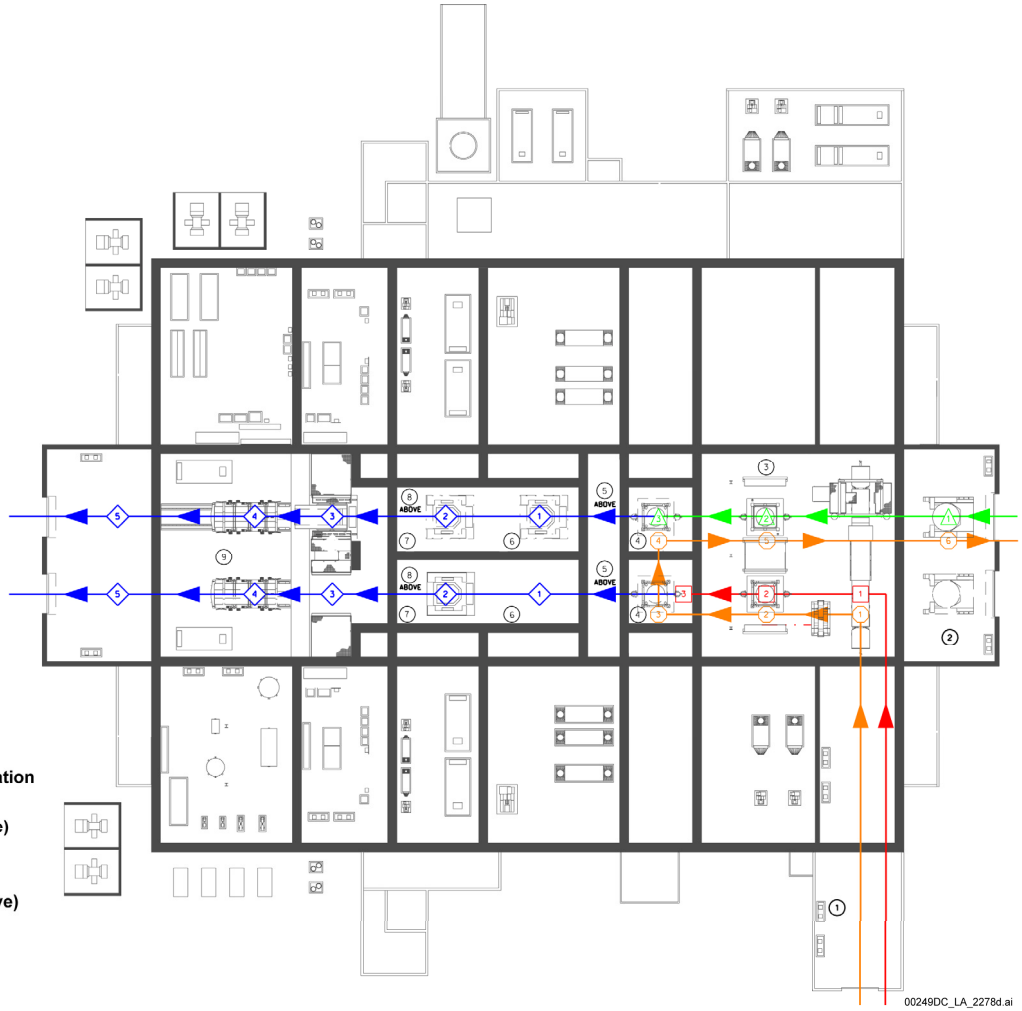
Receipt & Processing Requirements

- 450 MTHM/yr TADs for WPs (~55 TADs)
- 200 MTHM/yr TADs for AOs (~25 TADs)
- 50 MTHM/yr DPCs for AOs (~6 DPCs)
- 63 canisters/yr DOE SNF
- 315 canisters/yr DOE HLW

Design Approach:

- Parallel WP loading and closure lines

CRCF Material Flow Path



① Cask Receipt
② Aging Overpack Receipt
③ Cask/Aging Overpack Preparation
④ Unloading
⑤ Canister Transfer Area (Above)
⑥ Loading
⑦ Waste Package Positioning
⑧ Waste Package Closure (Above)
⑨ Waste Package Loadout

