SURFACE FACILITY DESIGN

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

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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

Aging Facility

CRCF-3
CRCF-2
CRCF-1
WHF
RF
IHF
North Portal

Orchard_N
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B
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9
240
8.ppt

Aging

Facility
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”
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

<table>
<thead>
<tr>
<th>Waste Forms</th>
<th>Facilities</th>
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<tbody>
<tr>
<td></td>
<td>Aging Facility</td>
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<tr>
<td>HLW</td>
<td>Canister</td>
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<tr>
<td>Naval SNF</td>
<td>Canister</td>
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<tr>
<td>DOE SNF</td>
<td>Canister</td>
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<tr>
<td>CSNF</td>
<td>Uncanistered</td>
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<tr>
<td>CSNF</td>
<td>TAD</td>
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</tbody>
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## Common Facility Waste Handling Equipment

<table>
<thead>
<tr>
<th>Mechanical Handling Equipment</th>
<th>Initial Handling Facility (IHF)</th>
<th>Canister Receipt &amp; Closure Facility (CRCF)</th>
<th>Wet Handling Facility (WHF)</th>
<th>Receipt Facility (RF)</th>
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<tbody>
<tr>
<td>Cask Handling Crane</td>
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<td>Cask Transfer Trolley</td>
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<td>Canister Transfer Machine</td>
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<td>Waste Package Closure System</td>
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<td>Waste Package Transfer Trolley</td>
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<td>Transport and Emplacement Vehicle</td>
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<td>Site Transporter</td>
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<tr>
<td>Spent Fuel Transfer Machine</td>
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<td>TAD Closure</td>
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<tr>
<td>DPC Cutting</td>
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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

- Cask Receipt
- Aging Overpack Receipt
- Cask/Aging Overpack Preparation
- Unloading
- Canister Transfer Area (Above)
- Loading
- Waste Package Positioning
- Waste Package Closure (Above)
- Waste Package Loadout

HLW or DOE SNF and TAD Canister in Transportation Cask
- Receive canister, remove impact limiters, upend
- Prepare canister for canister transfer
- Remove canister from cask

TAD Canister in Aging Overpack
- Receive aging overpack on site transporter
- Prepare aging overpack for canister transfer
- Remove canister from aging overpack

DPC in Transportation Cask
- Receive canister, remove impact limiters, upend
- Prepare canister for canister transfer
- Remove canister from cask
- Transfer DPC to aging overpack
- Prepare aging overpack for export
- Export aging overpack on site transporter

Waste Package
- Place canister into waste package
- Seal waste package
- Prepare waste package for export
- Transfer to TEV
- Export waste package

Legend
- Red: HLW or DOE SNF and TAD Canister in Transportation Cask
- Green: TAD Canister in Aging Overpack
- Orange: DPC in Transportation Cask
- Blue: 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

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, UPEIND
2 PREPARE CASK FOR CANISTER TRANSFER
3 REMOVE CANISTER FROM CASK

HORIZONTAL CASK

▲ MOVE TO CASK STAND
▲ TRANSFER TO TRAILER
▲ 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
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
WHF Section View
Aging Block Flow Diagram
Aging Pad Area Plan