Enclosure 4

Attachments to Westinghouse's Responses to the NRC's Request for Supplemental Information (RSIs) and Observations (OBSs) (Non-Proprietary)

(76 Pages)

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Revised Pages to FuelSolutions CoC Renewal Application (Non-Proprietary)

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Contents

Some FuelSolutions Storage System users may identify their ISFSI storage pad as ITS and may perform aging management inspections on a site specific basis.

2.2.2.8 ISFSI Security Equipment

The ISFSI security equipment (e.g., ISFSI security fences and gates, lighting, communications, and monitoring equipment) are not part of the FuelSolutions Storage System approved by the FuelSolutions Storage System CoC [2.6], and as such, are not described in detail in the FuelSolutions Storage System FSARs [2.3]. Two typical ISFSI storage pad layouts, which identify some ISFSI security features, are shown in Figures 1.4-1 and 1.4-2 of the FuelSolutions Storage System FSAR [2.3]. Existing plant programs and procedures ensure that the ISFSI security equipment requirements are met. Potential failure of the ISFSI security equipment would not prevent the FuelSolutions Storage System casks from performing their intended safety functions.

2.2.3 SSCs Within the Scope of CoC Renewal

The FuelSolutions SSC determined to be within the scope of renewal include are the W150 storage cask, the W100 transfer cask, and the W21 and W74 canisters. The W150 storage cask, the W100 transfer cask, and the W21 and W74 canisters satisfy Criteria 1 of the scoping evaluation process. Both the in-scope ITS and in-scope NITS subcomponents and parts of these in-scope FuelSolutions ~~The subcomponents of these in-scope~~ SSC and their intended safety functions are identified in Tables 2-4 through 2-7.

In determining the in-scope FuelSolutions NITS subcomponents and parts, it was noted that NUREG-2214 [2.2] Table 4-21 included aging management reviews for the FuelSolutions canister NITS subcomponents and parts. NUREG-2214 Tables 4-22 and 4-23 also included aging management reviews for most of the FuelSolutions storage cask and transfer cask NITS subcomponents and parts. The FuelSolutions storage cask and transfer cask NITS subcomponents and parts not included in NUREG-2214 Tables 4-22 and 4-23 were items such as O-rings, gaskets, vent screens, vent screen retainer plates, name plates and other associated NITS hardware which are easily accessible for inspection and replacement as necessary as part of a routine maintenance program.

Westinghouse used the above described approach of classifying most FuelSolutions NITS items as being in-scope in determining if aging deterioration or failure of a NITS item internal to a cask or canister could potentially adversely affect the performance of an ITS subcomponent or part safety function. It is conservative to conclude that most FuelSolutions NITS items are in-scope for the license renewal, and aging management reviews were performed for these NITS subcomponents and parts.

The Important to Safety and Safety Related FuelSolutions fuel transfer and auxiliary equipment listed in Table 2-2, along with the subcomponents identified in Table 2-8, are included within the scope of the CoC 1026 renewal.

The SNF assemblies, which are sealed and supported inside the W21 and W74 canisters (including any damaged W74 SNF assemblies in damaged fuel cans), are also determined to be within the scope of renewal. However, as noted in NUREG-1927 [2.1], fuel pellets are not

within the scope of renewal. The intended safety functions of the SNF assembly subcomponents are identified in Table 2-12.

The above identified FuelSolutions components and equipment are the ITS and safety related SSCs, ~~and~~along with the FuelSolutions ITS and NITS subcomponents and parts, within the scope of the CoC 1026 [2.6] renewal under 10 CFR Part 72, Subpart L.

2.2.4 SSC Not Within the Scope of CoC Renewal

As noted in Section 2.3.3 above the FuelSolutions storage cask and transfer cask NITS subcomponents and parts not included in NUREG-2214 Tables 4-22 and 4-23 were items such as O-rings, gaskets, vent screens, vent screen retainer plates, name plates and other associated NITS hardware which are easily accessible for inspection and replacement as necessary as part of a routine maintenance program. These types of FuelSolutions NITS subcomponents and parts do not meet scoping Criteria 2 as their failure does not prevent fulfillment of a function important to safety. These out of scope FuelSolutions cask NITS items are listed separately at the bottom of FuelSolutions Renewal Application Chapter 2 Tables 2-5 and 2-6 for the storage cask and transfer cask, respectively.

~~The~~ Other SSC that are not in the scope of renewal include certain fuel transfer and auxiliary equipment, ISFSI storage pad, ISFSI security equipment, and W100 and W150 instrumentation. These components are classified as NITS and do not meet scoping Criteria 2 as their failure does not prevent fulfillment of a function important to safety.

Fuel Transfer and Auxiliary Equipment

As listed in Table 2-3 below, certain fuel transfer and auxiliary equipment necessary for ISFSI operations (e.g., air-pallets, vertical transport trailer, horizontal transfer trailer, vacuum drying system, welding equipment, helium leak detector, etc.) are classified as NITS in Table 2.1-1 of the FuelSolutions Storage System FSAR [2.3]. These SSCs are not included as part of the FuelSolutions Storage System approved by the FuelSolutions Storage System CoC 1026 [2.6] under 10 CFR Part 72, Subpart L.

As discussed in Section 1.2 of the FuelSolutions Storage System FSAR [2.3], the FuelSolutions Storage System W150, W100, W21 and W74 components are designed to withstand potential failure of the Table 2-3 listed fuel transfer and auxiliary equipment. Failure of this equipment would not prevent the FuelSolutions Storage System components from fulfilling their intended safety functions. Therefore, the Table 2-3 fuel transfer and auxiliary equipment does not meet scoping Criteria 2 and is not in the scope of renewal. The actual fuel transfer and auxiliary equipment used at a given site is addressed by the General Licensee in the 10 CFR 72.212 Evaluation Report on a site-specific basis.

ISFSI Storage Pad

The FuelSolutions Storage System ISFSI storage pad is not part of the approved FuelSolutions Storage System CoC [2.6] under 10 CFR Part 72, Subpart L, and as such, is not described in detail in the FuelSolutions Storage System FSAR [2.3]. The ISFSI storage pad provides free-standing support of the FuelSolutions Storage System casks. The FuelSolutions Storage System

W150, W100, W21and W74 components are designed such that any potential failures of the ISFSI storage pad would not prevent them from fulfilling their intended safety functions. Therefore, the ISFSI storage pad does not meet scoping Criteria 2 and is not in the scope of renewal. The ISFSI Pad subcomponents are identified in Table 2-13.

Although not within the scope of the FuelSolutions Storage System CoC renewal, if required an aging management inspection of the ISFSI pad may be addressed on a site-specific basis by a General Licensee.

ISFSI Security Equipment

The ISFSI security equipment (e.g., ISFSI security fences and gates, lighting, communications, and monitoring equipment) are NITS components that are not part of the FuelSolutions Storage System approved by the FuelSolutions Storage System CoC 1026 [2.6] in accordance with 10 CFR Part 72, Subpart L. Failure of the ISFSI security equipment would not prevent fulfillment of a function that is important to safety.

Table 2-3 below lists the Structures, Systems and Components Not Within the Scope of the CoC 1026 Renewal.

3.1 Operating Experience Review

3.1.1 FuelSolutions Storage System Operating Experience

A total of seven FuelSolutions Storage System casks have been loaded with spent nuclear fuel and are currently in service at the Big Rock Point ISFSI site which is located in Michigan north of the town of Charlevoix, on the shore of Lake Michigan. The Big Rock Point W150 Dry Fuel Storage Casks with W74 Canisters were loaded in 2002 and 2003 and continue to be stored in accordance with Amendment 2 of the FuelSolutions Storage System CoC 1026.

3.1.2 User Operating Experience

A review of user operating experience for the FuelSolutions Storage System was performed to evaluate if there was any operating experience or inspection results that would impact the aging of the system. As of 2020, the FuelSolutions system is only in use at the Big Rock Point ISFSI located in Michigan. Therefore, the review only includes items at that site. This review found the following items:

- W150 Storage Cask Concrete and Grout Degradation
  - A few concrete "bug holes" [Ref 2.2, Table 6-3] and pits were found and repaired on the seven W150 storage casks.
  - Degraded grout in some cask seam locations was found and repaired.
  - No deterioration of cask coatings was identified in ~~annual~~ periodic inspections.
  - Concrete hairline cracks, which occurred during the initial cask loading time frame, near some of the W150 storage cask tie rod locations have not propagated.
  - Concrete handling damage, which occurred in a small area on one W150 storage cask was found and repaired during the canister loading campaign.
- W100 Transfer Cask
  - No deleterious coating degradation noted during ~~annual~~ periodic inspections.
  - No neutron shield tank leakage identified during ~~annual~~ periodic pressure test using air at approximately 5 psi.
  - Neutron shield tank relief valve found to be correctly set between 40 and 45 psig during ~~annual~~ periodic inspections.
- W74 Canister
  - No W74 canister degradation found during each five year borescope visual inspection of W150 Storage Cask #7 interior.

- Impact Limiters
  - Some deteriorated paint on impact limiter steel sheeting was noted during ~~annual~~ periodic inspections. No degradation of the steel sheeting encasing the impact limiter rigid polyurethane foam was noted.
- J-Skid and Other Auxiliary Equipment
  - Operable components have been exercised ~~annually~~ periodically with no degradation identified.

The conditions noted are proposed to be monitored by the aging management programs described in Appendix A for the applicable components. The types of degradation previously seen were utilized in determining the criteria for future inspections. Trending of these conditions and corrective actions, as necessary, are also part of the proposed aging management programs. The reviewed operating experience evaluations covered the in scope subcomponents. Out of scope components listed in Chapter 2 were not evaluated for this renewal application. In addition, relevant operating experience was gathered from the inspections of other dry fuel storage systems as described in Appendix C.

The aging management programs in Appendix A were developed considering this operating experience.

3.1.3 User Exemption Requests

No exemption requests have been identified at the time of writing this renewal application that have implications regarding aging management involving the design basis requirements for the structures, systems and components (SSCs) at the Big Rock Point ISFSI. If exemption requests are made in the future, they should be evaluated for impact on aging management.

3.2 Aging Management Review Methodology

The aging effects that may adversely affect the ability of SSC to perform intended safety functions during the extended period of operations have been assessed in this AMR. This AMR utilizes the recommended methodology provided in NUREG-1927 [2.1]. The aging management review process involves three major steps. This AMR utilizes the decision flowchart shown on Figure 3-1. The major steps are outlined as follows:

- Identify materials and service environments
- Identify aging mechanism or effects requiring management
- Identify the TLAAs or AMPs to manage the aging effects

FuelSolutions Storage System during the renewed license period. The information gained from an AMP will provide reasonable assurance that the subcomponent maintains it's function.

3.3 Aging Management Review Results

3.3.1 Aging Management Review Results – W21 and W74 Canisters

Table 2-4a and Table 2-4b summarize the results of the aging management review for the W21 and W74 canister subcomponents determined to be in the scope of the license renewal.

Additional description of the W21 and W74 canister subcomponents is provided in Section 3.3.1.1, while Sections 3.3.1.2 and 3.3.1.3 present the materials and environments for the specified subcomponents. The aging effects requiring management and the proposed activities required to manage these effects are discussed in Sections 3.3.1.4 and 3.3.1.5, respectively.

3.3.1.1 Description of W21 and W74 Canister Subcomponents

W21 and W74 Canisters

The W21 and W74 canisters are welded cylindrical structures with flat ends that provide confinement of the spent nuclear fuel during storage operations. The confinement boundary, comprised of the bottom closure plate, the shell, the top inner closure plate, vent and drain port tops or adapters, port covers, and associated welds, is constructed entirely of stainless steel. The W21 and W74 top outer closure plate, with welded port covers, is a circular plate edge-welded to the canister shell providing a redundant welded closure. Access to the canister cavity for the purposes of water and moisture removal and subsequent backfilling with a high purity helium is achieved via the vent and drain ports. Additional details regarding the W21 and W74 canister descriptions are included in sections 2.2.2.2 and 2.2.2.3 of this ~~report~~renewal application.

W21 and W74 Canister Fuel Baskets

The FuelSolutions W21 canister basket assemblies consist of a series of spacer plates, support rod assemblies, and poisoned guide tube assemblies. The guide tube assemblies provide lateral support for the fuel assemblies and maintain the position of the neutron absorbing material. The spacer plates maintain the relative spacing between guide tubes and provide structural support in the lateral direction for the basket assembly and SNF payload. The spacer plates are positioned and supported longitudinally by eight support rod assemblies.

FuelSolutions W74 canister includes an upper and lower basket assembly which are similar in construction. Each assembly consists of a series of spacer plates, support tube assemblies, and guide tube assemblies. The upper basket assembly includes an engagement spacer plate which supports the SNF assemblies in the upper basket assembly for normal vertical transfer and storage. The guide tube assemblies provide lateral support for the SNF assemblies and maintain the position of the neutron absorbing material. The spacer plates maintain the relative spacing between guide tubes and provide structural support for the basket assembly and SNF assemblies in the lateral direction. The spacer plates are positioned and supported longitudinally by four support tube assemblies.

3.3.1.5 Aging Management Activities (W21 and W74 Canisters)

Based on the aging management review of the W21 and W74 canister subcomponents documented in Tables 2-4a and 2-4b, including the basket assembly subcomponents and the W74 damaged fuel can subcomponents, an AMP is required for the aging management activities of the W21 and W74 canisters and a TLAA is required specifically for the effects of radiation on the neutron absorbers. These aging management activities are discussed in detail in Sections 3.4 and 3.5.

3.3.2 Aging Management Review Results – W150 Storage Cask

Table 2-5 summarizes the results of the aging management review for the W150 storage cask subcomponents determined to be in the scope of the license renewal.

Additional description of the W150 storage cask subcomponents is provided in Section 3.3.2.1, while Sections 3.3.2.2 and 3.3.2.3 present the materials and environments for the specified subcomponents. The aging effects requiring management and the proposed activities required to manage these effects are discussed in Sections 3.3.2.4 and 3.3.2.5, respectively.

3.3.2.1 Description of W150 Storage Cask Subcomponents

The W150 storage cask provides structural support, shielding, and supports natural circulation cooling for the W21 and W74 canisters. The W150 storage cask is ventilated by internal air flow paths which allow the decay heat to be removed by natural circulation around the metal W21 and W74 canister wall. Natural convection air enters the system horizontally through the four inlet vents and channels located at the bottom of the storage cask, converges vertically into the central inlet plenum, flows upward into the storage cask cavity, flows radially outward under the canister and through/between the canister support tubes, flows upward through the dual annuli formed by the cask liner, thermal shield, and canister shell, and finally flows outward to ambient through the outlet vents at the top of the cask. The internal cavity of the W150 storage cask has a coated steel liner and bottom plate. The steel and concrete walls of the W150 storage cask are designed to minimize side surface radiation dose rates. The steel liner is coated to promote radiant heat dissipation and to minimize corrosion. An aluminum thermal shield is located between the canister exterior wall and the W150 storage cask interior wall. The W150 storage cask lid is fabricated from steel and concrete and provides additional gamma attenuation in the upward direction, reducing both direct radiation and skyshine. The W150 storage cask top cover is bolted in place and protects the W21 and W74 canisters from the environment and postulated tornado missiles. A more detailed description is included in paragraph 2.2.2.4 of this ~~report~~renewal application.

3.3.2.2 W150 Storage Cask Materials

The W150 storage cask is fabricated from three reinforced concrete segments with a carbon steel inner liner and bottom plate. The three segments are held together with eight alloy steel tie rods, nuts and washers, with grout used between the keyed concrete segment joints to form a weather tight vertical cylinder. The W150 storage cask reinforced concrete is in contact with the carbon steel inner liner and bottom plate. External concrete surface degradation is mitigated by using a weather-resistant protective coating.

3.3.2.4 Aging Effects Requiring Management (W150 Storage Cask)

Based on a review of the W150 storage cask materials of construction and the environments experienced during the period of extended storage at the ISFSI sites the main aging effects requiring management are loss of material due to corrosion, loss of fracture toughness (due to radiation impacts) for the metal components, and concrete aging issues caused by freeze thaw cycles, alkali-silica reaction, and/or calcium hydroxide leaching.

