# Enclosure 6

Calculation No. VSC-04.3101, Revision 3,
VSC-24 CoC Renewal Aging Management Review
(1 paper copy)

| ENERGY*SOLUTIONS*<br>***Spent Fuel Division*** | **CALCULATION PACKAGE** | Calc. Pkg No. VSC-04.3101<br>File No.: VSC-04.3101<br>Revision: 3 |
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**PROJECT/CUSTOMER:**

VSC-04 / VSC-24 General Licensees

**TITLE:**

VSC-24 CoC Renewal Aging Management Review

**SCOPE:**

Product: ☐ FuelSolutions™ ☒ VSC-24 ☐ Other ____________
Service: ☒ Storage ☐ Transportation ☐ Other ____________
Conditions: ☒ Normal ☐ Off-Normal ☐ Accident ☐ Other ____________

Component(s):

VSC-24 System

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# RECORD OF REVISIONS

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| 0 | All | --- | Initial Issue | J. Hopf | S. Sisley |
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# *RECORD OF VERIFICATION*

| | **YES** | **NO** | **N/A** |
|---|---|---|---|
| (a) The objective is clear and consistent with the analysis. | ☒ | ☐ | |
| (b) The inputs are correctly selected and incorporated into the design. | ☒ | ☐ | ☐ |
| (c) References are complete, accurate, and retrievable. | ☒ | ☐ | ☐ |
| (d) Basis for engineering judgments is adequately documented. | ☒ | ☐ | ☐ |
| (e) The assumptions necessary to perform the design activity are adequately described and reasonable. | ☐ | ☐ | ☒ |
| (f) Assumptions and references, which are preliminary, are noted as being preliminary. | ☐ | ☐ | ☒ |
| (g) Methods and units are clearly identified. | ☒ | ☐ | ☐ |
| (h) Any limits of applicability are identified. | ☒ | ☐ | ☐ |
| (i) Computer calculations are properly identified. | ☐ | ☐ | ☒ |
| (j) Computer codes used are under configuration control. | ☐ | ☐ | ☒ |
| (k) Computer codes used are applicable to the calculation. | ☐ | ☐ | ☒ |
| (l) Input parameters and boundary conditions are appropriate and correct. | ☒ | ☐ | |
| (m) An appropriate design method is used. | ☒ | ☐ | |
| (n) The output is reasonable compared to the inputs. | ☒ | ☐ | |
| (o) Conclusions are clear and consistent with analysis results. | ☒ | ☐ | |

COMMENTS:

All comments resolved.

Verifier: Digitally signed by Steven Sisley
Date: 2014.03.27 15:59:06 -07'00'

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# 1. INTRODUCTION

## 1.1 Objective

The VSC-24 Ventilated Storage Cask System Storage Certificate of Compliance (CoC) (Reference 3.2.16) was initially issued on May 7, 1993 with an expiration date of May 7, 2013. Energy*Solutions* (ES) is applying for renewal of CoC No. 1007 for a term of 40 years (i.e., extended storage period to 60 years). The objective of this Aging Management Review (AMR) is to address the following four (4) areas, in accordance with the guidance of NUREG-1927 (Reference 3.2.1):

- Identification of materials and environments for in-scope SSCs,
- Identification of aging effects requiring management,
- Identification of Time Limited Aging Analyses (TLAAs), and
- Identification of Aging Management Programs (AMPs) for managing the effects of aging.

Fuel retrievability is addressed in a separate document.

## 1.2 Purpose

The purpose of the AMR is to assess potential aging effects that could adversely affect the ability of in-scope Structures, Systems, and Components (SSCs) to perform their intended functions, and the means by which they will be managed during the extended storage period.

## 1.3 Scope

The scope of this evaluation addresses the in-scope SSCs of the VSC-24 storage system for the extended storage period (60-years.) As discussed in Reference 3.1.1, the in-scope SSCs include the spent fuel assemblies, Multi-assembly Sealed Basket (MSB) assembly, Ventilated Concrete Cask (VCC) assembly, and MSB Transfer Cask (MTC) assembly. Section 6.1 identifies the materials and environments for in-scope SSCs of the VSC-24 Storage System. Section 6.2 identifies and discusses the potential aging effects that require management during the extended storage period, either by TLAA, AMP, or both. The TLAAs that support the VSC-24 CoC renewal are summarized in Section 6.3.1. The AMPs that are credited with managing the possible aging effects of the in-scope SSCs during the extended storage period are discussed in Section 6.3.2.

# 2. REQUIREMENTS

## 2.1 Design Inputs

None.

## 2.2 Regulatory Commitments

None.

## 3. REFERENCES

### 3.1 BFS Calculation Packages

3.1.1. VSC-04.3100, Revision 3, “VSC-24 CoC Renewal Scoping Evaluation”.

3.1.2. VSC-04.3202, Revision 0, “Helium Leakage Analysis.”

3.1.3. VSC-04.3201, Revision 1, “Estimation of Cladding Creep Rate in the VSC-24 Cask System after 40 Years of Dry Storage.”

3.1.4. VSC-04.3200, Revision 1, “MSB-24 Corrosion Analysis.”

3.1.5. VSC-04.3204, Revision 2, “Radiation Effects on VSC-24 Cask System Materials Over 60 Years of Storage.”

3.1.6. VSC-04.3203, Revision 1, “MSB Assembly Fatigue Analysis.”

3.1.7. Structural Integrity Associates, Inc., File No. 1200250.301, Revision 0, “Flaw Tolerance Evaluation of Spent Fuel Cask MSB #4 for Palisades Power Plant.”

3.1.8. WEP-109-003.12, Revision 1, “Generation of a Heat Load vs. Fuel Temperature Curve.”

3.1.9. VSC-04.3206, Revision 0, “Effect of Loss of MSB RX-277 Neutron Shielding After 20 Years of Storage.”

### 3.2 General References

3.2.1. U.S. Nuclear Regulatory Commission, NUREG-1927, “Standard Review Plan for Renewal of Spent Fuel Storage Dry Cask Storage System Licenses and Certificates of Compliance,” March 2011.

3.2.2. ASTM C1562-10, “Standard Guide for Evaluation of Materials Used in Extended Service of Interim Spent Nuclear Fuel Storage Systems”.

3.2.3. U.S. Nuclear Regulatory Commission, NUREG/CR-6745, “Dry Cask Storage Characterization Project – Phase 1: CASTOR V/21 Cask Opening and Examination”, September 2001.

3.2.4. U.S. Nuclear Regulatory Commission, NUREG/CR-6831, “Examination of Spent PWR Fuel Rods after 15 Years in Dry Storage”, September 2003.

3.2.5. EnergySolutions Spent Fuel Division, Inc., “Final Safety Analysis Report for the VSC-24 Ventilated Storage Cask System,” Docket No. 72-1007, Revision 8, April 2009.

3.2.6. U.S. Nuclear Regulatory Commission, Interim Staff Guidance 11, Rev. 3, “Cladding Considerations for the Transportation and Storage of Spent Fuel”, November 2003.

3.2.7. ACI 221.1R-98, “State-of-the-Art Report on Alkali-Aggregate Reactivity.”

3.2.8. U.S. Nuclear Regulatory Commission, NRC Inspection Report No. 72-1007/97-204 and Notice of Nonconformance, April 15, 1997.

3.2.9. Sierra Nuclear Corporation, "VSC Weld Cracking Evaluation in Response to NRC CAL 97-7-001", July 1997.

3.2.10. VSC-04.0004.001, Letter from John Meyers to Steve Sisley, "Provide EnergySolutions with Requested ANO Documentation for VSC-24 License Renewal", February 17, 2012.

3.2.11. VSC-04.0004.002, Letter from Gary Hollinger to Steve Sisley, "NextEra Energy Contract 00410614, Dry Fuel Storage VSC Certificate of Compliance", January 17, 2012.

3.2.12. VSC-04.0004.003, E-Mail from Robert VanWagner to Steve Sisley, "Documentation of Submittal", March 1, 2012.

3.2.13. NRC Letter to SNC, October 16, 1998, "Subject: Withdrawal of VSC-24 Safety Analysis Report Amendment Request (TAC No. L21826, Docket No. 72-1007)", BFS Letter No. NRC/BFS 98-009.

3.2.14. BFS Letter to NRC, Letter No. BFS/NRC 02-021, September 27, 2002, "Subject: Response to Remaining Questions on the Ventilated Storage Cask (VSC-24) Safety Analysis Report (SAR) from NRC Letter Dated October 16, 1998."

3.2.15. NRC Letter to BNFL Fuel Solutions Corporation, Received September 20, 2001, "Subject: VSC-24 Dry Storage System Amendment Request Regarding Demand for Information Issues", BFS Letter No. NRC/BFS 01-012.

3.2.16. U.S. Nuclear Regulatory Commission, Certificate of Compliance for Spent Fuel Storage Casks, Model No.: Ventilated Storage Cask (VSC-24), Certificate No. 1007, Docket No. 72-1007, Initial Issue (Effective May 7, 1993); Amendment No. 1 (Effective May 30, 2000); Amendment No. 2 (Effective September 5, 2000); Amendment No. 3 (Effective May 21, 2001); Amendment No. 4 (Effective February 3, 2003); Amendment No. 5 (Effective September 13, 2005); Amendment No. 6 (Effective June 27, 2006)..

3.2.17. American Society of Mechanical Engineers, ASME Boiler & Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, Subsection IWL, *Requirements for Class CC Concrete Components of Light-Water Cooled Plants*, 2004 Edition.

3.2.18. ACI 349.3R-02, *"Evaluation of Existing Nuclear Safety Related Concrete Structures."*

3.2.19. VSC-24 Lead Cask Inspection Report, Revision 1, February 11, 2013.

3.2.20. U.S. Nuclear Regulatory Commission, NUREG/CR-6732, "Zinc-Zircaloy Interaction in Dry Storage Casks", June 2001.

3.2.21. ACI 201.112-08, "Guide for Conducting a Visual Inspection of Concrete in Service", American Concrete Institute.

3.2.22. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA-HIF-09-004, *Report on the Diagnosis, Prognosis, and Mitigation of Alkali-Silica Reaction (ASR) in Transportation Structures*, January 2010.

3.2.23. American Society of Mechanical Engineers, ASME Boiler & Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, Subsection IWE, *Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants*, 2004 Edition.

# 4. ASSUMPTIONS

## 4.1 Design Configuration

N/A

## 4.2 Design Criteria

N/A

## 4.3 Calculation Assumptions

None.

## 5. CALCULATION METHODOLOGY

The AMR follows the methodologies recommended in NUREG-1927 (Reference 3.2.1.) The scoping evaluation (Reference 3.1.1) identifies the in-scope SSCs for which potential aging effects must be identified and evaluated. For each component (and sub-component), the material of construction and the environment to which the component is exposed are determined. The component environments are determined based on the component's location within the cask system, along with the conditions that may apply at the plant sites.

After the component material/environment combinations are determined, potential aging management effects are determined. Engineering literature is reviewed to identify expected aging/degradation mechanisms for different materials and environments. However, the evaluation primarily relies on VSC-24 cask system operating experience, and cask system inspection observations, to identify the aging effects that will require attention. An exception to this is the potential aging of the spent fuel assembly payload (which is sealed inside the MSB, and therefore cannot be directly observed or inspected). For the spent fuel assemblies, the evaluation relies on the information and guidance given in NUREG/CR-6745 and NUREG/CR-6831 (References 3.2.3 and 3.2.4).

After the potential aging effects are identified, it is determined whether the effects can be addressed by analysis (TLAA), through existing maintenance procedures, or will require an AMP. An example of the former would be corrosion of the carbon steel MSB radial shell, for which the amount of corrosion that would occur over 60 years in a worst-case (marine) environment has been determined, and is conservatively accounted for in the updated TLAA. Active management may also not be required if the expected degradation of the component would not result in its failure to perform its critical design functions. AMPs are developed to manage those aging effects that are not adequately addressed by TLAA.

## 6. CALCULATIONS

The identification of the VSC-24 system components (and sub-components) for which AMR is required, along with their associated material compositions and design functions, is discussed in Section 6.1. The determination of potential aging effects is discussed in Section 6.2. The Aging Management Activities (AMAs) that are credited with managing aging effect during the extended storage period are discussed in Section 6.3.

### 6.1 Identification of Component Materials and Environments

The VSC-24 storage system scoping evaluation (Reference 3.1.1) concludes that the MSB, VCC, MTC, and spent fuel assemblies are in-scope. All other equipment (e.g., ancillary equipment and equipment used in the loading process), as well as the ISFSI pad, are not in-scope. The complete list of sub-components for the MSB, VCC, MTC and spent fuel are listed in Table 6-2 through Table 6-5, respectively. The list includes all components and sub-components that are identified in the VSC-24 system SAR drawings. The list of sub-components, their material compositions, and their design functions (criticality control, heat transfer, structural support, radiation shielding and confinement), is taken directly from Table 2 through Table 5 of Reference 3.1.1.

#### 6.1.1 Component Materials

The materials of construction for each sub-component of the in-scope SSCs are listed in Table 6-2 through Table 6-5 and discussed in the following sub-sections.

#### 6.1.1.1 MSB Assembly

The MSB assembly is constructed almost entirely from carbon steel (primarily SA-516, Grade 70), with the exception of the castable neutron shielding material (RX-277) that is sealed within the carbon steel MSB lid. The carbon steel shell, bottom plate, top lids, and internal basket are all coated with a radiation-resistant, high-temperature, non-organic hard surface, such as Dimetcote 6 or Carbo-Zinc 11. The function of the coating is to protect the pool chemistry during the fuel loading operations and facilitate decontamination of the external surfaces of the MSB shell prior to loading the MSB assembly into the VCC assembly. The coating on the outside of the MSB shell and bottom plate is not relied on for corrosion protection during storage operations. A conservative corrosion allowance is applied on the radial and bottom outer surfaces of the MSB assembly.

The RX-277 neutron shielding material is sealed inside carbon steel casing plates. During the fabrication process, the RX-277 material is baked before being placed into the MSB lid to remove excess (unbound) water.

#### 6.1.1.2 VCC Assembly

The VCC assembly is constructed primarily of two types of materials; carbon steel (A36) and concrete. The VCC assembly is lined with a carbon steel inner shell and bottom plate. The liners that form the inlet and outlet duct structures are also constructed from carbon steel, as are the cask shield ring (which lies above the main ventilation duct) and the cask lid. All carbon steel surfaces that are exposed to air (as opposed to being covered with concrete) are coated with Dimetcote 6, or an equivalent coating.

The VCC also employs thick, steel-reinforced, concrete shielding on the sides and bottom. The concrete lies below the steel bottom plate, outside and steel radial liner, and envelops the inlet and outlet duct structures. The concrete is constructed from Type II Portland cement and is reinforced with A615 Grade 60 steel bars.

Other materials used to construct the VCC assembly include ceramic tiles that are placed at the bottom of the VCC cavity, which support the MSB assembly during normal storage operations and separate the bottom of the MSB assembly from the VCC bottom plate. The purpose of the ceramic tiles it to prevent contact between the MSB and the VCC, in order to prevent crevice corrosion or any bonding between the two surfaces.

As shown in Table 3, two minor VCC components are constructed from metals other than carbon steel. These are the inlet and outlet screens and the moly bolts that are used to fasten the screens to the ducts, both of which are zinc-plated.

#### 6.1.1.3 MTC Assembly

The MTC assembly consists of three primary materials; carbon steels (A588 Grade A or B, A516 Grade 70 and A36), common lead, and castable neutron shielding material (RX-277).

The carbon steel inner radial liner, outer radial shell, and top and bottom plates (or flanges) create a annular cavity in which the lead gamma shield and RX-277 neutron shield are sealed. Carbon steel heat transfer fins are embedded within the RX-277 neutron shield. The MTC assembly also features a top ring (which prevents the MSB from being lifted out of the MTC), lifting trunnions, and a bottom door and rail structure, all of which are also constructed of carbon steel.

All carbon steel components of the MTC are covered with Dimetcote 6, or equivalent, to protect the pool chemistry during the fuel loading operations, facilitate decontamination, and provide corrosion protection.

The only metal MTC components that may not be carbon steel are the (A325) bolts used to fasten on the MTC lid.

#### 6.1.1.4 Spent Fuel Assemblies

The spent fuel assembly payload consists of zircaloy fuel rod cladding (and end caps), spacer grids and guide tubes that may be zircaloy or stainless steel, and assembly top and bottom nozzle structures that may consist of stainless steel, inconel, or both. Sealed within the fuel rods are the burned ceramic fuel pellets, which consist of $UO_2$ along with a wide array of other actinide and fission product isotopes.

The VSC-24 system is also licensed to store various assembly control components (such as burnable poison rod assemblies, thimble plug assemblies and control rod assemblies). These rodded inserts may feature zircaloy or stainless steel rod cladding, stainless steel or inconel top fittings, and may contain neutron absorbing materials such as boron carbide, borosilicate glass or silver-indium-cadmium. The VSC-24 is also licensed to store assemblies that contain zircaloy or stainless steel dummy rods in place of fuel rods in one or more array locations.

The VSC-24 system is not licensed to store either stainless steel clad or MOX fuel assemblies.

### 6.1.2 Component Environments

### 6.1.2.1 Plant Site Environments

The VSC-24 storage system is currently used at three nuclear plant sites; the Point Beach site in Wisconsin (on the western shore of Lake Michigan), the Palisades plant in southwest Michigan (on the eastern shore of Lake Michigan) and the Arkansas Nuclear One site, which lies on a smaller lake (Lake Dardanelle, a dam-created lake on the Arkansas River) in northwest Arkansas. All three sites lie on moderate to large bodies of fresh water in the central region of the United States, relatively far from the oceans or Gulf of Mexico, so none of them constitute a marine environment. All three sites have moderate levels of rainfall and humidity (e.g., none are considered a desert or a swamp/coastal region). The average monthly temperatures at Point Beach and Palisades range from approximately 20°F to 70°F, whereas the ANO site is somewhat warmer, with average monthly temperatures ranging from approximately 30°F to 93°F.

### 6.1.2.2 Cask System Component Environments

The environments to which the various cask system components are exposed are affected by their location within the system, as well as the characteristics of the plant site environment. Examination of the cask system configurations shows that there are four basic types of environment that may apply for a given SSC.

Inert Gas (MSB Cavity)

The first environment is the inert gas environment within the MSB cavity. This environment is filled with helium gas. The temperature of this gas could range anywhere from close to ambient environmental temperatures (for very low heat loads) to as high as 700°F (for a heat load of 24 kW). The gas pressure is close to one atmosphere. The presence of oxygen or moisture within the MSB interior is limited to very low levels (to avoid deleterious chemical changes in the cladding or fuel pellets) through a requirement that the canister interior be pumped down to a pressure of 3 torr, filled with helium, pumped down to 3 torr again, and then filled again with helium. Each vacuum (pressure $\leq 3$ torr) is held for 30 minutes before helium is introduced into the MSB cavity. In addition to elevated temperatures and trace amounts of oxygen and/or moisture, the MSB interior components are exposed to significant gamma and neutron radiation.

The fuel assemblies, MSB storage sleeve assembly (basket), and inside (cavity facing) surfaces of the MSB radial shell, bottom plate, shield lid, and structural lid are all directly exposed to the inert gas environment. The RX-277 neutron shield material in the MSB shield lid assembly is encased and sealed within steel plates, but the welds that seal the RX-277 material inside the steel plates are not leak tested. If these welds were to leak, the RX-277 material could off-gas to the helium environment. Therefore, the potential for introduction of moisture from the RX-277 shielding material into the inert gas environment is considered, as discussed in Section 6.2.1.1. Of note is the fact that the maximum temperature of the MSB lid RX-277 material (under design-basis heat load and normal storage conditions) is less than 150°F (Reference 3.2.5).

### Sheltered Environment

The second environment applies for locations that are sheltered from the external environment, either by other cask system components or by external structures or protection. Components in this environment are not directly exposed to sun, rain or wind. However, they are still exposed to the ambient air. The air in the sheltered environment may contain various levels of moisture, as well as salinity and/or concentrations of other pollutants (particularly in marine environments). The temperature of the air in the sheltered environment may range from ambient air temperature to as high as 300°F (e.g., air in the VCC ventilation duct for the design basis maximum heat load of 24 kW). Generally, the elevated temperature of the sheltered environment air will keep moisture levels below those seen on the outer surfaces of the cask system.

The sheltered air environment applies for the exterior surfaces of the MSB radial shell, bottom plate and structural lid. It also applies for the surfaces of the VCC inner steel liner shell, steel liner bottom plate, and top lid (weather cover), that face the interior of the VCC cavity. It also applies for the air inlet and outlet duct steel surfaces that face the air (flow channel), and the VCC shield ring (that lies above the main ventilation duct). For many of the components/surfaces in the sheltered environment, gamma and neutron radiation levels are only somewhat lower than those seen in the MSB interior environment.

A sheltered air environment also applies for the carbon steel surfaces of the MTC, other than those which face the gamma and neutron shield cavity. Although it is also a sheltered air environment, the environment seen by the MTC is far less challenging than that seen by the MSB and VSC steel surfaces. The MTC is generally stored inside a building where air temperature and moisture levels are less variable and more controlled than those of the air seen by the (in-service) MSB and VCC surfaces. The MTC assembly can also be stored outdoors if adequately protected from the environmental conditions (i.e., a sheltered environment.) Stored MTCs are also not exposed to the elevated temperatures and radiation fluxes produced by the loaded MSB (although the MTCs are exposed to these effects for brief time periods, during the cask system loading process). Also, due to the absence of the MSB (and its radioactive payload), the surfaces of a stored MTC are much more accessible for inspection and repair than the corresponding (sheltered) MSB exterior and VCC interior surfaces.

### Embedded Environment

This environment applies for materials that are embedded or sealed inside another material. The primary examples of this are the VCC metal surfaces that are in contact with (i.e., fully covered by) concrete. This includes the outer radial surface of the steel radial liner, the bottom surface of the steel bottom plate, the concrete-side surfaces of the air inlet and outlet duct structures, and the reinforcing steel (rebar) embedded in the radial and bottom VCC concrete. The RX-277 material in the MSB lid and MTC, the lead shield in the MTC, the carbon steel heat transfer fins embedded in the MTC RX-277 neutron shield, and the steel surfaces that face the sealed cavities containing those shielding materials could also be defined as embedded environments.

The primary issue for embedded environments is any potential chemical reaction between the two materials that meet at a given surface. Any such reactions will be potentially governed by temperature, as well as the combination of materials (and the associated chemistry). Thus, for the VCC, the primary issue is any potential reactions between carbon steel and concrete. As shown in the VSC-24 system

FSAR (Reference 3.2.5, Figure 4.4-5), the temperature of the steel/concrete interfaces in the VCC could range from near ambient temperature to as high as 200°F. Temperatures of the MSB lid RX-277 range up to 150°F. For stored MTCs, temperatures of all materials will be kept within a low, narrow range (close to "room temperature"). The MTC materials (and associated material boundaries) are exposed to elevated temperatures (up to 270°F) for brief periods during the system loading process. The radiation levels seen in the embedded environments are lower than those seen by the sheltered air environments.

Exposed Environment

This environment is the exterior environment seen by the VCC assembly. It is an air environment that also includes all weather-related effects, such as insolation (sun), wind and rain (or snow/ice), as well as the range of ambient air temperatures that occur at the plant site. Radiation levels that occur on the exterior surfaces of the cask system are relatively low.

The VSC-24 FSAR (Reference 3.2.5) considers ambient air temperatures ranging from -40°F to 100°F (for normal and off-normal conditions). As discussed in Section 6.1.2.1, the moisture and salinity levels seen by the casks could vary widely, for various plant sites. As shown in Figure 4.4-5 of Reference 3.2.5, the exterior (top and side) surfaces of the cask system may be as much as 40°F hotter than the ambient air temperature (although the differential is less than 20°F for the great majority of the exterior surface).

The exposed environment applies for the top and side exterior surfaces of the VCC assembly. Thus, it applies for the radial concrete shield of the VCC, and for the exterior (top) surface of the VCC cover lid. It also applies for a small portion of the flange that lies on the top of the VCC steel inner liner. The steel plate that forms the bottom surface of the VCC is also in the exposed environment in most respects. It is sheltered (by the VCC) from sun and wind, but it is potentially exposed to standing water as well as the variations in external ambient temperature.

## 6.2 Determination of Potential Aging Effects

The potential aging mechanisms that could cause degradation of the in-scope SSCs are identified based upon a review of available literature, as discussed in Section 6.2.1. These potential aging mechanisms are evaluated for the specific materials and environments of the VSC-24 storage system in-scope SSCs to determine if they require AMAs for the extended period of storage. As recommended by NUREG-1927 (Reference 3.2.1), ASTM C1562 (Reference 3.2.2) has been reviewed to identify potential aging effects and degradation mechanisms that are deemed likely to occur in the VSC-24 storage system over the extended period of storage (i.e., 60 years), based on theoretical considerations, as well as general industrial experience (inside and outside the dry fuel storage industry). Aging effects that have actually occurred during the initial storage period for the VSC-24 storage system are determined based on a review of the available licensee records and operating experience, as discussed in Section 6.2.2.

### 6.2.1 Aging-Related Degradation Mechanisms

This section discusses the potential aging effects and degradation mechanisms of the in-scope SSCs during the extended storage period. Separate discussions are provided for the potential aging mechanisms related to degradation of the spent fuel assemblies in Section 6.2.1.1, reinforced concrete in Section 6.2.1.2, carbon steel component in Section 6.2.1.3, and other materials in Section 6.2.1.4. The potential aging effects and the associated degradation mechanisms that are identified for each of the subcomponents of the in-scope SSCs are summarized in Table 6-2 through Table 6-5.

#### 6.2.1.1 Spent Fuel Assemblies

As discussed in Section 6.1.1.4, only zircaloy-clad assemblies, with or without control components, may be stored in the VSC-24 storage system. Other materials of construction for the spent fuel assembly include the $UO_2$ fuel pellets and stainless steel and Inconel structural components.

During the storage period, the spent fuel assemblies are sealed inside the MSB cavity in an inert helium environment. The peak temperature of the fuel cladding for the design basis heat load of 24 kW and steady-state normal long-term storage conditions is predicted to be 684°F (Reference 3.2.5, Table 4.1-1). For vacuum drying conditions during fuel loading operations, the peak temperature of the fuel cladding is predicted to reach 796°F (424°C) under stead-state normal short-term conditions (Reference 3.2.5, Table 4.1-1).

Potential degradation mechanisms for the spent fuel assemblies have been identified based on a review of available literature (References 3.2.2, 3.2.3, 3.2.4, and 3.2.20). Generally, the potential degradation mechanisms for spent fuel assemblies are possible only if the MSB confinement boundary is breached, allowing ingress of air or water into the MSB cavity. Each of the potential degradation mechanisms and the associated aging effects on the spent fuel assemblies are discussed below. In general, no significant degradation of the spent fuel assemblies is expected to occur over the extended storage period, given that only low-burnup (<45 GWd/MTU) fuel is stored in the MSB, and that the inert helium atmosphere inside the MSB assembly is maintained. As shown in Reference 3.2.3, examination of 35.7 GWd/MTU (Surry) fuel rods after 15 years of storage showed no significant signs of degradation of any kind (i.e., cracking, creep, bow, or corrosion), and no release of fission products.

Oxidation of Fuel and Cladding:

Oxidation of the zircaloy fuel cladding and the irradiated $UO_2$ fuel pellets can occur if the fuel is exposed to air. The MSB confinement boundary is designed, constructed, and tested to assure that it will maintain confinement and the inert atmosphere in the MSB cavity during the storage period. For low-burnup fuel, such as that stored in the VSC-24 casks, research (References 3.2.3 and 3.2.4) suggests that degradation of the fuel cladding will not occur during the initial storage period and should not occur during extended storage if the inert atmosphere is maintained. However, in the unlikely event that air ingress were to occur, the potential degradation mechanisms and aging effects are evaluated.

The potential degradation mechanism and aging effects associated with oxidation of fuel and fuel cladding are described in ASTM C1562 (Reference 3.2.2.) Oxidation of the fuel pellets can cause swelling and has the potential to split the fuel cladding. Excessive oxidation of the fuel cladding, combined with internal stress, can cause the fuel cladding to breach. Both effects could affect the ability to retrieve fuel. The extent of oxidation of the fuel assembly materials is a function of several factors, including time, temperature, and burnup. Generally, high temperatures (above 300°C) are required for significant oxidation of the cladding to occur when exposed to air. The VSC-24 thermal analysis (Reference 3.2.5, Figure 4.4-7) shows that the peak cladding temperature after the initial storage period (i.e., 25 years after assembly discharge from the reactor) is less than 380°F (193°C), which is significantly lower than 300°C. Therefore, even in the unlikely event that air was to leak into the MSB cavity after the initial storage period, no significant oxidation of the fuel cladding would be expected to occur because of the low cladding temperature.

Corrosion due to Water Ingress:

Corrosion of the fuel assembly components (and the interior surfaces of the MSB assembly) can potentially occur if they are exposed to moisture during the storage period. Possible corrosion degradation mechanisms that could occur in the presence of moisture include pitting, stress corrosion cracking (SCC), and galvanic corrosion (Reference 3.2.2). All of these forms of corrosion require a corroding atmosphere (i.e., moisture) to occur. Potential sources of moisture in the MSB cavity are residual water in the MSB cavity and fuel assemblies following MSB loading operations and off-gassing of the RX-277 neutron shielding material in the MSB shield lid. Water ingress into the MSB cavity during storage is not considered to be credible for the double welded closure configuration of the MSB assembly.

The vacuum drying procedure used during the MSB loading operations assures that no significant amount of water remains in the MSB cavity. The $O_2$ partial pressure is reduced to a maximum of 0.01 mm Hg (1/62,500th of an atmosphere) through a multiple pump-down operation (Reference 3.2.5, Chapter 12, B.1.2.7.) The RX-277 neutron shielding material in the MSB shield lid is sealed inside a carbon steel weldment that, if it were to leak, could allow moisture from the RX-277 material to enter the MSB cavity. However, during the fabrication process, the RX-277 material is baked before being placed into the MSB lid to remove excess (unbound) water. Furthermore, the peak temperature of the RX-277 material during storage is significantly lower than the temperature at which the RX-277 material is baked. Therefore, no significant amount of moisture is expected to be released from the RX-277 during storage. The amount of corrosion from the small amount of residual water remaining in the cavity after MSB loading and off-gassing of the RX-277 neutron shield material during storage would be insignificant.

Cladding Creep:

NUREG/CR-6831 (Reference 3.2.4) discusses cladding creep as a potential degradation mechanism for spent fuel assemblies during long-term dry storage. The rate of creep is a function of the cladding temperature and hoop stress (which is a result of rod internal pressure). Cladding creep exceeding 1.0% strain could cause gross rupture of the fuel cladding. However, if the cladding temperatures do not exceed 400°C during loading or storage, creep will not cause gross rupture of the fuel (Reference 3.2.6). Also, cladding creep is not likely to be a significant effect over the extended storage period, since the rate of creep is a strong function of temperature, and the cladding temperatures that occur after 20 years of dry storage are relatively low. The effects of creep are addressed as discussed in Section 6.3.

Cladding Annealing:

Extended exposure to elevated temperature may result in annealing of the fuel rod cladding, which in turn may affect its structural properties. However, as shown in Reference 3.2.4, examination of moderate (35.7 GWd/MTU) burnup fuel rods, such as those in the VSC-24 storage system, after

15 years of dry storage showed that little if any cladding annealing occurred over the storage period. If no annealing occurred in the first 15 years of storage, none is expected to occur in later years, due to the significantly lower cladding temperatures that will exist. Therefore, it is concluded that cladding annealing is not a significant degradation mechanism that needs to be addressed for extended storage (past 20 years).

Hydride Redistribution and Reorientation:

As discussed in Reference 3.2.4, high cladding temperatures and hoop stresses that occur during the cask loading process (e.g., vacuum drying) result in hydrogen within cladding forming a solid solution that precipitates into hydrides when the cladding subsequently cools. Excessive concentrations of these hydrides, particularly those oriented in the radial direction, can adversely affect the structural properties of the cladding. The significance of this effect is primarily a function of the fuel assembly burnup, the fuel rod pressure and hoop stress, and the peak temperature reached during the cask loading process.

Reference 3.2.4 states that there was no evidence of radial hydrides in Surry and Calvert Cliffs assemblies that had burnup levels of 35.7 GWd/MTU and 46 GWd/MTU, respectively. In line with those observations, NRC's ISG-11 (Reference 3.2.6) states that significant hydride re-orientation (to the radial direction) is not expected to occur in low-burnup (< 45 GWd/MTU) fuel assemblies. ISG-11 goes on to state that structural integrity of spent fuel assemblies is assured, for low-burnup fuel, if the peak cladding temperature during cask loading process remains under 400 °C.

The VSC-24 FSAR allows cladding temperatures of up to 1058°F (570°C) during vacuum drying. The licensing-basis thermal analyses conservatively calculate a (steady-state) vacuum drying clad temperature of 796°F (424°C), which is just above the 400°C criterion specified in ISG-11. However, ISG-11 (Reference 3.2.6) also states that the 570°C criterion specified in older licenses like the VSC-24 remains acceptable, given that loading of high-burnup (> 45 GWd/MTU) fuel is not allowed, and that no Technical Specification (TS) changes are required.

It should be noted that the maximum initial heat generation level for all currently-loaded MSBs was less than 15 kW (versus the design-basis MSB heat load of 24 kW), so the actual peak cladding temperature that has ever occurred during the loading (vacuum drying) process is well below 400°C. No future VSC-24 system loadings are expected or planned. Also, a condition has been added to the VSC-24 license renewal application which limits MSB heat loads to 15 kW (i.e., maximum assembly heat loads of 0.625 kW) for future loadings.

After 20 years of storage, maximum cladding temperatures will be significantly lower than they were just after being loaded into the storage cask, and far below the 400°C temperature criterion specified in ISG-11. Neither ISG-11 nor References 3.2.3 and 3.2.4 make reference to any minimum temperature under which the cladding's structural properties would be adversely impacted. They also do not refer to any sort of time element, where the hydride concentration (radial, or in general) increases steadily with time, under a given set of temperature and clad stress conditions. Thus, if hydrides are not an issue during the initial (20 year) storage period, they will not become an issue during the expended storage period.

Based on all the above, it is concluded that cladding hydrides (and their redistribution or reorientation) is not a significant issue that needs to be addressed with respect to license extension (beyond 20 years).

Zinc-Zircaloy Chemical Interaction

Under certain high temperature conditions, where Zircaloy cladding lies in the vicinity of zinc (e.g., the zinc present in anti-corrosion primer coatings), chemical interaction between the cladding and the zinc is possible. Specifically, zinc vapor is emitted from the zinc-bearing material, and the vapor interacts with the cladding surface to form $Zn_3Zr$ compounds, which may affect the structural properties of the cladding. This is a potential issue since the MSB interior, including the inner surfaces of the fuel sleeves that lie very close to the assembly cladding surfaces, is coated with a zinc primer. The effect could occur during both vacuum drying and long-term storage.

This issue is evaluated in NUREG/CR-6732 (Reference 3.2.20). Tests were performed which specifically created conditions representative of those inside the VSC-24 system MSB. (The VSC-24 system is specifically referred to in the NUREG.) Metal coupons coated with zinc primer were placed in close (3-4 mm) proximity to Zircaloy rods that had a 20-35 μm oxide layer (which is representative for medium (<45,000 MWd) burnup PWR fuel). The coupons and cladding were then exposed to borated water for 5.5 hours, vacuum for 12 hours, and helium for 1.5-3.0 months, to model canister loading, vacuum drying and storage. The temperature was maintained at 300 °C for the vacuum and helium exposure periods. The testing shows that there is no significant zinc-Zircaloy chemical interaction at temperatures of 300 °C (or lower).

The maximum initial heat load of any of the existing VSC-24 systems is less than 15 kW. Also, a condition has been added to the VSC-24 license renewal application which limits MSB heat loads to 15 kW (i.e., maximum assembly heat loads of 0.625 kW) for future loadings. As shown in Figure 1 of Reference 3.1.8, a cask with a heat load of 15 kW yields a peak cladding temperature of ~250 °C. The peak fuel sleeve steel (i.e., zinc primer coating) temperature would be somewhat less. The peak clad temperature during vacuum drying would be ~300 °C for that basket heat load. During storage, the peak cladding and sleeve steel temperatures continue to fall, and will be well below 300 °C after the initial 20-year storage period. Therefore, it is concluded that zinc-Zircaloy interactions will not be an issue for any of the existing (loaded) VSC-24 cask systems. Also, as shown in Figure 4.4-7 of the VSC-24 FSAR (Reference 3.2.5), the peak cladding temperature after 20 years of storage is less than 225 °C, even for a design-basis cask with a maximum-allowable initial heat load of 24 kW. Therefore, zinc-Zircaloy cladding interaction is clearly not an aging issue that is of concern for the extended (20-60 year) license period.

#### 6.2.1.2 Reinforced Concrete

The potential aging effects and degradation mechanisms for reinforced concrete are discussed in this section. The VCC is the only in-scope SSC of the VSC-24 storage system that includes reinforced concrete. The VCC reinforced concrete is normal weight concrete that is constructed using Type II Portland cement, which has higher sulfate resistance and lower heat of hydration than general-purpose cement. The required compressive strength of the concrete is 4,000 psi. Air entrainment is required to be 3% to 6% by volume. The concrete is reinforced with ASTM A615, Grade 60 steel bars. The VCC reinforced concrete is designed in accordance with ACI-349 and constructed in accordance with ACI-318.

Aging effects and potential degradation mechanisms for the reinforced concrete are identified based on a review of available literature, primarily Reference 3.2.2. Generally, the aging effects in concrete are loss of material, cracking, and change in material properties. Each of the potential degradation mechanisms and the associated aging effects on concrete are discussed below.

### Freeze-Thaw:

Freeze-thaw cycles can damage concrete over the long-term, particularly in areas where any water is in contact with the concrete. Freeze-thaw effects can cause cracking of the concrete, and/or affect its mechanical properties. The severity of freeze-thaw effects varies significantly with the characteristics of the mixture (such as the permeability of the cement and the porosity of the aggregate). Site characteristics such as the number of annual freeze-thaw cycles and the amount of winter precipitation also can significantly affect the degree of freeze-thaw impact. As shown in Table 3, cracking, spalling, and pitting of concrete due to freeze-thaw cycles is an aging effect that requires management during the extended storage period.

### Calcium Hydroxide Leaching:

Leaching of Calcium Hydroxide (CaOH) due to water penetration through cracks can result in loss of concrete material (specifically, the conversion of binder/cement into gels that have no structural strength). The significance of the effect is governed by water temperature and salt content. Over the long-term, CaOH leaching can increase the porosity and permeability of concrete, rendering it more vulnerable to other degradation mechanisms. The most likely cause of CaOH leaching in the VCC concrete would be flowing water through cracks on the VCC exterior. As shown in Table 3, loss of concrete strength due to CaOH leaching is an aging effect that requires management during the extended storage period. The AMAs that are credited with managing loss of concrete strength due to CaOH leaching during the extended storage period are discussed in Section 6.3.

### Chemical Attack:

Concrete is vulnerable to long-term exposure to acidic materials or materials such as sulfates, often present in ground water. Such attacks may result in expansive stresses, leading to cracking, spalling, or strength loss. The VSC-24 system may be less vulnerable to such attacks since it rests, above ground, on the ISFSI pad, and is not in regular contact with ground water. Furthermore, the VCC concrete, which is designed in accordance with ACI 349 and constructed using materials conforming to ACI standards, has low permeability and high resistance to chemical attack. Furthermore, the VCCs are generally not exposed to aggressive chemical environments during storage. Therefore, chemical attach is not a credible degradation mechanism for the VCC concrete.

### Aggregate Reactions:

Concrete structures can be vulnerable to three types of chemical reactions with their aggregate; alkali-aggregate reaction, cement-aggregate reaction, and alkali-carbonate reaction. The alkali-aggregate reaction (also known as the alkali-silica reaction, or ASR) can occur when aggregate containing silica is exposed to alkaline solutions. It can cause severe expansion and cracking of concrete structures. The degree of vulnerability of the concrete to this effect is primarily a function of the aggregate that is used. The cement-aggregate reaction occurs between alkalis in the cement and silicates in the aggregates. It mainly occurs in environments that promote concrete shrinkage and alkali concentrations in the surface due to drying. The alkali carbonate reaction (between carbonate aggregates and alkalis) may produce expansion and cracking of the concrete. It often results in map cracking on the concrete surface. It has been known to occur for certain limestone aggregates.

Although the cement and aggregate combinations used in the VCC concrete mix design were tested for potential alkali reactivity in accordance with ASTM C289, the potential for aggregate reactions during the extended storage period exists. The aging effects of the aggregate reaction degradation mechanisms is generally map or pattern cracking on the concrete surface (more or less uniform spacing of cracks over the entire concrete surface) and possibly presence of alkali-silica gel on the concrete surface, as discussed in Reference 3.2.7. Aggregate reactions also have the potential to adversely affect the structural (strength) properties of the concrete. As shown in Table 3, loss of strength and cracking, spalling, and pitting of concrete due to aggregate reactions are aging effects that require management during the extended storage period. The AMAs that are credited with managing loss of strength and cracking, spalling, and pitting of concrete due to aggregate reactions during the extended storage period are discussed in Section 6.3.

Corrosion of Embedded Steel (Rebar):

Corrosion of rebar can occur as a result of concrete cracks, insufficient amounts of cover concrete, or highly-permeable (high water content) concrete. Corrosion of rebar can cause swelling (due to the greater volume of the rust) that produces tensile stress in the concrete, and can eventually cause cracking, rust staining and spalling of the concrete. Generally, when concrete is designed and constructed in accordance with the current ACI standards and adequate concrete cover of embedded steel is provided, corrosion of embedded steel is not a significant degradation mechanism. However, concrete degradation by other mechanisms can expose the embedded steel to a corroding environment. Corrosion may also occur as a result of lowering the pH of the concrete (from > 12.5 to < 10), due to alkaline product leaching, acidic material intrusion, or carbonation, or as a result of chlorides within the concrete. Induced or stray currents in the rebar can also greatly increase corrosion. These currents can be generated by the close proximity to high tension (power) lines, or by cathodic protection systems.

Reference 3.2.2 states that rebar corrosion can be a significant aging consideration, since the thickness or effectiveness of the cover concrete that protects the rebar could degrade over time, resulting in greatly enhanced rebar corrosion. Rebar corrosion may also be a significant effect for cask systems if significant electric currents (e.g., power lines) are present. As shown in Table 3, cracking, spalling, and pitting of concrete and loss of material due to corrosion of rebar are aging effects that require management during the extended storage period. The AMAs that are credited with managing cracking, spalling, and pitting of concrete and loss of material due to corrosion of rebar during the extended storage period are discussed in Section 6.3.

Elevated Concrete Temperatures:

The structural properties of concrete can degrade due to long-term exposure to elevated temperatures (i.e., greater than 150°F over a general area or greater than 200°F in a localized area.) The maximum long-term temperatures of the VCC concrete during the initial storage period are less than these values (Reference 3.2.5, Table 4.1-1.) During the extended storage period, the concrete temperatures will be much lower. Therefore, concrete degradation due to elevated temperatures is not a concern for the extended storage period.

Concrete Creep:

Stresses in concrete (primarily compressive stress) can result in creep of the concrete material over time. Creep is unlikely to be significant enough to have significant impacts, such as exposing the rebar steel. Also, due to the relieving of stresses, the rate of creep steadily decreases with time. Roughly 95% of the total eventual creep will occur over the initial 20-year storage period. Thus, concrete creep is not a significant aging degradation mechanism for extended storage periods over 20 years, as concluded in ASTM C1562 (Reference 3.2.2.)

Concrete Shrinkage:

Concrete shrinkage primarily occurs as a result of water leaving the concrete during the curing process, and over the first few years of service. Roughly 98% of the shrinkage occurs over the first five years. Thus, concrete shrinkage is not a significant aging degradation mechanism for extended storage periods over 20 years, as concluded in ASTM C1562 (Reference 3.2.2.).

Radiation Exposure:

The potential effects from radiation exposure in concrete are discussed in ASTM C1562 (Reference 3.2.2.) High neutron radiation may cause aggregate growth and water decomposition in concrete. High gamma radiation may affect the concrete cement and/or cause free water migration. These effects can degrade the mechanical and shielding properties of the concrete.

Due to the fact that neutron and gamma radiation seen by the concrete in dry fuel storage systems is not expected to approach levels for which any concrete impacts are observed, radiation effects are not likely to be a significant aging degradation mechanism, as concluded in ASTM C1562 (Reference 3.2.2.) However, as shown in Table 3, loss of concrete strength due to radiation is an aging effect that requires management during the extended storage period. The AMAs that are credited with managing loss of concrete strength due to radiation during the extended storage period are discussed in Section 6.3.

#### 6.2.1.3 Carbon Steel Components

The VSC-24 system steel components are either exposed to the inert gas atmosphere of the MSB assembly cavity, the sheltered air environment inside the VCC annulus, the embedded environment (i.e., in direct contact with another material, such as concrete), or the exterior environment. Of note is the fact that the VSC-24 system does not employ stainless steels (except for the VCC locking wire). It also employs a double-welded canister closure, in lieu of closure bolts and seals.

Aging effects in the carbon steel components of the VSC-24 storage system could include loss of material due to corrosion, loss of strength due to irradiation or elevated temperature, and crack growth due to fatigue. These aging effects and degradation mechanisms are discussed below:

Corrosion:

There are several types of corrosion mechanisms that could potentially result in degradation of the VSC-24 carbon steel components during the extended storage period. These include general corrosion, galvanic corrosion, and crevice corrosion.

Metal surfaces in contact with moist air or water are subject to general corrosion. The rate of general corrosion is governed by several factors, such as the moisture of the air, the salinity level of the air, the temperature of the metal surface, and the specific type of metal involved. General corrosion can be of particular concern for metals that make up the confinement boundary of a storage system.

Galvanic corrosion can occur when two dissimilar metals are in contact with one another, particularly in a moist or wet environment. Active metal components such as zinc or zinc-plated components may corrode fairly rapidly when in contact with less active metals such as ferrous steels. An example of this would be zinc-plated bolts in contact with typical steels. Coatings on metal surface can also potentially cause galvanic reactions. The VSC-24 system is less vulnerable to galvanic corrosion due to a lack of dissimilar metals. Carbon steel (with a zinc primer or epoxy coating) is used for all metal components. The only dissimilar metals present are minor components like the air inlet screens and the bolts used to attach them.

Crevice corrosion can occur when two metal surfaces are in close contact, with a narrow gap between them. In the presence of water or moisture, enhanced corrosion may occur within the gap, resulting in significant loss of material, as well as possible bonding together of the metal surfaces/components. The most likely locations for crevice corrosion to occur in the VSC-24 storage system is either between the MSB bottom plate and the VCC bottom plate or between the top end of the MSB shell and the VCC shield ring. These locations are within the sheltered environment of the VCC cavity, which is exposed to moisture in the air, but should not be exposed directly to water. The MSB bottom plate is separated from the VCC bottom plate by ¼-inch thick ceramic tiles to eliminate contact between the two surfaces. However, contact is possible between the top end of the MSB shell and the VCC shield ring. Therefore, crevice corrosion is a potential degradation mechanism in a moist environment. Crevice corrosion may also occur in the vicinity of bolts (e.g., the VCC or MTC lid bolts).

In general, all carbon steel components that are exposed to either the sheltered environment or exposed environment are subject to loss of material due to corrosion, which requires management during the extended storage period, as shown in Table 2, Table 3, and Table 4. The AMAs that are credited with managing loss of material due to corrosion during the extended storage period are discussed in Section 6.3.

Radiation Exposure:

High neutron radiation can cause loss of fracture toughness in steel (i.e., increases in the nil-ductility temperature). However, the neutron radiation seen by the metal components of dry fuel storage systems are generally orders of magnitude lower than that required to produce any significant effect, so neutron radiation is unlikely to be a significant aging effect for the steel components of the VSC-24 system. Gamma radiation does not have any significant impact on the properties of steel. However, as shown in Table 2, Table 3, and Table 4, loss of fracture toughness in carbon steel due to radiation is an aging effect that requires management during the extended storage period. The AMAs that are credited with managing loss of fracture toughness in carbon steel due to radiation during the extended storage period are discussed in Section 6.3.

Crack Growth:

Crack growth in carbon steel is a potential degradation mechanism over the extended storage period. The primary causes of crack growth in carbon steel are fatigue due to cyclic loading and delayed hydride cracking. Unlike stainless steels, carbon steel is not susceptible to stress corrosion cracking.

Fatigue failure can occur if cyclic stresses are high enough and there are a sufficient number of stress cycles. Since extension of the storage period from 20 to 60 years will result in an increased number of fatigue cycles, crack growth in the MSB assembly due to fatigue is a potential aging effect that requires management during the extended storage period, as shown in Table 6.2. The AMA that is credited with managing crack growth in the MSB assembly due to fatigue during the extended storage period is discussed in Section 6.3.

Fatigue failure in the steel components of the VCC and MTC assemblies is not a credible degradation mechanism. The MTC assembly is designed as a special lifting device with minimum factors of safety of 6 against yield strength and 10 against ultimate tensile strength. Since the maximum stresses in the MTC assembly are required to be very low, fatigue is not a credible failure mode of the MTC assembly. The only significant cyclic loading of the VCC steel liner is thermal loading, which produces compressive stress in the steel liner due to differential thermal expansion with the concrete shell. Fatigue failure will not occur under these conditions.

Another potential source of weld cracking is delayed, hydrogen induced underbead cracking that occurs due to disassociation of water vapor in the weld arc, and subsequent absorption of the hydrogen in the weld metal. This cracking may lead to lamellar tearing, especially given the nature of the VSC-24 closure weld joint. In fact, weld indications due to lamellar tearing were identified by NDE during the MSB loading process at two different sites. These defects were repaired and the MSBs were placed into storage. This is discussed in more detail in Section 6.2.2.1.

#### 6.2.1.4 Other Materials

The potential aging effects and degradation mechanisms for the VSC-24 cask system materials, other than concrete, carbon steel and spent fuel assemblies, are discussed in this section. These materials include shielding materials (lead and RX-277) that lie within the embedded environment, and the (polymeric) VCC lid gasket that is exposed to the exterior environment. Of note is the fact that the VSC-24 system does not employ neutron absorber sheets. The lead and RX-277 shielding materials lie within an embedded environment, within the MTC shell and the MSB lid.

The licensing-basis thermal evaluations in the VSC-24 system FSAR (Reference 3.2.5) show that the temperatures of these materials are well under their recommended limits, even for the design-basis MSB heat load. After the initial 20-year storage period, the temperatures of these materials are far lower. Thus, no temperature-related degradation mechanisms (e.g., RX-277 moisture loss) are expected to be significant during the extended storage period.

No significant corrosion potential has been identified for either of these materials, given their sealed environment. Significant corrosion between carbon steel and these two materials is not expected, particularly at the low temperatures that are present.

One potential aging mechanism is loss of RX-277 efficacy, due to reduction in $^{10}B$ concentration, that occurs as a result of accumulated neutron flux exposure. This effect is not expected to be significant, however, given the (low) magnitude of the neutron fluence seen by the RX-277 materials over 60 years of storage. As shown in Reference 3.1.5, the neutron fluence seen by the RX-277 material would be on the order of $10^{14}$, which is 11 orders of magnitude lower than the number of $^{10}B$ atoms present in the MSB lid RX-277 neutron shield.

### 6.2.2 VSC-24 System Operating Experience

A wide range of records (presented in References 3.2.10 through 3.2.12) pertaining to the operating experience for the VSC-24 cask system, at the three nuclear plant sites at which it is employed (Point Beach, Palisades, and Arkansas Nuclear One), have been reviewed to identify any aging/degradation effects that are occurring and will require attention during the extended storage period (from 20 to 60 years). These records include configuration changes (i.e., 72.48 evaluations and "use as is" fabrication non-conformances), site-specific engineering evaluations, fabrication and closure weld examination reports, corrective actions, work orders, inspection reports (annual and 5-year), and performance trending data (including outlet vent temperature and dose rate data).

#### 6.2.2.1 Configuration Changes

Configuration changes include any changes to the as-built (initial) configuration of the loaded cask systems that occur as a result of 72.48 changes/evaluations and fabrication non-conformances (that are used as is), as well as any site-specific engineering evaluations that had been performed. The specific focus of the review of these documents is to identify any configuration changes that, while evaluated and shown to be acceptable for the initial 20-year license period, may create issues during the extended storage period. The object of the review is not to judge the adequacy of any changes or evaluations with respect to the initial license period. Changes (and configurations) deemed to be acceptable for the initial license period are assumed to be acceptable for the extended storage period, unless a specific aging mechanism or time dependence in the engineering evaluations can be identified. Specific attention is paid to design changes that may render the system less able to withstand expected aging or degradation mechanisms such as corrosion or fatigue.

##### 6.2.2.1.1 Changes Made by General Licensees via 10CFR72.48

A full listing of the changes made by the general licensees, via 72.48 screenings and evaluations, are provided in the tables in Appendix A (Section 8). The tables provide a reference number/index and a brief description of each screening/evaluation, along with the CoC amendment number that is being modified by the 72.48.

As discussed above in Section 6.2.2.1, the 72.48 changes listed in Appendix A are reviewed to identify changes that may affect the system's vulnerability to aging or cause other issues during the extended storage period. A summary of significant configuration changes is given below.

General Changes/Issues (all sites)

Several minor configuration changes, due to 72.48s and fabrication non-conformances, were made at the three plant sites for components that lie inside the MSB confinement boundary (i.e., within the inert helium environment). None of these changes are deemed significant with respect to license extension since no aging or degradation (from corrosion or fatigue, etc.) is expected to occur inside the MSB, given that the helium environment is maintained. Therefore, any changes shown to be acceptable for the initial license period will be acceptable for the extended storage period as well.

Several fabrication non-conformances that involved coating thickness or surface finish that did not conform with the requirements of the fabrication specification were evaluated in accordance with 10CFR72.48. These components with these coating non-conformances were determined to be acceptable "as-is" for use. During the extended storage period, the potential for degradation of the non-conforming coating (e.g., loss of adhesion, blistering, flaking, etc.) and corrosion of the underlying carbon steel surfaces is considered. Although the coating on the steel surfaces of the MSB, VCC, and MTC assemblies protect the underlying surfaces from corrosion, the primary functions of the coating are to protect the spent fuel pool chemistry during fuel loading operations and to facilitate decontamination of the components after fuel loading operations. For the MSB shell and bottom plate, a bounding corrosion allowance is taken for the exterior surfaces in the structural evaluation. As discussed in Section 6.3.1.1, the MSB corrosion evaluation has been revised for the extended storage period. Therefore, coating degradation and corrosion on the exterior surfaces of the MSB shell and bottom plate do not require an aging management program (AMP) for the extended storage period. However, corrosion of other coated steel surfaces that are in the sheltered or exposed environments, where no corrosion allowance is taken in the licensing evaluations, is managed during the extended storage period, as discussed in Section 6.3.

There were many instances of indications (e.g., cracks) in the MSB closure welds that exceeded the flaw size screening criteria and required additional evaluation. Stress evaluations and MSB leak testing showed that the closure welds were adequate to meet the structural and confinement requirements at the time of loading. However, it is possible that the weld flaws would make the configuration more susceptible to corrosion on the MSB top surface, in the weld region. Therefore, corrosion of the MSB structural lid and closure weld requires management during the extended storage period.

The potential for hydrogen underbead cracking (i.e., cold cracking) and delayed hydride cracking (DHC) in the MSB closure welds was identified in NRC Inspection Report 72-1007/97-204 (Reference 3.2.8) after failures of the MSB inner closure welds were discovered at two different sites during the loading process. The weld failures were determined to be caused by lamellar tearing in the MSB shell. However, the potential for hydrogen underbead cracking was identified by NRC based on the chemistry of the MSB base metal. DHC, which could occur weeks or months after the welding operation, was identified as a possible failure mechanism for welds with underbead cracking made is a moist environment. Corrective actions included UT examination of the loaded MSB closures for flaw indications to check for possible DHC-induced failure of the closure welds. The allowable flaw size for the UT examination was established under the limiting loading conditions based on the flaw evaluation criteria of ASME Section XI. Based on the results of the UT examination, it was confirmed that the MSB closure welds were acceptable for continued storage.

It was also concluded, in Reference 3.2.9, that there is no known mechanism for crack growth of defects in the closure welds. Based on industry research on welds, and VSC-24 closure weld characteristics such as weld temperature, Reference 3.2.9 concluded that the delay time for the onset of hydrogen-induced cracking (deemed the only credible type of delayed cracking) is only a matter of hours; shorter than the time period between placement of the weld and weld inspections. No other (longer-term) mechanisms for delayed cracking or crack growth were identified. Therefore, it is concluded that closure weld crack growth is not an issue for extended storage.

Palisades-Specific Changes

An MSB shield lid plate was fabricated with a hole in the wrong location, which was subsequently repaired by plugging the hole with a steel cylinder that was welded in place. The repair of the MSB shield lid plate hole was evaluated and determined to be acceptable for use during the initial storage period. The MSB shield plug is sealed inside the MSB confinement boundary, it is exposed to the inert gas environment, in which corrosion will not occur. Since the MSB shell is shown to maintain the inert gas environment during the extended storage period, it is concluded that the repaired hole in the Palisades MSB shield lid plate is acceptable and does not require management during the extended storage period.

A weld indication was found in the radial shell of an MSB. The weld was found to be acceptable to use as is, but the conclusions of the evaluation did not account for the 0.18-inch corrosion allowance on the MSB shell, and may affect the fatigue evaluation of the MSB shell, which must now be extended out to 60 years. The crack growth evaluation is revised (Ref. 3.1.7) to show that the weld flaw is acceptable, after fully accounting for corrosion and fatigue affects that may occur over a 60-year storage period.

A weld undercut was found in the lifting lugs for an MSB. The resulting lug configuration was determined to be acceptable to use, as is, based on structural evaluations. These evaluations, however, did not consider significant corrosion of the lugs. Any determination of the allowable level of corrosion for the lifting lugs must consider the as-built configuration of these specific lugs.

Arkansas Nuclear One-Specific Changes

A loaded cask on an air pallet collided with a railcar, resulting in the MSB shifting within the VCC cavity, causing one of the four VCC air inlets to be blocked by the MSB, as well as several broken and displaced tiles. Subsequent evaluations concluded that the resulting configuration was acceptable, since the air outlet temperatures (vs. ambient) were below the 110°F maximum value, and MSB bottom contact with the VCC bottom was "not projected". Since the cask configuration was determined to be acceptable during the initial storage period, and MSB heat loads only decrease with time, this is not an age-related issue that must be addressed in the license extension or AMP.

The weld that connects the MTC outer shell to the bottom plate (or ring) was found to be undersized. The non-conformance was determined to be acceptable, as is, on the basis of an acceptable load test. This basis for acceptability must be considered when determining the acceptable amount of corrosion in the area of that weld, if any significant corrosion is seen (during pre-use inspections of the MTC).

Point Beach-Specific Changes

A polymer gasket may have been dropped into the MSB, and left there during storage. The (site specific) evaluation which determined that the presence of the gasket inside the MSB would be acceptable did not invoke any finite storage period. Therefore, it is concluded that this issue is not age-related, and need not be addressed in the license extension application or associated AMP.

A thinner than allowable cover plate seal weld occurred for one of the MSBs, which was dispositioned through an evaluation that showed no significant weld stress. This change could act to reduce the level of corrosion on the MSB lid top surface that is acceptable, particularly at the location of the seal welds.

6.2.2.1.2 Changes Made by Certificate Holder via 10CFR72.48

When the VSC-24 Storage System CoC was initially issued in 1993, only the GLs were permitted by 10 CFR Part 72.48 to make specific changes in the facility or spent fuel storage cask design described in the FSAR without prior NRC approval. However, in April 2001, 10 CFR Part 72.48 was changed to also allow the Certificate Holder (CH) to make specific changes in the facility or spent fuel storage cask design described in the FSAR without prior NRC approval. Since most of the VSC-24 storage system components had already been fabricated prior to this time, relatively few changes were made by the CH under the provisions of 10 CFR Part 72.48. Table 6-1 provides a summary of the changes to the VSC-24 Storage System that were evaluated by the CH in accordance with 10 CFR Part 72.48, along with the disposition and effectivity of each change. A discussion of these changes is provided in the following paragraphs for historical information. No specific aging mechanisms have been identified for these changes that would prevent the SSCs from performing their intended functions during the extended storage period.

Of the twelve (12) 72.48 screening reviews performed by the CH, only four (4) were related to fabrication non-conformances, which were not generic design changes. Two of these screening reviews (SR-01-002 and SR-01-006) involved cosmetic repair of the VCC concrete surface to correct surface defects caused by poor vibration technique. In another case, an 8.6-inch square go/no-go gage was used instead of the 8.7-inch square go/no-go gage required by the Specification when the 8.7-inch square go/no-go gage could not be passed through the MSB cells. In the final case (SR-01-005), a cement truck revolution counter was inadvertently reset when pouring concrete into AVCC-21. However, based on the revolution counts recorded and the remaining time to final discharge, the total revolutions were determined to be less than the limit of 300 revolutions.

SR-02-016 evaluated an alternate tile configuration for the VCC assembly, consisting of 24 tiles evenly spaced on a 30-inch mean radius. The change was requested by the GLs to provide a more stable support for the MSB assembly. To support this design change, the maximum vertical crane speed when lowering MSB into VCC was reduced from 2 feet per second (fps) to 0.75 fps. In addition, the allowable stress design criteria used for the structural evaluation of the MSB for the drop condition onto the tiles in the VCC was changed from elastic to plastic. It was concluded from SR-02-016 that the alternate tile configuration could not be added to the design under 10 CFR 72.48 without prior NRC approval. Therefore, the alternate tile configuration change was subsequently included in LAR 01-01 and included in Amendment 4 of the VSC-24 CoC.

SR-02-021 evaluated a number of design changes that had previously been submitted to NRC in LAR 00-02 in response to the DFI issued on October 6, 1997. Shortly after the 10 CFR 72.48 regulation was changed to authorize CoC holders to evaluate and implement proposed changes to the SAR that without prior NRC approval, the NRC notified BNFL Fuel Solutions (BFS) that these changes appeared to be allowed under the provisions of 10 CFR 72.48 and requested that BFS evaluate the changes against the screening criteria of 10 CFR 72.48 and notify NRC if any of the changes did not meet the criteria and required prior NRC approval. SR-02-021, which was prepared in response to the NRC request, concluded that these changes did not satisfy the screening criteria of 10 CFR 72.48 and, therefore, required prior NRC approval. Accordingly, these changes were again submitted to NRC in LAR 01-01 for re-review, and finally approved in Amendment 4 of the VSC-24 CoC.

Screening reviews SR-02-079 through SR-02-083 evaluated specific changes that were proposed to address RAIs contained in Reference 3.2.13 in order to address the DFI issued on October 6, 1997. All of these changes were determined to meet the screening criteria of 10 CFR 72.48 and were made without prior NRC approval. These changes were all incorporated into Revision 5 of the VSC-24 FSAR.

## Table 6-1 - Summary of 10CFR72.48 Changes Made by CH (2 Pages)

| Screening Review Number | Change Description Summary | Discussion | Disposition | Effectivity |
|---|---|---|---|---|
| SR-01-002 | Cosmetic repair of three areas on concrete surface (Unit No. AVCC-19) | Concrete surface defects, caused by poor vibration technique, determined to have no structural effect on cask unit. | Repaired | Unit Specific |
| SR-01-003 | MSB Unit #19 did not meet Specification requirement of passing the 8.7-inch go/no-go gage test. | An 8.6-inch go/no-go gage test was used instead. | Use As-Is | Unit Specific |
| SR-01-005 | Cement truck revolution counter inadvertently reset when pouring concrete into VCC (Unit No. AVCC-21.) | Evaluation of a fabrication non-conformance. Not a generic design change. | Use As-Is | Unit Specific |
| SR-01-006 | Cosmetic repair of concrete around VCC air inlet vent (Unit No. AVCC-20.) | Evaluation of a fabrication non-conformance. Not a generic design change. | Use As-Is | Unit Specific |
| SR-02-016 | Add alternate configuration of ceramic tiles at the bottom of the VCC cavity, consisting of 24 tiles evenly spaced on a 30-inch mean radius. | Change affects MSB support conditions. Change requires reduction of maximum vertical crane speed to 0.75 feet per second when lowering MSB into VCC. MSB stress evaluation for drop accident revised to use plastic allowable stress design criteria. | Change could <u>not</u> be made under §72.48 without prior NRC approval. Change were included in LAR 01-01. | NRC approval of changes included in CoC Amendment No. 4. |
| SR-02-021 | The following changes were evaluated in accordance with §72.48 per NRC request (Ref. 3.2.15): Reduce thickness of VCC liner to 1.75-inch; delete MTC Middle Liner; increase MSB Shell thickness to 1-inch; delete gap specification between fuel and MSB Sleeve; change snow load to 403 $lbf/ft^2$; increase maximum VCC height to 213.7-inch; increase VCC capacity for tordnado loading; revise MSB internal pressure calculation to address multiple fuel types, add volume for BRPA hold-down, and revise calculation approach for volume of fuel assembly end fittings; replace hydrostatic test with helium leak test required by CoC. | These changes were included in LAR 00-02 in response to the NRC DFI issued on October 6, 1997. After reviewing LAR 00-02, NRC requested that BFS make the changes in accordance with §72.48. BFS subsequently determined that not all of the changes from LAR 00-02 could be made under the provisions of §72.48 without prior NRC approval. This screening review includes those changes from LAR 00-02 that were determined to require prior NRC approval and were submitted to NRC in a subsequent LAR for re-review. | Change could <u>not</u> be made under §72.48 without prior NRC approval. Change were included in LAR 01-01. | NRC approval of changes included in CoC Amendment No. 4. |

## Table 6-1 - Summary of 10CFR72.48 Changes Made by CH (2 Pages)

| Screening Review Number | Change Description Summary | Discussion | Disposition | Effectivity |
|---|---|---|---|---|
| SR-02-045 | Add MTC fabrication and impact testing requirements to prevent brittle fracture. | Added Section 3.4.5.2 to FSAR. | Screened Out | Incorporated in FSAR Revision 4. |
| SR-02-079 | Add discussion or lightning protection and requirement for licensee to perform site-specific evaluation for lightning strikes. | Changes made in response to NRC RAI (Ref. 3.2.14, RAI 2-2). | Screened Out | Incorporated in FSAR Revision 5. |
| SR-02-080 | Added discussion of basis for not requiring continuous monitoring of MSB confinement boundary welds in Sections 2.3.3.2 and 7.1.5 of FSAR. | Changes made in response to NRC RAI (Ref. 3.2.14, RAI 2-3 and 7-1). | Screened Out | Incorporated in FSAR Revision 5. |
| SR-02-081 | Revise Section 2.4 of FSAR to add discussion of MSB re-flooding and requirement for each licensee to perform a site-specific evaluation for MSB re-flooding. | Changes made in response to NRC RAI (Ref. 3.2.14, RAI 4-4). | Screened Out | Incorporated in FSAR Revision 5. |
| SR-02-082 | Add FSAR Section 8.2 to require that each licensee develop a site-specific MSB unloading procedure, which includes an evaluation of MSB re-flooding. | Changes made in response to NRC RAI (Ref. 3.2.14, RAI 8-2). | Screened Out | Incorporated in FSAR Revision 5. |
| SR-02-083 | Revise MSB closure procedure (FSAR Section 8.1) and Bases for TS 1.2.8 to require helium purity of 99.995%. | Changes made in response to NRC RAI (Ref. 3.2.14, RAI 12-1). | Changes made in accordance with §72.48 without prior NRC approval. | Incorporated in FSAR Revision 5. |

### 6.2.2.2 Routine/Annual Cask Inspection Results

Periodic visual examinations are performed on the exterior of the VCCs in accordance with the requirements of TS 1.3.1 and 1.3.2. The wire mesh screens that cover the VCC inlets and outlets are inspected daily in accordance with TS 1.3.1 for signs of blockage or degradation. The exterior surfaces of all VCCs are inspected annually in accordance with TS 1.3.2 for damage, such as cracking, chipping, or spalling. This section discusses the aging effects that have been observed during the periodic inspections of the VCCs all three sites, as documented in the site inspection reports, condition reports, and work orders.

Vent Screen Degradation and Blockage:

Site records show that small amounts of debris, usually leaves or mud, are commonly found inside the air inlet ducts (usually just behind the inlet screens) during the period inspections of the VCC wire screens. In addition, damaged screens have been identified during the period inspections. Typically, the screen damage consists of bent screens or missing inlet screen fastening screws. When identified, debris is removed or damaged screens are repaired or replaced in accordance with existing maintenance procedures.

Concrete Degradation:

Site records associated with the annual inspection of the VCC exterior surface show that several aging effects have been observed in the concrete during the initial storage period. Generally, the aging effects consist of small surface defects, such as hairline cracks and pits (e.g., "bugholes" or "popouts") and local discoloration of the concrete (e.g., from mineral deposits.) Figure 1 shows an example of surface cracking and discoloration on the exterior concrete of a VCC.

Hairline cracking and pits in the concrete surface are fairly common, and generally appeared soon after the casks were placed in service. However, cracks and surface pits exceeding the size permitted by TS 1.3.2 (i.e., any defect wider than ½-inch and deeper than ¼-inch) have also been identified during the initial storage period. In accordance with current maintenance procedures, all such cracks are repaired by re-grouting to protect the embedded steel reinforcement from significant corrosion. Reports of defects requiring repair were uncommon during the first 10 years of ISFSI operation. There has been no clear increasing trend in the number of reported pits seen at any of the sites for the subsequent years, nor have there been any indications of failure of grout-repairs. However, some cracks have increased in size and length (e.g., a crack width grew from 1/16" to 3/32" in one case.)