HLW or DOE SNF and TAD Canister in Transportation Cask

1. Receive cask, remove impact limiters, upend
2. Prepare cask for canister transfer
3. Remove canister from cask

TAD Canister in Aging Overpack

1. Receive aging overpack on site transporter
2. Prepare aging overpack for canister transfer
3. Remove canister from aging overpack

DPC in Transportation Cask

1. Receive cask, remove impact limiters, upend
2. Prepare cask for canister transfer
3. Remove canister from cask
4. Transfer DPC to aging overpack
5. Prepare aging overpack for export
6. Export aging overpack on site transporter

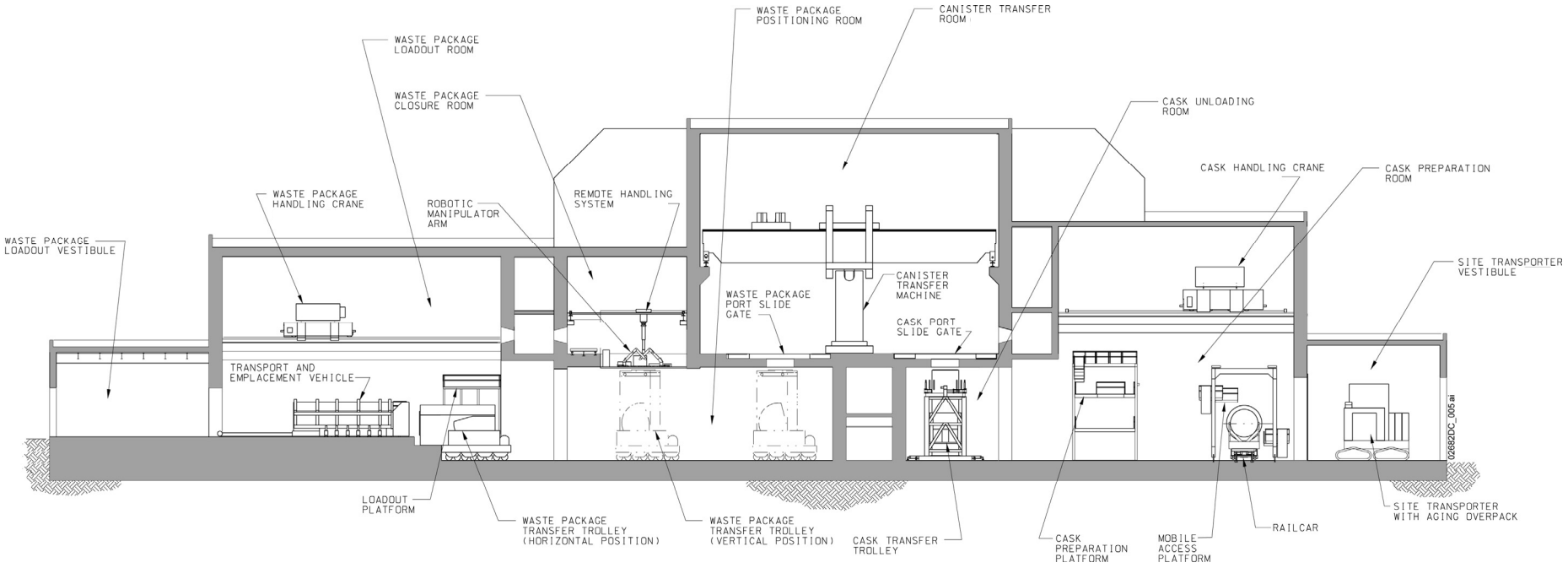
Waste Package

1. Place canister into waste package
2. Seal waste package
3. Prepare waste package for export
4. Transfer to TEV
5. Export waste package

Legend

- HLW or DOE SNF and TAD Canister in Transportation Cask
- TAD Canister in Aging Overpack
- DPC in Transportation Cask
- Waste Package

