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Presentation to the NWTRB: Management of Aging Storage Facilities and Spent Nuclear Fuel

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Federal Project Director
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Idaho Cleanup Project Spent Nuclear Fuel

Facilities

CPP-2707 – Cask dry storage

NRC-Licensed Facilities

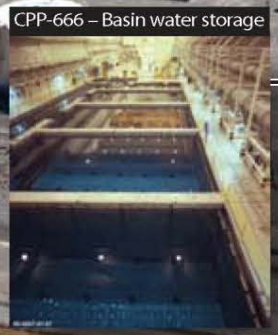
TMI – Horizontal modular dry storage

FSV-Vertical modular vault dry storage (Colorado)

CPP-603 – Shielded cave rack dry storage

CPP-749 Underground dry storage

CPP-666 – Basin water storage



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INTEC SNF Facilities

Idaho Nuclear Technology and Engineering Center

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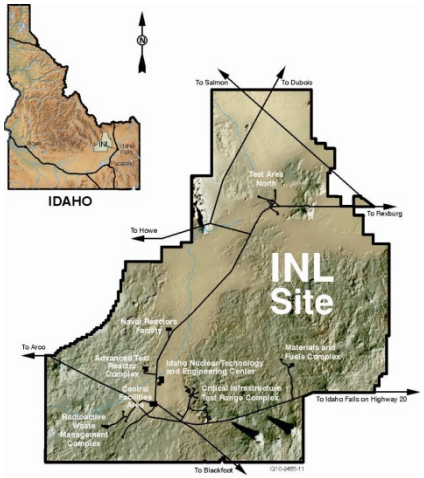

Idaho National Laboratory

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Spent Fuel Facilities

SNF is stored in 6 configurations:

- DOE Regulations
  - CPP-666 – Fuel Storage Area (Basin)
  - CPP-2707 – Cask Storage Pad
  - CPP-749 – Outdoor Fuel Storage Facility
  - CPP-603 – Irradiated Fuel Storage Facility
- NRC Regulations
  - CPP-1774 –TMI-2 Independent Spent fuel Storage Installation (NRC licensed)
  - Ft. St. Vrain, Independent Spent fuel Storage Installation (NRC licensed), Colorado

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Aging Management - NRC

- NRC Licensed Facilities (TMI-2 , FSV);10 CFR Part 72.42 Defines Requirements for Duration of License and Renewal
- Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance — Final Report (NUREG-1927)
- FSV license was extended in 2011 to November 2031.
- Three Mile Island License Renewal Application for an additional 20 years will be submitted to NRC in 2017 for renewal by 2019

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Aging Management - NRC

- Application for ISFSI license renewals must include the following:
  - Time-Limited Aging Analysis (TLAAs) that demonstrate that structures, systems, and components important to safety will continue to perform their intended function for the requested period of extended operation; and
  - A description of the Aging Management Program (AMP) for management of issues associated with aging that could adversely affect structures, systems, and components important to safety. Should provide for prediction of the extent of the effects of aging and timely corrective or mitigative actions
- The structures, systems, and components important to safety placed under the AMP is dependent on the outcome of the TLAA.

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TMI AMP Prior to License Renewal Application – Concrete Cracking Mitigation (HSM 5, NW)

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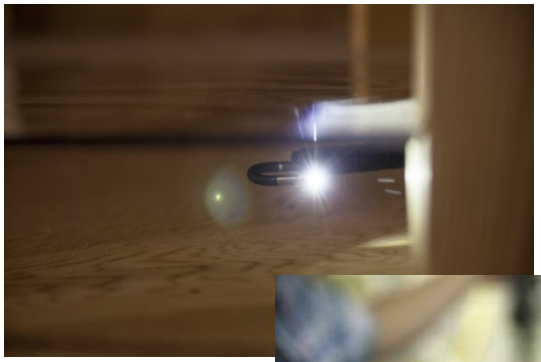
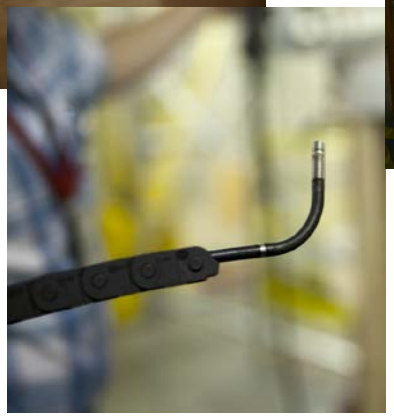
Technology Development – Internal inspection of TMI Horizontal Storage Module