Some concrete damage has also been identified that is not aging related, such as concrete spalling at the bottom corner of the VCC (where the outer surface of the concrete meets the ground) and gouges in the concrete surface due to contact with forklifts or snow removal equipment. When this type of damage is observed, it is repaired by re-grouting in accordance with existing maintenance procedures.

Efflorescence and mineral deposits in the location of cracks (see Figure 1) have been observed on the VCC exterior (particularly at ANO). Samples of mineral deposits, which were taken and tested by ANO, where confirmed to be primarily calcium carbonate. This aging effect, which is caused by migration of minerals (e.g., calcium hydroxide) from the concrete to the surface when water passes through cracks, if left unmanaged over long periods of time, can result in a reduction of concrete strength properties. However, re-grouting of cracks in accordance with the existing maintenance programs prevents the flow of water through cracks and leaching of calcium hydroxide from the concrete.

Other Degradation:

For some casks, coating flakes have been seen in the inlet ducts. This indicates some degree of coating failure on the carbon steel surfaces of the MSB assembly and VCC liner within the ventilation ducts/annulus, or below the MSB. This is consistent with the observations of the 5-year cask inspections (discussed in Section 6.2.2.3) and acceptable since the coatings on the VSC-24 interior metal surfaces are not relied upon for corrosion protection.

A small degree of coating failure and corrosion has been observed on the metal surfaces at the top end of the VCC, including the cask cover lid, lifting lugs and top flange. For the lifting lugs (which are only used at the Point Beach site), the rust has been removed and rust inhibitor has been applied.

#### 6.2.2.3 Five Year Cask Inspection Results

In accordance with TS 1.3.3, the ventilation ducts and annulus of the first cask placed into service at each site is visual examined every 5 years. The primary purpose of these inspections is to check for blockage of the ventilation ducts. However, these periodic examinations also provide a visual indication of the condition of MSB shell and VCC liner, inlet ducts, and outlet ducts, which or normally inaccessible. To date, three 5-year cask inspections have been performed at each of the three plant sites where the VSC-24 system is deployed (i.e., 5, 10 and 15 years after the first casks were placed into service). The year of initial cask placement was 1993, 1995 and 1996 for the Palisades, Point Beach and Arkansas Nuclear One sites, respectively. In general, none of the 5-year inspections showed any significant deterioration of the inspected surfaces. Minor degradation was generally seen in the first 5-year inspection, with no significant worsening of those conditions observed in the subsequent inspections. The observations of the 5-year inspections are discussed in this section.

Blockage of Ventilation Paths:

The results of the 5-year inspections show that very little blockage accumulated in the VCC inlets, annulus, and outlets. The most common form of blockage observed in the casks is small amounts of debris that have accumulated at the bottom of the main ventilation duct on the VCC bottom plate surface between the four crescent-shaped air entry holes, as shown in Figure 2. Chemical analysis showed that this debris was comprised of zinc, which was most likely from small pieces of zinc coating that were dislodged during the VCC handling operations or from paint over-spray during final MSB structural lid coating following loading into the VCC. In a few cases, the inspections showed spiders living inside the cask annulus. In addition, a small muddobber's nest was discovered within an air outlet duct of a VCC at Point Beach, as shown in Figure 3. Finally, small mineral deposits have been observed around the entry to the VCC outlet ducts, as shown in Figure 4. Chemical analysis of these deposits shows that they are made up of calcium carbonate (from exposed concrete at the joint between the liner shell and outlet duct) and zinc (from the coating used on the VCC liner) and have non-reactive properties. These deposits are believed to be due to condensation of moisture from warm humid air on the exposed concrete as the air exits the VCC annulus. The calcium leached from the concrete is not expected to prevent the VCC from performing its intended functions because the calcium deposits are very small and they have non-reactive properties. All of the obstructions discovered inside the VCC ventilation ducts and annulus were small and judged to have no significant impact on the airflow. All such obstructions were removed whenever possible.

Condition of MSB Shell:

In general, the 5-year inspections show that the majority of the MSB shell surface is in excellent condition, with very little coating degradation or signs of corrosion. All 5-year inspections found some discoloration on the MSB shell near the top end, similar to that shown in Figure 4. The coating discoloration is believed to have resulted from high temperatures in the heat affected zone of the MSB closure welds. Some deposits of a white substance are found on the MSB radial surface (as shown in Figure 7). This is believed to be residue deposits that result from the decontamination process and/or contact with pool water. Finally, some local areas of light oxidation (and discoloration) of the coating on the MSB shell has been observed.

The coating on the outside of the MSB shell and bottom plate is not relied upon for corrosion protection during the storage period. The MSB design basis includes a corrosion allowance of 0.003-inch per year, or 0.045 inches after 15-years of storage. The results of the 5-year inspections show that only local coating failure and corrosion has occurred on the MSB shell, and the amount of corrosion appears to be significantly less than the design basis.

Condition of VCC Liner and Ventilation Duct Surfaces:

The inspections show that over the great majority of the VCC liner surface and VCC inlet and outlet duct surfaces, the coating is in good shape and there is no corrosion, as shown in Figure 5. There are a few very local spots where coating failure and local surface corrosion was observed, as shown in Figure 6. Some discoloration of the coating on the cask inlet ducts has been observed, although there was no other visual evidence of corrosion occurring on these surfaces (nor the MSB surfaces). There is no evidence of any degradation of the VCC liner surface and VCC inlet and outlet duct surfaces that would significantly affect the ability of the VCC to perform its intended design functions.

#### 6.2.2.4 Performance Trends

One means of monitoring cask system degradation is to look for negative trends in system performance. As shown in References 3.2.10 through 3.2.12, two such system performance parameters have been monitored by the VSC-24 cask system operators; dose rates around the casks and ISFSI, and the temperature of the air leaving the cask outlet vents (relative to the external ambient temperature.) Increases in dose rates could indicate degradation of shielding materials. Increases in air outlet temperatures (relative to ambient) may indicate reduction in performance of the ventilation duct configuration (e.g., blockage.) Historical data from the outlet temperature readings and dose rate surveys at the existing ISFSIs are discussed below.

Outlet Temperature Readings:

Prior to Amendment 6 of the VSC-24 CoC, which was issued in June 2006, TS 1.2.3 included a requirement to monitor the air temperature at the outlet vents of the loaded VSC-24 casks to determine the rise in air temperature above ambient did not exceed 110°F. The basis for TS 1.2.3 was that an air temperature rise above 110°F could indicate blockage of the ventilation ducts and may result in system temperatures that are approaching the thermal acceptance criteria.

The historical outlet temperature monitoring records from the three VSC-24 ISFSI sites have been reviewed to identify any potential trends that may indicate aging effects in the casks. A plot of the temperature rise measurements over the initial storage period is shown for a typical cask in Figure 8. The daily measurements of the temperature increase (i.e., the difference between the air outlet temperature and ambient air temperature) in each VSC-24 cask during the initial storage period show that the average temperature rise has not changed significantly over time. The data does show cyclic behavior, with larger $\Delta T$ values generally occurring in the summer months. In all cases, the data show that the $\Delta T$ values are much less than the 110°F limit (generally less than half, i.e., 55°F), and are in line with what would be expected given the heat generation levels of the MSBs.

The air outlet temperature data, for all three sites, indicates that the component temperatures in the cask system have always been below the design-basis and/or allowable values by a wide margin. The data also provides evidence that no significant blockage of the airflow path in any VSC-24 cask has occurred over the initial storage period.

Dose Rate Surveys:

Dose rate measurements are periodically taken at various locations around the casks and ISFSI at each site to verify that the doses are within the regulatory limits. The dose rate measurements records have been reviewed for trends that may indication aging effects in the casks. The results show no adverse trends in the dose rate measurements that would indicate adverse aging effects in the cask shielding materials. The raw dose rate survey data, provided by the general licensees (plant sites) within References 3.2.10 through 3.2.12, is presented in three attachments in Appendix B (Section 9).

At the Palisades plant, regular dose rate readings were taken at the inlet ducts of the 18 casks in the ISFSI. Those inlet duct dose rate readings, and their trend with time, are shown in Figure 9. The data clearly shows a decreasing trend of air inlet dose rate with time, which is expected given the decay of spent fuel. In all cases, the measured inlet duct dose rates are far below the dose rate limit given in the TS.

Measurements of the dose rate on the cask side were not taken on a regular basis. The side dose measurements that were taken show that no cask side dose rate measurements exceed the value measured at the time of initial cask loaded, or the dose rate limit given in the TS.

The Palisades dose rate records also state that the dose rate all around the perimeter of the ISFSI has always remained low (< 0.5 mrem/hr), every year. Swipes were also taken of the cask exterior surfaces, and there were no instances of contamination levels over the 1000 dpm criterion. Palisades' records also include environmental surveys taken in the ISFSI area. No such surveys have measured any significant increases of fission product concentrations after placement of the casks.

The Palisades data described above shows decreasing dose rate trends for the cask inlet vents, and show no evidence of any increasing dose rates on or around the casks or ISFSI. The data also show no evidence of contamination or leakage of isotopes out of the casks.

At Point Beach, dose rates were monitored on the West, East, North and South fences around the ISFSI. The results of those dose rate measurements are summarized in Figure 10. The data show no significant increasing trend of area dose rate with time, after the last of the 16 casks was placed in the ISFSI in 2003. Dose rates did increase while casks were being added, particularly on the West fence, which was affected by casks being added to the VSC-24 ISFSI pad, as well as the addition of other cask types to a neighboring ISFSI pad.

A limited number of area dose rate measurements were performed at Arkansas Nuclear One in 2006, 2007 and 2008. Measurements were taken at several locations around the ISFSI pad edge, and within the cask array (between the casks). The measurements showed maximum gamma dose rates of 2 mrem/hr and maximum neutron dose rates of 0.2 mrem/hr. These dose rates are less than the dose rates present at the time of cask loading, and no trends of increasing dose rate with time was observed.

Given the lack of any significant dose rate increases (with time, or over any temporary period), it is concluded that significant degradation of the shielding performance of the casks has not occurred (i.e., there has never been any significant loss of shielding material).

#### 6.2.2.5 Lead Cask Inspection

The initial lead cask inspection for the VSC-24 Storage System was performed on Palisades Cask Number VSC-15 from May 21, 2012 through May 24, 2012, prior to the start of the extended storage period. The scope of the lead cask inspection included visual examination of the VCC bottom surface, remote visual examination of the VCC annulus (i.e., VCC liner and MSB shell), inlet air ducts, and outlet air ducts, and visual examination of the VCC cask lid, MSB structural lid and closure weld. The results of the initial lead cask inspection (Reference 3.2.19) indicate that VSC-24 storage system components have not undergone any unanticipated degradation during the initial storage period.

The VSC-24 lead cask is selected based upon a number of parameters that contribute to degradation, such as design configuration, environmental conditions, time in service, and total heat load of the SNF stored in the MSB. For the initial lead cask inspection, a single cask (Palisades Cask Number VSC-15) was selected from the fifty-eight loaded VSC-24 casks at the three ISFSIs. This cask, which was loaded in June 1999, was selected primarily because it has the highest initial heat load (14.7 kW) of all loaded VSC-24 casks. No significant differences were identified between the environmental conditions or design configuration used at the three (3) different sites. An overall timeline of the VSC-24 casks loaded to date is provided in Figure 1-2. The VSC-24 cask with the longest time in service is Palisades Cask Number VSC-01, which was loaded in May 1993. Although this cask has approximately six (6) more years in service than Palisades Cask Number VSC-15, it was not selected for the lead cask inspection since it is already inspected on the exterior every year in accordance with the requirements of TS 1.3.2, and on the interior at a 5-year frequency, in accordance with the requirements of TS 1.3.3. Rather, the cask with the highest heat load was selected for the initial lead cask inspection to gain additional operating experience.

Although not required for the lead cask inspection, the exposed concrete surfaces on the sides and top of the VCC lead cask were visually examined for concrete aging effects, including scaling, cracking, or spalling, increased porosity, map or pattern cracking, and other unanticipated concrete degradation. The exterior surfaces of the concrete were concluded to be in good overall condition. The visual examination of the VCC concrete exterior showed only a small number of bug holes that exceeded the acceptance criteria and required grout repair. No other aging effects were identified on the VCC concrete exterior.

The VCC was lifted and a remote visual inspection (borescope) of the VCC bottom surface, which is lined by a ¼-inch thick coated carbon steel plate, was performed to identify coating degradation and corrosion. In addition, the normally inaccessible underlying surface of the storage pad, which is not an in-scope SSC, was also remote visually inspected. The inspection results show that no unanticipated degradation of the VCC bottom surface has occurred during the initial storage period. The coating on the VCC bottom plate and the concrete surface of the underlying storage pad were both concluded to be in good condition. After the inspection of the VCC bottom surface, a 3-foot long by 3/8-inch wide gap was noted between the VCC bottom plate and the VCC bottom concrete. The separation of the bottom plate from the concrete resulted from flexing of the plate when the VCC was lifted to inspect its bottom surface. Since the VCC bottom plate provides no other function than to form the geometry of the air inlet ventilation ducts during the concrete pour, this condition will not prevent the VCC from performing its intended functions during the extended storage period.

A remote visual examination of the VCC annulus (VCC liner and MSB shell), inlet ducts, and outlet ducts was performed using a borescope to identify blockage of air flow and degradation of the coated carbon steel surfaces that line the ventilation paths. The results showed only a very small amount of debris and mineral deposits had accumulated in the ventilation flow path. In addition, no significant coating degradation or corrosion was found on the MSB shell, VCC liner, inlet ducts, or outlet ducts.

The VCC cask lid, MSB structural lid, and MSB closure weld were visually examined for evidence of coating degradation and corrosion. In order to access the MSB structural lid and closure weld, the VCC cask lid was removed and the VCC shield ring was lifted a small amount. Some corrosion was observed on the VCC lid bolts, but they were concluded to be acceptable. Upon removal of the VCC cask lid, the VCC lid gasket was found to be in good condition with no evidence of leakage during the initial storage period. The coating on the MSB structural lid and closure weld was also found to be in good condition. Upon removal of the temporary shielding used during the inspection, a few small areas of coating were scraped off of the MSB structural lid. The steel surfaces underneath the coating that was scraped off did not show any signs of corrosion. The exposed steel surfaces were cleaned and recoated. Upon completion of this inspection, a new VCC lid gasket was installed and the VCC cask lid was attached.

In conclusion, the results of the initial lead cask inspection show that no unanticipated degradation of Palisades Cask Number VSC-15 has occurred during the initial storage period. The inspected surfaces of the VCC and MSB assembly were in very good condition.

### 6.2.3 Summary of Potential Aging Effects – by Material/Environment

Potential aging effects identified in engineering literature, through theory and general industry experience, are discussed in Section 6.2.1. VSC-24 system operating experience, along with any observed aging effects, is discussed in Section 6.2.2. Those aging effects are summarized here, and in accordance with the recommendations of NUREG-1927 (Reference 3.2.1), they are categorized by the component material and environment combinations for which they are likely to occur.

For each VSC-24 cask system subcomponent, the applicable material, environment, design function(s) and aging/degradation mechanisms are tabulated in Table 6-2 through Table 6-5 (for the MSB, VCC, MTC and spent fuel assemblies, respectively). For minor sub-components that have no (important-to-safety) design function, aging effects are not identified or evaluated, since loss of design function for those components is not a concern. For these components, "N/A" is shown in the aging effects/mechanisms columns of the table.

#### 6.2.3.1 Inert Gas Environment (MSB Interior)

The spent fuel assemblies are confined in the inert helium environment inside the MSB cavity. The MSB basket assembly and the cavity-side surfaces of the MSB shell, bottom plate, shield lid and structural lid, all of which are coated carbon steel, are also exposed to the inert helium environment inside the MSB cavity. The inert gas atmosphere inside the MSB cavity is relied upon to prevent oxidation and corrosion of the fuel and carbon steel surfaces during storage. As discussed in Section 6.2.1.1, the potential degradation mechanisms identified for the spent fuel assemblies include oxidation, corrosion, cladding creep, cladding annealing and hydride redistribution and reorientation within the cladding.

Oxidation of the fuel and cladding, even if exposed to air during the extended storage period, is not considered a credible degradation mechanism since the peak temperatures of the fuel are much lower than the temperatures required to produce significant oxidation. Corrosion of the fuel assembly components during the extended storage period is not considered to be a credible degradation mechanism because there is no significant moisture content inside the MSB cavity (either from residual water or moisture from the RX-277 shielding material inside the MSB shield lid) and water leakage into the MSB cavity is not credible. Annealing of cladding has been shown to not be a significant degradation mechanism for low-burnup fuel based on industry experience. Finally, hydride redistribution and reorientation is not a credible degradation mechanism for the low burnup fuel assemblies stored in the VSC-24 cask considering the low peak temperatures maintained during fuel loading and storage operations.

The only fuel assembly degradation mechanism that may be significant is cladding creep. Although it is unlikely to be significant given the low cladding temperatures that occur during the extended storage period, it is evaluated, as discussed in Section 6.3.

The coated metal components of the MSB assembly that are exposed to the inert helium environment are not considered vulnerable to corrosion, given the very low potential concentrations of oxygen or moisture within the helium.

The MSB-interior metal components could be affected, however, by gamma and/or neutron radiation exposure. Also, fatigue effects, which could result in crack growth, are potentially significant for the MSB pressure-retaining boundary. There are no known mechanisms for crack growth of flaws in the closure welds.

Another potential age-related effect is the potential leakage of the helium gas from the MSB cavity during the extended storage period, which could affect the thermal performance of the MSB.

### 6.2.3.2 Sheltered Environment (Coated Carbon Steel)

The sheltered (air) environment inside the VCC annulus is seen by the exterior surfaces of the MSB bottom plate, cylindrical shell, and structural lid, as well as the interior surfaces of the VCC inner liner shell and bottom plate, bottom surfaces of the VCC weather cover, VCC shield ring, and inner surfaces of the VCC air inlet and outlet duct structures. Also all exposed surfaces of the MTC assembly are exposed to a sheltered environment, since the MTC assembly is stored either inside of a building or outside under cover. All of the components exposed to the sheltered environment consist of coated carbon steel. As discussed in Section 6.2.1.3, the potential degradation mechanisms identified for these steel components include corrosion, loss of strength due to radiation exposure, and crack growth.

All coated carbon steel surfaces exposed to the sheltered environment are susceptible to corrosion. As discussed in Section 6.2.2.3, the results of the 5-year inspections performed at all sites show that the majority of the coated carbon steel surfaces sheltered inside the VCC annulus are in excellent condition, with very little coating degradation or signs of corrosion. Only a small amount of localized corrosion has been observed, although the level of corrosion does not appear to be increasing significantly with time. Potential corrosion of the VSC-24 system carbon steel components is discussed in Section 6.3.

These steel components are also exposed to neutron and gamma radiation that are somewhat smaller than those seen in the MSB interior. The potential effects of radiation exposure are addressed as discussed in Section 6.3.

The MSB confinement boundary (radial shell, bottom plate and lid) may be subject to long-term fatigue effects (which are addressed as discussed in Section 6.3). Fatigue effects are not significant for the other, non-pressure-containing components. Finally, there are no known mechanisms for crack growth of flaws in the closure welds.

### 6.2.3.3 Embedded Environment

As discussed in Section 6.1.2.2, this environment includes all of the VCC carbon steel surfaces that are embedded in concrete, such as rebar, and those component surfaces that lie in contact with concrete, such as the VCC liner. The RX-277 neutron shield material in the MSB lid, the MTC lead gamma shield, the RX-277 MTC neutron shield, and the steel surfaces that contact those materials are also in an embedded environment (which is not exposed to outside air).

The degradation mechanisms considered for embedded steel include corrosion and loss of strength due to radiation exposure. The only identified degradation mechanism for embedded shielding materials (i.e., RX-277 and lead) is the loss of $^{10}$B due to neutron absorption. RX-277 and lead are not subject to significant corrosion.

Generally, when concrete is designed and constructed in accordance with the current ACI standards and adequate concrete cover of embedded steel is provided, corrosion of embedded steel is not a significant degradation mechanism. However, concrete degradation by other mechanisms can expose the embedded steel to a corroding environment. Corrosion of embedded steel can cause swelling (due to the greater volume of the rust) that produces tensile stress in the concrete, and can eventually cause cracking, rust staining and spalling of the concrete. Periodic inspections of the exterior concrete surfaces of loaded VSC-24 casks have shown little evidence of rust around cracks in the concrete, which could indicate some corrosion of embedded steel.

All the potential aging effects discussed above are evaluated and addressed as discussed in Section 6.3.

#### 6.2.3.4 Exterior Environment

The components of the VSC-24 storage system that are exposed to the exterior environment are the exterior surfaces of the VCC assembly (i.e., bottom surface of the bottom plate, outer surfaces of the concrete shell, top surface of the cask lid (weather cover), lid bolts, top surfaces of the liner flange (outboard of the cask lid), inlet/outlet wire screen covers and hardware, and (optional) lift lugs.)

The primary potential aging effect for the exposed carbon steel components is loss of material due to corrosion. Radiation exposure is not a concern for these metal components/surfaces, since radiation levels on the exterior surfaces of the cask system are relatively low. Fatigue effects are not significant for the (non-pressure-containing) metal components that are exposed to the exterior environment.

While the carbon steel surfaces exposed to the exterior environment (e.g., wind, sun or rain) have a greater potential for corrosion to occur that those in the sheltered environment (due to potentially higher moisture levels as well as direct contact with water), they are also readily accessible and more easily maintained. There is additional potential for crevice and/or galvanic corrosion in the vicinity of bolts. As discussed in Section 6.2.2, some minor localized corrosion of carbon steel on the outside of the VCC has been observed during periodic inspections.

Potential corrosion of the VSC-24 system metal components exposed to the exterior environment is evaluated and addressed as discussed in Section 6.3.

As discussed in Section 6.2.1.2, the VCC concrete that is exposed to the external environment is subject to cracking and loss of material (e.g., chipping or spalling) due to a range of degradation mechanisms, including freeze-thaw cycles, CaOH leaching, aggregate reactions, and corrosion of embedded steel. Results of the annual inspections of the VCC exterior surfaces show that several aging effects have been observed in the concrete during the initial storage period. Generally, the aging effects consist of small surface defects, such as hairline cracks and pits (e.g., "bugholes" or "popouts") and discoloration of the concrete from mineral deposits. The bulk concrete is also subject to gamma and neutron radiation. The concrete aging/degradation mechanisms discussed above are addressed as discussed in Section 6.3.

#### 6.2.3.5 MTC

The MTC components are subject to a much less challenging environment than the VCC and MSB components. The MTC assembly can be stored inside a building, where moisture and temperature is more controlled, or outdoors if adequately protected from the environmental conditions. The MTC assembly it is only periodically exposed to radiation when it is used for MSB loading operations. Temperatures of all materials during the loading process are all far below allowable levels, even under design-basis MSB heat loads. All metal MTC components are coated carbon steel (largely eliminating galvanic reaction concerns). Due to high safety factors, any cyclic stresses in MTC components are low, so fatigue is not considered to be a concern. The gamma and neutron shield materials are in a sealed cavity, not exposed to the outside air. Due to the absence of a radioactive payload during storage, the MTC is much more accessible for inspection.

The only aging effect of any potential concern for the MTC components is general corrosion on external steel surfaces and crack growth, but corrosion effects are expected to be minor or insignificant, given the mild environment the MTC is exposed to most of the time. Furthermore, all exposed surfaces of the MTC (other than the trunnions) are coated for corrosion protection in the spent fuel pool environment and the MTC assembly is cleaned and decontaminated after each exposure to the boric acid environment of the spent fuel pool.

## Table 6-2 - AMR Results for MSB Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function(1) | Material | Environment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Shell | HT, RS, PR, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | Sheltered | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Material | Corrosion | TLAA(4), AMP(6) |
| Bottom Plate | HT, RS, PR, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | Sheltered | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Material | Corrosion | TLAA(4) |
| Shield Lid Support Ring | SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Lifting Lug | SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Structural Lid | HT, RS, PR, SS | Coated CS | Inert Gas | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | Sheltered | Loss of Material | Corrosion | AMP(5) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Closure Weld Backing Ring | --- | Coated CS | Inert Gas | N/A | N/A | None |
| Shim | RS | Coated CS | Inert Gas | N/A | N/A | None |
| Shield Lid Top Plate | RS, PR, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Shield Lid Bottom Plate | RS, PR, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Shield Lid Side Ring | PR, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |

## Table 6-2 - AMR Results for MSB Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function(1) | Material | Environ-ment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Shield Lid Neutron Shield | RS | RX-277 | Embedded | Loss of Shielding Effectiveness | Radiation | TLAA(2) |
| Shield Lid Pipe & Flex Tubing | --- | Alloy Steel | Inert Gas | N/A | N/A | None |
| Swagelok Quick Connect | --- | Steel | Inert Gas | N/A | N/A | None |
| Structural Lid Valve Covers | PR, RS | Coated CS | Inert Gas | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(2) |
| | | | Sheltered | Loss of Material | General Corrosion | AMP(5) |
| | | | | Crack Growth | Fatigue | TLAA(3) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Shield Lid Support Plate | RS, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Storage Sleeve | CC, HT, RS, SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |
| Basket Edge Structure | SS | Coated CS | Inert Gas | Loss of Fracture Toughness | Radiation | TLAA(2) |

Notes:

(1) Intended functions of subcomponents from Table 1 of Reference 3.1.1: Criticality Control (CC), Heat Transfer (HT), Radiation Shielding (RS), Confinement (PR), and Structural Support (SS).

(2) Reference 3.1.5.

(3) Reference 3.1.6.

(4) Reference 3.1.4.

(5) AMP activities discussed in Sections 6.3.2.4 and 6.3.2.6.

(6) AMP activities discussed in Section 6.3.2.3.

## Table 6-3 - AMR Results for VCC Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function(1) | Material | Environment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Concrete Shell | HT, RS, SS | Concrete | Exposed | Loss of Strength | Aggregate Reactions | AMP(5) |
| | | | | | CaOH Leaching | |
| | | | | | Radiation | TLAA(3) |
| | | | | Cracking, Spalling & Pitting | Freeze/Thaw | AMP(5) |
| | | | | | Aggregate Reactions | AMP(5) |
| | | | | | Corrosion of Rebar | AMP(5) |
| Rebar | SS | CS | Embedded | Loss of Material | Corrosion of Rebar | AMP(5) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Cask Liner Shell | HT, RS, SS | Coated CS(2) | Sheltered | Loss of Material | Corrosion | AMP(6) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Cask Liner Bottom | HT, RS, SS | Coated CS(2) | Sheltered | Loss of Material | Corrosion | AMP(6) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Liner Flange | SS | Coated CS(2) | Exposed | Loss of Material | Corrosion | AMP(7) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Sheltered | Loss of Material | Corrosion | AMP(7) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Cask Lid | RS, SS | Coated CS | Exposed | Loss of Material | Corrosion | AMP(7) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Sheltered | Loss of Material | Corrosion | AMP(7) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Lid Bolts, Nuts, Lockwashers | SS | Coated CS | Exposed | Loss of Material | Corrosion | AMP(7) |
| Locking Wire w/ Lead Seal | --- | SS/Lead | Exposed | N/A | N/A | N/A |

## Table 6-3 - AMR Results for VCC Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function[1] | Material | Environ-ment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Lid Gasket | --- | Polymer | Exposed | N/A | N/A | N/A |
| Shielding Ring Plates (liner and shield ring assys) | RS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP[7] |
| Tile (MSB support) | --- | Ceramic | Sheltered | N/A | N/A | N/A |
| Air Inlet Assembly | HT | Coated CS[2] | Sheltered | Loss of Material | Corrosion | AMP[6] |
| | | | Embedded | N/A | N/A | N/A |
| Air Outlet Weldment | HT | Coated CS[2] | Sheltered | Loss of Material | Corrosion | AMP[6] |
| | | | Embedded | N/A | N/A | N/A |
| Air Inlet Screen/Hardware | HT | Galvanized Steel | Exposed | Loss of Material | Corrosion | AMP[4] |
| Air Outlet Screen/Hardware | HT | Varies | Exposed | Loss of Material | Corrosion | AMP[4] |
| Bottom Plate Assembly | HT | Coated CS[2] | Exposed | Loss of Material | Corrosion | AMP[8] |
| | | | Embedded | N/A | N/A | N/A |
| MTC Alignment Plates | --- | Coated CS[2] | Exposed | N/A | N/A | N/A |
| VCC Lifting Lugs (optional) | SS | Coated CS[2] | Exposed | Loss of Material | Corrosion | AMP[7] |
| | | | Embedded | N/A | N/A | N/A |

Notes:

[1] Intended functions of subcomponents from Table 2 of Reference 3.1.1: Criticality Control (CC), Heat Transfer (HT), Radiation Shielding (RS), Confinement (PR), and Structural Support (SS).

[2] Coatings are only applied to the air-facing surfaces of these steel components. The imbedded (concrete-facing) surfaces are not coated.

[3] Reference 3.1.5.

[4] AMP activities discussed in Section 6.3.2.1.

[5] AMP activities discussed in Section 6.3.2.2.

[6] AMP activities discussed in Section 6.3.2.3.

[7] AMP activities discussed in Section 6.3.2.4.

[8] AMP activities discussed in Section 6.3.2.6

## Table 6-4 - AMR Results for MTC Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function[(1)] | Material | Environ-ment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Outer Shell | SS, RS, HT | Coated CS | Sheltered | Loss of Material | Corrosion | AMP(2) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Inner Shell | SS, RS, HT | Coated CS | Sheltered | Loss of Material | Corrosion | AMP(2) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Middle Shell(4) | SS, RS, HT | CS | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Top Ring | SS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP(2) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Bottom Ring | SS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP(2) |
| | | | | Loss of Fracture Toughness | Radiation | TLAA(3) |
| | | | Embedded | Loss of Fracture Toughness | Radiation | TLAA(3) |
| Neutron Absorber Shield | RS, HT | RX-277 | Embedded | Loss of Shielding Effectiveness | Radiation | TLAA(3) |
| Lead Shield | RS, HT | Lead | Embedded | None | None | None |
| Drain Pipe | — | CS | Embedded | N/A | N/A | N/A |
| Angle, Heat Transfer | RS, HT | Coated CS | Embedded | None | None | None |
| Trunnion | SS | CS | Sheltered | Loss of Material | General Corrosion | AMP(2) |
| Trunnion Cylinder / End Covers | --- | Coated CS | Sheltered | Loss of Material | General Corrosion | AMP(2) |
| Trunnion Inner & Outer Plate(4) | SS, RS | Coated CS | Sheltered | Loss of Material | General Corrosion | AMP(2) |
| Trunnion Lead/ Neutron Shields(4) | RS | Lead & RX-277 | Embedded | Loss of Shielding Effectiveness | Radiation | TLAA(3) |
| MTC Lid | SS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP(2) |

## Table 6-4 - AMR Results for MTC Assembly Subcomponents (2 Pages)

| Subcomponent | Intended Function[1] | Material | Environ-ment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Lid Bolts | SS | CS | Sheltered | Loss of Material | Corrosion | AMP[2] |
| Shim/Flange | RS | CS | Sheltered | Loss of Material | Corrosion | AMP[2] |
| Rail Shield | SS, RS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP[2] |
| Rail Lower Plate | SS | Coated CS | Sheltered | Loss of Material | Corrosion | AMP[2] |
| Rail Alignment Plate/Door Bolt | --- | Coated CS | Sheltered | N/A | N/A | N/A |
| Shield Door | SS, RS, HT | Coated CS | Sheltered | Loss of Material | Corrosion | AMP[2] |
| Light MTC Shield Door Lead Plug | RS | Lead | Embedded | N/A | N/A | N/A |
| Door Top Cover | --- | Coated CS | Sheltered | N/A | N/A | N/A |
| Door Hydraulics/ Brackets/ Attach. Hardware | --- | Coated CS | Sheltered | N/A | N/A | N/A |
| Hydraulic Cylinder Assembly | --- | Coated CS | Sheltered | N/A | N/A | N/A |

Notes:

(1) Intended functions of subcomponents from Table 3 of Reference 3.1.1: Criticality Control (CC), Heat Transfer (HT), Radiation Shielding (RS), Confinement (PR), and Structural Support (SS).

(2) Existing maintenance procedures require regular inspection of the MTC exterior metal surfaces. Any failure or degradation of the coating on the metal surfaces is repaired (touched up). These procedures are sufficient to prevent significant corrosion of the MTC metal components, since the surfaces are very accessible during MTC storage, and the MTC is stored in a sheltered environment. See Section 6.3.2.5.

(3) Reference 3.1.5.

(4) Subcomponent removed by GL in accordance with 10 CFR 72.48 and subsequently adopted in CoC amendment 4 and incorporated in FSAR Revision 5. No MTCs include removed component.

## Table 6-5 - AMR Results for Spent Fuel Assembly Subcomponents

| Subcomponent | Intended Function(1) | Material | Environ-ment | Aging Effect | Aging Mechanism | Aging Management Activities |
|---|---|---|---|---|---|---|
| Fuel Pellets | --- | $UO_2$ | Inert Gas | N/A | N/A | None Required |
| Fuel Cladding | CC, RS, PR, SS | Zircaloy | Inert Gas | Change in Dimension | Cladding Creep | TLAA(3) |
| Spacer Grid Assemblies | CC, SS | Zircaloy or SS | Inert Gas | N/A | N/A | None Required |
| Upper End Fitting | SS | SS / inconel | Inert Gas | N/A | N/A | None Required |
| Upper End Fitting | SS | SS / inconel | Inert Gas | N/A | N/A | None Required |
| Guide Tubes | SS | Zircaloy | Inert Gas | N/A | N/A | None Required |
| Holddown Spring & Upper End Plugs | --- | SS / inconel | Inert Gas | N/A | N/A | None Required |
| Control Components | ---(2) | Varies(4) | Inert Gas | N/A | N/A | None Required |

Notes:

(1) Intended functions: Criticality Control (CC), Heat Transfer (HT), Radiation Shielding (RS), Confinement (PR), and Structural Support (SS).

(2) The VSC-24 criticality analysis does not account for negative reactivity effects of control components. Therefore, the control components do not have a criticality control function.

(3) This aging effect is addressed by the time-limited aging analysis (TLAA) described in Section 6.3.1.6.

(4) Generally stainless steel clad, containing neutron absorbing materials such as boron-carbide, borosilicate glass or silver-indium-cadmium alloy.

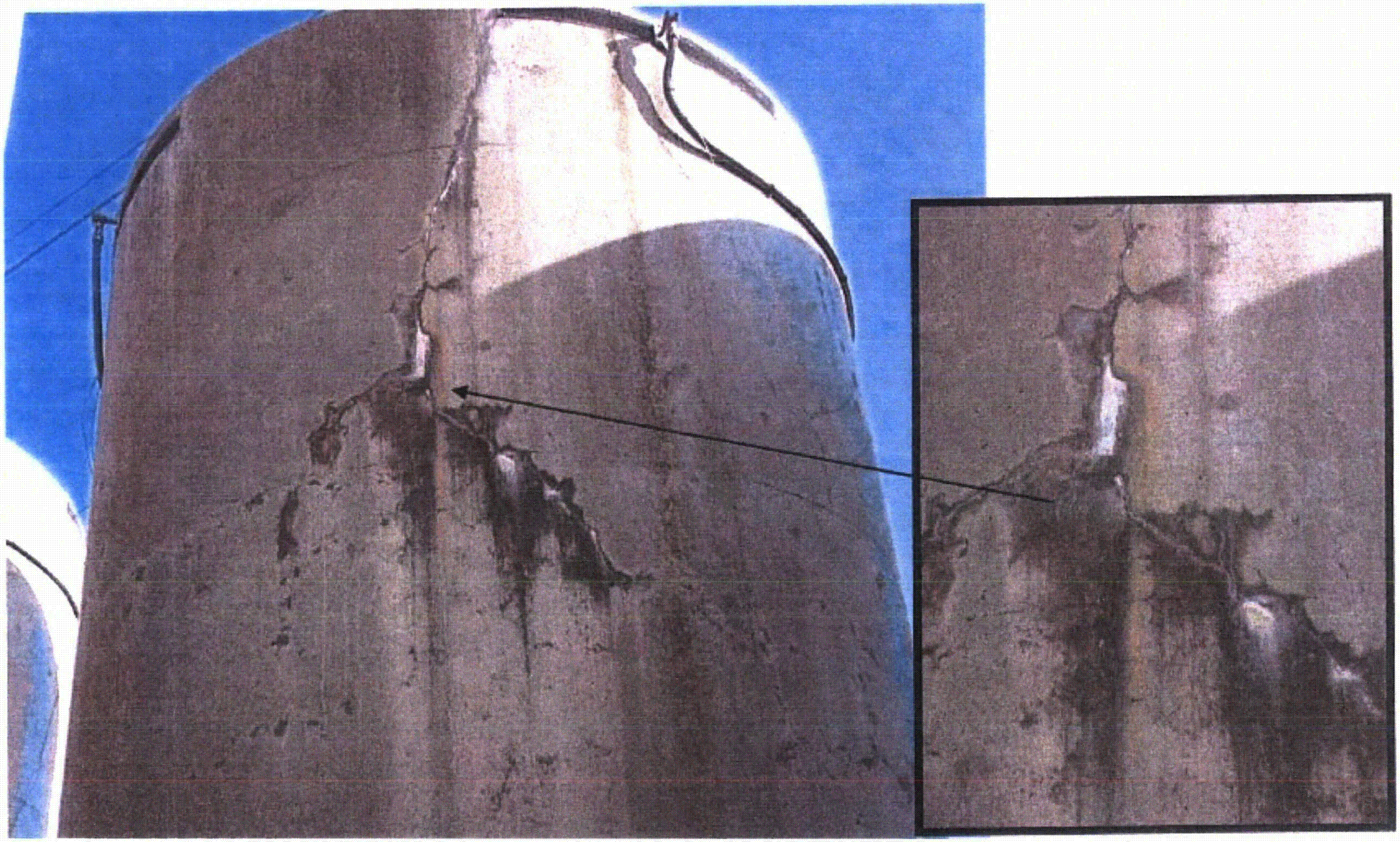

Figure 1 - VCC Surface Cracks and Mineral Deposits

**Figure 2 - Debris at Bottom of VCC Annulus**

Figure 3 - Muddobber Nest in VCC Outlet Duct

Figure 4 - Top End of VCC Annulus and MSB Assembly

Figure 5 - VCC Air Inlet Duct (looking up into VCC annulus)

Figure 6 - Local Coating Failure and Metal Corrosion

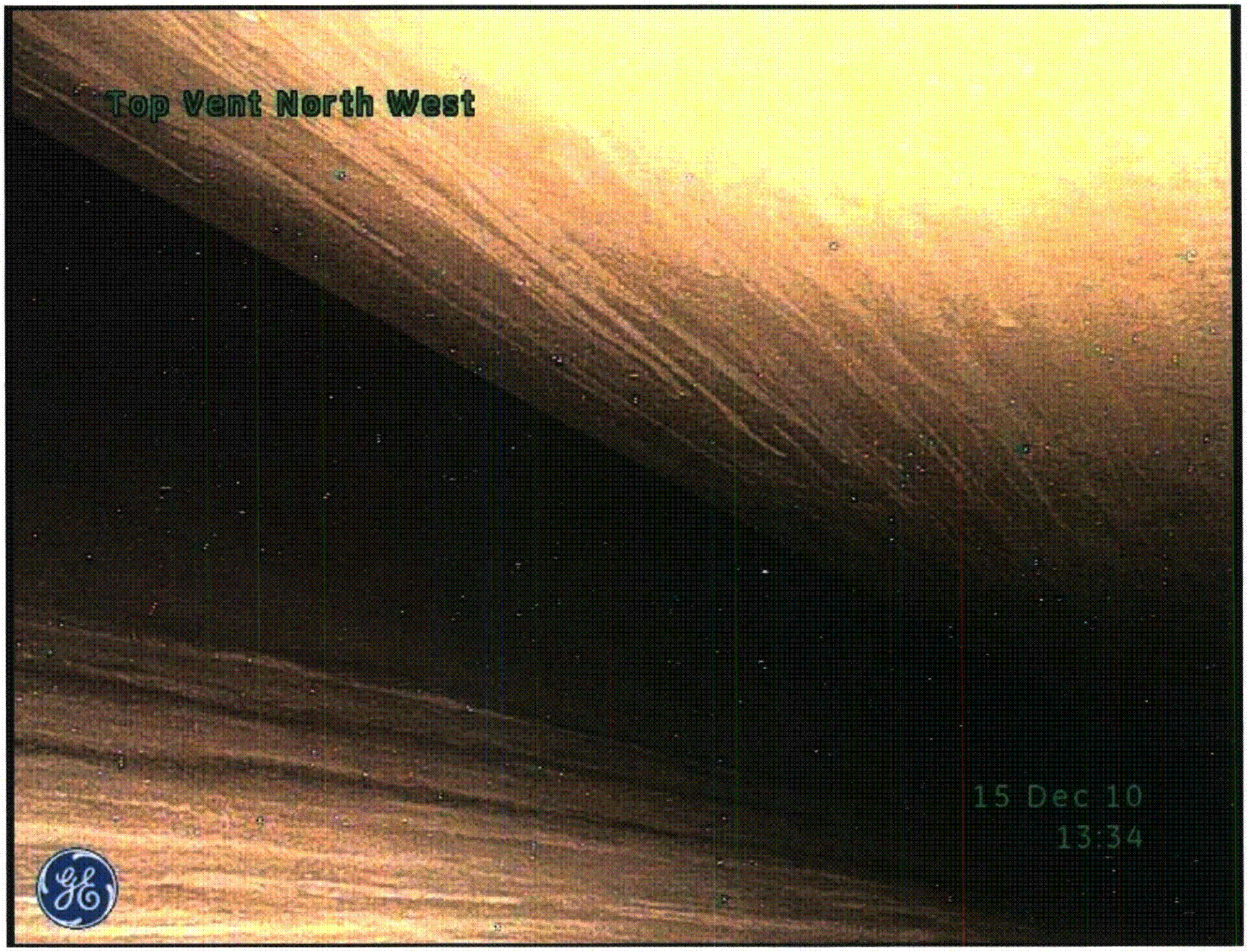

Figure 7 - Deposits on MSB Radial Surface

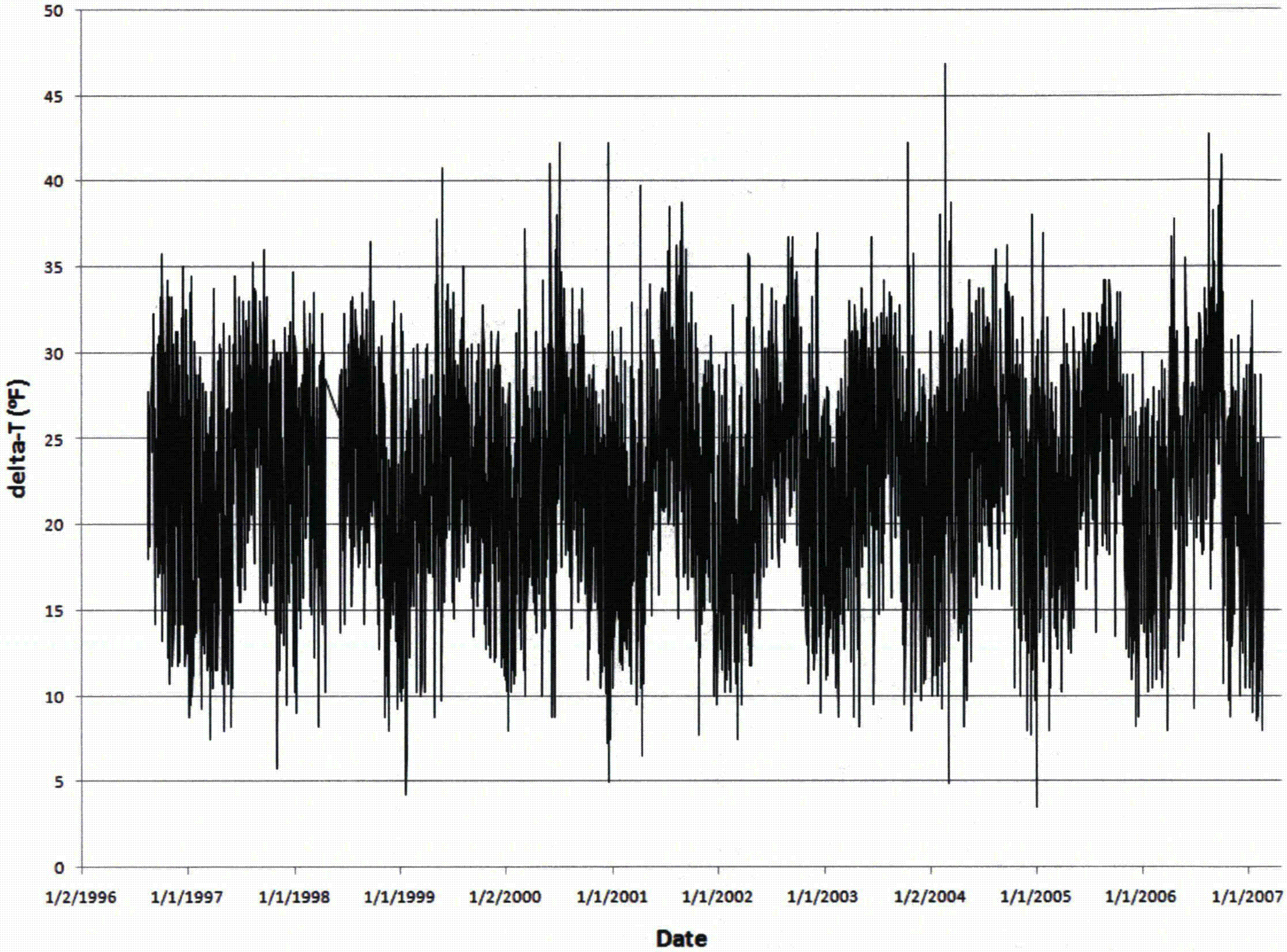

**Figure 8 - Ventilation Air Temperature Rise for a Typical Cask**

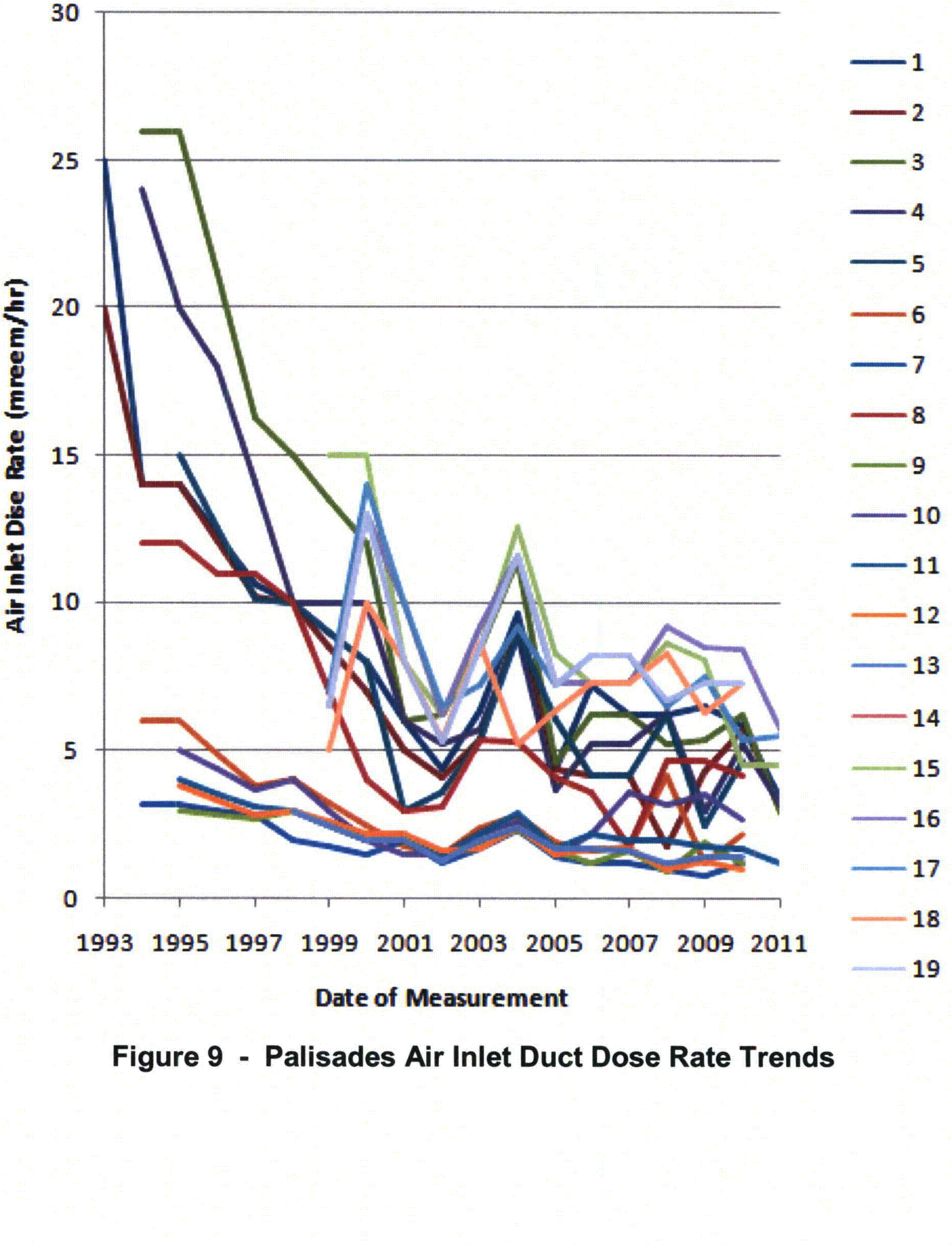

Figure 9 - Palisades Air Inlet Duct Dose Rate Trends

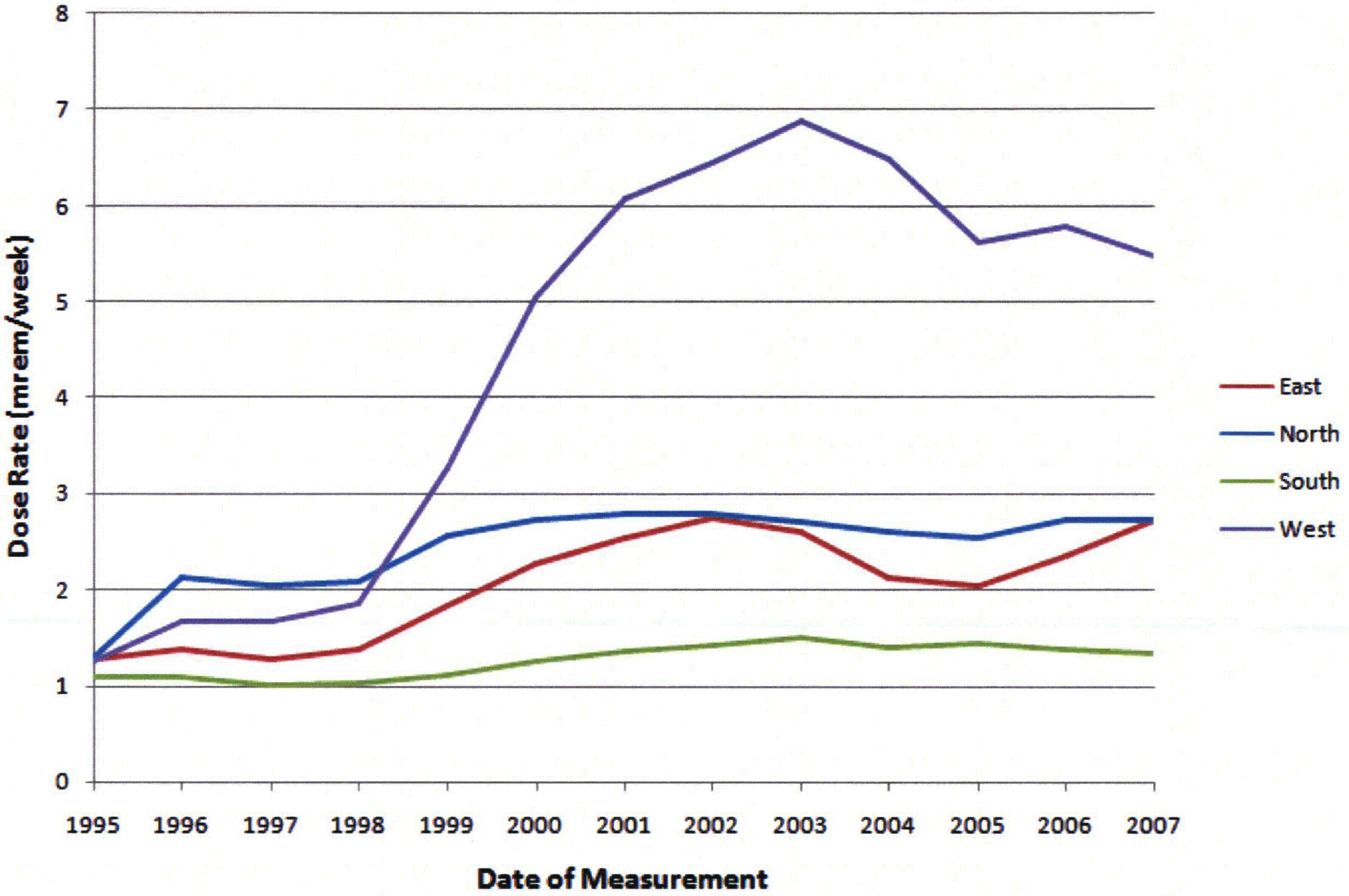

**Figure 10 - Point Beach ISFSI Fence Dose Rate Trends**

## 6.3 Aging Management Activities

Aging effects and degradation mechanisms are identified in Sections 6.2.1 and 6.2.2, and are categorized by component material and environment combination in Section 6.2.3. Summaries of the AMR results for the MSB assembly, VCC assembly, MTC assembly, and spent fuel assembly subcomponents are provided in Tables 2 through 5, respectively. These tables identify the Aging Management Activities (AMAs) that are credited with managing the aging effects for each subcomponent of the in-scope SSCs during the extended storage period. The aging/degradation mechanisms identified in Section 6.2 are either addressed by TLAA or AMP, or both. A discussion of the aging mechanisms that are addressed by TLAA is provided in Section 6.3.1. The AMPs that are credited with managing those aging effects that are not adequately addressed through TLAA are discussed in Section 6.3.2.

### 6.3.1 Time-Limited Aging Analysis

The following criteria defined in NUREG-1927 (Ref. 3.2.1) are used to identify TLAAs for existing SSCs with a time dependent operating life:

(1) Involves in-scope SSCs,

(2) Considers the effects of aging,

(3) Involves time limited assumptions (e.g., 20-year) that are explicit in the analysis,

(4) Determined to be relevant in making a safety determination,

(5) Provides conclusions, or the basis for conclusions, regarding the capability of the SSC to perform its intended safety function through the operating term, and

(6) Contained or incorporated by reference in the licensing basis.

Design documents for the VSC-24 Storage System were reviewed against the TLAA identification criteria discussed above. The following TLAAs were identified for further evaluation and disposition for the extended period of operation:

(1) MSB Helium Leakage Evaluation

(2) MSB Fatigue Evaluation

(3) MSB Corrosion Evaluation

(4) Palisades MSB #4 Weld Crack Growth Evaluation (Site-Specific)

(5) Radiation Effects Analysis

(6) Fuel Cladding Creep Evaluation

(7) Evaluation of Loss of MSB Lid RX-277 Shielding Function After 20 Years of Storage

Each of these TLAAs is further evaluated and dispositioned for the extended period of operation as follows: (i) Remains valid for the extended license period, (ii) Projected to the end of the extended period of operation, or (iii) Aging effects on intended safety functions will be adequately managed for the extended period of operation. The evaluations and dispositions of these TLAAs for the extended period of operation are discussed in the following subsections.

### 6.3.1.1 MSB Helium Leakage Evaluation

The original VSC-24 licensing evaluations considered the potential impact of leakage of helium out of the MSB (through the maximum leak path allowed by the specified MSB leak test criterion). The maximum amount of helium that could leak out of the MSB over a 50 year storage period was determined, and the potential impact on the MSBs thermal performance was evaluated.

The analysis was revised to increase the storage period from 50 to 60 years. The revised analysis (TLAA) is presented in Reference 3.1.2. The analysis concludes (as did the initial analysis) that helium leakage out of the MSB over the storage period is too small to have any significant impact.

### 6.3.1.2 MSB Fatigue Evaluation

Fatigue of the MSB assembly is addressed by the analysis performed in Reference 3.1.6. The MSB assembly is shown to not require a detailed fatigue evaluation since the number of significant cycles of mechanical, pressure, and thermal loading over the 60-year extended storage period are low. Therefore, the TLAA (Reference 3.1.6) is credited with managing crack growth of the MSB assembly due to fatigue during the extended storage period.

### 6.3.1.3 Corrosion of MSB Shell and Bottom Plate

The original VSC-24 licensing evaluations employed a corrosion allowance of 0.003 inches per year for the MSB radial shell and bottom plate; a bounding value based on uncoated carbon steel in a harsh, marine environment. The maximum corrosion loss on the external surfaces of the MSB shell and bottom plate is conservatively estimated to be 0.15-inch over a 50-year period.

The MSB corrosion analysis (Reference 3.1.4) has been revised to increase the storage period to 60 years. The additional thickness reduction of the MSB shell and bottom plate for the extended storage period is 0.03 inches, for a total corrosion allowance of 0.18 inches. The TLAA demonstrates that the maximum stresses in the corroded MSB shell and bottom plate continue to satisfy the corresponding allowable stress design criteria. Therefore, the corroded MSB shell and bottom will continued to satisfy their intended safety functions for the extended period of operation (i.e., 60 years.) The TLAA (Reference 3.1.4) is credited with managing corrosion of the MSB shell and bottom plate during the extended storage period.

### 6.3.1.4 Palisades MSB#4 Weld Crack Growth

As discussed in Section 6.2.2, indications of weld flaws (above the allowable size) were found in MSB closure welds and in the main longitudinal weld of Palisades MSB #4. An evaluation was performed to determine if the indications (or weld flaws) are subject to growth over the initial 50-year storage period. The evaluations showed that crack growth is not expected within the closure welds. The crack growth analysis of Palisades MSB #4 has been revised to account for the extended storage period of

60 years and the maximum corrosion allowance of 0.18 inches on the outside of the MSB shell (Reference 3.1.7). The revised analysis demonstrates that the crack depth and length do not increase significantly during the extended storage period and that the minimum flaw stability safety factors under all conditions are greater than required ASME Section XI. Based on the above, the TLAA (Reference 3.1.7) is credited with managing crack growth of the MSB #4 weld during the extended storage period.

#### 6.3.1.5 Radiation Effects on Cask System Materials

An analysis was performed (Reference 3.1.5) which addresses the impacts of both gamma and neutron radiation on all MSB and VCC materials (i.e., carbon steel, concrete and the RX-277 neutron shielding material in the MSB lid). The analysis considers the radiation that will be seen, by each material, over a 60-year storage period. The evaluated gamma and neutron radiation bound those that would be seen by any of the MTC materials (also steel and RX-277, as well as lead), since the MTC is only in contact with the radioactive payload periodically.

The TLAA (Reference 3.1.5) shows that the gamma and neutron radiation seen by VSC-24 cask system materials are below the levels required to have any measurable adverse effect on the properties of those materials. Therefore, the TLAA (Reference 3.1.5) is credited with managing the aging effects resulting from radiation exposure during the extended storage period.

#### 6.3.1.6 Fuel Assembly Cladding Creep

As discussed in Section 6.2.3.1, the only potentially significant aging mechanism that applies for the low-burnup, zircaloy-clad PWR fuel that qualifies for loading in the VSC-24 system (given that the helium atmosphere is maintained) is cladding creep.

The original VSC-24 licensing evaluations determined, using the Diffusion Controlled Cavity Growth (DCCG) methodology, that cladding creep over the initial 40 years of storage would not exceed the acceptance criterion of 1.0% cladding strain. A revised analysis (Reference 3.1.3) was performed to determine the amount of additional creep and cladding strain (if any) that may occur after the initial 40-years of storage.

The Reference 3.1.3 analysis shows that any cladding creep that occurs after the initial 40 years of storage is negligible. This is due to the fact that after 40 years of storage, cladding temperatures (even for design-basis fuel with the maximum allowable heat load at the time of loading) are approximately 150°C. The rate of cladding creep falls to negligible levels at this low temperature. Thus, the TLAA is credited with managing the creep of the fuel cladding during the extended storage period.

#### 6.3.1.7 Loss of MSB Lid Shielding Design Function After 20 Years of Storage

The Section 6.3.1.5 TLAA demonstrates that long-term radiation exposure will not significantly impact the shielding function of the MSB lid RX-277 material. No other significant potential sources of degradation have been identified, given that the RX-277 lies within a sealed chamber and is exposed to fairly low temperatures (well below the material's service temperature). However, to clearly demonstrate that measures to ensure shielding performance of the RX-277 material are not necessary, an additional TLAA (Reference 3.1.9) was performed to evaluate the impact of a complete loss of neutron shielding function of the MSB lid RX-277 material, after 20 years of storage.

The evaluation includes neutron shielding analyses that conservatively (and entirely) removed the RX-277 material from the MSB shield lid, but also accounted for the reduction (decay) in the MSB assembly payload's neutron source strength that occurs over the initial 20-year storage period. The evaluation also estimated the impacts of the (significant) reduction in assembly payload gamma source strengths that also occurs over the initial 20-year storage period.

The evaluations showed that the reduction in neutron source strength (over 20 years) more than offsets the effect of a complete loss of neutron shielding material. The analyses showed that, even with the MSB lid RX-277 material completely removed, the VCC top surface average neutron dose rate is lower than the initial, licensing-basis value, after accounting for the reduction in neutron source strength. The evaluation also showed that the VCC top surface average gamma dose rate is much lower (than the initial, licensing basis value) after the 20-year storage period. The total (neutron plus gamma) VCC top surface average dose rate was much lower than the allowable value of 200 mrem/hr (given in Technical Specification 1.2.4 of the VSC-24 FSAR), even with no credit taken for the neutron shielding properties of the MSB lid RX-277 material.

Significant loss of RX-277 gamma shielding properties is not considered credible, since gamma attenuation scales with bulk mass (density and thickness) and the RX-277 material lies within a sealed chamber that prevents a significant fraction of the bulk mass escaping. However, the reduction in assembly payload gamma source strength over the 20-year initial storage period is such that the gamma shielding properties of the RX-277 material are not needed either, in order to yield VCC top surface average dose rates within the specified limit.

Based on the results of this TLAA, along with the results of the Section 6.3.1.5 TLAA, it is concluded that there are no potential aging or degradation mechanisms of the MSB lid RX-277 material that require management with an AMP. No aging management activities to evaluate or ensure shielding performance, such as dose rate measurements, are necessary.

### 6.3.2 Aging Management Programs

Aging effects that could result in loss of in-scope SSC's intended function(s) are required to be managed during the extended storage period. The aging effects that require management are discussed in Section 6.2.1 and summarized in Table 6-2 through Table 6-5. Many aging effects are adequately managed for the extended storage period using TLAA, as discussed in Section 6.3.1. AMPs are used to manage those aging effects that are not managed by TLAA. The AMPs that manage each of the identified aging effects for all in-scope SSCs are described in the following subsections. The AMPs include the exiting surveillance requirements in the VSC-24 Technical Specifications for the VSC and MSB assemblies, with modifications to address aging effects that could potentially occur during the extended storage period. AMPs also include periodic inspection of the VCC top interior and the MTC assembly. In addition, the lead cask inspection described in Section 6.3.2.6 provides additional assurance that the VCC and MSB assemblies do not experience any unanticipated degradation.

#### 6.3.2.1 Examination of VCC Assembly Air Inlets and Outlets

The wire mesh screens that cover the inlet and outlet ducts of all VCC assemblies are visually inspected on a daily frequency in accordance with the current TS 1.3.1 (Ref. 3.2.5). The purpose of this AMP is to monitor the cask for conditions that cause blockage of the air ventilation paths (e.g., accumulation of snow or debris) or degradation of the wire mesh screens (and screen attachment hardware) that could prevent them from performing their intended functions (i.e., preventing material from entering and blocking the VCC air flow paths.) This AMP is credited with managing loss of material due to corrosion of the air inlet and outlet screens and attachment hardware. The elements of this AMP are summarized in Table 6-6 and discussed in this section.

Detection and removal of blockage of the screens that cover the VSC assembly air inlets and outlets on a daily frequency assures blockage of the vent screens will not reduce the natural convective heat transfer within the VCC assembly annulus, thereby providing reasonable assurance that the maximum material temperatures will not exceed the temperature limits. The thermal evaluation of the VSC-24 storage system demonstrates that the component temperatures do not exceed the corresponding accident temperatures limits when all air inlets are completely blocked for 30 hours. Identification and repair of degradation of the wire mesh screens (and attachment hardware) in accordance with the GL's Corrective Action Program assures that the wire mesh screens will maintain their intended functions.

Operating experience during the initial storage period shows that daily visual inspection of the air inlet and outlet vents provides adequate management of aging effects that could potentially result in a loss of the vent screens intended functions. As discussed in Section 6.2.2.2, only partial blockage of some inlet screen covers and degradation to some inlet and outlet screen covers, such as bent screens or missing/damaged hardware, have been identified during the initial storage period. All identified screen blockage and degradation was corrected in accordance with existing maintenance procedures. Therefore, the AMP activities (i.e., TS 1.3.1) will adequately manage the aging effects identified for the VCC assembly wire mesh screen covers (and attachment hardware) during the extended storage period.

#### 6.3.2.2 Examination of the VCC Assembly Exterior Concrete

The readily accessible exterior concrete surfaces of all VCC assemblies are required to be visually inspected for concrete degradation (e.g., cracking, chipping, or spalling) on a yearly frequency in accordance with current TS 1.3.2 (Ref. 3.2.5). The purpose of TS 1.3.2 is to maintain the surface condition of the VCC assembly concrete in order to prevent degradation of the concrete and maintain the VCC assembly's intended functions. The exterior concrete surfaces are also examined and monitored for indications of aging mechanisms that may cause loss of strength, such as cracking due to aggregate reactions or corrosion of embedded steel and increased porosity due to CaOH leaching. The aging effects that this AMP is credited with managing are identified in Table 3. The elements of this AMP are summarized in Table 6-7 and discussed in this section.

Aging effects for the VCC assembly concrete shell that are managed by this AMP include cracking, scaling, spalling, and loss of strength. Cracking, scaling, and spalling of the concrete surface can result from several different aging mechanisms, including freeze-thaw cycles, ASR-induced expansion, and corrosion of embedded steel (e.g., rebar), as discussed in Section 6.2.1.2. The exterior concrete surfaces of the VCC assembly are visually inspected for damage, such as concrete cracking, scaling, or spalling, in accordance with current TS 1.3.2. In addition, concrete surfaces are visually inspected for rust stains, increased porosity, and/or discoloration that are indicative of rebar corrosion and CaOH leaching. Also, the concrete-to-steel interfaces at the VCC bottom plate and VCC outlet assemblies shall be are inspected for gaps and voids that may provide a pathway for water to enter the VCC concrete.

Defects in the concrete surface or at the steel-to-concrete interfaces of the VCC bottom plate and VCC outlet assemblies that exceed ½-inch in diameter (or width) and ¼-inch deep are required to be repaired by filling them with grout to prevent further degradation of the interior concrete and embedded steel reinforcing, evaluated to determine their cause, and monitored (i.e., crack mapping) and trending during the extended storage period to identify possible presence of ASR-induced expansion and corrosion of embedded steel. Progressive growth of defects in the concrete surface may indicate degradation due to ASR-induced expansion or corrosion of embedded steel. Repair of defects in the concrete surface prevents exposure of the rebar to oxygen and moisture, which is required for rebar corrosion. Progressive growth of defects in the concrete surface may indicate degradation due to ASR-induced expansion, leaching or CaOH, or corrosion of reinforcing steel, which require further corrective actions.

Concrete that shows evidence of significant rebar corrosion, such as splitting cracks (i.e., longitudinal cracks that propagate parallel to the rebar) or excretion of rust (i.e., discoloration or staining at or below cracks on the concrete surface), shall be tested using non-destructive examination (NDE) techniques, such as impact or other suitable methods, to detect rebar corrosion and/or delamination of concrete (which can result from rebar corrosion), and evaluated for continued storage. A cask with aging effects due to rebar corrosion that is not acceptable for continued storage shall be repaired or replaced.

Loss of concrete strength may result from ASR or leaching of CaOH, as discussed in Section 6.2.1.2. These aging mechanisms are typically indicated by map cracking (i.e., more or less uniform spacing of cracks over the entire concrete surface), surface deposits (efflorescence or gel staining), or increased porosity on the concrete surface. The exposed concrete surfaces on the sides and top of the VCC assembly shall be visually examined for evidence that may indicate loss of strength. Visual examination of the VCC concrete exterior surfaces shall be performed in accordance with ACI 201.1 R-08 (Ref. 3.2.21), or an equivalent industry-consensus standard. Performance monitoring (i.e., crack mapping) performed at regular intervals (i.e., annually), provides a non-destructive means to assess potential degradation of the VCC concrete strength. If performance monitoring indicates the potential presence of ASR-induced degradation or leaching of CaOH, then additional actions shall be taken to confirm the presence of the degradation mechanism, determine the cause of the aging effect, determine if the aging effect has adversely affected the concrete strength, and evaluate the VCC assembly for continued storage.

Concrete surfaces that show visual evidence of degradation from aggregate reactions, as determined by the qualified inspector, shall be further investigation to confirm or refute the presence of ASR gel in the concrete. The preliminary investigation shall consist of field tests of the affected cask(s) to detect the presence of ASR silica gel on the concrete surface using uranyl acetate fluorescence, as described in Federal Highway Administration Report No. FHWA-HIF-09-004 (Reference 3.2.22), or other suitable methods identified by the GL. Alternatively, samples of surface deposits can be sent for X-ray analysis to help determine if silica gel is present.