CRCF Section View



Receipt Facility (RF) Requirements

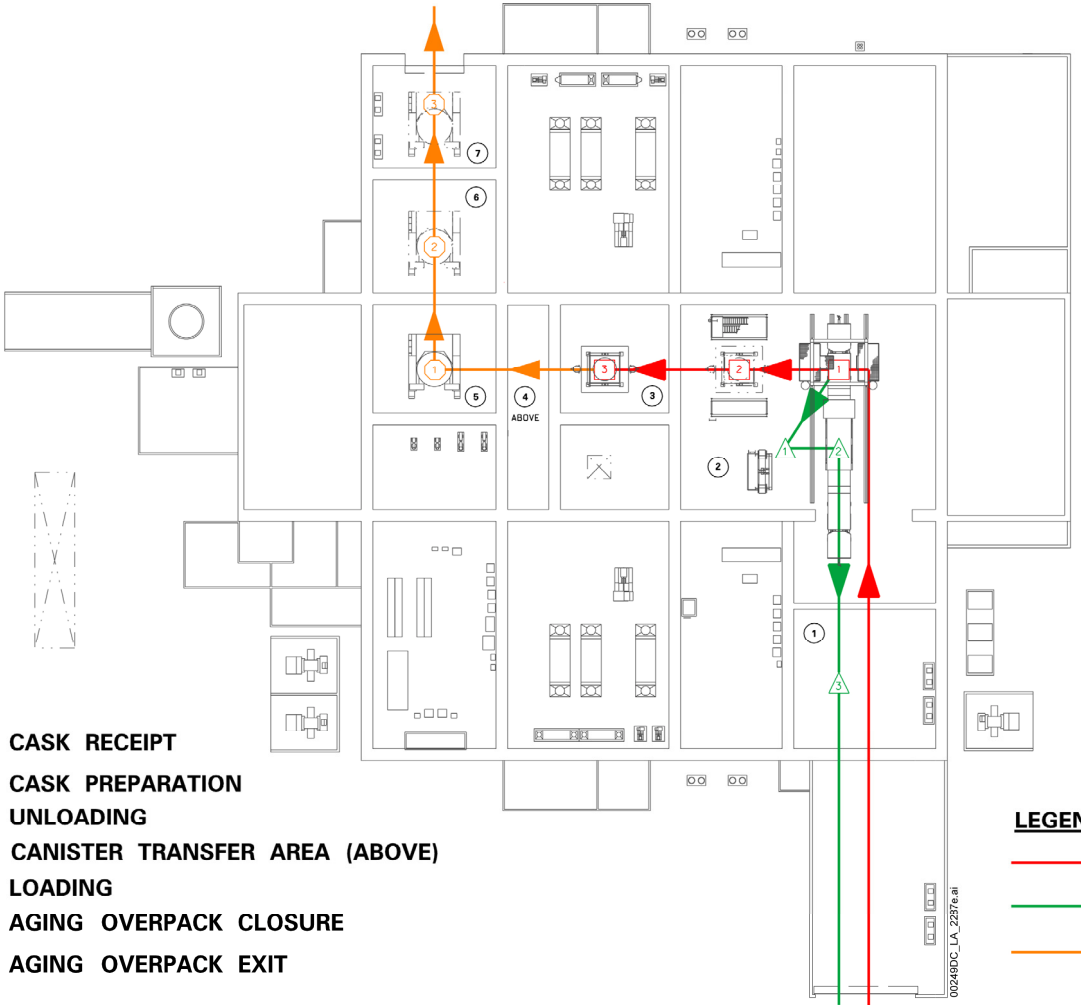
Receipt & Processing Requirements:

- **1000 MTHM/yr TADs for AOs (~125 TADs)**
- **140 MTHM/yr DPCs for AOs (~18 DPCs)**

Design Approach:

- **Reduces demand on CRCFs and WHF**
- **Decouple receipt from waste package loading**
- **Equipment the same as CRCF receive and transfer**