3.3.2.5 Aging Management Activities (W150 Storage Cask)

Based on the aging management review of the W150 storage cask subcomponents documented in Table 2-5, it has been determined that the aging management activities required for the W150 storage cask are the Reinforced Concrete Structures AMP (for the W150 storage cask concrete) and the Monitoring of Metallic Surfaces AMP (for W150 metallic materials). These aging management activities are discussed in the AMPs identified in Section ~~3.5~~3.4. For those components potentially impacted by radiation, the radiation impacts have been evaluated and determined that no additional aging management activities beyond those in the W150 storage cask AMPs are needed. A W150 TLAA is not required since no W150 analysis was incorporated or referenced in the initial W150 design basis.

3.3.3 Aging Management Review Results – Fuel Assembly

Table 2-7 summarizes the results of the aging management review for the Fuel Assembly subcomponents determined to be in the scope of the license renewal.

Additional description of the fuel assembly subcomponents is provided in Section 3.3.3.1, while Sections 3.3.3.2 and 3.3.3.3 present the materials and environments for the specified subcomponents. The aging effects requiring management and the proposed activities required to manage these effects are discussed in Sections 3.3.3.4 and 3.3.3.5, respectively.

3.3.3.1 Description of Fuel Assembly

Fuel contained within the W21 or W74 canister consists of up to 21 PWR or 64 BWR fuel assemblies respectively. Maximum heat loads, and burnups times, along with required cooling times for the subject canister is addressed in the respective Technical Specification. This renewal application evaluates the bounding information as necessary.

Fuel rod cladding provides the primary confinement barrier, while the fuel assembly maintains the axial distribution of the radiological source and its position within the fuel basket. As noted in NUREG-2214 [2.2] fuel assembly hardware includes guide tubes, spacer grids, and lower and upper end fittings. The guide tubes may be fabricated using from zirconium-based alloys. The other components are usually fabricated using various nickel alloys and stainless steels. In the helium environment these components are considered to not be subject to credible degradation (creep, fatigue, hydriding, general corrosion, stress corrosion cracking, and radiation embrittlement) and thus, aging management during the 60-year timeframe is not required.

3.3.4.2 W100 Transfer Cask Materials

The W100 transfer cask structure, top and bottom covers, and lifting trunnions are fabricated from stainless steel. Other materials included in the W100 transfer cask design are lead (for gamma shielding), RX-277 or NS-3 solid neutron shielding (for the transfer cask covers), alloy steels for bolting, and ethylene propylene elastomer (for the bottom cover seals). The solid neutron shielding and lead shielding materials are completely enclosed, and therefore there are no significant galvanic or chemical reactions between these materials and the air or borated water. As identified in the FuelSolutions Storage System FSAR [2.3], the neutron shield jacket is coated with a high emissivity (> .875), low absorptivity < .25), temperature resistant (>325 degrees f) coating. This coating enhances radiation heat transfer from the W100 transfer cask while minimizing the effects of insolation.

The material of each W100 transfer cask subcomponent is identified in Table 2-6.

3.3.4.3 W100 Transfer Cask Environments

The exterior of the W100 transfer cask is exposed to water or borated water (PWR) during fuel loading (while the W100 transfer cask was in a spent fuel pool), and to demineralized water in the annulus. Following fuel loading of the W21 and W74 canisters, the W100 transfer cask is removed from the spent fuel pool.

The W100 transfer cask is exposed to either a sheltered environment, if stack-up is performed in the building, or an air-outdoor environment if stack-up is performed outside. The relatively brief exposure of the W100 transfer cask to borated and demineralized water while in the spent fuel pool and the outside environment during transfer and loading operations (if applicable), does not significantly contribute to the aging of the W100 transfer cask during the renewal period. It is the prolonged or frequently recurring exposure to environmental conditions and stresses that must be evaluated for aging effects, such as those encountered during idle storage of the cask.

The environment to which the W100 transfer cask is exposed between W21 and W74 canister loading campaigns may be the sheltered atmosphere within a building. To be conservative and bound sites which store the W100 transfer cask outside, the W100 transfer cask storage environment is considered to be ambient air.

3.3.4.4 Aging Effects Requiring Management for W100 Transfer Cask

Based on a review of the W100 transfer cask materials of construction and the environments experienced during the period of extended storage, the main aging effects requiring management ~~is~~ are loss of material due to corrosion and decreased effectiveness of the neutron shielding material in the W100 transfer cask covers.

3.3.4.5 Aging Management Activities for W100 Transfer Cask

Based on the aging management review of the W100 transfer cask subcomponents documented in Table 2-6, the aging management activities required for the W100 transfer cask are an AMP for the W100 transfer cask, and a TLAA for W100 transfer cask fatigue.

The solid neutron shielding material used in the W100 transfer cask covers is in an enclosed environment and while no exterior damage or change in the properties of the material is expected to occur over the service life of the W100 transfer cask, to verify the continued effectiveness of the RX-277 or NS-3 solid neutron shielding material a radiological surveillance inspection of the covers is included in the W100 Transfer Cask AMP listed in Section 3.4 and further described in Appendix A of this renewal application. ~~Therefore, no AMP or TLAA is required.~~

3.3.5 Aging Management Review Results – Fuel Transfer/Auxiliary Equipment

Table 2-8 summarizes the results of the aging management review for the fuel transfer and auxiliary equipment and subcomponents identified in the FuelSolutions Storage System FSAR [2.3] and determined to be within the scope of the CoC 1026 renewal.

Additional description of the fuel transfer and auxiliary equipment is provided in Section 3.3.5.1, while Sections 3.3.5.2 and 3.3.5.3 present the materials and environments. The aging effects requiring management and the proposed activities required to manage these effects are discussed in Sections 3.3.5.4 and 3.3.5.5, respectively.

3.3.5.1 Description of Fuel Transfer and Auxiliary Equipment

The in-scope FuelSolutions fuel transfer and auxiliary equipment necessary for ISFSI operations and spent fuel handling includes the cask lifting yoke, canister vertical lift fixture, cask cavity axial spacer, shielded docking collar, cask restraints, empty canister lift fixture, the standard lifting slings used inside the plant facility, and the storage cask impact limiter. The actual fuel transfer and auxiliary equipment used at a given site is identified and addressed by the General Licensee in the 10 CFR 72.212 Evaluation Report on a site-specific basis.

The cask lifting yoke assembly includes a steel A-frame and two lifting arms which interface with the W100 transfer cask upper trunnions. Shackles and low stretch slings are used to secure the lifting yoke to the crane hook. The canister vertical lift fixture is a steel frame which is slung below the cask lifting yoke A-frame and attaches to the W21 or W74 canister, that is used to lift or lower the canister into and out of the W100 transfer cask.

The cask cavity axial spacer is a circular steel frame used in the bottom end of the W100 transfer cask when a short canister is placed inside the cask, to take up the axial space in the cask cavity and provide positive support for the canister. The cask spacer is mounted to the inside of the transfer cask bottom cover to simplify removal during horizontal transfer operations.

A shielded docking collar is a large shielded ring placed on the top end of a W150 storage cask cavity for canister transfer operations to or from the storage cask. The inside diameter of a docking collar allows close fit up with a transfer cask or a transportation cask, while allowing the transfer cask or transportation cask to dock directly to the storage cask upper shield ring. Cask restraints attach the transfer cask lower trunnions or transportation cask upper trunnions to the shielded docking collar on both sides of the cask. A separate set of cask restraints are also used to secure the transfer cask to the transportation cask.

FuelSolutions Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
3 Parameters Monitored / Inspected	The parameters monitored and/or inspected under this AMP include: • visual inspections to look for evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. • The size and location of localized corrosion or stress corrosion cracks • The inspections also look for the appearance and location of deposits on the canister surfaces.
4 Detection of Aging Effects	Visual inspection of the canister surface is to be performed per ASME Code Section XI, Article IWA-2200 for VT-3 examinations utilizing a video camera, fiber-optic scope or other remote inspection device for the accessible areas of the canister surface since direct visual examination may not be possible due to neutron and gamma radiation fields near canister surfaces within the storage cask. Additional assessments are to be performed as necessary for suspected areas of localized corrosion and SCC. VT-1 visual examinations are performed per acceptance criteria when indicated by the assessment of the VT-3 results. Indications of corrosion within 2 inches of a weld are to receive an augmented surface examination for the presence of cracking. Volumetric examination consistent with the requirements of ASME Code Section XI, IWB-2500, for category B-J components may also be utilized to assess the presence of cracking. Inspection of selected areas on the canister may be upgraded to the VT-1 standard. The inspection is to be performed on a minimum of one canister at each ISFSI based on the following criteria: • EPRI Susceptibility Criteria {Ref: Technical Report 3002005371} • Age of the Canister • Canister loaded with Lowest Heat Load • Canisters with the greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and SCC • Where applicable, canister with previously identified manufacturing deviations which may affect the surface. Inspections are to be performed by qualified individual(s) every 5 years ~~(+/- 25%)~~ starting with the first inspection performed within either the later of one (1) year ~~of~~ after the initial canister's 20th year loading anniversary or within one year ~~from~~ after the issuance of first renewal of the CoC. If possible, examinations should occur on the same canister to support trending.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Inspection records, including photos and /or videos, are to be retained for comparison in subsequent

FuelSolutions Reinforced Concrete Structures AMP

(~~4~~ 5 pages)

Element	Description
1 Scope of Program	The AMP addresses reinforced concrete structures such as the concrete portions of the W150 Storage Cask. The associated SSCs include the concrete shell, shear key, and reinforcing steel in air-outdoor or sheltered environments. The following aging effects are addressed in this program: • Cracking or loss of material (spalling, scaling) due to freeze-thaw degradation • Cracking, loss of strength, and loss of material (spalling, scaling) due to aggressive chemical attack • Cracking, and loss of strength due to reaction with aggregates • Loss of material (spalling, scaling) due to salt scaling • Loss of strength, increase in porosity and permeability and reduction of concrete pH (reducing corrosion resistance of steel embedments) due to leaching of calcium hydroxide • Cracking, loss of strength, loss of material (spalling, scaling), and loss of concrete/steel bond due to corrosion for reinforcing steel. Although the ISFSI Storage Pad is not considered Important to Safety, as noted in FuelSolutions Storage System FSAR Section 1.2, the pad should be inspected as may be required elsewhere.
2 Preventive Actions	Condition monitoring is utilized to manage aging effects including continuance of inspections of air inlet/outlet vents to confirm they are not blocked which also ensures design temperature limits are not exceeded and thermal dehydration of the concrete remains noncredible during the period of extended operation. As the storage cask reinforced concrete is designed and analyzed in accordance with the applicable provisions of ACI-349 and constructed using standard commercial practices, in accordance with the applicable provisions of ACI-318, no additional preventive actions are required.
3 Parameters Monitored / Inspected	The accessible and exposed concrete surfaces are visually examined for indications of surface deterioration. The parameters monitored or inspected quantify the following aging effects: • Cracking • loss of material (spalling, scaling) • increased porosity/permeability Degradation could affect the ability of the concrete to provide radiation shielding, to provide a path for heat transfer and to provide tornado missile shielding. The inlet and outlet vents are also monitored by visual inspection to ensure they are not obstructed. For inaccessible areas, an inspection using a video camera, fiber-optic scope or other remote inspection equipment via existing access points to determine if there

FuelSolutions Reinforced Concrete Structures AMP

(~~4~~5 pages)

Element	Description
	is any evidence of concrete degradation. The parameters evaluated consider any surface geometries that may identify water ponding which potentially increases the rate of degradation. The accessible internal concrete surfaces of the storage cask are inspected for indications of degradation. These indications may impact the long-term ability of the storage cask to meet its intended functions.
4 Detection of Aging Effects	To manage and verify the shielding performance of the storage cask concrete during the period of extended operation, ~~The~~ the AMP includes a visual inspection of the readily accessible exterior surfaces of the storage cask to detect if there are any aging effects. The visual inspection shall identify cracking, loss of material (spalling, scaling), increased porosity/permeability, staining or other ~~survey can identify staining or~~ degradation-related activity and the degree of damage. This visual inspection ~~confirms~~ identifies the current exterior condition of the storage cask and ~~can~~ shall identify the extent and cause of any aging effects noted. This visual inspection uses the inspection evaluation and acceptance criteria of ACI-349.3R-02 (ACI, 2010) and is conducted ~~annually~~at least once every five (5) years on each storage cask in operation during the period of extended storage by ~~an individual~~ personnel meeting the qualification requirements in Chapter 7 of ACI-349.3R-02 (ACI, 2010). A visual inspection of the lower vent interior concrete areas ~~readily accessible areas~~ of ~~the~~ one storage cask ~~annular space and interior areas of the vents~~ shall be performed using a using a video camera, fiber-optic scope or other remote inspection equipment. This visual inspection shall meet the requirements in accordance with the acceptance criteria in ACI 349.3R-02 (ACI, 2010) and be performed by personnel meeting the qualification requirements in Chapter 7 of ACI 349.3R-02 (ACI, 2010) at least once every five (5) years. Note: As the interior of the storage cask cavity and upper vents have a steel lining~~utilizes a steel liner~~, the Metallic Surfaces AMP addresses these metallic portions of the storage cask. ~~In addition to visual inspections, radiological surveys of the storage cask are performed to verify compliance with 10 CFR 72.104. Cask surface dose rates are monitored per FuelSolutions STORAGE SYSTEM Technical Specification 5.3.5, Cask Surface Dose Rate Evaluation Program. The results of dose rate surveys are also reviewed[4] by NRC Region III inspectors.~~ Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results for the inspection will be documented, including descriptions of observed aging effects and supporting sketches, photographs or video.

[4] ~~NRC Inspection Report 07200043/2018001; 05000155/2018001 Big Rock Point Independent Spent Fuel Storage Installation ML18330A231 dated 11/26/2018.~~

FuelSolutions Reinforced Concrete Structures AMP

(~~4~~ 5 pages)

Element	Description
	The internal concrete inspection shall be performed on one of the storage casks at each ISFSI at a frequency of 5 years ~~(+/- 25%)~~. The first inspection should occur within 1 year ~~of~~ after the 20th anniversary of initial storage cask loading at the site or within 1 year ~~of~~ after the issuance of the renewed license, whichever is later. The inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Methods are commensurate with consensus defect evaluation guides and standards. The inspections and surveillances described for reinforced concrete are performed periodically in order to identify areas of degradation. The results will be evaluated by a qualified individual, and areas of degradation not meeting established criteria will be documented in the site's corrective action program for resolution or detailed evaluation. Inspection records, including photos and /or videos, are to be retained for comparison in subsequent examinations. The results from the visual inspections will be compared against previous inspections in order to trend progression of identified aging effects over time.
6 Acceptance Criteria	American Concrete Institute Standard 349.3R-02 includes quantitative three-tier evaluation and acceptance criteria for visual inspections of concrete surfaces as follows: • Tier 1 acceptance without further evaluation • Tier 2 acceptance after review • Tier 3 acceptance requiring further evaluation Acceptance signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform its design basis function. Degradations or conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's corrective action program for evaluation and resolution. The loss of material due to age-related degradation will be evaluated by ~~a~~ qualified personnel in accordance with ACI 349.3R-02. A technical basis will be provided for any deviation from ACI 349.3R-02 acceptance criteria.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's corrective action program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify

FuelSolutions Reinforced Concrete Structures AMP

(~~4~~ 5 pages)

Element	Description
	any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.
10 Operating Experience	Previous operating experience for the W150 Storage Cask indicates very minimal degradation detected to date, mostly limited to concrete “bug hole” and grout degradation. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP. A renewal application pre-submittal inspection was performed on the FuelSolutions storage cask at Big Rock Point in July 23, 2019[5]. Three separate tasks were completed consisting of a video inspection of the accessible area in the annulus between the cask and canister; a visual inspection of the cask interior and visual inspection of the cask storage pad. A representative canister and storage cask were selected by Entergy based on increased susceptibility for moisture intrusion and corrosion. Heat loads at the time of loading the canisters at Big Rock Point were within 0.5 kW of each other, and all storage casks were placed into service within months of each other (as noted, between November 2002 and May 2003). The inspection revealed some minor observations; however, no structural deficiencies were identified and all parts continue to perform their design function. NRC Region III Inspectors[6] reviewed the previous five-year cask inspection documentation for Big Rock Point storage cask number 7 that included both pictures and video of the interior of the cask and did not identify any findings of significance.

[5] Report 4T002-RPT-001, Rev 0 “FuelSolutions Renewal Application Pre-Submittal Inspection,” August 29, 2019

[6] Errata to Big Rock Point Independent Spent Fuel Storage Installation - Inspection Reports 07200043-12-001 and 05000155-12-007 (ADAMS Accession ML13071A379) dated 03/11/13.