If silica gel is not present in the concrete, then there is a low potential for ASR-induced degradation and no further immediate corrective actions are required. However, if the presence of silica gel is confirmed, then Crack Index (CI) measurements shall be taken on the affected cask(s) in accordance with FHWA-HIF-09-004 3.2.22 to determine the extent of ASR-induced degradation in the concrete. Any cask with a CI that is greater than 0.5 mm/m (0.018 in/yard) and/or with crack widths that exceed

0.15 mm (0.006 in) requires detailed in-situ and/or laboratory investigations to determine the current condition of the concrete and its potential for future degradation.

At a minimum, detailed in-situ investigations shall include periodic CI measurements, taken at least twice a year for a minimum of 3 years, to monitor the progression of ASR induced degradation. After 3 years, the CI measurement frequency may be reduced to once every 5 years if the CI shows no significant increasing trend. As discussed in FHWA-HIF-09-004 (Reference 3.2.22), CI measurements should be taken under similar environmental conditions each time since crack widths are affected by temperature and humidity.

Although destructive examination of the concrete should be avoided if possible, detailed laboratory testing, including potrographic examination, mechanical testing, expansion testing, and alkali content testing, may be performed using concrete core samples from the cask, if required to assess the condition of the concrete and the potential for further ASR-induced degradation. The collective results from the detailed in-situ and laboratory testing are used to identify mitigation measures and evaluate the cask. Potential mitigation measures for ASR-affected concrete, as discussed in Section 6.0 of FHWA-HIF-09-004 3.2.22, include application of a siloxane or silane sealer to the concrete surface to reduce its moisture content below 80%, the level below which ASR-induced expansion is significantly reduced or suppressed. A VCC assembly that is determined to have concrete that has a significant potential for further expansion due to ASR and/or does not meet the strength requirements specified in the FSAR shall be evaluated for continued storage, and repaired or replaced, if necessary.

As discussed in Section 6.2.2.2, operating experience during the initial storage period shows that typical degradation of the concrete exterior surface consist of small surface defects, such as hairline cracks and pits (e.g., “bugholes” or “popouts”) and local discoloration of the concrete from mineral deposits (e.g., efflorescence). Cracks and surface pits exceeding the size permitted by TS 1.3.2 have been identified and repaired with grout in accordance with the GL’s existing maintenance procedures. Furthermore, there has been no clear increasing trend in the number of reported cracks or pits seen at any of the sites for the subsequent years, nor have there been any indications of failure of grout-repairs. Therefore, the AMP activities (i.e., TS 1.3.2) will adequately manage the aging effects identified for the exterior surfaces of the VCC assembly during the extended storage period.

#### 6.3.2.3 Examination of the VCC Assembly Ventilation Ducts and Annulus

In accordance with the requirements of TS 1.3.3 and this AMP, the first VSC-24 cask loaded at each site is visually examined on a 5-year frequency. The visual examination of each air inlet duct, outlet duct, and the VCC annular region (top to bottom) is performed using remote visual equipment (e.g., bore-scope and video recorder). The main purpose of this examination is to confirm that no unanticipated blockage has accumulated inside the VCC assembly ventilated flow path that could interfere with the natural convective air flow and prevent the VCC assembly from performing its intended heat transfer function. The other purpose of this examination is to confirm, through remote visual inspection, that the metal surfaces that line the inside the VCC assembly air inlets, air outlets, and cask annulus (including the MSB shell), which are normally inaccessible, are not experiencing any unanticipated degradation that could prevent them from performing their intended functions. Monitoring the condition of the interior of the first VSC-24 cask placed in service at each site for unanticipated blockage and material degradation provides confirmation that the design is performing as intended. As shown in Table 3, this AMP is credited with managing loss of material due to corrosion of the VCC air inlet and outlet ducts, liner shell and liner bottom. The elements of this AMP are summarized in Table 6-8 and discussed in this section.

The steel plates that line the VCC air inlet and outlet ducts and the cask annulus serve as cast-in-place formwork, which form the VCC geometry that provides the ventilation flow path, thus providing a heat transfer function. In addition, the VCC liner provides radiation shielding and is credited for structural support for certain load conditions. The shield ring plates located at the top of the VCC annulus provide radiation shielding at the top of the cask. Although the exposed surfaces of these steel components are coated, degradation of the coating and some corrosion could occur during the extended storage period. If significant corrosion is observed on these steel components, then the VCC assembly shall be evaluated for continued storage. Significant corrosion is considered to be corrosion that results in loss of material, such as excessive pitting or scaling that has an adverse affect on the shielding, structural, or thermal safety functions of the VCC assembly. Corrosion that results only in discoloration of the surface (e.g., light oxidation or "rust blooms") will not result in the loss of any of the VCC assembly's intended functions, but should be monitored and trended with future surveillances. VCC assemblies that are determined to not be acceptable for continued storage shall be repaired or replaced.

Although the exterior surfaces of the MSB are coated, a corrosion allowance of 0.003 inches per year is conservatively assumed for the MSB shell and bottom plate, as discussed in Section 6.3.1.3. This general corrosion rate is based on uncoated carbon steel in a marine environment. Some degradation of the coating and corrosion on the exterior surfaces of the MSB shell and bottom plate is expected to occur during storage, and is acceptable. The visual examination of the exterior surface of the MSB shell provides qualitative confirmation that there is not any unanticipated degradation of the MSB shell (e.g., excessive pitting corrosion greater than the design basis corrosion allowance) that could prevent the MSB from performing its intended safety functions. If the visual examination (by a qualified inspector) indicates the possibility of corrosion in excess of 0.003 inches per year of storage, further evaluations shall be performed to confirm the level of corrosion, to evaluate the extent of condition, and to evaluate the MSB for continued service.

Operating experience during the initial storage period shows that no significant blockage has accumulated within the ventilation flow path of the inspected casks and that the majority of the steel surfaces inspected are in excellent condition, with very little coating degradation or signs of corrosion. Debris within the airflow path most commonly occurs just inside the inlet vent screens. Small amounts of blockage have also been observed deeper within the ventilation flow path, such as a muddobber's nest and mineral deposits. Whenever possible, debris is removed from the ventilation flow paths in accordance with GL procedures. However, in some cases, such as buildup of mineral deposits which are difficult to remove, blockage that is less than 10% of the cross-sectional flow area of a segment is allowed to remain since it has no significant affect on the thermal performance of the system. As discussed in Section 6.2.2.3, the results of the VCC 5-year inspections show that the amount of coating degradation and corrosion that has occurred on the MSB shell is minimal, and much less than the design basis corrosion allowance of 0.003-inches per year. The results of the 5-year inspections also show no evidence of significant corrosion on the VCC liner and ventilation duct surfaces that would significantly affect the ability to perform their intended functions.

### 6.3.2.4 Examination of VSC Top End Steel Components

The top interior of one VSC-24 cask loaded at each site is visually examined on a 10-year interval (±1 year) during the extended storage period to manage loss of material (corrosion) on the coated steel surfaces. The first examination is to be performed on one cask at each site within one (1) year before or after the first cask loaded at the site has been in storage for 20-years, or the effective date of the CoC renewal. The examination shall be performed on the first cask loaded at each site. Alternatively, the GL may select a different cask for inspection based on maximum cask heat load or cask accessibility.[1] However, the same cask shall be used for the subsequent examinations so that trending can be performed.

The scope of the examination includes visual inspection of all readily accessible surfaces (internal and external) of the VCC cask lid, VCC liner flange, VCC shield ring plates, VCC lid gasket, VCC lid bolts, MSB structural lid, MSB valve covers, and MSB closure weld. If (optional) lifting lugs are present on the top end of the VCC, they are also to be inspected. The purposes of this examination are to confirm, through visual inspection, that the surfaces of the VCC cask lid, VCC liner flange, VCC shield ring plates, VCC lid gasket, VCC lid bolts, MSB structural lid, MSB valve covers, and MSB closure weld, many of which are normally inaccessible, are not experiencing any unanticipated degradation that could prevent them from performing their intended functions. Monitoring the condition of the VSC top end steel components of one cask at each site for unanticipated material degradation provides confirmation that the design is performing as intended. The aging effects that this AMP is credited with managing are identified in Tables 2 and 3. The elements of this AMP are summarized in Table 6-9 and discussed in this section.

Visual inspection of the VCC liner flange, shield ring plates, MSB structural lid, and MSB closure weld may be performed using long-handled tools and/or remote visual equipment (e.g., borescope/camera). In order to perform the examination of the VSC top end steel components, the VCC cask lid must be removed. If the view of the MSB closure weld is blocked by the VCC shield ring plates, the VCC shield ring plates may be lifted slightly (no more than 2") to expose the MSB closure weld. Dose rates around the MSB closure weld shall be monitored and temporary shielding may be used to minimize occupational exposure. Following the completion of the surveillance activities, replace the VCC cask lid gasket, secure the VCC cask lid, and replace the locking wire.

The VCC cask lid provides radiation shielding and structural support safety functions. In addition, the cask lid and lid gasket serve to protect the MSB assembly from the exposed external environment. Corrosion of the VCC cask lid, lid bolts or liner flange could diminish their structural and shielding capacities. Also, degradation of the VCC cask lid, lid bolts, liner flange, or lid gasket could allow water to leak into the top of the VCC assembly. However, even if water were to leak through the lid gasket, the geometry of the VCC shielding ring plates will direct the flow of water down the VCC annulus and prevent water from accumulating on the top of the MSB assembly, thereby preventing any unanticipated corrosion of the VCC liner and MSB shell. Furthermore, any significant amount of

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[1] Since this examination is included in the scope of the lead cask inspection discussed in Section 6.3.2.6, it may be included in the lead cask inspection for the 20-year intervals, but must be performed separately for the intermediate 10-year intervals. For those sites that do not perform lead cask inspections, this examination must be performed per the specified timing and intervals.

water that drips to the bottom of the VCC annulus will drain out the VCC inlet channels. The carbon steel surfaces of the VCC liner and MSB assembly that form the VCC annulus are coated for corrosion protection. Moisture that accumulates on the coated surfaces of the VCC liner and MSB shell will evaporate or drain out of the VCC assembly. The VCC shield ring plates provide only a shielding safety function. Coating degradation and general surface corrosion (i.e., discoloration of the surface) of the VCC shield ring plates is permitted as it will not significantly diminish their shielding capacity.

The safety functions of the MSB structural lid, valve covers, lifting lugs (if present), and closure weld include confinement, structural support, shielding, and heat transfer. Significant corrosion of the MSB structural lid, valve covers, lifting lugs (if present), and closure weld (i.e., corrosion resulting in loss of material, such as scaling) could diminish their ability to perform the intended safety functions. However, corrosion that results only in discoloration of the steel surface finish, such as rust blooms, is not considered to be significant since it will not result in the loss of intended functions. Safety analyses of the MSB structural lid and closure weld are based on nominal dimensions and do not include a corrosion allowance.

Any indications of water leakage into the top of the VCC assembly or coating degradation (e.g., blistering, cracking, peeling, or loss of adhesion with the underlying metal surface) or corrosion observed on the VCC cask lid, liner flange, shield ring plates, and MSB structural lid, valve covers, and closure weld that is identified during the visual inspection should be documented using appropriate means (i.e., photographs, video recording, and/or written descriptions.) Coating on the VCC cask lid and MSB structural lid, valve covers, and closure weld that is degraded to the extent that the underlying steel surface is exposed shall be removed to allow further examination of the underlying metal surface to determine if any significant loss of material has occurred. If it is determined that corrosion of the MSB structural lid, valve covers, and/or closure weld has caused significant loss of material, such as pitting or scaling (as opposed to surface discoloration,) then the GL shall document the condition in accordance with the site's Corrective Action Program, evaluate the cask for continued storage, and determine the extent of condition. VCC lid bolts with significant corrosion (i.e., more than discoloration of the surface finish) shall be replaced.

Operating experience from the initial lead cask inspection performed on Palisades Cask Number VSC-15, discussed in Section 6.2.2.5, shows that the VCC lid gasket showed no evidence of leakage during the initial storage period. The coating on the VCC lid, liner flange, shield ring plates, and the MSB structural lid and closure weld were also found to be intact and adhered to the underlying steel, except in two small areas where the coating was intact but appeared to be blistered or bubbled. Upon removal of the temporary shielding used during the inspection, a few small areas of coating were scraped off of the structural lid. The coating in the areas that appeared to be blistered and the area that had been scraped was removed, and visual inspection of the underlying steel surface did not identify any signs of corrosion. The exposed steel surfaces were cleaned and recoated. Upon completion of this inspection, a new VCC lid gasket was installed and the VCC cask lid was attached.

### 6.3.2.5 Examination of the MTC Assembly

The MTC assembly aging effects that require management by AMP, as identified in Table 4, are limited to loss of material due to corrosion of the exposed surfaces of the coated and uncoated carbon steel subcomponents. The scope of the AMP includes visual examination of all readily accessible interior and exterior surfaces of the MTC assembly, and functional testing of the MTC shield doors.

The MTC assembly used at each site is examined on a 10-year frequency (± 1-year), with the initial inspection completed within 2-years following the later of the 20th anniversary of the first cask loaded at that site or the CoC renewal date.

Although the MTC assembly is stored in a sheltered environment, the MTC assembly is intermittently exposed to the wet environment of the spent fuel pool during the MSB assembly loading operations. Most surfaces of the MTC assembly that are exposed to the spent fuel pool water are coated to protect the spent fuel pool chemistry, facilitate decontamination, and protect against corrosion. Coating degradation and exposure to moist atmospheric conditions (i.e., sheltered environment) may lead to corrosion of the MTC assembly carbon steel subcomponents. The purpose of this AMP is to ensure that the MTC assembly does not experience any coating degradation or loss of material during the extended storage period that could prevent it from performing its intended functions. The elements of this AMP are summarized in Table 6-10 and discussed in this section.

The scope includes a visual examination of all readily accessible interior and exterior surfaces of the MTC assembly and a functional test of the MTC shield doors. The MTC assembly examination shall be performed annually. However, if the MTC assembly has not been used for a period exceeding one year, the frequency of examination may be reduced to once every ten years. The visual examination is performed to identify degradation of the coating and corrosion of the coated and uncoated carbon steel surfaces that could prevent the MTC assembly from performing its intended functions. Exposed surfaces of the MTC assembly where the coating is degraded (e.g., blistered, cracked, chipped, or peeling) to the extent that the underlying steel is exposed shall be further examined to determine if corrosion of the underlying steel has occurred. The functional test of the MTC shield door assembly is performed to verify that the shield doors slide as required for the MSB vertical transfer operations.

Coating degradation and corrosion identified during the visual examination of the MTC assembly will be documented using appropriate means (i.e., photographs, and/or written descriptions) and evaluated, reviewed, approved, and corrected using the GL's Corrective Action Program. Any part of the MTC assembly with coating degradation that exposes the underlying carbon steel surface must be further examined to verify that the underlying steel has not experienced any loss of material from corrosion. An MTC assembly that has experienced loss of material from corrosion, as opposed to surface discoloration (e.g., rust blooms), shall be evaluated for continued use. Areas with coating degradation and/or corrosion shall be repaired and recoated, as applicable, to prevent further loss of material during the extended storage period. The evaluation should consider the as-built condition of the MTC assembly (e.g., any fabrication deviations, such as the undersized weld discussed in Section 6.2.2.1.1).

The functional test of the MTC shield door assembly shall demonstrate that the shield doors can be opened and closed with the MTC hydraulic assemblies. Degradation of the MTC hydraulic assemblies may cause them to not function properly. Degradation of the lubrication coating on the sliding surfaces of the shield doors may cause increased sliding resistance. If required, the MTC hydraulic assemblies may be repaired or replaced and the sliding surfaces may be re-coated with lubrication.

### 6.3.2.6 Lead Cask Inspection

The lead cask inspection program further demonstrates that the VCC and MSB assemblies have not undergone unanticipated degradation while in storage in accordance with guidance provided in Appendix E of NUREG-1927 (Ref. 3.2.1). At each site, the lead cask inspection is performed at the end of the initial 20-year storage period and at 20-year intervals during the extended storage period. The results of the lead cask inspection performed at Palisades, at the end of the initial storage period are discussed in Section 6.2.2.5. The aging effects that the lead cask inspection is credited with managing are identified in Tables 2 and 3. The elements of the lead cask inspection program are summarized in Table 6-11 and discussed in this section.

One or more VSC-24 lead casks at one or more sites is selected for inspection based upon a number of parameters that contribute to degradation, such as design configuration, environmental conditions, time in service, and total heat load of the SNF stored in the MSB. The lead cask inspection may be limited to a single VSC-24 lead cask at one site if there are not significant differences in the cask selection parameters that warrant separate inspections. The selection of the lead cask should also consider possible overlap of inspections previously performed on VSC-24 casks.

The scope of the VSC-24 lead cask inspection includes visual inspection of the VCC interior, the VCC bottom surface, and the VCC top interior (including the MSB structural lid and closure weld), which are all normally inaccessible. The visual inspection of the VCC interior is discussed in Section 6.3.2.3. The additional inspections are described in the following paragraphs.

The bottom surface of the VCC, which is normally inaccessible during storage, is visually examined for evidence of unanticipated degradation. Although the ISFSI pad is not an in-scope component SSC, it is also recommended to perform a visual inspection of the normally inaccessible ISFSI pad surface underneath the VCC for evidence of concrete degradation, given the opportunity. The VCC is lifted up approximately 6-inches to perform the inspections using long-handled tools and/or remote visual equipment (e.g., bore-scope/camera).

The bottom surface of the VCC is covered by ¼-inch thick carbon steel plate, which is secured to the VCC concrete by stud anchors and serves as cast-in-place formwork that forms the VCC air inlet ducts. The bottom plate also helps prevent loss of material (i.e., spalling of bottom concrete) in the event of a postulated bottom drop accident. Although the steel plate on the bottom surface of the VCC assembly is coated, degradation of the coating and corrosion of the steel plate is expected to occur during the initial storage period and is acceptable, provided that the steel plates lining the air inlet ducts do not displace and result in blockage of the air flow. Coating degradation and general corrosion occurring on the bottom surface of the VCC Bottom Plate Assembly (excluding the air inlet ducts) will not prevent the VCC from fulfilling its intended safety functions, and need not be repaired, but is documented using appropriate means (i.e., photographs, and/or written descriptions.)

All readily accessible surfaces of the VCC cask lid, lid bolts, liner flange, and shield rings, and the MSB structural lid and closure weld are visually examined for evidence of coating degradation and corrosion. Also, the VCC cask lid gasket and the top end of the VCC cavity are visually examined for evidence of water intrusion. In order to perform this surveillance, the cask lid is removed. Visual inspection of the VCC liner flange, VCC shield rings, MSB structural lid, and MSB closure weld is performed using long-handled tools and/or remote visual equipment (e.g., bore-scope/camera). If required, the VCC shielding ring is lifted slightly to expose the MSB closure weld for visual examination.

The VCC cask lid provides radiation shielding and structural support safety functions. In addition, the cask lid and lid gasket serve to protect the MSB assembly from the exposed external environment.

Corrosion of the cask lid, lid bolts and/or cask flange could diminish their structural and shielding capacities. Also, degradation of the cask lid, lid bolts, cask flange, and/or lid gasket could allow water to leak into the top of the VCC assembly. However, even if water were to leak through the lid gasket, the geometry of the VCC shielding ring plates will direct the flow of water down the VCC annulus and prevent water from accumulating on the top of the MSB assembly, thereby preventing any unanticipated corrosion of the VCC liner and MSB shell. Furthermore, any significant amount of water that drips to the bottom of the VCC annulus will drain out the VCC inlet channels. The carbon steel surfaces of the VCC liner and MSB assembly that form the VCC annulus are coated for corrosion protection. Moisture that accumulates on the coated surfaces of the VCC liner and MSB shell will evaporate or drain out of the VCC assembly. The VCC shield rings provide only a shielding safety function. Coating degradation and general surface corrosion (i.e., discoloration of the surface) of the VCC shield rings is permitted as it will not significantly diminish their shielding capacity.

The safety functions of the MSB structural lid and closure weld include confinement, structural support, shielding, and heat transfer. Significant corrosion of the MSB structural lid and closure weld (i.e., corrosion resulting in loss of material, such as scaling) could diminish their ability to perform the intended safety functions. However, corrosion that results only in discoloration of the steel surfaces, such as rust blooms, is not considered to be significant since it will not result in the loss of intended functions. Safety analyses of the MSB structural lid and closure weld are based on nominal dimensions and do not include a corrosion allowance.

Coatings on the readily accessible surfaces of the VCC cask lid, VCC liner flange, and MSB structural lid and closure weld that are blistered, cracked, peeling, or have lost adhesion with the underlying metal surface to the extent that the underlying steel surface is exposed are considered degraded. Corrosion of the VCC cask lid, VCC liner flange, and MSB structural lid and closure weld is considered to be significant if it results in loss of material (e.g., excessive pitting or scaling) that will adversely affect the structural or shielding safety functions of the components. Corrosion that results only in discoloration of the VCC cask lid, VCC liner flange, and MSB structural lid and closure weld surfaces, such as rust blooms, is not considered to be significant since it will not result in the loss of intended functions. VCC lid bolts that are significantly corroded (i.e., more than discoloration of the surface finish) shall be replaced. Coating degradation and general surface corrosion of the VCC shield rings is permitted as it will not significantly diminish their shielding capacity.

Coating degradation and/or corrosion observed on the VCC cask lid, VCC liner flange, VCC shield rings, and MSB structural lid and closure weld that are identified during the visual inspection, and indications of lid gasket degradation and water leakage into the top of the VCC, are documented using appropriate means (i.e., photographs, video recording, and/or written descriptions.) Coating on the VCC cask lid, MSB structural lid, or MSB closure weld coating that is degraded to the extent that the underlying steel surface is exposed shall be removed to allow further examination of the underlying metal surface to determine if any significant loss of material has occurred. If it is determined that corrosion of the MSB structural lid and/or closure weld has caused significant loss of material, such as excessive pitting or scaling (as opposed to surface discoloration,) then the condition is evaluated in accordance with the site's Corrective Action Program. Corrective actions should address measures to prevent continued loss of material during the extended storage period, and the extent of condition to other VCC assemblies. A VCC that has significant corrosion that will prevent subcomponents from performing their intended function(s) must be evaluated for continued storage. Prior to placing the lead cask back in service, the coating on the readily accessible surfaces of the VCC cask lid, VCC liner flange, VCC shield rings, and MSB structural lid and closure weld shall be repaired if the underlying steel surface is exposed.

## Table 6-6 - Examination of VCC Assembly Air Inlets and Outlets

| AMP Element | AMP Activity |
|---|---|
| Scope | Inspection of the external surfaces of the wire mesh screen covers on all air inlets and outlets of all in-service casks (TS 1.3.1). |
| Preventative Actions | Maintain inlets and outlets free from blockage for prolonged periods to prevent system temperatures from exceeding the applicable temperature limits. |
| Parameters Monitored or Inspected | The wire mesh screens that cover the air inlet and outlet openings are inspected for blockage (e.g., from debris or snow drifts) and degradation or damage (e.g., bent screens, missing attachment hardware, and corrosion.) |
| Detection of Aging Effects | Detection and removal of screen blockage ensures that system temperatures will not exceed the applicable temperature limits. Detection of degraded or damaged screen covers ensures that screen covers will not be breached. |
| -Method or Technique: | Visual examination by personnel qualified in accordance with the GLs procedure. |
| -Frequency: | Daily. |
| -Sample Size: | All wire mesh screen covers on all in-service casks. |
| -Data Collection: | Records of corrective actions. |
| -Timing of inspections: | Routine. |
| Monitoring and Trending | Trending may be performed based on deficiencies documented in accordance with GL's Corrective Action Program. |
| Acceptance Criteria | Wire mesh screen covers shall cover the VCC air inlet and outlet duct openings and be free of blockage. |
| Corrective Actions | If surveillance shows blockage of the wire mesh screen covers, remove the blockage. If wire mesh screens are degraded or damaged to the extent that they cannot perform their intended function, repair or replace degraded or damaged components in accordance with the GL's Corrective Action Program. In the event that a screen breach is identified, conduct a close-up inspection of the breached inlet or outlet for internal blockage and remove any readily accessible blockage inside the inlet or outlet. |
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | Partial blockage of VCC air inlet duct screens from snowfall and debris (e.g., leaves or mud) has periodically been identified. Screen damage (e.g., bent screens or missing/degraded attachment hardware) has also been identified, but less frequently. All degraded conditions identified have been corrected in accordance with existing site maintenance procedures. The existing AMP activity has provided adequate aging management during the initial storage period. |

## Table 6-7 - Examination of VCC Assembly Exterior (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Scope | Inspection of the exterior concrete surfaces (TS 1.3.2) and the steel-to-concrete interfaces of the VCC bottom plate and VCC outlet assemblies of all in-service VCC assemblies. |
| Preventative Actions | Maintain surface condition of concrete in order to prevent degradation of the concrete interior (e.g., reinforcing steel.) |
| Parameters Monitored or Inspected | Damage/degradation of concrete exterior surface including: (1) Cracking, loss of bond, and loss of material (spalling or scaling) due to freeze-thaw, aggregate reactions, or corrosion of embedded steel, (2) Excretion of rust at crack opening due to rebar corrosion, (3) Increased porosity and/or discoloration due to CaOH leaching, or (4) Gaps or voids at the steel-to-concrete interfaces of the VCC bottom plate and VCC outlet assemblies. |
| Detection of Aging Effects | Aging effects on the exterior concrete surfaces will be detected before the affected SSCs lose the ability to perform their intended functions. |
| -Method or Technique: | Visual examination of the VCC concrete exterior surfaces shall be performed in accordance with ACI 201.1 R-08 (Ref. 3.2.21), or an equivalent industry-consensus standard. Visual examination performed and evaluated by personnel qualified in accordance with industry guidelines for implementing the requirements of the Maintenance Rule (10 CFR 50.56). Inspector qualifications in accordance with ASME Code, Section XI, Subsection IWL (Ref. 3.2.17) or ACI 349.3R (Ref. 3.2.18) are both acceptable. |
| -Frequency: | Yearly. |
| -Sample Size: | All readily accessible external concrete surfaces of all in-service casks. |
| -Data Collection: | Video/photographs of examination, crack/defect maps with sizes and depths of cracks and voids, location and description of other surface defects (e.g., porosity, discoloration, or rust stains on concrete surface). Records of corrective actions. |
| -Timing of inspections: | Routine. |
| Monitoring and Trending | Crack/defect maps shall be monitored and trended to identify progressive growth of defects that may indicate degradation due to ASR-induced expansion or corrosion of rebar. Crack/defect maps should be compared with those from previous inspections to identify accelerated degradation of the structure during the period of extended storage. A baseline crack/defect map should be developed at the beginning of the extended storage period either from previous inspection results or from the initial inspection during the extended storage period. The cask concrete will be monitored for trends of increasing porosity, discoloration, and/or rust stains to detect degradation from CaOH leaching and rebar corrosion. |
| Acceptance Criteria | No defects on concrete exterior surface that that are greater than ½-inch in diameter (or width) and ¼-inch deep. No evidence of degradation mechanisms that may result in loss of concrete strength (e.g., ASR-induced expansion, leaching, or corrosion of rebar.) |

## Table 6-7 - Examination of VCC Assembly Exterior (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Corrective Actions | Repair of Defects: Defects on the concrete exterior surface exceeding acceptance criteria shall be documented and evaluated in accordance with the GL's corrective action program. Any defects on concrete exterior surface or at the steel-to-concrete interfaces of the VCC bottom plate or VCC outlet assemblies that exceed ½-inch in diameter (or width) and ¼-inch deep shall be repaired by filling defects with grout in accordance with the GL's procedures.<br>Rebar Corrosion: Concrete showing evidence of significant rebar corrosion, such as splitting cracks or accelerated crack growth, shall be tested using acoustic impact or other suitable NDE techniques, to detect rebar corrosion or concrete delamination (which can result from rebar corrosion), and evaluated for continued storage. A cask with aging effects due to rebar corrosion that is not acceptable for continued storage shall be repaired or replaced.<br>Aggregate Reactions: Corrective actions for concrete surfaces that show evidence of degradation from aggregate reactions, as determined by the qualified inspector, shall include a preliminary investigation to confirm or refute the presence of ASR gel in the concrete. This may consist of field tests of the affected cask(s) to detect the presence of ASR silica gel on the concrete surface using uranyl acetate fluorescence, or other suitable methods identified by the GL. Alternatively, samples of surface deposits can be sent for X-ray analysis to help determine if ASR gel is present.<br>If ASR is confirmed by the preliminary investigation, Crack Index (CI) measurements shall be taken on the affected cask(s) in accordance with FHWA-HIF-09-004 (Reference 3.2.22) to determine the extent of ASR induced degradation in the concrete. Any cask with a CI that is greater than 0.5 mm/m (0.018 in/yard) and/or with crack widths that exceed 0.15 mm (0.006 in) requires detailed in-situ and/or laboratory investigations to determine the current condition of the concrete and its potential for future degradation. At a minimum, CI measurements shall continue to be taken at least twice a year for a minimum of 3 years to monitor the progression of ASR-induced degradation. After 3 years, the CI measurement frequency may be reduced to 5 years if the CI shows no significant increasing trend. Detailed laboratory testing, performed using concrete core samples from the cask, may include petrographic examination, mechanical testing, expansion testing, and alkali content testing, as required. The affected cask(s) shall be assessed based on the results of the detailed investigation to identify mitigation measures.<br>A VCC that is determined to have concrete that has a significant potential for further expansion due to ASR and/or does not satisfy the FSAR strength requirements shall be evaluated for continued storage, and repaired or replaced if necessary. |

## Table 6-7 - Examination of VCC Assembly Exterior (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | Hairline cracks and small pits in the VCC external concrete surface that meet the acceptance criteria have been observed during the initial storage period. Defects exceeding acceptance criteria have also been identified and repaired. Some concrete discoloration (e.g., efflorescence or mineral deposits), particularly around cracks, has also been observed on the exterior concrete of some VCCs. There has been no increasing trend in the number of reported pits seen at any of the sites for the subsequent years, nor have there been any indications of failure of grout-repairs. A small void was identified at the steel-to-concrete interface of the VCC bottom plate during the lead cask inspection at Palisades. This void is believed to have resulted from concrete pouring during construction rather than from aging effects. |

## Table 6-8 - Examination of VCC Assembly Ventilation Ducts and Annulus

| AMP Element | AMP Activity |
|---|---|
| Scope | The interior (i.e., inlet ducts, VCC annulus, and outlet ducts) of the first VSC cask placed into service at each site (TS 1.3.3). |
| Preventative Actions | Identify any unanticipated blockage in the VCC inlet ducts, outlet ducts, and annulus and remove to prevent system temperatures from exceeding the applicable temperature limits. |
| Parameters Monitored or Inspected | Blockage of the internal ventilation flow path and degradation of the coated carbon steel surfaces that line the ventilation flow path (i.e., air inlet and outlet assemblies, VCC liner shell, and MSB shell). |
| Detection of Aging Effects | Identification of unanticipated blockage and degradation of the coated carbon steel surfaces on the MSB shell and VCC interior. |
| -Method or Technique: | Remote visual examination. Visual examination performed and evaluated by personnel qualified in accordance with industry guidelines for implementing the requirements of the Maintenance Rule (10 CFR 50.56). Qualifications for personnel performing the general visual examinations of the coated steel surfaces of the VCC and MSB assemblies in accordance with the requirements of IWE-2330 (Reference 3.2.23) are acceptable. |
| -Frequency: | 5-year. |
| -Sample Size: | First cask placed in-service at each site. |
| -Data Collection: | Documentation of examination, including blockage identified and condition of MSB shell and VCC interior surfaces. Records of corrective actions. |
| -Timing of inspections: | After the first cask is loaded at the site. |
| Monitoring and Trending | Blockage, coating degradation, and corrosion of the internal ventilation flow path shall be compared with results from previous inspections to identify potential accelerated degradation of the structure during the extended storage period. A baseline should be developed at the beginning of the extended storage period either from previous inspection results or from the initial inspection during the extended storage period. |
| Acceptance Criteria | No significant blockage (i.e., >10% of segment cross-section area) of any air flow paths. No significant corrosion on the VCC inlet ducts, outlet ducts, and liner that prevents the VCC from performing its intended functions. Maximum material loss on MSB shell due to corrosion shall not exceed 0.003 inch/year times the number of years since the cask was placed in-service. |
| Corrective Actions | Blockage that exceeds the acceptance criteria shall be removed. Any blockage that can be removed by reasonable means should be removed. VCC assemblies with significant corrosion on the plates that line the inlet and outlet vents and/or the VCC liner shall be evaluated for continued use and the extent of condition must be evaluated. VCC assemblies that are not acceptable for continued storage shall be repaired or replaced. Corrosion on the MSB shell shall be evaluated by a qualified inspector to verify that it does not exceed the acceptance criteria. An MSB shell with corrosion that exceeds the acceptance criteria shall be evaluated for continued use and extent of condition. The extent of condition evaluation |

## Table 6-8 - Examination of VCC Assembly Ventilation Ducts and Annulus

| AMP Element | AMP Activity |
|---|---|
| | shall include examination of other MSB shells for corrosion exceeding the acceptance criteria. An MSB shell that is not acceptable for continued storage must be removed from service and the used fuel must be retrieved from the MSB assembly. |
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | No significant blockage has accumulated within the ventilation flow path of the inspected casks and that the majority of the steel surfaces inspected are in excellent condition, with very little coating degradation or signs of corrosion. |

## Table 6-9 - Examination of VSC Top End Steel Components (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Scope | Measurement of the neutron dose rate at the centerline on the top surface of the VCC cask lid. Visual inspection of all readily accessible surfaces (internal and external) of the VCC cask lid, VCC liner flange, VCC shield ring plates, VCC lid gasket, VCC lid bolts, MSB structural lid, MSB valve covers, and MSB closure weld. Replacement of the VCC lid gasket.(1) |
| Preventative Actions | Identification and repair of any coating degradation or corrosion on the VCC top interior components prevents continued degradation that could potentially affect the ability of the SCCs to perform their intended functions during the extended storage period. |
| Parameters Monitored or Inspected | Neutron dose rate at the centerline on the top surface of the VCC cask lid. Degradation of the VCC cask lid, liner flange, shield ring plates, lid gasket, lid bolts, and the MSB structural lid, valve covers, and closure weld. |
| Detection of Aging Effects | Identification of unanticipated degradation on the VCC top interior surfaces; Identification of unanticipated degradation on the top surfaces of the MSB assembly. |
| -Method or Technique: | Dose rate measurements obtained using calibrated equipment by site radiation protection personnel. Direct or remote visual examination of readily accessible surfaces. Visual examination performed and evaluated by personnel qualified in accordance with industry guidelines for implementing the requirements of the Maintenance Rule (10 CFR 50.56). Qualifications for personnel performing the general visual examinations of the coated steel surfaces of the VCC and MSB assemblies in accordance with the requirements of IWE-2330 are acceptable. |
| -Frequency: | 10-year (± 1 year). |
| -Sample Size: | One cask at each site. |
| -Data Collection: | Documentation of examination, including condition of VCC top interior surfaces. Records of corrective actions. |
| -Timing of Inspections: | Starting after the latest of the 20th anniversary of the first cask loaded at the site or the effective date of the CoC renewal. |
| Monitoring and Trending | Coating degradation and corrosion shall be compared with those from previous inspections to identify accelerated degradation of the structure during the period of extended storage. A baseline should be developed from the initial inspection during the extended storage period. |
| Acceptance Criteria | No significant coating degradation on the metal surfaces of the components and no corrosion that results in significant loss of material and prevents the VCC and MSB assemblies from performing their intended functions. Corrosion that results only in discoloration (e.g., oxidation or "rust blooms") of these surfaces, is not considered to be significant since it will not result in the loss of intended functions. Coating degradation and corrosion of the VCC shield rings is permitted as it will not significantly diminish its shielding capacity. |

## Table 6-9 - Examination of VSC Top End Steel Components (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Corrective Actions | All examination results that do not satisfy the applicable acceptance criteria shall be evaluated in accordance with the GL's Corrective Action Program, including extent of condition, which may require the similar examinations of additional casks and additional corrective actions. Unacceptable coating degradation on the metal surfaces shall be repaired in accordance with the GL's procedures. Any VCC lid bolts with significant corrosion (i.e., more than discoloration of the surface finish) shall be replaced. If the VCC lid gasket does not satisfy the acceptance criteria, the extent of condition must be determined, including examination and replacement of the VCC lid gaskets on other casks, as needed. |
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | The results of the initial lead cask inspection performed on Palisades Cask No. VSC-15 show that there has been no unanticipated degradation of the VCC top interior during the initial storage period. The top end of the MSB assembly (structural lid and closure weld) had no evidence of significant corrosion, although the coating was scraped off when temporary shielding used during the inspection was removed. The steel surfaces under the damaged coating showed no signs of significant corrosion. The areas of damaged coating were subsequently cleaned and recoated. |

Notes:

1. The VCC lid gasket shall be replaced prior to re-installation of the VCC cask lid following the inspection, even if no degradation of the VCC lid gasket is identified.

## Table 6-10 - Examination of MTC Assembly

| AMP Element | AMP Activity |
|---|---|
| Scope | Visual examination of all readily accessible interior and exterior surfaces of the MTC assembly and functional testing of the MTC shield doors. |
| Preventative Actions | Identification and repair of corrosion on the exposed surfaces of the MTC assembly prevents continued degradation that could potentially affect the ability of the SCCs to perform their intended functions during the extended storage period, protects pool chemistry during fuel loading/unloading operations, and facilitates decontamination of the exposed MTC surfaces. Maintenance of the hydraulic assemblies and sliding surfaces of the MTC shield door assembly assures that the shield doors will function. |
| Parameters Monitored or Inspected | Degradation of the coating and corrosion of the underlying carbon steel on all readily accessible surfaces. Degradation of the hydraulic assemblies and sliding surfaces of the MTC shield door assembly. |
| Detection of Aging Effects | Identification of unanticipated degradation of coatings and corrosion of the MTC assembly subcomponents. |
| -Method or Technique: | Visual examination. |
| -Frequency: | 10 years (± 1 year). |
| -Sample Size: | Each MTC assembly. |
| -Data Collection: | Photographs of examination. |
| -Timing of inspections: | Completed the initial inspection within 2-years following the later of the 20th anniversary of the first cask loaded at the site or the effective date of the CoC renewal. |
| Monitoring and Trending | Areas of degraded coating and corrosion that the GL determines do not require repair before MTC use must be recorded and monitored during subsequent examinations to identify potential accelerated degradation of the structure during the extended storage period. |
| Acceptance Criteria | Individual local areas of coating loss may not expose more than 2 $in^2$ of underlying steel and the total combined coating loss may not expose more than a total of 40 $in^2$ of underlying steel. Corrosion must not exceed 10% of a component's nominal thickness (or depth) or reduce a bolts nominal cross-sectional area by more than 5%. MTC shield door must be capable of being opened and closed with the MTC hydraulic assemblies. |
| Corrective Actions | Areas of degraded coating that exceed the acceptance criteria shall be repaired by re-coating in accordance with coating manufacturer's instructions. If corrosion has resulted loss of material that exceeds that acceptance criteria, evaluate the MTC assembly for continued use. Repair or replace degraded hydraulic assemblies. |
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | N/A. |

## Table 6-11 - Lead Cask Inspection (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Scope | Inspection of the bottom surface of VCC, internal ventilation flow path (i.e., inlet ducts, VCC annulus, and outlet ducts), and VCC top interior (i.e., VCC cask lid, lid bolts, liner flange and shield plates, and the MSB structural lid, valve covers and closure weld) of a lead cask. Replacement of the VCC lid gasket.(1) |
| Preventative Actions | Identification and repair of any coating degradation or corrosion on the VCC top interior components prevents continued degradation that could potentially affect the ability of the SCCs to perform their intended functions during the extended storage period. |
| Parameters Monitored or Inspected | Degradation of the VCC bottom surface; blockage of the VCC internal ventilation flow path; degradation of the coated carbon steel surfaces that line the VCC ventilation flow path (i.e., air inlet and outlet assemblies, VCC liner shell, and MSB shell); and degradation of the VCC cask lid, VCC liner flange, VCC lid bolts, VCC shield plates, MSB structural lid, MSB lid valve covers, and MSB closure weld. |
| Detection of Aging Effects | Identification of unanticipated coating degradation and/or corrosion on all metal surfaces. |
| -Method or Technique: | Direct visual examination of readily accessible surfaces and remote visual examination of the VCC ventilation flow path and VCC bottom surface. Visual examination performed and evaluated by personnel qualified in accordance with industry guidelines for implementing the requirements of the Maintenance Rule (10 CFR 50.56). Qualifications for personnel performing the general visual examinations of the coated steel surfaces of the VCC and MSB assemblies in accordance with the requirements of IWE-2330 are acceptable. |
| -Frequency: | 20-year (± 1-year). |
| -Sample Size: | One or more casks at each site.(2) |
| -Data Collection: | Video/photographs of examination. |
| -Timing of inspections: | Completed the initial lead cask inspection activities prior to 1-year following the end of the initial storage period.(3) Repeat lead cask inspections of the same cask(s) in accordance with the specified frequency. |
| Monitoring and Trending | Coating degradation and corrosion shall be compared with those from previous inspections to identify accelerated degradation of the structure during the period of extended storage. A baseline should be developed from the initial inspection during the extended storage period. |
| Acceptance Criteria | No significant coating degradation on the metal surfaces that exposes the underlying carbon steel surface and no corrosion that results in significant loss of material and prevents the VCC and MSB assemblies from performing their intended functions. No significant blockage (i.e., >10% of segment cross-section area) of any air flow paths. |

## Table 6-11 - Lead Cask Inspection (2 Pages)

| AMP Element | AMP Activity |
|---|---|
| Corrective Actions | All examination results that do not satisfy the applicable acceptance criteria shall be evaluated in accordance with the GL's Corrective Action Program, including extent of condition, which may require the similar examinations of additional casks and additional corrective actions. Repair unacceptable coating degradation on the VCC cask lid, MSB structural lid, or MSB closure weld that results in exposure of the underlying steel surface in accordance with the GL's procedures. Remove unacceptable blockage from VCC ventilation path. Replace VCC lid bolts with unacceptable corrosion (i.e., more than discoloration of the surface finish). |
| Confirmation Process | Ensure that corrective actions are completed and effective in accordance with the GL's Corrective Action Program. |
| Administrative Controls | Formal review and approval of Corrective Actions in accordance with the GL's Corrective Action Program. |
| Operating Experience | The results of the initial lead cask inspection performed on Palisades Cask No. VSC-15 show that there has been no unanticipated degradation of the inspected components during the initial storage period. The bottom surface of the VCC did not show any evidence of significant corrosion or degradation. The readily accessible surfaces of the MSB shell and VCC liner, inlets, and outlets had no evidence of significant corrosion and all air flow paths were free of blockage. Finally, the top end of the MSB assembly (structural lid and closure weld) showed no evidence of significant coating degradation and no corrosion. |

Notes:

(1) The VCC lid gasket shall be replaced prior to re-installation of the VCC cask lid following the inspection, even if no degradation of the VCC lid gasket is identified.

(2) Each GL must perform lead cask inspection(s) at their site unless they provide justification that their casks are bounded by lead cask inspection(s) performed for similar storage systems at other site(s).

(3) Since the VSC-24 CoC renewal application is in under timely-submittal-review and the initial storage period has already ended, each GL must complete lead cask inspection activities within 1-year of the CoC renewal effective date.

## 7. CONCLUSIONS

### 7.1 Results

The VSC-24 system components, their operating environments, and their design functions are described in Sections 6.1.1, 6.1.2, and 6.1.3, respectively. Aging mechanisms for the VSC-24 system components are identified and described in Section 6.2, with aging mechanisms identified by theory and general industry experience discussed in Section 6.2.1, and aging mechanisms identified and observed through the VSC-24 system's operating experience are discussed in Section 6.2.2. A summary and breakdown of aging/degradation mechanisms by component material and environment is provided in Section 6.2.3. In Section 6.3, the AMAs that address the aging effects are discussed. Aging effects that are addressed through TLAAs are discussed in Section 6.3.1. The AMPs credited with managing all other aging effects are discussed in Section 6.3.2.

The effects of MSB shell and bottom plate corrosion, metal component fatigue, weld crack/flaw growth, gamma and neutron fluences, helium leakage from the MSB, and fuel assembly cladding creep are all addressed by analysis. Damage or degradation of air inlet vent screens, minor flaws (cracks, gouges or pits) in the exterior concrete surface, buildup of debris behind the air inlet vent screens and degradation of coatings on accessible surfaces are all adequately managed by existing cask system maintenance procedures. Corrosion of inaccessible metal component surfaces other than the MSB shell and bottom plate (for which no corrosion allowance was taken in the licensing analyses), aging/degradation mechanisms that affect the bulk concrete, corrosion of rebar, and potential obstructions that occur deep within the ventilation flow path are aging/degradation mechanisms that may require additional monitoring and/or actions, that are defined as part of the Aging Management Program (AMP).

### 7.2 Compliance With Requirements

N/A

### 7.3 Range of Validity

N/A

### 7.4 Summary of Conservatism

N/A

### 7.5 Limitations or Special Instructions

N/A

## 8. APPENDIX A - LIST OF GENERAL LICENSEE CHANGES MADE VIA 72.48

### Table A-1 - ANO 72.48 Evaluations (3 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| N/A | "Unit 2 Operations Logs" | 0 |
| FFN-96-039 | "Spent Fuel Removal and Dry Storage," ANO procedure 1302.025, Rev. 1 (Rev. 0 did not allow loading of fuel) | 0 |
| N/A | "Spent Fuel Removal and Dry Storage," ANO procedure 1302.025, Rev. 2 | 0 |
| N/A | "Document Change Notices ANO-075 and ANO-083 For AVCC Fabrication Specification " Relating to Concrete Placement Temperature And Density | 0 |
| FFN-96-044 | "Length Changes For VSC Components: MTC, MSB, and VCC " Relating to Increased Length, Weight and Other Miscellaneous Changes for Application of the System to ANO" | 0 |
| FFN-96-045 | "Deletion of Swagelok Fitting From The MSB Shield Lid" | 0 |
| FFN-96-046 | "MTC Lifting Trunnions Changed to Solid Material" | 0 |
| FFN-96-047 | "VCC Rail Car Hydraulic Jacking and Air Transporter Operation," ANO procedure 1402.230, Rev. 0 | 0 |
| FFN-96-048 | "MSB Shield Lid Change from Two Piece Lid to One Piece Lid" | 0 |
| FFN-96-078 | "Address Confirmatory Action Letter," Change to Section 8.0 of VSC FSAR. Add loading procedure details to avoid hydrogen ignition. | 0 |
| FFN-96-079 | "Addition of Dry Fuel Storage and ANO Compliance with NUREG-0612," 10CFR50.59 Evaluation Only | 0 |
| FFN-96-100 | "Use of Kevlar Slings in Lieu of Wire Slings for MSB Lift" | 0 |
| FFN-96-101 | "MTC Doors Change from All Steel to Lead and Steel Composite" | 0 |
| FFN-96-102 | "Minor Design Changes/Improvements in the ANO MTC". Remove MTC door cover and middle radial shell. Changes to hydraulic ram attachments. Change shim material from A36 to stainless steel. Shorter rail lengths. Replace hollow (lead, RX-277 filled) trunnion with solid steel trunnion. MTC/VCC adapter plate non-conformance. | 0 |
| FFN-96-103 | "Minor Design Changes/Improvements in the ANO VCC". Increase MTC alignment plate length. Revise air outlet opening to 49" wide. Change number and spacing of nelson studs. | 0 |
| FFN-96-104 | "Minor Design Changes/Improvements in the ANO MSB" Rev. 1 | 0 |
| FFN-96-123 | "Use of Carboline Carbo Zinc 11, Carbo Zinc 11 HS, and Carbo Zinc 11 SG on VSC Components," Change to Section 1.0 and 4.3 of VSC FSAR to allow use of HS and SG versions of Carbo Zinc. | 0 |
| FFN-96-124 | "Reduction in Height of Shim Material for MSB Shield Lid Weld" | 0 |
| FFN-96-171 | "Spent Fuel Removal and Dry Storage," ANO procedure 1302.025, Rev. 5, PC 2. Adds procedure to allow circulation of helium or nitrogen after drain down reduce MSB interior moisture. Allow lowering of water level in cask loading pit. | 0 |
| FFN-96-172 | "Reduction in Thickness of Shim Material for the MTC Yoke" | 0 |
| FFN-96-173 | "ANO MTC Fabrication Nonconformances Accepted as [Use As Is]". Door with slightly non-conformant shape (start of angled section). Bottom plate weld not ground flush. Shell to bottom plate weld length out of tolerance. Local removal of steel (0.15") from door surfaces, to prevent doors from sticking. | 0 |
| FFN-97-002 | "ANO VCC Fabrication Nonconformances Accepted as [Use As Is]". VCC liner 0.1" too long. Air outlet assembly 0.2" too wide. | 0 |

# Table A-1 - ANO 72.48 Evaluations (3 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| FFN-97-003 | "ANO MSB Fabrication Nonconformances Accepted as [Use As Is]". MSB #3 shield lid 0.071" too thin in local area near edge. Structural lid to shell radial gaps up to ~0.1 inches above tolerance. Increase shield lid Swagelok cavity hole diameter in MSB #3. Perpendicularity tolerance exceeded by 0.025" for an MSB fuel sleeve. | 0 |
| FFN-97-005 | "VCC Liner Tile Installation Adhesive (Note 10 of Drawing AVCC-24-001)" DCN ANO-159. Evaluates use of alternative adhesive for the VCC bottom plate ceramic tiles. | 0 |
| FFN-97-013 | "ANO VCC-24-03 Base Plate/Storage Pad Gap". | 0 |
| FFN-97-038 | "ANO VCC Ground Strap Screen Penetration, DCN No. ANO-150". Allows one inch penetration to be cut into one of the four VCC inlet screens to allow installation of a ground strap. | 0 |
| FFN-97-039 | "ANO VCC-24-06 Air Inlet Concrete Damage [Use as Is]". Evaluates local concrete chipping (loss) in local area around VCC #6 air inlet duct. | 0 |
| FFN-97-056 | "MSB Shield Lid to Shell Root Pass Weld". DCN ANO-157. Allows root pass weld to be made in "one or multiple" passes, instead of (exactly) two passes. | 0 |
| FFN-97-061 | "VCC Cover Plate Bolts," DCN ANO-159. Evaluates reduction in length of VCC lid (cover plate) bolts. | 0 |
| FFN-97-130 | "Use of Carboline 890 and Inspection of Critical Welds on MTC". Evaluates change from Carbo Zinc 11 + Keeler & Long MTC coatings to (only) Carboline 890. Also, a change to require visual and NDE inspection of only critical welds/areas of MTC. | 0 |
| FFN-97-138 | "Preheat-Post Weld Soak, NDE and Hydrogen Control Requirements for MSB Lid Welds". Weld procedure changes. Tack welds and balanced root pass to reduce movement. Preheat temperature of 200 °F is held for one hour after welding. Inspections must wait until 2 hours after welding. | 0 |
| FFN-97-145 | "ANO MTC Welding Nonconformances Accepted as [Use As Is]". One inch MTC outer shell to bottom plate groove weld undersized by 0.0625" to 0.25". 5/8" fillet weld between MTC bottom plate and door rail undersized by 0.0625" to 0.125". Outer vessel vertical weld under-filled (concave) by 3/32". | 0 |
| FFN-97-157 | "Inspection of Multi-Assembly Sealed Basket Components". ANO procedure 1409.639, Rev. 0. Procedure for identifying, removing and repairing undocumented welds on MSBs. | 0 |
| FFN-97-165 | "Spent Fuel Removal and Dry Storage". ANO procedure 1302.025, Rev. 7. Incorporates lessons learned from Cask #1 loading into loading procedure. Changes to design of vacuum drying system (which is not an in-scope SSC). Adds steps to maintain gap flow after MSB and cask loading pit have been drained. | 0 |
| FFN-98-010 | "ANO MSB Bottom Plate Flatness Out of Tolerance Use As Is". Evaluates four MSB bottom plates that exceed the (0.13") flatness tolerance. | 0 |
| FFN-98-011 | "ANO MSB Tube Welding Fabrication Nonconformances Accepted as [Use As Is]". Evaluates welds connecting the drain and vent tubes to the MSB shield lid bottom plate that did not apply the specified preheat. | 0 |
| FFN-98-092 | "Changes to Estimated MTC Dose Rates". | 0 |
| FFN-98-093 | "Design Change to the ANO MTC for Time of Flight Ultrasonic Testing". DCNs ANO-160, ANO-161, ANO-162, and ANO-163. ½" x 1" groove is cut into upper inside diameter of MTC and shims are modified, to allow time of flight ultrasonic testing required by NRC. | 0 |
| FFN-98-122 | "VSC FSAR Drawing AVCC-24-001, Rev. 5, and DCN ANO-165", DCN-165. Changes set time for VCC bottom plate ceramic tile adhesive from 48 hours to that specified by the manufacturer. | 0 |
| FFN-98-130 | "Modification to VCC Shield Ring", DCN-167. Add 2" x 2" ring of steel to bottom inner diameter (corner) of VCC shield ring, to reduce radiation streaming that may occur if MSB is not perfectly centered within VCC cavity. | 0 |

## Table A-1 - ANO 72.48 Evaluations (3 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| FFN-99-012 | " VCC Cover Plate Bolts", DCN 168, DCN-169, DCN-170. Allows VCC weather cover plate bolts to be drilled out and subsequently repaired (by re-tapping and using a larger bolt), if the bolts stick and do not allow removal of the weather cover in order to perform MSB structural lid weld inspection. | 0 |
| FFN-99-023 | "ANO MSB Material Repair NDE Nonconformance Accepted As "Use As Is". Evaluates indications in welds in a non-accessible part of the MSB bottom plate (indications were found after basket installation). | 0 |
| FFN-99-039 | "2MSB-013 Drain Line Use As Is". Evaluates use of MSB drain line that is different material (SA106 vs. A53) and is not coated with zinc primer. | 0 |
| FFN 99-1101 | "VCC Liner Tile Installation Adhesive (Note 10) Rev. 1". Changes procedure to require a 48 hour cure time for only Mapai Plancrete "W" adhesive. Cure times for GE RTV adhesive are per manufacturer's instructions. | 0 |
| FFN-00-020 | ANO Procedure 1302.024, "Dry Fuel Storage Equipment Preparation". Removes requirement to install MTC door locking pin. | 0 |
| FFN-00-021 | ANO Procedure 1302.025, "Spent Fuel and Dry Storage Operations". Allows MSB weld hydrostatic testing requirements to be satisfied by the weld helium leakage requirements. | 0 |
| FFN-00-032 | Review of 1999-2000 MSB Fabrication Documentation. Several changes, including alternate MSB lid vent/drain configuration (larger tubes, ball valve). Minor weld configuration changes. Allow the shield ring to be made from two pieces. | 0 |
| FFN-00-033 | Review of 1999-2000 VCC Fabrication Documentation. Add doubler plate to air inlet channels. Remove MTC alignment plate. Allow the use of HS and SG versions of Carbo Zinc 11. | 0 |
| FFN-00-033 (Rev. 1) | VSC-FSAR, Correction / Addition to "Review of 1999-2000 VCC Fabrication Documentation. (Same configuration changes as Rev. 0) | 0 |
| FFN-00-035 | "BFS RX-277 NCR ANO 02-MSB-001 and -002 "Use–as-is" VSC #15", May 23, 2000. Evaluates complete absence of hydrogen and boron in MSB lid RX-277 shielding material, in response to an inappropriate commercial grade dedication performed for MSB #15. | 0 |
| FFN-00-035 (Rev. 1) | Evaluation; Revision of "BFS RX-277 NCR ANO 02-MSB-001 and -002 "Use–as-is" VSC #15", to include VSC # 16, 17, and 18. (Same change as Rev. 0, for three other casks.) | 1,3,2 |
| FFN-00-069 | "Specification A2MSB-99-001 Revision 3 and BFS ECN ANO02-035", July 7, 2000. Editorial, clarification and programmatic changes only (no configuration change). | 1 |
| FFN-01-012 | "Surface Area of Contact Between VCC-018 and the Storage Pad Less Than Required by VSC-24 FSAR (use-as-is)," | 2 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| N/A | "Organization and Responsibilities/Quality Assurance", 1000.001/1000.164, 029-01-0 /Initial Issue | 0 |
| Procedure 1000.131 R/2 PC-2 | "10CFR50.59 Review Program" | 0 |
| Procedure 1015.003-B R/41 PC-2 | "Unit Two Operations Logs" | 0 |
| Procedure 1015.003-B R/41 PC-3 | "Unit Two Operations Logs" | 0 |
| Procedure 1005.002 R/13 | "Control of Heavy Loads" | 0 |
| Procedure 1022.012 R/17 PC-1/3 | "Storage Control and Accountability of Special Nuclear Material" | 0 |
| Procedure series 1023 | "Exclusion of Fitness for Duty Procedures from the 10CFR50.59 Review Program" | 0 |
| Procedure series 1043 | "Exclusion of Security Department Procedures from the 10CFR50.59 Review Program" | 0 |
| Procedure series 1053 and 1000.028 | "Exclusion of All 1054 Series Procedures and 1000.028 from 50.59/72.48 Reviews" | 0 |
| Procedure 1062.001, Rev. 10 | "NRC Reporting" | 0 |
| Procedure series 1064 | "Exclusion of Certain Training Procedures from the 10CFR50.59 Review Program" | 0 |
| Procedure 1104.006 R/24-26 | "Spent Fuel Pool Cooling" | 0 |
| Procedure 1104.035 R/17 PC-1 | "Fuel Handling and Radwaste Ventilation" | 0 |
| Procedure 1203.042 Rev. 3 | "Refueling Abnormal Operations" | 0 |
| Procedure 1203.025 R/16 PC-1 | "Natural Emergencies" | 0 |
| Procedure 1302.024,R/0-12 | "Dry Fuel Storage Equipment Preparation" | 0 |
| Procedure 1302.025 R/1-13 | "Spent Fuel Removal and Dry Storage" | 0 |
| Procedure 1302.026 R/0-4 | "Unloading the MSB" | 0 |
| Procedure 1302.028 R/0-4 | "Fuel Selection Criteria for Dry Fuel Storage" | 0 |
| Procedure 1302.038 R/0 | "Fuel Assembly Burnup Measurement" | 0 |
| Procedure 1302.040 R/0 | "Portable Demin Skid Resin Transfer" | 0 |
| Procedure 1302.041, R/0 | "Ultrasonic Testing Examination of The MSB Structural Lid While In VCC" | 0 |
| Procedure 1302.041 Rev. 0, PC-1 | "Ultrasonic Testing Examination of The MSB Structural Lid While In VCC" | 4 |
| Procedures in the 1303 series | "MT&E Calibration Procedures, Exclusion from the 10CFR50.59 Program" | 0 |
| Procedure 1402.081, R/1 TC-2 & PC-2 | "Load Testing of Crane L3 Unit 1 Aux Fuel, 2L35, L7" | 0 |
| Procedure 1402.091 Rev. 4 | "Visual Inspection of Special Lifting Devices" | 0 |
| Procedure 1402.133, Revs. 9-13 | "Operation of the Spent Fuel Crane L-3 Units 1 & 2" | 0 |
| Procedure 1402.135 Rev. 4 | "Inspection & Preventative Maintenance of Fuel Handling Crane (L3)" | 0 |
| Procedure 1402.230 Revs. 1-7 | "VCC Rail Car Hydraulic Jacking and Air Transporter Operation" | 0 |
| Procedure 1402.233 Revs. 0-2 | "Operation of Turbine Building Cranes for Spent Fuel Movement L-1 & 2L-1" | 0 |
| Work Plan 1409.520 Rev. 0 | "Dry Fuel Storage Project Loading Exercise (without fuel)" | 0 |
| Work Plan 1409.636 Rev. 0, | "Spent Fuel Bridge Grapple Repair" | 0 |
| Work Plan 1409.639 Revs. 0-1 | "Inspection of Multi-Assembly Sealed Basket Components" | 0 |
| Work Plan 1409.671 R/0, PC 0-3 | "Inspection of Multi-Assembly Sealed Basket Components" | 0 |
| Work Plan 1409.683 Rev. 0 | "Inspection of Multi-Assembly Sealed Basket Components" | 0 |
| Work Plan 1409.686 Rev. 0 | "Removal Of Empty MSB From The Unit 1 SFP" | 0 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| Procedure 1412.171 Rev. 3 | "Unit 1 (L3) Spent Fuel Overhead Crane Motor and Controller Lubrication" | 0 |
| Procedure 1412.215 Rev. 1 | "Unit 1 (L 1) Turbine Building Overhead Crane Motor & Controller Lubrication" | 0 |
| Procedure 1415.002 Rev. 8 | "Liquid Penetrant Examination" | 0 |
| Procedure 1415.021, Rev. 4 | "Location of Weld Interfaces" | 0 |
| Procedure 1415.026 Rev. 2 | "High Temperature Liquid Penetrant Examination" | 0 |
| Procedure 1415.028 Rev. 1 | "NDE Equipment Calibration" | 0 |
| Procedure 1415.048 Revs. 0-2 | "Helium Leak Detection for Dry Fuel Storage MSB" | 0 |
| Procedure 1415.056 Revs. 0-2 | "TOFD Ultrasonic Examination of MSB Structural Lid-to-Shell Welds" Clarifications and editorial revisions to procedure. | 0 |
| Procedure 1502.003 R/15, 17-20 | "Refueling Equipment and Operator Checkouts" | 0 |
| Procedure 1502.004 Rev. 30 | "Control of Unit 1 Refueling" | 0 |
| Procedure 1502.010 Revs. 2, 3, 5 | "Control of Fuel and Control Rod Movement in Unit-1 Spent Fuel Area" | 0 |
| Procedure 1506.001 Rev. 18 | "Fuel and Control Component Handling" | 0 |
| Procedure 1601.101 Rev. 1 | "Operation of High Pressure Water Decontamination Systems" | 0 |
| Procedure 1601.110 R/000-00-0 | "Operation of the Tri-Nuc" | 0 |
| Procedure 1601.207 Rev. 1 PC-1 | "Environmental/Area TLD Program" | 0 |
| Procedure 1601.303 Revs. 0-6 | "Radiation Monitoring Requirements for Loading and Storage of the VSC" | 0 |
| Procedure 1601.304 Rev. 0 | "Radiation Monitoring Requirements for Unloading the VSC" | 0 |
| Procedure 1601.436 Rev. 0 | "TMX412 Multi-Gas Monitor Calibration and Operation" | 0 |
| Procedure 1605.094 Rev. 0 | "Operation of Leybold Mass Spectrometer" | 0 |
| Procedure 1605.012 R/008-00-0 | "Determination of Nitrite" | 0 |
| Procedure 1605.014 R/011-00-0 | "Determination of Hardness" | 0 |
| 1605.026 Rev. 005-00-0 | "Operation of AA-Scan 1 AA/AE Spectrophotometer" | 0 |
| Procedure 1605.012 R/008-00-0 | "Determination of Nitrite" | 0 |
| Procedure 1605.038 *2/7/2000* | "Determination of Hydrazine - High Range (Titration Method)/Exclusion of Procedures From The 10CFR50.59 Review Program" | 0 |
| Procedure 1607.004 R/5 PC-1/2 | "Sampling Spent Fuel Pool Cooling System and Fuel Transfer Canal" | 0 |
| Procedure 2104.006 Revs. 14-17 | "Fuel Pool Systems" | 0 |
| Procedure 2104.025 R/16 PC-1 | "Service Air System" | 0 |
| Procedure 2104.035 Revs. 10-11 | "Fuel Handling and Radwaste Area Ventilation" | 0 |
| Procedure 2106.015 Rev. 14 PC-2 | "Condensate Transfer System" | 0 |
| Procedure 2107.001 Rev. 38 PC-6 | "Electrical System Operations" | 0 |
| Procedure 2107.005 Rev. 10 PC-2 | "Lighting and Miscellaneous Electrical Distribution" | 0 |
| Procedure 2203.008 Rev. 6 | "Natural Emergencies" | 0 |
| Procedure 2203.021 Rev. 5 | "Loss of Instrument Air" | 0 |
| Procedure 2203.034 Rev. 4 PC-2 | "Fire or Explosion" | 0 |
| Procedure 2402.080 Rev. 7 PC-3 | "Operation of Spent Fuel Handling Crane 2L-35 Unit 2" | 0 |
| Procedure 2409.594 Rev. 0 | "Dry Fuel Storage Project Loading Exercise (Without Fuel)" | 0 |
| Procedure 2502.001 Rev. 27 | "Refueling Shuffle" | 0 |
| Procedure 2503.003 Rev. 14 PC-3 | "Operation of Fuel Handling Equipment" | 0 |

# Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| Procedure 2502.003 R/15, PC 0,1,5 | "Preparation for Refueling" | 0 |
| Procedure 2503.003 Revs. 14-15 | "Operation of Fuel Handling Equipment" | 0 |
| Procedure 2607.004, Rev. 4 | "Sampling the Unit 2 Spent Fuel Pool and Fuel Transfer Canal" | 0 |
| EOI procedure NDE 2.10 Rev. 1 | "NDE Certification" | 0 |
| Procedure QCO-01 Rev. 15 | "QC Personnel Qualification" | 0 |
| Procedure QCO-10 Rev. 8 | "Qualification, Certification, and Training of NDE Personnel" | 0 |
| N/A | "Exclude Quality Administrative Dept. Procedures/ QA Procedures/ QA Operating Procedures from 10CFR50.59 Review Requirements" | 0 |
| WPS E-P1-A-A1-CVN-1 Rev. 2 | ANO Dry Fuel Storage MSB Welding Procedure Specification | 0 |
| N/A | "Reactor FSAR Changes to Address Use of Ventilated Storage Casks" ANO Unit-1 and Unit-2 FSAR changes; 10CFR50.59 evaluation | 0 |
| N/A | "Revision to 9.6.2.6" ANO-1 Reactor FSAR change; 10CFR50.59 evaluation | 0 |
| L-96-0034 | "Unit 1 Reactor FSAR Change to Address Higher Boron Concentration in the Spent Fuel Pool" | 0 |
| VSC FSAR, SER, & Fabrication Specs. for MSBs, VCC, & MTC | "Miscellaneous Minor Clarification Changes to Subject Documents" | 0 |
| N/A | "Changes to VSC Documents Relating to the Safety Classification of Components" Rev. 1, *3/30/98* | 0 |
| N/A | "Use of Carboline Top Coat, Carbozinc 11 and Keeler and Long Paint" [superseded by FFN-96-123 and FFN-97-130] | 0 |
| Design Change Package 92-2001 | "High Level Waste Storage Project" Addresses installation of demineralized water and serve air lines. | 0 |
| Design Change Package 92-2001 Rev. 0 - DCPR 6 | "Independent Spent Fuel Storage Installation" Electrical conduit details for demin water and air service systems. | 0 |
| Design Change Package 92-2001, DCPR7 | "High Level Waste Storage Project" | 0 |
| Plant Change 94-*8014* | "Addition of Nitrogen Bottle to Instrument Air System" | 0 |
| Plant Change 95-7050 Rev. 0 | "Installation of New Spent Fuel Crane Main Hoist Saturable Reactors and Resistor Bank" | 0 |
| Design Change Package 96-1007 | "In Mast Sipping" | 0 |
| Plant Change 96-7001 Rev. 0 | "Extend the South Travel Reach of Spent Fuel Crane, L-3" | 0 |
| Plant Change 961001-P-201, R/0 | "Extend the North Travel Reach of Spent Fuel Crane, L-3" | 0 |
| ER 927031-P-101 | "Reactor Building and Spent Fuel Pool Upender Improvements" | 0 |
| ER 938046-P-201 | "Spent Fuel Pool Underwater Lighting" | 0 |
| ER 963036-P-101, DCPR 1 | "Dry Cask Impact Inhibitor" | 0 |
| ER 963036-P-101 DCPR 1 | "Addition of Safety Sling Supports to L-3" | 0 |
| ER 963036-P-301 | "High Level Waste Project (Storage Pad Extension)" | 0 |
| ER 963149-P-101 | "Reactor Building and Spent Fuel Pool Upender Improvements" | 0 |
| ER 963172-P-301 | "Removal of Spent Fuel Pool Gate Tabs and Anchors" | 0 |
| ER 963203-P-201 | "Installation of Additional Spent Fuel Pool Level Indicators" | 0 |
| ER 968015-P-201 | "Removal of 2FP-1009" | 0 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| Temp Alt 96-1-014 | "Modification of Trip Lever Allowing L-3 Crane to Travel Over Unit 1 New Fuel Storage Racks" | 0 |
| OP-1303 Series/ ANO-96-2-00125 | "M& TE Calibration Procedures/Exclusion of M& TE Calibration Procedure From The 10CFR50.59 Review Program" | 0 |
| ER 974142-P-101 | "H-3 Grapple Replacement" | 0 |
| ER 974977-E-301 | "Vibration Sensor Mounting Pads" | 0 |
| Temp Alt 97-2-019 | "TAP for SFP Vent Flow Instrument Loop" | 0 |
| N/A | "MTC/MSB Gap Flow" Minor FSAR clarification evaluated by 1302.025 Rev. 2, 72.48 evaluation. | 0 |
| N/A | "Preheat Requirements for Multi-Assembly Sealed Basket Lid Welds" Rev. 2 | 0 |
| N/A | "Unit 2 Reactor FSAR Change Clarifying Operation of Spent Fuel Bridge" | 0 |
| N/A | "Use of RTV for MSB Shield Lid Swagelok Sealant" | 0 |
| N/A | "Reinforcement Requirements for MSB Structural Lid Welds" | 0 |
| N/A | "MSB Vessel Wall Inspection by Acid Etching" | 0 |
| N/A | "ANO MSB Valve Cover Weld Tolerance Conformance" Rev. 1 | 0 |
| N/A | "MSB Shield Lid to Vent and Drain Tube Seal Weld Size" | 0 |
| N/A | "10CFR50.59 Review for Previous 10CFR72.48 Reviews Completed without Environmental Evaluations" | 0 |
| DRN 98-0012 | "Allow Use of Radwaste Temporary Compressor to Supply Unit 1 and Unit 2 Service Air" | 0 |
| N/A | "ANO MSB Shield Lid Bottom Plate Weld Indication Resolution" | 0 |
| N/A | "Minor MSB Drawing Changes - DCNs ANO-154, ANO-156, and ANO-157" | 0 |
| N/A | "Removal of External Restraints for L-3 and 2L-35 Cranes" | 0 |
| N/A | "Revision of Selected VSC-24 Dose, Stress and Brittle Fracture Calculations" | 0 |
| N/A | "Change from RTDs to Type T thermocouples, | 0 |
| DCP 974011N301 | "Install Computerized Data Acquisition System At ISFSI" | 0 |
| N/A | "DEAM Appendix No.2 Standard "Procurement of Welding Consumables", | 0 |
| N/A | Software Change Request, 8/20/99 (management of operations logs) | 0 |
| ER 963036N301 | Temperature Monitoring Equipment for New VSC-24 Casks | 0 |
| Procedure 1302.025 R/013-02-0 | "Spent Fuel Removal and Dry Fuel Storage Operations" Revised details of procedure for Vacuum Drying System (not an in-scope SSC). | 0 |
| N/A | "Review of BFS SDR 99-063-10 and HiTech NCR 1329 for ANO MSB #16", June 30,2000. | 1 |
| N/A | "Review of BFS SDR 99-063-12R and HiTech NCR 1334R1 for ANO MSB #16 and #17", June 30, 2000. | 1 |
| Procedure 1402.230 R/008-00-0 | "VCC Rail Car Hydraulic Jacking and Air Transporter Operation" | 1 |
| Procedure 1402.233 R/003-00-0 | "Operation of Turbine Building Crane for Spent Fuel Movement L-1 & 2L-1" | 1 |
| Procedure 1601.303 R/006-01-0 | "Radiation Monitoring Requirements for Loading and Storage of the VSC" | 1 |
| Procedure 1601.304 R/000-02-0 | "Radiation Monitoring Requirements for Unloading the VSC" | 1 |
| N/A | "Review of BFS SDR 99-063-11 and HiTech NCR 1331 for ANO MSB #18", July 7,2000. | 1 |
| Procedure 1605.094 R/000-02-0 | "Operation of the Leybold Mass Spectrometer" | 1 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| ER 963036 N 301 | "Temperature Monitoring Equipment for New VSC-24 Casks" | 1 |
| N/A | "Review of BFS SDR 99-063-007 and HiTech NCR 1325 for ANO MSB #18", July 10,2000" | 1 |
| Procedure 1302.024 R/013-00-0 | "Dry Fuel Storage Equipment Preparation" | 1 |
| Procedure 1032.025 R/014-00-0 and R/014-00-1 | "Spent Fuel Removal and Dry Storage Operations" | 1 |
| Procedure 1022.012 R/022-00-0 | "Storage, Control, and Accountability of Special Nuclear Material" | 1 |
| Procedure 1302.028 R/005-00-0 | "Fuel Selection Criteria for Dry Storage" | 1 |
| Procedure 1302.026 R/005-00-0 | "Unloading the MSB" | 1 |
| Procedure 1302.024 R/013-00-0 | "Dry Fuel Storage Equipment Preparation" | 1 |
| Procedure 1402.230 R/008-00-0 | "VCC Rail Car Hydraulic Jacking and Air Transporter Operation" | 1 |
| Procedure 1402.233 R/005-00-0 | "Operation of Turbine Building Cranes for Spent Fuel Movement L-1 & 2L-1" | 1 |
| Procedure 3403.001 R/000-00-0 | "VSC-24 System Equipment Preparation" | 1 |
| Procedure 3403.002 R/000-00-0 | "VSC-24 System Loading Operations" | 1 |
| Procedure 3403.003 R/000-00-0 | "VSC-24 System Unloading Operations" | 1 |
| Procedure 3406.001 R/000-00-0 | "VCC Rail Car Hydraulic Jacking and Air Transporter Operation" | 1 |
| Procedure 3406.002 R/000-00-0 | "Operation of Turbine Building Cranes for Spent Fuel Movement L-1 & 2L-1" | 1 |
| Form 1015.003B Rev. 044-07-0 | "Unit Two Operations Log" | 1 |
| Procedure 1601.303 R/006-02-0 | "Radiation Monitoring Requirements for Loading and Storage of the VSC" | 1 |
| Procedure 3403.002 R/000-01-0 | "VSC-24 System Loading Operations" | 1 |
| N/A | "Engineering Report 95-R-0015-01, Revision 6" May 23, 2001. | 2 |
| N/A | Memo to Darrell Williams "Review of Amendment 3 to the VSC FSAR and COC" May 18, 2001. | 2 |
| ANO-2001-0001 | "Addition of a Ramp to the VSC-24 Storage Pad to Facilitate Loading Last VSC-24 Casks" (ER 963036C302) | 2 |
| ANO-2001-0002 | "Fuel Selection Criteria for Dry Storage" (Procedure 1302.028) | 2 |
| ANO-2001-0003 | "Install Temperature Monitoring System at ISFSI" (ER 963036N03) | 2 |
| ANO-2001-0004 | "VSC-24 System Loading Operations" (Procedure 3403.002, change 000-02-00) | 2 |
| ANO-2001-0005 | "VSC-24 Drawing AVCC-24-001 Note 9." Remove text "Cut ends to be bent under". (Refers to attachment of inlet duct screens.) | 2 |
| ANO-2001-0006 | "Helium Leak Detection for Dry Fuel Storage" (Procedure 1415.048, rev 004-00-0) | 2 |
| ANO-2001-0007 | Delete "1415.series NDE Procedures and Replace with ENSW Procedure NDE 9.40 rev 01-00-0." Change procedures for weld dye penetrant examinations. | 2 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| ANO-2001-0008 | "10CFR 72.212 Report rev 7, VSC-24 MSB Drawings A2MSB-24-001 and A2MSB-24-004, and VSC-24 MSB Specification A2MSB-99-001." Reduce bake temperature and increase bake time for RX-277. Defines mass of RX-277 as the only critical condition for CGD. Specify Carbo Zinc 11 SG (vs. Std. or HS) for MSBs #19-#20. Allow use of 8.6" no-go gauge for MSB #19 fuel sleeves. | 2 |
| ANO-2001-0009 | "VSC-24 Drawings A2VCC-24-001, A2VCC-24-003, A2VCC-24-004, A2VCC-24-005; VSC-24 Specifications A2VCC-99-001, A2VCC-99-002, A2VCC-99-003, A2VCC-99-005, and A2VCC-99-006." Add allowable concrete aggregate. Increase allowable concrete placement temperature (per ACI-301). Concrete aggregate and density nonconformances. Add 12 tiles to bottom plate. VCC steel dimensional changes. | 2 |
| ANO-2001-0010 | "Control Room Emergency Air Conditioning and Ventilation" | 2 |
| ANO-2001-0011 | Software Change Request (Form 1082.004C) | 2 |
| ANO-2001-0012 | "Procedure 3403.002, VSC-24 System Loading Operations" | 2 |
| ANO-2001-0013 | "Justification of continued use of the Spent Fuel Handling Machine, H-3, for fuel handling activities (ER10220E101)" | 2 |
| ANO-2001-0015 | "Train Bay Modifications (ER003333C302)" | 3 |
| ANO- 2001-0016 | "Implementation of Unit 1 ITS Text (OP-1502.003)" | 2 |
| ANO-2001-0017 | "Water Transfer System Modification (ER963036N101)" | 3 |
| ANO-2001-0018 | Final FSAR Report for the VSC-24, Rev 3 FSAR December 12 2001. Allows loading of CE 16x16 fuel. Relies solely on soluble boron credit for criticality control (vs. burnup credit). Adds requirements and procedures for determining and maintaining soluble boron concentration. | 3 |
| ANO-2001-0019 | Procedure 3403.002: Implementation of demarcation for transition to ITS | 3 |
| ANO-2002-0001 | IT-107, Software Development Life Cycle" Exclusion of IT-107 | 3 |
| ANO-2002-0002 | Procedure 2409.736 Reverse Osmosis Filtration of Unit 2 Spent Fuel Pool | 3 |
| ANO-2002-0003 | Procedure 1104.006, Spent Fuel Cooling System | 3 |
| ANO-2002-0004 | Procedure 1502.004, Control of Unit 1 Refueling | 3 |
| ANO-2002-0005 | Procedure 2305.003, Preparation for Refueling | 3 |
| ANO-2002-0006 | Procedure 2502.001, Refueling | 3 |
| ANO-2002-0007 | Procedure 2503.003, Operation of Fuel Handling Equipment | 3 |
| ANO 2002-0008 | Procedure 2503.003, Operation of Fuel Handling Equipment | 3 |
| ANO-2002-0009 | Procedure 2502.003, Fuel Handling Due to a faulty Reactor Building Up-ender | 3 |
| ANO-2002-0010 | ER-ANO-2000-2688-will replace the existing 100 ton L3 | 3 |
| ANO-2002-0011 | ER-ANO-2000-3333-012 installs a steel plate between rails in the Unit 1 Aux Bldg | 4 |
| ANO-2002-0012 | Operation of the Turbine Bldg Cranes (L-1 & L-2) for SF Unit 1 ITS. | 4 |
| ANO-2002-0013 | Procedure 3403.003, VSC-24 System Unloading Operations Updated Unit 1 ITS. | 4 |
| ANO-2002-0014 | Procedure 1104.006, Spent Fuel Cooling System | 4 |
| ANO-2002-0015 | RP department for procedures tagging | 4 |
| ANO 2002-0016 | VSC-24 System Loading Operations Incorporated previously screened changes | 4 |
| ANO-2002-0017 | 3406.001, VCC Rail Car Hydraulic Jacking and Air Transporter Operation. | 4 |

## Table A-2 - ANO 72.48 Screenings (7 Pages)

| 72.48/ Document Number | Title/Description | FSAR Revision |
|---|---|---|
| ANO-2002-0018 | 1302.040, Portable Demin Skid Resin Transfer | 4 |
| ANO-2002-0019 | 1402.135, Inspection &Preventative Maintenance of Fuel Handling Crane L-3 | 4 |
| ANO-2002- 0020 | ER-ANO-2002-0841-001 Continued use of spent fuel handling machine (H-3) | 4 |
| ANO-2002-0021 | 3403.002 - VSC-24 System Loading Operations Implementation of Unit 1 ITS, August 12 2002. Requirement update for installation and removal of Water Transfer System Headers. Add precaution on accessing top of VSC system while Unit 2 is in operation. | 4 |
| N/A | Review, ER-ANO-2000-2688-002, Uprate L-3 Spent Fuel Crane | 4 |
| N/A | Review ER-ANO-2000-3333-030, Movement of the Loaded or Empty VSC-24 **MTC** Using the Ederer Brand L-3 Crane (assuming Crane is not Single-Failure-Proof). | 4 |
| N/A | Review ER-95-R-0015-01, Revision 10 update, dated May 20, 2003. | 4 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 93-0124 | C-136G Rev 0 | Specification for the Ventilated Storage Cask System Heavy Haul Trailer (HHT) | 0 |
| 93-0505 | AP 5.26 Rev 0 | New Procedure-Training | 0 |
| 93-0587 | FC-864 Rev 0 | Commencement of fuel loading (details of loading process, which remain fully compliant with C-of-C and Tech Spec requirements, evaluation of impacts on plant). | 0 |
| 93-0622 | FHS-M-34 Rev 0 | Use of Vertical Air Transporter vs. Hydraulic Roller Skid | 0 |
| 93-0860 | AP 9.30 Rev 9 | Add dry fuel storage casks to plant Q list. (No impact on system) | 0 |
| 93-1045 | FHS-M-33 Rev 1 | Rev Of Equipment Prep | 0 |
| 93-1152 | C-136L Rev 1 | Rev of "Specification of supply of VSC-24 System Casks" Vendor Comments. Includes following changes. Filling MSB structural lid lifting bolt holes with steel plugs. Fabricate the MSB Support as one solid piece of metal with lifting holes removed. Incorporate the drain line support add-on washer into the support plate. Use commercial grade epoxy paint. | 0 |
| 93-1188 | C-136L Rev 1 | Rev of "Specification of supply of VSC-24 System Casks" Administrative changes only | 0 |
| 93-1191 | AP 5.26 Rev 1 | Training - Add helium leak check verifier certification | 0 |
| 93-1305 | C-136D Rev 0 | "Fabrication Specification for the MTC" incorporates outstanding DCN's. Evaluate welding procedure vs. C-of-C and SAR requirements. (All other non-editorial changes are evaluated in other 72.48s.) | 0 |
| 93-1306 | C-136B Rev 0 | "Fabrication Specification for the VCC" incorporates outstanding DCN's. Evaluate welding procedure vs. C-of-C and SAR requirements. (All other non-editorial changes are evaluated in other 72.48s.) | 0 |
| 93-1340 | SM-LID Rev 2 | Welding Procedure "Manual Welding Procedure for MSB". Evaluates MSB closure welding procedures vs. C-of-C and SAR requirements. Addresses lack of 200-deg weld preheat requirement, and the NRC-exemption of post weld heat treatment requirements vs. ASME requirements using results of Charpy V-notch testing. | 0 |
| 93-1341 | FC-LID Rev 2 | Welding Procedure "Automated Welding Procedure for MSB" Evaluates welding procedures. Issues similar to those discussed above for 72.48 93.1340. Also develops procedures to use argon gas to push water out of MSB, and to monitor for combustible gases. | 0 |
| 93-1374 | SM-LID Rev 2 | Welding Procedure "Manual Welding Procedure for MSB" Rev 1. Evaluates exception taken to ASME Section III. Issues similar to those discussed above for 72.48 93.1340. | 0 |
| 93-1375 | FC-LID Rev 2 | Welding Procedure "Automated Welding Procedure for MSB" Rev 1. Evaluates exception taken to ASME Section III. Issues similar to those discussed above for 72.48 93.1340. | 0 |
| 94-0116 | C-136H Rev 0 | Issuance of "Fabrication Specification for the MSB Vacuum Drying System" | 0 |
| 94-0124 | C-136G Rev 0 | "Specification of the VSC System Heavy Haul Trailer" | 0 |
| 94-0135 | C-PAL-94-012 Rev 0 | "DFS Sensotec Digital Vacuum Gauge exceeded allowable tolerance". Evaluates impact of MSBs #1 and #2 not meeting the requirement that a <3 mm vacuum be held for 30 minutes. Evaluation shows that UO2 oxidation is less than 0.5% criterion. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 94-0155 | EA-SC-93-083-01 R/0 | Design changes to Ventilated Storage Cask. Incorporates lessons learned from first 2 cask loadings. Changes include MSB structural lid bolt hole plugging, shield lid integral plate, painting of MSB structural lid welds, fabrication drawing editorial and clarification changes, changing the MSB shell to bottom plate weld from V-groove to ½" double bevel, increase VCC alignment plate size, and minor air inlet duct, air outlet duct, and shielding ring configuration changes to ease fabrication. | 0 |
| 94-0171 | SC-93-094 Rev 0 | "100 Ton Fuel Building Crane L3 Modification" | 0 |
| 94-0200 | CLP-M-6 Rev 1 | Rev of "Inspection of Heavy Load Lift Devices" | 0 |
| 94-0255 | AP 5.26 Rev 1 | Training-Revised to reference new loading and preoperational procedures. | 0 |
| 94-0291 | FC-864-02 Rev 1 | "ISFSI Pad Seismic & Environmental Calculation" | 0 |
| 94-0318 | MSM-M-42 Rev 3 | Rev of "Painting Carbon Steel with Inorganic Zinc Primer." Increases temperature limit and allows primer to be applied as special process. | 0 |
| 94-0346 | TM-94-031 Rev 6 | "VDS Heisse Gauge Fitting Installation". Use of more accurate MSB internal pressure gauge. | 0 |
| 94-0352 | DWO-1 Rev 47 | Rev of "Operations Daily Weekly/Bi-Weekly Items" | 0 |
| 94-0358 | FHS-M-33 Rev 1 | Rev of "Equipment Preparation for Dry Fuel Loading Operations." Incorporates lessons learned from first 2 cask loadings. | 0 |
| 94-0359 | FHS-M-32 Rev 3 | Rev of "Loading and Placing the VSC into Storage." Incorporates lessons learned from first 2 cask loadings. | 0 |
| 94-0366 | EA-SC-93-083-03 R/0 | "VCC Tile Strength Calculation". (No change to configuration.) | 0 |
| 94-0405 | EA-SC-93-083-02 R/0 | Application of ASME Section III, subsection NC Requirements to MSB. Documentation of Code Compliance. Evaluates NRC-approved code exceptions, along with mid-height MSB girth weld and single liquid penetrant exams on ¼" fillet welds for the valve cover plates and the shield and structural lid joints. | 0 |
| 94-0420 | EA-FC-864-02 Rev 2 | "Justification for the use of the VSC Dry Cask System at the Palisades Nuclear Plant." Review of changes between generic drawings and specification referenced in the VSC-24 SAR Rev 0 and the site specific drawings and specifications. Changes include: A 60-deg. groove weld prep for the MSB shell to bottom plate weld. A Sch-80 drain pipe and support/guide pipe. Drain line detail changes. Increase in the MSB lifting bolt/hole size. Weld a support plate to the bottom of the MSB shield lid. Use an equal leg weld and increased root prep for the MSB top plate to shell weld. Weld fuel support plates (strips) to the bottom of the fuel sleeves. Change non-structural welds between fuel sleeves from continuous to stitch. Add slope to VCC outlet duct to facilitate water drainage. Add more VCC cover plate bolts. Add rounded top VCC concrete corner. Improved VCC concrete rebar configuration. Add alternative VCC bottom tile configuration (single outer ring). Allow 3%-6% entrained air in concrete (vs. < 3% requirement), based on achievement of required strength. Allow a 144 (vs. 145) lb/ft$^3$ concrete density. Ad support legs to air inlet assembly. Change in MTC lid bolt material spec. Add MTC lid lifting bolts (and holes). Remove MTC middle steel shell. Allow use of lead bricks in MTC radial shield. Hydraulic skid changes. Minor dimensional changes in MSB/MTC shims. Replace hollow trunnion (with lead and RX-277 shield interior) will solid steel trunnion. Configuration changes to MTC lifting yoke. Accept minor dimensional non-conformances to the MSB, VCC, and MTC. Editorial and clarification changes to the fabrication drawings. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 94-0469 | SPEC A 123 Rev 11 | Rev of "Painting with Inorganic Zinc Primer." Adds new temperature limit for post-welding MSB lid painting. | 0 |
| 94-0473 | SPEC A 123 Rev 12 | "Painting with Inorganic Zinc Primer." Carboline carbo zinc 11 SG added to approved materials list. | 0 |
| 94-0538 | FHSO-17 Rev 1 | Rev of "Multi-Assembly Basket Loading Procedure" Update of loading procedure requirements. (No component changes, remains within C-of-C and SAR requirements.) | 0 |
| 94-0575 | COP-27 Rev 8 | Rev of "Spent Fuel Tool System Chemistry" | 0 |
| 94-0602 | EA-HAR-94-01 Rev 0 | "Evaluation for Batch A through I Fuel for Dry Fuel Storage and Selection of Fuel for Loading into VSC-3 through VSC-13" | 0 |
| 94-0609 | EDC-SC-93-083-03 Rev N/A | "Design Change to VCC Air Outlet Temperature Probe Mounting Plate". Revises fabrication drawing to allow for matching plate holes (for screen attachment bolts). Allows attachment of air temperature probes. No affect on SAR drawings. | 0 |
| 94-0616 | EDC-SC-93-083-02 Rev N/A | "Engineering Design Changes on MSB-4". Adds clarification that NITS items may be bought commercial grade. Allows SA-516 Gr. 70 steel to be used for drain pipe support washer plate. Addresses non-conformance where one lifting lug is welded to shield lid support ring. | 0 |
| 94-0647 | C-136A Rev 5 | Rev of "Specification for the Supply of the Ventilated Storage Cask System". Evaluates Rev. 5 updates the specification to the as built configuration. | 0 |
| 94-0651 | COP-27 Rev 9 | Rev of "Spent Fuel Pool System Chemistry," added more explicit sampling instructions. C-PAL-94-0172. | 0 |
| 94-0667 | C-136E Rev 0 | "Construction Specification for the Cask Storage Foundation." | 0 |
| 94-0690 | FHS-M-32 Rev 4 | Rev of "Loading and Placing the VSC into Storage" Incorporates lessons learned from 1994 pre-operational testing. | 0 |
| 94-0734 | AP 3.12 Rev 3 | Rev of "FSAR and VSC Licensing Basis Book" | 0 |
| 94-0743 | CLP-M-6 Rev 3 | Rev of "Inspection of Heavy Load Lift Devices." Adds visual inspection of MTC and MTC Yoke to comply with ANSI N14.6. | 0 |
| 94-0755 | EA-CPAL-94-0456 Rev 1 | "Analysis of the VSC #3 Weather Cover Dose Rates" | 0 |
| 94-0799 | GOP 11 Rev 16 | Rev of "Refueling Operations and Fuel Handling," clarified steps required to support FHSO-17. | 0 |
| 94-0804 | EA-HAR-94-01 Rev 1 | Rev of "Evaluation of Batch A Through I Fuel Storage and Selection of Fuel for Loading into VSC #3 through VSC #13." This revision moves potentially high dose rate fuel to interior of cask to reduce worker exposure. C-PAL-94-0456. | 0 |
| 94-0818 | FHS-M-32 Rev 5 | Rev of "Loading and Placing the VSC into Storage", incorporates lessons learned from Cask #3. | 0 |
| 94-0820 | EDC-SC-93-083-07 Rev N/A | NCR-01-143-MSB & NCR-01-146-MSB issued for MSB #4. Evaluates non-conformances for some NITS components, and a damaged MSB top coating that was subsequently repaired. | 0 |
| 94-0852 | C-136C Rev 0 | Rev of "Fabrication Specification for the MSB," clarifies test for legibility. | 0 |
| 94-0854 | EA-HJM-94-01 Rev 0 | "Evaluation of Thermal Performance of VSC-1 and VSC-2. PPAC requires yearly evaluation of cask thermal performance curve. | 0 |
| 94-0856 | EA-SC-93-083-02 R/1 | "Application of ASME Section III, Subsection NC Requirements to the MSB." Provides clarification to impact testing requirements and visual acceptance criteria for weld undercut used for MSB 1-4. Documents clarifications made to the code application. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 94-0857 | EDC-SC-93-083-05 Rev N/A | Engineering Design Changes on MSB and VCC," DCN's issued during fabrication of MSB 5-14 and VCC 9-14. Identifies additional changes which need to be evaluated subsequent to that documented in EA-SC-083-01 and Safety Review PS&L 94-0155. (No effects on component integrity or function were identified.) | 0 |
| 94-0858 | EA-FC-864-48 Rev 0 | Dose Rate for Palisades VSC Cask Top. Provides clarification of the certificate of compliance Section 1.2.4. | 0 |
| 94-0873 | EDC-SC-93-083-08 Rev N/A | "Engineering Design Change" Identifies a design change and two nonconforming conditions which need to be evaluated. Adds 1½ -4 skip butt weld to prevent side ring from warping. | 0 |
| 94-0881 | EA-FC-864-49 Rev 0 | "Soil Erosion from Dunes At the Spent Fuel Storage Installation" | 0 |
| 94-0910 | EA-CPAL-94-0554 Rev 0 | "Dry Fuel Storage Dose Rate For VSC-04 Greater than 50 mrem/hr" | 0 |
| 94-0917 | FHS-M-32 Rev 6 | "Loading and Placing the VSC into Storage" | 0 |
| 94-0919 | FHS-M-32 | Rev of "Loading and Placing the VSC into Storage", incorporates lessons learned from Cask loading #4 | 0 |
| 94-0929 | EA-HJM-94-02 Rev 0 | "Thermal Acceptance Band for VSC-3 and VSC-4 for DWO-1" | 0 |
| 94-0933 | AP 4.43 Rev 4 | Rev of "Nuclear Material Control," clarifies requirements of C of C Section 1.1.7 and 1.2.3. | 0 |
| 94-0972 | FC-LID Rev 4 | Temporary Change to "Automated Welding Procedure for MSB." Changes MSB #7 weld gaps per Engineering Design Change SC-93-083-09 and SE Log 94-1014. | 0 |
| 94-1011 | EA-CPAL-94-0617 | "Dry Fuel Storage Project Support Analysis-Minimum Required Wall Thickness for MSB shell During Normal Operating Conditions. Evaluation Withdrawn this was evaluated under 94-1072. | 0 |
| 94-1014 | EDC-SC-93-083-09 Rev N/A | Engineering Design Change-Documents a nonconforming condition (NCR05-05-MSB) on MSB #7. Evaluates out-of-tolerance radial gap between the MSB shield lid and the MSB shell. | 0 |
| 94-1016 | C-136D Rev 0 | Fabrication Specification for the MTC-Revises approved generic spec to Palisades specific specification. All non-editorial revisions addressed in other 72.48 evaluations. | 0 |
| 94-1017 | EDC-SC-93-083-10 Rev 2 | "Application of ASME Section III, Subsection NC requirements to MSB," Extend exemption to code preheat requirements to base metal weld repairs, weld end preparation repairs and welding machine guide ring temperature attachment welds. | 0 |
| 94-1050 | EDC-SC-93-083-11 Rev N/A | "Non-conformance Reports on MSB and VSC Arrangement Drawing Changes". Evaluates issues with reading RT exam films, a change in welding electrode positions, a non-conforming weld pre-heat condition, Charpy impact testing results, an incomplete weld over the top 1/8" of the fuel sleeve configuration, and below minimum density for the RX-277 in an MSB shield lid. | 0 |
| 94-1063 | FHSO-1 Rev 3 | Rev of "MSB Loading Procedure." Changes spent fuel pool temperature limit from 90°F to 100°F. | 0 |
| 94-1064 | FHS-M-32 Rev 7 | Rev of "Loading and Placing the VSC into Storage." Changes spent fuel pool temperature limit from 90°F to 100°F. | 0 |
| 94-1072 | EA-FC-864-50 Rev 0 | "Dry Fuel Storage Project (FC-864) Support Analysis - MSB #4 Structural Integrity Assessment". Evaluates crack indications in MSB #4 shell weld that exceed ASME code allowables. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 94-1096 | EDC-SC-93-083-12 Rev N/A | "Non-conformance Reports on MSB-7 and Drawing Change on C136P, Sht 8." Addresses a 0.03" MSB sleeve length non conformance, and another non-conformance that was restored (repaired) to an allowable condition. | 0 |
| 94-1099 | FHS-M-32 Rev 8 | Rev of "Loading and Placing the VSC into Storage," relaxes vacuum drying acceptance criteria for MSB #6. Increases the allowable vacuum pressure from the previous 0.03 psia value, while still ensuring that the C-of-C vacuum criterion of 0.058 psia is met. | 0 |
| 94-1124 | FHS-M-32 Rev 8/9 | Rev of "Loading and Placing the VSC into Storage," makes several improvements concerning administrative methods, welding, vacuum drying, and air vent maintenance based on lessons learned from loading VSC #6. | 0 |
| 94-1143 | EDC-SC-93-083-13 Rev N/A | "Engineering Design Change (EDC)". Evaluates misc nonconforming issues. Evaluates changes to the (non-safety-related) vacuum drying system, a dimensional clarification on a drawing, cracked/loose coating that was restored to conforming condition, a weld undercut on the shield lid support ring, and flame cut marks that will also be restored to drawing requirements using weld repair. | 0 |
| 94-1170 | EA-HAR-94-01 Rev 2 | "Evaluation of Batch A through I Fuel for Dry Fuel Storage and Selection of Fuel for Loading VSC 3 through VSC 13." | 0 |
| 94-1173 | FSAR CH 14 Rev 16 | Rev of FSAR Chapter 14 "Postulated Cask Drop Accidents." Cask drop analysis in FSAR revised to reflect change in MTC/MSB drop scenario. MSB/MTC drop in track alley no longer defined as credible. | 0 |
| 94-1183 | EA-DFS-94-001 Rev 0 | "MSB 4 Pressure During Unloading," determines the max allowed internal pressure for MSB #4 based on limiting stress permitted by ASME Code. | 0 |
| 94-1304 | AP 3.07 Rev 8A | Rev of "Safety Evaluations," improves instructions for 72.48 evaluations based on experience. | 0 |
| 94-1305 | DWO-1 Rev 49/23 | Rev of "Operations DailylWeekly/Bi-Weekly Items", improves the forms for documenting daily inspections of the casks. | 0 |
| 94-1393 | EA-HAR-94-05 Rev 0 | Review of "Thermal Performance Curve for VSC-1 through VSC-4 and VSC-6 through VSC-8. | 0 |
| 94-1395 | TSR-9418 Rev 0 | "Evaluation of Temporary Lead Shielding" evaluates the installation of four 45 pound lead snakes on the top door cover of the MTC during cask loading activities. | 0 |
| 94-1405 | EA-D-PAL-94-076B Rev 0 | "Calculation for the Maximum Temperature for the Ventilated Concrete Cask and MSB." | 0 |
| 94-1418 | FHS-M-32 Rev 10 | Rev of "Loading and Placing the VSC into Storage," makes improvements to administrative methods, HP inspection requirements, and vacuum, drying based on previous experience. | 0 |
| 94-1441 | EA-HAR-94-04 Rev 0 | "Development of Excel Spread-sheet for Use in Predicting Air Flow and Temperature in VSC-24 DFS Casks." | 0 |
| 94-1466 | FHSO-17 Rev 4 | Rev of MSB Loading Procedure," adds description of temperature instrument used to monitor spent fuel pool temperature and lowers maximum allowed tolerance. | 0 |
| 94-1476 | FHS-M-33 Rev 3 | Rev of "Equipment Preparation for Dry Fuel Loading Operations" adds description of new instrument with tighter tolerance to be used for spent fuel pool temperature measurements(C-PAL-94-0975). | 0 |
| 94-1478 | FHS-M-32 Rev 10 | Rev of "Loading and Placing the VSC into Storage," revised to reflect use of helium to backfill MSB when it is drained of water. (C-PAL-94-1065). | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 94-1487 | FHSO-17 Rev 5A | Rev of "MSB Loading/Unloading Procedure." Clarifies MSB unloading procedures. (No effect on components. Procedure remains within licensing requirements.) | 0 |
| 94-1507 | EDCSC-93-083-06 Rev N/A | Engineering Design Change for SC-93-083-Evaluates conditions documented in Non-conformance Reports for MSB's 5,9,10. Evaluates MSB structural lid surface lamination that was restored to confirming condition, an MSB interior surface gouge that was repaired (restored to conforming condition), weld undercuts pinholes and tears in the fuel sleeves that were repaired, <1/8" incomplete welds at the sleeve ends, minor paint chipping on the top inside edges of some fuel sleeves that were repaired, removal of sand underneath a fuel sleeve coating and subsequent re-coating, an unauthorized MSB shell rerolling where the shell was restored to a compliant condition, alternate MSB dimension measurement methods, an oversized gap at the end of the MSB shield lid support ring, the permitting of a 0.3" x 0.4" chamfer at the bottom corner of the MSB structural lid, localized dents in a storage sleeve, and an MSB structural lid that falls to more than 0.031" below the top of the shell. | 0 |
| 94-1509 | EA-HAR-94-01 Rev 3 | "Evaluation of Batch A Through I Fuel for Dry Fuel Storage and Selection of Fuel for Loading into VSC-3 through VSC-13" this revision changes the MSB loading, revises numbering and loads bundle A-64 into MSB-9 instead of MSB-5. | 0 |
| 94-1520 | EA-CPAL-94-1065-01 Rev 0 | "Evaluation of MSB Vacuum Drying Process with Respect to Oxidation of $UO_2$." | 0 |
| 94-1533 | FHS-M-32 Rev 10 | Rev of "Loading and Placing the VSC into Storage," –Safety Review revised to reflect the addition of contingency actions to procedure in the event that air is accidentally introduced to the MSB during vacuum drying. | 0 |
| 94-1544 | C-136A Rev 0 | "Specification for the Supply of the VSC System," –This Revision changes the revision number of the specification from 5 to 0. C-PAL-94-0954. | 0 |
| 94-1552 | DWO-1 Rev 50/24 | Rev of "Operators Daily/Weekly/Bi-Weekly Items" and Basis. This revision changes the cask thermal performance check by deleting the reference to a specific temperature indicator. | 0 |
| 94-1586 | EDC-SC-93-083-14 Rev 0 | "Dry Fuel Storage Phase II, Inability to Meet Vacuum Drying Criteria for MSB #9" - Due to a leak at the swagelok fitting, Dow Corning 732 sealant will be used. | 0 |
| 95-0003 | EA-FC-864-11 Rev 4 | "Evaluation of MTC/MSB Drop in the VCC with the MTC/MSB Center of Gravity Located Outside the VCC Boundary". MTC/MSB wt lowered to reflect Pal site-specific rather than SAR generic assumptions. | 0 |
| 95-0055 | FHS-M-32 Rev 11 | Rev of "Loading and Placing the VSC into Storage" - Eliminates use of VDS water pump to remove MSB water, and specifies use of helium to push out water instead. Other procedure clarifications. | 0 |
| 95-0109 | EDC-SC-93-083-17 Rev N/A | Resolution of fabrication issues. A lamination in the VCC liner longitudinal seam was removed/repaired before welding. Rebar w/o tags were returned to the supplier and tested. CarboZinc 11 used on VCC components was procured as a non-safety-related material and used as is, since the coating does not perform a safety function. | 0 |
| 95-0125 | EA-HAR-95-01 Rev 0 | Thermal performance curve for VSC-5 | 0 |
| 95-0139 | AP 3.12 Rev 5 | Rev of FSAR and VSC Licensing Basis Book – adds requirements to send FSAR revs to Maintenance Rule engineer, other misc changes | 0 |

# Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 95-0141 | EA-C-PAL-1065-02 Rev 0 | Evaluation of Casks Already Loaded with respect to oxidation of $UO_2$ | 0 |
| 95-0145 | EA-HAR-94-01 Rev 4 | Evaluation of Batch A thru I fuel for DFS loading and selection of fuel for VSC-3 thru VSC-13, Rev to eliminate specifying which MSB loaded into which VCC. | 0 |
| 95-0150 | EDC-SC-93-083-15 Rev N/A<br>EA-SC-93-083-12 R/0 | EDC resolves several nonconformances regarding cleanliness, weld condition and grinding on MSB #10 backing ring, the allowance of a 1/8" land on the top edge of the MSB lid support ring, a shield lid diameter that is 0.04" under tolerance, fabrication drawing clarifications and editorial changes, and an alternate MSB shield lid side ring weld configuration that features a smaller (3/8" vs. 0.5" ) weld. | 0 |
| 95-0154 | EDC-SC-93-083-16 Rev N/A | EDC and Non-conformance disposition of VCC-09 – dispositions DCN's and NCR's issued during VCC construction. | 0 |
| 95-0313 | QT-36 | Rev of ISFSI pad monitoring program - clarifies method of taking data. | 0 |
| 95-0335 | EDC-SC-93-083-18 Rev N/A | EDC and Non-conformance disposition of MSB-05, VCC-10 and VCC-11 - dispositions vendor DCN's and NCR's and Consumers changes. Addresses failure of one temperature monitor during the 48-hour concrete curing period, and an (above allowable) 80-deg temperature measurement during the curing period. Details for installation of a dolly lock for the Heavy Haul Trailer are added. Evaluates a non conforming MSB shield lid bottom diameter and concentricity condition that was repaired/restored using weld repair and machining, as well as a final shield lid bottom diameter that is below tolerance. Other coating and weld-related repairs to MSB #5 are addressed. | 0 |
| 95-0364 | EDC-SC-93-083-19 Rev N/A | Evaluates a DCN and nonconformances resulting from the fabrication of VCC-10. Addresses lack of fabricator dimensional measurements that were later performed, confirming compliance. Evaluates a VCC shield ring OD that is 0.15" above tolerance, and a VCC liner inner diameter that is 0.065" below tolerance. | 0 |
| 95-0449 | EDC-SC-93083-21 Rev N/A | Engineering Design Change (Address non-conformance resulting from fabrication of VCC's 10 thru 12). Evaluates having one concrete temperature monitor damaged and out of calibration (other monitors confirm acceptable concrete temperatures). | 0 |
| 95-0490 | EA-HAR-95-03 Rev 0 | Thermal performance curve for VSC-9. | 0 |
| 95-0574 | EDC-SC-93-083-22 Rev N/A | EDC dispositions DCN's and NCR's for: use of different adhesive to affix VCC tiles, a VCC-11 liner with a diameter 0.06" below tolerance, a VCC-12 liner wall out of allowed limit for plumb, bringing a concrete batch into slump requirements by adding water (in accordance w/ fab spec), the use of (larger) #5 rebar in place of #4 rebar, VCC-11 through VCC-14 shield ring ODs that are up to 0.27" below tolerance, and a VCC-14 liner bottom plate that is 0.03" above flatness tolerance. | 0 |
| 95-0575 | FC-LID Rev 4 | Temporary change to FC-LID for MSB-11 thru 14 to add a series of NDE exams to preloading operation to detect any laminations and any "nuisance" indications that came up before in previous loadings. | 0 |
| 95-0622 | EDC-SC-93-083-20 Rev N/A | Dispositions DCN's and NCR's for MSB fabrication drawings. Lists several components that were restored to compliance via weld repair. Addresses fuel sleeve support bars that are slightly (<0.1") below the length tolerance, potential lack of fuel sleeve weld visual inspection, concavity of the MSB bottom plate that results in plate center elevation below tolerance, an alternate (1/8") weld configuration for the End Fitting to top plate weld, and a change in the examination requirements after temporary welds are removed. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 95-0699 | FHS-M-35 Rev 0 | New procedure - "Layup of DFS components" | 0 |
| 95-0757 | FC-LID Rev 1 | TCN to address defect in MSB-10 which was not due to a lamination but by underbead or hydrogen cracking. Adds a procedure to examine MSBs, after receipt and before release for loading, to detect flaws and defects. (Procedure not required by license documents.) | 0 |
| 95-0799 | EA-HAR-94-01 Rev 6 | "Evaluation of Batch A thru I fuel for DFS and fuel selection for VSC-3 thru VSC-13" - EA revised to specify loading some XF batch fuel as alternates to Batch A due to problems with debris removal from some Batch A fuel. | 0 |
| 95-0838 | EA-HAR-95-04 Rev 0 | Thermal performance curve for VSC-10 | 0 |
| 95-1053 | EA-BWB-95-02 Rev 0 | Thermal performance curve forVSC-11, VSC-12 and VSC-13. | 0 |
| 95-1109 | FHS-M-34 Rev 1,<br>EA-SC-93-083-04 R/0,<br>EA-SC-93-083-05 R/1,<br>EA-SC-93-083-13 R/0,<br>EA-SC-93-083-14 R/0,<br>EA-SC-93-083-16 R/0,<br>EA-SC-93-083-17 R/0,<br>EA-SC-93-083-18 R/0,<br>C136H, Sht 6 | Rev of unloading procedure to refine the process with a cask decay heat load of less than 11.94 kW - pressure buildup due to cooling of MSB with SFP water; lid hole form steam venting, cutting/removing lids, hole drilling, use of load cell. | 0 |
| 95-1250 | EA-CPAL-94-0554 Rev 3 | "Dry Fuel Storage Dose Rate for VSC-04 thru VSC-13"- EA revised to evaluate additional loaded casks (5 - 13). | 0 |
| 95-1351 | C-136R Rev 0 [cart/frame 5008/3520 read only] | "Specification for the Supply of VSC-24 System casks CVCC-24-15 thru -24" - Spec revised to clarify the Consumers/SNC interface for procurement of cask systems. | 0 |
| 95-1354 | EDC-SC-93-083-24 Rev N/A | EDC - small steel surveyors pins will be embedded into the corners of the ISFSI storage pad. Pins mark easy to find and hard to damage reference points for monitoring the pad and surrounding sand dunes. | 0 |
| 95-1374 | AP 5.26 Rev 3 | Rev of "independent spent fuel storage installation training and certification program" - additional training requirements are being added for unloading a cask in preparation for MSB-4. | 0 |
| 95-1434 | FHS-M-32 Rev 12 | Rev of "Loading and Placing the VSC into Storage" - Rev to require control room HVAC operability per SO 54 during fuel handling and heavy load movements. | 0 |
| 95-1554 | EA-FC-864-17 Rev 3 | "Specs for minimum sizes, slings, Bolts, shackles associated with VSC component lifts." | 0 |
| 95-1607 | EA-FC-864-30 Rev 3 | "FC-864 Heavy Loads Methodology" - EA revised to reflect addition of a load cell. | 0 |
| 95-1641 | EDC-SC-93-083-26 Rev N/A | EDC changes the height for attaching the cask identification nameplate from 60" to 60.5" to accommodate the replacement nameplates to allow maximum use of existing anchor points. | 0 |
| 95-1644 | EA-SC-93-083-22 R/0 | "Minimum temperature of MSB shield lid plate after 20 years and 50 years" - EA shows that ambient temp requirement of 10F min maintains the 50F margin above the Charpy test temperature. | 0 |
| 95-1685 | EDC-SC-98-083-29 Rev 0 | "ISFSI Pad Surface Repair" - EDC provides for repairing the concrete surface of the pad which is spalling and causing problems with the VAT's. EDC also repositions casks to increase storage space. | 0 |
| 95-1719 | EA-SC-93-083-21 R/0 | "Fuel Pool Impact Limiter Pad Evaluation" - Tests were performed by the manufacturer of the foam used in the spent fuel pool ILP. EA evaluates test data and concludes ILP will be OK. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 95-1720 | EA-FC-864-09 Rev 7 [needs for FC-973] | "DFS Project MSB Transfer Cask Drop Analysis and Impact Limiter Design" - This *rev* to EA evaluates the MSB drop analysis because of ILP foam test data which shows reduced strength after immersion in the SFP. | 0 |
| 95-1760 | EA-SC-93-083-10 Rev 0 | "Heat Transfer Analysis of the VCC" - EA provides computer model for thermal analysis of VSC components. | 0 |
| 95-1808 | EA-FC-864-11 Rev 4 [needs for FC-973] | "Evaluation of MTC/MSB Drop on the VCC with the MTC/MSB CG Located Outside the VCC Boundary" - *Rev* to use Palisades site-specific weights which are lower than the weights used the SNC generic analysis. | 0 |
| 95-1830 | EA-HAR-95-05 Rev 0 | Dose Rate from Discharge Pipe of MSB Assuming Damaged Fuel. New Calculation. | 0 |
| 95-1838 | EA-SC-93-083-23 R/0 | "Calculation for the Limiting Ventilated Concrete Cask Inlet-Outlet Differential Temperature" - EA calculates the maximum allowed VCC inlet-outlet temperature differences for VSC-1 thru VCS-13. This calc superseded calc EA-D-PAL-076B-01. | 0 |
| 95-1839 | EA-SC-93-083-07 R/0 | "Fuel Temperature Transient Calculation for Vacuum Drying" EA performs a calculation of the maximum fuel temperature in the MSB/MTC during vacuum drying using the Palisades as-built configuration. | 0 |
| 95-1994 | EA-SC-93-083-24 R/0 | "Evaluation of Hydrodynamic Responses of MSB Discharge System During Reflood/Cooling" - EA evaluates structural integrity and forces experienced during cask flooding and steam venting. | 0 |
| 95-2112 | EDC-SC-93-083-23 Rev N/A | EDC addresses non-conformances for VCC 1-14 and MSB-14, all of which are repaired and restored to conforming condition. Also provides clarification for No-Go gauge. | 0 |
| 95-2113 | EA-FC-864-17 Rev 4 [need for FC-973] | "Specs for minimum sizes, slings, Bolts, shackles associated with VSC component lifts." - Rev to incorporate the actual tolerance of the Dillon load cell used during unloading. | 0 |
| 96-0138 | EA-SC-95-055-03 Rev 0 [need for FC-973] | "Alternative Compliance Measure for Concrete Truck Uniformity" - EA provides alternative verification method for concrete truck uniformity requirements contained in ASTM C94 during VCC construction. | 0 |
| 96-0180 | EA-SC-93-083-17 R/1 | "Reflooding/Cooling of MSB" - revised EA to delete calculation of unvented pressure buildup. | 0 |
| 96-0221 | EM-04-27 Rev 0 | "Fuel Visual Inspection prior to Dry Cask Storage" – this procedure determines what fuel assemblies are suitable for dry fuel storage - procedure replaces EGAD-RSA-24. | 0 |
| 96-0249 | C-136L Rev 3 | Spec for the supply of VSC-24 system casks" - spec rev changed for turnover to Palisades. | 0 |
| 96-0250 | C-136P Rev 1 | "Fabrication specification for MSB" - spec rev changed for turnover to Palisades. | 0 |
| 96-0251 | C-136N Rev 0 | "Fabrication specification for VCC" - spec rev changed for turnover to Palisades. | 0 |
| 96-0287 | FHS-M-33 Rev 4 | "Equipment Preparation for Dry fuel Loading Operations" - Procedure revised to delete the Track Alley and LDS inspections, reordered some steps to improve procedure, flow, and added more explanation for some steps. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 96-0338 | FHSO-17 Rev 5A | "MSB Loading/Unloading Procedure" - Adds fuel handling prerequisites from GOP 11 so that GOP 11 is no longer needed for dry fuel storage fuel handling. Allows use of installed SFP temperature indication rather than MT&E temperature gauge unless SFP temperature is approaching upper limit of 99.8F. | 0 |
| 96-0342 | EA-SC-93-083-02 R/3 | "Evaluation of Design Changes to Ventilated Storage Cask (VSC) Phase II" – consolidated summary of EAs, EDCs, DCR, DCNs and NCRs, previously evaluated under 72.48, affecting the VCCs. | 0 |
| 96-0550 | EA-SC-93-083-21 R/1 | "Fuel Pool Impact Limiting Pad Evaluation" – Rev incorporates an evaluation of the results of the 500 day test of Last-A-Foam FR-3710 used in the impact limiter pad. | 0 |
| 96-0669 | EA-SC-93-083-24 R/1 | "Evaluation of Hydrodynamic Responses of MSB Discharge System During Reflood/Cooling" - Rev to address NRC request that a discharge sparger design use sparger test results for the design. | 0 |
| 96-0720 | FHS-M-34 Rev 2,<br>EA-SC-93083-04 R/1,<br>EA-SC-93083-16 R/1,<br>EA-SC-93083-17 R/1,<br>EA-SC-93083-25 R/0 | Rev of unloading procedure to incorporate lessons learned during unloading mockup and to address NRC comments. | 0 |
| 96-0722 | EA-SC-93-083-26 R/0 | "MSB Temperature Stresses During Unloading" – EA evaluates the thermal stresses in the MSB during unloading process. | 0 |
| 96-0734 | EA-SC-93-083-27 R/0 | "MSB Kryton -85 and Nitrogen Content Determination," Calc documents Krypton -85 and nitrogen content determinations for the atmosphere in MSB-04. | 0 |
| 96-0735 | CH 3.49 Rev 0 | "Gas Sampling of Multi-Assembly Sealed Baske!." Rev for 96-0726 to provide detailed instructions for obtaining and analyzing the MSB atmosphere and KR-85 samples. | 0 |
| 96-0737 | EA-FC-864-30 Rev 2 | "FC-864 Heavy Loads Methodology" - A lift device for the MSB shield lid assembly was modified to accommodate removing the shield lid which the MTC/MSB is in the SFP. | 0 |
| 96-0738 | EA-FC-864-17 Rev 5 | "Specs for minimum sizes, slings, Bolts, shackles associated with VSC component lifts," - Rev allows the use of the 55 ton shackles supplied with the Dillon load cell. | 0 |
| 96-0787 | SM-1-8 Rev 3 | "Weld procedure specification - SMAW carbon and P8 stainless steel" - procedure defines requirements for shielded metal arc welding between carbon and stainless steel. | 0 |
| 96-0788 | SM-1-8 Rev 3 | "Welding procedure specification SMAW carbon and P8 stainless steel" - this is a temporary change to exempt the weld between the 2-inch vent assembly and the shield lid from the 200F preheat for MSB-4 unloading. | 0 |
| 96-0818 | EDC-SC-93-083-35 Rev 0 | "Repair of Minor Paint Defects" – Evaluates the use of an alternative coating to repair some minor paint defects on MSB #14. (This is necessitated by the fact that the original, specified base coating (primer) will not adhere to the MSB over-coating. | 0 |
| 96-0888 | EA-CPAL-94<br>Rev 01065B-01 | Evaluation of Maximum heat Load Allowed for dry Fuel Storage due to Oxidation" - EA evaluates the time the helium atmosphere has to be restored in the MSB if it lost during cask loading to prevent fuel exposure to air and potential for $UO_2$ oxidation. | 0 |
| 96-0972 | EA-SC-93-083-28 R/0 | "Temporary Shielding Evaluation for Loading of VSC and MSB/MTC" - this calc evaluates weight stresses in the MSB resulting from temporary shielding installed in the lids. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 96-1421 | C-136R Rev 1 | Rev of "Supply of *VSC-24* System Casks CVCC-24-15 through 24," This spec is being revised to address administrative issues due to the shift in responsibility of VCC fabrication from SNC to Consumers. | 0 |
| 96-1939 | EA-SC-95-055-02 R/0<br>EA-SC-95-055-04 R/0 | "Evaluation of Design changes to the MSB shield lid/shielding calculations using MCBEND for the new MSB vent design - EA evaluates changes and enhancements to the MSB shield lid. | 0 |
| 96-1968 | FHS-M-32 Rev 13 | Rev of "Loading and Placing the VSC into Storage" – Adds argon purge to remove combustible gases during welding, adds steps for combustible gas monitoring, changes boron limits in SFP per commitments made for NRC Bulletin 96-04. | 0 |
| 96-1969 | FHS-M-34 Rev 3 | Rev of unloading procedure - Adds argon purge to remove combustible gases during welding, adds steps for combustible gas monitoring, changes boron limits in SFP per commitments made for NRC Bulletin 96-04. | 0 |
| 96-2097 | EA-SC-95-055-03 R/1 | "Alternative compliance measure for concrete truck uniformity" - Rev incorporates editorial changes requested by NPAD. | 0 |
| 97-0124 | EA-VSC-94-03 Rev 0<br>[need for FC-973] | "Evaluation of the Source Spectra for Fuel Assemblies as a Function of Initial Enrichment, burnup and cooling time" - This is a new EA that covers higher enrichment and burn up of fuel for dry fuel storage. | 0 |
| 97-0177 | FHS-M-32 Rev 14 | Rev of "Loading and Placing the VSC into Storage" to implement requirements if air is accidentally introduced into the MSB. | 0 |
| 97-0292 | EDC-SC-93-038-36 Rev 0 | "Repair of Anchors for Ventilation Screens on Dry Fuel Storage Project: - This repairs and/or replaces expansion anchors that attach air inlet screens, nameplates and air outlet vents on the VCC exterior. | 0 |
| 97-0437 | FHS-M-32 Rev 13 | "Loading and Placing the VSC into Storage." Rev from 96-1968 Added steps for control of hydrogen gas; and to add steps for control of boron concentration. | 0 |
| 97-0438 | FHS-M-34 Rev 3 | "Unloading the Multi-Assembly Sealed Basket." Rev from 96-1969 to reflect lessons learned and to incorporate resolution of issues associated with chemical, galvanic or other reaction in Spent fuel storage casks | 0 |
| 97-0530 | EA-BWB-95-02 Rev 1 | Thermal performance curve for VSC-11, VSC-12 and VSC-13. | 0 |
| 97-0577 | DWO-1 Rev 54 | "Operators Daily/Weekly/Bi-Weekly Items" - change to procedure revises (clarifies) the acceptance criteria for the average outlet temperature per CPAL-97-0135. | 0 |
| 97-0578 | EA-SC-95-055-07 R/0 | "MSB Pneumative Pressure Testing" - EA justifies changing from a hydrostatic test on the MSB to a pneumatic test as an acceptable alternative. | 0 |
| 97-0579 | EA-SC-95-055-06 R/0 | "Requirements to Avoid Bulk Boiling During MSB loading" - EA establishes administrative controls to prevent bulk boiling in the MSB during loading. | 0 |
| 97-0646 | Technical data Book Fig 13.1 Rev 7 | "Palisades Technical Data Book Figure 13.1" - curve for VSC thermal performance is being revised to include VSC-11, VSC-12 and VSC-13, and other misc changes. | 0 |
| 97-0734 | FHS-M-32 Rev 15 | Rev of "Loading and Placing the VSC into Storage" - Revised to incorporate water temperature measurements using an installed thermocouple. adds steps for draindown contingency actions, and misc clarifications/enhancements. | 0 |

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| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 97-0736 | FHS-M-34 Rev 4 | Rev of unloading procedure to accommodate shield lid designs w/ and w/out an installed thermocouple, removes the contingency to return the MSB to the SFP and incorporates new method of calculating time-to-boil. | 0 |
| 97-0856 | NDT-UT-28 Rev 0 | Rev of "Straight Beam Ultrasonic Examination" – imposes ultrasonic examination requirements to detect laminations following MSB-14 lid prep activities. | 0 |
| 97-0857 | NDT-RT-01 Rev 11 | "Radiographic Examination of Welds" – implements requirements from SAR regarding weld repair examination during lid prep. | 0 |
| 97-0858 | NDT-PT-02 Rev 8 | "Liquid Penetrant Examination - Nonstandard Temperature" - implements the SAR requirements regarding weld repair examination during lid prep. | 0 |
| 97-0859 | NDT-PT-01 Rev 12 | "Liquid Penetrant Examination - implements the SAR requirements regarding weld repair examination during lid prep. | 0 |
| 97-0860 | NDT-VT-01 Rev 13 | "Visual Examination" - implements SAR requirements regarding weld repair examination during lid prep. | 0 |
| 97-0864 | QT-36/ ST-36 Rev 2 | Rev of "ISFSI Pad Monitoring Program" - changes frequency of the performance of this procedure from quarterly to semi-annually and revises acceptance criteria for settlement. | 0 |
| 97-0980 | SC-95-055 Rev 0,<br>EA-SC-93-083-03 R/1,<br>EA-SC-93-083-12 R/1<br>EA-SC-95-055-03 R/1<br>EA-SC-95-055-04 R/0 | "Evaluation of Design changes to VCC Phase III" – evaluates design changes made during fabrication and construction under Phase III including VSC-15 - VSC-18. Addresses several editorial and clarification changes to fabrication drawings/specs, as well as changes that tighten tolerances/requirements vs. the SAR and C-of-C. Evaluates change in shield lid backing ring material from SA-516 Gr. 70 to A36, the addition of a structural lid bottom chamfer, the relaxation of certain VCC and MSB interior component tolerances, the use of a lower VOC content version of CarboZinc11 coating, potential corrosion of fuel sleeves, the addition of MSB pressure boundary ultrasonic examination and NDE requirements, an increase in ceramic tile width from 1.7" to 2.0", the addition of an air outlet assembly support bracket, the allowance of a circumferential weld for the VCC inner liner, a change in the weld configuration in the area of the VCC flange, allowing the air outlet ducts to be fabricated out of two sections, a change in the MTC and VCC bottom liner plate Nelson stud material from A36 to A108, allowing the VCC shield ring to be constructed out of a single 3" x 6" steel piece, a change in the outer VCC shield ring and weld configuration, and a revision in concrete uniformity verification requirements. | 0 |
| 97-1075 | MET-MSB04 Rev 0 | New procedure - "Palisades Plant MSB Seal Area Weld Search" - implements method that will be used to search the shell seal area. | 0 |
| 97-1084 | NDT-UT-11 Rev 5 | Rev of "Ultrasonic examination of vessel welds" – provides instruction to define responsibilities for the exam. | 0 |
| 97-1086 | NDT-MT-01 Rev 10 | Rev of "Magnetic Particle examination" – provides instructions and defines responsibilities for magnetic particle exam. | 0 |
| 97-1088 | NDT-MT-06 Rev 0 | Rev of "Magnetic Particle Examination of Lifting Device Painted Surface" - provides instructions and defines responsibilities for magnetic particle exam. | 0 |
| 97-1102 | AP 5.26 Rev 4 | ISFSI Training and Certification Program - rev for organization and company name changes and a new job role (VDS operator). | 0 |

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| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 97-1119 | WI-DFS-N-05 Rev 1 | Rev of "Coating/Coating Touch-up of DFS Components" - Allows use of HS and SG versions of Carbozinc 11 primer. Takes an exception to the 1 $ft^2$ coating touch up rule. | 0 |
| 97-1126 | FSHO-17 Rev 5 | Cancellation of MSB loading/ unloading procedure – replaced by two procedures, one for loading and one for unloading. | 0 |
| 97-1129 | FHSO 17A Rev 0 | new procedure - MSB loading procedure (see above) | 0 |
| 97-1131 | FHSO-17B Rev 0 | new procedure - MSB unloading procedure (see above) | 0 |
| 97-1137 | FHS-M-35 Rev 1 | Rev of "Layup of DFS components" - rev to document cleanliness guidelines and incorporate other minor changes. | 0 |
| 97-1256 | COP-27 Rev 13 | Rev of "Spent Fuel Pool Chemistry" - this rev increases required SFP boron from 2900 to 3050 ppm during cask loading and unloading per NRC Bulletin 96-04. | 0 |
| 97-1276 | FHS-M-33 Rev 6 | Rev of "Equipment Preparation for DFS" - Rev to add equipment for lid weld preheat. | 0 |
| 97-1289 | PREP-LID Rev 1<br>DCN-CPC07 -MD-23<br>EDC-SC-95-055-01 | Rev of "MSB weld prep procedure" - incorporates portions of welding procedure FC-LID pertaining to weld joint preparation and incorporates lessons learned from previous MSB loadings concerning misc fit-up testing details. Adds two markings to shield lid, changes drain tube material from carbon steel to stainless steel, adds more weld/prep inspections, add MSB #14 shell interior inspections for lamination, adds acid-etch examination of shell interior, for undocumented welds, for all MSBs, allows removal of metal from the shield lid side to create a uniform lid/shell gap thickness (for automated welding). | 0 |
| 97-1297 | FHS-M-34 Rev 5 | Rev of unloading procedure to revise solely to support upcoming dry run activities in preparation for the next series of VSC loadings incl. heat loads up to 24 kw. | 0 |
| 97-1325 | SM-LID Rev 3 | Rev of "welding procedure specification SM-LID" – adds argon gas purge during MSB loading activities (NRC Bulletin 96-04 requirement.) | 0 |
| 97-1345 | EA-SC-95-055-05 R/0 | "Evaluation of MSB Lid Weld Pre-heating during casks loading" - EA evaluates the effects of preheating on the cask and the loading process. | 0 |
| 97-1348 | NDT-G-07 Rev 1<br>[see EDC-SC-95-055-02] | "Establishment of Reference Point Lo" (for marking welds and components). | 0 |
| 97-1373 | EDC-SC-95-055-02 Rev 0 | "Evaluation of Design changes to VSC Phase "I" – Slightly increases the depth at which the Swagelok fittings sit in the shield lid. Modifies shims thickness and shape. Changes drain pipe material from carbon to stainless steel. | 0 |
| 97-1383 | FHS-M-32 Rev 6 | Rev of loading procedure - changes to lid welding to pre/post weld heating to 200F per NRC CAL response and allows casks w/ 24 kw heat load. | 0 |
| 97-1386 | EA-SC-93-083-21 R/2 | "Fuel Pool Impact limiter Pad Evaluation" - EA incorporates the 1000 day test results for the foam used in the ILP test. | 0 |
| 97-1389 | FC-LID Rev 6 | Rev of "Automatic Flux Cored Arc Welding" - revised to incorporate lessons learned, removed joint preparation to PREP-LID and add 200F preheat for lid welds. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 97-1492 | EA-SC-93-083-04 R/2<br>EA-SC-93-083-14 R/1<br>EA-SC-93-083-20 R/0<br>EA-SC-93-083-24 R/2<br>EA-SC-93-083-26 R/1<br>EA-SC-93-083-29 R/0<br>EA-SC-93-083-30 R/0<br>EA-SC-95-055-04 R/1 | "Evaluation of MSB unloading process" - revised to incorporate analyses for a 24 kW heat load and implementing requirements per NRC Bulletin 96-04 commitments (argon gas purge, monitoring, boron limits, cleanliness, water temperature monitoring). | 0 |
| 97-1547 | MET-MSB04 Rev 1 | Rev of "Palisades Plant MSB Macroetch Examination" - revised to include use of nitric acid as an alternative for etching. | 0 |
| 97-1608 | QT-36<br>[not found] | Cancellation of "ISFSI Pad Monitoring Program" – replaced by ST-36 | 0 |
| 97-1610 | QT-36 Basis Rev 1 | Cancellation "ISFSI Pad Monitoring Program Basis Document" replaced by ST-36. | 0 |
| 97-1641 | RPWHT-1 Rev 2 | Rev of "Welding procedure specification" - describes how to use electric heat elements, and post weld heat treatment permitted by ASME III NC-4600. | 0 |
| 97-1643 | EDC-SC-95-055-08 Rev 0 | Documentation of Evaluations for DCN and fabrication non-conformances associated with shield lid see EA-SC-95-055-04 Rev 1. Bevels MSB shield lid top plate at bottom of 5.1" hole. Reduces lengths of stitch welds between shield lid bottom plate and fitting block. Counter-bore top of fitting block. Shield lid tube to fitting plug (block) weld changed from fillet to seal weld. A ½" hole in the shield lid, drilled in the wrong location, is filled with a solid steel plug. Slightly out of tolerance shield lids are used as is. Shield lid fitting block has out of tolerance holes; some Swagelock valves and flush plugs do not meet location requirements; shield lid side ring is outside of machining (surface finish) tolerances (all used as is). | 0 |
| 97-1644 | EDC-SC-95-055-07 Rev 0 | Documentation of fabrication nonconformances associated with VSC-24 drawings. Evaluates an out of dimensional tolerance structural lid backing ring. Evaluates structural lids with various dimensional non-conformances (for use as is). Evaluates an MSB shell diameter and shell to support ring gap size that are above tolerance. Evaluates various minor dimensional non-conformances in fuel sleeves. Evaluates an MSB base coating (CarboZinc11) thickness that is over tolerance, a paint application blast profile that is deeper than allowed, and MSB top coating thicknesses that are outside tolerances. Also evaluates a non-continuous weld between the VCC inner liner and the shield ring support weld. | 0 |
| 97-1645 | EDC-SC-95-055-06 Rev 0 | "Ventilated Concrete Cask (VCC) Concrete Repair Instructions" - Adds a note to drawing C-136S Sht 2 to incorporate the use of Work Instruction WI-DFS-N-07 which will provide instructions on the methods used to repair the VCC vents (C-PAL-97-1287). | 0 |
| 97-1659 | FHS-M-32 Rev 17 | Rev of "Loading and Placing the VSC into Storage. "- The procedure is being revised to place a "shim" on the top of the VCC to correct for the concave VCC top surface when placing the MTC on casks 15-21. Ultrasonic testing of the structural lid weld was added to ensure cracking did not occur during or after the lid welding. | 0 |
| 97-1708 | NDT-UT-11 Rev 6 | Rev of "Ultrasonic Examination of Vessel Welds." – This procedure is used to measure the thickness of VSC-24 cask components by ultrasonic examination and is being revised to incorporate clarifications and enhancements. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 97-1709 | WI-DFS-N-02 Rev 4 | Rev of "Vacuum Drying System (VDS) Checkout/Component Test." - This Work Instruction ensures the proper operation of the vacuum drying system and tests the Burks water pump to ensure it does not exceed 7 gpm flow when flooding an MSB during the unloading process. This ensures the MSB pressure does not exceed design limits. | 0 |
| 97-1733 | EA-BWB-97-01 Rev 0<br>[Tied to T -338 Rev] | Rev of "Evaluation of Batch A Through K Fuel for Dry Fuel Storage and Development of Thermal Performance Curve of Special Test T-338." - The EA determines which spent fuel meets the Certificate of Compliance criteria for loading into the DFS casks. Fuel batches that are being considered because they meet the 5 year cooling requirement are the H, J and K batches. Loadings and thermal performance curves are provided for up to 18 casks. | 0 |
| 97-1806 | FHS-M-34 Rev 6 | Rev of "Unloading the Multi-Assembly Sealed Basket." - Incorporates lessons learned from the September 1997 cask loading mockup and provides other procedural clarifications and improvements, including addition of an inner liner flange shim the top of the VCC prior to setting the MTC on the VCC. (C-PAL-97-1289). | 0 |
| 97-1808 | FHS-M-33 Rev 7 | Rev of "Equipment Preparations for Dry Fuel Loading Operations." - Incorporates lessons learned during the September 1997 cask loading mockup. The changes are comprised of editorial corrections, clarifications, and minor enhancements. | 0 |
| 97-1930 | EA-SC-95-055-05 R/0<br>[Rev to 97-1345 R/1 to SDR LOG 97-1345] | "Evaluation of MSB Lid Weld Pre-Heating During Cask Loading" - revised to provide a better justification for the question on why the change (preheat lid welds) does not significantly increase the occupational dose. The change explains that although the loading time is estimated to be increased by approx 12 hours, the dose increase is expected to be less than 5% of that estimated in the SAR and remains below the dose estimate in the SAR of 918 mrem because the equipment is installed/removed remotely and there is little activity in the area while pre/post-heating is occurring. This revision was requested by an NPAD review. | 0 |
| 98-0738 | FHS-M-34 Rev 6<br>[see PS&L 97-1806] | Rev of "Unloading the Multi-Assembly Sealed Basket" – The procedure and 1 OCFR72.48 safety review are being revised to incorporate monitoring for hydrogen during weld removal activities. | 0 |
| 98-0761 | EA-SC-95-055-08 R/0 | "Evaluation of MSB Lid Weld Ultrasonic Examination" – This EA evaluates the effects of performing UT exams on the MSB structural lid weld during cask loading and on MSBs previously loaded into the VCC. The temperature of the weld area (due to decay heat or weld preheat) is evaluated for UT equipment selection, personnel dose evaluation, and structural evaluation for the device that will lift the shield ring when in the VCC. | 0 |
| 98-0775 | AP-5.26 Rev 5 | Rev of "Independent Spent Fuel Storage Installation Training and Certification Program" - The procedure is changed to provide training and qualification requirements for certification of personnel who will perform ultrasonic testing of the dry fuel storage MSB structural lid welds to ensure no cracks exist after the welding. | 0 |
| 98-0821 | SI-UT-105 Rev 0 | New Procedure "Time-OF-Flight Diffraction Ultrasonic Examination of VSC-24 Dry Fuel Storage Cask Structural Lid to Shell Weld" | 0 |
| 98-0830 | EA-FC-864-13 Rev 1 | "Dry Fuel Storage Project (FC-864) Support Analysis - Design Calculations VSC-24 Criticality Safety Analysis (Palisades Fuel With Borated Water)" | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 98-0845 | FT-6 Rev 2 | Rev of "Five Year Inspection of the First VSC Placed In Service" - Procedure and basis were revised based on experience from the Nov 97 exam of VSC-04. Other changes made were to change the responsible supervisor from the SS to the reactor engineering supervisor and to require a CR to be initiated if degradation or unusual conditions are detected. | 0 |
| 98-0869 | EA-SC-95-055-08 R/0<br>[Rev 1 to SE - see PS&L 98-0761] | Evaluate the effects of performing an ultrasonic examination of MSB lid weld during cask loading and for the MSB's already loaded into VCC's and stored on the pad. | 0 |
| 98-0982 | ST-36 basis & AT-36 basis Rev 0 | Rev of "ST-36 & Basis and AT-36 & Basis" – Surveillance ST -36 and its basis document are being replaced by AT -36 and its basis document. This change reflects a revised NRC commitment to inspect the ISFSI pad and surrounding sand dunes annually rather than semi-annually. | 0 |
| 98-1345 | EA-FC-864-02 Rev 4,<br>EA-SC-95-055-09 R/0 | Justification for the Use of the VSC-24 Dry Cask System at the Palisades Nuclear Plant in Accordance with 10CFR72 Subpart K and Evaluation of Design Changes. | 0 |
| 98-1393 | EDC-SC-95-055-11 Rev 0 | Ventilated Concrete Cask (VCC) Drawing Changes | 0 |
| 98-1405 | AT-9 & Basis Rev 1 | Inspection of Ventilated Storage Cask Exterior & Basis | 0 |
| 98-1563-2 | EA-SC-95-055-08 R/1<br>WI-DFS-N-09 Rev 0<br>[need 1563-1] | Evaluation of MSB Structural Lid Weld Ultrasonic Testing Examination | 0 |
| 98-1564 | EDC-SC-95-055-13 Rev 0<br>WI-DFS-N-09 Rev 0 | Documents to support Ultrasonic Testing of MSB Structural Lid to Shell Weld with the MSB in the VCC. | 0 |
| 98-1664-1 | SI-UT-105 Rev 3<br>[need 1679.2] | Time of Flight Diffraction Ultrasonic Examination of VSC-24 Dry Fuel Storage Cask Structural Lid to Shell Weld. | 0 |
| 98-1679-1 | AP5.26 Rev 6 | Independent Spent Fuel Storage Installation Training and Certification Program. | 0 |
| 98-1684 | EDC-SC-95-055-12 Rev 0<br>WI-DFS-N-08 | Document Issued to Support Ultrasonic Testing Examination of MSB Structural Lid to Shell Weld with the MSB in the VCC. | 0 |
| 98-1705-1 | SI-UT-106 Rev 1<br>[need 1705.2] | Ultrasonic Instrument and Scanner Linearity Verification. | 0 |
| 98-1759 | SI-UT-105 Rev 3 with FMR-1 | Time of Flight Diffraction Ultrasonic Examination of VSC-24 Dry Fuel Storage Cask Structural Lid to Shell Weld. | 0 |
| 98-1865 | EDC-SC-95-055-17 Rev 0<br>WI-DFS-N-08 | VCC Weather Cover Bolting Changes. | 0 |
| 98-1879-2 | GOP-11 Rev 29<br>[need 1879.1] | Refueling Operations and Fuel Handling. | 0 |
| 98-1964 | EDC-SC-95055-18 R/0<br>WI-DFS-N-08 R/1<br>EA-SC-95055-08 R/2<br>EA-SC-95055-10 R/O | Documents Issued/Revised to Support VCC Weather Cover Boiting Changes. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 98-2072-2 | EM-04-27 Rev 1<br>[need 2072.1] | Fuel Visual Inspection Prior to Dry Cask Storage. | 0 |
| 98-2135 | EA-SC-95-055-11 R/0 | Verification and Validation of the UT -EXAM.xLS Spreadsheet Program. | 0 |
| 98-2137 | WI-DFS-N-05 Rev 1 | Coating/Coating Touch Up to Dry Fuel Storage Components - Work Instruction developed to allow coating/touch up. | 0 |
| 98-2212 | EDC-SC-95-055-19 Rev 0<br>EA-FC-864-06 R/2 | Documents Revised to Support Cask Lifting Yoke Charpy Impact Testing | 0 |
| 98-2252 | NDT-VT-01 Rev 14 | Visual Examination | 0 |
| 98-2253 | NDT-MT-06 Rev 1 | Magnetic Particle Examination of Lifting Device Painted Surface. | 0 |
| 98-2298 | EA-SC-95-055-08 R/3 | Evaluation of MSB Structural Lid Weld Ultrasonic Testing Examination. | 0 |
| 98-2340 | NDT-PT-01 Rev 13 | Liquid Penetrant Examination. | 0 |
| 98-2341 | NDT-PT-02 Rev 10 | Liquid Penetrant Examination - Non Standard Temperature. | 0 |
| 98-2342 | NDT-MT-01 Rev 11 | Magnetic Particle Examination. | 0 |
| 98-2343 | MET-MSB04 Rev 2 | Palisades Plant MSB Macroetch Examination. | 0 |
| 98-2344 | NDT-RT-01 Rev 12 | Radiographic Examination of Welds. | 0 |
| 98-2345 | NDT-UT-11 Rev 7 | Ultrasonic Examination of Vessel Welds. | 0 |
| 99-0042 | WI-DFS-N-05 Rev 2 | Clarification of WI on Coating/Coating Touch up of Dry Fuel Storage Components. | 0 |
| 99-0078 | EA-SC-95-055-12 R/0 | Evaluation and Disposition of MSB Structural Lid to Shell Weld Flaw Indications. Evaluates flaws over maximum allowable sizes, increasing the minimum cask move temperature from 0 to 35 degrees, and the structural lid top for MSB #7 being 3/8" over the top of the shell. | 0 |
| 99-0161-2 | DWO-1 Rev 56 | Operators Daily/Weekly/Bi-weekly items. Provides clarification to procedures for clearing snow from cask inlet vents. | 0 |
| 99-0213 | EA-DFS-99-01 Rev 0<br>[need extra copy for SE book] | Evaluation of Spent Fuel for Dry Fuel Storage Casks 15 thru 19 and Development of Thermal Performance Curve for Special Test T -338. | 0 |
| 99-0218 | EA-SC-95-055-13 R/0 | Evaluation of Fabrication Differences on the MSB Transfer Cask (MTC) and Lifting Yoke. Evaluates potential impacts of materials changes of various MTC and yoke steel components (including the MTC doors, door bolt, and alignment plate), in response to lack of CMTRs for several such components. | 0 |
| 99-0219 | EDC-SC-95-055-23 Rev 0<br>EA-SC-95-055-14 R/0 | Reduction (by 1/8") of Structural Lid Thickness to Allow Proper Fit up on the Shield Lid. | 0 |
| 99-0229 | AP5.26 Rev7 | Independent Spent Fuel Storage Installation Training and Certification Program. | 0 |
| 99-0287-2 | 99003-LPT Rev 0<br>[need 0287.1 also need WO] | Load Test Procedure - Material was removed from MTC lifting yoke in order to provide samples for Charpy V-Notch testing. | 0 |
| 99-0290-2 | ND-PT -02 Rev 11 and NDT-UT-02 Rev 8<br>{0290-1 50.59] | Liquid Penetrant Examination- Non-Standard Temperature/Ultrasonic Thickness Measurement. | 0 |
| 99-0358 | FHS-M-33 Rev 8 | Equipment Preparation for Dry Fuel Loading Operations. | 0 |
| 99-0359 | FHS-M-35 Rev 2 | Layup of Dry Fuel Storage Components. | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 99-0360 | FHS-M-34 Rev 7 | Unloading the multi-assembly sealed basket. | 0 |
| 99-0365 | EDC-SC-95-055-25 Rev 0<br>EDC-SC-95-055-27 Rev 0<br>EA-SC-95-055-04<br>[shield lid] | Evaluation of Design Changes to Ventilated Storage Cask (VSC) - Phase III. | 0 |
| 99-0382 | FHS-M-32 Rev 18 | Loading and Placing the VSC into Storage. | 0 |
| 99-0395 | EA-SC-95-055-01 R/1<br>EDC-SC-95-055-24<br>EDC-SC-95-055-27 | Evaluation of Design Changes to Ventilated Storage Cask (VSC) Phase III. Evaluates MSB #18 fuel sleeves whose widths are slightly (0.075") under tolerance. Evaluates MSB #19 fuel sleeve support plates that are slightly (0.015") too long. Evaluates an MSB top coating thickness that is outside of tolerance, and some coating damage that was subsequently repaired. | 0 |
| 99-0401 | WI-DFS-N-10 Rev 0 | Preparation of MSB Shell, Lids and Valve Cover Plates for Welding-converts PREP-LID, Rev 1 to a Work Order. | 0 |
| 99-0450 | EDC-SC-95-055-30 Rev 0 | VSC Cask Location. | 0 |
| 99-0469-2 | T-338 Rev 2 | Thermal Performance Monitoring of the Ventilated Storage Casks. | 0 |
| 99-0475 | SM-LID Rev 4 | Shielded Metal Arc Welding. | 0 |
| 99-0480 | FC-LID Rev 9 | Automatic Flux Core Welding. | 0 |
| 99-0487 | FHSO-17A & B<br>[not found] | Multi-Assembly Basket Loading Procedure & Unloading Procedure. | 0 |
| 99-0492 | FHS-M-32 Rev 18 | Loading and Placing the VSC into Storage. | 0 |
| 99-0511 | WI-DFS-N-10 Rev 1 | Preparation of MSB Shell, Lids and Valve Cover Plates for Welding. | 0 |
| 99-0550 | WI-DFS-N-05 Rev 3 | Coating/Coating Touch up of Dry Fuel Storage Components. | 0 |
| 99-0712 | FHS-M-32 Rev 22 | Loading and Placing the VSC into storage. | 0 |
| 99-0728 | FHS-M-32 Rev 23 | Loading and Placing the VSC into storage. | 0 |
| 99-0730 | FHS-M-32 Rev 24 | Loading and Placing the VSC into storage. | 0 |
| 99-0731 | FHS-M-32 Rev 24 | Loading and Placing the VSC into storage. | 0 |
| 99-0849 | EDC-SC-95-055-38 Rev 0 | Draindown equipment changes associated with ventilated storage cask system (VSC-24) drawings. Evaluates the use of an alternate MSB drain down assembly (equipment). No effect on licensed design, or any SSCs. | 0 |
| 99-0860 | FHS-M-34 Rev 8 | Unloading the multi-assembly sealed basket. | 0 |
| 99-0864 | FHS-M-32 Rev 26 | Loading and Placing the VSC into storage. | 0 |
| 99-0899 | FHS-M-32 Rev 27 | Loading and Placing the VSC into storage. | 0 |
| 99-0911 | FHS-M-32 Rev 28 | Loading and Placing the VSC into storage. | 0 |
| 99-0939 | FHS-M-32 Rev 29 | Loading and Placing the VSC into storage. | 0 |
| 99-0960-1 | FHS-M-32 Rev 30 | Loading and Placing the VSC into storage. | 0 |
| 99-1014 | FHS-M-32 Rev 31 | Loading and Placing the VSC into storage. | 0 |
| 99-1034 | FHS-M-32 Rev 32 | Loading and Placing the VSC into storage. | 0 |
| 99-1087 | FHS-M-35 Rev 3 | Layup of Dry Fuel Storage Components into storage with or without the HHT. | 0 |
| 99-1103 | FHS-M-34 Rev 9 | Unloading the multi-assembly sealed basket. | 0 |
| 99-1104 | FHS-M-32 Rev 33 | Loading and Placing the VSC into storage | 0 |