RF Material Flow Path



1. CASK RECEIPT
2. CASK PREPARATION
3. UNLOADING
4. CANISTER TRANSFER AREA (ABOVE)
5. LOADING
6. AGING OVERPACK CLOSURE
7. AGING OVERPACK EXIT

DPC AND TAD CANISTER IN TRANSPORTATION CASK

1. RECEIVE CASK, REMOVE IMPACT LIMITERS, UPEND
2. PREPARE CASK FOR CANISTER TRANSFER
3. REMOVE CANISTER FROM CASK

HORIZONTAL CASK

1. MOVE TO CASK STAND
2. TRANSFER TO TRAILER
3. EXPORT HORIZONTAL DPC

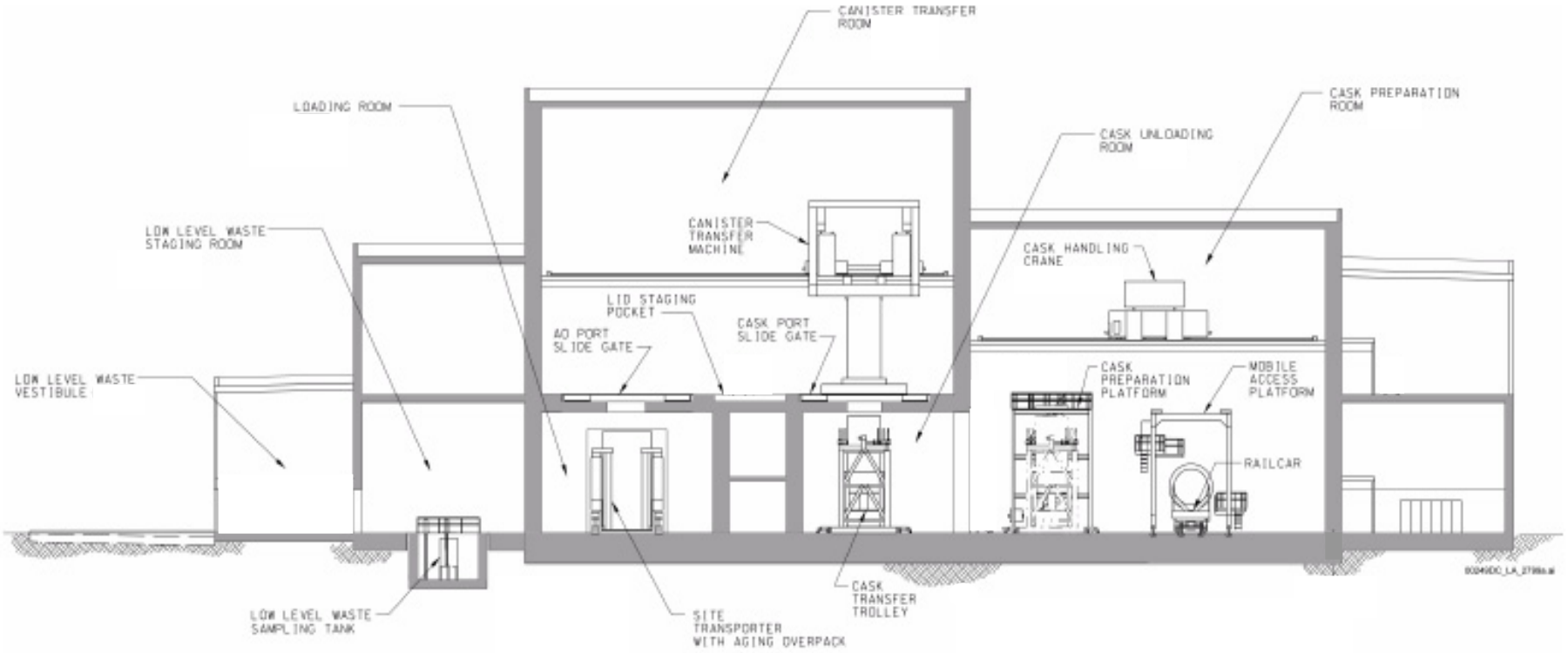
TAD CANISTER AND DPC IN AGING OVERPACK

1. PLACE CANISTER INTO AGING OVERPACK
2. PREPARE AGING OVERPACK FOR EXPORT
3. EXPORT AGING OVERPACK ON SITE TRANSPORTER

LEGEND

- DPC AND TAD CANISTER IN TRANSPORTATION CASK
- HORIZONTAL CASK
- TAD CANISTER AND DPC IN AGING OVERPACK

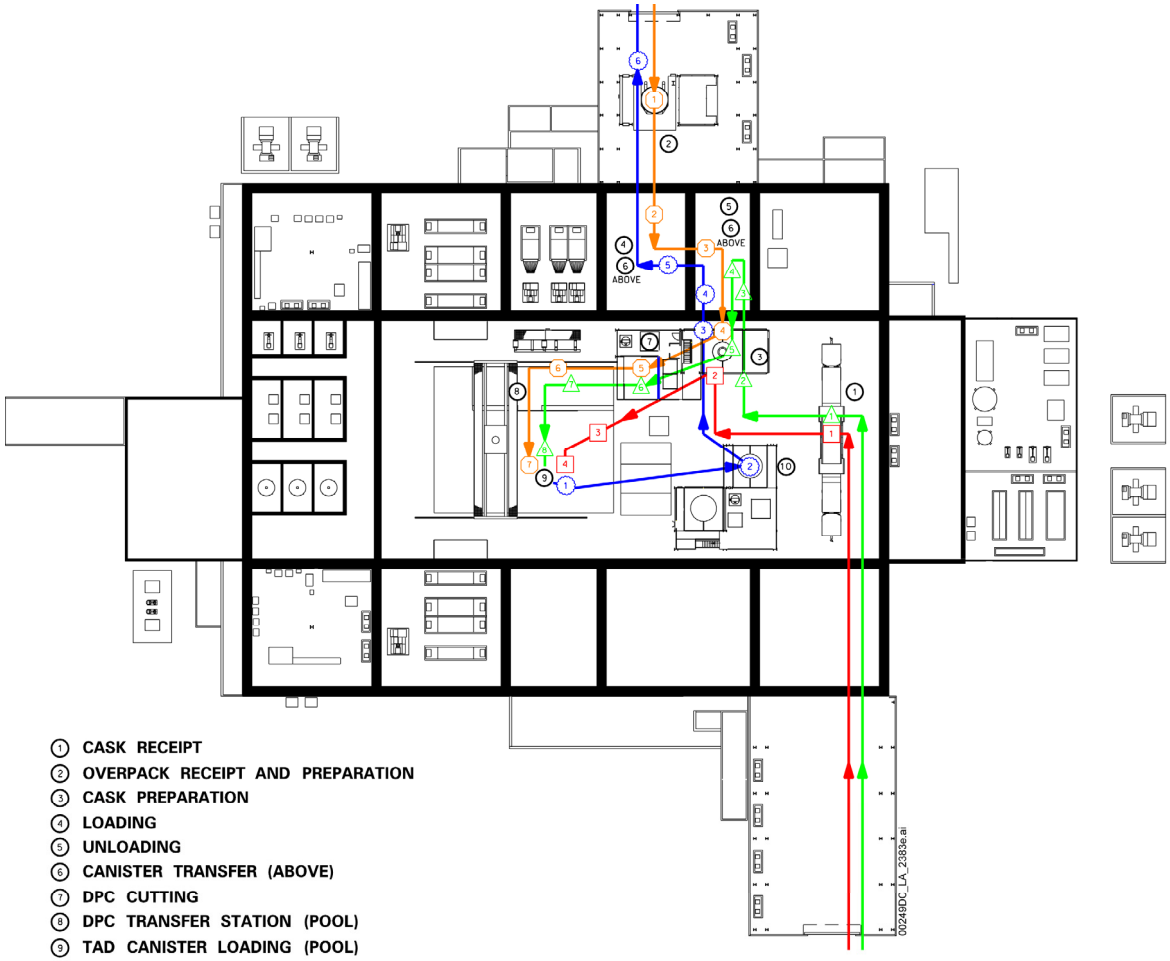
RF Section View



WHF Requirements