FuelSolutions Reinforced Concrete Structures AMP

(~~4~~ 5 pages)

Element	Description
	As storage cask inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

FuelSolutions Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
	The internal inspection shall be performed on one storage cask at a frequency of 5 years ~~(+/- 25%).)~~ starting with the first inspection within the later of either one (1) year ~~of~~ after the initial canister's 20th year loading anniversary or within one year ~~from~~ after the issuance of first renewal of the CoC. The site may consider using the storage cask that contains the canister being used for the Welded Stainless Steel Canister AMP to consolidate efforts. Data from inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans and procedures are used to: • establish a baseline before or at the beginning of the period of extended operation • track trending of parameters or effects not corrected following a previous inspection, including ▪ locations and size of any areas of corrosion, wear or cracking ▪ disposition of components with identified aging effects and the results of supplemental inspections
6 Acceptance Criteria	The acceptance criteria for the visual inspections are: • no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion • no indications of loose bolts or hardware, displaced parts • no degradation (e.g., blisters, cracking, flaking, delamination) of coatings on metallic surfaces indicative of base metal corrosion. If evidence of corrosion or wear is identified, then the severity of the degradation must be determined using approved site-specific procedures. These may include additional visual, surface or volumetric NDE methods to determine the loss of material.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Actions Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g., increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the

FuelSolutions W100 Transfer Cask AMP

(3 pages)

Element	Description
1 Scope of Program	The program covers the subcomponents of the W100 Transfer Cask to ensure that aging effects do not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The effected SSCs include the trunnion retainers and sleeves, bolts for the top cover, bottom cover, and ram access cover, and the pressure relief device in the environments of air-indoor/outdoor and demineralized water. This program manages loss of material due to general corrosion, galvanic corrosion, pitting and crevice corrosion and wear to ensure that this aging effect does not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The Transfer Cask AMP includes inspections of trunnion retainers and sleeves for loss of material and wear, guide rails for wear, cover bolts and pressure relief devices for corrosion, cask covers for neutron shielding deterioration involving boron depletion, and neutron shield jacket for coating degradation.
2 Preventive Actions	The Transfer Cask AMP utilizes condition monitoring to detect degradation and ensure that the equipment maintains its intended function through the extended storage period. No preventative actions are included as part of this AMP.
3 Parameters Monitored / Inspected	The Transfer Cask AMP inspects for visual evidence of degradation of accessible surfaces, and deterioration of the neutron shielding material performance.
4 Detection of Aging Effects	The Transfer Cask AMP manages loss of material due to corrosion, predominately for stainless steel, steel, and brass components, ~~and~~ degradation of the coating on the neutron shield jacket, and deterioration of the neutron shielding material performance. Inspection shall be performed at a minimum once a year while in use. If the Transfer Cask is not used, a pre-use inspection is appropriate for the Transfer Cask. When the Transfer Cask is not in use, periodic inspections are not needed. Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible cask surfaces, including the cask exterior, cask interior cavity, ~~lid~~ top cover surfaces, and the cask bottom (during lifting or down ending). A radiological surveillance inspection of the RX-277 or NS-3 solid neutron shielding material performance in the top, bottom, and ram access covers of a loaded transfer cask shall be performed once per loaded fuel canister transfer campaign using calibrated neutron detection equipment and qualified radiation protection program personnel.

FuelSolutions W100 Transfer Cask AMP

(3 pages)

Element	Description
	Data from these ~~examination~~inspections, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented.
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans/procedures are used to: • establish a baseline before the use of the transfer cask in the first loading campaign in the period of extended operation • track trending of parameters or effects not corrected following a previous inspection ➢ the locations, size, and depth of any areas of corrosion ➢ the disposition of components with identified aging effects and the results of supplemental inspections ➢ the deterioration of the solid neutron shielding material performance
6 Acceptance Criteria	For accessible surfaces, including trunnions, acceptance criteria are no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, crevice corrosion, and wear scratches/gouges. If evidence of corrosion, wear, or coating degradation are identified, then the severity of the degradation of the base metal must be determined using approved site-specific procedures. These may include additional visual, surface, or volumetric NDE methods to determine the loss of material. For inaccessible internal surfaces, the acceptance criteria are no evidence of leakage from the neutron shield jacket or loss of wall thickness beyond a predetermined limit established by system-specific design standards or industry codes and standards. Coating acceptance criteria are no degradation or interruptions (e.g., chipping/scratches/flacking) of the coated surface. For acceptance of the RX-277 or NS-3 solid neutron shielding in the top, ~~and~~ bottom, and ram access covers of a loaded transfer cask, the top, ~~and~~ bottom, and ram access cover neutron dose rates shall not exceed the bounding neutron dose rates in FSAR WSNF-220 Table 5.1-2.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Action Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are

APPENDIX C: SYSTEM INSPECTIONS

Introduction

It should be noted that starting in 2012, approximately 10 years after being placed in service, inspections of the FuelSolutions Storage System storage cask exterior and cask interior started being performed on ~~an annual and five year~~a periodic basis~~, respectively,~~ to assure conformance within system parameters.

~~Annual~~ Periodic inspections of the exterior surfaces have been performed on each of the FuelSolutions W150 Storage Cask in service. In addition, an interior inspection of the FuelSolutions W150 storage Cask #7 at the Big Rock Point ISFSI as part of a five (5) year schedule since 2012 with no major degradation detected.

~~Annual~~ Periodic inspections of the FuelSolutions W100 Transfer Cask have also been performed. The inspections include coatings and accessible welds. The W100 Transfer Cask inspection have been performed since 2013 with no degradation detected.

Pre-application Inspection

In addition to the in-service inspections noted above, an extensive pre-submittal inspection of the FuelSolutions W74 Canister, a FuelSolutions Storage Cask W150 was performed in 2019 to gather information to support development of the renewal application and the supporting AMPs included in this application. As the seven (7) storage casks were placed in service within several months of each other and the canister heat loads at the time of the loading were within 0.5 kw of each other and, the storage cask selected for inspection is considered representative of the all the fuel storage casks in service. Although the ISFSI Storage Pad is not considered to be an in-scope item for the purpose of this CoC renewal application, it was prudently included in the inspection none the less.

The inspection consisted of three separate tasks. A video inspection of the access area in the annulus between the storage cask and the canister, a visual inspection of the exterior of the cask and a visual inspection of the cask storage pad itself. The canister selected was TSC-LO-005-N. The storage cask inspected was W150-610-NMC. As noted in the inspection report[10], "The videoscope was fed through each of the top vents to inspect the exterior of the canister, the interior of the cask shield plate and the support and guide rails. The videoscope was fed through the bottom vents to observe the bottom plate and support tubes. Videos were recorded during the inspection. Any indications observed were investigated to determine the extent of the indication."

The inspection of the FuelSolutions Storage Cask exterior concrete "…revealed only some minor local passive cracks. The cracks were less 0.4 mm in width. There were no observed instances of damage, scaling or spalling. There were no indications of leaching or chemical attacks. There were no indications of exposed reinforcing bar or reinforcing corrosion. Some of the grout placed in the joints between cask sections has been replaced. This grout is cosmetic only and is replaced as necessary." Results of the inspection of the FuelSolutions Storage Cask interior note "…there was

[10] Report 4T002-RPT-001, Rev 0 "FuelSolutions Renewal Application Pre-Submittal Inspection," August 29, 2019

some debris, dirt and water marks in the vents and on the shield plate inside the W150 cask. No structural deficiencies were observed. The cask continues to perform its design function."

Inspection of the FuelSolutions W74 canister exterior surface revealed *"Some dirt and water marks were observed on the cask surface. Several indications were observed. Two indications had a depth of 0.003" and one had a depth of 0.04", 0.535" long. These indications on a 5/8" thick shell result in negligible loss of section and are therefore considered to be minor in nature. All indications appear to be from the fabrication of the canister or during cask loading operations. There was no indication of cracks, unanticipated degradation or corrosion."*

As noted above, although the ISFSI pad is not considered to be in scope for this CoC renewal application, the results did reveal *"There were several observed locations of damage to the top surface of the pad. In addition, there were surface cracks throughout the pad. None of the observed damage or cracks affect the ability of the pad to perform its design function."*

In total, the pre-application inspection of the W150 Storage Cask and the exterior of the W74 Canister state there *"are no observed deficiencies or unanticipated degradation on the exterior of the cask."*

As noted in the pre-application inspection report: *"Inspection of the FuelSolutions W100 Transfer cask was not included in this inspection. In accordance with CCA-000190 the utilities most recent Transfer Cask inspections were used in lieu of performing the inspection. Inspections in accordance with Big Rock Point Procedure T365-37 performed in 2013 thru 2018 were reviewed. The inspections included the surface coatings, accessible welds, cover alignment, bolts and impact limiters. There were no identified deficiencies in the inspected components."*

Baseline Inspections

Baseline inspections confirm that the results of pre-application inspections are bounding of the site and verify the adequacy of the AMPs. Considering the renewal application pre-submittal inspection was performed at the site (Big Rock Point) currently using the FuelSolution Storage System, the AMP baseline inspections to be performed upon entering the period of extended operation can assess the condition of SSCs to confirm the results of the pre-application inspections conducted and serve to verify the technical justifications provided.

Baseline inspections are to be performed on the in-scope SSC at the ISFSI site at the time the system enters the period of extended storage (i.e., 20 years after the first FuelSolutions Storage System was placed in service). The baseline inspection meets the criteria defined in the AMPs in Appendix A. The first (baseline) inspection should occur within one year ~~of~~ after the 20th anniversary of the initial storage cask loading at the site or within one year ~~of~~ after the issuance of the renewed license, whichever is later. Subsequent inspections will occur on a 5 year frequency ~~(+/- 25%)~~ starting from the baseline date. This schedule applies to the canister external inspection and the storage cask internal inspection.

For the storage cask external inspections, the first (baseline) inspection should occur within one year ~~of~~ after the 20th anniversary of the initial overpack loading at the site or within one year ~~of~~ after the issuance of the renewed license, whichever is later. Future inspections will occur with a ~~+~~5

year frequency ~~(+/- 25%)~~ starting from the baseline date. Other AMP inspections are pre-use type inspections for which the baseline inspection will occur before the first use of the applicable component once it has been in service more than 20 years. Note that the W21 Canister High-Burnup Fuel Monitoring and Assessment AMP does not have an inspection component and the schedule is based on the demonstration project as described in the AMP in Appendix A.

Table 9.A.1-2 FuelSolutions Reinforced Concrete Structures AMP

(4 pages)

Element	Description
1 Scope of Program	The AMP addresses reinforced concrete structures such as the concrete portions of the W150 Storage Cask. The associated SSCs include the concrete shell, shear key, and reinforcing steel in air-outdoor or sheltered environments. The following aging effects are addressed in this program: • Cracking or loss of material (spalling, scaling) due to freeze-thaw degradation • Cracking, loss of strength, and loss of material (spalling, scaling) due to aggressive chemical attack • Cracking, and loss of strength due to reaction with aggregates • Loss of material (spalling, scaling) due to salt scaling • Loss of strength, increase in porosity and permeability and reduction of concrete pH (reducing corrosion resistance of steel embedments) due to leaching of calcium hydroxide • Cracking, loss of strength, loss of material (spalling, scaling), and loss of concrete/steel bond due to corrosion for reinforcing steel. Although the ISFSI Storage Pad is not considered Important to Safety, as noted in FuelSolutions Storage System FSAR Section 1.2, the pad should be inspected as may be required elsewhere.
2 Preventive Actions	Condition monitoring is utilized to manage aging effects including continuance of inspections of air inlet/outlet vents to confirm they are not blocked which also ensures design temperature limits are not exceeded and thermal dehydration of the concrete remains noncredible during the period of extended operation. As the storage cask reinforced concrete is designed and analyzed in accordance with the applicable provisions of ACI-349 and constructed using standard commercial practices, in accordance with the applicable provisions of ACI-318, no additional preventive actions are required.
3 Parameters Monitored / Inspected	The accessible and exposed concrete surfaces are visually examined for indications of surface deterioration. The parameters monitored or inspected quantify the following aging effects: • Cracking • loss of material (spalling, scaling) • increased porosity/permeability Degradation could affect the ability of the concrete to provide radiation shielding, to provide a path for heat transfer and to provide tornado missile shielding. The inlet and outlet vents are also monitored by visual inspection to ensure they are not obstructed. For inaccessible areas, an inspection of the concrete inlet ducts using a video camera, fiber-optic scope or other remote inspection equipment via existing access points on one cask to determine if there is any evidence of concrete degradation. The parameters evaluated consider any surface geometries that may identify water ponding which potentially increases

Table 9.A.1-2 FuelSolutions Reinforced Concrete Structures AMP
(4 pages)

	the rate of degradation. The accessible internal concrete surfaces of the storage cask are inspected for indications of degradation. These indications may impact the long-term ability of the storage cask to meet its intended functions.
4 Detection of Aging Effects	To manage and verify the shielding performance of the storage cask concrete during the period of extended operation, the AMP includes a visual inspection of the readily accessible exterior surfaces of the storage cask to detect if there are any aging effects. The visual inspection shall identify cracking, loss of material (spalling, scaling), increased porosity/permeability, staining or other degradation-related activity and the degree of damage. This visual inspection identifies the current exterior condition of the storage cask and shall identify the extent and cause of any aging effects noted. This visual inspection uses the inspection evaluation and acceptance criteria of ACI-349.3R-02 (ACI, 2010) and is conducted at least once every five (5) years on each storage cask in operation during the period of extended storage by personnel meeting the qualification requirements in Chapter 7 of ACI-349.3R-02 (ACI, 2010). A visual inspection of the lower vent interior concrete areas of one storage cask shall be performed using a using a video camera, fiber-optic scope or other remote inspection equipment. This visual inspection shall meet the requirements in accordance with the acceptance criteria in ACI 349.3R-02 (ACI, 2010) and be performed by personnel meeting the qualification requirements in Chapter 7 of ACI 349.3R-02 (ACI, 2010) at least once every five (5) years. Note: As the interior of the storage cask cavity and upper vents have a steel lining, the Metallic Surfaces AMP addresses these metallic portions of the storage cask. Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results for the inspection will be documented, including descriptions of observed aging effects and supporting sketches, photographs or video. The internal concrete inspection shall be performed on one of the storage casks at each ISFSI at a frequency of 5 years. The first inspection should occur within 1 year after the 20th anniversary of initial storage cask loading at the site or within 1 year after the issuance of the renewed license, whichever is later. The inspection shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Methods are commensurate with consensus defect evaluation guides and standards. The inspections and surveillances described for reinforced concrete are performed periodically in order to identify areas of degradation. The results will be evaluated by a qualified individual, and areas of degradation not meeting established criteria will be

Table 9.A.1-2 FuelSolutions Reinforced Concrete Structures AMP
(4 pages)

	documented in the site's corrective action program for resolution or detailed evaluation. Inspection records, including photos and /or videos, are to be retained for comparison in subsequent examinations. The results from the visual inspections will be compared against previous inspections in order to trend progression of identified aging effects over time.
6 Acceptance Criteria	American Concrete Institute Standard 349.3R-02 includes quantitative three-tier evaluation and acceptance criteria for visual inspections of concrete surfaces as follows: • Tier 1 acceptance without further evaluation • Tier 2 acceptance after review • Tier 3 acceptance requiring further evaluation Acceptance signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform its design basis function. Degradations or conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's corrective action program for evaluation and resolution. The loss of material due to age-related degradation will be evaluated by qualified personnel in accordance with ACI 349.3R-02. A technical basis will be provided for any deviation from ACI 349.3R-02 acceptance criteria.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's corrective action program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.

Table 9.A.1-2 FuelSolutions Reinforced Concrete Structures AMP
(4 pages)

10 Operating Experience	Previous operating experience for the W150 Storage Cask indicates very minimal degradation detected to date, mostly limited to concrete "bug hole" and grout degradation. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP. A renewal application pre-submittal inspection[11] was performed on the FuelSolutions storage cask at Big Rock Point in July 23, 2019. Three separate tasks were completed consisting of a video inspection of the accessible area in the annulus between the cask and canister; a visual inspection of the cask interior and visual inspection of the cask storage pad. A representative canister and storage cask were selected by Entergy based on increased susceptibility for moisture intrusion and corrosion. Heat loads at the time of loading all of the canisters at Big Rock Point were within 0.5 kW of each other, and all storage casks were placed into service within months of each other (as noted, between November 2002 and May 2003). The inspection revealed some minor observations; however, no structural deficiencies were identified and all parts continue to perform their design function. NRC Region III Inspectors reviewed [Insp Rpt].[12]the previous five-year cask inspection documentation for Big Rock Point storage cask number 7 that included both pictures and video of the interior of the cask and did not identify any findings of significance. As storage cask inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

[11] Report 4T002-RPT-001, Rev 0 "FuelSolutions Renewal Application Pre-Submittal Inspection," August 29, 2019

[12] Errata to Big Rock Point Independent Spent Fuel Storage Installation - Inspection Reports 07200043-12-001 and 05000155-12-007 (ADAMS Accession ML13071A379) dated 03/11/13.