## Table A-3 - Palisades 72.48 Screenings/Evaluations (19 Pages)

| 72.48 Number | Document ID | Description | FSAR Revision |
|---|---|---|---|
| 99-1275 | FSAR Change Request #1875 | Editorial comments and changes to section 9.11.5, Section 14.11.2.2.1, Section 14.11.2.3.1. | 0 |
| 99-1375 | DBD-207 Rev 0 | Spent fuel cooling system, change evolves, changing the referenced spent fuel pool minimum boron concentration for loading VSC-24 casks. | 0 |

## Table A-4 - Point Beach 72.48 Evaluations (4 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| 94-041-05 | VSC System for the Independent Spent Fuel Storage Installation at PBNP. Increases volume of water drained from MSB before welding from 30 gal to 40 gal. Allows MSB-specific, calculated water drain time limit to be used instead of the 47 hour limit. Establishes that CarboZinc11 can be used to coat the MSB interior for subsequent MSBs (after MSBs #1 and #2). Increases required spent fuel pool soluble boron concentration from 2850 ppm to 3010 ppm. Adds procedures to avoid inadvertent lifting of cask system components. | 0 |
| 95-064 | Dry Storage Vacuum Drying System and Cask Reflood System. Modifications and details of mechanical portion of the vacuum drying and cask reflooding system. (Only involved non-Q components of these non-SSC auxiliary systems). | 0 |
| 95-074-01 | RP-7 Part 5, remove the multi- assembly sealed basket (MSB) and the MSB transfer cask (MTC) from the SFP. Evaluates change in MSB shield lid weight and effects on procedures, as well as change in pre-welding MSB drain water volume from 75 to 30 gallons. | 0 |
| 95-079-01 | Change MSB Sleeve Material Thickness: Sleeve material thickness reduced from 0.20 to 0.1875 inches. Change MSB support bar dimensions to 1.45" x 28.0" x 2" stock. Other editorial changes and clarifications to fabrication drawings. | 0 |
| 95-080 | Change MSB Bottom Plate Orientation and Weld Location: The bottom plate orientation was changed such that the MSB bottom plate is welded inside the shell, rather than to the bottom of the shell as originally designed. | 0 |
| 95-081 | "MTC Lifting Yoke Changes" Evaluation of removal of some MTC heat transfer angles. Removal of heat transfer angles was necessary to allow pouring of RX-277 into MTC shielding locations. Change keeper plate material from A36 to A514 to avoid dissimilar metal weld. | 0 |
| 95-082 | VCC Diameter Change: This change was implemented to ensure that the VCC concrete walls were at least 29 inches thick. This could allow a 0.25" increase in the nominal diameter of the VCC. Other fabrication drawing clarifications. | 0 |
| 95-083 | Lead Brick Stack-up Height: Evaluation of a fabrication deviation in which the lead shielding the MTC was as much as 0.25" lower than shown on the fabrication drawing. | 0 |
| 95-084 | MTC Lifting Trunnions Changed to Solid Material: Evaluation of design change for the MTC lifting trunnions. The trunnions were changed from steel pipe filled with lead and RX-277 to solid steel. Welds attaching trunnion to inner and outer shells are improved from partial penetration welds to full penetration welds with backing rings. The diameter of the trunnion cover plate is slightly changed. | 0 |
| 95-085 | Elimination of the Swagelock Quick Disconnect from the MSB Drain line: This change allows faster draining, vacuum drying. and backfilling of the MSB. A pipe plug is used in place of the fitting. | 0 |
| 95-086 | Change MSB Structural Lid Lifting Bolt Radius from 27.0" to 26.5": This change prevents possible interference between the structural lid to MSB shell weld and the lifting lug landing area. | 0 |
| 95-087 | Replace the (axial) top 5 inches of lead (Pb) in the MTC cask wall assembly with 4 (axial) inches of RX-277 (leaving a 1 inch axial space between the RX-277 and the MTC top ring). This was done to reduce the weight of the MTC. | 0 |
| 95-088 | Allows the MSB shield lid bottom plate to be constructed from one five inch thick plate as opposed to two 2.5" thick plates. This improves handling of the shield lid. | 0 |
| 95-089 | Elimination of the MTC middle shell and use of molded lead bricks vs. a poured lead shield between the inner and middle shells. This was done to simplify fabrication. | 0 |
| 95-090 | Safety Evaluation for PCC Nonconformance Reports for the MSB Unit #1. Evaluates fuel sleeve corner cracking that was repaired. Evaluates an out-of-tolerance fuel sleeve / support wall gap. Evaluates an MSB shell diameter that is above tolerance in local spots. | 0 |
| 95-092 | Procedures for sampling and discharging MSB gaseous contents prior to unloading. | 0 |
| 95-093 | Change MSB bottom plate to MSB shell weld from a single-bevel groove to a double-V groove. | 0 |

## Table A-4 - Point Beach 72.48 Evaluations (4 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| 95-094 | MSB Shield Lid Design Changes. Increase MSB lid vent line diameter from ½" to 1.0". Permit use of ball valve vs. Swagelok fitting. Use two 2.5-inch plates (vs. one 5.0-inch plate) for MSB shield lid bottom plate. Increase MSB structural lid port hole dimension from 4.5" to 8" and change valve cover dimensions accordingly. Add seal weld between the two 2.5-inch MSB bottom plates at vent port opening. Recess threaded hole for drain pipe in MSB shield lid bottom plate. Enlarge valve opening diameter in shield lid from 4.0" to 4.25". | 0 |
| 95-096 | Change cask wall to rail assembly weld. This change eases fabrication. Allows ½" groove weld in (hard to access) locations where 5/8" fillet weld cannot be achieved. | 0 |
| 95-106 | Field Procedures for Hot Tapping into a Storage Cask Possibly Containing Radioactive Gas. (no SSCs affected) | 0 |
| 95-110 | PBNP Dry Storage Transporter. (not an SSC) | 0 |
| 95-114 | MTC Lifting yoke dimension changes: ECRs 95-0052 and 95-0240. Reduced pin diameter and other dimensional changes. (Yoke is not in-scope SSC). | 0 |
| 95-118 | Increase MSB Design Pressure from 34.6 psig to 41.6 psig. | 0 |
| 95-119 | Evaluation for moving MTC containing loaded WMSB-01 from Decon Area. Allows movement of MTC despite lack of 300% load testing of rail-to-shell welds. | 0 |
| 96-029 | Precision Components Corp. NR-951 04-019. Evaluates MSB shell ODs that are above tolerance in two local areas. | 0 |
| 96-030 | Precision Components Corp. NR-951 04-026. Evaluates out-of-tolerance MSB basket ring OD, basket-to-shell radial gap, and basket perpendicularity. | 0 |
| 96-031 | MSB Storage Sleeve Support Bar. Evaluates reduction in fuel sleeve support bar thickness from 1.45" to 1.35". | 0 |
| 96-032 | PCC NR-951 04.024, -027, -028, -035. Evaluates removal of some steel from shield lid bottom so that structural lid top is flush with shell, removal of shield lid side material to ensure minimum lid/shell gap thickness, and the use of thicker shims in places where lid/shell gap is above tolerance range. | 0 |
| 96-033 | Repair of MSB Sleeve Cracks. Adds requirement that fuel sleeve corners be visually inspected for cracking, and allows weld repair on such cracks. | 0 |
| 96-034 | PCC NR-951 04-036. Evaluates a shield lid support ring width that is above the tolerance range in some locations, and an MSB shell OD that is above the tolerance range in some locations. | 0 |
| 96-035 | PCC NR-951 04-029. Evaluates an MSB shield lid side ring whose thickness is below the tolerance range. | 0 |
| 96-036 | PCC NR-951 04-037. Add requirement to weigh the MSB shield lid prior to placing the MSB/MTC back into the spent fuel pool, under the MSB unloading process. Also adds details to PAB crane procedures. | 0 |
| 96-043-01 | Modification of Time Limit for Draining the MSB: VSC-24 Certificate of Compliance (C of C), Condition for System Use (CSU) 1.2.10. Allows MSB-specific calculation of minimum drain down time. | 0 |
| 96-044 | Change to RP-7, Part 6. Change to RP-8 Major, Part 4. Adjusts length of slings used in MSB unloading process. | 0 |
| 96-045 | Temporary change to RP-8, Part 4, "Placing the MSB Transfer Cask (MTC) into the Spent Fuel Pool (SFP)". | 0 |
| 96-046 | Temporary change to RP-8, Part 4, "Placing the MSB Transfer Cask (MTC) into the Spent Fuel Pool (SFP)". | 0 |

# Table A-4 - Point Beach 72.48 Evaluations (4 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| 96-115-01 | Change to RP-8, "Major, Unloading the Multi-Assembly Sealed Basket (MSB)." Temporary change to RP-8, Part 4, "Placing the MSB Transfer Cask (MTC) into the Spent Fuel Pool (SFP)". Increases time to remove zinc from pool after cask loading from 50.7 to 73.9 days. Updates MSB unloading procedure to reflect various changes, such as increase the in soluble pool boron level from 2850 ppm to 3010 ppm, new procedures related to hydrogen ignition, and a pool water depth requirement of <63 feet. | 0 |
| 97-043-01 | WMSB-02 Shell and Shield Lid Arc Strike Removal: Evaluates impacts of MSB shell and shield lid base metal removal required to repair the effects of a welding arc strike. | 0 |
| 97-061 | Re-design of Dry Storage Cask (i.e., MSB) Reflood System. Describes various changes to the Cask Reflood System (and out-of-scope, auxiliary system only used in the MSB unloading process). | 0 |
| 97-062 | RP-7 (Major), Dry Cask Loading and Storage, Revision 4. Describes changes to cask loading procedure in response to hydrogen ignition event. Updates component weights and required soluble boron concentrations. Evaluates coating chemical effects and other sources of hydrogen. Specifies chemicals that may be allowed for VSC system loading process (e.g., lubricants, adhesives, decontamination fluids). | 0 |
| 97-100 | RP-8 (Major), Unloading Multi-Assembly Sealed Basket I(MSB), rev. 4. Describes changes to cask <u>un</u>loading procedure in response to hydrogen ignition event. (Similar to 97-062, except for cask unloading procedure.) | 0 |
| 97-106 | RP-7 Part 6 (Minor)(IPTE), "Preparing a Multi-Assembly Sealed Basket (MSB) For Storage in a Ventilated Concrete Cask (VCC)". Describes changes to cask loading procedure in response to hydrogen ignition event (issues similar to those discussed in 97-062). | 0 |
| 97-107 | RP-7, Part 3 (Minor)(IPTE), "Placing the MSB Transfer Cask (MTC) Into the Spent Fuel Pool", Revision 6. Describes changes to cask loading procedure in response to hydrogen ignition event (issues similar to those discussed in 97-062). | 0 |
| 97-108 | RP-7, Part 4, rev. 4; "LOADING SPENT FUEL INTO THE MULTI-ASSEMBLY SEALED BASKET (MSB)". Describes changes to cask loading procedure in response to hydrogen ignition event (issues similar to those discussed in 97-062). Requires that only non-IFBA W 14x14 fuel can be loaded in MSBs that used CarboZinc11, and requires that initial spent fuel pool temperatures be less than 95 °F. | 0 |
| 97-109 | RP-7, Part 5, rev 6; "REMOVE THE MULTI-ASSEMBLY SEALED BASKET (MSB) AND MSB TRANSFER CASK (MTC) FROM THE SFP". Revises required boron soluble concentration to 3010 ppm and creates procedures for ensuring that the boron concentration is maintained. | 0 |
| 97-110 | AOP-8H (MAJOR), "Hydrogen Ignition in MSB," Revision 1. Additional details for cask loading procedure that address the issue of potential hydrogen ignition. | 0 |
| 97-130 | NDE Aspects of Work Plans for WO 9707051, WMSB-02 Preparation, Etching & Beveling, and W0970752 WMSB-04 Preparation, Etching, & Beveling. Describes procedures for etching the MSB interior, performing magnetic particle examinations, and performing dye penetrant examinations, in response to generic MSB weld issues that had been discovered. | 0 |
| 97-131 | ECR 97-0088 (change to ISFSI MSB structural lid to shell weld preparation). Specifies a 15-deg. bevel for the MSB structural lid top edge weld prep. The licensing drawings simply refer to a ¾" bevel groove weld, with no specified prep angle. | 0 |
| 97-143 | WMSB-02 Shell and Shield Lid Arc Strike Removal. (similar to 97-043-01). | 0 |
| 97-148 | RP-8 Part 3, (Minor), IPTE, PREPARING A MULTI-ASSEMBLY SEALED BASKET (MSB) FOR PLACEMENT INTO THE SPENT FUEL POOL (SFP), Revision 2. Rewrite of MSB unloading procedure that includes various updates based on changes evaluated in other 72.48s. | 0 |

## Table A-4 - Point Beach 72.48 Evaluations (4 Pages)

| 72.48 Evaluation Number | Description | FSAR Revision |
|---|---|---|
| 97-150 | Revision 2 to Weld Checklist PBF-9063a "Weld Checklist MSB Shield Lid", Revision 2 to PBF-9063b "Weld Checklist MSB Structural Lid Groove and Lid to Lid Seal Weld", Revision 1 to PBF-9063c "Weld Checklist MSB Valve Cover Plates". Changes to welding procedures in response to generic MSB closure weld issues. Requires 200 °F pre-heat that extends to one hour after completion of welding, a 2 hour interval between welding and the start of inspections, the use of tack welds and a balanced weld sequence to reduce torque stresses, and the use of low-hydrogen consumables. | 0 |
| 97-153 | Installation of hydrogen monitoring systems for MSB monitoring. Modification 92-120*F. Requires monitoring of hydrogen inside the MSB for the loading and unloading processes, in response to the hydrogen ignition event. Provides details of monitoring system design. | 0 |
| 99-016 | Thinner Weld Thickness on the MSB Outer Valve Cover Plates on WVSC-24-04: Evaluates undersized welds on the MSB outer valve cover plates. | 0 |
| 99-017 | Gasket FME in WVSC-24-04 – SE to Restore Full Qualification for Operable but Degraded Condition: Evaluates the impact of having a rubber gasket present in MSB #4 during storage. Response to loss of gasket during loading process. | 0 |
| 2000-0060 | WVSC-24-09 Lid Separation Issue – CR 00-1201 and Associated Operability Determination: Evaluates performance/acceptability of the ¼" weld between the MSB structural and shield lids, with respect to a vertical drop scenario. | 0 |
| 2001-0187 | Build WVSC-24-13 through WVSC-24-16: Various editorial and administrative changes/updates to fabrication specifications and drawings, for use in VSC systems #13 - #16. | 3 |

## Table A-5 - Point Beach 72.48 Screenings (4 Pages)

| 72.48 Screening Number | Description | FSAR Revision |
|---|---|---|
| S1 | Modify MTC Lifting Yoke and Trunnions to facilitate in service inspection and improve safety of components. | 0 |
| S2 | Revise standard tolerance called out on VCC drawings to accommodate fabrication inspections with a fractional measuring tape. | 0 |
| S3 | Revise VCC drawings to improve clarity and presentation. Include references to VCC specification and ACI standards. | 0 |
| S4 | Make MTC Alignment Angles removable to maximize clearance in SFP and Decon Area. | 0 |
| S5 | Modify MTC Door Rails and remove Door Top Cover to eliminate interference with SFP racks in cask loading area. | 0 |
| S6 | Revise MTC specification to correct nameplate information and reference to Wisconsin Electric Power Company. | 0 |
| S7 | Revise VCC baseplate drawing to clarify weld detail. Add a weld to base plate vent channel to avoid cracking during shipment. | 0 |
| S8 | Revise VCC drawings to clarify hoop bar design. | 0 |
| S9 | Revise VCC Specification to correct reference to ANSI standard for handling, packaging, shipping and storage. | 0 |
| S10 | Revise VCC drawings to clarify painting and tile placement details. | 0 |
| S11 | Increase MSB Structural Lid Lifting Bolt thread length from 1.5" to 2.45" to allow use of a longer stud on the hoist rings. | 0 |
| S12 | Modify MTC Door Rail pins to improve operation. Add eye bolt to Extensions to allow use of a crane for lifting. | 0 |
| S13 | Revise VCC fab drawings to clarify rebar placement details. | 0 |
| S14 | Revise MSB fab drawings to improve clarity and presentation. Modify storage sleeve assembly to avoid interference (corner radius from 0.25" to 0.75"). | 0 |
| S15 | Modify orientation of VCC Lifting Lugs relative to air inlet channels to ease installation of leveling jacks. Revise the drawings to clarify rebar placement details. | 0 |
| S16 | Revise VCC Specification to clarify QA scoping for individual items. | 0 |
| S17 | Revise MTC Specification to clarify load test requirements. | 0 |
| S18 | Revise VCC drawing to make rebar tolerances consistent with AWS standards (±1/8" for rebar to lifting lug attachment). | 0 |
| S19 | Revise MSB drawing to clarify MSB internal dimension. Modify Storage Sleeve with the addition of a chamfer to facilitate fabrication. | 0 |
| S20 | Substitute heavier reinforcing bars for VCC to facilitate fabrication. | 0 |
| S21 | Allow VCC vertical reinforcing bars to be spliced per ACI specifications | 0 |
| S22 | Revise MTC Materials Specification to allow the use of standard materials for bolting the rail assembly. | 0 |
| S23 | Revise MTC Trunnion weld detail to facilitate fabrication. | 0 |
| S24 | Modify MTC Lifting Yoke Pin to allow attachment of a handle to end of pin. Modification will facilitate handling and improve personnel safety. | 0 |
| S25 | Modify MTC Door alignment pin holes to ensure pins engage properly in the closed position. | 0 |
| S26 | Revise MTC drawing to clarify placement of heat transfer angles and lead shielding. Revise drawing to allow substitution of equivalent lubricants for door rails. | 0 |
| S27 | Modify MTC Lifting Yoke nameplate to incorporate as-built weights. | 0 |
| S28 | Revise MSB drawings to clarify vent line weld detail, shorten drain line guide angle and clarify storage sleeve fabrication/welding. | 0 |

## Table A-5 - Point Beach 72.48 Screenings (4 Pages)

| 72.48 Screening Number | Description | FSAR Revision |
|---|---|---|
| S29 | Revise VCC drawings to make alignment plate levelness criteria consistent with the levelness criteria for the liner flange. | 0 |
| S30 | Specification of MTC Trunnion Yield Strength (37 ksi) for alternate, ASTM A350 Grade LF2 material (i.e., same as that specified for original material). | 0 |
| S31 | Reduce MSB weld shim height to facilitate installation and removal. | 0 |
| S32 | Revise VCC drawings to allow use of standard material for VCC lid bolts to facilitate fabrication. (commercial zinc-plated bolts) | 0 |
| S33 | Reinforcement of VCC Air Inlet Screens. (welds added) | 0 |
| S34 | Modify wording in MSB Fabrication spec for material testing and list of items not important to safety. | 0 |
| S35 | Changes to MSB by Sierra Nuclear Corp. after SAR approval. (coating requirements, tightened fab tolerances, more detailed procedures). | 0 |
| S36 | Changes to MTC by Sierra Nuclear Corp after SAR approval. (coating requirements, tightened fab tolerances, more detailed procedures). | 0 |
| S37 | Changes to VCC by Sierra Nuclear Corp after SAR approval. (coating requirements, tightened fab tolerances, more detailed procedures). | 0 |
| S38 | Screening for PCC Nonconformance Reports for MSB Unit 1. Misplaced hole in basket assembly, slightly oversized drain pipe hole, shield lid side wall out of perpendicular. | 0 |
| S39 | HI-Tech Nonconformance Report (No. 1077) VCC Liner. Change in weld prep angle for VCC #1 and VCC # 2 liners' circumferential joint. | 0 |
| S40 | HI-Tech Nonconformance Report (No. 1080) MTC. Evaluates procedural violation for MTC shell weld and subsequent rework. | 0 |
| S41 | HI-Tech Nonconformance Report (No. 1081) VCC Liner. Documents gouge in VCC #8 liner and subsequent repair. | 0 |
| S42 | HI-Tech Nonconformance Report (No. 1082) Lifting Yoke. Documents surface finish discrepancy on yoke hook inside surfaces, and subsequent repair. | 0 |
| S43 | HI-Tech Nonconformance Report (No. 1084) MTC. Documents NDE discovery of deficiencies in multiple MTC welds, and their subsequent repair. | 0 |
| S44 | HI-Tech Nonconformance Report (No. 1085) MTC. Evaluates two .06" x .03" scratches on MTC rail extension inside surfaces that were polished flat (and used as is). | 0 |
| S45 | The Edward Gray Company (TEGC) NCR NO. 1. Evaluates used as is rebar that is slightly out of tolerance. | 0 |
| S46 | The Edward Gray Company (TEGC) NCR NO. 2. Evaluates used as is rebar that is slightly out of tolerance. | 0 |
| S47 | The Edward Gray Company (TEGC) NCR NO. 3 & 4. Evaluates adjustment of liner base leveling bolts for VCCs 1 & 2. | 0 |
| S48 | The Edward Gray Company (TEGC) NCR No. 5. Evaluates used as is rebar that is slightly out of tolerance. | 0 |
| S49 | The Edward Gray Company (TEGC) NCR No. 6. Evaluates used as is rebar that is slightly out of tolerance. | 0 |
| S50 | The Edward Gray Company (TEGC) NCR No. 7. Evaluates used as is rebar for VCC basemat that is slightly out of tolerance. | 0 |
| S51 | The Edward Gray Company (TEGC) NCR No. 8. Evaluates used as is rebar for VCC basemat that is slightly out of tolerance. | 0 |
| S52 | The Edward Gray Company (TEGC) NCR No. 9. Evaluates used as is rebar that is slightly out of tolerance, and repair of cut off lower hooks by attaching a steel bar. | 0 |
| S53 | The Edward Gray Company (TEGC) NCR No. 11. Evaluates used as is rebar that is slightly out of tolerance/spec. | 0 |

## Table A-5 - Point Beach 72.48 Screenings (4 Pages)

| 72.48 Screening Number | Description | FSAR Revision |
|---|---|---|
| S54 | The Edward Gray Company (TEGC) NCR No. 14. Evaluates used as is rebar that is slightly out of tolerance. | 0 |
| S55 | PR7, Part 7 "Loading the Multi-Assembly Sealed Basket (MSB) into a Ventilated Concrete Cask (VCC), Rev. 1. (Add procedure details.) | 0 |
| S56 | Temporary change to RP-7, "Dry Cask Loading and Storage". Procedure clarification. | 0 |
| S57 | Changes to RP-7 Resulting from Dry Run Experience. Adds loading procedure details. Increase required boron concentration to 2860 ppm. Reduces required SFP water level from 64.0 ft. to 63.5 ft. | 0 |
| S58 | RP-8, Rev. 1, Unloading the Multi-Assembly Sealed Basket. Provides clarifications for unloading procedure and slightly reduces SFP water level. | 0 |
| S59 | RP-7 Part 7 "Loading the MSB into a VSC", Rev. 2 Draft. Procedure clarifications. | 0 |
| S60 | PR7, Part 7 "Loading the Multi-Assembly Sealed Basket (MSB) into a Ventilated Concrete Cask (VCC). Procedure clarifications (e.g., use of temporary shielding). | 0 |
| S61 | Move 8" hole in structural lid from R=23.9" to R=23.7". | 0 |
| S62 | MSB Nameplate was incorrectly engraved. | 0 |
| S63 | MSB Socket Set plug material change to from SA 516 Gr. 70 to ASTM A-182-93B CL 2. | 0 |
| S64 | MTC Trunnion Material Test Results. Demonstrates compliance with 37 ksi strength requirements. | 0 |
| S65 | MSB Bottom plate flatness: Out of tolerance. | 0 |
| S66 | Inspection Hold Point was bypassed for painting. | 0 |
| S67 | MSB Storage Sleeves: 1. Weld Spatter 2. Corner of sleeve melted away (at top end) | 0 |
| S68 | MSB #3 Structural Lid Backing Ring Tabs. Use of smaller tabs. No effect on final configuration. | 0 |
| S69 | Add VCC lifting lug load testing to Spec. PB-600. | 0 |
| S70 | Minor tool marks on bottom of shield lids. Evaluated for use as is. | 0 |
| S71 | Discontinuities (over 1/32" criterion) discovered during UT inspection of Bottom Plate and Shell wall. All discontinuities repaired. | 0 |
| S72 | W09604767 and W0964768 - MTC Trunnion and Lifting Yoke Examination. (Documents examination – no unacceptable results) | 0 |
| S73 | Revise VCC drawings to improve clarity and presentation. | 0 |
| S74 | Revise nameplate for MTC and Lifting Yoke to include minimum operational temperatures. | 0 |
| S75 | Revise design of VCC air inlet/outlet screen assemblies. Chance screen from 23 gauge to 20 gauge. Air inlet screen frame changed from three pieces to one piece. Screens are epoxied to frame. Add support bar to bottom of air inlet screens. | 0 |
| S76 | W09608611 Apply CS11 and Epoxy coating to exterior of MSB-02. Recoat after coating was removed to examine welds. | 0 |
| S77 | Changes to: RP-7 Major, RP-7, Part 6; RP-8 Major, RP-8, Part 4. Adds procedural steps to remove flammable gas, remove the shims, and restore the MSB lid to its proper orientation, after the hydrogen ignition event. | 0 |
| S78 | Add VCC lifting lug load testing to Spec. PB-600 (Duplicate Screening of S69). | 0 |
| S79 | Discontinuities discovered during UT inspection of Bottom Plate and Shell wall- Rev. 1. All discontinuities repaired. | 0 |
| S80 | Modify MSB Storage Sleeve Assembly to facilitate fabrication. | 0 |
| 97-690 | Site machining/grinding of MSB structural lid to provide a more consistent root spacing. | 0 |
| 97-729 | Moving the MTC to the PAB Truck Bay. Procedure details. | 0 |

## Table A-5 - Point Beach 72.48 Screenings (4 Pages)

| 72.48 Screening Number | Description | FSAR Revision |
|---|---|---|
| 97-1073 | DSP 4, MSB Drain Down/Saturation Time Limit Calc. Allows for MSB-specific calculation of maximum drain down time. | 0 |
| 97-1087 | PBTP 075, "RP 8, Part 3; RP 7! Parts 5 and 6 Dry Run", IPTE, Rev. 0. Development of one-time dry run procedure for cask loading. | 0 |
| 97-1115 | Revisions to MSB loading dry run procedure. | 0 |
| 97-1147 | Temporary Change to PBTP 075, "RP 8 Part 3, RP 7 Parts 5 & 6." IPTE, Rev. 1. Loading procedure details. | 0 |
| 97-1162 | Temporary Change to PBTP 075, "RP 8 Part 3, RP 7 Parts 5 & 6," IPTE, Rev. 1. Loading procedure details. | 0 |
| 97-1136 | Discontinuities of shell wall violation of min wall thickness. Out of tolerance MSB bottom plate and shell were repaired and restored to compliance. | 0 |
| 97-1137 | Drain line hole in shield lid - damage to 5th and 6th threads. Evaluated for use as is using helium leak test. | 0 |
| 97-1138 | PCC NR's -031, -039, -040, -041, -042, -043. Documents several MSB shell and sleeve non-conformances that were restored to conformance through repair. Evaluates a localized fuel sleeve out of tolerance dimension for use as is. Welded surfaces requiring CarboZinc11 that did not meet the 1-3 mil blast profile were evaluated for use as is using a coating adhesion test. Evaluates local MSB shell ODs above tolerance band for use as is. | 0 |
| 97-1139 | Storage sleeve wall thickness change from 3/16" back to .200". | 0 |
| 97-1140 | Change Bill of Materials on drawing for socket set plug (from A516 Gr. 70 to ASTM A-182-93B CL 2). | 0 |
| 97-1141 | Clarify welding symbols on drawing of MSB. | 0 |
| 97-1142 | Welding of sleeve material after thickness change to .200". Changes weld specification from 3/16" full penetration weld back to 3/16" fillet weld. | 0 |
| 97-1143 | Address minor cracking of the ends of the storage sleeves during the fabrication process. Applies 1/16" radius to top and bottom edges of fuel sleeve plates to prevent end cracking. | 0 |
| 97-1147 | Add procedures for positioning MSB lid. | 0 |
| 97-1152 | Adds procedures for maintaining soluble boron concentrations inside MSB. | 0 |
| 97-1162 | Revises dry run procedure to allow MSB reflooding w/ demin water, to minimize borated water residence time (to minimize any coating effects). | 0 |
| 97-1343 | MSB venting and purging procedure details | 0 |
| 98-1042 | Evaluates non-compliant (continuous vs, stitch) welds on fuel sleeve seams for use as is. | 0 |
| S100 | Procedure for placing assemblies back in pool after weld burn. | 0 |
| S101 | Re-application of CarboZinc and Keeler & Long coatings to MSB #2 exterior, after they were removed to inspect welds after the hygrogen ignition event. | 0 |

## 9. APPENDIX B - PLANT SITE DOSE SURVEY DATA (THREE ATTACHMENTS)

# ATTACHMENT 1

# PALISADES
# DOSE SURVEY DATA

## (60 pages)

Form HP 2.17-1

950/24*11*04/LP

# RADIOLOGICAL AREA STATUS SHEET

Date Surveyed 6-20-93 Time Surveyed 1315

| | | | |
|---|---|---|---|
| Area/Room Description<br>ISFSI | | Building<br>NA | Room ID<br>921 |
| Meter Type – Serial No.<br>R02 – 373 | Meter Type – Serial No.<br>Tele – 1031 | Meter Type – Serial No.<br>RM-14 – 335 | Air Sampler Type / Serial No.<br>N / A |
| Surveyed By<br>P. APKER / A. Jones | Recorded By<br>P. Apker / A. Jones | Reviewed By<br>Jm Stuedemann | Date<br>6-20-93 ✓ |
| Reason For Survey<br>HP 2.14 | | Contamination Levels<br>General <1000 dpm/100cm²<br>Highest <1000 dpm/100cm² | Air Sample N ___ % DAC<br>A ___ uCi/cc |

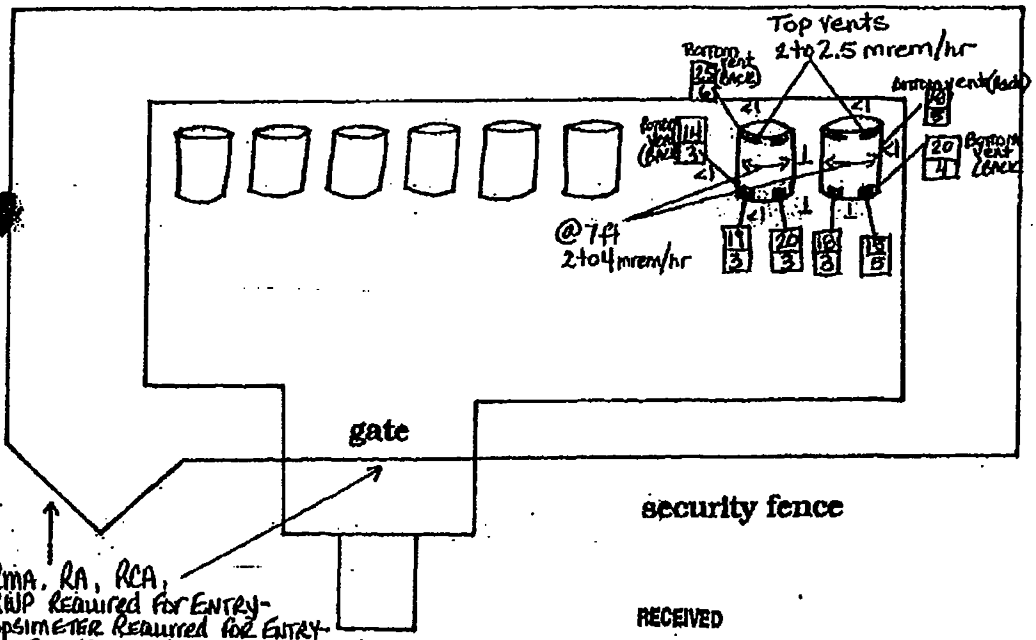
HOT SPOTS Mrem/hr

Ⓐ ___ 12" N ID ___

Ⓑ ___ 12" ___ ID A

Ⓒ ___ 12" N ID ___

Ⓓ ___ 12" ___ ID A



RMA, RA, RCA,
RWP Required for Entry-
Dosimeter Required for Entry-
No Smoking, Eating, Drinking,
or Chewing Beyond This Point

security fence

RECEIVED

NOV 29 1993

EHD - PAL

Gross Masslinn of Area - <100 ccpm/Probe Area

| SMEARS dpm/100cm² |
|---|
| ① NA |
| ② ↓ |
| ③ |
| ④ |
| ⑤ |
| ⑥ |
| ⑦ |
| ⑧ |
| ⑨ |
| ⑩ |
| ⑪ |
| ⑫ |
| ⑬ |
| ⑭ |
| ⑮ |
| ⑯ |
| ⑰ |
| ⑱ |
| ⑲ |
| ⑳ |
| ㉑ |
| ㉒ ↓ |

**POSTINGS AND BOUNDARIES / LEGEND**

RA = Radiation Area
CA = Contamin Area
AA = Airborne Area
RCD = RAD Controlled Doors
HRA = High Radiation Area
HCA = High Contamin Area
Radiation X X X X
Contamin O O O O
GM = Gross Masslinn
☒ Contact
☐ 12"

**MINIMUM PROTECTIVE CLOTHING / NOT FOR WORK OR CLIMBING**

☒ Lab Coat
☐ Paper Overalls
☐ ___ Pair Cloth
☐ Hood
☐ Nylon Shoe Covers
☒ Rubber Overshoes
☐ ___ Pair Poly Shoe Covers
☒ 1 Pair Rubber Gloves W/ Cotton Liners
☐ 2 Pair Rubber Gloves W/ Cotton Liners
☐ ___

6145 2422 6145 2422

Proc No HP-2.17
Attachment 2
Revision 12
Page 1 of 1

# RADIOLOGICAL SURVEY SHEET

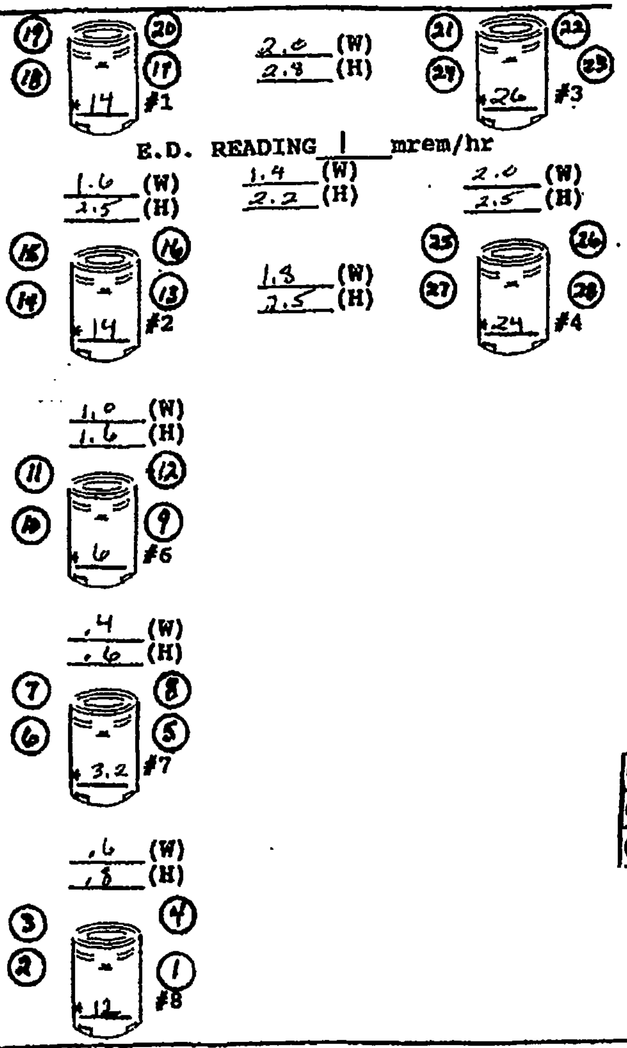
| | | | | |
|---|---|---|---|---|
| Room # 921 | RWP # 940001 | Item Description MONTHLy /DAILY SURVEY I.S.F.S.I. | | Date 11-11-94<br>Time 1815 |
| ☒ Smear<br>☐ Masslin<br>☐ Frisk | ☒ Gamma<br>☐ Beta<br>☐ Neutron | RWP Updated YES [✓ NO]<br>Status Sheet Updated YES [✓ NO] | Meter Type/Serial # RO-2 / 5200<br>Surveyed By/Recorded By S. Leblanc, A. Privett / S. Leblanc | Meter Type/Serial # Ludlum # 728<br>Meter Type/Serial # N/A<br>Reviewed By<br>Date 11/14/94 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * = Highest dose rate at air inlet (GAMMA).
(#) = Air outlet smears.

(W) = Waist
(H) = Head

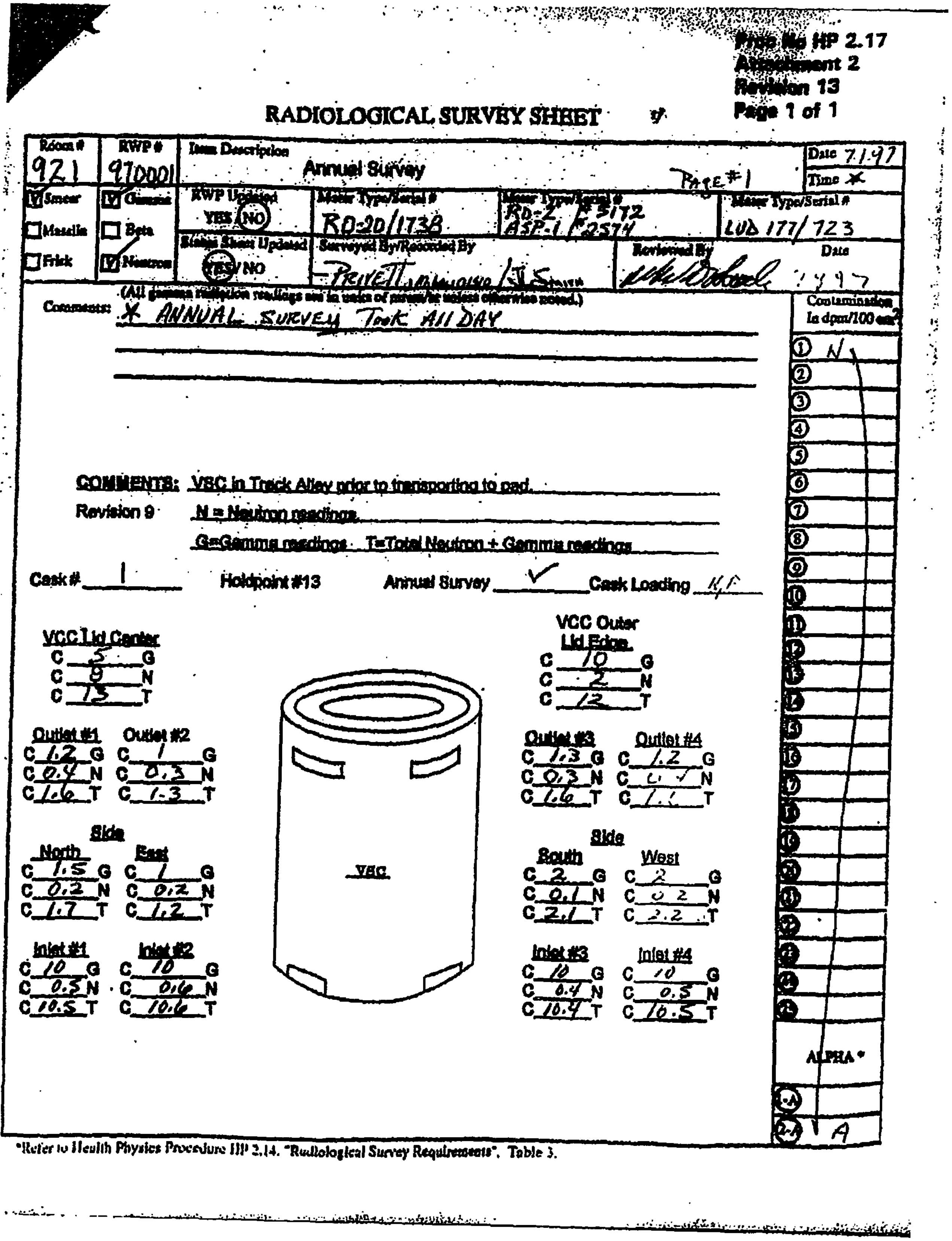
E.D. READING 1 mrem/hr



| | |
|---|---|
| ㉖ | <1K |
| ㉗ | <1K |
| ㉘ | <1K |

| Contamination In dpm/100 cm² | |
|---|---|
| ① | <1K |
| ② | <1K |
| ③ | <1K |
| ④ | <1K |
| ⑤ | <1K |
| ⑥ | <1K |
| ⑦ | <1K |
| ⑧ | <1K |
| ⑨ | <1K |
| ⑩ | <1K |
| ⑪ | <1K |
| ⑫ | <1K |
| ⑬ | <1K |
| ⑭ | <1K |
| ⑮ | <1K |
| ⑯ | <1K |
| ⑰ | <1K |
| ⑱ | <1K |
| ⑲ | <1K |
| ⑳ | <1K |
| ㉑ | <1K |
| ㉒ | <1K |
| ㉓ | <1K |
| ㉔ | <1K |
| ㉕ | <1K |
| ALPHA * | |
| (1-A) | N/ |
| (2-A) | /A |

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements". Table 3.



Proc. No HP 2.17
Attachment 2
Revision 13
Page 1 of 1

## RADIOLOGICAL SURVEY SHEET

| | | | | |
|---|---|---|---|---|
| Room # 921 | RWP # 970001 | Item Description: Annual Survey — Page #1 | | Date 7.1.97<br>Time * |
| ☑ Smear<br>☐ Maslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated: YES [✓ NO] | Meter Type/Serial #: RD-20/1738 | Meter Type/Serial #: RD-2 #5172<br>ASP-1 #2574 — Meter Type/Serial #: LUD 177/723 |
| | | Status Sheet Updated: [✓ YES] / NO | Surveyed By/Recorded By: PRIVETT, [illegible] / [illegible] SMITH | Reviewed By — Date 7 1 97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK ALL DAY

**COMMENTS:** VSC in Track Alley prior to transporting to pad.

Revision 9 — N = Neutron readings.

G=Gamma readings  T=Total Neutron + Gamma readings

Cask # 1  Holdpoint #13  Annual Survey ✓  Cask Loading N/F

VCC Lid Center
C 5 G
C 9 N
C 13 T

VCC Outer Lid Edge
C 10 G
C 2 N
C 12 T

| Outlet #1 | Outlet #2 | Outlet #3 | Outlet #4 |
|---|---|---|---|
| C 1.2 G | C 1 G | C 1.3 G | C 1.2 G |
| C 0.4 N | C 0.3 N | C 0.3 N | C 0.1 N |
| C 1.6 T | C 1.3 T | C 1.6 T | C 1.1 T |

Side

| North | East | South | West |
|---|---|---|---|
| C 1.5 G | C 1 G | C 2 G | C 2 G |
| C 0.2 N | C 0.2 N | C 0.1 N | C 0.2 N |
| C 1.7 T | C 1.2 T | C 2.1 T | C 2.2 T |

| Inlet #1 | Inlet #2 | Inlet #3 | Inlet #4 |
|---|---|---|---|
| C 10 G | C 10 G | C 10 G | C 10 G |
| C 0.5 N | C 0.6 N | C 0.4 N | C 0.5 N |
| C 10.5 T | C 10.6 T | C 10.4 T | C 10.5 T |

VSC

Contamination In dpm/100 cm²
① N
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
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⑱
⑲
⑳
㉑
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㉔
㉕

ALPHA *
1-A
2-A A

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 3.

Proc. No HP 2.17
Attachment 2
Revision 13
Page 1 of 1

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | | Date 7-1,2-97 |
|---|---|---|---|---|
| 921 | 970001 | Annual Survey | PAGE #1 * | Time All Day |

| | | | | | |
|---|---|---|---|---|---|
| ☑ Smear<br>☐ Masslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated<br>YES [✓ NO] | Meter Type/Serial #<br>RD-20/1738 | Meter Type/Serial #<br>RD-2 #5172<br>ASP-1 #2574 | Meter Type/Serial #<br>LUD 177/723 |
| | | Status Sheet Updated<br>[✓ YES] NO | Surveyed By/Recorded By<br>M. Maurino, PRIVETT / JL Smith | Reviewed By | Date<br>7-3-97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK All DAY.

COMMENTS: VSC in Track Alley prior to transporting to pad.

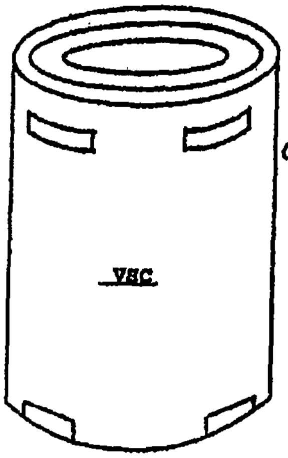
Revision 9 N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Cask # 2 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 5 G
C 9 N
C 14 T

**VCC Outer Lid Edge**
C 10 G
C 4 N
C 14 T



**Outlet #1**
C 1.4 G
C 0.2 N
C 1.6 T

**Outlet #2**
C 1.2 G
C 0.3 N
C 1.5 T

**Outlet #3**
C 0.8 G
0.2 C ~~0.8~~ N
C ~~0.8~~ T 1.0
ACP 7-2-97

**Outlet #4**
C 1.2 G
C 0.3 N
C 1.5 T

**Side**

**North**
C 1.2 G
C 0.2 N
C 1.4 T

**East**
C 1.5 G
C 0.1 N
C 1.6 T

**Side**

**South**
C 1.7 G
C 0.2 N
C 1.9 T

**West**
C 1.5 G
C 0.1 N
C 1.6 T

**Inlet #1**
C 3.0 G
C 0.4 N
C 3.4 T

**Inlet #2**
C 10.0 G
C 0.2 N
C 10.2 T

**Inlet #3**
C 2.0 G
C 0.4 N
C 2.4 T

**Inlet #4**
C 8.0 G
C 0.3 N
C 8.3 T

| Contamination In dpm/100 cm² | |
|---|---|
| ① | N |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
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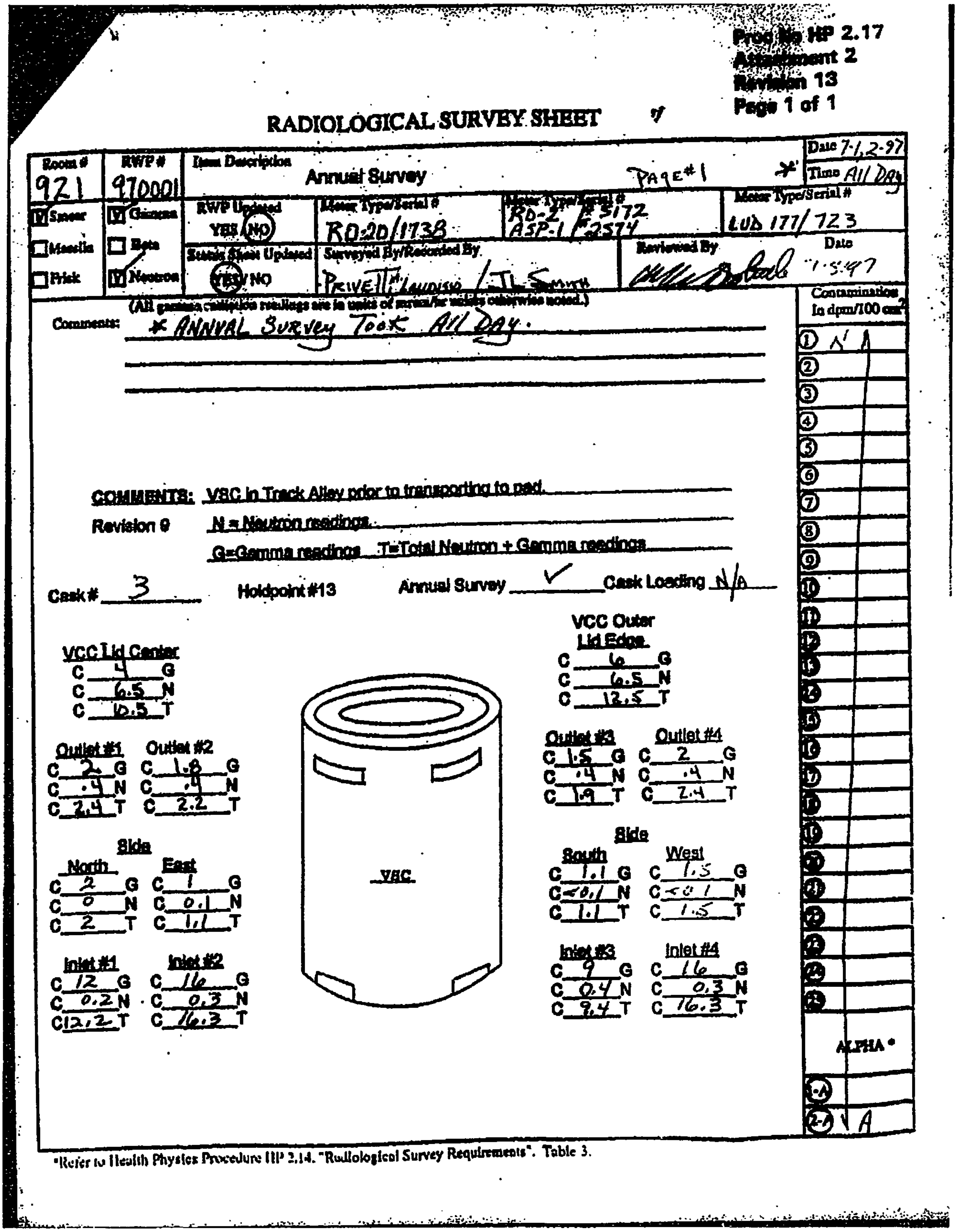
| ALPHA * | |
| 1-A | |
| 2-A | A |

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements". Table 3.



Proc No HP 2.17
Attachment 2
Revision 13
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## RADIOLOGICAL SURVEY SHEET

Room # 921
RWP # 970001
Item Description Annual Survey PAGE#1 *
Date 7-12-97
Time All Day
☒ Smear ☐ Maslin ☐ Frisk
☒ Gamma ☐ Beta ☒ Neutron
RWP Updated YES [✓ NO]
Status Sheet Updated [✓ YES] NO
Meter Type/Serial # RO-20/1738
Meter Type/Serial # RD-2 #5172 ASP-1 #2574
Meter Type/Serial # LUD 177/723
Surveyed By/Recorded By Privett/Laudisio / JL Smith
Reviewed By
Date 1-5-97

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK ALL DAY.

COMMENTS: VSC in Track Alley prior to transporting to pad.
Revision 9 N = Neutron readings.
G=Gamma readings T=Total Neutron + Gamma readings

Cask # 3 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 4 G
C 6.5 N
C 10.5 T

**VCC Outer Lid Edge**
C 6 G
C 6.5 N
C 12.5 T

**Outlet #1**
C 2 G
C .4 N
C 2.4 T

**Outlet #2**
C 1.8 G
C .4 N
C 2.2 T

**Outlet #3**
C 1.5 G
C .4 N
C 1.9 T

**Outlet #4**
C 2 G
C .4 N
C 2.4 T

**Side**

**North**
C 2 G
C 0 N
C 2 T

**East**
C 1 G
C 0.1 N
C 1.1 T

**Side**

**South**
C 1.1 G
C <0.1 N
C 1.1 T

**West**
C 1.5 G
C <0.1 N
C 1.5 T

**Inlet #1**
C 12 G
C 0.2 N
C 12.2 T

**Inlet #2**
C 16 G
C 0.3 N
C 16.3 T

**Inlet #3**
C 9 G
C 0.4 N
C 9.4 T

**Inlet #4**
C 16 G
C 0.3 N
C 16.3 T

Contamination In dpm/100 cm²
① NA
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
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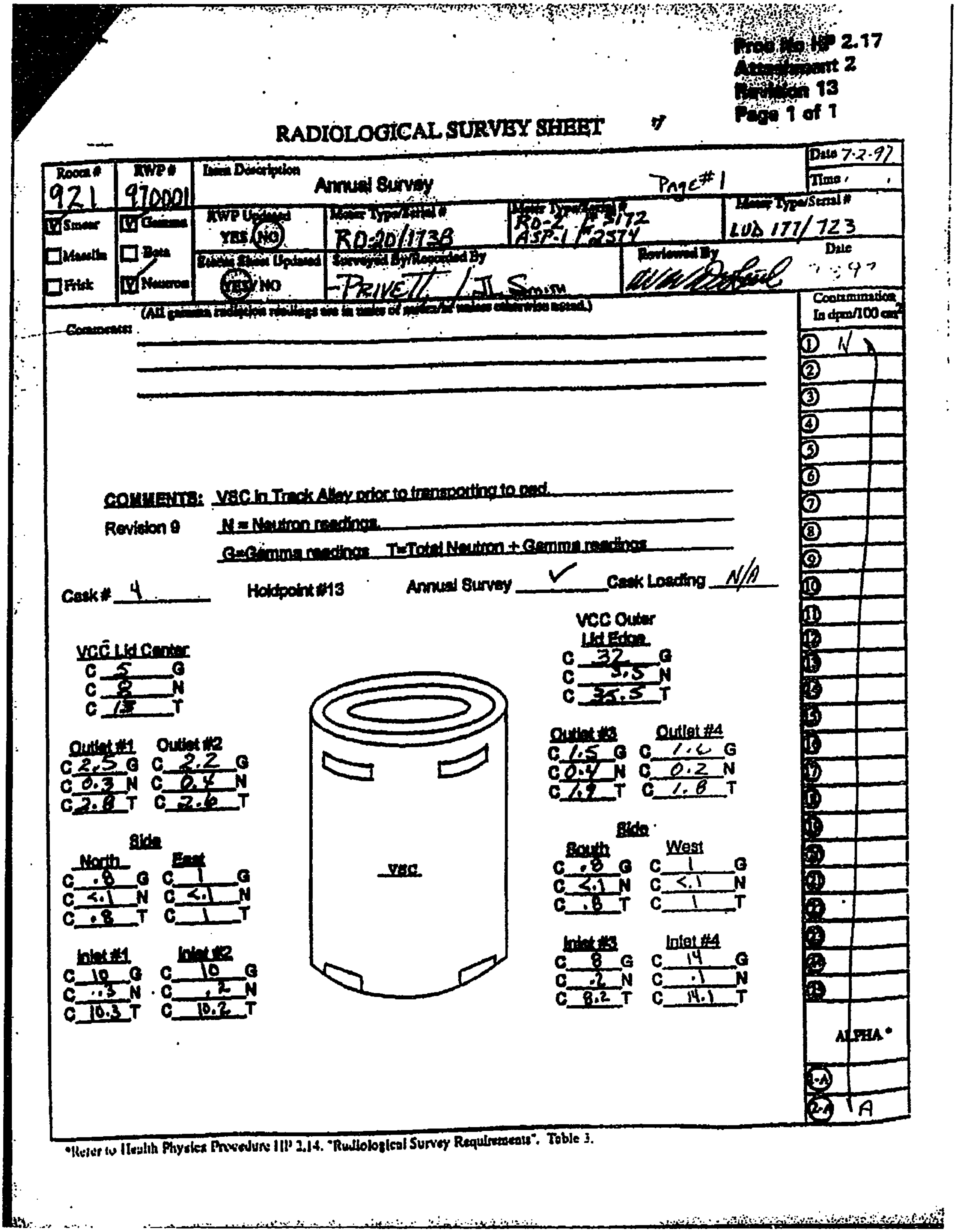
ALPHA *
1-A
2-A NA

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements". Table 3.



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Revision 13
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## RADIOLOGICAL SURVEY SHEET

| | | | | |
|---|---|---|---|---|
| Room # 921 | RWP # 970001 | Item Description Annual Survey Page#1 | | Date 7-2-97<br>Time |
| ☑ Smear<br>☐ Maslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated YES [✓ NO] | Meter Type/Serial # RO-20/1738 | Meter Type/Serial # RO-2 #3172 ASP-1 #2574 | Meter Type/Serial # LUD 177/723 |
| | | Status Sheet Updated [✓ YES] NO | Surveyed By/Recorded By Privett / J. Smith | Reviewed By | Date 7-3-97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments:

**COMMENTS:** VSC in Track Alley prior to transporting to pad.

Revision 9 N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Cask # 4 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

VCC Lid Center
C 5 G
C 8 N
C 13 T

VCC Outer Lid Edge
C 32 G
C 3.5 N
C 35.5 T

Outlet #1
C 2.5 G
C 0.3 N
C 2.8 T

Outlet #2
C 2.2 G
C 0.4 N
C 2.6 T

Outlet #3
C 1.5 G
C 0.4 N
C 1.9 T

Outlet #4
C 1.6 G
C 0.2 N
C 1.8 T

Side

North
C .8 G
C <.1 N
C .8 T

East
C 1 G
C <.1 N
C 1 T

South
C .8 G
C <.1 N
C .8 T

West
C 1 G
C <.1 N
C 1 T

VSC

Inlet #1
C 10 G
C .3 N
C 10.3 T

Inlet #2
C 10 G
C .2 N
C 10.2 T

Inlet #3
C 8 G
C .2 N
C 8.2 T

Inlet #4
C 14 G
C .1 N
C 14.1 T

Contamination In dpm/100 cm²
① N
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
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ALPHA*
1-A
2-A A

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements". Table 3.

# RADIOLOGICAL SURVEY SHEET

| | | | |
|---|---|---|---|
| Room # 921 | RWP # 97O0O1 | Item Description Annual Survey Page # 1 | Date 7-1-97<br>Time All DAY |
| ☑ Smear<br>☐ Maslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated YES [✓ NO]<br>Status Sheet Updated [✓ YES] NO | Meter Type/Serial # RO-20/1738<br>Meter Type/Serial # RO-2 # 3172 ASP-1 # 2574<br>Meter Type/Serial # LUD 177/723 |
| | | Surveyed By/Recorded By M. Laudisio Privett — JL Smith | Reviewed By / Date 7 3 97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: ✱ ANNUAL SURVEY TOOK ALL DAY

**COMMENTS:** VSC in Track Alley prior to transporting to pad.

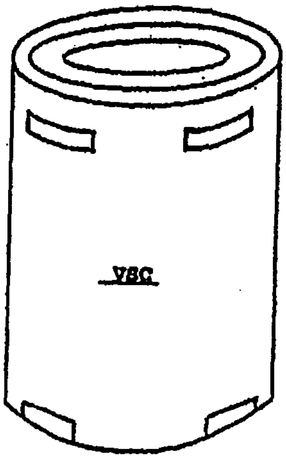
Revision 9 N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Cask # 5 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 12.0 G
C 6.0 N
C 18.0 T

**VCC Outer Lid Edge**
C 14.0 G
C 2.0 N
C 16.0 T



**Outlet #1**
C 1.5 G
C 0.2 N
C 1.7 T

**Outlet #2**
C 1.5 G
C 0.1 N
C 1.6 T

**Outlet #3**
C 0.7 G
C 0.2 N
C 0.9 T

**Outlet #4**
C .5 G
C .2 N
C .7 T

**Side**

**North**
C 0.4 G
C <0.1 N
C 0.4 T

**East**
C 1.0 G
C <0.1 N
C 1.0 T

**South**
C 1.0 G
C <0.1 N
C 1.0 T

**West**
C .7 G
C <.1 N
C .7 T

**Inlet #1**
C 7 G
C 0.2 N
C 7.2 T

**Inlet #2**
C 10.0 G
C 0.1 N
C 10.1 T

**Inlet #3**
C 7.0 G
C 0.1 N
C 7.1 T

**Inlet #4**
C 10.0 G
C 0.1 N
C 10.1 T

| Contamination In dpm/100 cm² | |
|---|---|
| ① | N |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
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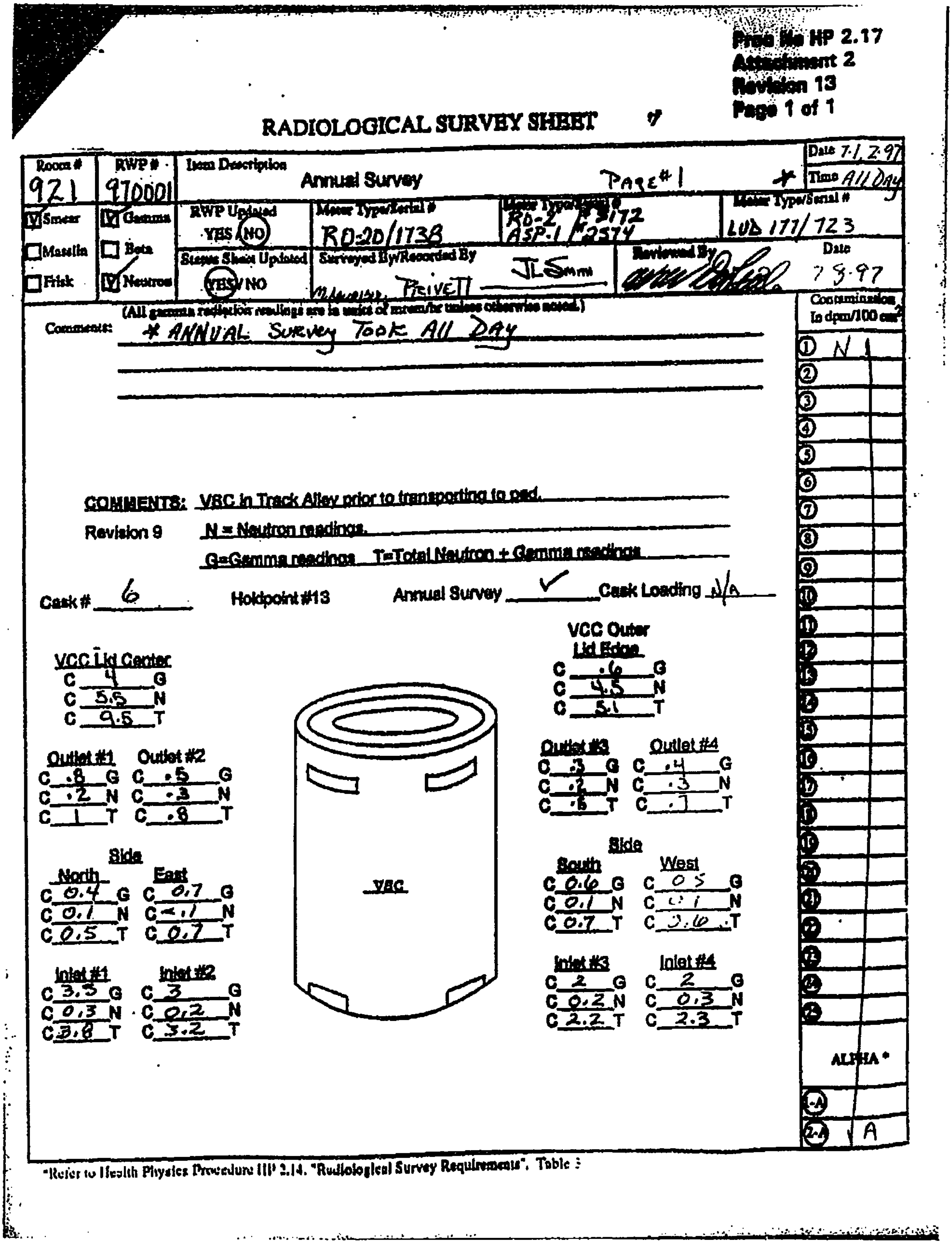
| ALPHA * | |
| 1-A | |
| 2-A | A |

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 3.