Borescope





V-21 Dry Storage Cask

HEPA Filter Vent Port

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DOE System

- DOE Regulated Environmental Management Facilities (CPP-666 –Fuel Storage Area (Basin), CPP-2707 –Cask Storage Pad (CPP-749 –Underground Fuel Storage Facility, CPP-603 –Irradiated Fuel Storage Facility)
  - The life cycle baseline for fuel storage is consistent with the settlement agreement dates, 2023 (CPP-666 basin storage emptied) and 2035 (balance of fuel facilities emptied)
  - Surveillance and Maintenance
  - System Health Reports, a CWI Initiative
  - Risk Management – Repository or Availability of Interim Storage out of Idaho

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Key Schedule Drivers Dictate Analytical Timeframes Within DOE

- 1995 Programmatic Spent Nuclear Fuel Management and INEL Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (DOE/EIS-0203) and RODs
- **1995 Settlement Agreement**
  - E.8., “DOE shall complete the transfer all spent fuel from wet storage facilities at INEL by December 31, 2023.”
  - C.1., “DOE shall remove all spent fuel including naval spent fuel and Three Mile Island spent fuel from Idaho by January 1, 2035.”
- Agreement to remove all Fort Saint Vrain (FSV) fuel from the State of Colorado by 1/1/2035.

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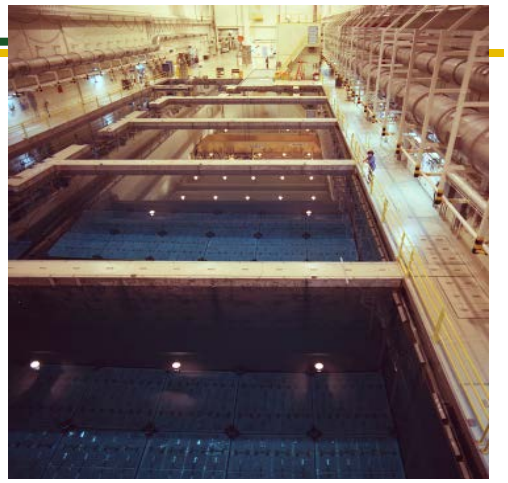
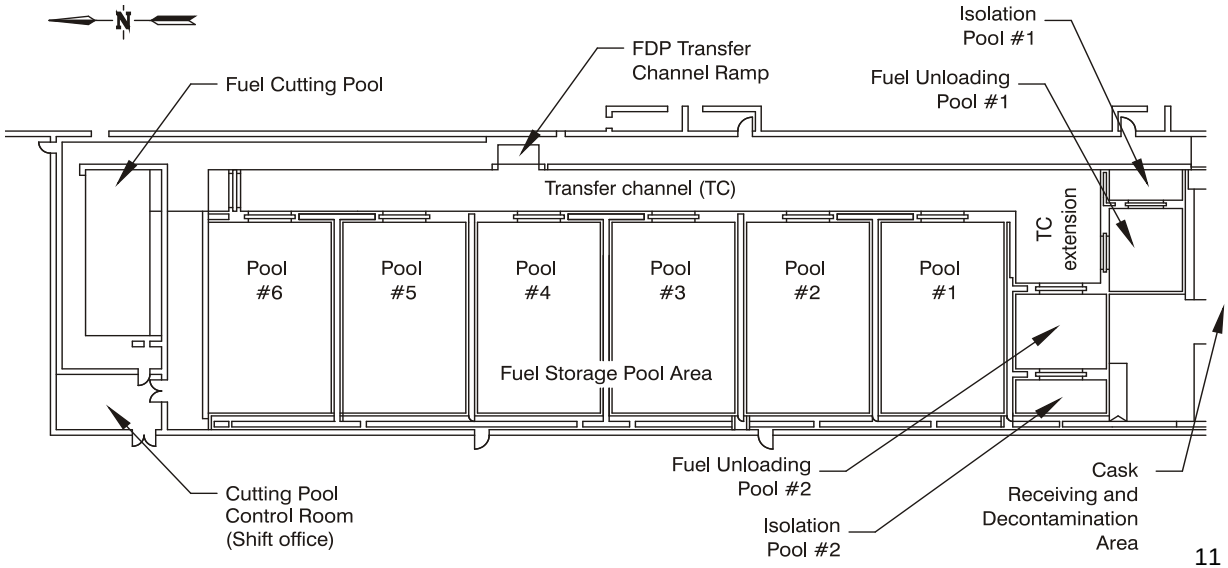
Fuel Storage Basin (CPP-666)