Table 9.A.1-3 FuelSolutions Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
1 Scope of Program	This program manages the effects of aging for: (1) the external surfaces of steel, stainless steel and aluminum components that are directly exposed to outdoor air or are sheltered within W150 Storage Cask, and (2) the Fuel Transfer and Auxiliary Equipment. The scope of the program includes the following cask subcomponents and the applicable site fuel transfer and auxiliary equipment: • Storage Cask Thermal shield panel assembly • Storage Cask Shear lug and thermal shield support lug • Storage Cask steel liner and shield ring • Storage Cask canister support tubes • Storage Cask Tie rod hardware • Ram anchor • Storage Cask Top cover assembly • Storage Cask Top cover bolts • Storage Cask Support rails • Storage Cask Guide rails • Cask lifting yoke • Canister vertical lift fixture • Cask cavity axial spacer • Shielded docking collar • Cask restraints • Empty canister lift fixture • Standard lifting slings (inside plant facility) • Storage cask impact limiter steel casing The following aging effects are addressed in this program: • Loss of material is due to general corrosion, galvanic corrosion, pitting and crevice corrosion and wear • Loss of preload due to stress relaxation • Coating degradation on steel and aluminum surfaces Periodic visual inspections monitor for general and localized corrosion, wear, coating degradation, and loss of preload (bolting).
2 Preventive Actions	This program is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.
3 Parameters Monitored / Inspected	This program monitors the condition of external metallic surfaces to identify general corrosion, localized corrosion, wear, and loss of preload of bolted connections. Localized corrosion of stainless steels may be a precursor to stress corrosion cracking (SCC). Parameters monitored or inspected for external metallic surfaces include: • visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion, SCC, and wear

Table 9.A.1-3 FuelSolutions Monitoring of Metallic Surfaces AMP
(4 pages)

Element	Description
	• visual evidence of loose or missing bolts, physical displacement, and other conditions indicative of loss of preload • visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base metal Accessible storage cask internal surfaces are inspected for indications of corrosion and wear and coating degradation.
4 Detection of Aging Effects	Inspections are performed by personnel qualified in accordance with site procedures and programs to perform the specified task. Visual inspections follow site procedures that are demonstrated to be capable of evaluating conditions against the acceptance criteria. <u>Readily Accessible Surfaces</u> Inspections cover 100 percent of normally accessible surfaces, including the external metallic surfaces, bolting, covers, vents, and other metallic components. The visual survey performed on metallic surfaces will identify the source of any staining or corrosion-related activity and the degree of damage. A visual inspection of the metallic exterior surfaces of the storage cask to detect aging effects is conducted annually. Visual inspections of fuel transfer and auxiliary equipment shall be performed at a minimum of once a year while in use. If the fuel transfer and auxiliary equipment is not used, a pre-use visual inspection shall be performed. When the fuel transfer and auxiliary equipment is not in use, periodic inspections are not needed. The visual inspections are performed in accordance with site implementing procedures. <u>Normally Inaccessible Surfaces</u> A visual inspection of the interior areas of the storage cask shall be performed with remote inspection techniques such as borescope (or equivalent). The visual inspection should include an examination of the accessible areas of the canister exterior surface and the storage cask thermal shield. The accessible areas of the storage cask guide rails and support rails should be examined for coating degradation and corrosion. This visual inspection of the metallic components shall meet the requirements of a VT-3 Examination, as given in the ASME Boiler & Pressure Vessel Code (B&PVC) Section XI, Article IWA-2200, to the extent practical, even though they are not ASME components. The internal inspection shall be performed on one storage cask at a frequency of 5 years starting with the first inspection within the later of either one (1) year after the initial canister's 20th year loading anniversary or within one year after the issuance of first renewal of the CoC. The site may consider using the storage cask that contains the canister being used for the Welded Stainless Steel Canister AMP to consolidate efforts. Data from inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.

Table 9.A.1-3 FuelSolutions Monitoring of Metallic Surfaces AMP
(4 pages)

Element	Description
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans and procedures are used to: • establish a baseline before or at the beginning of the period of extended operation • track trending of parameters or effects not corrected following a previous inspection, including ➢ locations and size of any areas of corrosion, wear or cracking ➢ disposition of components with identified aging effects and the results of supplemental inspections
6 Acceptance Criteria	The acceptance criteria for the visual inspections are: • no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion • no indications of loose bolts or hardware, displaced parts • no degradation (e.g., blisters, cracking, flaking, delamination) of coatings on metallic surfaces indicative of base metal corrosion. If evidence of corrosion or wear is identified, then the severity of the degradation must be determined using approved site-specific procedures. These may include additional visual, surface or volumetric NDE methods to determine the loss of material.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Actions Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g., increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions are completed in accordance with the ISFSI CAP.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.
10 Operating Experience	Previous operating experience for the W150 Storage Cask indicates very minimal degradation detected to date, mostly limited to coating degradation. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP.

Table 9.A.1-3 FuelSolutions Monitoring of Metallic Surfaces AMP
(4 pages)

Element	Description
	A renewal application pre-submittal inspection[13] was performed on the FuelSolutions storage casks at Big Rock Point in July 2019. Three separate tasks were completed consisting of a video inspection of the accessible area in the annulus between the cask and canister, visual inspection of the cask interior and a visual inspection of the cask storage pad. A representative canister and storage cask were selected by Entergy based on increased susceptibility for moisture intrusion and corrosion. Heat loads at the time of loading all of the canisters at Big Rock Point were within 0.5 kW of each other, and all storage casks were placed into service within months of each other (as noted, between November 2002 and May 2003). The inspection revealed some minor observations; however no structural deficiencies, and all parts continue to perform their design function. NRC Region III Inspectors reviewed [Insp Rpt].[14]the previous five-year cask inspection documentation for Big Rock Point storage cask number 7 that included both pictures and video of the interior of the cask and did not identify any findings of significance. As storage cask inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

[13] Report 4T002-RPT-001, Rev 0 "FuelSolutions Renewal Application Pre-Submittal Inspection," August 29, 2019

[14] Errata to Big Rock Point Independent Spent Fuel Storage Installation - Inspection Reports 07200043-12-001 and 05000155-12-007 (ADAMS Accession ML13071A379) dated 03/11/13.

Table 9.A.1-4 FuelSolutions W100 Transfer Cask AMP

(3pages)

Element	Description
1 Scope of Program	The program covers the subcomponents of the W100 Transfer Cask to ensure that aging effects do not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The effected SSCs include the trunnion retainers and sleeves, bolts for the top cover, bottom cover, and ram access cover, and the pressure relief device in the environments of air-indoor/outdoor and demineralized water. This program manages loss of material due to general corrosion, galvanic corrosion, pitting and crevice corrosion and wear to ensure that this aging effect does not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The Transfer Cask AMP includes inspections of trunnion retainers and sleeves for loss of material and wear, guide rails for wear, cover bolts and pressure relief devices for corrosion, cask covers for neutron shielding deterioration involving boron depletion, and neutron shield jacket for coating degradation.
2 Preventive Actions	The Transfer Cask AMP utilizes condition monitoring to detect degradation and ensure that the equipment maintains its intended function through the extended storage period. No preventative actions are included as part of this AMP.
3 Parameters Monitored / Inspected	The Transfer Cask AMP inspects for visual evidence of degradation of accessible surfaces, and deterioration of the neutron shielding material performance.
4 Detection of Aging Effects	The Transfer Cask AMP manages loss of material due to corrosion, predominately for stainless steel, steel, and brass components, degradation of the coating on the neutron shield jacket, and deterioration of the neutron shielding material performance. Inspection shall be performed at a minimum once a year while in use. If the Transfer Cask is not used, a pre-use inspection is appropriate for the Transfer Cask. When the Transfer Cask is not in use, periodic inspections are not needed. Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible cask surfaces, including the cask exterior, cask interior cavity, top cover surfaces, and the cask bottom (during lifting or down ending). A radiological surveillance inspection of the RX-277 or NS-3 solid neutron shielding material performance in the top, bottom, and ram access covers of a loaded transfer cask shall be performed once per loaded fuel canister transfer campaign using calibrated neutron detection equipment and qualified radiation protection program personnel. Data from these inspections, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented.

Table 9.A.1-4 FuelSolutions W100 Transfer Cask AMP
(3pages)

5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans/procedures are used to: • establish a baseline before the use of the transfer cask in the first loading campaign in the period of extended operation • track trending of parameters or effects not corrected following a previous inspection ➢ the locations, size, and depth of any areas of corrosion ➢ the disposition of components with identified aging effects and the results of supplemental inspections ➢ the deterioration of the solid neutron shielding material performance
6 Acceptance Criteria	For accessible surfaces, including trunnions, acceptance criteria are no detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, crevice corrosion, and wear scratches/gouges. If evidence of corrosion, wear, or coating degradation are identified, then the severity of the degradation of the base metal must be determined using approved site-specific procedures. These may include additional visual, surface, or volumetric NDE methods to determine the loss of material. For inaccessible internal surfaces, the acceptance criteria are no evidence of leakage from the neutron shield jacket or loss of wall thickness beyond a predetermined limit established by system-specific design standards or industry codes and standards. Coating acceptance criteria are no degradation or interruptions (e.g., chipping/scratches/flacking) of the coated surface. For acceptance of the RX-277 or NS-3 solid neutron shielding in the top, bottom, and ram access covers of a loaded transfer cask, the top, bottom, and ram access cover neutron dose rates shall not exceed the bounding neutron dose rates in FSAR WSNF-220 Table 5.1-2.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Action Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary actions, identify any changes to the existing AMP, and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the site QA program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.

Table 9.A.1-4 FuelSolutions W100 Transfer Cask AMP
(3pages)

10 Operating Experience	Previous operating experience for the W100 Transfer Cask indicates very minimal degradation detected to date, mostly limited to coating degradation. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP. As transfer cask inspections are performed in the future, inspection information will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
1 Scope of Program	This program manages the effects of aging for the surfaces of welded stainless steel canisters that are directly exposed the sheltered. The scope of the program includes the following canister sub-components: • Shell • Bottom closure plate • Shell extension • Bottom end plate • Top outer closure plate • Leak test port cover The following aging effects are addressed in this program: • Cracking due to stress corrosion cracking • Loss of material (precursor to stress corrosion cracking) due to pitting and crevice corrosion Examinations are performed of the accessible portions of the welded stainless steel dry storage canister confinement boundary external surfaces for atmospheric deposits, localized corrosion, and Stress Corrosion Cracking (SCC). In particular, examinations focus on accessible canister welds, weld heat-affected-zone areas, and known areas of the canister to which temporary supports or attachments were attached by welding and subsequently removed (based on available fabrication records) with the following attributes: • Locations where a crevice is formed on the canister surface • Horizontal (±30-degree) surfaces where deposits may accumulate at a faster rate compared to vertical surfaces • Canister surfaces that are cold relative to the average surface temperature • Canister surfaces with higher amounts of atmospheric deposits Examinations can be performed in coordination of the ASME Section XI code inspections provided in Code Case N860, "Examination Requirements and Acceptance Standards for Spent Nuclear Fuel Storage and Transportation Containment Systems."
2 Preventive Actions	Condition monitoring is utilized to manage aging effects. During fabrication of the canisters, however, preventative actions were used to minimize corrosion and stress corrosion cracking by selection of stainless steel materials. In addition, fabrication controls were in place during canister fabrication to support improved canister corrosion resistance. Although these preventative actions minimize the likelihood of aging effects, they cannot replace condition monitoring during the storage period. As this AMP is based on condition monitoring, new preventative actions are not included.

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
3 Parameters Monitored / Inspected	The parameters monitored and/or inspected under this AMP include: • visual inspections to look for evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. • The size and location of localized corrosion or stress corrosion cracks • The inspections also look for the appearance and location of deposits on the canister surfaces.
4 Detection of Aging Effects	Visual inspection of the canister surface is to be performed per ASME Code Section XI, Article IWA-2200 for VT-3 examinations utilizing a videoscope (or equivalent technology) device for the accessible areas of the canister surface since direct visual examination may not be possible due to neutron and gamma radiation fields near canister surfaces within the storage cask. Additional assessments are to be performed as necessary for suspected areas of localized corrosion and SCC. VT-1 visual examinations are performed per acceptance criteria when indicated by the assessment of the VT-3 results. Indications of corrosion within 2 inches of a weld are to receive an augmented surface examination for the presence of cracking. Volumetric examination consistent with the requirements of ASME Code Section XI, IWB-2500, for category B-J components may also be utilized to assess the presence of cracking. Inspection of selected areas on the canister may be upgraded to the VT-1 standard. The inspection is to be performed on a minimum of one canister at each ISFSI based on the following criteria: • EPRI Susceptibility Criteria {Ref: Technical Report 3002005371} • Age of the Canister • Canister loaded with Lowest Heat Load • Canisters with the greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and SCC • Where applicable, canister with previously identified manufacturing deviations which may affect the surface. Inspections are to be performed by qualified individual(s) every 5 years starting with the first inspection performed within either the later of one (1) year after the initial canister's 20th year loading anniversary or within one year after the issuance of first renewal of the CoC. If possible, examinations should occur on the same canister to support trending.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Inspection records including photos and /or videos are to be retained for comparison in subsequent examinations. Changes to the size or location of discolored areas (e.g.

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
	rust), localized corrosion, pitting and crevice corrosion, and/or stress corrosion cracking should be identified and assessed for further evaluation or subsequent inspections. Trending of parameters or effects include the locations and size of any areas of localized corrosion or SCC, disposition of canisters with identified aging effects and the results of any supplemental canister inspections.
6 Acceptance Criteria	No indications of localized corrosion pits, etching, crevice corrosion, stress corrosion cracking, red-orange-colored corrosion products emanating from crevice locations, or red-orange-colored corrosion products in the vicinity of canister fabrication welds, closure welds, and welds associated with temporary attachments during canister fabrication. Minor surface corrosion is acceptable. Identified flaws may be assessed in accordance with the acceptance standards identified in ASME Code Section XI, IWB-3514. Results of Inspections Requiring Additional Evaluation Indications of interest (locations on the canister surface susceptible to SCC including areas adjacent to fabrication welds, closure welds, locations where temporary attachments may have been welded to and subsequently removed from the canister and the weld heat-affected zones) that are subject to additional examination and disposition through the corrective action program include: • Localized corrosion pits, crevice corrosion, stress corrosion cracking, and etching; deposits or corrosion products • Red-orange colored corrosion products or red-orange colored corrosion tubercles with deposit accumulations especially when adjacent to welds or weld heat affected zones of these areas and locations where temporary attachments were welded to and subsequently removed from the canister • Appearance of any color of liner corrosion products of any size parallel to or traversing fabrication welds, closure welds, and the weld heat affected zones. • Red-orange colored corrosion products greater than 1 mm in diameter combined with deposit accumulations on any location of the canister • Red-orange colored corrosion tubercles of any size
7 Corrective Actions	Indications not meeting the acceptance criteria above (AMP element 6) require additional evaluation after being entered into the site's corrective action program. An evaluation is to be performed to determine the extent and impact of the corrosion on the canister's ability to perform its intended function. The site's Quality Assurance (QA) program ensures that corrective actions are completed within the Corrective Action Program (CAP)and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process is to be commensurate with the site's QA program. The QA program ensures that the confirmation process includes provisions to preclude

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
	repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The site QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.
10 Operating Experience	Previous operating experience for the W74 Canister indicates very minimal corrosion detected to date. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP. A renewal application re-submittal inspection was performed on the W74 system at Big Rock Point in July 2019.[15] Three separate tasks were completed consisting of a video inspection of the accessible area in the annulus between the cask and canister; a visual inspection of the cask interior and visual inspection of the cask storage pad. A representative canister and storage cask were selected by Entergy based on increased susceptibility for moisture intrusion and corrosion. Heat loads at the time of loading all of the canisters at Big Rock Point were within 0.5 kW of each other, and all storage casks were placed into service within months of each other (between November 2002 and May 2003). The inspection revealed some minor observations; however, no structural deficiencies were identified, and all parts continue to perform their design function. Surface rust was observed (Cask Serial Number W150-610-NMC) on washers under the nut on the tie rods (minimal depth) causing discoloration in the bearing plate and nut. Both these components are stainless steel and are not in danger of corroding. NRC Region III Inspectors[16] reviewed the previous five-year cask inspection documentation for Big Rock Point storage cask number 7 that included both pictures and video of the interior of the cask and did not identify any findings of significance. As canister inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

[15] Report 4T002-RPT-001, Rev 0 "FuelSolutions Renewal Application Pre-Submittal Inspection," August 29, 2019

[16] Errata to Big Rock Point Independent Spent Fuel Storage Installation - Inspection Reports 07200043-12-001 and 05000155-12-007 (ADAMS Accession ML13071A379) dated 03/11/13.