- **Receipt & Processing**
  - **Capable of receiving 230 MTHM/yr bare CSNF**
    - **7 day maximum turn around for TC**
  - **Capable of receiving 77 MTHM/yr CSNF in DPC**
- **Facility Design Approach**
  - **Full utilization approach for stations – more than one TC, DPC, TAD can be processed simultaneously**
  - **WHF process flows circularly from the conveyance (east) to preparation operations (north) to pool handling operations (west) to export/welding operations (south)**

WHF Material Flow Path



① CASK RECEIPT
② OVERPACK RECEIPT AND PREPARATION
③ CASK PREPARATION
④ LOADING
⑤ UNLOADING
⑥ CANISTER TRANSFER (ABOVE)
⑦ DPC CUTTING
⑧ DPC TRANSFER STATION (POOL)
⑨ TAD CANISTER LOADING (POOL)
⑩ TAD CANISTER CLOSURE

TRANSPORTATION CASK WITH SNF (NO DPC)

1. RECEIVE CASK, REMOVE IMPACT LIMITERS, AND UPEND
2. PREPARE CASK FOR POOL HANDLING
3. PLACE CASK IN THE POOL
4. TRANSFER SNF FROM CASK TO TAD CANISTER IN SHIELDED TRANSFER CASK

DPC IN A TRANSPORTATION CASK

△1 RECEIVE CASK, REMOVE IMPACT LIMITERS, AND UPEND
△2 PREPARE TRANSPORTATION CASK FOR DPC TRANSFER
△3 REMOVE DPC FROM TRANSPORTATION CASK
△4 PLACE DPC INTO SHIELDED TRANSFER CASK
△5 PREPARE DPC FOR DPC CUTTING
△6 CUT OPEN THE DPC
△7 PLACE DPC IN SHIELDED TRANSFER CASK IN THE POOL
△8 TRANSFER SNF FROM DPC TO TAD CANISTER IN SHIELDED TRANSFER CASK

DPC IN AN AGING OVERPACK

1. RECEIVE AGING OVERPACK WITH DPC AND UNBOLT LID
2. REMOVE DPC FROM AGING OVERPACK
3. PLACE DPC INTO SHIELDED TRANSFER CASK
4. PREPARE DPC FOR DPC CUTTING
5. CUT OPEN THE DPC
6. MOVE DPC IN SHIELDED TRANSFER CASK TO THE POOL
7. TRANSFER SNF FROM DPC TO TAD CANISTER IN SHIELDED TRANSFER CASK

