

# **Lead System Inspections**

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Meeting to Obtain Stakeholder Input on Potential  
Changes to Guidance for Renewal of Spent Fuel Dry  
Cask Storage System Licenses and Certificates of  
Compliance

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# Lead Canister/Cask Inspection Current Guidance

- Described in NUREG-1927 Appendix E Component-Specific Aging Management
- Ensure confinement function of the canister for the license renewal
- Demonstrate that canisters have not undergone unanticipated degradation
- Remote Visual Inspection of one or more canisters
- Interior of associated concrete important to safety (ITS) structures systems and components (SSC) such as overpack or horizontal storage module
- Expected to be performed before submittal of the license renewal application

# Lead Canister/Cask Inspection Observations from Past Inspections

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- Corrosion products on stainless steel canisters
- Accumulated atmospheric deposits
- Evidence of water intrusion
- Coating degradation
- Concrete aging
- Scope of inspection was not well defined
- Inspection methods not qualified or demonstrated
- Inspection systems and access restrictions limited the area of canister/cask that was inspected

# Lead Canister/Cask Inspection Shortfalls with Current Guidance

- Semi-qualitative assessment of condition does not provide quantitative information needed to determine if aging effects are present or assess the current condition of the ITS SSCs
- Multiple degradation modes based on materials location and age of the systems
- Changes in design, materials, and fabrication practices may influence aging of ITS SSCs
  - CoC amendments
  - Concrete is a locally variable product
  - Variations/changes to ITS SSCs fabrication
  - Repairs

# Current Considerations for Lead System Inspections

- Identify ITS SSCs within the scope of the lead system inspection
  - ITS SSCs function, location, and operating environment
  - Area of coverage for the ITS SSCs
  - Aging effects for the ITS SSCs
- Standards for inspections
  - Demonstrated methods
  - Qualified personnel, procedures, and equipment
  - Consensus codes and standards
- Operating experience and information obtained in the application of Aging Management Programs (AMPs) for ITS SSCs should be considered (e.g., external concrete aging, coating degradation, and indications of corrosion)

# Scope of the Inspection

- At least one system per site
  - Inspection of multiple systems may be necessary to capture variations in systems, designs, environments, loading, and aging effects
- SSCs locations and surfaces that may not be addressed in AMPs
  - Cask: Body, seals, lid, bolts and coatings
  - Canister: Body and welds
  - Overpack: coatings, seals, ventilation and canister support structures
  - Horizontal Storage Modules: interior and exterior concrete, canister support structure and coatings

# Inspection Methods

- Qualified inspection methods
  - Visual Inspection: VT-1, VT-3, EVT-1
  - Surface: Eddy current testing (ET)
  - Volumetric: Ultrasonic testing (UT)
- Consensus codes and standards
  - American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code
  - American Concrete Institute (ACI)
  - American Society for Nondestructive Testing (ASNT)
- Analysis methods for collected samples
  - ASTM International

# Aging Effects - Examples

- Bolted Cask (Coated Carbon Steel)
  - Coating degradation
  - Corrosion of the cask
  - Corrosion/cracking of bolts
- Canister (Welded Stainless Steel)
  - Localized corrosion (pitting, crevice, or intergranular)
  - Stress corrosion cracking
  - Accumulation of atmospheric deposits
- Overpack
  - Concrete spallation, cracking, leaching
  - Coating deterioration
  - Steel liner corrosion
- Horizontal Storage Module
  - Concrete spallation, cracking, leaching
  - Coating deterioration
  - Corrosion of the canister support structure

# Acceptance Criteria

- Predefined and based on the ITS function of the SSCs within the scope of the inspection
  - Consider aging effects specific to design, materials, location and the operating environment of the ITS SSCs
- Acceptance criteria should be based on and supported by consensus codes and standards
  - ASME B&PV Code Section XI
  - ACI 349.3R
- Storage system technical specifications

# Corrective Actions

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- Evaluate, repair, replace, and mitigation actions if acceptance criteria are not met
  - Supplemental inspections to determine the extent of condition
  - Entry into Corrective Action Program (CAP)
  - Incorporation of inspection results into applicable AMPs for other ITS SSCs

# Operational Experience

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- Relevant operational experience
  - Inspections on similar designs
  - Inspections of ITS SSCs materials in similar environments
  - Reactor operating experience
  - Information obtained from applying AMPs

# Acronyms

AMP: Aging management program

ACI: American Concrete Institute

ASNT: American Society for  
Nondestructive Testing

ASTM International: Formerly known as  
American Society for Testing and Materials

ASME B&PV code: American Society of  
Mechanical Engineers Boiler and Pressure  
Vessel code

ET: Eddy current testing

EVT-1: Enhanced visual testing-1  
(Boiling water reactor vessels and  
internals project, BWRVIP-03)

ITS: Important to safety

SSC: Structures systems and components

UT: Ultrasonic testing

VT-1: Visual Testing-1 (ASME B&PV code  
Section XI, Article IWA-2200)

VT-3: Visual Testing-3 (ASME B&PV code  
Section XI, Article IWA-2200)