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
1 Scope of Program	This program manages the effects of aging for the surfaces of welded stainless steel canisters that are directly exposed the sheltered environment. The scope of the program includes the following canister sub-components: • Shell • Bottom closure plate • Shell extension • Bottom end plate • Top outer closure plate • Leak test port cover The following aging effects are addressed in this program: • Cracking due to stress corrosion cracking • Loss of material (precursor to stress corrosion cracking) due to pitting and crevice corrosion Examinations are performed of the accessible portions of the welded stainless steel dry storage canister confinement boundary external surfaces for atmospheric deposits, localized corrosion, and Stress Corrosion Cracking (SCC). In particular, examinations focus on accessible canister welds, weld heat-affected-zone areas, and known areas of the canister to which temporary supports or attachments were attached by welding and subsequently removed (based on available fabrication records) with the following attributes: • Locations where a crevice is formed on the canister surface • Horizontal (±30-degree) surfaces where deposits may accumulate at a faster rate compared to vertical surfaces • Canister surfaces that are cold relative to the average surface temperature • Canister surfaces with higher amounts of atmospheric deposits Examinations can be performed in coordination of the ASME Section XI code inspections provided in Code Case N860, "Examination Requirements and Acceptance Standards for Spent Nuclear Fuel Storage and Transportation Containment Systems."
2 Preventive Actions	Condition monitoring is utilized to manage aging effects. During fabrication of the canisters, however, preventative actions were used to minimize corrosion and stress corrosion cracking by selection of stainless steel materials. In addition, fabrication controls were in place during canister fabrication to support improved canister corrosion resistance. Although these preventative actions minimize the likelihood of aging effects, they cannot replace condition monitoring during the storage period. As this AMP is based on condition monitoring, new preventative actions are not included.

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
3 Parameters Monitored / Inspected	The parameters monitored and/or inspected under this AMP include: • visual inspections to look for evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. • The size and location of localized corrosion or stress corrosion cracks • The inspections also look for the appearance and location of deposits on the canister surfaces.
4 Detection of Aging Effects	Visual inspection of the canister surface is to be performed per ASME Code Section XI, Article IWA-2200 for VT-3 examinations utilizing a videoscope (or equivalent technology) device for the accessible areas of the canister surface since direct visual examination may not be possible due to neutron and gamma radiation fields near canister surfaces within the storage cask. Additional assessments are to be performed as necessary for suspected areas of localized corrosion and SCC. VT-1 visual examinations are performed per acceptance criteria when indicated by the assessment of the VT-3 results. Indications of corrosion within 2 inches of a weld are to receive an augmented surface examination for the presence of cracking. Volumetric examination consistent with the requirements of ASME Code Section XI, IWB-2500, for category B-J components may also be utilized to assess the presence of cracking. Inspection of selected areas on the canister may be upgraded to the VT-1 standard. The inspection is to be performed on a minimum of one canister at each ISFSI based on the following criteria: • EPRI Susceptibility Criteria {Ref: Technical Report 3002005371} • Age of the Canister • Canister loaded with Lowest Heat Load • Canisters with the greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and SCC • Where applicable, canister with previously identified manufacturing deviations which may affect the surface. Inspections are to be performed by qualified individual(s) every 5 years starting with the first inspection performed within either the later of one (1) year after the initial canister's 20th year loading anniversary or within one year after the issuance of first renewal of the CoC. If possible, examinations should occur on the same canister to support trending.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Inspection records including photos and /or videos are to be retained for comparison in subsequent

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
	examinations. Changes to the size or location of discolored areas (e.g. rust), localized corrosion, pitting and crevice corrosion, and/or stress corrosion cracking should be identified and assessed for further evaluation or subsequent inspections. Trending of parameters or effects include the locations and size of any areas of localized corrosion or SCC, disposition of canisters with identified aging effects and the results of any supplemental canister inspections.
6 Acceptance Criteria	No indications of localized corrosion pits, etching, crevice corrosion, stress corrosion cracking, red-orange-colored corrosion products emanating from crevice locations, or red-orange-colored corrosion products in the vicinity of canister fabrication welds, closure welds, and welds associated with temporary attachments during canister fabrication. Minor surface corrosion is acceptable. Identified flaws may be assessed in accordance with the acceptance standards identified in ASME Code Section XI, IWB-3514. Results of Inspections Requiring Additional Evaluation Indications of interest (locations on the canister surface susceptible to SCC including areas adjacent to fabrication welds, closure welds, locations where temporary attachments may have been welded to and subsequently removed from the canister and the weld heat-affected zones) that are subject to additional examination and disposition through the corrective action program include: • Localized corrosion pits, crevice corrosion, stress corrosion cracking, and etching; deposits or corrosion products • Red-orange colored corrosion products or red-orange colored corrosion tubercles with deposit accumulations especially when adjacent to welds or weld heat affected zones of these areas and locations where temporary attachments were welded to and subsequently removed from the canister • Appearance of any color of liner corrosion products of any size parallel to or traversing fabrication welds, closure welds, and the weld heat affected zones. • Red-orange colored corrosion products greater than 1 mm in diameter combined with deposit accumulations on any location of the canister Red-orange colored corrosion tubercles of any size
7 Corrective Actions	Indications not meeting the acceptance criteria above (AMP element 6) require additional evaluation after being entered into the site's corrective action program. An evaluation is to be performed to determine the extent and impact of the corrosion on the canister's ability to perform its intended function. The site's Quality Assurance (QA) program ensures that corrective actions are completed within the Corrective Action Program (CAP)and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process is to be commensurate with the site's QA program. The QA program ensures that the confirmation process includes provisions to preclude

Table 9.A.1-1 FuelSolutions Welded Stainless Steel Canister AMP
(4 pages)

Element	Description
	repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The site QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on tollgate assessments.
10 Operating Experience	Previous operating experience for the W74 Canister indicates very minimal corrosion detected to date. That operating experience has been incorporated into the guidance on inspections and acceptance criteria contained in this AMP. A renewal application re-submittal inspection was performed on the W74 system at Big Rock Point in July 2019.[18] Three separate tasks were completed consisting of a video inspection of the accessible area in the annulus between the cask and canister; a visual inspection of the cask interior and visual inspection of the cask storage pad. A representative canister and storage cask were selected by Entergy based on increased susceptibility for moisture intrusion and corrosion. Heat loads at the time of loading all of the canisters at Big Rock Point were within 0.5 kW of each other, and all storage casks were placed into service within months of each other (between November 2002 and May 2003). The inspection revealed some minor observations; however, no structural deficiencies were identified, and all parts continue to perform their design function. Surface rust was observed (Cask Serial Number W150-610-NMC) on washers under the nut on the tie rods (minimal depth) causing discoloration in the bearing plate and nut. Both these components are stainless steel and are not in danger of corroding. NRC Region III Inspectors[19] reviewed the previous five-year cask inspection documentation for Big Rock Point storage cask number 7 that included both pictures and video of the interior of the cask and did not identify any findings of significance. As canister inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

[18] Report 4T002-RPT-001, Rev 0 "FuelSolutions Renewal Application Pre-Submittal Inspection," August 29, 2019

[19] Errata to Big Rock Point Independent Spent Fuel Storage Installation - Inspection Reports 07200043-12-001 and 05000155-12-007 (ADAMS Accession ML13071A379) dated 03/11/13.

Revised Pages to SENTRY System CoC Renewal Application Addenda (Non-Proprietary)

Westinghouse Electric Company
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Cranberry Township, PA 16066

such that any potential failure of the ISFSI storage pad would not prevent fulfilling system safety functions.

The cask storage pad enveloping design parameters used to analyze SENTRY Dry Storage System cask deceleration during postulated design basis end drop accidents and postulated non-mechanistic tipover events are delineated in SENTRY Dry Storage System Technical Specification 4.2.2, *Pad Properties to Limit Cask Gravitational Loadings Due to Postulated Drops of the Storage Cask* [2.4], and SENTRY Dry Storage System SAR Table 4.6-8, *Envelope Parameters used for End Drop and Tipover Analyses*. The results of the postulated cask end drop and tipover events are summarized in SENTRY Dry Storage System SAR Table 4A-4, *Peak Accelerations for the ISFSI Pad Sensitivity Analyses*.

If SENTRY Dry Storage System users classify their ISFSI storage pad as Important to Safety, then ISFSI storage pad aging management inspections should be identified and performed on a site-specific basis.

2.2.2.8 ISFSI Security Equipment

The ISFSI security equipment (e.g., ISFSI security fences and gates, lighting, communications, and monitoring equipment) are not part of the SENTRY Dry Storage System under CoC 1026 [2.6], and as such, are not described in detail in the SENTRY Dry Storage System SAR [2.3]. Plant security programs and procedures ensure that the ISFSI security equipment requirements are met. Potential failure of the ISFSI security equipment would not prevent the SENTRY Dry Storage System casks from performing their intended safety functions.

2.2.3 SSCs Within the Scope of CoC Renewal

The SENTRY SSCs determined to be within the scope of renewal include are the W180 storage cask, the W110 transfer cask, and the W21H and W37 canisters. The W180 storage cask, the W110 transfer cask, and the W21H and W37 canisters (including W37 damaged fuel cans and fuel assembly spacers) satisfy Criteria 1 of the scoping evaluation process. Both the ~~The~~ in-scope ITS and in-scope NITS subcomponents and parts of these in-scope SENTRY SSCs and their intended safety functions are identified in Tables 2-4 through 2-7.

The SENTRY Dry Storage System is an evolutionary storage system design which is incorporated into CoC 1026 as noted in the Introduction of Chapter 1 (above) and the SENTRY Dry Storage System SAR [2.3] General Information section of Chapter 1. ~~In~~Thus in determining the in-scope SENTRY NITS subcomponents and parts, it was noted that NUREG-2214 ~~(2.3)~~[2.2] Table 4-21 included aging management reviews for the FuelSolutions canister NITS subcomponents and parts. NUREG-2214 Tables 4-22 and 4-23 also included aging management reviews for most of the FuelSolutions storage cask and transfer cask NITS subcomponents and parts. The FuelSolutions storage cask and transfer cask NITS subcomponents and parts not included in NUREG-2214 Tables 4-22 and 4-23 were items such as O-rings, gaskets, vent screens, vent screen retainer plates, name plates and other associated NITS hardware which are easily accessible for inspection and replacement as necessary as part of a routine maintenance program.

Westinghouse used the above described ~~NUREG-2214~~ approach of classifying most SENTRY NITS items as being in-scope in determining if aging deterioration or failure of a NITS item internal to a cask or canister could potentially adversely affect the performance of an ITS subcomponent or part safety function. It is conservative to conclude that most SENTRY NITS items are in-scope for the license renewal, and aging management reviews were performed for these NITS subcomponents and parts.

The Important to Safety and Safety Related SENTRY Dry Storage System fuel transfer and auxiliary equipment listed in Table 2-2, and further identified in Table 2-8, are included within the scope of the CoC 1026 renewal.

The SNF assemblies, which are sealed and supported inside the W21H and W37 canisters (including any damaged W37 SNF assemblies in damaged fuel cans), are also determined to be within the scope of renewal. However, as noted in NUREG-1927 [2.1], fuel pellets are not within the scope of renewal. The intended safety functions of the SNF assembly subcomponents are identified in Table 2-10.

The above identified SENTRY Dry Storage System components and equipment are the ITS and safety related SSCs, ~~and the~~along with SENTRY ITS and NITS subcomponents and parts~~,~~ which are also within the scope of the CoC 1026 [2.6] renewal under 10 CFR Part 72, Subpart L.

2.2.4 SSC Not Within the Scope of CoC Renewal

As noted in Section 2.3.3 above the FuelSolutions storage cask and transfer cask NITS subcomponents and parts not included in NUREG-2214 Tables 4-22 and 4-23 were items such as O-rings, gaskets, vent screens, vent screen retainer plates, name plates and other associated NITS hardware which are easily accessible for inspection and replacement as necessary as part of a routine maintenance program. These types of SENTRY NITS subcomponents and parts do not meet scoping Criteria 2 as their failure does not prevent fulfillment of a function important to safety. These out of scope SENTRY cask NITS items are listed separately at the bottom of SENTRY Renewal Application Chapter 2 Tables 2-5 and 2-6 for the storage cask and transfer cask, respectively.

~~The~~ Other SSC that are not in the scope of renewal include certain fuel transfer and auxiliary equipment, the ISFSI storage pad, ISFSI security equipment, and W110 and W180 instrumentation. These components are classified as NITS and do not meet scoping Criteria 2 as their failure does not prevent fulfillment of a function important to safety.

Fuel Transfer and Auxiliary Equipment

As listed in Table 2-3 below, certain fuel transfer and auxiliary equipment necessary for ISFSI operations (e.g., inflatable seals, annulus water pressure equalizer tank, draining and drying machine, automatic remote welding machine, hydrostatic test pump, mass spectrometer for leak testing, etc.) are classified as NITS in Table 3.1-1 of the SENTRY Dry Storage System SAR [2.3]. These SSCs are not included as part of the SENTRY Dry Storage System described in the SENTRY Dry Storage System CoC 1026 [2.6] under 10 CFR Part 72, Subpart L.

As described in Section 1.2 of the SENTRY Dry Storage System SAR [2.3], the SENTRY Dry Storage System W180, W110, W21H and W37 component safety functions are not affected by the potential failure of the Table 2-3 listed fuel transfer and auxiliary equipment. Failure of this equipment would not prevent the SENTRY Dry Storage System components from fulfilling their intended safety functions. Therefore, the Table 2-3 fuel transfer and auxiliary equipment does not meet scoping Criteria 2 and is not in the scope of CoC 1026 renewal. The actual fuel transfer and auxiliary equipment used at a given site is addressed by the General Licensee in the 10 CFR 72.212 Evaluation Report on a site-specific basis.

ISFSI Storage Pad

The SENTRY Dry Storage System ISFSI storage pad is not part of the SENTRY Dry Storage System CoC 1026 [2.6] under 10 CFR Part 72, Subpart L, and as such, is not described in detail in the SENTRY Dry Storage System SAR [2.3]. The ISFSI storage pad provides free-standing support of the SENTRY Dry Storage System casks. The SENTRY Dry Storage System W180, W110, W21H and W37 components are designed such that any potential failures of the ISFSI storage pad would not prevent them from fulfilling their intended safety functions. Therefore, the ISFSI storage pad does not meet scoping Criteria 2 and is not in the scope of renewal. The ISFSI Pad subcomponents are identified in Table 2-11.

Although not within the scope of the CoC 1026 renewal, if required aging management inspections of the ISFSI pad may be addressed on a site-specific basis by a General Licensee.

ISFSI Security Equipment

The ISFSI security equipment (e.g., ISFSI security fences and gates, lighting, communications, and monitoring equipment) are NITS components that are not part of the SENTRY Dry Storage System under CoC 1026 [2.6] in accordance with 10 CFR Part 72, Subpart L. Failure of the ISFSI security equipment would not prevent fulfillment of a SENTRY Dry Storage System function that is important to safety.

Table 2-3 below lists the Structures, Systems and Components Not Within the Scope of the CoC 1026 Renewal.

3.1 Operating Experience Review

3.1.1 CoC 1026 Dry Storage System Operating Experience

The SENTRY Dry Storage System is the follow-on dry fuel storage system design related to the CoC 1026 FuelSolutions Storage System. Both systems use vertical cylindrical reinforced concrete storage casks with an inner steel liner. Both systems use welded stainless steel canisters. Both systems use stainless steel transfer casks having inner and outer stainless steel shells enclosing lead shielding, with exterior neutron shielding material enclosed by a stainless steel jacket.