- SS Lined Pools - 3.5 M Gal Demineralized Water
- SS storage racks in pools 1-6
- Al Storage Racks in Half of Pool 6
- Al and SS buckets, baskets, and cans
- Al-, SS-, and Zr-Clad Fuel
- Currently less than 30% Storage Position Utilization



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Fuel Storage Basin (CPP-666)

CPP-666 Corrosion Monitoring Plan

- Measure Thickness & Weld Integrity of Al and SS Tie Plates in Pool 6 and Pool 2 – 2 yrs.
- Measure Corrosion Coupons – 3 yrs.
- Inspect Accessible Portions of Pool Liner and Racks – 1 yr.

Water Chemistry Monitoring

  - Analyze Pool Water Samples for Chloride, Specific Conductivity & pH Monthly
  - Trend and Report Results Annually
- NuPac Cask Monitoring
- Continuous Nitrogen Purge H2 < detectable

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Fuel Storage Basin (CPP-666)

Results Summary

- All Water Quality Parameters Within Acceptable Limits, however trend indicated resin decreasing in efficiency.
- Resin Bed Replacement $7M project in FY 2014

Acceptable Range

- Average Specific Conductivity < 5 µS/cm Limit
- Average pH Limit 5.2 – 7.5
- Average Chloride Limit < 1 ppm
- Average Pool Temp < Limit 122 °F

Results Summary

- NuPac 125B-1, H2 below detectable limits < 0.5% hydrogen
- NuPac 125B-3, H2 between 1.25% and 1.9%

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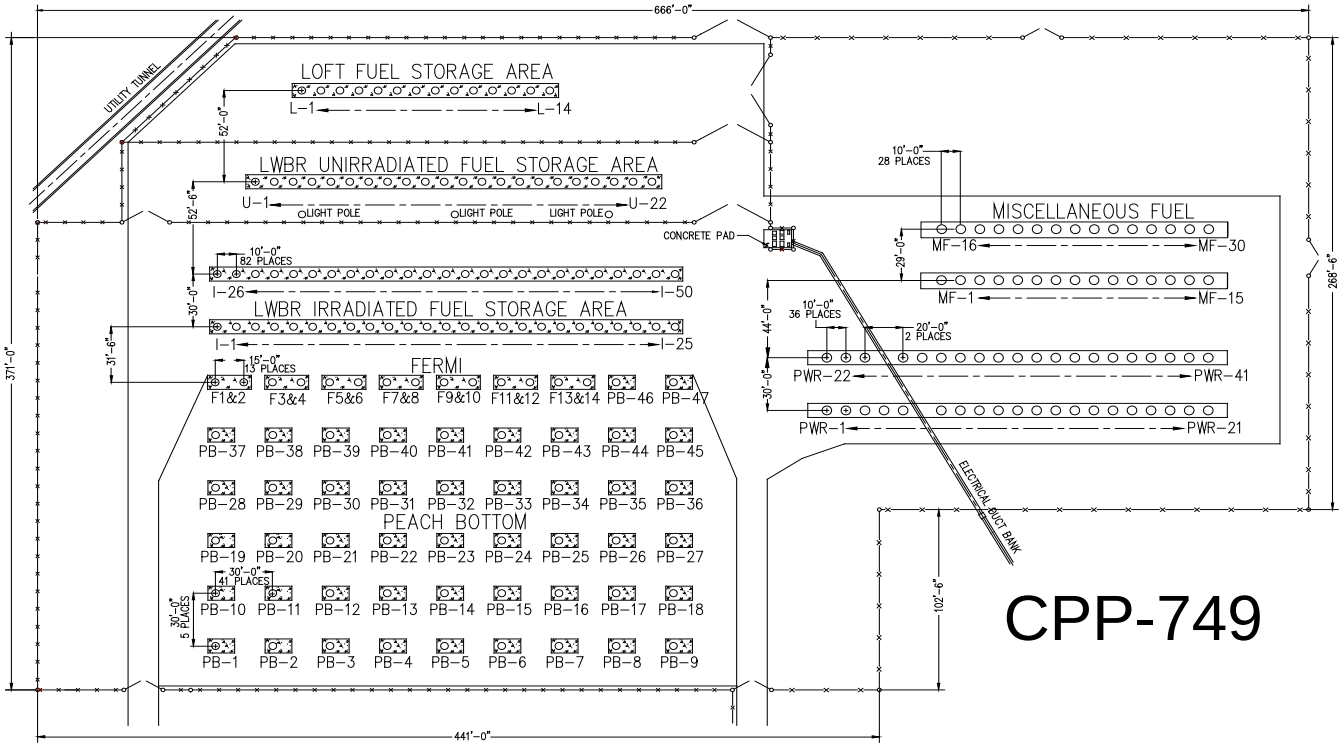
Outdoor Fuel Storage Facility (OFSF) (CPP-749 Vaults)