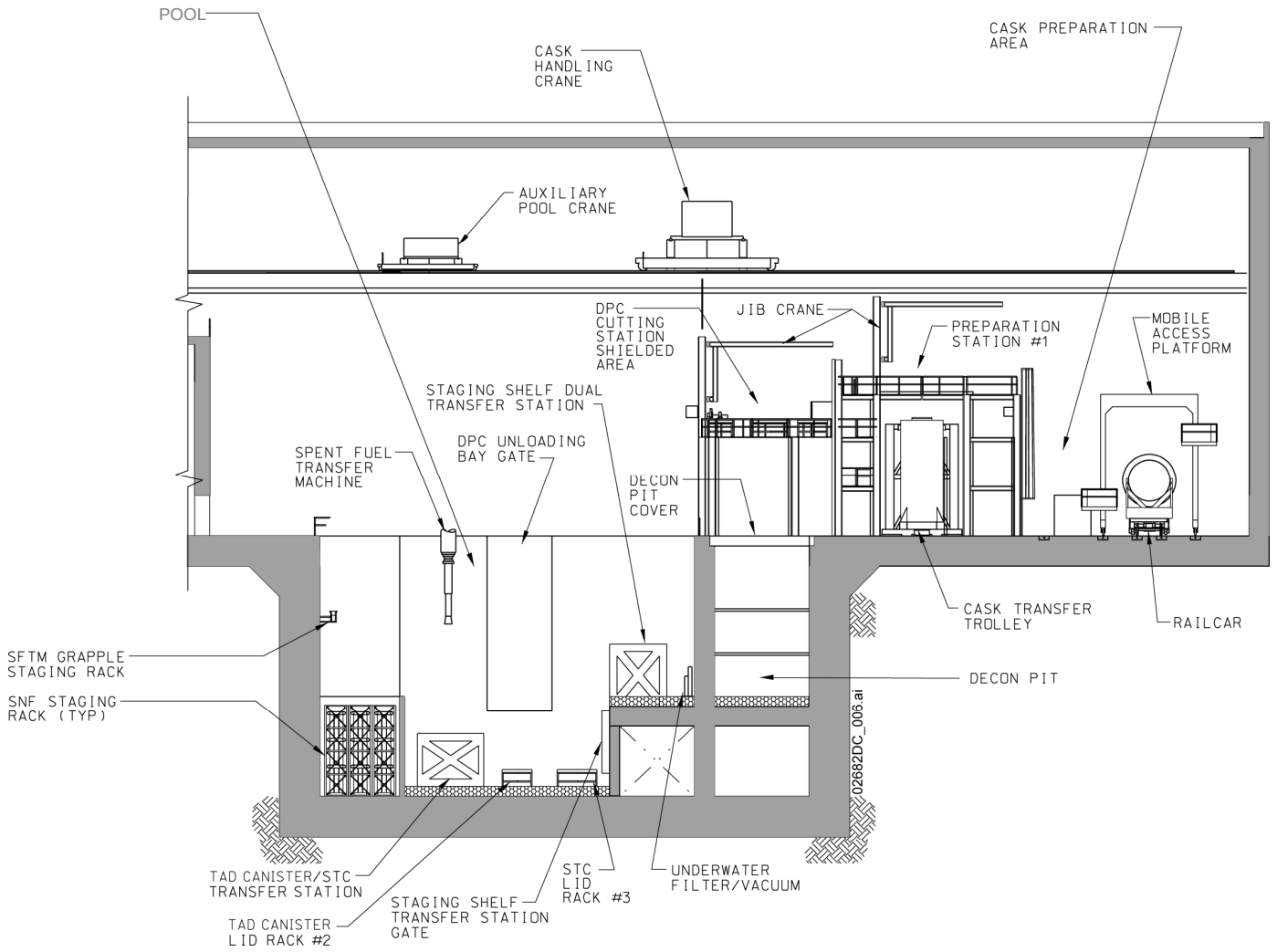
LOADED TAD CANISTER

① LOADED TAD CANISTER IN SHIELDED TRANSFER CASK
② DRY AND CLOSE TAD CANISTER
③ PREPARE TAD CANISTER IN SHIELDED TRANSFER CASK FOR TRANSFER INTO AGING OVERPACK
④ REMOVE TAD CANISTER FROM SHIELDED TRANSFER CASK
⑤ PLACE TAD CANISTER INTO AGING OVERPACK
⑥ PREPARE TAD CANISTER IN AGING OVERPACK FOR EXPORT FROM WHF