The SENTRY Dry Storage System advances the use of materials and engineering technologies in producing a cost and time saving "step-change" to dramatically shorten cooling times and increase heat loads.

3.1.2 User Operating Experience

A review of user operating experience for the CoC 1026 dry storage system was performed to evaluate if there was any operating experience or inspection results that would impact the aging of CoC 1026 systems. As of 2020, the only CoC 1026 FuelSolutions storage systems in use are at the Big Rock Point ISFSI located in Michigan. Therefore, the review only includes items at that site. This review found the following items:

- Storage Cask Concrete and Grout Degradation
  - A few concrete "bug holes" [Ref 2.2, Table 6-3] and pits were found and repaired on the seven storage casks.
  - Degraded grout in some cask seam locations was found and repaired.
  - No deterioration of cask coatings was identified in ~~annual~~ periodic inspections.
  - Concrete hairline cracks, which occurred during the initial cask loading time frame, near some storage cask top bolting locations have not propagated.
  - Concrete handling damage, which occurred in a small area on one storage cask was found and repaired during the canister loading campaign.
- Transfer Cask
  - No deleterious coating degradation noted during ~~annual~~ periodic inspections.
  - No neutron shield jacket deterioration identified during ~~annual~~ periodic pressure test using air at approximately 5 psi.
  - Neutron shield jacket relief valve found to be correctly set between 40 and 45 psig during ~~annual~~ periodic inspections.
- Welded Stainless Steel Canister
  - No welded stainless steel canister degradation found during each five year borescope visual inspection of Big Rock Point Storage Cask #7 interior.
- Auxiliary Equipment

- Equipment has been inspected and exercised ~~annually~~ periodically with no degradation identified.

The conditions noted are proposed to be monitored by the aging management programs described in Appendix A for the applicable components. The types of degradation previously seen were utilized in determining the criteria for future inspections. Trending of these conditions and corrective actions, as necessary, are also part of the proposed aging management programs. The reviewed operating experience evaluations covered the in scope subcomponents. Out of scope components listed in Chapter 2 were not evaluated for this renewal application. In addition, relevant operating experience was gathered from the inspections of other dry fuel storage systems as described in Appendix C.

The aging management programs in Appendix A were developed considering this operating experience.

3.1.3 User Exemption Requests

No exemption requests have been identified at the time of writing this renewal application that have implications regarding aging management involving the design basis requirements for the CoC 1026 structures, systems and components (SSCs) at the Big Rock Point ISFSI. If exemption requests are made in the future, they should be evaluated for impact on aging management.

3.2 Aging Management Review Methodology

The aging effects that may adversely affect the ability of SSC to perform intended safety functions during the extended period of operations have been assessed in this AMR. This AMR utilizes the recommended methodology provided in NUREG-1927 [2.1]. The aging management review process involves three major steps. This AMR utilizes the decision flowchart shown on Figure 3-1. The major steps are outlined as follows:

- Identify materials and service environments
- Identify aging mechanism or effects requiring management
- Identify the TLAAs or AMPs to manage the aging effects

3.2.1 Identification of In-Scope SSC's Requiring Aging Management Review

As discussed in Chapter 2, the SSC and subcomponents involving potential aging effects were identified as being in-scope for license renewal and aging management review. These SSCs / subcomponents are presented in Table 2-4 through Table 2-8 in Chapter 2.

SSC or subcomponents that are not in scope for renewal are excluded from evaluation in this AMR.

3.2.2 Identification of Materials and Environments

The SENTRY Dry Storage System SAR [2.3] provides a detailed description of the SENTRY Dry Storage System and the materials used in the SSCs. Each in scope SSC / subcomponent for

clean demineralized water and uses inflatable seals in the top of the annulus prior to submergence of the transfer cask into the spent fuel pool.

3.3.4.2 W110 Transfer Cask Materials

The W110 transfer cask structure, bottom covers, W21H auxiliary shielding, and lifting devices are fabricated from stainless steel. Other materials included in the W110 transfer cask design are lead (for gamma shielding), ~~[~~ ~~]~~[a,c] ~~solid~~ epoxy-resin neutron shielding material, stainless steel for bolting, and elastomers (for the bottom cover and annulus seals). The ~~solid~~ epoxy-resin neutron shielding and lead shielding materials are completely enclosed, and therefore there are no significant galvanic or chemical reactions between these materials and the air or borated water. As identified in the SENTRY Dry Storage System SAR [2.3], the transfer cask exterior is coated [ ]$^{(a,c)}$. This coating enhances radiation heat transfer from the W110 transfer cask while minimizing the effects of insolation.

The material of each W110 transfer cask subcomponent is identified in Table 2-6.

3.3.4.3 W110 Transfer Cask Environments

The exterior of the W110 transfer cask is exposed to water or borated water (PWR) during fuel loading (while the W110 transfer cask is in a spent fuel pool), and to demineralized water in the annulus. Following fuel loading of the W21H and W37 canisters, the W110 transfer cask is removed from the spent fuel pool.

The relatively brief exposure of the W110 transfer cask to borated and demineralized water while in the spent fuel pool does not significantly contribute to the aging of the W110 transfer cask during the renewal period. It is the prolonged or frequently recurring exposure to environmental conditions that must be evaluated for aging effects, such as those encountered during extended transfer cask storage periods.

The environment to which the W110 transfer cask is exposed between W21H and W37 canister loading campaigns may be the sheltered atmosphere within a building. To be conservative and bound sites which store the W110 transfer cask outside, the W110 transfer cask storage environment is considered to be ambient air.

3.3.4.4 Aging Effects Requiring Management for W110 Transfer Cask

Based on a review of the W110 transfer cask materials of construction and the environments experienced during the period of transfer cask extended storage, the main aging effect requiring management is coating deterioration and fatigue during transfer cask handling and decreased effectiveness of the epoxy-resin neutron shielding material in the W110 transfer cask neutron shield jacket.

3.3.4.5 Aging Management Activities for W110 Transfer Cask

Based on the aging management review of the W110 transfer cask subcomponents documented in Table 2-6, the aging management activities required for the W110 transfer cask are an AMP for the W110 transfer cask, and a TLAA for W110 transfer cask fatigue.

The ~~[~~ ~~]~~[a,e] epoxy-resin ~~solid~~ neutron shielding material used in the W110 transfer cask neutron shield jacket is in an enclosed environment and while no exterior damage or change in the properties of the material is expected to occur over the service life of the W110 transfer cask, thermal and radiation degradation may occur which is addressed in the W110 transfer cask AMP and TLAA. ~~Therefore, no AMP or TLAA is required.~~

3.3.5 Aging Management Review Results – Fuel Transfer/Auxiliary Equipment

Table 2-8 summarizes the results of the aging management review for the fuel transfer and auxiliary equipment and subcomponents identified in the SENTRY Dry Storage System SAR [2.3] and determined to be within the scope of the CoC 1026 renewal.

Additional description of the fuel transfer and auxiliary equipment is provided in Section 3.3.5.1, while Sections 3.3.5.2 and 3.3.5.3 present the materials and environments. The aging effects requiring management and the proposed activities required to manage these effects are discussed in Sections 3.3.5.4 and 3.3.5.5, respectively.

3.3.5.1 Description of Fuel Transfer and Auxiliary Equipment

The in-scope SENTRY Dry Storage System fuel transfer and auxiliary equipment necessary for ISFSI operations and spent fuel handling includes the transfer cask lifting yoke and paddle extension, canister handling device (aka, vertical canister lift fixture), active cooling system (and associated instrumentation), and the transfer mating device. The actual fuel transfer and auxiliary equipment used at a given site is identified and addressed by the General Licensee in the 10 CFR 72.212 Evaluation Report on a site-specific basis.

The transfer cask lifting yoke includes a steel A-frame and two lifting arms which interface with the W110 transfer cask lifting feature lugs. Either lifting yoke pins secure the lifting yoke to the crane hook or a paddle extension is used between the crane hook and the lifting yoke pins if the lifting yoke user does not want the crane hook to contact the spent fuel pool water. The canister handling device is a steel fixture which is slung below the cask lifting yoke A-frame and uses canister lifting adapters which bolt to the W21H or W37 canister closure lid assembly. The canister handling device is used to lift or lower the canister into and out of the W110 transfer cask.

The transfer mating device is a component that ensures the correct attachment of W110 transfer cask to W180 storage cask, facilitates the disassembly and extraction of the transfer cask bottom lids, and the lifting or lowering of the canister between the two casks. The attachment of the storage cask to the transfer mating device is done first by bolting the mating device to the W180 storage cask top using the W180 cover lid threaded holes. Then, the mating device is attached to the transfer cask lower flange by tightening the transfer cask lower flange bolts to the mating device while both W110 and W180 casks are in a vertical stack-up position. The mating device

SENTRY Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
3 Parameters Monitored / Inspected	The parameters monitored and/or inspected under this AMP include: • Visual inspections to look for evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. • The size and location of localized corrosion or stress corrosion cracks. • The inspections also look for the appearance and location of deposits on the canister surfaces.
4 Detection of Aging Effects	Visual inspection of the canister surface is to be performed per ASME Code Section XI, Article IWA-2200 for VT-3 examinations utilizing a video camera, fiber-optic scope or other remote inspection device for the accessible areas of the canister surface since direct visual examination may not be possible due to neutron and gamma radiation fields near canister surfaces within the storage cask. Additional assessments are to be performed as necessary for suspected areas of localized corrosion and SCC. VT-1 visual examinations are performed per acceptance criteria when indicated by the assessment of the VT-3 results. Indications of corrosion within 2 inches of a weld are to receive an augmented surface examination for the presence of cracking. Volumetric examination consistent with the requirements of ASME Code Section XI, IWB-2500, for category B-J components may also be utilized to assess the presence of cracking. Inspection of selected areas on the canister may be upgraded to the VT-1 standard. The inspection is to be performed on a minimum of one canister of each type (e.g., W21H and W37) when used at each ISFSI based on the following criteria: • EPRI Susceptibility Criteria {Ref: Technical Report 3002005371}. • Age of the Canister. • Canister loaded with Lowest Heat Load. • Canisters with the greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and SCC. • Where applicable, canister with previously identified manufacturing deviations which may affect the surface. Inspections are to be performed by qualified individual(s) every 5 years ~~(+/- 25%)~~ starting with the first inspection performed within one (1) year after the initial canister's 20th year loading anniversary at the site. If possible, examinations should occur on the same canister to support trending.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Inspection records including photos and /or videos are to be retained for comparison in subsequent examinations. Changes to the size or location of discolored areas (e.g. rust),

SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
1 Scope of Program	The AMP addresses reinforced concrete structures such as the concrete portions of the SENTRY W180 Storage Cask. The associated SSCs include the concrete shell and reinforcing steel in air-outdoor or air-outdoor groundwater environments. The following aging effects are addressed in this program: • Cracking or loss of material (spalling, scaling) due to freeze-thaw degradation. • Cracking, loss of strength, and loss of material (spalling, scaling) due to aggressive chemical attack. • Cracking, and loss of strength due to reaction with aggregates. • Loss of material (spalling, scaling) due to salt scaling. • Loss of strength, increase in porosity and permeability, and reduction of concrete pH (reducing corrosion resistance of steel embedments) due to leaching of calcium hydroxide. • Cracking, loss of strength, loss of material (spalling, scaling), and loss of concrete/steel bond due to corrosion of reinforcing steel. Although the ISFSI Storage Pad is not considered within the scope of this AMP, it should be inspected for aging effects.
2 Preventive Actions	Condition monitoring is utilized to manage aging effects including continuance of inspections of air inlet/outlet vents to confirm they are not blocked which also ensures design temperature limits are not exceeded and thermal dehydration of the concrete remains noncredible during the period of extended operation. As the storage cask reinforced concrete is designed and analyzed in accordance with the applicable provisions of ACI-349 and constructed using standard commercial practices, in accordance with the applicable provisions of ACI-318, no additional preventive actions are required.
3 Parameters Monitored / Inspected	The accessible and exposed concrete surfaces are visually examined for indications of surface deterioration. The parameters monitored or inspected quantify the following aging effects: • Cracking. • Loss of material (spalling, scaling). • Increased porosity/permeability. Degradation could affect the ability of the concrete to provide radiation shielding, to provide a path for heat transfer and to provide tornado missile shielding. ~~The inlet and outlet vents are also monitored by visual inspection to ensure they are not obstructed.~~ ~~For inaccessible areas, use a video camera, fiber-optic scope or other remote inspection equipment via existing access points to determine if there is any evidence of concrete degradation. The parameters evaluated consider any surface geometries that may identify water ponding which potentially increases the rate of degradation. The accessible internal concrete surfaces of the storage cask are~~

SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
	~~inspected for indications of degradation. These indications may impact the long-term ability of the storage cask to meet its intended functions.~~
4 Detection of Aging Effects	To manage and verify the shielding performance of the storage cask concrete during the period of extended operation, the~~The~~ AMP includes a visual inspection of the readily accessible exterior surfaces of the storage cask to detect if there are any aging effects. The visual ~~survey can~~ inspection shall identify cracking, loss of material (spalling, scaling), increased porosity/permeability, staining or other degradation-related activity and the degree of damage. This visual inspection ~~confirms~~ identifies the current exterior condition of the storage cask and ~~can~~ shall identify the extent and cause of any aging effects noted. This visual inspection uses the inspection evaluation and acceptance criteria of ACI-349.3R-02 (ACI, 2010) and will be conducted ~~annually (+/- 25%)~~at least once every five (5) years on each storage cask in operation during the period of extended storage by ~~an individual~~personnel meeting the qualification requirements in Chapter 7 of ACI-349.3R-02 (ACI, 2010). ~~A visual inspection of the readily accessible areas of the storage cask annular space and interior areas of the vents shall be performed using a using a video camera, fiber-optic scope or other remote inspection equipment. This visual inspection shall meet the requirements and acceptance criteria in ACI 349.3R-02 (ACI, 2010) and be performed at least once every five (5) years. Note: As~~ Since the interior of the storage cask cavity ~~utilizes a steel liner~~and vents have a steel lining, the Monitoring of Metallic Surfaces AMP addresses these metallic portions of the storage cask. ~~In addition to visual inspection, radiological surveys of the storage cask are performed to verify compliance with 10 CFR 72.104. Cask surface dose rates are monitored per SENTRY Dry Storage System (DSS) Technical Specification 5.3.5 "Cask Surface Dose Rate Evaluation Program."~~ Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results for the inspection will be documented, including descriptions of observed aging effects and supporting sketches, photographs or video. ~~The internal inspection shall be performed on one of the storage casks at each ISFSI at a frequency of 5 years (+/- 25%). The first inspection should occur within 1 year after the 20th anniversary of initial storage cask loading at the site.~~ Inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Methods are commensurate with consensus defect evaluation guides and standards. The inspections and surveillances described for reinforced concrete are performed periodically in order to identify areas of degradation. The results will be evaluated

SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
	by a qualified individual, and areas of degradation not meeting established criteria will be documented in the site's corrective action program for resolution or detailed evaluation. Inspection records, including photos and /or videos, are to be retained for comparison in subsequent examinations. The results from the visual inspections will be compared against previous inspections in order to trend progression of identified aging effects over time.
6 Acceptance Criteria	American Concrete Institute Standard 349.3R-02 includes quantitative three-tier evaluation and acceptance criteria for visual inspections of concrete surfaces as follows: • Tier 1 acceptance without further evaluation. • Tier 2 acceptance after review. • Tier 3 acceptance requiring further evaluation. Acceptance signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform its design basis function. Degradations or conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's corrective action program for evaluation and resolution. The loss of material due to age-related degradation will be evaluated by ~~a~~ qualified personnel in accordance with ACI 349.3R-02. A technical basis will be provided for any deviation from ACI 349.3R-02 acceptance criteria.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's corrective action program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control.