- 61 1st Generation Vaults
- 157 2nd Generation w/LWBR, Shippingport PWR, and Tory IIA Fuel



CPP-749

OFSF (CPP-749 Vaults) cont.

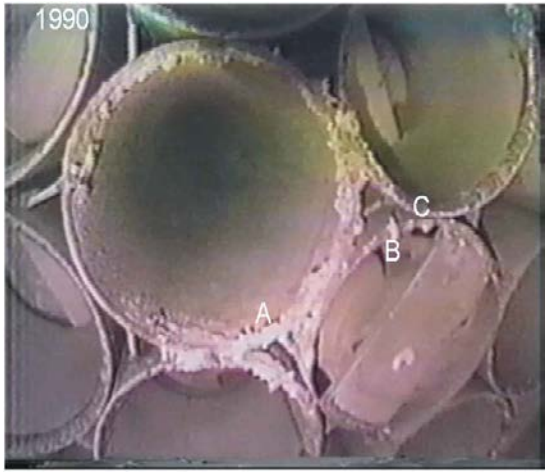
CPP-749 Vault Monitoring History

Before 2002:

- Sampled for H_2 then Purged as necessary – 2 yrs.
- Inspections identified:
  - Visual Corrosion of Peach Bottom Al Baskets (1st Gen Vault)
  - Evidence of Water in 1st Gen Vaults
- 1997 – 2000 Transferred 6 Peach Bottom to 2nd Gen Vaults

After 2002:

- Sampled for H_2 then Purge as necessary – 3 yrs.
- Tory-IIA Fuel– Qtrly
- Vault Internal Inspections When Available
- 2005 Began Measuring Corrosion Rates



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OFSF (CPP-749 Vaults) cont.

Results Summary:

Corrosion Measurements are Within Acceptable Limits

Exterior Inspection– minor paint, sealant & concrete cracking

Interior Inspection

- 35 2nd Gen Inspected (2008) & 1 1st Gen Inspected (2009)
- No water, little corrosion, intact paint