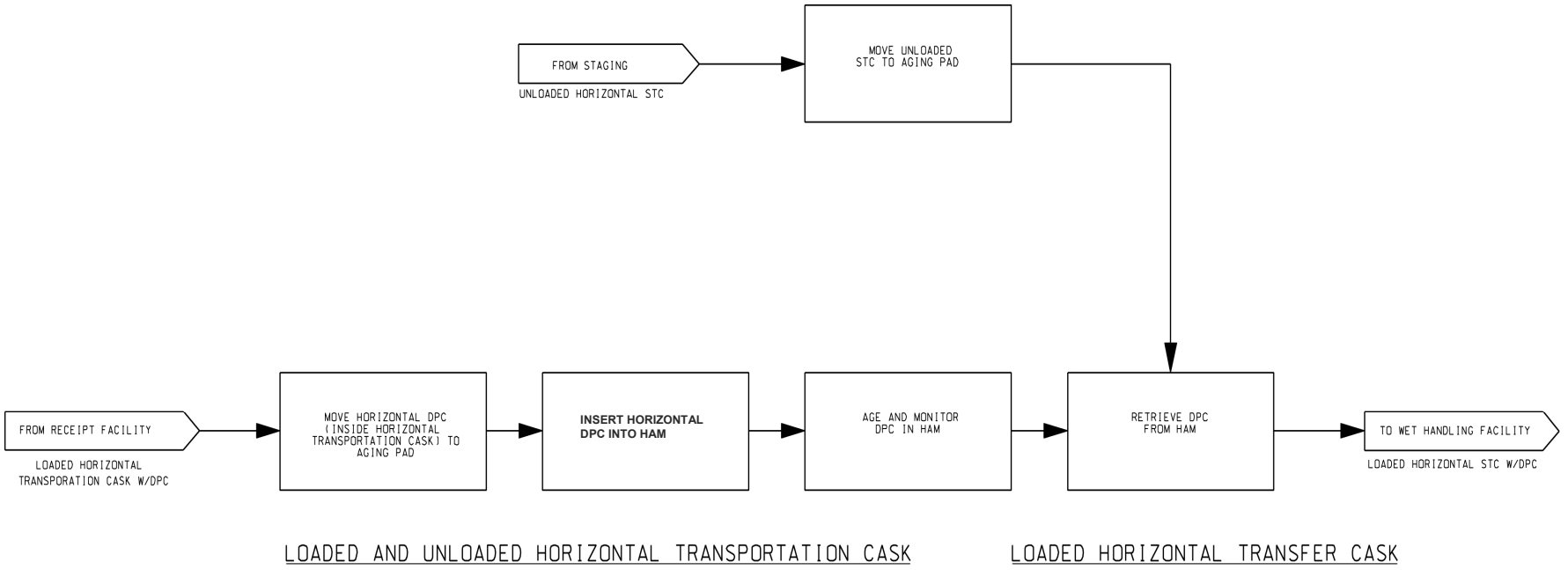
LEGEND

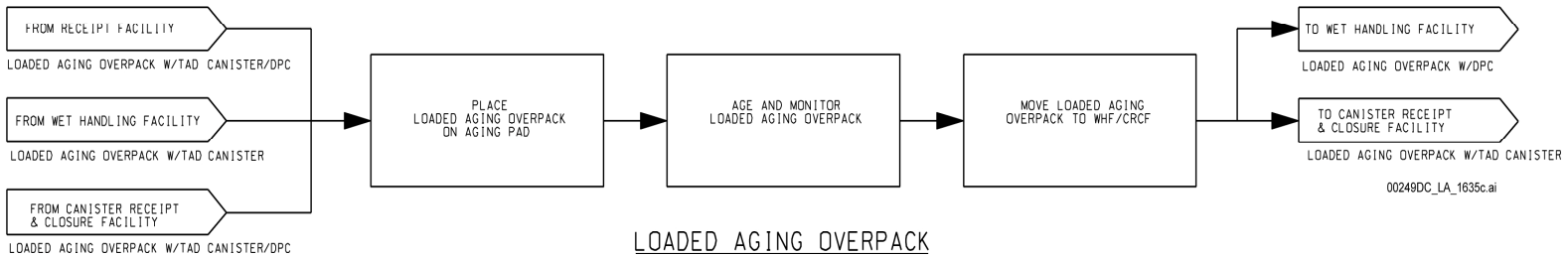
- TRANSPORTATION CASK WITH SNF (NO DPC)
- TRANSPORTATION CASK WITH DPC
- AGING OVERPACK WITH DPC
- LOADED TAD CANISTER

WHF Section View



Aging Block Flow Diagram





Aging Pad Area Plan