SENTRY W110 Transfer Cask AMP

(~~2~~ 3 pages)

Element	Description
1 Scope of Program	The program covers the subcomponents of the W110 Transfer Cask to ensure that aging effects do not challenge the capability of the transfer casks to fulfill structural support, radiation shielding, and heat transfer functions. The effected SSCs include the transfer cask bottom sealing lid for wear, thread inserts when used in stainless-steel threaded connections, and the coating on the external surfaces of the transfer cask. This program monitors bottom lid sealing and threaded inserts for wear and coating degradation to ensure that aging effects do not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The Transfer Cask AMP includes inspections of the coated areas for coating degradation due to radiation embrittlement and thermal aging and the bottom sealing lid and the thread inserts for loss of material due to wear.
2 Preventive Actions	The Transfer Cask AMP utilizes condition monitoring to detect degradation and ensure that the equipment maintains its intended function through the extended storage period. No preventative actions are included as part of this AMP.
3 Parameters Monitored / Inspected	The Transfer Cask AMP inspects for visual evidence of degradation of accessible surfaces, and deterioration of the neutron shielding material performance.
4 Detection of Aging Effects	The Transfer Cask AMP manages loss of material due to wear, predominately for stainless steel components, ~~and~~ degradation of the coating on the external parts of the transfer cask, and deterioration of the neutron shielding material performance. Inspections shall be performed at a minimum once a year while in use. If the Transfer Cask is not used, a pre-use inspection is appropriate for the Transfer Cask. When the Transfer Cask is not in use, periodic inspections are not needed. Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible cask surfaces, including the cask exterior, cask interior cavity, cover surfaces, and the cask bottom. The Transfer Cask lifting feature lugs and bottom lid halves bolts shall be dye penetrant tested or examined with an equivalent NDE method for fatigue cracking. A radiological surveillance inspection of the [ ]$^{(a,c)}$ epoxy-resin neutron shielding material performance in the side walls of a loaded transfer cask shall be performed once per loaded fuel canister transfer campaign using calibrated neutron detection equipment and qualified radiation protection program personnel. Data from these ~~examination~~inspections, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented.

SENTRY W110 Transfer Cask AMP

(~~2~~ 3 pages)

Element	Description
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans/procedures are used to: • Establish a baseline before the use of the transfer cask in the first loading campaign in the period of extended operation. • Track trending of parameters or effects not corrected following a previous inspection. ➢ The locations, size, and depth of any areas of corrosion. ➢ The disposition of components with identified aging effects and the results of supplemental inspections. ➢ The deterioration of the epoxy-resin neutron shielding material performance.
6 Acceptance Criteria	For accessible surfaces, acceptance criteria are no detectable loss of material from the base metal, including uniform wall thinning, and wear scratches/gouges/thread galling. If evidence of wear, or coating degradation are identified, then the severity of the degradation of the base metal must be determined using approved site-specific procedures. These may include additional visual, surface, or volumetric NDE methods to determine the loss of material. If evidence of wear or thread galling are identified on the thread inserts they shall be replaced. Coating acceptance criteria are no degradation or interruptions (e.g., chipping/scratches/flaking) of the coated surface. For acceptance of the [ ]$^{(a,c)}$ epoxy-resin neutron shielding material performance in the side walls of a loaded transfer cask, the side wall neutron dose rates shall not exceed the Side, Active Region Maximum, Contact, Conservative Neutron Dose Rates in SENTRY SAR Tables 6.1-3 and 6.1-4 for W37 and W21H canisters, respectively.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Action Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP)and include any necessary actions, identify any changes to the existing AMP, and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the site QA program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control.

SENTRY W110 Transfer Cask AMP

(~~2~~ 3 pages)

Element	Description
	Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary, based on the toll gate assessments.
10 Operating Experience	Operating experience from the CoC 1026 FuelSolutions Storage System installed at Big Rock Point was utilized in the development of this AMP. As operating experience is achieved for the Sentry W110 Transfer Cask it will be added to the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID). As transfer cask inspections are performed in the future, inspection information will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

APPENDIX C: SENTRY SYSTEM INSPECTIONS

Introduction

The SENTRY Dry Storage System SAR [2.3] Section 12.2, identifies the inspection requirements for the storage system once a storage cask has been placed on the ISFSI storage pad. The following inspection requirements are identified in the SAR for the SENTRY Dry Storage System components utilized for storage of SNF at the ISFSI.

W21H and W37 Canisters

The SENTRY Dry Storage System SAR states that the W21H and W37 canisters rely on no mechanical or moving parts once they are in their storage configuration. The exposed materials are corrosion-resistant stainless steel. There are no prescribed maintenance program inspections necessary during the initial 20-year storage period. No inspection of a loaded canister during the initial 20 year storage period is required due to the integrity of the canister, as verified during fabrication, acceptance testing, and canister closure. Periodic monitoring of the W180 storage cask in accordance with the Technical Specifications provides added assurance that fuel cladding degradation does not occur.

W180 Storage Cask

The exposed surface of ~~the~~ each W180 storage cask is to be inspected ~~annually~~ at least every five (5) years for surface defects such as concrete cracking, spalling, or chipping, and for carbon steel corrosion or coating deterioration. Storage cask vent screens are visually inspected periodically and repaired or replaced as necessary. In addition, every five (5) years for the first W180 storage cask placed into service, the interior surface is to be inspected for damage by direct or indirect visual methods.

W110 Transfer Cask

Prior to each use, the W110 transfer cask is it is to be visually inspected for apparent defects or damage. The inspection is to evaluate the condition of the cask relative to sealing surfaces, interior surface condition and cleanliness, coatings, visual integrity of the welds, damage to the lifting features, and general fit-up of the components. In addition, a surface contamination survey is to be performed on the transfer cask interior.

The rupture discs (or relief valves), annulus inflatable seals, auxiliary shielding and annulus sealing ring including O-ring (for W21H configuration The bottom sealing lid O-ring and detachable lid bolt sealing washers are also to be inspected prior to each use and replaced as necessary. In addition, other transfer cask bolts and threaded holes are to be inspected prior to each use and proper lubrication of transfer cask threaded connections is to be verified. The torque on the lifting feature bolts is to be verified before each use of the transfer cask.

Inspection for defects in accessible transfer cask materials and welds is to be performed ~~annually~~periodically, and after performing major repairs to the transfer cask. The lifting feature

lugs are to be dye penetrant tested or examined with an equivalent NDE method and the bolts are to be replaced or examined with an appropriate NDE method. The tests and inspections of the lifting feature lugs are to be in accordance with ANSI N14.6 [2.9] to verify that no permanent deformation has occurred since the last inspection. The functionality of the transfer cask threaded components and quick-connect fittings is to be verified.

Baseline Inspections

Baseline inspections are to be performed on the in-scope SENTRY Dry Storage System SSC at the ISFSI site at the time the system enters the period of extended storage. The baseline inspection meets the criteria defined in the AMPs in Appendix A. The first baseline inspection should occur within one year after the 20th anniversary of the initial W180 storage cask loading at the site. Subsequent inspections will occur on a 5 year frequency ~~(+/- 25%)~~ starting from the baseline date. This schedule applies to the canister external inspection and the storage cask internal inspection.

For the storage cask external inspections, the first baseline inspection should occur within one year after the 20th anniversary of the initial W180 storage cask loading at the site. Future inspections will occur with a ~~1~~ 5 year frequency ~~(+/- 25%)~~ starting from the baseline date.

Other AMP inspections are pre-use type inspections for which the baseline inspection will occur before the first use of the applicable component after it has been in service more than the initial 20 year storage period.

Note that the High-Burnup Fuel Monitoring and Assessment AMP does not have an inspection component and the schedule is based on the demonstration project as described in the AMP in Appendix A.

SENTRY System CoC-1026 Renewal Application Addenda
Table 2-6 W110 Transfer Cask (4 pages)

Structure, System, or Component	Intended Safety Function	Material	Environment	Aging Mechanism	Aging Effect	Aging Management Activity	Technical Basis (NUREG- 2214 Section)	(a,c)	Qual CAT
Shielding box	SH	Stainless steel (welded)	Air—indoor/outdoor	Stress corrosion cracking	Cracking	No	3.2.2.5		B
		Stainless Steel	Air—indoor/outdoor	Pitting and crevice corrosion	Loss of material	No	3.2.2.2		
				Microbiologically influenced corrosion	Loss of material	No	3.2.2.4		
				Stress corrosion cracking	Cracking	No	3.2.2.5		
				Radiation embrittlement	Cracking	No	3.2.2.9		
			Embedded (lead)	Radiation embrittlement	Cracking	No	3.2.2.9		
Neutron shielding shell	SR	Stainless steel	Air—indoor/outdoor	Pitting and crevice corrosion	Loss of material	No	3.2.2.2		B
				Microbiologically influenced corrosion	Loss of material	No	3.2.2.4		
				Stress corrosion cracking	Cracking	No	3.2.2.5		
				Radiation embrittlement	Cracking	No	3.2.2.9		
			Embedded (epoxy-resin)	Radiation embrittlement	Cracking	No	3.2.2.9		
Neutron shielding	SH	Epoxy-resin	Embedded (stainless steel)	Thermal aging	Loss of ductility	W110 Transfer Cask AMP	3.3.1.2		B
				Radiation embrittlement	Cracking	W110 Transfer Cask AMP	3.3.1.3		
				Boron depletion	Loss of shielding	W110 Transfer Cask Neutron Shielding TLAA and W110 Transfer Cask AMP	3.3.1.1		
Rupture disc	SR	Stainless steel	Air—indoor/outdoor	Pitting and crevice corrosion	Loss of material	No	3.2.2.2		NITS
				Microbiologically influenced corrosion	Loss of material	No	3.2.2.4		
				Stress corrosion cracking	Cracking	No	3.2.2.5		
				Radiation embrittlement	Cracking	No	3.2.2.9		
			Embedded (stainless steel)	Radiation embrittlement	Cracking	No	3.2.2.9		
Bottom lid halves	SR	Stainless steel	Air—indoor/outdoor	Pitting and crevice corrosion	Loss of material	No	3.2.2.2		A
				Microbiologically influenced corrosion	Loss of material	No	3.2.2.4		
				Stress corrosion cracking	Cracking	No	3.2.2.5		
				Fatigue	Cracking	W110 Transfer Cask Subcomponent Fatigue TLAA	3.2.2.7		
				Radiation embrittlement	Cracking	No	3.2.2.9		
Bottom sealing lid	SH, SR	Stainless steel (welded)	Air—indoor/outdoor	Stress corrosion cracking	Cracking	No	3.2.2.5		B
		Stainless Steel	Air—indoor/outdoor	Pitting and crevice corrosion	Loss of material	No	3.2.2.2		
				Microbiologically influenced corrosion	Loss of material	No	3.2.2.4		
				Stress corrosion cracking	Cracking	No	3.2.2.5		
				Radiation embrittlement	Cracking	No	3.2.2.9		
				Wear	Loss of material	W110 Transfer Cask AMP	3.2.2.11		

*Safety Functions: Confinement (CO), Subcriticality (CR), Retrievability (RE), Radiation Shielding (SH), Structural Integrity (SR), Thermal/Heat Removal (TH)

Table 12A.1-1 SENTRY Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
1 Scope of Program	This program manages the effects of aging for the surfaces of SENTRY W21H and W37 welded stainless steel canisters that are directly exposed to the sheltered W180 storage cask environment. The scope of the program includes the following canister subcomponents: • Upper and Lower Shell • Bottom Plate • Closure Lid • Closure Ring • Port Cover • Heat Dissipation Fins (W21H Configuration Only) The following aging effects are addressed in this program: • Cracking due to stress corrosion cracking. • Loss of material (precursor to stress corrosion cracking) due to pitting and crevice corrosion. Examinations are performed of the accessible portions of the welded stainless steel dry storage canister confinement boundary external surfaces for atmospheric deposits, localized corrosion, and Stress Corrosion Cracking (SCC). In particular, examinations focus on accessible canister welds, weld heat-affected-zone areas, and known areas of the canister to which temporary supports or attachments were attached by welding and subsequently removed (based on available fabrication records) with the following attributes: • Locations where a crevice is formed on the canister surface. • Horizontal (±30-degree) surfaces where deposits may accumulate at a faster rate compared to vertical surfaces. • Canister surfaces that are cold relative to the average surface temperature. • Canister surfaces with higher amounts of atmospheric deposits. Examinations can be performed in coordination of the ASME Section XI code inspections provided in Code Case N860, “Examination Requirements and Acceptance Standards for Spent Nuclear Fuel Storage and Transportation Containment Systems.”
2 Preventive Actions	Condition monitoring is utilized to manage aging effects. During fabrication of the canisters, however, preventative actions were used to minimize corrosion and stress corrosion cracking by selection of stainless steel materials. In addition, fabrication controls were in place during canister fabrication to support improved canister corrosion resistance. Although these preventative actions minimize the likelihood of aging effects, they cannot replace condition monitoring during the storage period. As this AMP is based on condition monitoring, new preventative actions are not included.

Table 12A.1-1 SENTRY Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
3 Parameters Monitored / Inspected	The parameters monitored and/or inspected under this AMP include: • Visual inspections to look for evidence of discontinuities and imperfections, such as localized corrosion, including pitting corrosion and stress corrosion cracking of the accessible canister welds and weld heat affected zones. • The size and location of localized corrosion or stress corrosion cracks. • The inspections also look for the appearance and location of deposits on the canister surfaces.
4 Detection of Aging Effects	Visual inspection of the canister surface is to be performed per ASME Code Section XI, Article IWA-2200 for VT-3 examinations utilizing a video camera, fiber-optic scope or other remote inspection device for the accessible areas of the canister surface since direct visual examination may not be possible due to neutron and gamma radiation fields near canister surfaces within the storage cask. Additional assessments are to be performed as necessary for suspected areas of localized corrosion and SCC. VT-1 visual examinations are performed per acceptance criteria when indicated by the assessment of the VT-3 results. Indications of corrosion within 2 inches of a weld are to receive an augmented surface examination for the presence of cracking. Volumetric examination consistent with the requirements of ASME Code Section XI, IWB-2500, for category B-J components may also be utilized to assess the presence of cracking. Inspection of selected areas on the canister may be upgraded to the VT-1 standard. The inspection is to be performed on a minimum of one canister of each type (e.g., W21H and W37) when used at each ISFSI based on the following criteria: • EPRI Susceptibility Criteria {Ref: Technical Report 3002005371}. • Age of the Canister. • Canister loaded with Lowest Heat Load. • Canisters with the greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and greatest potential for the accumulation and deliquescence of deposited salts that may promote localized corrosion and SCC. • Where applicable, canister with previously identified manufacturing deviations which may affect the surface. Inspections are to be performed by qualified individual(s) every 5 years starting with the first inspection performed within one (1) year after the initial canister's 20th year loading anniversary at the site. If possible, examinations should occur on the same canister to support trending.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Inspection records including photos and /or videos are to be retained for comparison in subsequent examinations. Changes to the size or location of discolored areas (e.g. rust),

Table 12A.1-1 SENTRY Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
	localized corrosion, pitting and crevice corrosion, and/or stress corrosion cracking should be identified and assessed for further evaluation or subsequent inspections. Trending of parameters or effects include the locations and size of any areas of localized corrosion or SCC, disposition of canisters with identified aging effects and the results of any supplemental canister inspections.
6 Acceptance Criteria	No indications of localized corrosion pits, etching, crevice corrosion, stress corrosion cracking, red-orange-colored corrosion products emanating from crevice locations, or red-orange-colored corrosion products in the vicinity of canister fabrication welds, closure welds, and welds associated with temporary attachments during canister fabrication. Minor surface corrosion is acceptable. Identified flaws may be assessed in accordance with the acceptance standards identified in ASME Code Section XI, IWB-3514. Results of Inspections Requiring Additional Evaluation Indications of interest (locations on the canister surface susceptible to SCC including areas adjacent to fabrication welds, closure welds, locations where temporary attachments may have been welded to and subsequently removed from the canister and weld heat-affected zones) that are subject to additional examination and disposition through the corrective action program include: • Localized corrosion pits, crevice corrosion, stress corrosion cracking, and etching; deposits or corrosion products. • Red-orange-colored corrosion products or red-orange-colored corrosion tubercles with deposit accumulations especially when adjacent to welds or weld heat affected zones and locations where temporary attachments were welded to and subsequently removed from the canister. • Appearance of any color of liner corrosion products of any size parallel to or traversing fabrication welds, closure welds, and weld heat affected zones. • Red-orange colored corrosion products greater than 1 mm in diameter combined with deposit accumulations on any location of the canister. • Red-orange colored corrosion tubercles of any size.
7 Corrective Actions	Indications not meeting the acceptance criteria above (AMP element 6) require additional evaluation after being entered into the site's corrective action program. An evaluation is to be performed to determine the extent and impact of the corrosion on the canister's ability to perform its intended function. The site's Quality Assurance (QA) program ensures that corrective actions are completed within the Corrective Action Program (CAP)and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.