Proc file HP 2.17
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## RADIOLOGICAL SURVEY SHEET

| | | | | |
|---|---|---|---|---|
| Room # 921 | RWP # 970001 | Item Description Annual Survey PAGE # 1 * | | Date 7-1, 2-97<br>Time All Day |
| ☑ Smear<br>☐ Masslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated YES [✓ NO] | Meter Type/Serial # RO-20/1738 | Meter Type/Serial # RO-2 # 5172 ASP-1 # 2574 |
| | | | | Meter Type/Serial # LUD 177/723 |
| | | Status Sheet Updated [✓ YES] NO | Surveyed By/Recorded By M. Prevett — JL Smm | Reviewed By · Date 7-8-97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK All DAY

COMMENTS: VSC in Track Alley prior to transporting to pad.

Revision 9 N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Cask # 6 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 4 G
C 5.5 N
C 9.5 T

**VCC Outer Lid Edge**
C .6 G
C 4.5 N
C 5.1 T

**Outlet #1**
C .8 G
C .2 N
C 1 T

**Outlet #2**
C .5 G
C .3 N
C .8 T

**Outlet #3**
C .3 G
C .2 N
C .5 T

**Outlet #4**
C .4 G
C .3 N
C .7 T

VSC

**Side**

**North**
C 0.4 G
C 0.1 N
C 0.5 T

**East**
C 0.7 G
C <.1 N
C 0.7 T

**South**
C 0.6 G
C 0.1 N
C 0.7 T

**West**
C 0 5 G
C 0.1 N
C 0.6 T

**Inlet #1**
C 3.5 G
C 0.3 N
C 3.8 T

**Inlet #2**
C 3 G
C 0.2 N
C 3.2 T

**Inlet #3**
C 2 G
C 0.2 N
C 2.2 T

**Inlet #4**
C 2 G
C 0.3 N
C 2.3 T

| Contamination In dpm/100 cm² |
|---|
| ① N |
| ② |
| ③ |
| ④ |
| ⑤ |
| ⑥ |
| ⑦ |
| ⑧ |
| ⑨ |
| ⑩ |
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| ALPHA * |
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| 2-A A |

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 2

Proc No HP 2.17
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# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7-1-97 |
|---|---|---|---|
| 921 | 970001 | Annual Survey Page #1 * | Time All DAY |

☑ Smear ☐ Masslin ☐ Frisk

☑ Gamma ☐ Beta ☑ Neutron

RWP Updated: YES [✓ NO]

Meter Type/Serial #: RO-20/1738

Meter Type/Serial #: RO-2 #3172 ASP-1 #2574

Meter Type/Serial #: LUD 177/723

Status Sheet Updated: [✓ YES] / NO

Surveyed By/Recorded By:

Reviewed By: Date 7/3/97

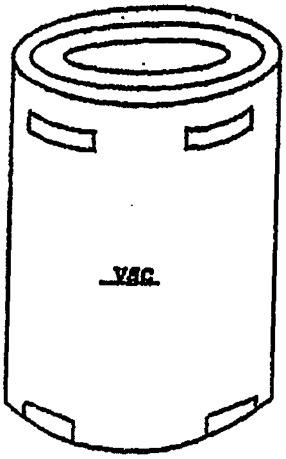
Comments: (All gamma radiation readings are in units of mrem/hr unless otherwise noted.)
* ANNUAL SURVEY TOOK ALL DAY.

COMMENTS: VSC in Track Alley prior to transporting to pad.
Revision 9 N = Neutron readings.
G=Gamma readings T=Total Neutron + Gamma readings

Cask # 7 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 5.0 G
C 5.5 N
C 10.5 T

**VCC Outer Lid Edge**
C 20 G
C 20 N
C 40 T



| | Outlet #1 | Outlet #2 | Outlet #3 | Outlet #4 |
|---|---|---|---|---|
| G | C 0.5 | C 0.3 | C 0.5 | C 0.1 |
| N | C 0.2 | C 0.2 | C 0.2 | C .2 |
| T | C 0.7 | C 0.5 | C 0.7 | C .3 |

| | Side North | Side East | Side South | Side West |
|---|---|---|---|---|
| G | C 0.4 | C 0.5 | C 0.6 | C .7 |
| N | C <0.1 | C <0.1 | C <0.1 | C <.1 |
| T | C 0.4 | C 0.5 | C 0.6 | C 0.7 |

| | Inlet #1 | Inlet #2 | Inlet #3 | Inlet #4 |
|---|---|---|---|---|
| G | C 2.0 | C 2.0 | C 2.5 | C 2.5 |
| N | C <0.1 | C 0.2 | C <0.1 | C 0.3 |
| T | C 2.0 | C 2.2 | C 2.5 | C 2.8 |

| Contamination In dpm/100 cm² | |
|---|---|
| ① | N |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
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| ALPHA * | |
| 1-A | |
| 2-A | A |

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 3.

Proc. No HP 2.17
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# RADIOLOGICAL SURVEY SHEET

| | | | | | |
|---|---|---|---|---|---|
| Room #. 921 | RWP # 970001 | Item Description Annual Survey Page #1 | | | Date 7-1-97<br>Time All DAY |
| ☑ Smear<br>☐ Maslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated YES [✓ NO]<br>Status Sheet Updated [✓ YES] / NO | Meter Type/Serial # RO-20/1738<br>Surveyed By/Recorded By Claudia Privett | Meter Type/Serial # RO-2 #5172<br>ASP-1 #2574 | Meter Type/Serial # LUD 177/723<br>Reviewed By / Date 8/97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK ALL DAY

**COMMENTS:** VSC in Track Alley prior to transporting to pad.

Revision 9 N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Cask # 9 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 4.2 G
C 5.0 N
C 9.2 T

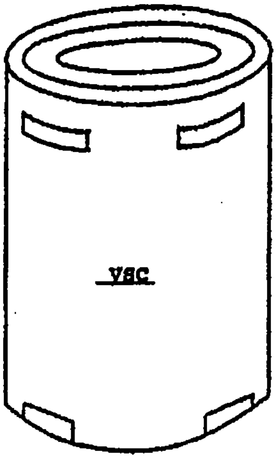
**VCC Outer Lid Edge**
C 1.0 G
C 4.5 N
C 5.5 T

**Outlet #1**
C 0.8 G
C 0.6 N
C 1.4 T

**Outlet #2**
C 0.4 G
C 0.5 N
C 0.9 T

**Outlet #3**
C 0.2 G
C 0.2 N
C 0.4 T

**Outlet #4**
C 0.2 G
C [illegible] N
C T



**Side**

**North**
C 0.6 G
C <0.1 N
C 0.6 T

**East**
C 0.4 G
C <0.1 N
C 0.4 T

**South**
C 0.3 G
C <0.1 N
C 0.3 T

**West**
C 0.2 G
C <0.1 N
C 0.2 T

**Inlet #1**
C 2.5 G
C 0.2 N
C 2.7 T

**Inlet #2**
C 2 G
C 0.1 N
C 2.1 T

**Inlet #3**
C 1.5 G
C <0.1 N
C 1.5 T

**Inlet #4**
C 1.8 G
C 0.2 N
C 2.0 T

Contamination In dpm/100 cm²
① N
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
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ALPHA *
1-A
2-A NA

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 3.

Proc. No HP 2.17
Attachment 2
Revision 13
Page 1 of 1

# RADIOLOGICAL SURVEY SHEET

Room #: 921
RWP #: 970001
Item Description: Annual Survey PAGE #1
Date: 7-1-97
Time: All DAY

☒ Smear
☐ Masslin
☐ Frisk

☒ Gamma
☐ Beta
☒ Neutron

RWP Updated: YES [✓ NO]
Meter Type/Serial #: RO-20/1738
Meter Type/Serial #: RD-2 #5172 ASP-1 #2574
Meter Type/Serial #: LUD 177/723
Status Sheet Updated: [✓ YES] NO
Surveyed By/Recorded By: Prevett
Reviewed By:
Date: 8-97

(All gamma radiation readings are in mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK ALL DAY

**COMMENTS:** VSC in Track Alley prior to transporting to pad.
Revision 9 N = Neutron readings.
G=Gamma readings T=Total Neutron + Gamma readings

Cask # 10 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 3.0 G
C 5.0 N
C 8.0 T

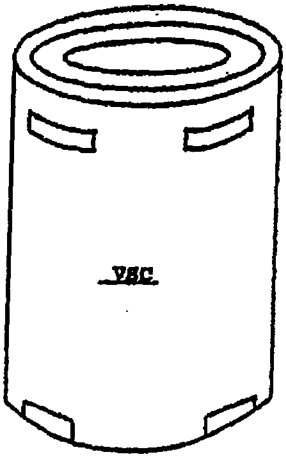
**VCC Outer Lid Edge**
C 1.0 G
C 4.0 N
C 5.0 T

**Outlet #1**
C 0.5 G
C 0.2 N
C 0.7 T

**Outlet #2**
C 0.3 G
C 0.3 N
C 0.6 T

**Outlet #3**
C 0.4 G
C 0.3 N
C 0.7 T

**Outlet #4**
C 0.2 G
C 0.3 N
C [illegible] T



**Side**

**North**
C 0.7 G
C 0.1 N
C 0.8 T

**East**
C 0.6 G
C 0.1 N
C 0.7 T

**Side**

**South**
C 0.5 G
C <0.1 N
C 0.5 T

**West**
C 0.6 G
C 0.1 N
C 0.7 T

**Inlet #1**
C 3.5 G
C 0.2 N
C 3.7 T

**Inlet #2**
C 2.7 G
C 0.1 N
C 2.8 T

**Inlet #3**
C 2.5 G
C 0.1 N
C 2.6 T

**Inlet #4**
C 2.5 G
C 0.2 N
C 2.7 T

| Contamination In dpm/100 cm² |  |
|---|---|
| ① | N A |
| ② |  |
| ③ |  |
| ④ |  |
| ⑤ |  |
| ⑥ |  |
| ⑦ |  |
| ⑧ |  |
| ⑨ |  |
| ⑩ |  |
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| ALPHA * |  |
| 1-A |  |
| 2-A | A |

*Refer to Health Physics Procedure HP 2.14, "Radiological Survey Requirements", Table 3.

Proc No HP 2.17
Attachment 2
Revision 13
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# RADIOLOGICAL SURVEY SHEET

| | | | | | |
|---|---|---|---|---|---|
| Room # 921 | RWP # 970001 | Item Description Annual Survey PAGE #1 | | | Date 7-1-97<br>Time All DAY |
| ☑ Smear<br>☐ Maslin<br>☐ Frisk | ☑ Gamma<br>☐ Beta<br>☑ Neutron | RWP Updated YES [✓ NO] | Meter Type/Serial # RO-20/1138 | Meter Type/Serial # RO-2 #5172<br>ASP-1 #2574 | Meter Type/Serial # LUD 177/723 |
| | | Status Sheet Updated [✓ YES]/NO | Surveyed By/Recorded By M. Laudisio, Privett | Reviewed By | Date 7-1-97 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK ALL DAY

COMMENTS: VSC in Truck Alley prior to transporting to pad.

Revision 9 N = Neutron readings.

G=Gamma readings. T=Total Neutron + Gamma readings

Cask # 11 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

**VCC Lid Center**
C 4.0 G
C 5.0 N
C 9.0 T

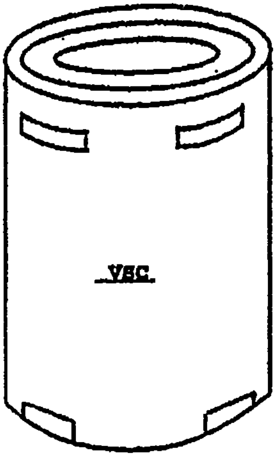
**VCC Outer Lid Edge**
C 1.2 G
C 4.0 N
C 5.2 T

**Outlet #1**
C 0.6 G
C 0.2 N
C 0.8 T

**Outlet #2**
C 0.5 G
C 0.3 N
C 0.8 T

**Outlet #3**
C 0.5 G
C 0.2 N
C 0.7 T

**Outlet #4**
C 0.6 G
C .1 N
C [illegible] T



**Side**

**North**
C 1.0 G
C <0.1 N
C 1.0 T

**East**
C 0.5 G
C <0.1 N
C 0.5 T

**Side**

**South**
C 0.5 G
C 0.1 N
C 0.6 T

**West**
C 0.6 G
C <0.1 N
C 0.6 T

**Inlet #1**
C 3.0 G
C 0.1 N
C 3.1 T

**Inlet #2**
C 2.5 G
C 0.2 N
C 2.7 T

**Inlet #3**
C 3.0 G
C 0.1 N
C 3.1 T

**Inlet #4**
C 3.0 G
C 0.1 N
C 3.1 T

Contamination In dpm/100 cm²
① N
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
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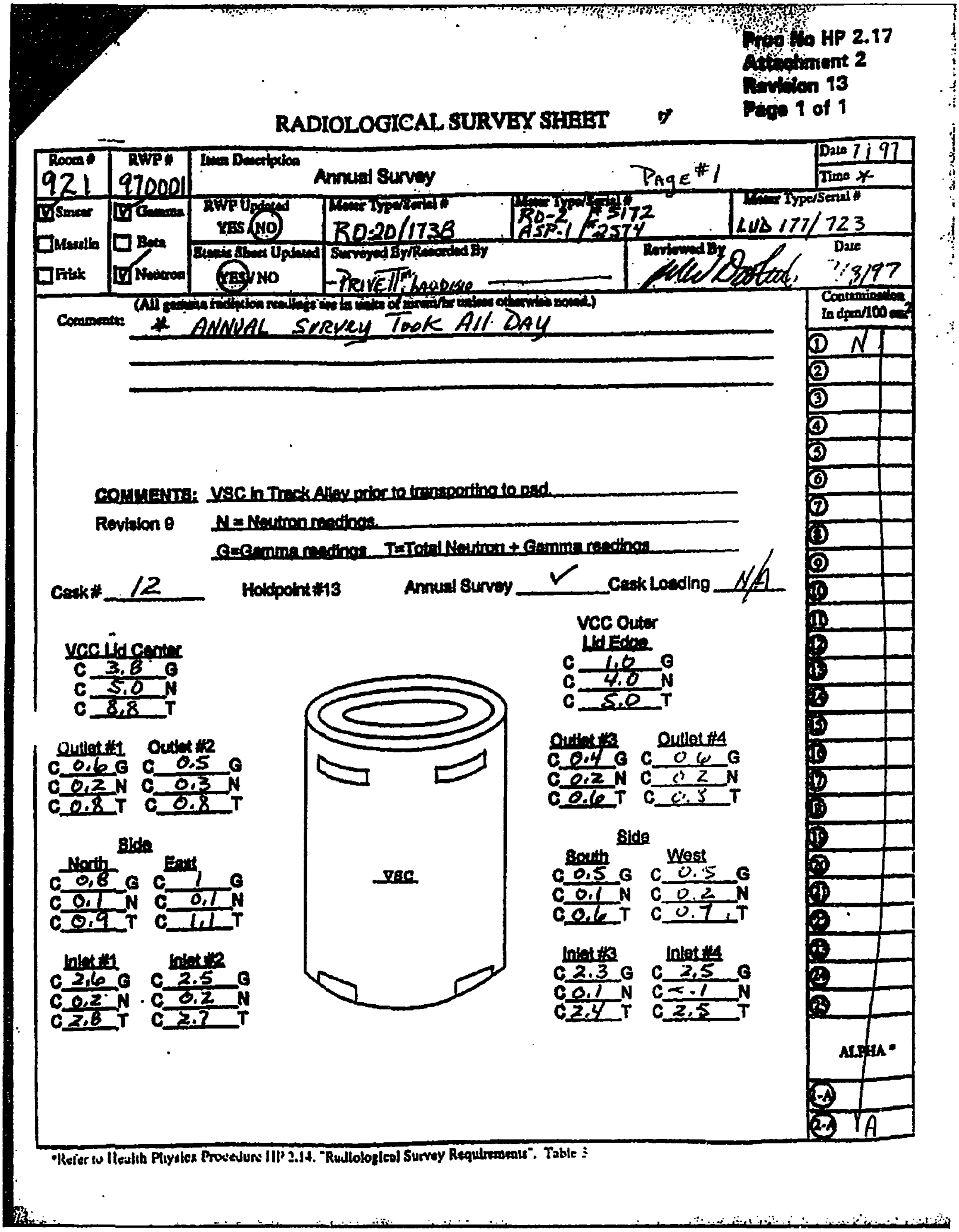
㉓
㉔
㉕

ALPHA *
1-A
2-A A

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements", Table 3.



Proc No HP 2.17
Attachment 2
Revision 13
Page 1 of 1

## RADIOLOGICAL SURVEY SHEET

Room # 921
RWP # 970001
Item Description: Annual Survey Page #1
Date 7 / 97
Time *

☑ Smear ☐ Masslin ☐ Frisk
☑ Gamma ☐ Beta ☑ Neutron

RWP Updated YES [✓ NO]
Meter Type/Serial # RO-20/1738
Meter Type/Serial # RO-2 #5172 ASP-1 #2574
Meter Type/Serial # LUD 177/723

Status Sheet Updated [✓ YES] / NO
Surveyed By/Recorded By PRIVETT / LANDISIO
Reviewed By
Date 7/3/97

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: * ANNUAL SURVEY TOOK All DAY

**COMMENTS:** VSC in Track Alley prior to transporting to pad.
Revision 9 N = Neutron readings.
G=Gamma readings T=Total Neutron + Gamma readings

Cask # 12 Holdpoint #13 Annual Survey ✓ Cask Loading N/A

VCC Lid Center
C 3.8 G
C 5.0 N
C 8.8 T

VCC Outer Lid Edge
C 1.0 G
C 4.0 N
C 5.0 T

Outlet #1
C 0.6 G
C 0.2 N
C 0.8 T

Outlet #2
C 0.5 G
C 0.3 N
C 0.8 T

Outlet #3
C 0.4 G
C 0.2 N
C 0.6 T

Outlet #4
C 0.6 G
C 0.2 N
C 0.3 T

VSC

Side

North
C 0.8 G
C 0.1 N
C 0.9 T

East
C 1 G
C 0.1 N
C 1.1 T

South
C 0.5 G
C 0.1 N
C 0.6 T

West
C 0.5 G
C 0.2 N
C 0.7 T

Inlet #1
C 2.6 G
C 0.2 N
C 2.8 T

Inlet #2
C 2.5 G
C 0.2 N
C 2.7 T

Inlet #3
C 2.3 G
C 0.1 N
C 2.4 T

Inlet #4
C 2.5 G
C <.1 N
C 2.5 T

Contamination In dpm/100 cm²

| | |
|---|---|
| ① | N |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
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| ⑭ | |
| ⑮ | |
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| ㉕ | |

ALPHA *

| | |
|---|---|
| 1-A | |
| 2-A | /A |

*Refer to Health Physics Procedure HP 2.14. "Radiological Survey Requirements", Table 3

Form HP 2.17-1

950/24*11*84/LP

# RADIOLOGICAL AREA STATUS SHEET

Date Surveyed 5/5/98 Time Surveyed 0900

| | | | |
|---|---|---|---|
| Area/Room Description<br>IBFSI | | Building | Room ID<br>921 |
| Meter Type – Serial No.<br>RO 20 1755 | Meter Type – Serial No.<br>ASP-1 2573 | Meter Type – Serial No.<br>~~N/A~~ Lud 2929 | Air Sampler Type / Serial No.<br>N/A |
| Airborne Radioactivity<br>Total % DAC N/A | Surveyed / Recorded By<br>Schuetzler, BARKER / Barker Schuetzler | Reviewed By | Date<br>5MAY98 |

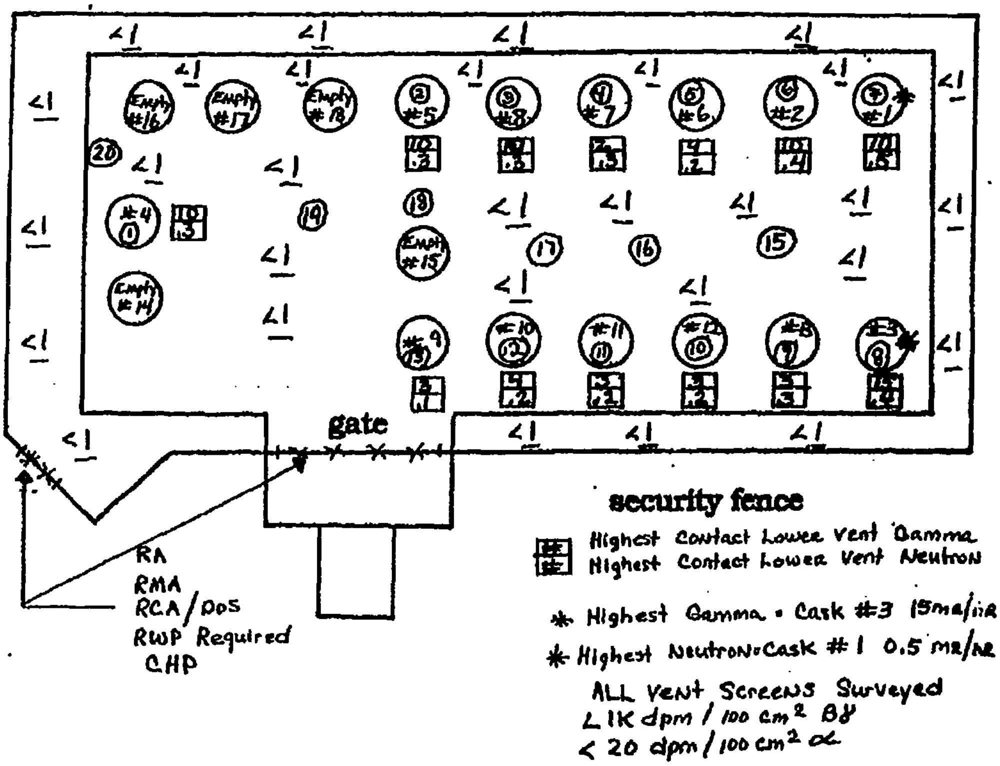
HOT SPOTS mrem/hr

△A N 12" # △C N 12" # △E N 12" #

△B 12" A # △D 12" A # △F 12" A #

Perimeter Fence Area < 0.5 mR/hR

~~Load Casks~~ CDS 5/5/98 Loaded Casks Labeled Radioactive material



ALL Vent Screens Surveyed

< 1K dpm / 100 cm² βγ

< 20 dpm / 100 cm² α

| SMEARS dpm/100cm² |
|---|
| ① < 1K |
| ② < 1K |
| ③ < 1K |
| ④ < 1K |
| ⑤ < 1K |
| ⑥ < 1K |
| ⑦ < 1K |
| ⑧ < 1K |
| ⑨ < 1K |
| ⑩ < 1K |
| ⑪ < 1K |
| ⑫ < 1K |
| ⑬ < 1K |
| ⑭ < 1K |
| ⑮ < 1K |
| ⑯ < 1K |
| ⑰ < 1K |
| ⑱ < 1K |
| ⑲ < 1K |
| ⑳ < 1K |
| ALPHA |
| ⑨ < 20 |
| ③ < 20 |

**NOTES:** ACCESS TO AREAS ABOVE 8' REQUIRES "CONTACTING H.P. FOR APPROVAL."
Floors, walls and components in CLEAN AREAS below 8' were <1K dpm/gross masslinn/probe.
All dose rate readings in mrem/hr unless noted otherwise.

**POSTINGS AND BOUNDARIES / LEGEND**

RA = Radiation Area
CA = Contamin Area
AA = Airborne Area
RM = Rad Material
CHP = Contact HP For Entry
RMA = RAD Material Area
RCA = RAD Controlled Area
LDA = Low Dose Area
RCD = RAD Controlled Doors
HRA = High Radiation Area
HCA = High Contamin Area
IC = Internal Contamination
Radiation X—X—X—X
Contamin ⊖—⊖—⊖—⊖
GM = Gross Masslinn
* = A/S Location
△ = Hot Spot
☐ Contact
☐ 12"

**MINIMUM ANTI-C CLOTHING REQUIREMENTS FOR ENTRY BEHIND CONTAMINATION BOUNDARIES**

☐ GROUP A CLOTHING SET
Lab Coat
Glove Liners
1 Pair Rubber Gloves
Shoe Covers
Rubber Overshoes

☐ GROUP B CLOTHING SET
Cloth Overalls
Hood
Glove Liners
2 Pair Rubber Gloves
Shoe Covers
Rubber Overshoes

# RADIOLOGICAL AREA STATUS SHEET

060 / 24"11"04 / LP

**Date Surveyed** 9/3/01 **Time Surveyed** 1320

| | | | |
|---|---|---|---|
| **Area/Room Description**<br>Independent Spent Fuel Storage Installation (ISFSI) | | **Building**<br>N/A | **Room ID**<br>921 |
| **Meter Type / Serial No.**<br>Ro-2 #6159 | **Meter Type / Serial No.**<br>ASP-1 #2573 | **Meter Type / Serial No.**<br>Lud-177 #724 | **Air Sampler Type / Serial No.**<br>N/A |
| **Airborne Radioactivity**<br>Total %DAC N/A | **Surveyed / Recorded By**<br>J. Collins / Collins | **Reviewed By** | **Date**<br>9/5/01 |

△A N/A 12" N/A # N/A  △B N/A 12" N/A # N/A  △C N/A 12" N/A # N/A

△D N/A 12" N/A # N/A  △E N/A 12" N/A # N/A  △F N/A 12" N/A # N/A

Cask #4 outlet vent smears
dpm / 100cm²

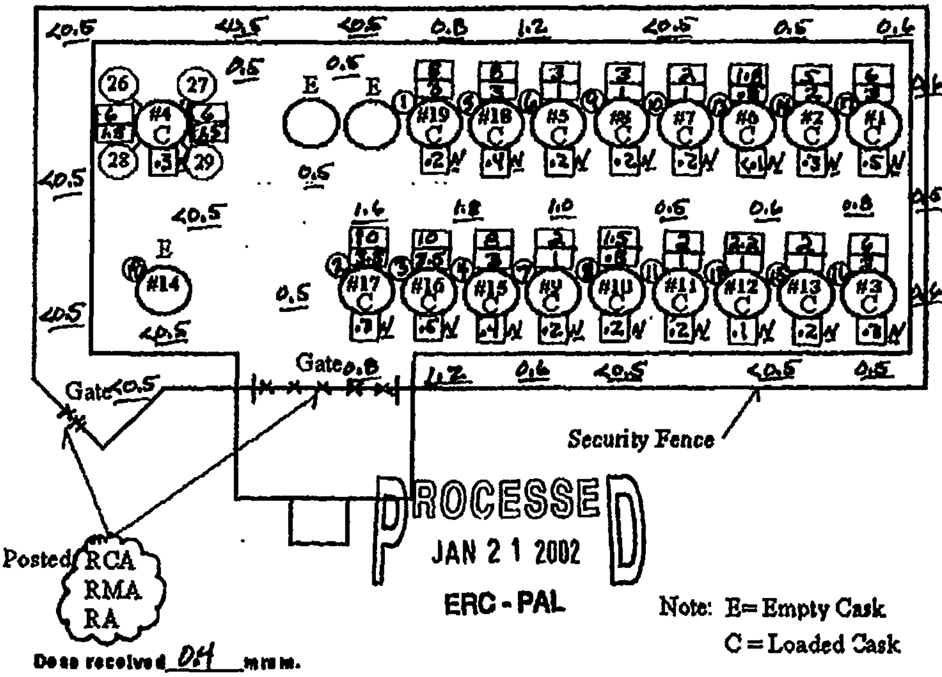
㉖ <1000 ㉘ <1000

㉗ <1000 ㉙ <1000

Inlet vent dose rates:

Highest Gamma 10 -Cask # 16/17

Highest Neutron •5 -Cask # 16/11



PROCESSED
JAN 21 2002
ERC - PAL

Note: E= Empty Cask
C = Loaded Cask

Dose received 04 mrem.

| SMEARS dpm / 100cm² |
|---|
| ① <1000 |
| ② <1000 |
| ③ <1000 |
| ④ <1000 |
| ⑤ <1000 |
| ⑥ <1000 |
| ⑦ <1000 |
| ⑧ <1000 |
| ⑨ <1000 |
| ⑩ <1000 |
| ⑪ <1000 |
| ⑫ <1000 |
| ⑬ <1000 |
| ⑭ <1000 |
| ⑮ <1000 |
| ⑯ <1000 |
| ⑰ <1000 |
| ⑱ <1000 |
| ⑲ N/A |
| ⑳ |
| ㉑ |
| ㉒ |
| ㉓ |
| ㉔ |
| ㉕ N/A |

ALPHA
○ N/A
○

**NOTES; ACCESS TO AREAS ABOVE 8' REQUIRES "CONTACTING H.P. FOR APROVAL."**
Floors, walls and components in CLEAN AREAS below 8' were <1Kdpm / gross muslinn / probe
All dose rate readings in mrem/hr unless noted otherwise

**POSTINGS AND BOUNDIRES / LEGEND**

RA==Radiation Area LDA=Low Dose Area
CA==Contam Area HRA=High Radiation Area
AA==Airborne Area HCA=High Contam Area
RM==Rad Material IC===Internal Contam
CHP=Contact HP for Entry
RMA=RAD Material Area
RCA=RAD Controlled Area
LHRA=Locked High Radiation Area

Radiation -X-X-X-X-
Contam -θ-θ-θ-θ-
GM = Gross Maslinn
✳=== A/S Location
△ =Hot Spot
□ -Contact
□ -12"

**MINIMUM ANTI-C CLOTHING REQUIREMENTS FOR ENTRY BEHIND CONTAMINATION BOUNDRIES**

| ☐ GROUP A CLOTHING SET | ☐ GROUP B CLOTHING SET |
|---|---|
| Lab Coat | Cloth Overalls |
| Glove Liners | Hood |
| 1 Pair Rubber Gloves | Glove Liners |
| Shoe Covers | 1 Pair Rubber Gloves |
| Rubber Overshoes | Shoe Covers |
| | Rubber Overshoes |

# RADIOLOGICAL SURVEY SHEET

| | | | | |
|---|---|---|---|---|
| Room # 921 | RWP # 0001 | Item Description<br>**ANNUAL I.S.F.S.I. SURVEY** | | Date 1/23/02<br>Time 1300 |
| ☐ Smear<br>☐ Muslin<br>☐ Flask<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | RWP Updated<br>Yes / [✓ No] | Meter Type / Serial # ASP1 - 3163 | Meter Type / Serial # R02 - 5159 | Meter Type / Serial # N/A |
| | | Status Sheet Updated<br>[✓ Yes] / No | Surveyed By / Recorded By S.Farnum / S.Farnum | Reviewed By J.S.Ridley | Date 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ______ Cask # 1

PROCESSED
JAN 0 8 2003
ERC - PALO

**VCC Lid Center**

C N/A G

C N/A N

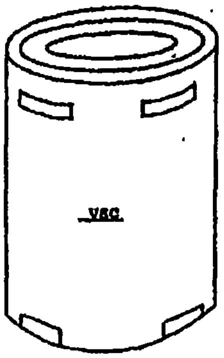
C N/A T

**VCC Outer Lid Edge**

C N/A G

C N/A N

C N/A T



**Outlet #1**

C N/A G

C N/A N

C N/A T

**Outlet #2**

C N/A G

C N/A N

C N/A T

**Outlet #3**

C ______ G

C N/A N

C N/A T

**Outlet #4**

C ______ G

C N/A N

C N/A T

**Side 5' From Bottom**

**North**

C 0.8 G

C <0.1 N

C 0.8 T

**East**

C 0.8 G

C <0.1 N

C 0.8 T

**Side 5' From Bottom**

**South**

C 1.2 G

C 0.1 N

C 1.3 T

**West**

C 1 G

C <0.1 N

C 1.0 T

**Inlet #3**

C 3.2 G

C 0.3 N

C 3.5 T

**Inlet #4**

C 4 G

C 0.4 N

C 4.4 T

**Inlet #3**

C 4 G

C 0.2 N

C 4.2 T

**Inlet #4**

C 4 G

C 0.2 N

C 4.2 T

Dose received 2 mrem.

| Contamination in dpm / 100 cm² | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

| ALPHA | |
|---|---|
| 1-A | N/ |
| 2-A | /A |

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Time 1300 |

| | | RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslin<br>☐ Track<br>N/A | ■ Gamma<br>☐ Beta<br>■ Neutron | Yes / [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A |
| | | **Status Sheet Updated** | **Surveyed By / Recorded By** | **Reviewed By** | **Date** |
| | | [✓ Yes] / No | S. FARNUM | | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

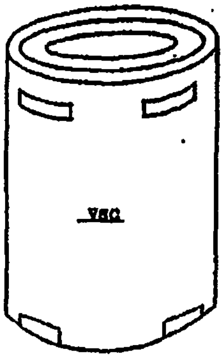
N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 2

**VCC Lid Center**
C N/A G
C ____ N
C ____ T

**VCC Outer Lid Edge**
C N/A G
C ____ N
C ____ T



**Outlet #1**
C N/A G
C ____ N
C ____ T

**Outlet #2**
C N/A G
C ____ N
C ____ T

**Outlet #3**
C ____ G
C N/A N
C ____ T

**Outlet #4**
C ____ G
C N/A N
C ____ T

**Side 5' From Bottom**

**North**
C 0.8 G
C <0.1 N
C 0.8 T

**East**
C 1 G
C <0.1 N
C 1.0 T

**South**
C 1 G
C 0.1 N
C 1.1 T

**West**
C 0.8 G
C 0.1 N
C 0.9 T

**Inlet #3**
C 4 G
C 0.1 N
C 4.1 T

**Inlet #4**
C 3.5 G
C <0.1 N
C 3.5 T

**Inlet #3**
C 3 G
C 0.1 N
C 3.1 T

**Inlet #4**
C 3 G
C 0.1 N
C 3.1 T

Dose received 2 mrem.

Contamination in dpm / 100 cm²

①–㉕ N/A

ALPHA

1-A N/

2-A /A

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1300 |

☐ Smear<br>☐ Muslin<br>☐ Frisk
N/A

☒ Gamma
☐ Beta
☒ Neutron

| RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|
| Yes / [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | S Farnum / S. FARNUM | JSRidley | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

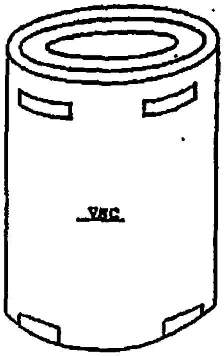
N = Neutron readings

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 3

**VCC Lid Center**
C N/A G
C N/A N
C N/A T

**VCC Outer Lid Edge**
C N/A G
C N/A N
C N/A T



**Outlet #1**
C N/A G
C N/A N
C N/A T

**Outlet #2**
C N/A G
C N/A N
C N/A T

**Outlet #3**
C ____ G
C N/A N
C N/A T

**Outlet #4**
C ____ G
C N/A N
C N/A T

**Side 5' From Bottom**

**North**
C 0.8 G
C 0.1 N
C 0.9 T

**East**
C 0.6 G
C 0.1 N
C 0.7 T

**Side 5' From Bottom**

**South**
C 0.6 G
C 0.1 N
C 0.7 T

**West**
C 0.8 G
C 0.2 N
C 1.0 T

**Inlet #3**
C 4.5 G
C 0.2 N
C 4.7 T

**Inlet #4**
C 6 G
C 0.2 N
C 6.2 T

**Inlet #3**
C 3.5 G
C 0.2 N
C 3.7 T

**Inlet #4**
C 5 G
C 0.2 N
C 5.2 T

Dose received 2 mrem.

| Contamination in dpm / 100cm² | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
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| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

| ALPHA | |
|---|---|
| 1-A | N/ |
| 2-A | /A |

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | **ANNUAL I.S.F.S.I. SURVEY** | Time 1300 |

☐ Smear<br>☐ Muslin<br>☐ Frisk  N/A

☒ Gamma<br>☐ Beta<br>☒ Neutron

RWP Updated: Yes / [✓ No]

Meter Type / Serial #: ASP1 – 3163

Meter Type / Serial #: R02 – 5159

Meter Type / Serial #: N/A

Status Sheet Updated: [✓ Yes] / No

Surveyed By / Recorded By: S. Farnum / S. FARNUM

Reviewed By: J S Riley

Date: 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

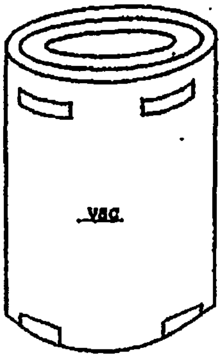
Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 4

**VCC Lid Center**

C N/A G
C N/A N
C N/A T

**VCC Outer Lid Edge**

C N/A G
C N/A N
C N/A T



**Outlet #1**

C N/A G
C N/A N
C N/A T

**Outlet #2**

C N/A G
C N/A N
C N/A T

**Outlet #3**

C ____ G
C N/A N
C N/A T

**Outlet #4**

C ____ G
C N/A N
C N/A T

**Side 5' From Bottom**

| | North | East |
|---|---|---|
| G | 0.4 | 0.4 |
| N | <0.1 | 0.1 |
| T | 0.4 | 0.5 |

**Side 5' From Bottom**

| | South | West |
|---|---|---|
| G | 0.5 | 0.4 |
| N | <0.1 | 0.1 |
| T | 0.5 | 0.5 |

| | Inlet #3 | Inlet #4 |
|---|---|---|
| G | 4 | 3 |
| N | 0.2 | 0.3 |
| T | 4.2 | 3.3 |

| | Inlet #3 | Inlet #4 |
|---|---|---|
| G | 5 | 3 |
| N | 0.2 | 0.1 |
| T | 5.2 | 3.1 |

Dose received 2 mrem.

Contamination in dpm / 100 cm²

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ N/A

ALPHA

1-A 2-A N/A

# RADIOLOGICAL SURVEY SHEET

| | | | |
|---|---|---|---|
| Room # 921 | RWP # 0001 | Item Description ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1330 |

☐ Smear
☐ Muslin
☐ Frisk
N/A

■ Gamma
☐ Beta
■ Neutron

RWP Updated Yes [✓ No]

Meter Type / Serial # ASP1 - 3163

Meter Type / Serial # R02 - 5159

Meter Type / Serial # N/A

Status Sheet Updated [✓ Yes] / No

Surveyed By / Recorded By S Farnum S. FARNUM

Reviewed By J Roley

Date 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ______ Cask # 5

Contamination in dpm / 100cm²

① 
② 
③ 
④ 
⑤ 
⑥ 
⑦ 
⑧ N
⑨ 
⑩ 
⑪ 
⑫ 
⑬ 
⑭ 
⑮ 
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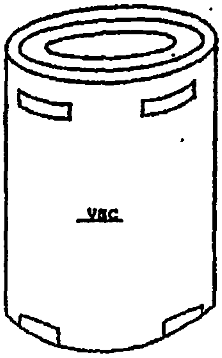
**VCC Lid Center**

C N/A G
C ____ N
C ____ T

**VCC Outer Lid Edge**

C N/A G
C ____ N
C ____ T



**Outlet #1**

C N/A G
C ____ N
C ____ T

**Outlet #2**

C N/A G
C ____ N
C ____ T

**Outlet #3**

C ____ G
C N/A N
C ____ T

**Outlet #4**

C ____ G
C N/A N
C ____ T

**Side 5' From Bottom**

**North**

C 0.2 G
C <0.1 N
C 0.2 T

**East**

C 0.4 G
C <0.1 N
C 0.4 T

**Side 5' From Bottom**

**South**

C 1 G
C 0.1 N
C 1.1 T

**West**

C 1 G
C 0.1 N
C 1.1 T

**Inlet #3**

C 3 G
C 0.1 N
C 3.1 T

**Inlet #4**

C 3 G
C 0.1 N
C 3.1 T

**Inlet #3**

C 3.5 G
C 0.1 N
C 3.6 T

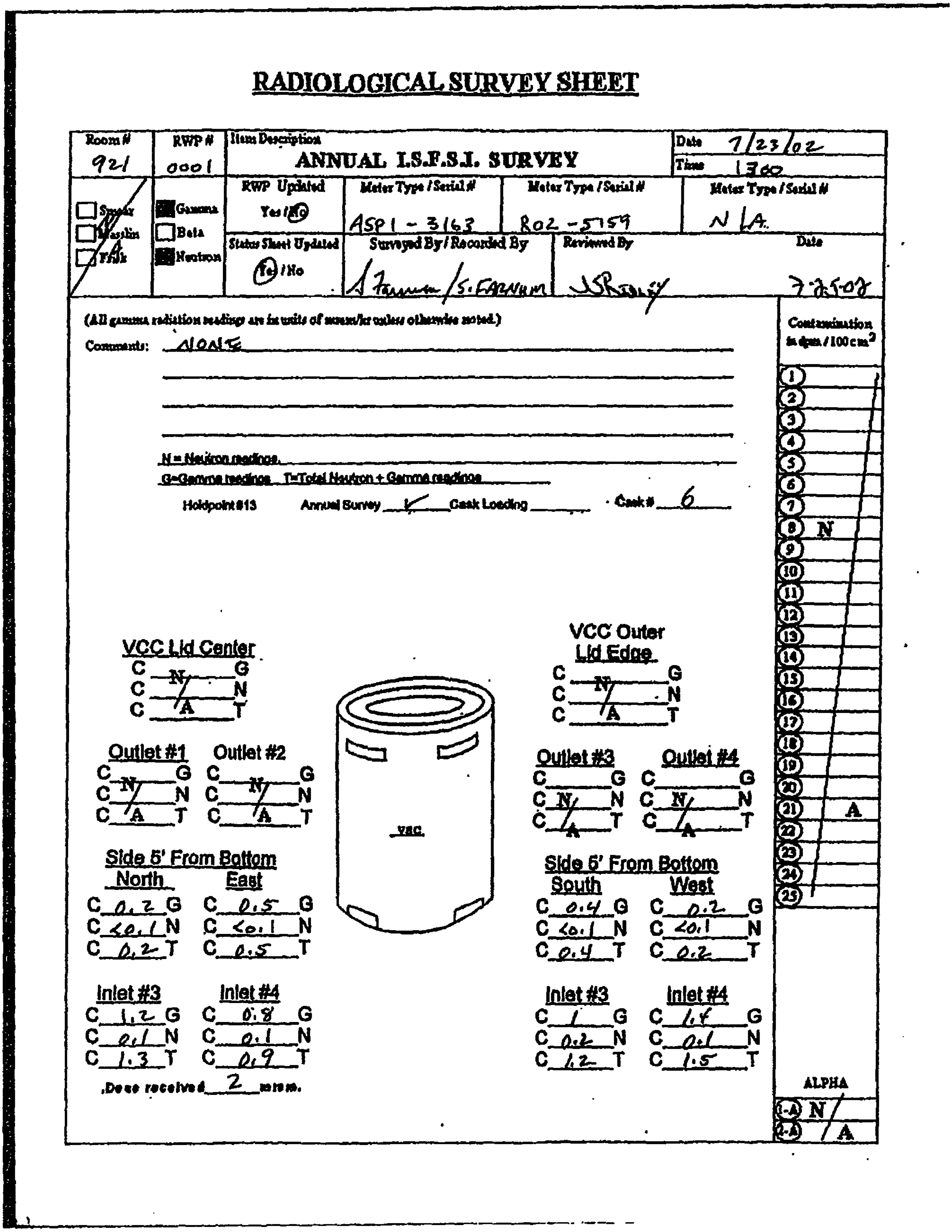
**Inlet #4**

C 2.5 G
C 0.2 N
C 2.7 T

Dose received 2 mrem.

ALPHA

1-A N/
2-A A



# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Time 1300 |

| | | RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslin<br>☐ Frisk<br>N/A | ■ Gamma<br>☐ Beta<br>■ Neutron | Yes / [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A. |
| | | **Status Sheet Updated** | **Surveyed By / Recorded By** | **Reviewed By** | **Date** |
| | | [✓ Yes] / No | S. Farnum / S. FARNUM | JS Risley | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 6

**VCC Lid Center**

C N/A G
C ____ N
C ____ T

**VCC Outer Lid Edge**

C N/A G
C ____ N
C ____ T

**Outlet #1**

C N/A G
C ____ N
C ____ T

**Outlet #2**

C N/A G
C ____ N
C ____ T

**Outlet #3**

C ____ G
C N/A N
C ____ T

**Outlet #4**

C ____ G
C N/A N
C ____ T

**Side 5' From Bottom**

| North | | East | |
|---|---|---|---|
| C 0.2 | G | C 0.5 | G |
| C <0.1 | N | C <0.1 | N |
| C 0.2 | T | C 0.5 | T |

**Side 5' From Bottom**

| South | | West | |
|---|---|---|---|
| C 0.4 | G | C 0.2 | G |
| C <0.1 | N | C <0.1 | N |
| C 0.4 | T | C 0.2 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 1.2 | G | C 0.8 | G |
| C 0.1 | N | C 0.1 | N |
| C 1.3 | T | C 0.9 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 1 | G | C 1.4 | G |
| C 0.2 | N | C 0.1 | N |
| C 1.2 | T | C 1.5 | T |

Dose received 2 mrem.

Contamination in dpm / 100 cm²

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ N ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ A ㉒ ㉓ ㉔ ㉕

ALPHA

1-A N/
2-A /A

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Time 1300 |

☐ Smear
☐ Maslin
☐ Trisk
N/A

☒ Gamma
☐ Beta
☒ Neutron

| RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|
| Yes/ [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | S Farnum / S. FARNUM | JSRidley | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings

G=Gamma readings T=Total Neutron + Gamma readings

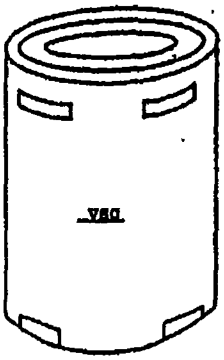
Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 7

**VCC Lid Center**
C N/A G
C N
C T

**VCC Outer Lid Edge**
C N/A G
C N
C T

**Outlet #1**
C N/A G
C N
C T

**Outlet #2**
C N/A G
C N
C T



**Outlet #3**
C ____ G
C N/A N
C T

**Outlet #4**
C ____ G
C N/A N
C T

**Side 5' From Bottom**

**North**
C 0.2 G
C <0.1 N
C 0.2 T

**East**
C 0.2 G
C <0.1 N
C 0.2 T

**Side 5' From Bottom**

**South**
C 0.4 G
C 0.1 N
C 0.5 T

**West**
C 0.2 G
C <0.1 N
C 0.2 T

**Inlet #3**
C 0.8 G
C 0.1 N
C 0.9 T

**Inlet #4**
C 0.8 G
C 0.3 N
C 1.1 T

**Inlet #3**
C 1 G
C 0.2 N
C 1.2 T

**Inlet #4**
C 1 G
C 0.2 N
C 1.2 T

Dose received 2 mrem.

Contamination in dpm/100cm²

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N/ |
| 2-A | /A |

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Time 1330 |

| | | RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Muslin<br>☐ Frisk<br>N/A | ■ Gamma<br>☐ Beta<br>■ Neutron | Yes / [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A |
| | | Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
| | | [✓ Yes] / No | S Farnum / S. FARNUM | JSRelly | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

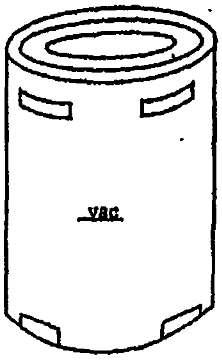
Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 8

**VCC Lid Center**

C N/A G
C N
C T

**VCC Outer Lid Edge**

C N/A G
C N
C T



**Outlet #1**

C N/A G
C N
C T

**Outlet #2**

C N/A G
C N
C T

**Outlet #3**

C G
C N/A N
C T

**Outlet #4**

C G
C N/A N
C T

**Side 5' From Bottom**

| North | | East | |
|---|---|---|---|
| C 0.4 | G | C 0.4 | G |
| C 0.1 | N | C <0.1 | N |
| C 0.5 | T | C 0.4 | T |

**Side 5' From Bottom**

| South | | West | |
|---|---|---|---|
| C 0.4 | G | C 0.5 | G |
| C 0.1 | N | C 0.1 | N |
| C 0.5 | T | C 0.6 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 2.2 | G | C 2.6 | G |
| C 0.3 | N | C 0.2 | N |
| C 2.5 | T | C 2.8 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 2.4 | G | C 3 | G |
| C <0.1 | N | C 0.1 | N |
| C 2.4 | T | C 3.1 | T |

Dose received 2 mrem.

Contamination in dpm / 100cm²

①
②
③
④
⑤
⑥
⑦
⑧ N
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑ A
㉒
㉓
㉔
㉕

ALPHA

1-A N/
2-A /A

# RADIOLOGICAL SURVEY SHEET

| | | | |
|---|---|---|---|
| Room # 921 | RWP # 0001 | Item Description ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1300 |

| | | | | |
|---|---|---|---|---|
| ☐ Swear<br>☐ Muslin<br>☐ Frisk<br>N/A | ■ Gamma<br>☐ Beta<br>■ Neutron | RWP Updated<br>Yes / [✓ No] | Meter Type / Serial #<br>ASP1 - 3163 | Meter Type / Serial #<br>R02-5759 |

| | | |
|---|---|---|
| Meter Type / Serial # N/A | | |
| Status Sheet Updated<br>[✓ Yes] / No | Surveyed By / Recorded By<br>S Farnum / S. FARNUM | Reviewed By<br>J Rodney |
| Date 7-25-02 | | |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

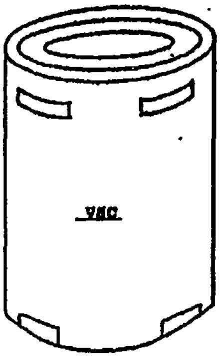
Holdpoint #13 Annual Survey ✓ Cask Loading ______ Cask # 9

**VCC Lid Center**

C N/A G
C N/A N
C N/A T

**VCC Outer Lid Edge**

C N/A G
C N/A N
C N/A T



| Outlet #1 | | Outlet #2 | |
|---|---|---|---|
| C N/A | G | C N/A | G |
| C N/A | N | C N/A | N |
| C N/A | T | C N/A | T |

| Outlet #3 | | Outlet #4 | |
|---|---|---|---|
| C ______ | G | C ______ | G |
| C N/A | N | C N/A | N |
| C N/A | T | C N/A | T |

**Side 5' From Bottom**

| North | | East | |
|---|---|---|---|
| C 0.8 | G | C 0.2 | G |
| C 0.1 | N | C 0.1 | N |
| C 0.9 | T | C 0.3 | T |

**Side 5' From Bottom**

| South | | West | |
|---|---|---|---|
| C 0.2 | G | C 0.6 | G |
| C <0.1 | N | C 0.1 | N |
| C 0.2 | T | C 0.7 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 1 | G | C 1.2 | G |
| C 0.2 | N | C 0.2 | N |
| C 1.2 | T | C 1.4 | T |

| Inlet #3 | | Inlet #4 | |
|---|---|---|---|
| C 1 | G | C 0.8 | G |
| C <0.1 | N | C 0.2 | N |
| C 1.0 | T | C 1.0 | T |

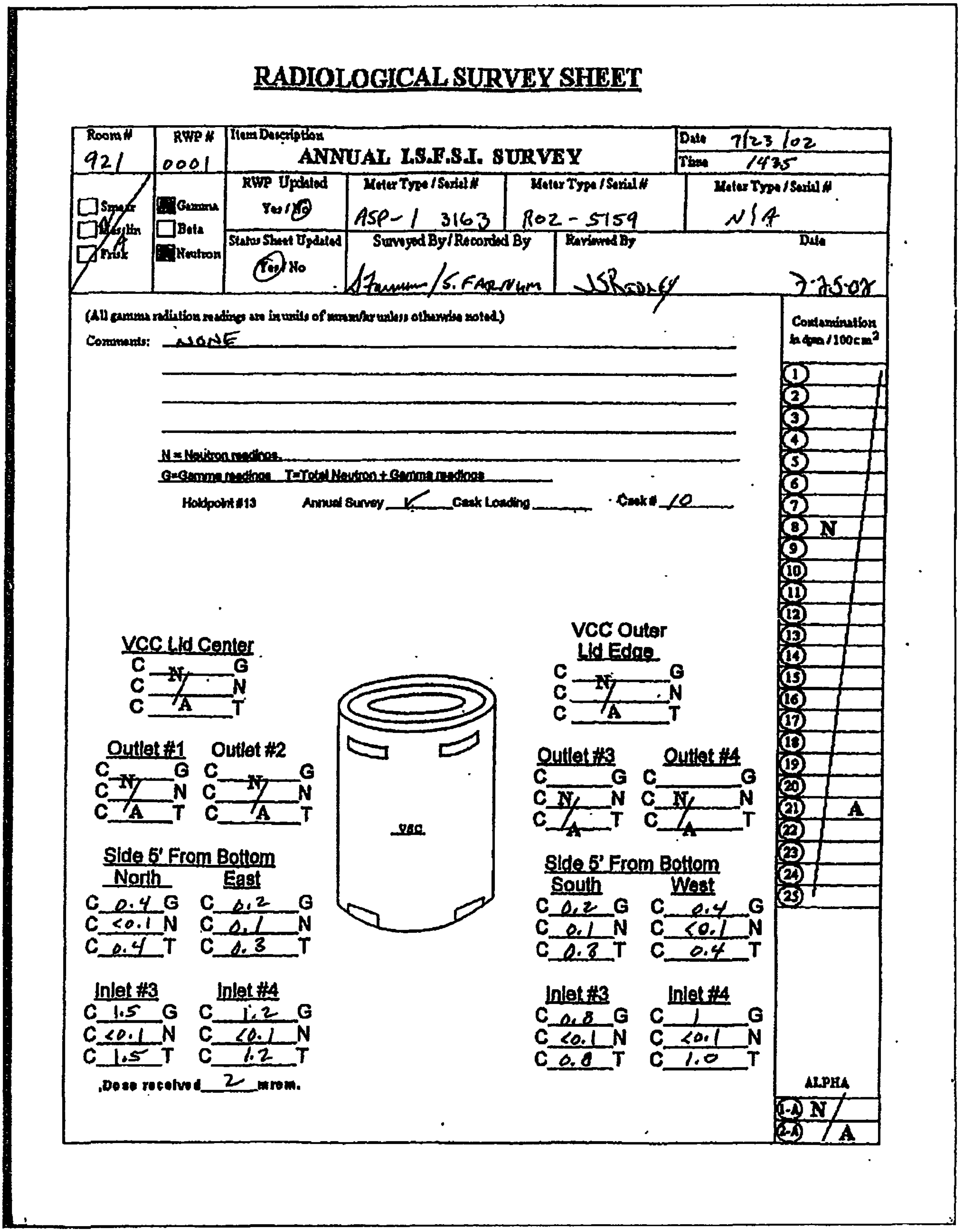
Dose received 2 mrem.

Contamination in dpm / 100 cm$^2$

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N |
| 2-A | A |



## RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1435 |

☐ Smear<br>☐ Maslin<br>☐ Frisk<br>N/A

☒ Gamma<br>☐ Beta<br>☒ Neutron

| RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|
| Yes / [✓ No] | ASP-1 3163 | R02-5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | S Farnum / S. FARNUM | JSRodney | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings
G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 10

**VCC Lid Center**
C N/A G
C N
C T

**VCC Outer Lid Edge**
C N/A G
C N
C T

**Outlet #1**
C N/A G
C N
C T

**Outlet #2**
C N/A G
C N
C T

**Outlet #3**
C G
C N/A N
C T

**Outlet #4**
C G
C N/A N
C T

VSC

**Side 5' From Bottom**

**North**
C 0.4 G
C <0.1 N
C 0.4 T

**East**
C 0.2 G
C 0.1 N
C 0.3 T

**South**
C 0.2 G
C 0.1 N
C 0.3 T

**West**
C 0.4 G
C <0.1 N
C 0.4 T

**Inlet #3**
C 1.5 G
C <0.1 N
C 1.5 T

**Inlet #4**
C 1.2 G
C <0.1 N
C 1.2 T

**Inlet #3**
C 0.8 G
C <0.1 N
C 0.8 T

**Inlet #4**
C 1 G
C <0.1 N
C 1.0 T

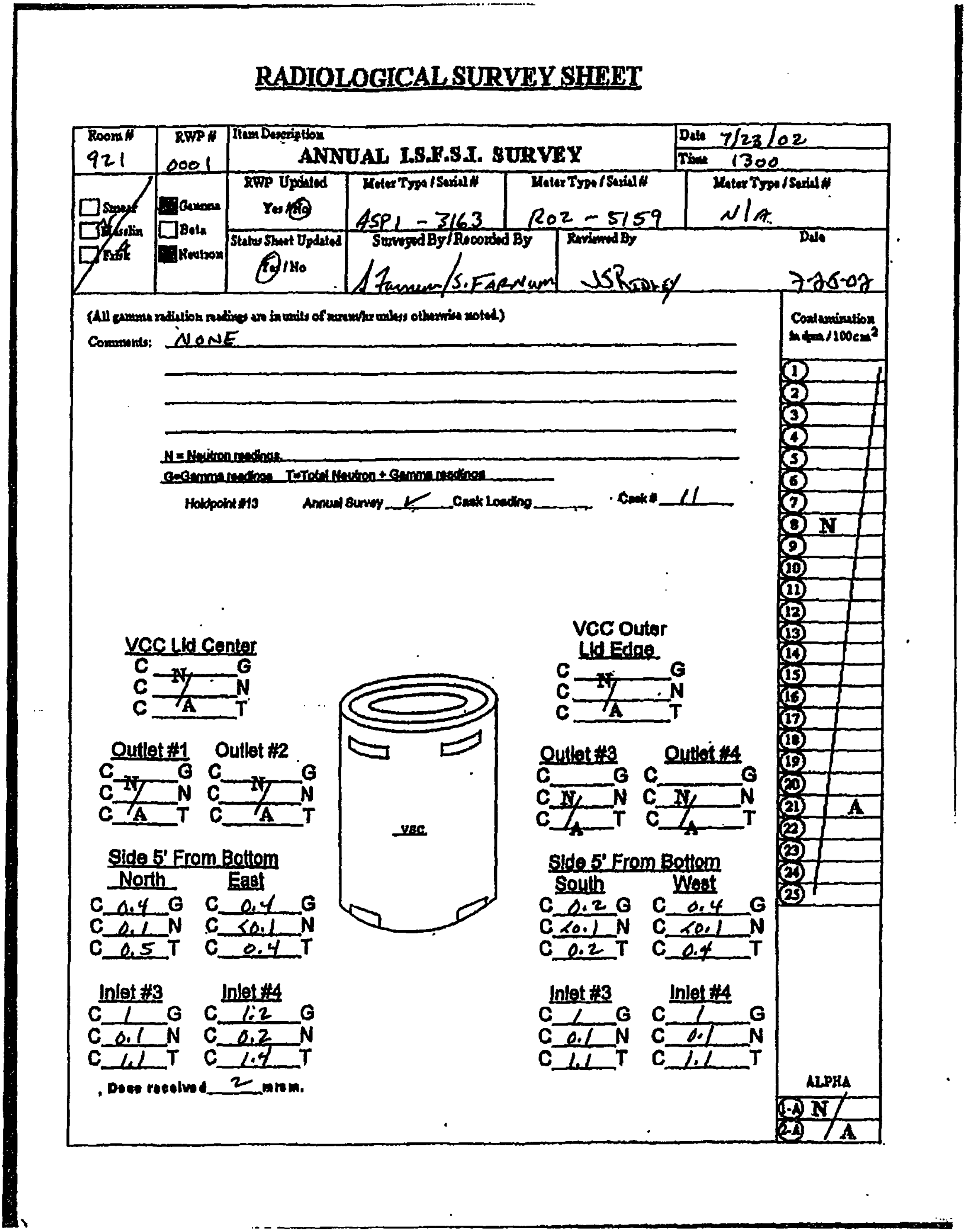
Dose received 2 mrem.

Contamination in dpm/100cm²

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N/ |
| 2-A | /A |



# RADIOLOGICAL SURVEY SHEET

Room # 921
RWP # 0001
Item Description ANNUAL I.S.F.S.I. SURVEY
Date 7/23/02
Time 1300

☐ Smear ☐ Muslin ☐ Frisk N/A
☒ Gamma ☐ Beta ☒ Neutron

RWP Updated Yes [✓ No]
Meter Type / Serial # 4SP1 - 3163
Meter Type / Serial # R02 - 5159
Meter Type / Serial # N/A
Status Sheet Updated [✓ Yes] / No
Surveyed By / Recorded By S Farnum/S.FARNUM
Reviewed By JSRidley
Date 7-26-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)
Comments: NONE

N = Neutron readings
G=Gamma readings T=Total Neutron + Gamma readings
Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 11

**VCC Lid Center**
C ____ G
C N/A N
C ____ T

**VCC Outer Lid Edge**
C ____ G
C N/A N
C ____ T

**Outlet #1**
C ____ G
C N/A N
C ____ T

**Outlet #2**
C ____ G
C N/A N
C ____ T

**Outlet #3**
C ____ G
C N/A N
C ____ T

**Outlet #4**
C ____ G
C N/A N
C ____ T

**Side 5' From Bottom**

**North**
C 0.4 G
C 0.1 N
C 0.5 T

**East**
C 0.4 G
C <0.1 N
C 0.4 T

**Side 5' From Bottom**

**South**
C 0.2 G
C <0.1 N
C 0.2 T

**West**
C 0.4 G
C <0.1 N
C 0.4 T

**Inlet #3**
C 1 G
C 0.1 N
C 1.1 T

**Inlet #4**
C 1.2 G
C 0.2 N
C 1.4 T

**Inlet #3**
C 1 G
C 0.1 N
C 1.1 T

**Inlet #4**
C 1 G
C 0.1 N
C 1.1 T

, Dose received 2 mrem.

Contamination in dpm/100cm²
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ⑰ ⑱ ⑲ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕ N/A

ALPHA
1-A 2-A N/A

# RADIOLOGICAL SURVEY SHEET

Room # 921

RWP # 0001

Item Description: **ANNUAL I.S.F.S.I. SURVEY**

Date 7/23/02

Time 1300

☐ Smear ☐ Maslin ☐ Swipe

☒ Gamma ☐ Beta ☒ Neutron

RWP Updated: Yes / [✓ No]

Meter Type / Serial #: ASP1-3163

Meter Type / Serial #: R02-5159

Meter Type / Serial #: N/A

Status Sheet Updated: [✓ Yes] / No

Surveyed By / Recorded By: / S. FARNUM

Reviewed By:

Date: 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

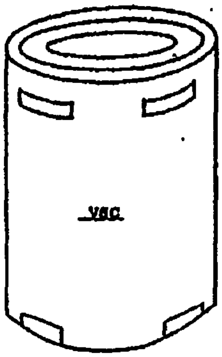
N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 12

**VCC Lid Center**
C N G
C / N
C A T

**VCC Outer Lid Edge**
C N G
C / N
C A T



**Outlet #1**
C N G
C / N
C A T

**Outlet #2**
C N G
C / N
C A T

**Outlet #3**
C ____ G
C N N
C / A T

**Outlet #4**
C ____ G
C N N
C / A T

**Side 5' From Bottom**

**North**
C 0.4 G
C 0.1 N
C 0.5 T

**East**
C 0.4 G
C 0.1 N
C 0.5 T

**Side 5' From Bottom**

**South**
C 0.2 G
C 0.1 N
C 0.3 T

**West**
C 0.4 G
C <0.1 N
C 0.4 T

**Inlet #3**
C 1 G
C 0.2 N
C 1.2 T

**Inlet #4**
C 1.4 G
C 0.2 N
C 1.6 T

**Inlet #3**
C 1 G
C <0.1 N
C 1.0 T

**Inlet #4**
C 1 G
C 0.1 N
C 1.1 T

Dose received 2 mrem.

Contamination in dpm / 100 cm²

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N/ |
| 2-A | /A |

# RADIOLOGICAL SURVEY SHEET

Room # 921
RWP # 0001
Item Description: ANNUAL I.S.F.S.I. SURVEY
Date 7/23/02
Time 1300

☐ Smear ☐ Muslin ☐ Frisk N/A
☒ Gamma ☐ Beta ☒ Neutron

RWP Updated Yes [✓ No]
Meter Type / Serial # ASP1 - 3163
Meter Type / Serial # R02- 5759
Meter Type / Serial # N/A.

Status Sheet Updated [✓ Yes]/No
Surveyed By / Recorded By J Farnum / S. Farnum
Reviewed By JSRaney
Date 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

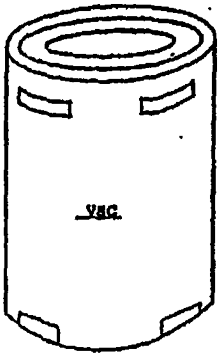
N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 13

**VCC Lid Center**
C N/A G
C N
C T

**VCC Outer Lid Edge**
C N/A G
C N
C T



**Outlet #1**
C N/A G
C N
C T

**Outlet #2**
C N/A G
C N
C T

**Outlet #3**
C G
C N/A N
C T

**Outlet #4**
C G
C N/A N
C T

**Side 5' From Bottom**

**North**
C 0.6 G
C 0.1 N
C 0.7 T

**East**
C 0.5 G
C <0.1 N
C 0.5 T

**Side 5' From Bottom**

**South**
C 0.2 G
C <0.1 N
C 0.2 T

**West**
C 0.4 G
C 0.1 N
C 0.5 T

**Inlet #3**
C 1.2 G
C 0.1 N
C 1.3 T

**Inlet #4**
C 1 G
C 0.1 N
C 1.1 T

**Inlet #3**
C 1 G
C 0.1 N
C 1.1 T

**Inlet #4**
C 1 G
C <0.1 N
C 1.0 T

, Dose received 2 mrem.

Contamination in dpm / 100cm²

①
②
③
④
⑤
⑥
⑦
⑧ N
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑ A
㉒
㉓
㉔
㉕

ALPHA

1-A N/
2-A /A

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Time 1300 |

| | | RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Muslin<br>☐ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Yes / [✓ No] | ASP-1 3163 | RO2-5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | S. Farnum / S. FARNUM | J S Ridley | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: ALONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

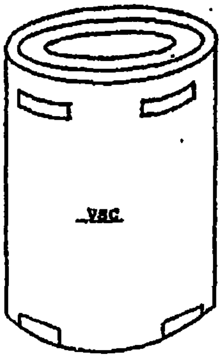
Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 15

**VCC Lid Center**

C N/A G
C ____ N
C ____ T

**VCC Outer Lid Edge**

C N/A G
C ____ N
C ____ T



**Outlet #1**

C N/A G
C ____ N
C ____ T

**Outlet #2**

C N/A G
C ____ N
C ____ T

**Outlet #3**

C ____ G
C N/A N
C ____ T

**Outlet #4**

C ____ G
C N/A N
C ____ T

**Side 5' From Bottom**

| | North | East | South | West |
|---|---|---|---|---|
| G | 1.6 | 1.2 | 1 | 1.6 |
| N | 0.1 | <0.1 | <0.1 | 0.1 |
| T | 1.7 | 1.2 | 1 | 1.7 |

| | Inlet #3 | Inlet #4 | Inlet #3 | Inlet #4 |
|---|---|---|---|---|
| G | 5 | 6 | 5 | 5 |
| N | 0.3 | 0.2 | 0.2 | 0.2 |
| T | 5.3 | 6.2 | 5.2 | 5.2 |

Dose received 2 mrem.