Cathodic Protection – no issues

Hydrogen Monitoring – All vaults < 2%, most much less

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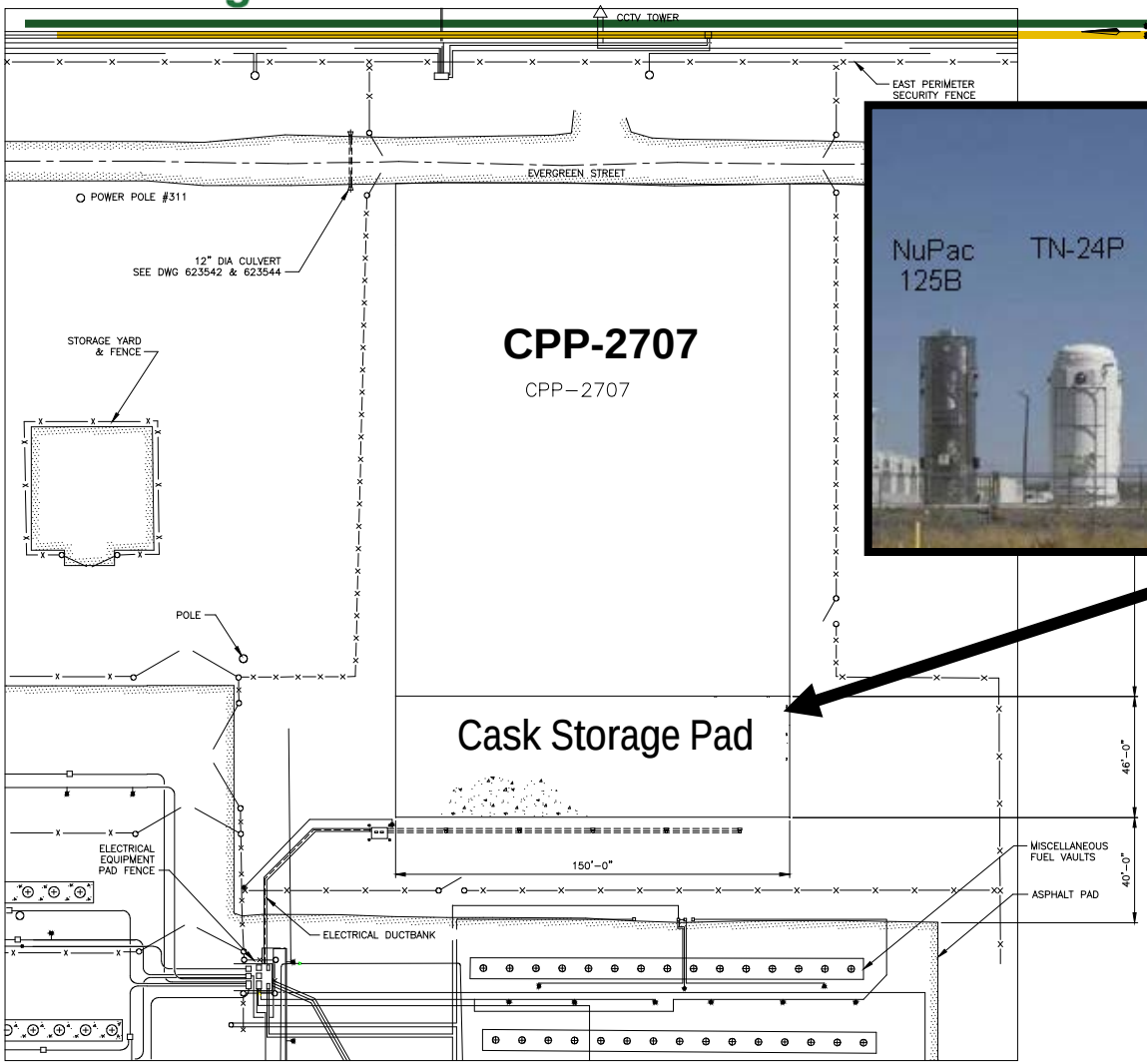
CPP-2707 Cask Storage



CPP-2707 PLAN VIEW

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CPP-2707 Cask Storage

Results Summary:

Pressure & Temperature Trending

Gas Sampling

- Frequency based on H2 and inspection history:
  - REA-2023 1 year.; NuPac 125B-2 1 yr.; VSC-17 3 yrs.; Others 5 yrs.
- H2 Increase observed in REA-2023, VSC-17 and TN-REG Casks
  - REA-2023 H2 leveled off at 1%
  - Others had No Significant H2 Accumulation
- Kr-85 present in TN-REG and TN-BRP indicating defective fuel