Table 12A.1-1 SENTRY Welded Stainless Steel Canister AMP

(4 pages)

Element	Description
8 Confirmation Process	The confirmation process is to be commensurate with the site's QA program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The site QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on the toll gate assessments.
10 Operating Experience	Operating experience from the CoC 1026 FuelSolutions Storage System installed at Big Rock Point was utilized in the development of this AMP. As operating experience is achieved for the SENTRY canisters, it will be added to the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID). As canister inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

Table 12A.1-2 SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
1 Scope of Program	The AMP addresses reinforced concrete structures such as the concrete portions of the SENTRY W180 Storage Cask. The associated SSCs include the concrete shell and reinforcing steel in air-outdoor or air-outdoor groundwater environments. The following aging effects are addressed in this program: • Cracking or loss of material (spalling, scaling) due to freeze-thaw degradation. • Cracking, loss of strength, and loss of material (spalling, scaling) due to aggressive chemical attack. • Cracking, and loss of strength due to reaction with aggregates. • Loss of material (spalling, scaling) due to salt scaling. • Loss of strength, increase in porosity and permeability, and reduction of concrete pH (reducing corrosion resistance of steel embedments) due to leaching of calcium hydroxide. • Cracking, loss of strength, loss of material (spalling, scaling), and loss of concrete/steel bond due to corrosion of reinforcing steel. Although the ISFSI Storage Pad is not considered within the scope of this AMP, it should be inspected for aging effects.
2 Preventive Actions	Condition monitoring is utilized to manage aging effects including continuance of inspections of air inlet/outlet vents to confirm they are not blocked which also ensures design temperature limits are not exceeded and thermal dehydration of the concrete remains noncredible during the period of extended operation. As the storage cask reinforced concrete is designed and analyzed in accordance with the applicable provisions of ACI-349 and constructed using standard commercial practices, in accordance with the applicable provisions of ACI-318, no additional preventive actions are required.
3 Parameters Monitored / Inspected	The accessible and exposed concrete surfaces are visually examined for indications of surface deterioration. The parameters monitored or inspected quantify the following aging effects: • Cracking. • Loss of material (spalling, scaling). • Increased porosity/permeability. Degradation could affect the ability of the concrete to provide radiation shielding, to provide a path for heat transfer and to provide tornado missile shielding.
4 Detection of Aging Effects	To manage and verify the shielding performance of the storage cask concrete during the period of extended operation, the AMP includes a visual inspection of the readily accessible exterior surfaces of the storage cask to detect if there are any aging effects. The visual inspection shall identify cracking, loss of material (spalling, scaling), increased porosity/permeability, staining or other degradation-related activity and the degree of damage. This visual inspection identifies the current

Table 12A.1-2 SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
	exterior condition of the storage cask and shall identify the extent and cause of any aging effects noted. This visual inspection uses the inspection evaluation and acceptance criteria of ACI-349.3R-02 (ACI, 2010) and will be conducted at least once every five (5) years on each storage cask in operation during the period of extended storage by personnel meeting the qualification requirements in Chapter 7 of ACI-349.3R-02 (ACI, 2010). Since the interior of the storage cask cavity and vents have a steel lining, the Monitoring of Metallic Surfaces AMP addresses these metallic portions of the storage cask. Data from all inspection and monitoring activities, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results for the inspection will be documented, including descriptions of observed aging effects and supporting sketches, photographs or video. Inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Monitoring and trending of the results from documented inspection should support the ability to evaluate the results against acceptance criteria. Methods are commensurate with consensus defect evaluation guides and standards. The inspections and surveillances described for reinforced concrete are performed periodically in order to identify areas of degradation. The results will be evaluated by a qualified individual, and areas of degradation not meeting established criteria will be documented in the site's corrective action program for resolution or detailed evaluation. Inspection records, including photos and /or videos, are to be retained for comparison in subsequent examinations. The results from the visual inspections will be compared against previous inspections in order to trend progression of identified aging effects over time.
6 Acceptance Criteria	American Concrete Institute Standard 349.3R-02 includes quantitative three-tier evaluation and acceptance criteria for visual inspections of concrete surfaces as follows: • Tier 1 acceptance without further evaluation. • Tier 2 acceptance after review. • Tier 3 acceptance requiring further evaluation. Acceptance signifies that a component is free of significant deficiencies or degradation that could lead to the loss of structural integrity. Acceptable after review signifies that a component contains deficiencies or degradation but will remain able to perform its design basis function until the next inspection or repair. Acceptance requiring further evaluation signifies that a component contains deficiencies or degradation that could prevent (or could prevent prior to the next inspection) the ability to perform its design basis function. Degradations or

Table 12A.1-2 SENTRY System Reinforced Concrete Structures AMP

(4 pages)

Element	Description
	conditions meeting the ACI 349.3R-02 Tier 2 and 3 criteria will be entered into the site's corrective action program for evaluation and resolution. The loss of material due to age-related degradation will be evaluated by qualified personnel in accordance with ACI 349.3R-02. A technical basis will be provided for any deviation from ACI 349.3R-02 acceptance criteria.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's corrective action program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g. increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control. Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on the toll gate assessments.
10 Operating Experience	Operating experience from the CoC 1026 FuelSolutions Storage System installed at Big Rock Point was utilized in the development of this AMP. As operating experience is achieved for the Sentry W180 Storage Cask, it will be added to the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID). As storage cask inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

Table 12A.1-3 SENTRY System Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
1 Scope of Program	This program monitors the effects of aging of metallic surfaces for the SENTRY W180 Storage Cask and Fuel Transfer and Auxiliary Equipment including: (1) The external surfaces of steel and stainless steel subcomponents that are directly exposed to air-outdoor or sheltered environments (2) The coating on exposed carbon steel surfaces. The scope of the program includes the following cask subcomponents and the applicable site fuel transfer and auxiliary equipment: • Storage Cask Steel Liner Body • Storage Cask Steel Bottom Lower Cap • Storage Cask Steel Top Cover • Storage Cask Top • Storage Cask Inner Block • Storage Cask Closing Bolts and Washers • Storage Cask Top and Bottom Vents • Storage Cask Top and Bottom Tip Over Devices (W37 Configuration) • Storage Cask End Drop Device (W37 Configuration) • Storage Cask Tip Over Device (W21H Configuration) • Storage Cask End Drop Device (W21H Configuration) • Storage Cask Auxiliary Shielding and Support Ring (W21H Configuration) • Storage Cask Positioning Plate (W21H Configuration) • Transfer Cask Lifting Yoke • Lifting Yoke Paddle Extension • Transfer Matting Device • Active Cooling System Metallic Surfaces • Canister Handling Device (Vertical Canister Lift Fixture) • Coating on Exposed Carbon Steel Surfaces The following aging effects are addressed in this program: • Loss of material is due to general corrosion, galvanic corrosion, and pitting and crevice corrosion. • Cracking is due to stress corrosion cracking. • Coating degradation on steel surfaces due to radiation embrittlement and thermal aging. Periodic visual inspections monitor for general and localized corrosion, and coating degradation.
2 Preventive Actions	This program is a condition monitoring program to detect evidence of degradation. It does not provide guidance for the prevention of aging.

Table 12A.1-3 SENTRY System Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
3 Parameters Monitored / Inspected	This program monitors the condition of external metallic surfaces to identify general corrosion and localized corrosion. Localized corrosion of stainless steels may be a precursor to stress corrosion cracking (SCC). Parameters monitored or inspected for external metallic surfaces include: • Visual evidence of discontinuities, imperfections, and rust staining indicative of corrosion, and SCC. • Visual evidence of coating degradation (e.g., blisters, cracking, flaking, delamination) indicative of corrosion of the base metal. Accessible storage cask internal surfaces are inspected for indications of corrosion and wear and coating degradation.
4 Detection of Aging Effects	Inspections are performed by personnel qualified in accordance with site procedures and programs to perform the specified task. Visual inspections follow site procedures that are demonstrated to be capable of evaluating conditions against the acceptance criteria. Readily Accessible Surfaces Inspections cover 100 percent of normally accessible surfaces, including the external metallic surfaces, bolting, covers, vents, and other metallic components. The visual survey performed on metallic surfaces will identify the source of any staining or corrosion-related activity and the degree of damage. A visual inspection of the metallic exterior surfaces of the storage cask to detect aging effects is conducted annually. Visual inspections of fuel transfer and auxiliary equipment shall be performed at a minimum of once a year while in use. If the fuel transfer and auxiliary equipment is not used, a pre-use visual inspection shall be performed. When the fuel transfer and auxiliary equipment is not in use, periodic inspections are not needed. The visual inspections are performed in accordance with site implementing procedures. Normally Inaccessible Surfaces A visual inspection of the interior areas of the storage cask shall be performed with remote inspection techniques such as a video camera, fiber-optic scope or other remote inspection device. The visual inspection should include an examination of the accessible areas of the cask internal surfaces for coating degradation and corrosion. This visual inspection of the metallic components shall meet the requirements of a VT-3 Examination, as given in the ASME Boiler & Pressure Vessel Code (B&PVC) Section XI, Article IWA-2200, to the extent practical, even though they are not ASME components. The internal inspection shall be performed on one storage cask at a frequency of 5 years. The first inspection should occur within one (1) year after the initial canister's

Table 12A.1-3 SENTRY System Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
	20th year loading anniversary. The site may consider using the storage cask that contains the canister being used for the Welded Stainless Steel Canister AMP to consolidate efforts. Data from inspections shall be documented, including a detailed description of the surface condition and location of areas showing surface degradation.
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans and procedures are used to: • Establish a baseline before or at the beginning of the period of extended operation. • Track trending of parameters or effects not corrected following a previous inspection, including – Locations and size of any areas of corrosion, wear or cracking. – Disposition of components with identified aging effects and the results of supplemental inspections.
6 Acceptance Criteria	The acceptance criteria for the visual inspections are: • No detectable loss of material from the base metal, including uniform wall thinning, localized corrosion pits, and crevice corrosion. • No indications of loose bolts or hardware, displaced parts. • No degradation (e.g., blisters, cracking, flaking, delamination) of coatings on metallic surfaces indicative of base metal corrosion. If evidence of corrosion is identified, then the severity of the degradation must be determined using approved site-specific procedures. These may include additional visual, surface or volumetric NDE methods to determine the loss of material.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Actions Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The site's QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP) and include any necessary functionality assessments, cause evaluations, extent of condition, actions, identify any modifications to the existing AMP (e.g., increased frequency), and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the ISFSI QA Program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and completion of inspections, evaluations, and corrective actions are completed in accordance with the ISFSI CAP.
9 Administrative Controls	The ISFSI QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control.

Table 12A.1-3 SENTRY System Monitoring of Metallic Surfaces AMP

(4 pages)

Element	Description
	Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary based on the toll gate assessments.
10 Operating Experience	Operating experience from the CoC 1026 FuelSolutions Storage System installed at Big Rock Point was utilized in the development of this AMP. As operating experience is achieved for the SENTRY W180 Storage Cask and fuel transfer and auxiliary equipment, it will be added to the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID). As storage cask inspections are performed in the future, inspection results will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

Table 12A.1-4 SENTRY W110 Transfer Cask AMP

(3 pages)

Element	Description
1 Scope of Program	The program covers the subcomponents of the W110 Transfer Cask to ensure that aging effects do not challenge the capability of the transfer casks to fulfill structural support, radiation shielding, and heat transfer functions. The effected SSCs include the transfer cask bottom sealing lid for wear, thread inserts when used in stainless-steel threaded connections, and the coating on the external surfaces of the transfer cask. This program monitors bottom lid sealing and threaded inserts for wear and coating degradation to ensure that aging effects do not challenge the capability of the transfer cask to fulfill structural support, radiation shielding, and heat transfer functions. The Transfer Cask AMP includes inspections of the coated areas for coating degradation due to radiation embrittlement and thermal aging and the bottom sealing lid and the thread inserts for loss of material due to wear.
2 Preventive Actions	The Transfer Cask AMP utilizes condition monitoring to detect degradation and ensure that the equipment maintains its intended function through the extended storage period. No preventative actions are included as part of this AMP.
3 Parameters Monitored / Inspected	The Transfer Cask AMP inspects for visual evidence of degradation of accessible surfaces, and deterioration of the neutron shielding material performance.
4 Detection of Aging Effects	The Transfer Cask AMP manages loss of material due to wear, predominately for stainless steel components, degradation of the coating on the external parts of the transfer cask, and deterioration of the neutron shielding material performance. Inspections shall be performed at a minimum once a year while in use. If the Transfer Cask is not used, a pre-use inspection is appropriate for the Transfer Cask. When the Transfer Cask is not in use, periodic inspections are not needed. Visual inspections are performed in accordance with the ASME Code Section XI, Article IWA-2213, for VT-3 examinations. The inspections cover 100 percent of the normally accessible cask surfaces, including the cask exterior, cask interior cavity, cover surfaces, and the cask bottom. The Transfer Cask lifting feature lugs and bottom lid halves bolts shall be dye penetrant tested or examined with an equivalent NDE method for fatigue cracking. A radiological surveillance inspection of the [ ]$^{(a,c)}$ epoxy-resin neutron shielding material performance in the side walls of a loaded transfer cask shall be performed once per loaded fuel canister transfer campaign using calibrated neutron detection equipment and qualified radiation protection program personnel. Data from these inspections, including evidence of degradation and its extent and location, shall be documented on a checklist or inspection form. The results of the inspection shall be documented, including descriptions of observed aging effects and supporting sketches, photographs, or video. Corrective actions resulting from each AMP inspection shall also be documented.

Table 12A.1-4 SENTRY W110 Transfer Cask AMP

(3 pages)

Element	Description
5 Monitoring and Trending	Inspection results are compared to those obtained during previous inspections, so that the progression of degradation can be evaluated and predicted. Monitoring and trending methods and plans/procedures are used to: • Establish a baseline before the use of the transfer cask in the first loading campaign in the period of extended operation. • Track trending of parameters or effects not corrected following a previous inspection. ➢ The locations, size, and depth of any areas of corrosion. ➢ The disposition of components with identified aging effects and the results of supplemental inspections. ➢ The deterioration of the epoxy-resin neutron shielding material performance.
6 Acceptance Criteria	For accessible surfaces, acceptance criteria are no detectable loss of material from the base metal, including uniform wall thinning, and wear scratches/gouges/thread galling. If evidence of wear, or coating degradation are identified, then the severity of the degradation of the base metal must be determined using approved site-specific procedures. These may include additional visual, surface, or volumetric NDE methods to determine the loss of material. If evidence of wear or thread galling are identified on the thread inserts they shall be replaced. Coating acceptance criteria are no degradation or interruptions (e.g., chipping/scratches/flaking) of the coated surface. For acceptance of the [ ]$^{(a,c)}$ epoxy-resin neutron shielding material performance in the side walls of a loaded transfer cask, the side wall neutron dose rates shall not exceed the Side, Active Region Maximum, Contact, Conservative Neutron Dose Rates in SENTRY SAR Tables 6.1-3 and 6.1-4 for W37 and W21H canisters, respectively.
7 Corrective Actions	Results that do not meet the acceptance criteria are addressed by the site's Corrective Action Program (CAP) in accordance with the ISFSI Quality Assurance (QA) program. The QA Program ensures that corrective actions are completed within the ISFSI Corrective Action Program (CAP)and include any necessary actions, identify any changes to the existing AMP, and determine if the condition is reportable per 10 CFR 72.75.
8 Confirmation Process	The confirmation process will be commensurate with the site QA program. The QA program ensures that the confirmation process includes provisions to preclude repetition of significant conditions adverse to quality and the completion of inspections, evaluations, and corrective actions.
9 Administrative Controls	The QA program ensures that administrative controls include provisions that address instrument calibration and maintenance, inspector requirements, record retention requirements, and document control.

Table 12A.1-4 SENTRY W110 Transfer Cask AMP

(3 pages)

Element	Description
	Administrative controls also address the frequency for updating the AMP based on inspection results along with industry operating experience. This AMP will be updated as necessary, based on the toll gate assessments.
10 Operating Experience	Operating experience from the CoC 1026 FuelSolutions Storage System installed at Big Rock Point was utilized in the development of this AMP. As operating experience is achieved for the Sentry W110 Transfer Cask it will be added to the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID). As transfer cask inspections are performed in the future, inspection information will be uploaded into the ISFSI Aging Management Institute of Nuclear Power Operations Database (ISFSI AMID) to be shared with other users.

SENTRY Drawing WDD-DW-00126 is Westinghouse Proprietary Class 2 in it's entirety.
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