**Contamination in dpm / 100 cm²**

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

**ALPHA**

| | |
|---|---|
| 1-A | N |
| 2-A | A |

# RADIOLOGICAL SURVEY SHEET

Room # 921

RWP # 0001

Item Description: ANNUAL I.S.F.S.I. SURVEY

Date 7/23/02

Time 1300

☐ Smear ☐ Maslin ☐ Frisk N/A

☒ Gamma ☐ Beta ☒ Neutron

RWP Updated Yes / [✓ No]

Meter Type / Serial # ASP1 - 3163

Meter Type / Serial # R02 - 5159

Meter Type / Serial # N/A

Status Sheet Updated [✓ Yes] / No

Surveyed By / Recorded By S. Farnum / S. FARNUM

Reviewed By J. Rodney

Date 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 16

**VCC Lid Center**

C N/A G
C N
C T

**VCC Outer Lid Edge**

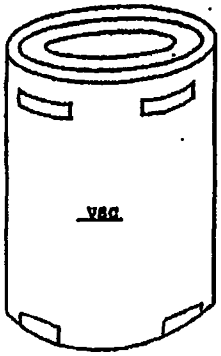
C N/A G
C N
C T

**Outlet #1**

C N/A G
C N
C T

**Outlet #2**

C N/A G
C N
C T



**Outlet #3**

C N/A G
C N
C T

**Outlet #4**

C N/A G
C N
C T

**Side 5' From Bottom**

**North**

C 1.5 G
C 0.2 N
C 1.7 T

**East**

C 1.5 G
C 0.2 N
C 1.7 T

**Side 5' From Bottom**

**South**

C 1 G
C 0.2 N
C 1.2 T

**West**

C 1.2 G
C 0.1 N
C 1.3 T

**Inlet #3**

C 4 G
C 0.3 N
C 4.3 T

**Inlet #4**

C 6 G
C 0.2 N
C 6.2 T

**Inlet #3**

C 6 G
C 0.2 N
C 6.2 T

**Inlet #4**

C 5 G
C 0.5 N
C 5.5 T

Dose received 2 mrem.

| Contamination in dpm / 100 cm² | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N/ |
| 2-A | /A |

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date 7/23/02<br>Time 1300 |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | |

☐ Smear ☐ Muslin ☐ Fixed N/A

☒ Gamma ☐ Beta ☒ Neutron

RWP Updated: Yes / [✓ No]

Meter Type / Serial #: ASP 1 - 3163

Meter Type / Serial #: R02 - 5159

Meter Type / Serial #: N/A

Status Sheet Updated: [✓ Yes] / No

Surveyed By / Recorded By: S Farnum / S. FARNUM

Reviewed By: J S Rainey

Date: 7-25-02

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

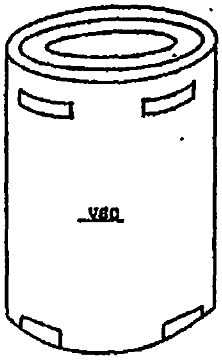
Comments: NONE

N = Neutron readings

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ______ Cask # 17

**VCC Lid Center**
C N/A G
C N/A N
C N/A T



**VCC Outer Lid Edge**
C N/A G
C N/A N
C N/A T

**Outlet #1**
C N/A G
C N/A N
C N/A T

**Outlet #2**
C N/A G
C N/A N
C N/A T

**Outlet #3**
C ______ G
C N/A N
C N/A T

**Outlet #4**
C ______ G
C N/A N
C N/A T

**Side 5' From Bottom**

**North**
C 1.4 G
C 0.1 N
C 1.5 T

**East**
C 1.2 G
C 0.1 N
C 1.3 T

**Side 5' From Bottom**

**South**
C 1 G
C <0.1 N
C 1 T

**West**
C 1 G
C 0.1 N
C 1.1 T

**Inlet #3**
C 5 G
C 0.2 N
C 5.2 T

**Inlet #4**
C 6 G
C 0.1 N
C 6.1 T

**Inlet #3**
C 6 G
C 0.5 N
C 6.5 T

**Inlet #4**
C 5 G
C 0.5 N
C 5.5 T

Dose received 2 mrem.

Contamination in dpm/100cm²

①
②
③
④
⑤
⑥
⑦
⑧ N
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑ A
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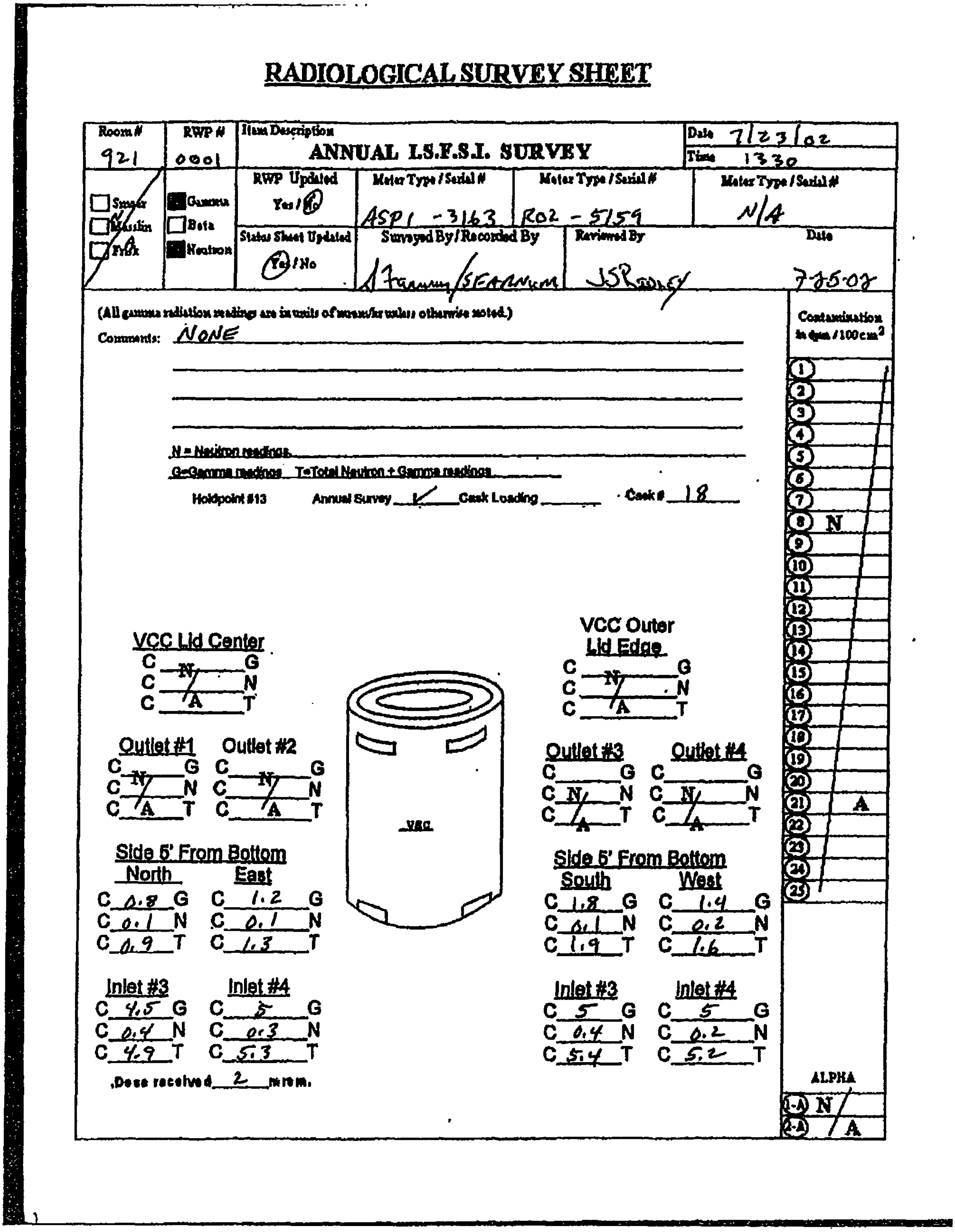
㉓
㉔
㉕

ALPHA

(1-A) N
(2-A) A



# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1330 |

☐ Smear<br>☐ Muslin<br>☐ Frisk<br>N/A

☒ Gamma<br>☐ Beta<br>☒ Neutron

| RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|
| Yes / [✓ No] | ASP1 - 3163 | R02 - 5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | S Fannum/SFANNUM | JSRidley | 7-25-02 |

(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 18

**VCC Lid Center**
C N/A G
C N
C T

**VCC Outer Lid Edge**
C N/A G
C N
C T

**Outlet #1**
C N/A G
C N
C T

**Outlet #2**
C N/A G
C N
C T

**Outlet #3**
C G
C N/A N
C T

**Outlet #4**
C G
C N/A N
C T

VSC

**Side 5' From Bottom**

**North**
C 0.8 G
C 0.1 N
C 0.9 T

**East**
C 1.2 G
C 0.1 N
C 1.3 T

**Side 5' From Bottom**

**South**
C 1.8 G
C 0.1 N
C 1.9 T

**West**
C 1.4 G
C 0.2 N
C 1.6 T

**Inlet #3**
C 4.5 G
C 0.4 N
C 4.9 T

**Inlet #4**
C 5 G
C 0.3 N
C 5.3 T

**Inlet #3**
C 5 G
C 0.4 N
C 5.4 T

**Inlet #4**
C 5 G
C 0.2 N
C 5.2 T

Dose received 2 mrem.

Contamination in dpm / 100cm²

①
②
③
④
⑤
⑥
⑦
⑧ N
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑ A
㉒
㉓
㉔
㉕

ALPHA

1-A N/
2-A /A

# RADIOLOGICAL SURVEY SHEET

| Room # | RWP # | Item Description | Date / Time |
|---|---|---|---|
| 921 | 0001 | ANNUAL I.S.F.S.I. SURVEY | Date 7/23/02<br>Time 1330 |

| | | RWP Updated | Meter Type / Serial # | Meter Type / Serial # | Meter Type / Serial # |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslin<br>☐ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Yes / [✓ No] | ASP 1 - 3163 | R02 - 5159 | N/A |

| Status Sheet Updated | Surveyed By / Recorded By | Reviewed By | Date |
|---|---|---|---|
| [✓ Yes] / No | /SFARNUM | JSRIDLEY | 7-26-02 |

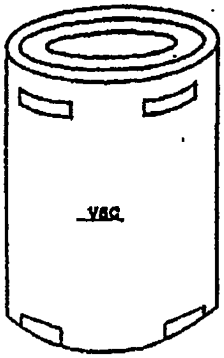
(All gamma radiation readings are in units of mrem/hr unless otherwise noted.)

Comments: NONE

N = Neutron readings.

G=Gamma readings T=Total Neutron + Gamma readings

Holdpoint #13 Annual Survey ✓ Cask Loading ____ Cask # 19



**VCC Lid Center**

C N/A G
C N/A N
C N/A T

**VCC Outer Lid Edge**

C N/A G
C N/A N
C N/A T

**Outlet #1**

C N/A G
C N/A N
C N/A T

**Outlet #2**

C N/A G
C N/A N
C N/A T

**Outlet #3**

C ____ G
C N/A N
C N/A T

**Outlet #4**

C ____ G
C N/A N
C N/A T

**Side 5' From Bottom**

**North**

C 0.8 G
C 0.2 N
C 1.0 T

**East**

C 1.4 G
C 0.1 N
C 1.5 T

**Side 5' From Bottom**

**South**

C 1.6 G
C 0.3 N
C 1.9 T

**West**

C 1 G
C 0.1 N
C 1.1 T

**Inlet #3**

C 4 G
C 0.2 N
C 4.2 T

**Inlet #4**

C 5 G
C 0.3 N
C 5.3 T

**Inlet #3**

C 5 G
C 0.3 N
C 5.3 T

**Inlet #4**

C 5 G
C 0.3 N
C 5.3 T

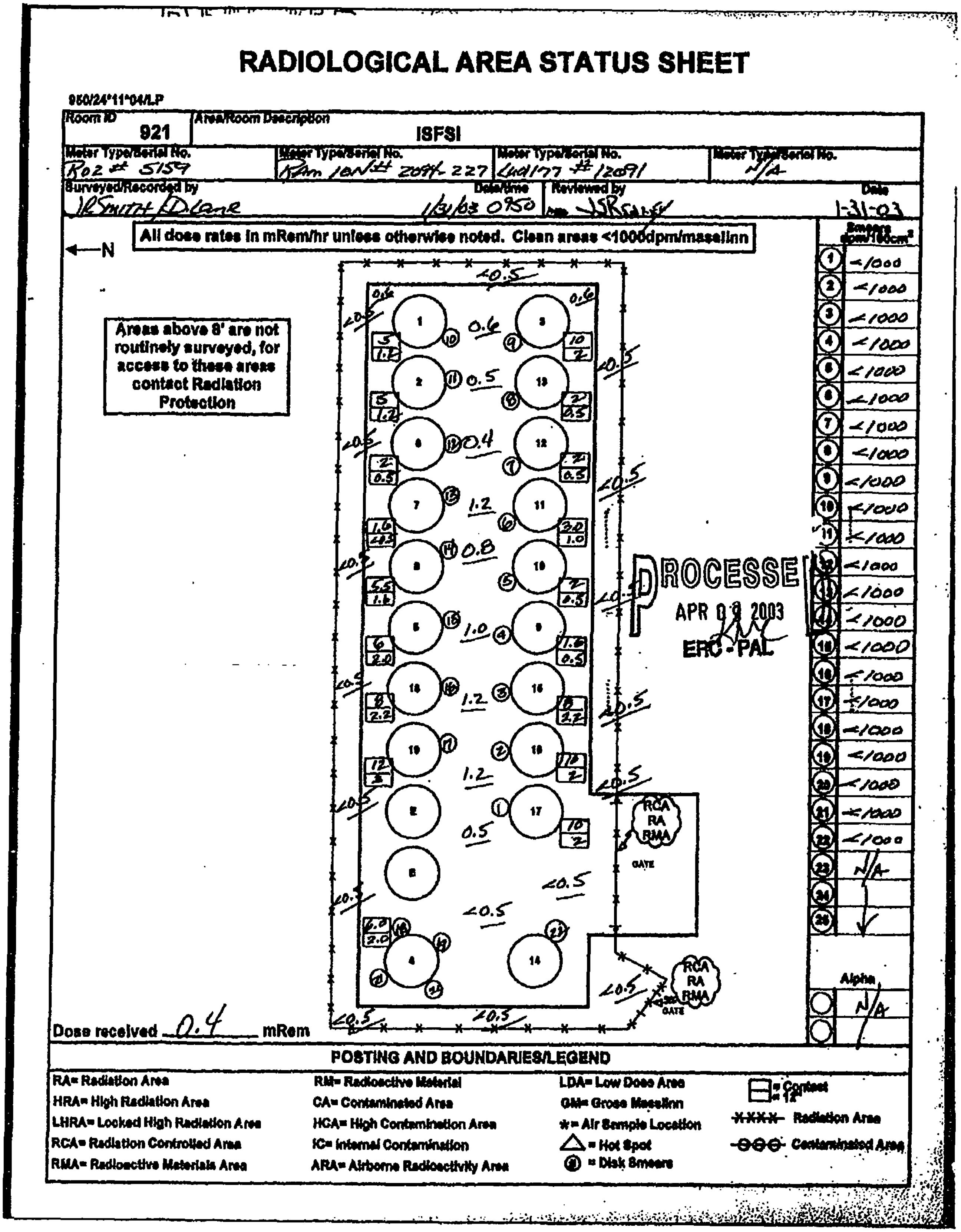
Dose received 2 mrem.

Contamination in dpm / 100cm²

| | |
|---|---|
| ① | |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | A |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | |

ALPHA

| | |
|---|---|
| 1-A | N/ |
| 2-A | /A |



## RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| | | | |
|---|---|---|---|
| Room ID<br>921 | Area/Room Description<br>ISFSI | | |
| Meter Type/Serial No.<br>Ro2 # 5159 | Meter Type/Serial No.<br>Ram ION # 2094 227 | Meter Type/Serial No.<br>Lud177 # 12091 | Meter Type/Serial No.<br>N/A |
| Surveyed/Recorded by<br>JRSmith / D Lane | Date/time<br>1/31/03 0950 | Reviewed by<br>JSR | Date<br>1-31-03 |

All dose rates in mRem/hr unless otherwise noted. Clean areas <1000dpm/masslinn

Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

| Smears dpm/100cm² | |
|---|---|
| ① | <1000 |
| ② | <1000 |
| ③ | <1000 |
| ④ | <1000 |
| ⑤ | <1000 |
| ⑥ | <1000 |
| ⑦ | <1000 |
| ⑧ | <1000 |
| ⑨ | <1000 |
| ⑩ | <1000 |
| ⑪ | <1000 |
| ⑫ | <1000 |
| ⑬ | <1000 |
| ⑭ | <1000 |
| ⑮ | <1000 |
| ⑯ | <1000 |
| ⑰ | <1000 |
| ⑱ | <1000 |
| ⑲ | <1000 |
| ⑳ | <1000 |
| ㉑ | <1000 |
| ㉒ | <1000 |
| ㉓ | N/A |
| ㉔ | |
| ㉕ | |
| Alpha | |
| ○ | N/A |
| ○ | |

Dose received 0.4 mRem

### POSTING AND BOUNDARIES/LEGEND

| | | | |
|---|---|---|---|
| RA= Radiation Area | RM= Radioactive Material | LDA= Low Dose Area | ⊟ = Contact<br>= 12" |
| HRA= High Radiation Area | CA= Contaminated Area | GM= Gross Masslinn | -X-X-X- Radiation Area |
| LHRA= Locked High Radiation Area | HCA= High Contamination Area | ☀= Air Sample Location | -⊖⊖⊖- Contaminated Area |
| RCA= Radiation Controlled Area | IC= Internal Contamination | △ = Hot Spot | |
| RMA= Radioactive Materials Area | ARA= Airborne Radioactivity Area | ⓢ = Disk Smears | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

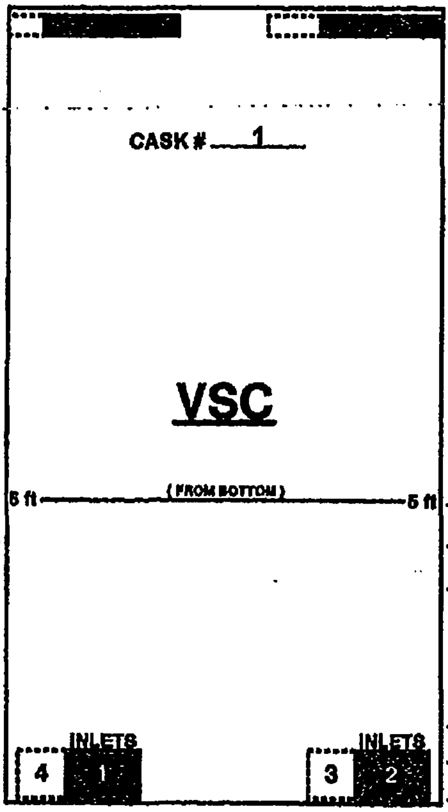
| | | | | | |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslinn<br>☒ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Status Sheet/RWP Updated<br>Yes [✓ No] | Meter Type/Serial No.<br>RO-2 #5159 | Meter Type/Serial No.<br>ASP-1 #2574 | Meter Type/Serial No.<br>N/A |
| | | Surveyed/Recorded by<br>JUBAL COLLINS / Jubal Collins | | Reviewed by | Date<br>8-6-03 |

**Note: All Dose Rates in mRem/hr unless otherwise noted**

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.8 | 0.6 | Gamma | 1.0 | 0.6 | Gamma |
| 0.1 | 0.1 | Neutron | 0.2 | 0.2 | Neutron |
| 0.9 | 0.7 | Total | 1.2 | 0.8 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 5 | 5 | Gamma | 6 | 5 | Gamma |
| 0.4 | 0.4 | Neutron | 0.4 | 0.4 | Neutron |

| Smears dpm/100 cm$^2$ | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm$^2$ | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

| | | Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslinn<br>☐ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: J Bradley

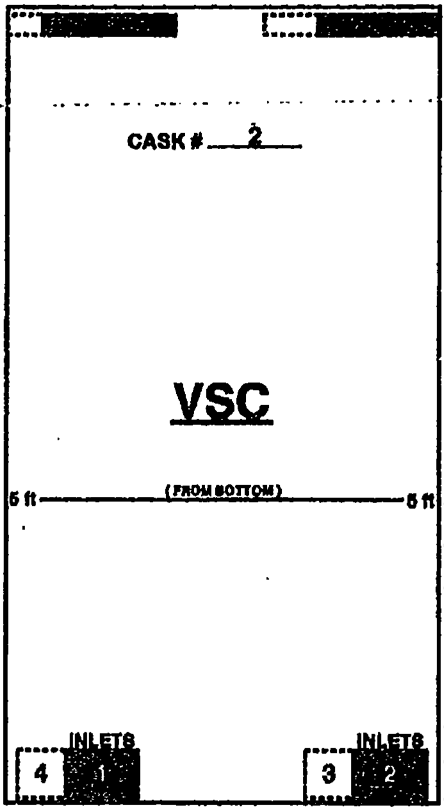
Date: 8-6-03

**Note: All Dose Rates in mRem/hr unless otherwise noted**

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



| North | West | |
|---|---|---|
| 0.8 | 0.6 | Gamma |
| 0.1 | <0.1 | Neutron |
| 0.9 | 0.6 | Total |

| South | East | |
|---|---|---|
| 0.8 | 0.8 | Gamma |
| 0.1 | 0.1 | Neutron |
| 0.9 | 0.9 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 5 | 4.8 | Gamma |
| 0.3 | 0.3 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 4.8 | 5 | Gamma |
| 0.2 | 0.4 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☑ Frisk N/A

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by:

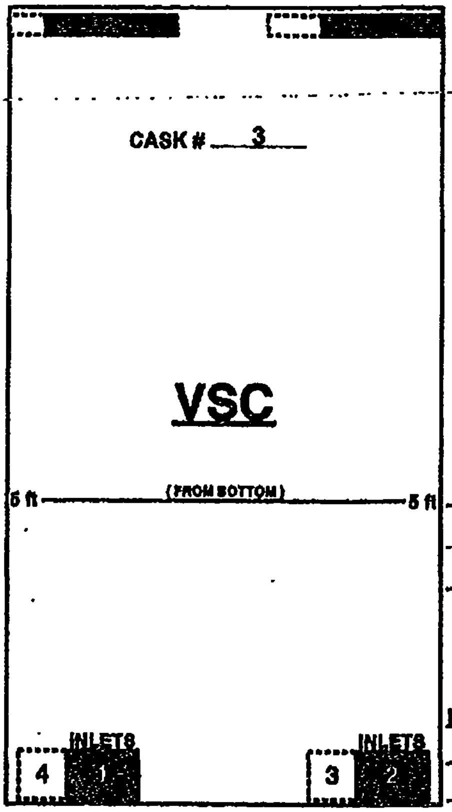
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes Inlets located on oppisite side of VSC



| North | West | |
|---|---|---|
| 1.2 | 0.6 | Gamma |
| 0.1 | 0.1 | Neutron |
| 1.3 | 0.7 | Total |

| South | East | |
|---|---|---|
| 0.6 | 0.5 | Gamma |
| 0.1 | 0.1 | Neutron |
| 0.7 | 0.6 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 5 | 8 | Gamma |
| 0.3 | 0.4 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 5 | 6 | Gamma |
| 0.5 | 0.4 | Neutron |

Smears dpm/100 cm²

| | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

Masslinn Wipe dpm/Masslinn

| | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

Alpha Smear dpm/100 cm²

| | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear N/A
☐ Masslinn
☑ Frisk

☒ Gamma
☐ Beta
☒ Neutron

| Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|
| Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: J Rasley

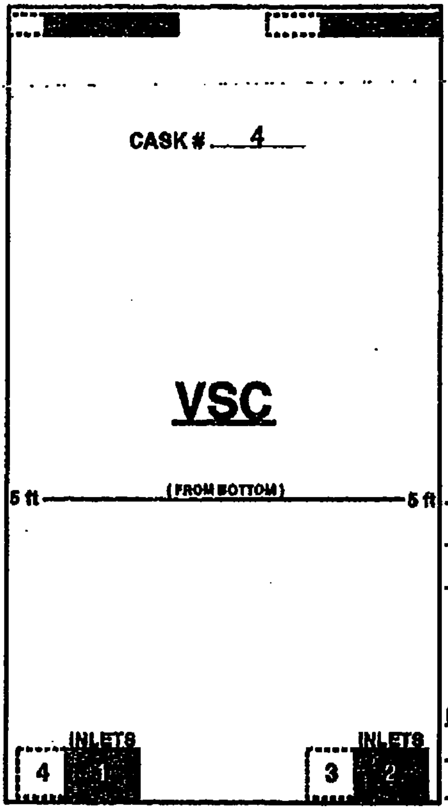
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.5 | 0.4 | Gamma | 0.6 | 0.5 | Gamma |
| 0.1 | 0.1 | Neutron | <0.1 | 0.1 | Neutron |
| 0.6 | 0.5 | Total | 0.6 | 0.6 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 4.8 | 5 | Gamma | 4.2 | 4 | Gamma |
| 0.6 | 0.7 | Neutron | 0.7 | 0.7 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

N/A: ☐ Smear ☐ Masslinn ☐ Frisk

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS

Reviewed by: JSRadley

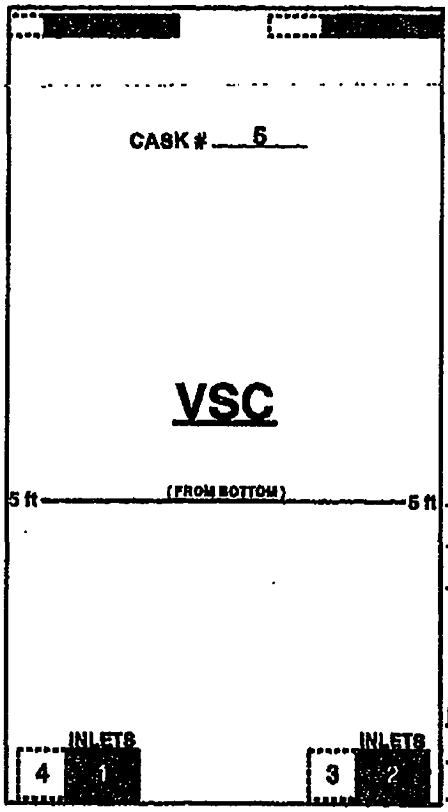
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------- = Denotes inlets located on oppisite side of VSC



| North | West | |
|---|---|---|
| 0.4 | 0.8 | Gamma |
| <0.1 | 0.1 | Neutron |
| 0.4 | 0.9 | Total |

| South | East | |
|---|---|---|
| 0.8 | 0.5 | Gamma |
| 0.1 | 0.1 | Neutron |
| 0.9 | 0.6 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 4.8 | 4.4 | Gamma |
| 0.4 | 0.2 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 5 | 3.8 | Gamma |
| 0.4 | 0.3 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear
☐ Masslinn
☐ Frisk
N/A

☒ Gamma
☐ Beta
☒ Neutron

| Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|
| Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

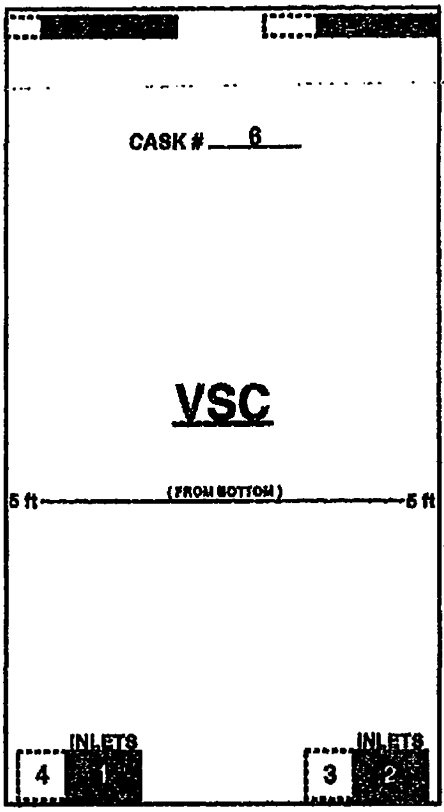
Surveyed/Recorded by: JUBAL COLLINS /
Reviewed by:
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



| North | West | |
|---|---|---|
| 0.2 | 0.2 | Gamma |
| <0.1 | <0.1 | Neutron |
| 0.2 | 0.2 | Total |

| South | East | |
|---|---|---|
| 0.3 | 0.3 | Gamma |
| 0.1 | 0.1 | Neutron |
| 0.4 | 0.4 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 1.8 | 1.4 | Gamma |
| 0.4 | 0.4 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 1.2 | 2.2 | Gamma |
| 0.4 | 0.2 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

| | | Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslinn<br>☑ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

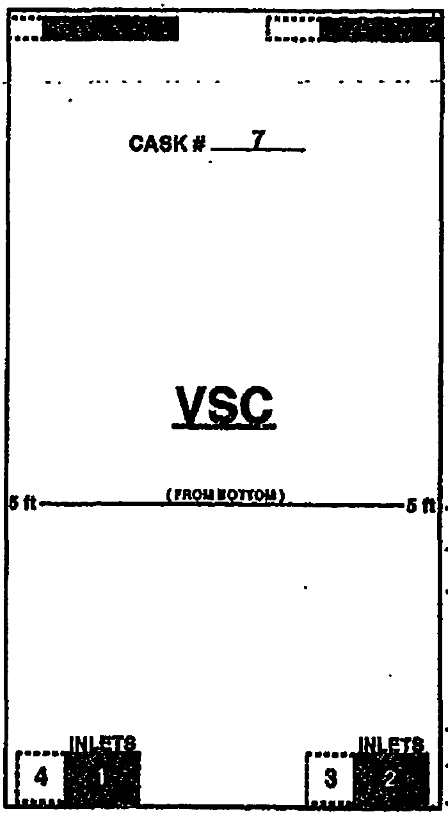
| Surveyed/Recorded by | Reviewed by | Date |
|---|---|---|
| JUBAL COLLINS / Jubal Collins | JSKelley | 8-6-03 |

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.2 | 0.3 | Gamma | 0.3 | 0.2 | Gamma |
| <0.1 | <0.1 | Neutron | 0.1 | <0.1 | Neutron |
| 0.2 | 0.3 | Total | 0.4 | 0.2 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 1.4 | 1.2 | Gamma | 1.5 | 1.2 | Gamma |
| 0.2 | 0.3 | Neutron | 0.2 | 0.2 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
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| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| | | | |
|---|---|---|---|
| Room ID<br>921 | RWP#<br>2003-0001 | Item Description<br>VENTILATED STORAGE CASK, ANNUAL SURVEY | Date/Time<br>8-6-2003 / 10:40 |

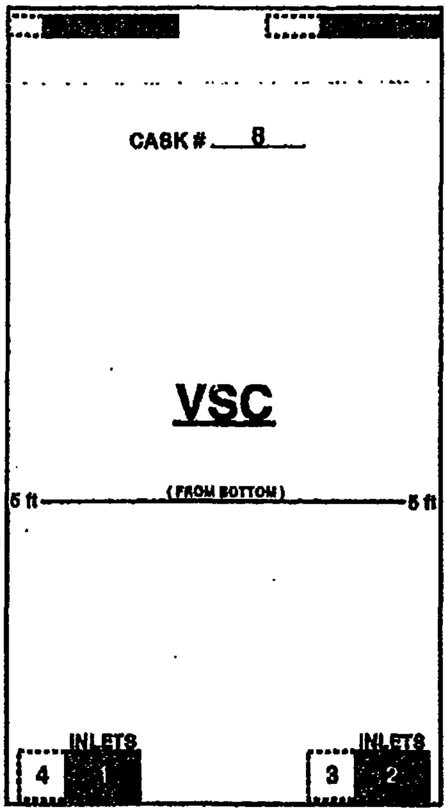
| | | | | | |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslinn<br>☑ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Status Sheet/RWP Updated<br>Yes / [✓ No] | Meter Type/Serial No.<br>RO-2 #5159 | Meter Type/Serial No.<br>ASP-1 #2574 | Meter Type/Serial No.<br>N/A |
| | | Surveyed/Recorded by<br>JUBAL COLLINS / Jubal Collins | Reviewed by | | Date<br>8-6-03 |

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



CASK # 8

| North | West | |
|---|---|---|
| 0.4 | 0.5 | Gamma |
| <0.1 | <0.1 | Neutron |
| 0.4 | 0.5 | Total |

| South | East | |
|---|---|---|
| 0.4 | 0.4 | Gamma |
| 0.1 | <0.1 | Neutron |
| 0.5 | 0.4 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 3.2 | 4.4 | Gamma |
| 0.3 | 0.4 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 3.5 | 5 | Gamma |
| 0.4 | 0.4 | Neutron |

| Smears dpm/100 cm$^2$ | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm$^2$ | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear N
☐ Masslinn A
☑ Frisk

☒ Gamma
☐ Beta
☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: JSRowly

Date: 8-6-03

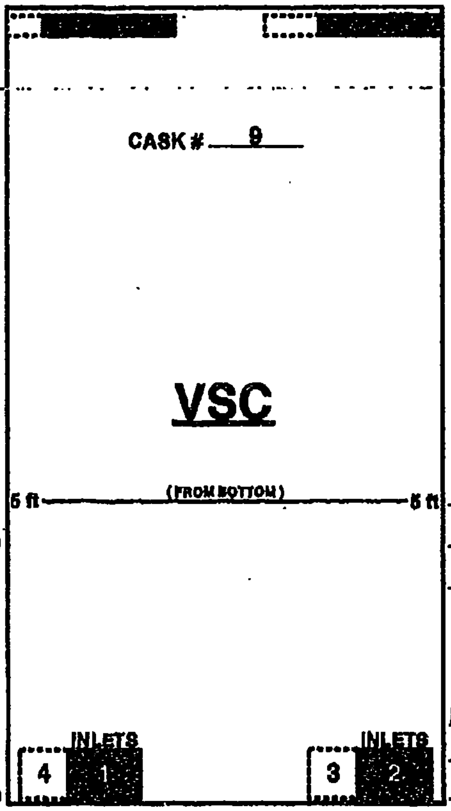
Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC

CASK # 9



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.6 | 0.2 | Gamma | 0.2 | 0.6 | Gamma |
| <0.1 | <0.1 | Neutron | <0.1 | 0.1 | Neutron |
| 0.6 | 0.2 | Total | 0.2 | 0.8 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 1.4 | 1.4 | Gamma | 1.2 | 1.5 | Gamma |
| 0.4 | 0.5 | Neutron | 0.4 | 0.4 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear
☐ Masslinn
☐ Frisk
N/A

☒ Gamma
☐ Beta
☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

| Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|
| RO-2 #5159 | ASP-1 #2574 | N/A |

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by:

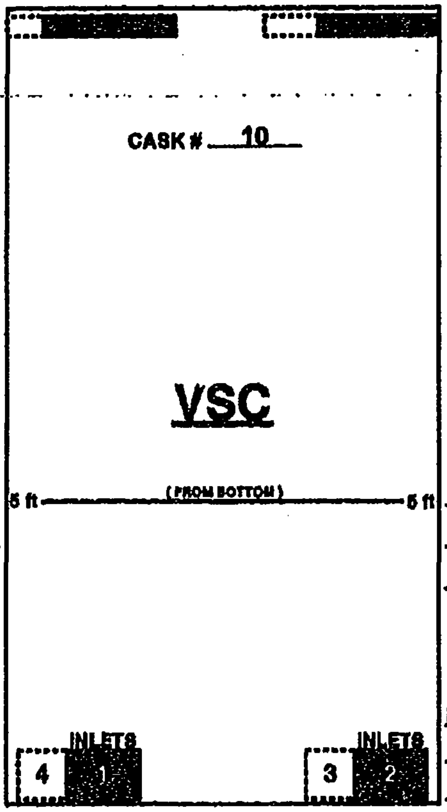
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



CASK # 10

| North | West | |
|---|---|---|
| 0.4 | 0.2 | Gamma |
| 0.1 | 0.1 | Neutron |
| 0.5 | 0.3 | Total |

| South | East | |
|---|---|---|
| 0.2 | 0.2 | Gamma |
| <0.1 | 0.1 | Neutron |
| 0.2 | 0.3 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 1.8 | 1.6 | Gamma |
| 0.4 | 0.4 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 1.5 | 1.8 | Gamma |
| 0.4 | 0.4 | Neutron |

| | Smears dpm/100 cm² |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| | Masslinn Wipe dpm/Masslinn |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| | Alpha Smear dpm/100 cm² |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | | Date/Time |
|---|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | | 8-6-2003 / 10:40 |

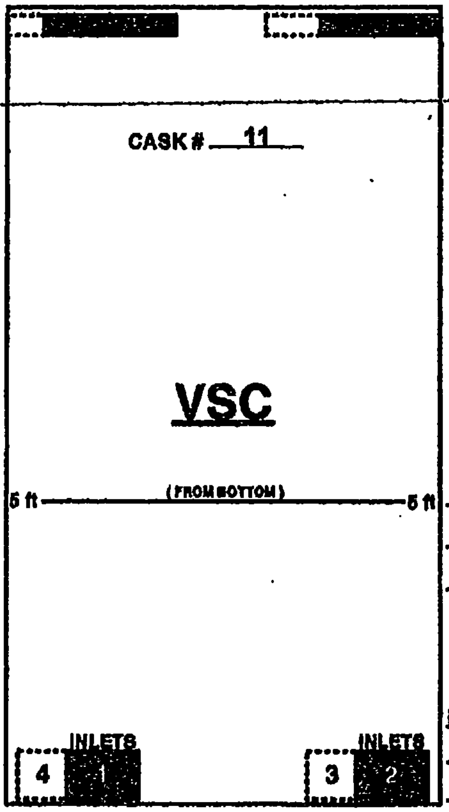
| | | Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|---|---|
| ☐ Smear<br>☐ Masslinn<br>☐ Frisk<br>N/A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |
| | | Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins | | Reviewed by: JSRiley | Date: 8-6-03 |

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.4 | 0.2 | Gamma | 0.2 | 0.2 | Gamma |
| 0.1 | 0.1 | Neutron | <0.1 | <0.1 | Neutron |
| 0.5 | 0.3 | Total | 0.2 | 0.2 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 1.8 | 1.6 | Gamma | 1.6 | 1.5 | Gamma |
| 0.4 | 0.4 | Neutron | 0.3 | 0.4 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☐ Frisk — N/A

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS /

Reviewed by:

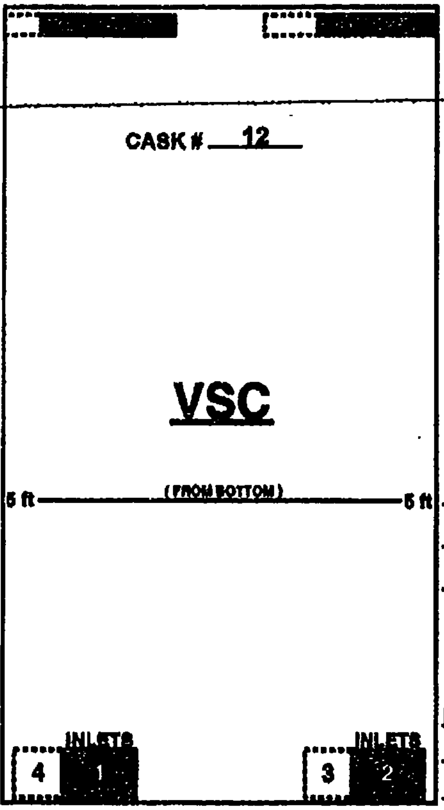
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



CASK # 12

| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.4 | 0.2 | Gamma | 0.2 | 0.4 | Gamma |
| 0.1 | <0.1 | Neutron | <0.1 | <0.1 | Neutron |
| 0.5 | 0.2 | Total | 0.2 | 0.4 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 1.0 | 1.2 | Gamma | 1.4 | 1.2 | Gamma |
| 0.3 | 0.3 | Neutron | 0.3 | 0.4 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

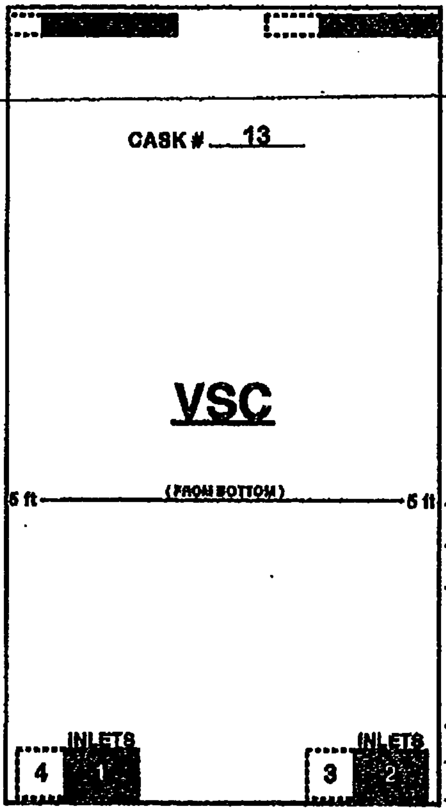
| Room ID | RWP# | Item Description | | Date/Time |
|---|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | | 8-6-2003 / 10:40 |
| ☐ Smear<br>☐ Masslinn<br>☐ Frisk<br>N A | ☒ Gamma<br>☐ Beta<br>☒ Neutron | Status Sheet/RWP Updated<br>Yes [✓ No] | Meter Type/Serial No.<br>RO-2 #5159 | Meter Type/Serial No.<br>ASP-1 #2574 |
| | | Surveyed/Recorded by<br>JUBAL COLLINS / | Reviewed by | Meter Type/Serial No.<br>N/A<br>Date<br>8-6-03 |

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.5 | 0.3 | Gamma | 0.2 | 0.5 | Gamma |
| <0.1 | 0.1 | Neutron | <0.1 | <0.1 | Neutron |
| 0.5 | 0.4 | Total | 0.2 | 0.5 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 1.6 | 1.6 | Gamma | 1.6 | 1.4 | Gamma |
| 0.4 | 0.4 | Neutron | 0.3 | 0.4 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☑ Frisk N/A

☒ Gamma ☐ Beta ☒ Neutron

| Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|
| Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

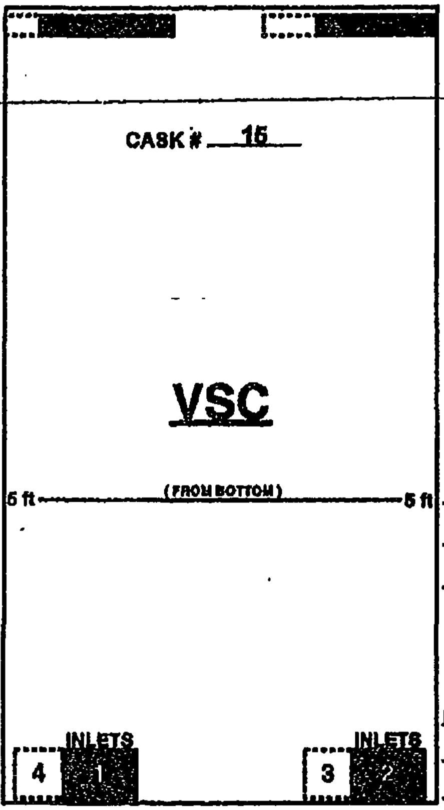
| Surveyed/Recorded by | Reviewed by | Date |
|---|---|---|
| JUBAL COLLINS / Jubal Collins | | 8-6-03 |

*Note: All Dose Rates in mRem/hr unless otherwise noted*

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



| North | West | |
|---|---|---|
| 2 | 1.2 | Gamma |
| 0.1 | 0.1 | Neutron |
| 2.1 | 1.3 | Total |

| South | East | |
|---|---|---|
| 1.2 | 1.6 | Gamma |
| 0.1 | 0.2 | Neutron |
| 1.3 | 1.8 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 8 | 6 | Gamma |
| 0.5 | 0.7 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 6 | 8 | Gamma |
| 0.7 | 0.5 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
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| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☑ Frisk N A

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: J Strunk

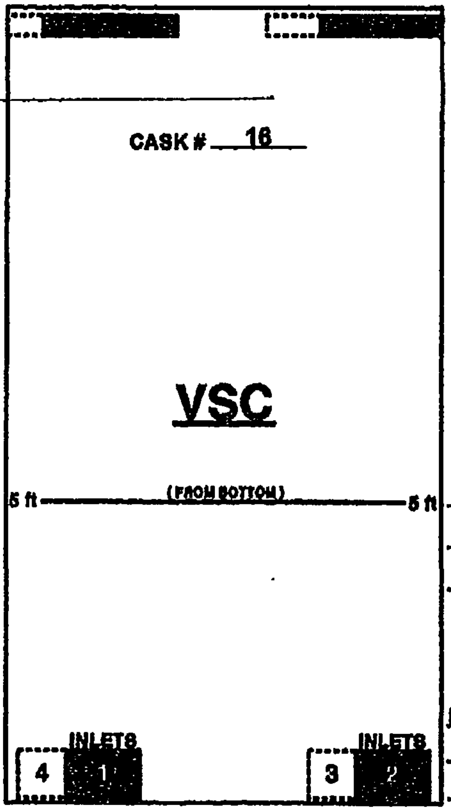
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on opposite side of VSC



CASK # 16

| North | West | |
|---|---|---|
| 1.8 | 1.6 | Gamma |
| 0.2 | 0.1 | Neutron |
| 2.0 | 1.7 | Total |

| South | East | |
|---|---|---|
| 1.2 | 1.4 | Gamma |
| 0.2 | 0.2 | Neutron |
| 1.4 | 1.6 | Total |

| Inlet #1 | Inlet #2 | |
|---|---|---|
| 6 | 6 | Gamma |
| 1.4 | 1.4 | Neutron |

| Inlet #3 | Inlet #4 | |
|---|---|---|
| 6 | 8 | Gamma |
| 1.4 | 1.2 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☑ Frisk N/A

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: JSRoy

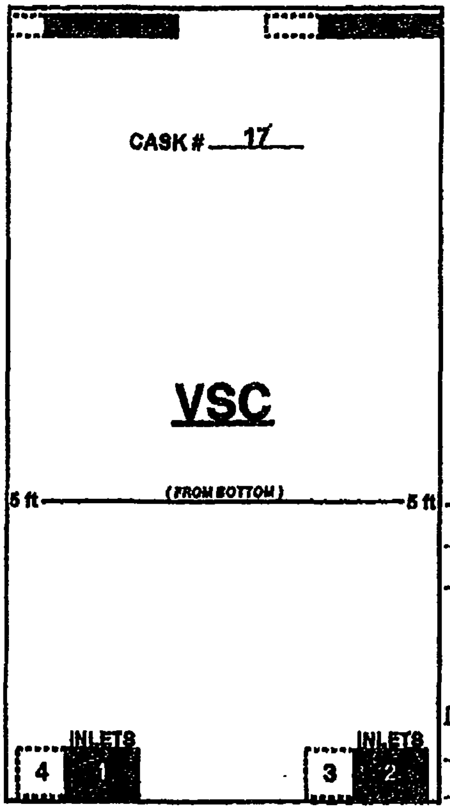
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



CASK # 17

| North | West | | South | East | |
|---|---|---|---|---|---|
| 1.2 | 1.5 | Gamma | 1.4 | 1.2 | Gamma |
| 0.2 | 0.2 | Neutron | 0.1 | 0.2 | Neutron |
| 1.4 | 1.7 | Total | 1.5 | 1.4 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 6 | 5 | Gamma | 6 | 6 | Gamma |
| 0.8 | 0.9 | Neutron | 1.2 | 0.9 | Neutron |

Smears dpm/100 cm²

| | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
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| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

Masslinn Wipe dpm/Masslinn

| | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

Alpha Smear dpm/100 cm²

| | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

☐ Smear ☐ Masslinn ☒ Frisk N/A

☒ Gamma ☐ Beta ☒ Neutron

Status Sheet/RWP Updated: Yes [✓ No]

Meter Type/Serial No.: RO-2 #5159

Meter Type/Serial No.: ASP-1 #2574

Meter Type/Serial No.: N/A

Surveyed/Recorded by: JUBAL COLLINS / Jubal Collins

Reviewed by: JSBoley

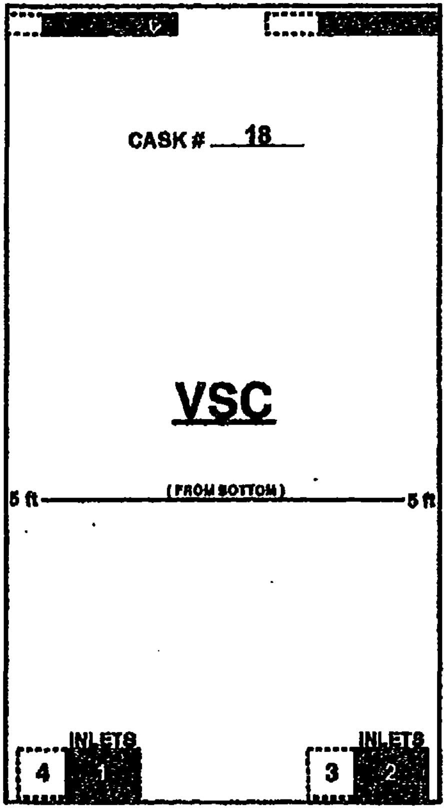
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



CASK # 18

| North | West | | South | East | |
|---|---|---|---|---|---|
| 1.0 | 1.6 | Gamma | 1.6 | 1.0 | Gamma |
| <0.1 | 0.1 | Neutron | 0.1 | 0.1 | Neutron |
| 1.0 | 1.6 | Total | 1.7 | 1.1 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 6 | 8 | Gamma | 8 | 8 | Gamma |
| 0.5 | 0.6 | Neutron | 0.5 | 0.5 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
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| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N/A |
| ○ | |

# RADIOLOGICAL SURVEY SHEET

| Room ID | RWP# | Item Description | Date/Time |
|---|---|---|---|
| 921 | 2003-0001 | VENTILATED STORAGE CASK, ANNUAL SURVEY | 8-6-2003 / 10:40 |

N/A: ☐ Smear ☐ Masslinn ☑ Frisk

☒ Gamma ☐ Beta ☒ Neutron

| Status Sheet/RWP Updated | Meter Type/Serial No. | Meter Type/Serial No. | Meter Type/Serial No. |
|---|---|---|---|
| Yes [✓ No] | RO-2 #5159 | ASP-1 #2574 | N/A |

Surveyed/Recorded by: JUBAL COLLINS /

Reviewed by:

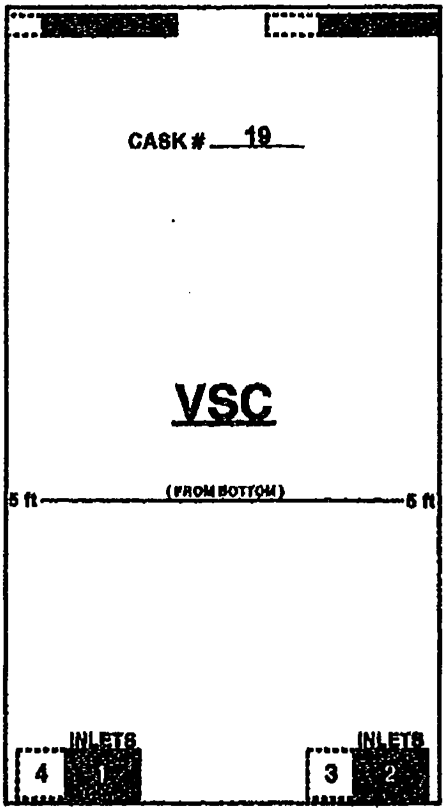
Date: 8-6-03

Note: All Dose Rates in mRem/hr unless otherwise noted

Comments:

All dose rates are on contact

------ =Denotes inlets located on oppisite side of VSC



| North | West | | South | East | |
|---|---|---|---|---|---|
| 0.8 | 1.0 | Gamma | 1.8 | 1.4 | Gamma |
| 0.1 | 0.2 | Neutron | 0.2 | 0.2 | Neutron |
| 0.9 | 1.2 | Total | 2 | 1.6 | Total |

| Inlet #1 | Inlet #2 | | Inlet #3 | Inlet #4 | |
|---|---|---|---|---|---|
| 6 | 8 | Gamma | 8 | 8 | Gamma |
| 0.5 | 0.3 | Neutron | 0.5 | 0.5 | Neutron |

| Smears dpm/100 cm² | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | N/A |

| Masslinn Wipe dpm/Masslinn | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | N/A |

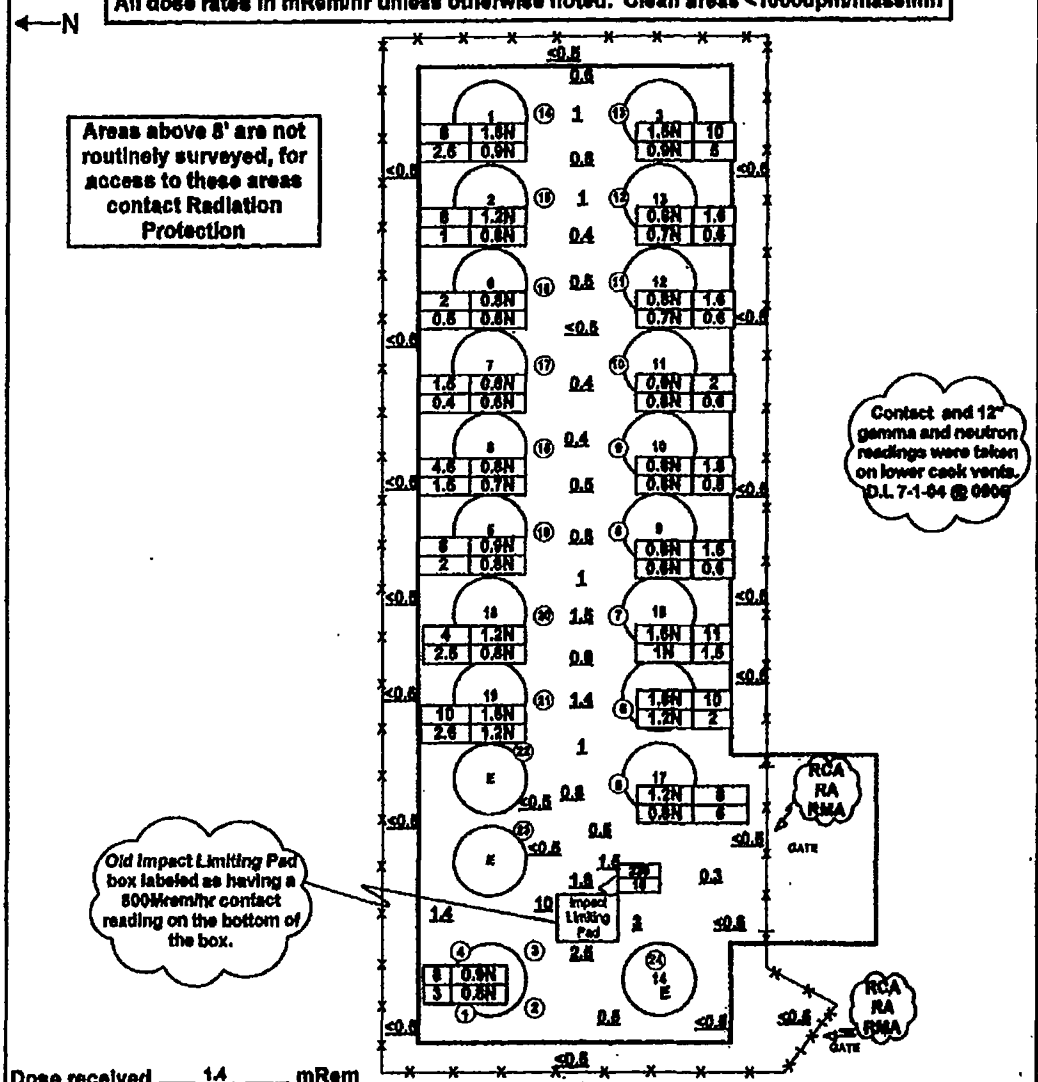
| Alpha Smear dpm/100 cm² | |
|---|---|
| ○ | N |
| ○ | A |

# RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| | | | |
|---|---|---|---|
| Room ID<br>921 | Area/Room Description<br>ISFSI | | |
| Meter Type/Serial No.<br>RO-2 #5159 | Meter Type/Serial No.<br>Lud-177 #12091 | Meter Type/Serial No.<br>ASP-1 #2574 | Meter Type/Serial No.<br>Lud-2929 #146792 |
| Surveyed/Recorded by<br>D. Lane, V. Maya/ D.Lane | Date/time<br>7-1-04/0905 | Reviewed by<br>JK | Date<br>7-2-04 |

All dose rates in mRem/hr unless otherwise noted. Clean areas <1000dpm/masslinn



Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Contact and 12" gamma and neutron readings were taken on lower cask vents. D.L. 7-1-04 @ 0900

Old Impact Limiting Pad box labeled as having a 800Mrem/hr contact reading on the bottom of the box.

| Smears dpm/100cm² | |
|---|---|
| ① | <1K |
| ② | <1K |
| ③ | <1K |
| ④ | <1K |
| ⑤ | <1K |
| ⑥ | <1K |
| ⑦ | <1K |
| ⑧ | <1K |
| ⑨ | <1K |
| ⑩ | <1K |
| ⑪ | <1K |
| ⑫ | <1K |
| ⑬ | <1K |
| ⑭ | <1K |
| ⑮ | <1K |
| ⑯ | <1K |
| ⑰ | <1K |
| ⑱ | <1K |
| ⑲ | <1K |
| ⑳ | <1K |
| ㉑ | <1K |
| ㉒ | <1K |
| ㉓ | <1K |
| ㉔ | <1K |
| ㉕ | N/A |
| Alpha | |
| ① | <20 |
| ② | <20 |

Dose received 1.4 mRem

## POSTING AND BOUNDARIES/LEGEND

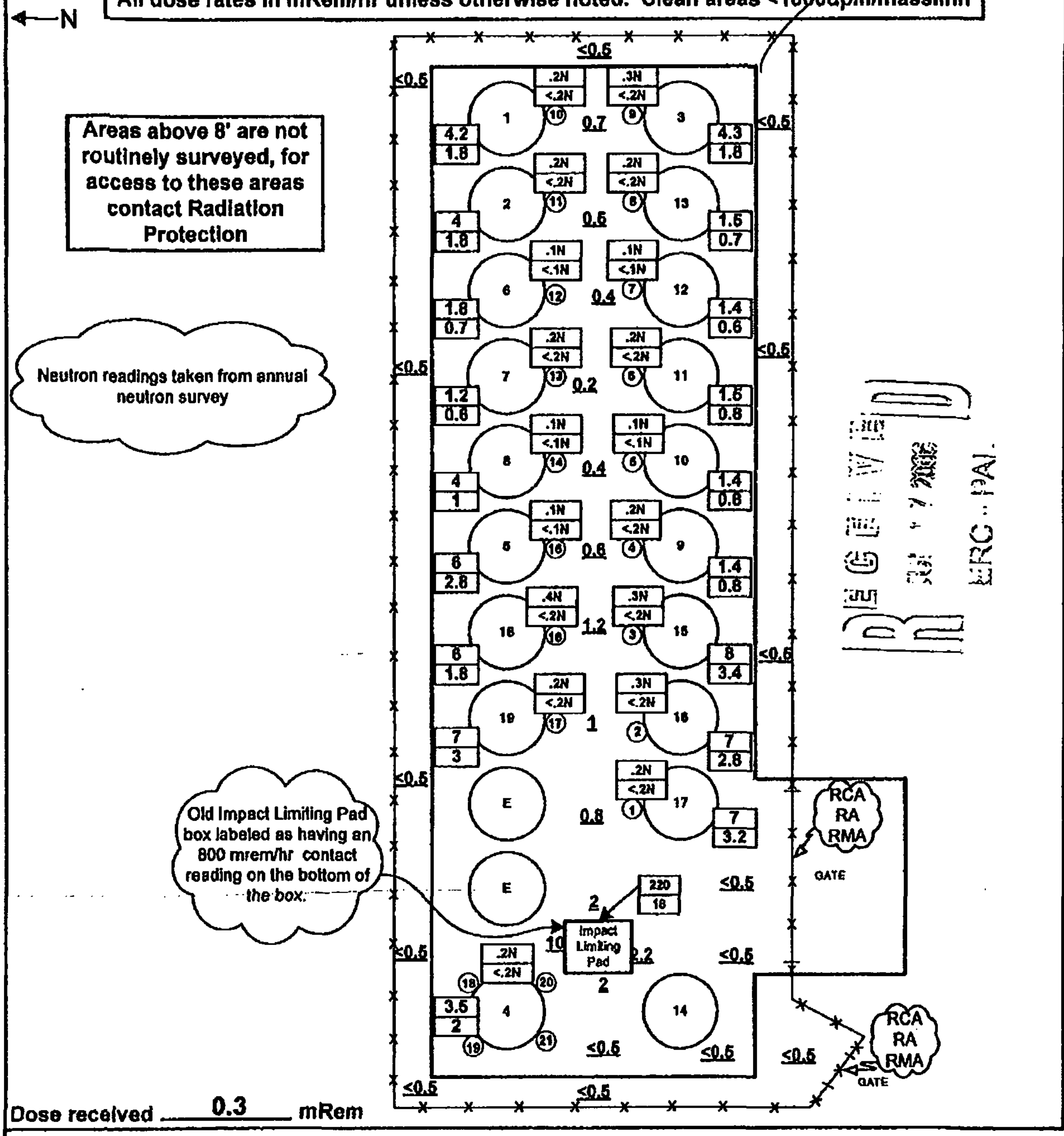
| | | | |
|---|---|---|---|
| RA= Radiation Area | RM= Radioactive Material | LDA= Low Dose Area | ⊟ = Contact / = 12" |
| HRA= High Radiation Area | CA= Contaminated Area | GM= Gross Masslinn | -X-X-X- Radiation Area |
| LHRA= Locked High Radiation Area | HCA= High Contamination Area | ✲= Air Sample Location | |
| RCA= Radiation Controlled Area | IC= Internal Contamination | △= Hot Spot | -⊖⊖⊖- Contaminated Area |
| RMA= Radioactive Materials Area | ARA= Airborne Radioactivity Area | ⓧ = Disk Smears | E = Empty |

# RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| | | | |
|---|---|---|---|
| Room ID<br>921 | Area/Room Description<br>**ISFSI North** | | |
| Meter Type/Serial No.<br>RO-2 #5159 | Meter Type/Serial No.<br>LUD-177 #189637 | Meter Type/Serial No.<br>N/A | Meter Type/Serial No.<br>N/A |
| Surveyed/Recorded by<br>Jim Slattery | Date/time<br>12/27/2005 0850 | Reviewed by | Date<br>12-28-05 |

**All dose rates in mRem/hr unless otherwise noted. Clean areas <1000dpm/masslinn**



Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Neutron readings taken from annual neutron survey

Old Impact Limiting Pad box labeled as having an 800 mrem/hr contact reading on the bottom of the box.

Dose received 0.3 mRem

| Smears dpm/100cm² | |
|---|---|
| ① | <1K |
| ② | <1K |
| ③ | <1K |
| ④ | <1K |
| ⑤ | <1K |
| ⑥ | <1K |
| ⑦ | <1K |
| ⑧ | <1K |
| ⑨ | <1K |
| ⑩ | <1K |
| ⑪ | <1K |
| ⑫ | <1K |
| ⑬ | <1K |
| ⑭ | <1K |
| ⑮ | <1K |
| ⑯ | <1K |
| ⑰ | <1K |
| ⑱ | <1K |
| ⑲ | <1K |
| ⑳ | <1K |
| ㉑ | <1K |
| ㉒ | N/A |
| ㉓ | |
| ㉔ | |
| ㉕ | N/A |
| Alpha | |
| ○ | N |
| ○ | A |

## POSTING AND BOUNDARIES/LEGEND

RA= Radiation Area
HRA= High Radiation Area
LHRA= Locked High Radiation Area
RCA= Radiation Controlled Area
RMA= Radioactive Materials Area

RM= Radioactive Material
CA= Contaminated Area
HCA= High Contamination Area
IC= Internal Contamination
ARA= Airborne Radioactivity Area

LDA= Low Dose Area
GM= Gross Masslinn
*= Air Sample Location
△ = Hot Spot
\# = Disk Smears

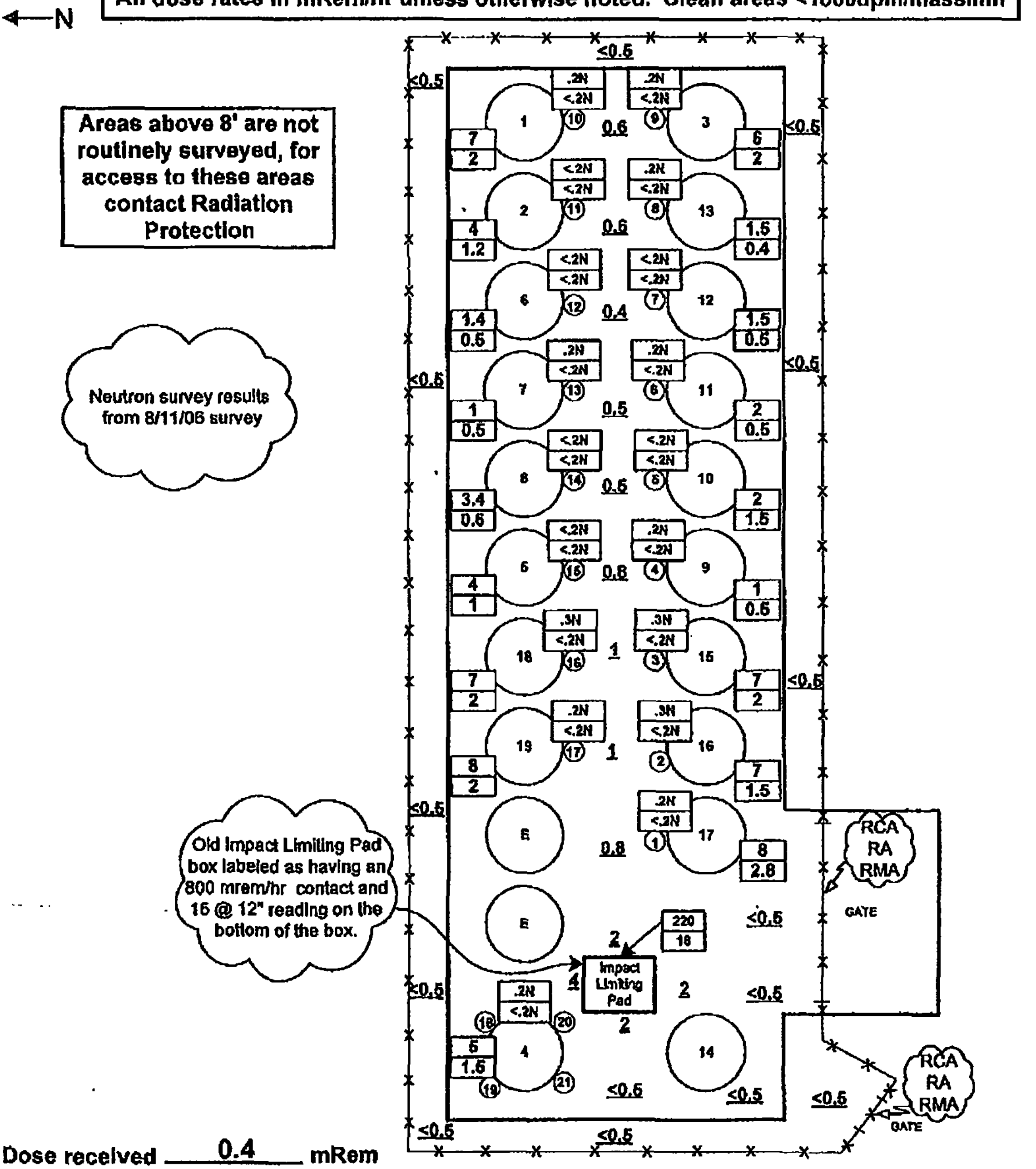
□ = Contact
□ = 12"
-X-X-X- Radiation Area
-O-O-O- Contaminated Area

# RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| | | | |
|---|---|---|---|
| Room ID<br>921 | Area/Room Description<br>ISFSI North | | |
| Meter Type/Serial No.<br>RO-2 #2325 | Meter Type/Serial No.<br>ASP-1 #2573 | Meter Type/Serial No.<br>Lud 177 #13013 | Meter Type/Serial No.<br>N/A |
| Surveyed/Recorded by<br>LDDine | Date/time<br>11-15-06/1130 | Reviewed by<br>Cal L Mud | Date<br>11-17-06 |

**All dose rates in mRem/hr unless otherwise noted. Clean areas <1000dpm/masslinn**



Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Neutron survey results from 8/11/06 survey

Old Impact Limiting Pad box labeled as having an 800 mrem/hr contact and 15 @ 12" reading on the bottom of the box.