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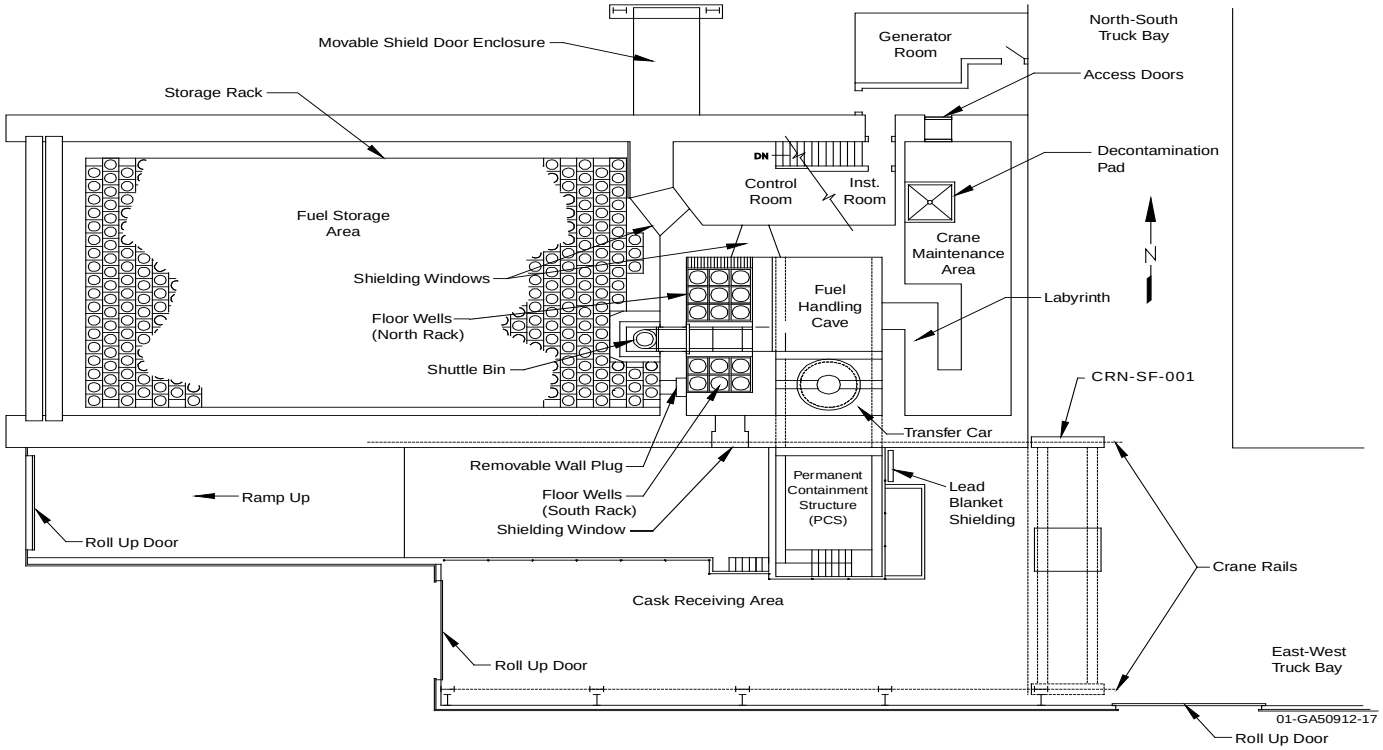
Irradiated Fuel Storage Facility (IFSF) (CPP-603)

- Shield walls enclose storage area, fuel handling cave, and crane maintenance area
- Carbon steel racks in the storage area and cave
- Carbon steel and Stainless Steel buckets and inserts contain Al-, Zr-, SS-clad fuels



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IFSF (CPP-603)

- Remote Camera Visual Inspection of Rack and Canister Surfaces and Open Ports – 4 yrs.
  - Result: Visual Inspection All Surfaces in Good Condition
- Corrosion Measurements of CS, Al, and SS Coupons – 2 yrs.
  - Corrosion Rate < 0.1 MPY since 1974 based on 2 unused CS Canisters

TSR-114 Monitoring Requirement

- Perform preventive maintenance on the IFSF roof – Annually
  - Results: No Water Ingress, Roof Coatings Good Condition

IFSF (CPP-603)

- Corrosion potential of rack and canister exteriors highest from January to March (dew point higher than rack temperature, 0-2000 hours)
- Corrosion potential low from March to December (dew point lower than rack temperature, 2000-7500 hours)
- Corrosion potential of canister interiors assumed to be similar to exteriors when fuel is dry