Dose received 0.4 mRem

| Smears dpm/100cm² | |
|---|---|
| ① | <1K |
| ② | <1K |
| ③ | <1K |
| ④ | <1K |
| ⑤ | <1K |
| ⑥ | <1K |
| ⑦ | <1K |
| ⑧ | <1K |
| ⑨ | <1K |
| ⑩ | <1K |
| ⑪ | <1K |
| ⑫ | <1K |
| ⑬ | <1K |
| ⑭ | <1K |
| ⑮ | <1K |
| ⑯ | <1K |
| ⑰ | <1K |
| ⑱ | <1K |
| ⑲ | <1K |
| ⑳ | <1K |
| ㉑ | <1K |
| ㉒ | N/A |
| ㉓ | |
| ㉔ | |
| ㉕ | N/A |

| Alpha | |
|---|---|
| ○ | N |
| ○ | A |

## POSTING AND BOUNDARIES/LEGEND

RA= Radiation Area
HRA= High Radiation Area
LHRA= Locked High Radiation Area
RCA= Radiation Controlled Area
RMA= Radioactive Materials Area

RM= Radioactive Material
CA= Contaminated Area
HCA= High Contamination Area
IC= Internal Contamination
ARA= Airborne Radioactivity Area

GM= Gross Masslinn
★= Air Sample Location
△ = Hot Spot
㊞ = Disk Smears

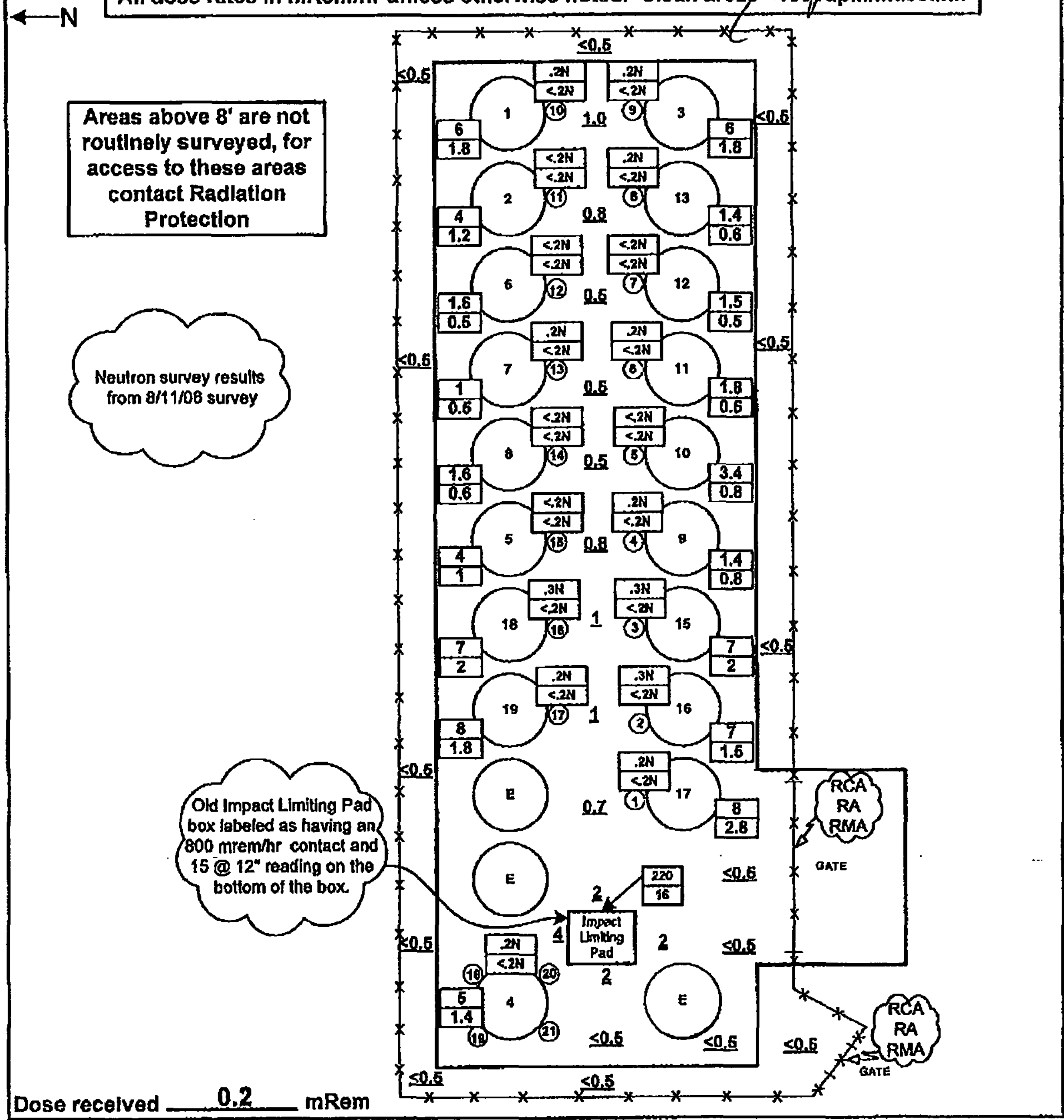
⊟ = Contact / = 12"
-X-X-X-X- Radiation Area
-O-O-O- Contaminated Area

# RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| | | | |
|---|---|---|---|
| Room ID<br>921 | Area/Room Description<br>ISFSI North | | |
| Meter Type/Serial No.<br>RO-2 #264 | Meter Type/Serial No.<br>ASP-1 #2573 | Meter Type/Serial No.<br>M-3 205881 | Meter Type/Serial No.<br>N/A |
| Surveyed/Recorded by<br>MAElder/mae | Date/time<br>05-19-2007 17:30 | Reviewed by<br>VR Smoot | Date<br>05-21-07 |

All dose rates in mRem/hr unless otherwise noted. Clean areas <1000dpm/masslinn



Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Neutron survey results from 8/11/06 survey

Old Impact Limiting Pad box labeled as having an 800 mrem/hr contact and 15 @ 12" reading on the bottom of the box.

| Smears dpm/100cm² | |
|---|---|
| ① | <1K |
| ② | <1K |
| ③ | <1K |
| ④ | <1K |
| ⑤ | <1K |
| ⑥ | <1K |
| ⑦ | <1K |
| ⑧ | <1K |
| ⑨ | <1K |
| ⑩ | <1K |
| ⑪ | <1K |
| ⑫ | <1K |
| ⑬ | <1K |
| ⑭ | <1K |
| ⑮ | <1K |
| ⑯ | <1K |
| ⑰ | <1K |
| ⑱ | <1K |
| ⑲ | <1K |
| ⑳ | <1K |
| ㉑ | <1K |
| ㉒ | N/A |
| ㉓ | |
| ㉔ | |
| ㉕ | N/A |

| Alpha | |
|---|---|
| ○ | N |
| ○ | A |

Dose received 0.2 mRem

## POSTING AND BOUNDARIES/LEGEND

| | | | |
|---|---|---|---|
| RA= Radiation Area | RM= Radioactive Material | | ☐= Contact<br>= 12" |
| HRA= High Radiation Area | CA= Contaminated Area | GM= Gross Masslinn | |
| LHRA= Locked High Radiation Area | HCA= High Contamination Area | *= Air Sample Location | ~~XXX~~ Radiation Area |
| RCA= Radiation Controlled Area | IC= Internal Contamination | △ = Hot Spot | ~~OOO~~ Contaminated Area |
| RMA= Radioactive Materials Area | ARA= Airborne Radioactivity Area | ⓪ = Disk Smears | |

# RADIOLOGICAL AREA STATUS SHEET

950/24*11*04/LP

| Room ID | Area/Room Description | Rx. Power |
|---|---|---|
| 921 | ISFSI North | 100% |

| Meter Type/Serial No/Cal Due Date | Meter Type/Serial No/Cal Due Date | Meter Type/Serial No/Cal Due Date | Meter Type/Serial No/Cal Due Date |
|---|---|---|---|
| T-Pole #6605-096 10/18/08 | L177 #13006 10/24/08 | N/A | N/A |

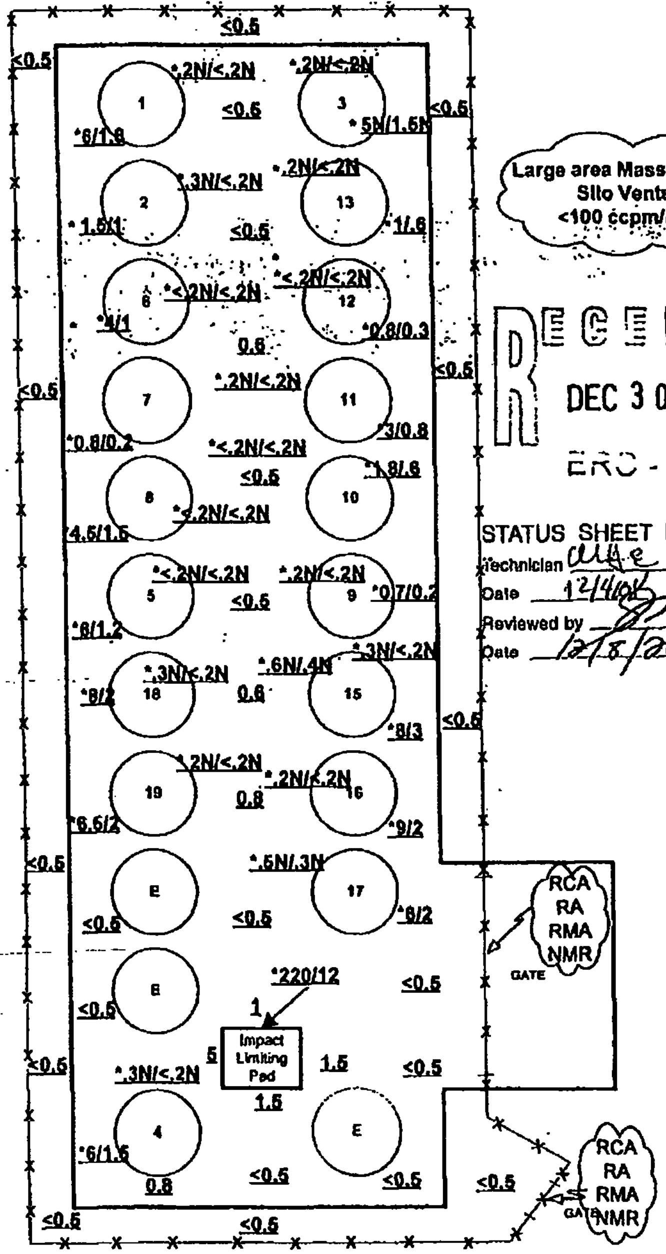
| Surveyed/Recorded by/Badge number | Date/time | Reviewed by/Badge Number | Date |
|---|---|---|---|
| P. Raynor U-0052 | 09-16-08 1300 | EPWilliams/P-452 | 9/17/08 |

All dose rates in mRem/hr unless otherwise noted. Clean areas <100 ccpm/LAS

←N

Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Neutron=(N) dose rates Neutron Dose rates performed annually. Neutron dose rates performed on 08-16-08 by VEM (ASP-1#2573)



Large area Masslinns of Silo Vents <100 ccpm/LAS

RECEIVED
DEC 3 0 2008
ERC - PAL

STATUS SHEET REVISED
Technician Ull.e
Date 12/4/08
Reviewed by
Date 12/8/2008

Old Impact Limiting Pad labeled--
800 mrem/hr contact
15 mrem/hr @ 12'
(bottom of box)
09-08-07 1640

Dose received 0.2 mRem

Smears dpm/100cm²

| | |
|---|---|
| ① | N/A |
| ② | |
| ③ | |
| ④ | |
| ⑤ | |
| ⑥ | |
| ⑦ | |
| ⑧ | |
| ⑨ | |
| ⑩ | |
| ⑪ | |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | |
| ㉒ | |
| ㉓ | |
| ㉔ | |
| ㉕ | N/A |

Alpha

| | |
|---|---|
| ○ | N |
| ○ | A |

## POSTING AND BOUNDARIES/LEGEND

| | | | |
|---|---|---|---|
| LHRA = Locked High Radiation Area | CA= Contaminated Area | [#] = Large Area Smear | -X-X-X- Radiological Boundary |
| HRA = High Radiation Area | RCA = Radiologically Controlled Area | △# = Air Sample Location | -⊖-⊖-⊖- Contamination Area |
| RA = Radiation Area | RMA = Radioactive Materials Area | HS = Hot Spot | ▽? = Catch Basin |
| ARA = Airborne Radioactivity Area | RM = Radioactive Material | ○# = Disk Smears | NMR = Neutron Monitoring Required |
| HCA = High Contamination Area | IC = Internal Contamination | */# = Contact/12" | |

# RADIOLOGICAL AREA STATUS SHEET

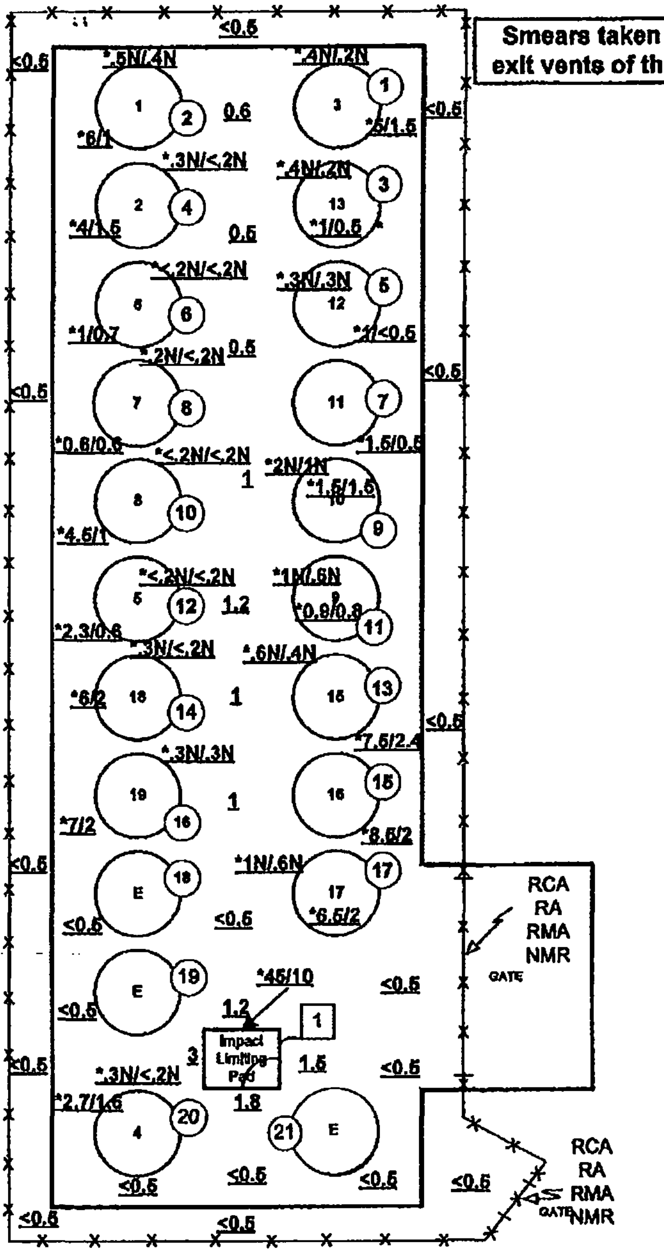
| | | |
|---|---|---|
| Log Number<br>2010-008 | | |
| Room ID<br>921 | Area/Room Description<br>ISFSI North | Reactor Power:<br>100% |

| | | | |
|---|---|---|---|
| Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date |
| Tele-6605-007 2/28/10 | M-3 238954 6-30-10 | L177-240647 2/28/10 | RM 2307 2-28-10 |

| | | | |
|---|---|---|---|
| Surveyed/Recorded by/Badge number | Date/time | Reviewed by/Badge Number | Date |
| Bradley Bishop P-123 | 1-06-10 1100 | Gary A. Sturm | 1-13-10 |

←N

Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection



Smears taken on the exit vents of the casks

Neutron dose rates from Annual Survey performed on 6/25/09

Dose received 0.3 mRem

| Smears dpm/100cm² | |
|---|---|
| ① | < 1k |
| ② | < 1k |
| ③ | < 1k |
| ④ | < 1k |
| ⑤ | < 1k |
| ⑥ | < 1k |
| ⑦ | < 1k |
| ⑧ | < 1k |
| ⑨ | < 1k |
| ⑩ | < 1k |
| ⑪ | < 1k |
| ⑫ | < 1k |
| ⑬ | < 1k |
| ⑭ | < 1k |
| ⑮ | < 1k |
| ⑯ | < 1k |
| ⑰ | < 1k |
| ⑱ | < 1k |
| ⑲ | < 1k |
| ⑳ | < 1k |
| ㉑ | < 1k |

| Masslinn Wipe ccpm/LAS | |
|---|---|
| 1 | <100 |
| 2 | N/A |

| Alpha Smear dpm/100cm² | |
|---|---|
| ③ | < 20 |
| ⑫ | < 20 |
| ⑳ | < 20 |

## POSTING AND BOUNDARIES/LEGEND

LHRA = Locked High Radiation Area
HRA = High Radiation Area
RA = Radiation Area
ARA = Airborne Radioactivity Area
HCA = High Contamination Area
CA= Contaminated Area
RCA = Radiologically Controlled Area
RMA = Radioactive Materials Area
RM = Radioactive Material
IC = Internal Contamination
# = Large Area Smear
△ = Air Sample Location
HS = Hot Spot
= Disk Smears
*#/# = Contact/12"
-X-X-X- Radiological Boundary
-⊖-⊖-⊖- Contamination Area
= Catch Basin
NMR = Neutron Monitoring Required

# RADIOLOGICAL AREA STATUS SHEET

| Log Number | | |
|---|---|---|
| 2010-1887 | | |
| Room ID | Area/Room Description | Reactor Power: |
| 921 | ISFSI North | 100% |

| Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date | Meter Type/Serial No./Cal Due Date |
|---|---|---|---|
| ASP-1 3940 9/30/10 | L-177 12048 8/24/11 | L-177 260647 8/24/11 | Tele 6605-001 8/20/11 |

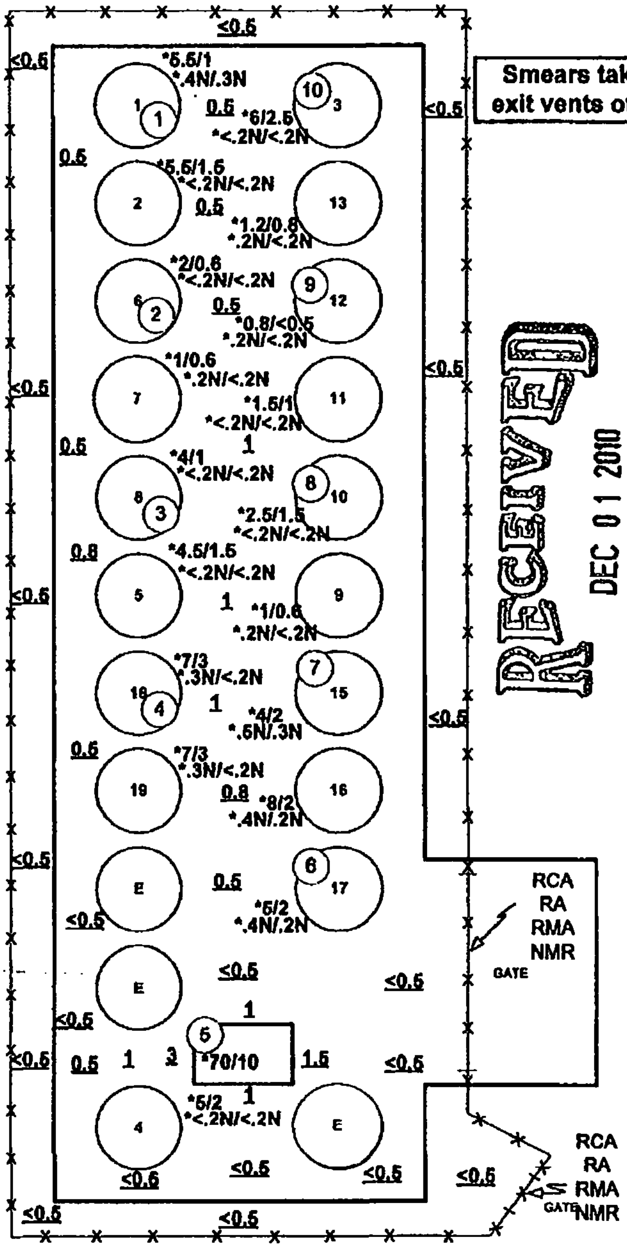
| Surveyed/Recorded by/Badge number | Date/time | Reviewed by/Badge Number | Date |
|---|---|---|---|
| Aaron Williams 12149 | 10/29/10 1100 | 11495 | 10-29-10 |

←N

**Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection**

Neutron Dose rates are performed in July.

**Smears taken on the exit vents of the casks**



Dose received 0.3 mRem

| Smears dpm/100cm² | |
|---|---|
| ① | < 1k |
| ② | < 1k |
| ③ | < 1k |
| ④ | < 1k |
| ⑤ | < 1k |
| ⑥ | < 1k |
| ⑦ | < 1k |
| ⑧ | < 1k |
| ⑨ | < 1k |
| ⑩ | < 1k |
| ⑪ | N/A |
| ⑫ | |
| ⑬ | |
| ⑭ | |
| ⑮ | |
| ⑯ | |
| ⑰ | |
| ⑱ | |
| ⑲ | |
| ⑳ | |
| ㉑ | |

| Masslinn Wipe ccpm/LAS | |
|---|---|
| 1 | N/A |
| 2 | N/A |

| Alpha Smear dpm/100cm² | |
|---|---|
| ① | < 20 |
| ⑤ | < 20 |
| ⑨ | < 20 |

**POSTING AND BOUNDARIES/LEGEND**

| | | | |
|---|---|---|---|
| LHRA = Locked High Radiation Area | CA= Contaminated Area | # = Large Area Smear | -*-*-*- Radiological Boundary |
| HRA = High Radiation Area | RCA = Radiologically Controlled Area | △ = Air Sample Location | ⊖⊖⊖ Contamination Area |
| RA = Radiation Area | RMA = Radioactive Materials Area | HS = Hot Spot | Y = Catch Basin |
| ARA = Airborne Radioactivity Area | RM = Radioactive Material | ○ = Disk Smears | NMR = Neutron Monitoring Required |
| HCA = High Contamination Area | IC= Internal Contamination | */# = Contact/12" | |

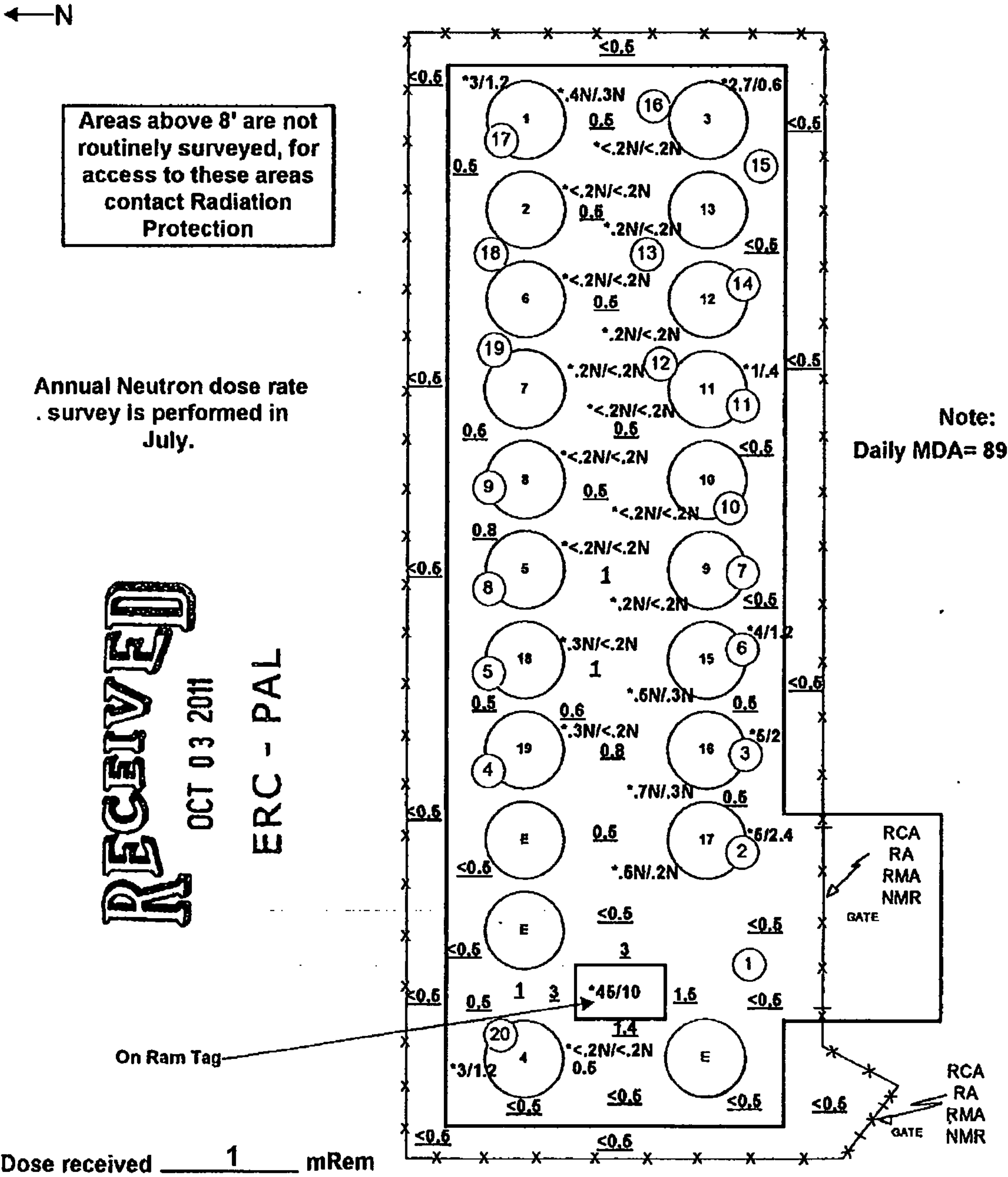
# RADIOLOGICAL AREA STATUS SHEET

| | | | |
|---|---|---|---|
| Log Number<br>2011-780 | | | |
| Room ID<br>921 | Area/Room Description<br>ISFSI North | | Reactor Power:<br>100 % |
| Meter Type/Serial No./Cal Due Date<br>RO20# 6323 12/29/11 | Meter Type/Serial No./Cal Due Date<br>M-3# 239031 11/03/11 | Meter Type/Serial No./Cal Due Date<br>ASP-1#3163 12/18/11 | Meter Type/Serial No./Cal Due Date<br>L-2929# 126124 12/06/11 |
| Surveyed/Recorded by/Badge number<br>Jim Slattery #12002 | Date/time<br>7/28/11 @12:10 | Reviewed by/Badge Number<br>11495 | Date<br>7-29-11 |

**Alpha Ratio To Be Calculated Whenever >20 dpm/100cm2 Alpha Identified**

Areas above 8' are not routinely surveyed, for access to these areas contact Radiation Protection

Annual Neutron dose rate . survey is performed in July.



Note:
Daily MDA= 89.1 DPM

Dose received 1 mRem

| Smears dpm/100cm² | |
|---|---|
| ① | <MDA |
| ② | <MDA |
| ③ | <MDA |
| ④ | <MDA |
| ⑤ | <MDA |
| ⑥ | <MDA |
| ⑦ | <MDA |
| ⑧ | <MDA |
| ⑨ | <MDA |
| ⑩ | <MDA |
| ⑪ | <MDA |
| ⑫ | <MDA |
| ⑬ | <MDA |
| ⑭ | <MDA |
| ⑮ | <MDA |
| ⑯ | <MDA |
| ⑰ | <MDA |
| ⑱ | <MDA |
| ⑲ | <MDA |
| ⑳ | <MDA |
| ㉑ | N/A |

| Masslinn Wipe ccpm/LAS | |
|---|---|
| 1 | N/A |
| 2 | N/A |

| Alpha Smear dpm/100cm² | |
|---|---|
| ○ | N/A |
| ○ | N/A |
| ○ | N/A |

## POSTING AND BOUNDARIES/LEGEND

| | | | |
|---|---|---|---|
| LHRA = Locked High Radiation Area | CA= Contaminated Area | [#] = Large Area Smear | -x-x-x- Radiological Boundary |
| HRA = High Radiation Area | RCA = Radiologically Controlled Area | △ = Air Sample Location | -o-o-o- Contamination Area |
| RA = Radiation Area | RMA = Radioactive Materials Area | HS = Hot Spot | ▽ = Catch Basin |
| ARA = Airborne Radioactivity Area | RM = Radioactive Material | (#) = Disk Smears | |
| HCA = High Contamination Area | IC= Internal Contamination | *#/# = Contact/12" | |

# ATTACHMENT 2

# POINT BEACH
# DOSE SURVEY DATA

(4 pages)

for the ISFSI (Table 11-3) show increases with the placement of casks at the ISFSI with the highest values at E-03 which is the closest to the ISFSI [see Figs. 9-1 and 9-2 for locations]. The results near the site boundary (E-31, E-32) are comparable to the background site E-20, within the associated measurement error, indicating no measurable increase in ambient gamma radiation at the site boundary due to the operation of the ISFSI.

**Table 11-2**
**Average ISFSI Fence TLD Results (mR/7 days)**

| | TLD FENCE LOCATION | | | |
|---|---|---|---|---|
| | North | East | South | West |
| 1995 | 1.29 | 1.28 | 1.10 | 1.26 |
| 1996 | 2.12 | 1.39 | 1.10 | 1.68 |
| 1997 | 2.05 | 1.28 | 1.00 | 1.66 |
| 1998 | 2.08 | 1.37 | 1.02 | 1.86 |
| 1999 | 2.57 | 1.84 | 1.11 | 3.26 |
| 2000 | 2.72 | 2.28 | 1.25 | 5.05 |
| 2001 | 2.78 | 2.54 | 1.36 | 6.08 |
| 2002 | 2.79 | 2.74 | 1.42 | 6.46 |
| 2003 | 2.70 | 2.60 | 1.50 | 6.88 |
| 2004 | 2.61 | 2.12 | 1.41 | 6.50 |
| 2005 | 2.54 | 2.05 | 1.44 | 5.63 |
| 2006 | 2.73 | 2.35 | 1.38 | 5.80 |
| 2007 | 2.72 | 2.73 | 1.34 | 5.47 |

**Table 11-3**
**Average TLD Results Surrounding the ISFSI (mR/7 days)**

| | Sampling Site | | | | | | |
|---|---|---|---|---|---|---|---|
| | E-03 | E-28 | E-29 | E-30 | E-31** | E-32** | E-20*** |
| Pre-Operation* | 0.93 | 0.87 | 0.87 | 0.81 | 0.93 | 0.98 | 0.88 |
| 1996 | 0.87 | 0.78 | 0.81 | 0.79 | 0.93 | 1.00 | 0.78 |
| 1997 | 0.91 | 0.89 | 0.84 | 0.84 | 0.89 | 0.97 | 0.79 |
| 1998 | 0.82 | 0.68 | 0.80 | 0.82 | 0.91 | 0.85 | 0.77 |
| 1999 | 0.88 | 0.83 | 0.76 | 0.80 | 0.90 | 0.99 | 0.78 |
| 2000 | 0.98 | 0.88 | 0.92 | 0.99 | 0.98 | 1.06 | 0.90 |
| 2001 | 1.31 | 0.95 | 1.07 | 1.02 | 1.10 | 1.04 | 1.03 |
| 2002 | 1.45 | 0.91 | 1.22 | 1.10 | 1.26 | 1.25 | 1.14 |
| 2003 | 1.29 | 0.82 | 0.94 | 1.02 | 1.20 | 1.15 | 0.99 |
| 2004 | 1.35 | 0.80 | 0.96 | 1.05 | 1.23 | 1.18 | 1.06 |
| 2005 | 1.30 | 0.72 | 0.96 | 0.98 | 1.15 | 1.04 | 1.00 |
| 2006 | 1.44 | 0.80 | 1.19 | 1.07 | 1.21 | 1.07 | 1.11 |
| 2007 | 1.37 | 0.78 | 1.07 | 1.05 | 1.18 | 0.97 | 1.05 |

*Pre-Operation data are the averages of the years 1992 through 3d quarter of 1995.
**Sites E-31 and E-32 are located at the Site Boundary to the West and South-West of the ISFSI, respectively.
***E-20 is located approximately 17 miles WSW of the ISFSI.

Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

Mr. Richard Farrell
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

LABORATORY REPORT NO.: 8006-100-897
DATE: 11/2/2009
SAMPLES RECEIVED: 10/12/2009
PURCHASE ORDER NO.:

Dear Mr. Farrell:

Below are the results of the readout of supplemental TLDs deployed during the third quarter, 2009.

| | |
|---|---|
| Period: | 3rd Quarter, 2009 |
| Date Annealed: | 06/17/09 |
| Date Placed: | 07/02/09 |
| Date Removed: | 10/07/09 |
| Date Read: | 10/14/09 |
| Days in the Field: | 97 |
| Days from Annealing to Readout: | 119 |
| In-transit exposure: | 3.03 ± 0.22 |

| Location | Total mR | Net mR | Net mR per 7 days |
|---|---|---|---|
| SGSF-North | 15.3 ± 0.9 | 12.3 ± 0.8 | 0.88 ± 0.06 |
| SGSF-East | 15.1 ± 0.9 | 12.1 ± 0.9 | 0.87 ± 0.07 |
| SGSF-South | 17.4 ± 0.4 | 14.3 ± 0.1 | 1.03 ± 0.02 |
| SGSF-West | 15.8 ± 0.5 | 12.8 ± 0.3 | 0.92 ± 0.02 |
| ISFSI-North | 39.7 ± 0.7 | 36.7 ± 0.5 | 2.65 ± 0.04 |
| ISFSI-East | 42.2 ± 1.5 | 39.1 ± 2.2 | 2.82 ± 0.16 |
| ISFSI-South | 22.0 ± 0.9 | 18.9 ± 0.9 | 1.37 ± 0.07 |
| ISFSI-West | 75.6 ± 3.2 | 72.5 ± 9.9 | 5.24 ± 0.72 |
| Control | 17.3 ± 0.8 | 14.3 ± 0.6 | 1.03 ± 0.05 |

Sincerely,

SA Coorlim,
Quality Assurance

APPROVED

Bronia Grob, M. S.
Laboratory Manager

cc: K. Johansen

**ATI Environmental, Inc.
Midwest Laboratory**
*700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517*

Mr. Richard Farrell
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

LABORATORY REPORT NO.: 8006-100-934
DATE: 07-16-10
SAMPLES RECEIVED: 07-09-10
PURCHASE ORDER NO.:

Dear Mr. Farrell:

Below are the results of the readout of supplemental TLDs deployed during the second quarter, 2010.

| | |
|---|---|
| Period: | 2nd Quarter, 2010 |
| Date Annealed: | 03/08/10 |
| Date Placed: | 04/01/10 |
| Date Removed: | 07/08/10 |
| Date Read: | 07/12/10 |
| Days in the Field: | 98 |
| Days from Annealing to Readout: | 126 |
| In-transit exposure: | 3.94 ± 0.25 |

| Location | Total mR | Net mR | Net mR per 7 days |
|---|---|---|---|
| SGSF-North | 17.0 ± 0.4 | 13.1 ± 0.4 | 0.93 ± 0.04 |
| SGSF-East | 17.6 ± 0.3 | 13.6 ± 0.3 | 0.97 ± 0.03 |
| SGSF-South | 18.5 ± 0.5 | 14.5 ± 0.5 | 1.04 ± 0.04 |
| SGSF-West | 18.3 ± 0.6 | 14.4 ± 0.6 | 1.03 ± 0.05 |
| ISFSI-North | 39.5 ± 2.1 | 35.5 ± 2.1 | 2.54 ± 0.15 |
| ISFSI-East | 45.7 ± 1.2 | 41.8 ± 1.2 | 2.99 ± 0.08 |
| ISFSI-South | 22.9 ± 0.8 | 19.0 ± 0.8 | 1.36 ± 0.06 |
| ISFSI-West | 72.0 ± 2.9 | 68.1 ± 2.9 | 4.86 ± 0.20 |
| Control | 19.2 ± 1.0 | 15.3 ± 1.0 | 1.09 ± 0.08 |

Sincerely,

SA Coorlim,
Quality Assurance

APPROVED
Bronia Grob, M. S.
Laboratory Manager

cc: K. Johansen

**ATI Environmental, Inc.**
**Midwest Laboratory**
*700 Landwehr Road • Northbrook, IL 60062-2310*
*phone (847) 564-0700 • fax (847) 564-4517*

---

Mr. Daniel Craine
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

| | |
|---|---|
| LABORATORY REPORT NO.: | 8006-100-990 |
| DATE: | 08-04-11 |
| SAMPLES RECEIVED: | 07-11-11 |
| PURCHASE ORDER NO.: | |

---

Below are the results of the readout of supplemental TLDs deployed during the second quarter, 2011.

| | |
|---|---|
| Period: | 2nd Quarter, 2011 |
| Date Annealed: | 03/10/11 |
| Date Placed: | 04/05/11 |
| Date Removed: | 07/08/11 |
| Date Read: | 07/15/11 |
| Days in the Field: | 94 |
| Days from Annealing to Readout: | 127 |
| In-transit exposure: | 4.44 ± 0.37 |

| Location | Total mR | Net mR | Net mR Std Qtr | Net mR per 7 days |
|---|---|---|---|---|
| SGSF-North | 17.4 ± 0.5 | 12.9 ± 0.5 | 12.5 ± 0.6 | 0.96 ± 0.05 |
| SGSF-East | 18.0 ± 0.3 | 13.6 ± 0.3 | 13.2 ± 0.5 | 1.01 ± 0.03 |
| SGSF-South | 18.8 ± 0.4 | 14.4 ± 0.4 | 13.9 ± 0.5 | 1.07 ± 0.04 |
| SGSF-West | 20.3 ± 0.9 | 15.8 ± 0.9 | 15.3 ± 0.9 | 1.18 ± 0.07 |
| ISFSI-North | 37.4 ± 1.5 | 33.0 ± 1.5 | 31.9 ± 1.5 | 2.45 ± 0.11 |
| ISFSI-East | 41.6 ± 1.1 | 37.1 ± 1.1 | 36.0 ± 1.1 | 2.77 ± 0.09 |
| ISFSI-South | 23.0 ± 0.9 | 18.5 ± 0.9 | 17.9 ± 0.9 | 1.38 ± 0.07 |
| ISFSI-West | 66.6 ± 2.5 | 62.1 ± 2.5 | 60.2 ± 2.5 | 4.63 ± 0.19 |
| Control | 19.0 ± 1.3 | 14.6 ± 1.3 | 14.1 ± 1.3 | 1.08 ± 0.10 |

SA Coorlim,
Quality Assurance

APPROVED
Bronia Grob, M. S.
Laboratory Manager

cc: K. Johansen

# ATTACHMENT 3

# ANO

# DOSE SURVEY DATA

## (6 pages)

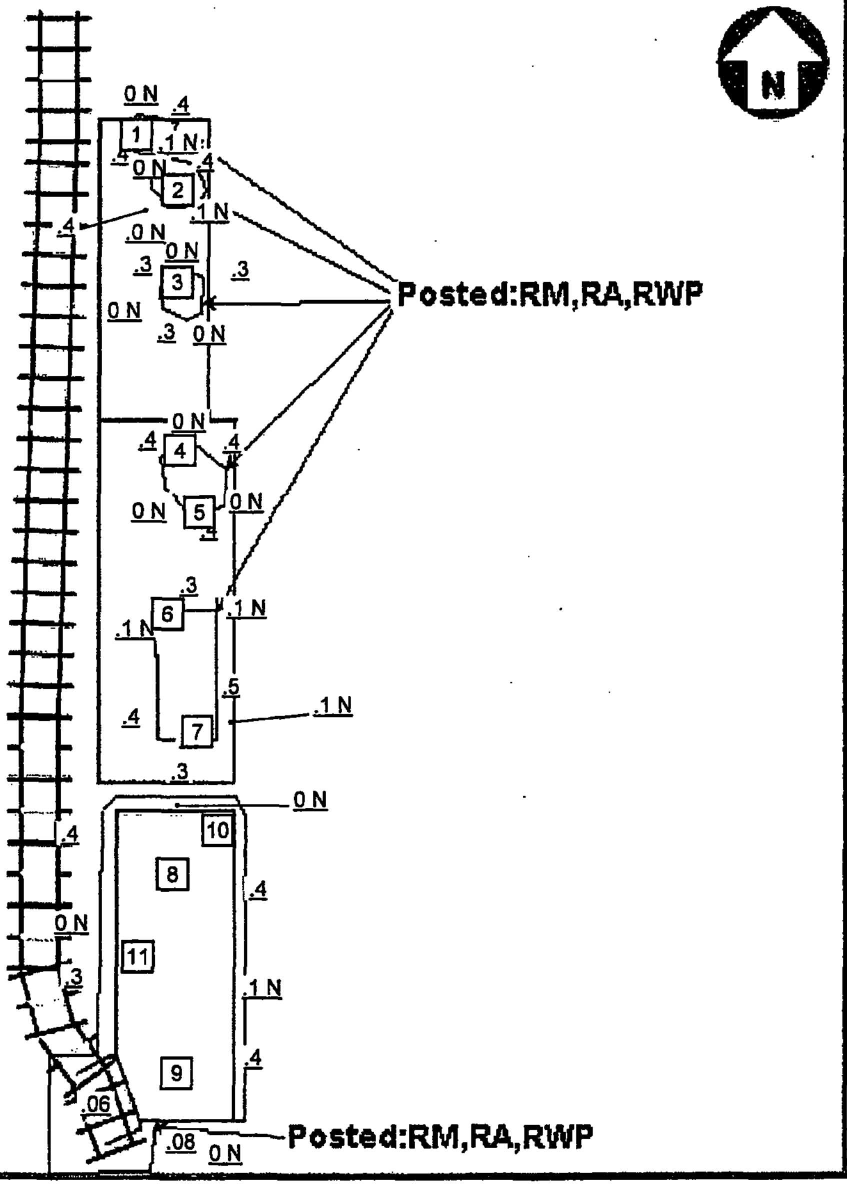
Survey: **ANO-0403-0090**
Template: **Ad Hoc**

Arkansas Nuclear One - Entergy Operations Inc.

Printed: 03-22-2004 15:50:53
Page 1

## MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad

Calc. No. VSC-04.3101, Rev. 3 Page 1 of 6 Appendix B, Attachment 3



**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | <100 |
| 2 - | <100 |
| 3 - | <100 |
| 4 - | <100 |
| 5 - | <100 |
| 6 - | <100 |
| 7 - | <100 |
| 8 - | <100 |
| 9 - | <100 |
| 10 - | <100 |
| 11 - | <100 |

**Alpha Data** (DPM/100cm2)

**L.A.S. Alpha** (ccpm/LAS)

### Survey Data

Unit: **C**
Building:
Elevation:
Room:
RxPwr: **N/A**
Template: **Ad Hoc**
Frequency: **Monthly**
Survey Date: **03-10-2004**
Survey Time: **08:30:00**
Status: **Complete**
RWP: **2004-1001-1**
Surveyed By: **Lloyd L. Robinson**
Badge: **964**
Reviewed By: **James D. Looper**
Notes:
**Dry Fuel Storage Pad PC-420/PMK**

### Instruments Used

Instrument: **ASP/HP-270 - ASP-055**
Cal Due: **03-31-2004**
SrcCk Due: **03-11-2004**
D/C & Bkg: **N/A N/A**

Instrument: **PNR - CHP-MF-127**
Cal Due: **07-31-2004**
SrcCk Due: **03-11-2004**
D/C & Bkg: **N/A N/A**

Instrument: **RM - CHP-CR-242**
Cal Due: **06-30-2004**
SrcCk Due: **N/A**
D/C & Bkg: **10 100**

All Radiation values are in mrem/hr unless otherwise noted
Smear contamination values are in DPM/100 Sqcm unless otherwise noted
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
⑪ denotes smear locations
12 denotes large area wipe locations.

Survey: **ANO-0512-0282**
Template: **Ad Hoc**

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## MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad

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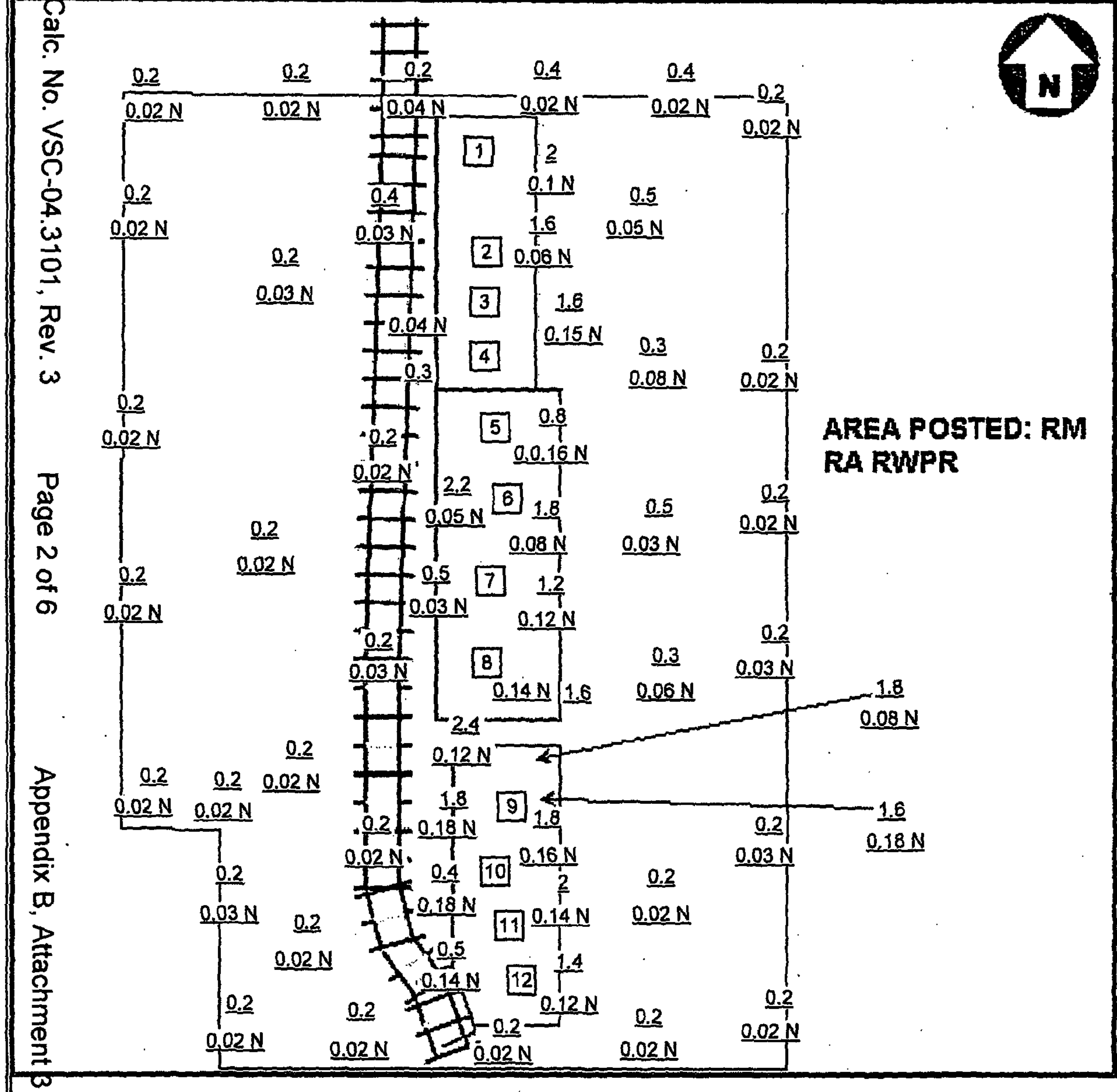
Appendix B, Attachment 3



**AREA POSTED: RM RA RWPR**

**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | <100 |
| 2 - | <100 |
| 3 - | <100 |
| 4 - | <100 |
| 5 - | <100 |
| 6 - | <100 |
| 7 - | <100 |
| 8 - | <100 |
| 9 - | <100 |
| 10 - | <100 |
| 11 - | <100 |
| 12 - | <100 |

**Alpha Data** (DPM/100cm2)

**L.A.S. Alpha** (ccpm/LAS)

**Survey Data**

Unit: **C**
Building:
Elevation:
Room:
RxPwr: **NA**
Template: **Ad Hoc**
Frequency: **Monthly**
Survey Date: **12-11-2005**
Survey Time: **14:30:00**
Status: **Complete**
RWP: **2005-1401-1**
Surveyed By: **James D. Blackburn**
Badge: **438**
Reviewed By: **James D. Looper**
Notes:
**DFS PAD MONTHLY**
**PEER CHECKED BY: RDJ 2167**

**Instruments Used**

Instrument: **PNR - 11398**
Cal Due: **02-28-2006**
SrcCk Due: **12-12-2005**
D/C & Bkg: **N/A N/A**

Instrument: **RSO - 11671**
Cal Due: **05-31-2006**
SrcCk Due: **12-12-2005**
D/C & Bkg: **N/A N/A**

Instrument: **RM - CHP-CR-059**
Cal Due: **03-31-2006**
SrcCk Due: **N/A**
D/C & Bkg: **10 80**

*All Radiation values are in mrem/hr unless otherwise noted*
*Smear contamination values are in DPM/100 Sqcm unless otherwise noted*
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
⑪ denotes smear locations
12 denotes large area wipe locations.

Survey: **ANO-0706-0063**
Template: **Ad Hoc**

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## MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad

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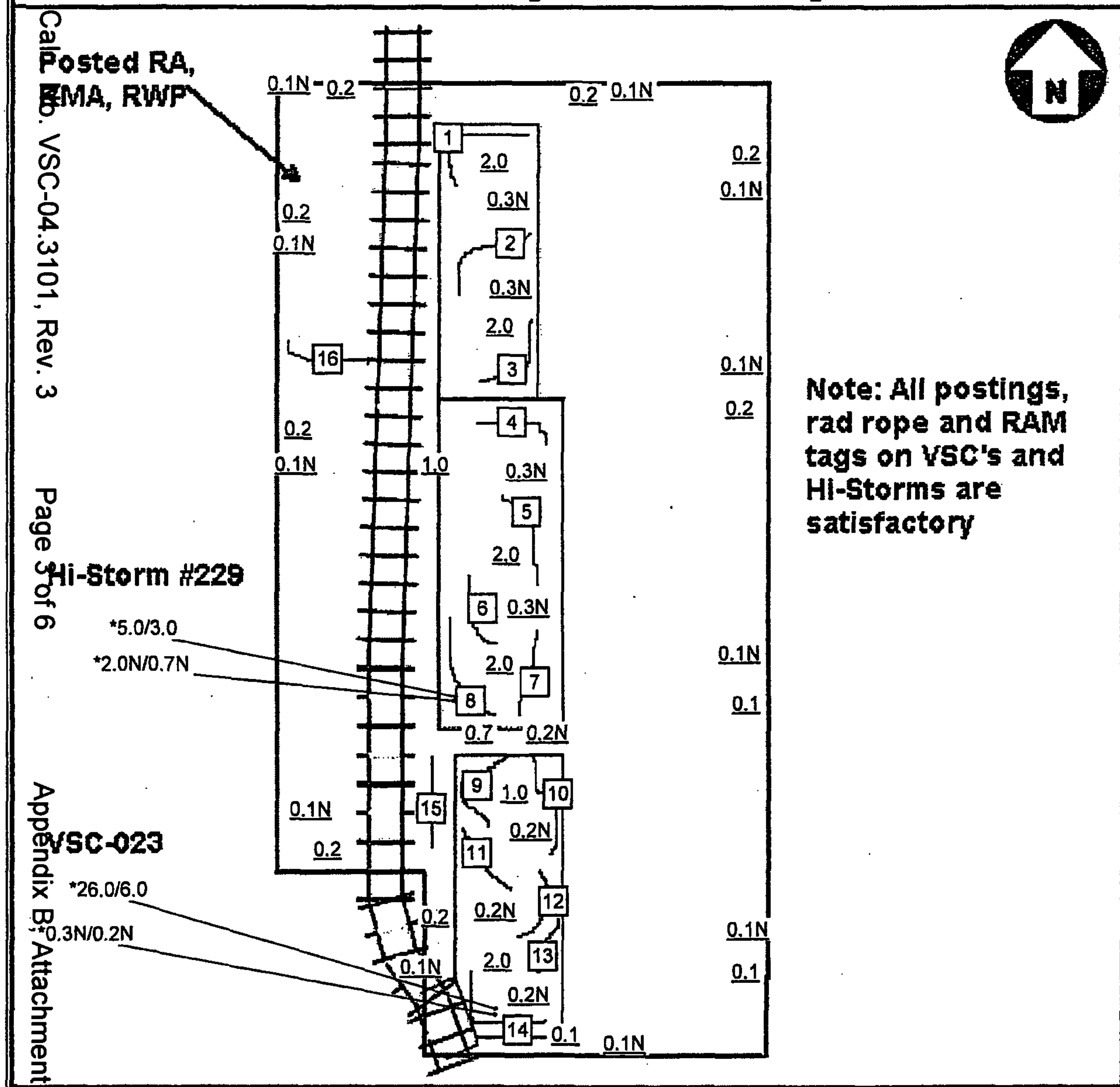

**Note: All postings, rad rope and RAM tags on VSC's and Hi-Storms are satisfactory**

**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | <100 |
| 2 - | <100 |
| 3 - | <100 |
| 4 - | <100 |
| 5 - | <100 |
| 6 - | <100 |
| 7 - | <100 |
| 8 - | <100 |
| 9 - | <100 |
| 10 - | <100 |
| 11 - | <100 |
| 12 - | <100 |
| 13 - | <100 |
| 14 - | <100 |
| 15 - | <100 |
| 16 - | <100 |

**Alpha Data** (DPM/100cm2)

### Survey Data

Unit: **C**
Building:
Elevation:
Room:
RxPwr: **100**
Template: **Ad Hoc**
Frequency: **Monthly**
Survey Date: **06-09-2007**
Survey Time: **08:50:00**
Status: **Complete**
RWP: **2007-1001-1**
Surveyed By: **Samuel E. Bradshaw**
Badge: **830**
Reviewed By: **Stanley D. Marvel**
Notes:
**PS1-14 DFS Pad**

### Instruments Used

Instrument: **ASP/HP-270 - ASP-022**
Cal Due: **08-31-2007**
SrcCk Due: **06-10-2007**
D/C & Bkg: **N/A N/A**

Instrument: **RM - CHP-CR-061**
Cal Due: **08-31-2007**
SrcCk Due: **N/A**
D/C & Bkg: **10 60**

Instrument: **PNR - PNR-005**
Cal Due: **10-31-2007**
SrcCk Due: **06-10-2007**
D/C & Bkg: **N/A N/A**

All Radiation values are in mrem/hr unless otherwise noted
*Smear contamination values are in DPM/100 Sqcm unless otherwise noted*
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
(11) denotes smear locations
[12] denotes large area wipe locations.

Survey: **ANO-0712-0182**
Template: **PS1-14**

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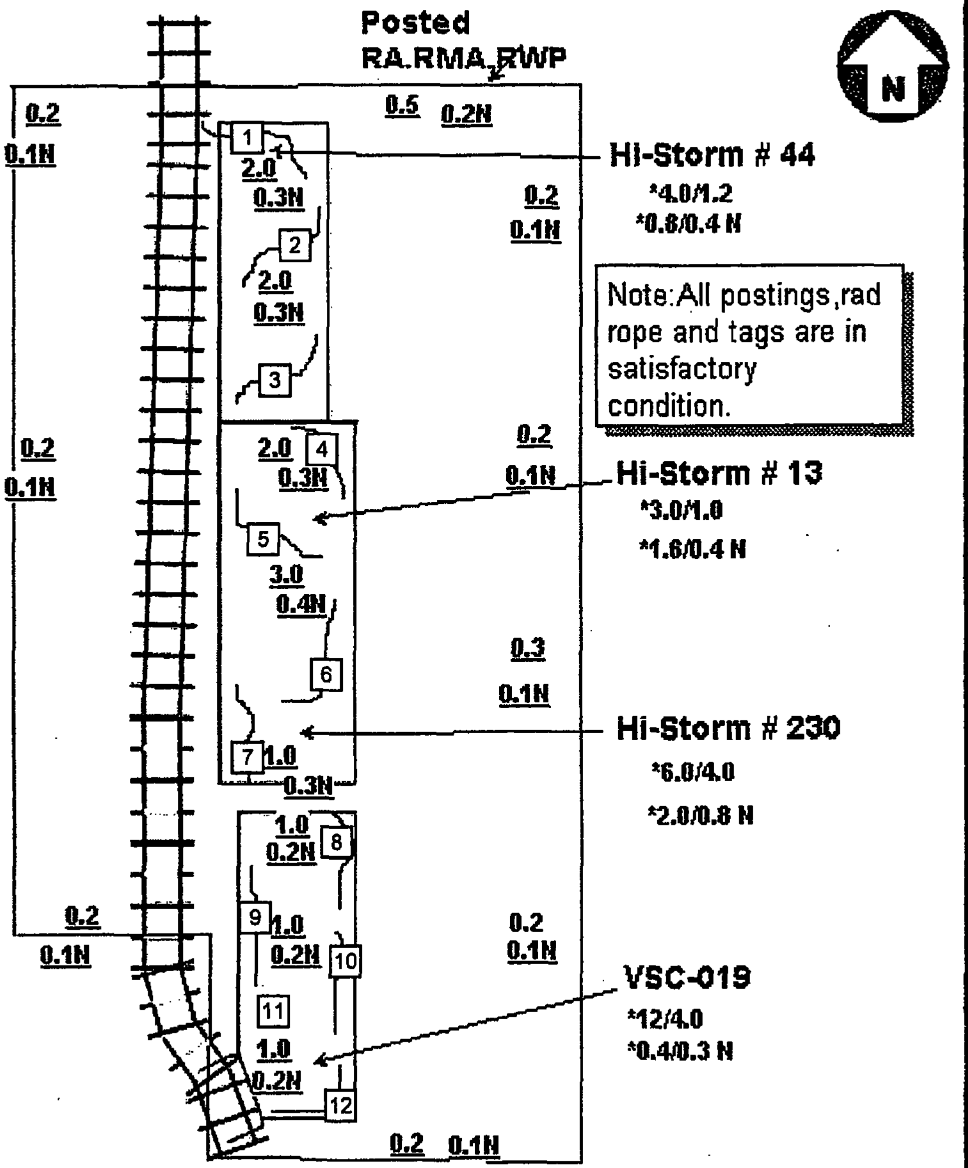
## MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad



Note: All postings, rad rope and tags are in satisfactory condition.

**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | ND |
| 2 - | ND |
| 3 - | ND |
| 4 - | ND |
| 5 - | ND |
| 6 - | ND |
| 7 - | ND |
| 8 - | ND |
| 9 - | ND |
| 10 - | ND |
| 11 - | ND |
| 12 - | ND |

**Alpha Data** (DPM/100cm2)

**Survey Data**

Unit: **C**
Building:
Elevation:
Room:
RxPwr: **100**
Template: **PS1-14**
Frequency: **Monthly**
Survey Date: **12-22-2007**
Survey Time: **10:00:00**
Status: **Complete**
RWP: **20071001-1**
Surveyed By: **Brian K. Bradshaw**
Badge: **877**
Reviewed By: **Stanley D. Marvel**
Notes:

**Instruments Used**

Instrument: **ASP/270 - ASP-029**
Cal Due: **03-17-2008**
SrcCk Due: **12-22-2007**
D/C & Bkg: **N/A N/A**

Instrument: **ASP/NRD - PNR-010**
Cal Due: **06-05-2008**
SrcCk Due: **12-22-2007**
D/C & Bkg: **N/A N/A**

Instrument: **LM-177 - CHP-CR-087**
Cal Due: **02-06-2008**
SrcCk Due: **N/A**
D/C & Bkg: **10 80**

All Radiation values are in mrem/hr unless otherwise noted
Smear contamination values are in DPM/100 Sqcm unless otherwise noted
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

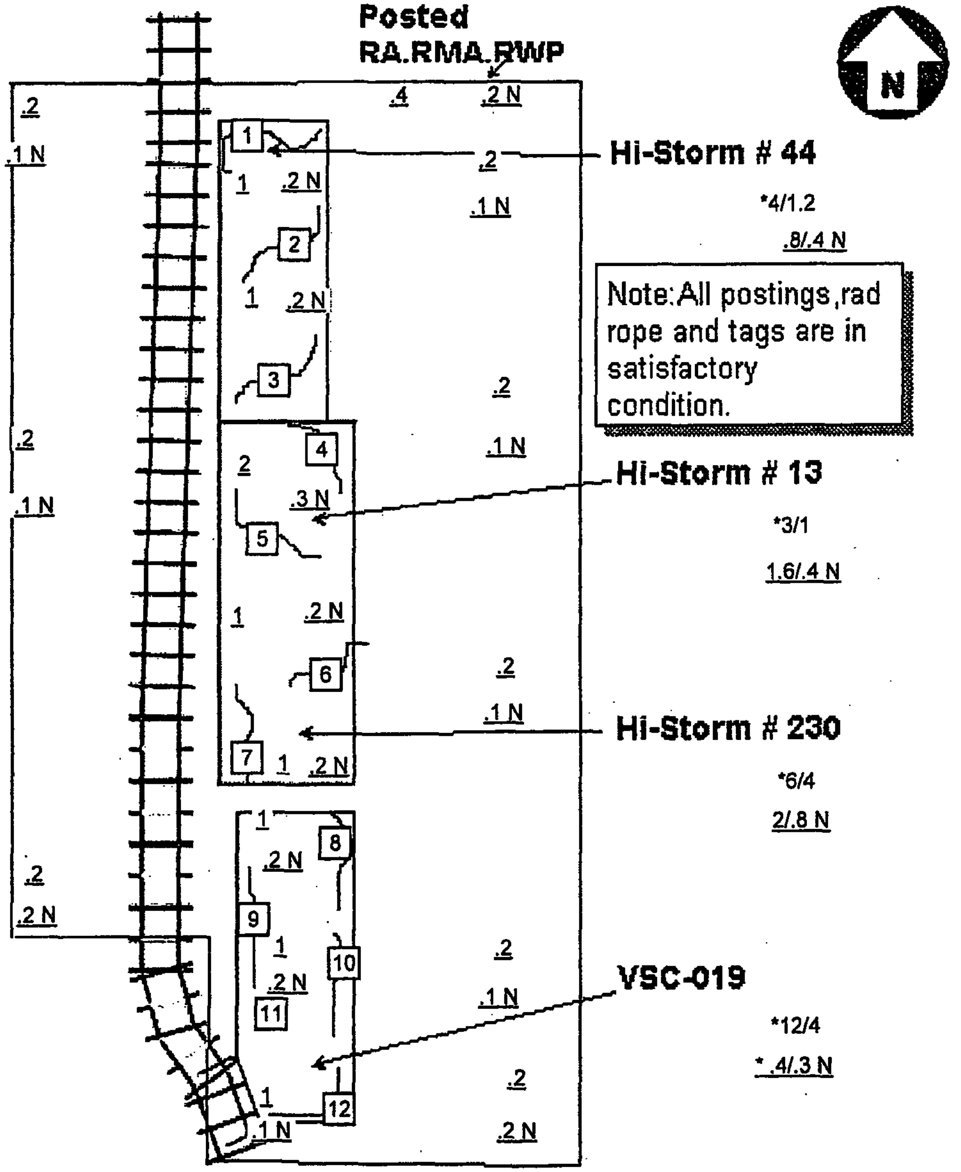
12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
⑪ denotes smear locations
12 denotes large area wipe locations.

Survey: **ANO-0803-0169**
Template: **PS1-14**

# Arkansas Nuclear One - Entergy Operations Inc.

Printed: 04-11-2008 01:12:45
Page 1

## MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad



Note: All postings, rad rope and tags are in satisfactory condition.

**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | ND |
| 2 - | ND |
| 3 - | ND |
| 4 - | ND |
| 5 - | ND |
| 6 - | ND |
| 7 - | ND |
| 8 - | ND |
| 9 - | ND |
| 10 - | ND |
| 11 - | ND |
| 12 - | ND |

**Alpha Data** (DPM/100cm2)

### Survey Data

Unit: **C**
Building:
Elevation:
Room:
RxPwr: **100**
Template: **PS1-14**
Frequency: **Monthly**
Survey Date: **03-13-2008**
Survey Time: **14:30:00**
Status: **Complete**
RWP: **2008-2001-1**
Surveyed By: **John E. Butler**
Badge: **601**
Reviewed By: **Stanley D. Marvel**
Notes:

### Instruments Used

Instrument: **LM-177 - CHP-CR-175**
Cal Due: **06-03-2008**
SrcCk Due: **N/A**
D/C & Bkg: **10 100**

Instrument: **RAMION - RAM-061**
Cal Due: **08-11-2008**
SrcCk Due: **03-13-2008**
D/C & Bkg: **N/A N/A**

Instrument: **ASP/NRD - 11398**
Cal Due: **07-22-2008**
SrcCk Due: **03-13-2008**
D/C & Bkg: **N/A N/A**

All Radiation values are in mrem/hr unless otherwise noted
Smear contamination values are in DPM/100 Sqcm unless otherwise noted
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
⑪ denotes smear locations
12 denotes large area wipe locations.

Survey: **ANO-0806-0116**
Template: **PS1-14**

## Arkansas Nuclear One - Entergy Operations Inc.

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Page 1

**MAP NUMBER PS1-14 LOCATION High Level Waste Storage Pad**

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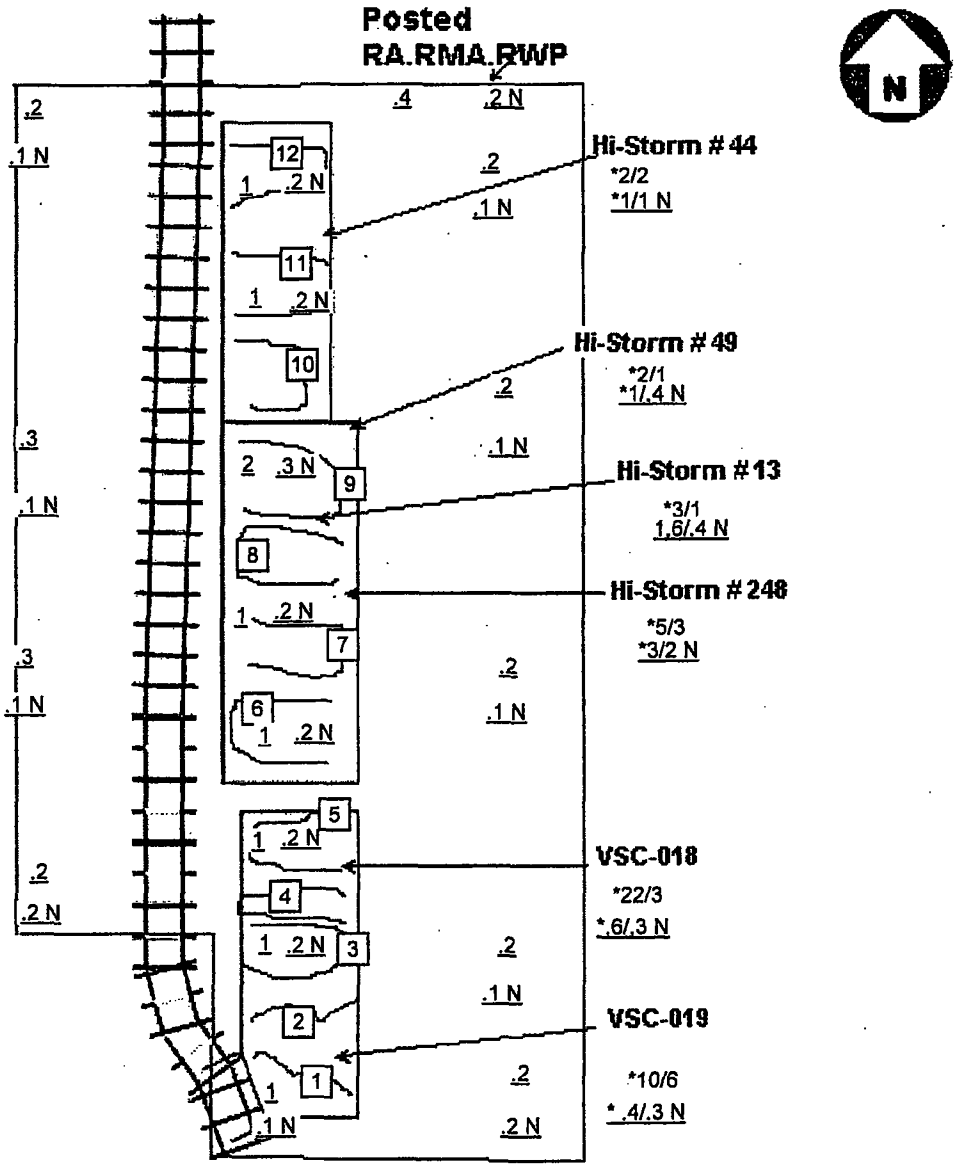

Note:All postings,rad rope and tags are in satisfactory condition.

**Smear Data** (DPM/100cm2)

**L.A.S. Data** (ccpm/LAS)

| | |
|---|---|
| 1 - | ND |
| 2 - | ND |
| 3 - | ND |
| 4 - | ND |
| 5 - | ND |
| 6 - | ND |
| 7 - | ND |
| 8 - | ND |
| 9 - | ND |
| 10 - | ND |
| 11 - | ND |
| 12 - | ND |

**Alpha Data** (DPM/100cm2)

**Survey Data**

| | |
|---|---|
| Unit: | C |
| Building: | |
| Elevation: | |
| Room: | |
| RxPwr: | 100 |
| Template: | PS1-14 |
| Frequency: | Monthly |
| Survey Date: | 06-13-2008 |
| Survey Time: | 12:50:00 |
| Status: | Complete |
| RWP: | 20081001-1 |
| Surveyed By: | Lloyd A. Branch |
| Badge: | 1188 |
| Reviewed By: | Robert Sebring |
| Notes: | |

**Instruments Used**

Instrument: **ASP/270 - ASP-029**
Cal Due: **09-13-2008**
SrcCk Due: **06-13-2008**
D/C & Bkg: **N/A N/A**

Instrument: **ASP/NRD - CHP-MF-005**
Cal Due: **10-21-2008**
SrcCk Due: **06-14-2008**
D/C & Bkg: **N/A N/A**

Instrument: **LM-177 - RHP-CR-174**
Cal Due: **08-04-2008**
SrcCk Due: **N/A**
D/C & Bkg: **10 80**

All Radiation values are in mrem/hr unless otherwise noted
Smear contamination values are in DPM/100 Sqcm unless otherwise noted
☐ Smear < 100 CCPM H.S. - denotes Hot Spot
*12/13 denotes gamma contact / far (30cm)
*12/13 B denotes beta contact / far (30 cm)

12.5 denotes gamma genera area, T denotes RADS telemetry
*75 B denotes beta contact doserate
*12 denotes gamma contact doserate
⑪ denotes smear locations
12 denotes large area wipe locations.