VERIFICATION OF VYNPS LICENSE RENEWAL PROJECT REPORT

Title of Report: **Aging Management Review of the Primary Containment**

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This report documents evaluation related to the VYNPS license renewal project. Signatures certify that the report was prepared, checked and reviewed by the License Renewal Project Team in accordance with the VYNPS license renewal project guidelines and that it was approved by the ENI License Renewal Project Manager and the VYNPS Manager, Engineering Projects.

License Renewal Project Team signatures also certify that a review for determining potential impact to other license renewal documents (based on previous revisions) was conducted for this revision.

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REVISION DESCRIPTION SHEET

Revision Number	Description	Pages and/or Sections Revised
0	Initial Issue	

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1.0 Introduction

1.1 Purpose

This report documents the structural aging management review (AMR) of the Vermont Yankee Nuclear Power Station (VYNPS) primary containment structure. The aging management review (AMR) is part of the integrated plant assessment (IPA) performed to extend the operating license of VYNPS. This review is limited to the primary containment system and its components and commodities. The areas outside this boundary, reactor building or secondary containment are discussed in engineering report AMRC-02 **(Ref. 14a)**. For additional information on the license renewal project overall scope and documentation, refer to engineering report LRPG-01, License Renewal Project Plan.

The purpose of this report is to document the aging management review of the VYNPS primary containment and its structural components and commodities. In accordance with guidance in NEI 95-10 **(Ref. 2)**, the approach for demonstrating the management of aging effects is to first identify the structure's components and commodities that are subject to aging management review. These components and commodities perform an intended function without moving parts or a change in configuration (i.e., passive) and are not subject to replacement based on qualified life or specified time period (i.e., long-lived).

Applicable aging effects were determined using EPRI 1002950 (**Ref. 4**), EPRI TR-103842 (**Ref. 3**), and NUREG-1557 (**Ref. 6**). These reports provide the generic bases for identification of the aging effects based on specific materials and environments and document the confirmation of the validity of the aging effects through review of industry experience. This aging management review report (AMRR) documents the identification and evaluation of aging effects requiring management for the primary containment.

1.2 Structure Description

The VYNPS primary containment system (PCS) is a low leakage pressure suppression containment system housing the reactor pressure vessel (RPV), the reactor coolant recirculation loops, and other branch connections of the reactor primary system **(Ref.9)**. The PCS consists of a drywell and a torus or suppression chamber connected by vent pipes. The drywell surrounds the RPV and primary systems. The torus, a toroidal structure containing water, is located below the drywell. The vent system connecting the drywell to the torus terminates below the water surface of the torus. Torus-to-drywell vacuum relief valves, in conjunction with the reactor building-to-torus vacuum relief valve assemblies, maintain the design basis negative pressure requirements to protect the integrity of the primary containment from negative pressure. When operating at power, the containment is flooded with nitrogen to preclude the availability of oxygen.

The PCS (referred to in this report as the drywell) is designed to sustain the expected maximum internal pressure and temperature and the maximum net unbalanced transient loads to limit offsite doses resulting from a postulated LOCA to below values set forth in 10 CFR 100. The drywell includes portions of the safety relief valve discharge lines (SRVDL) in the torus airspace that span the distance between the vent system and the T-quenchers located below the torus water level.

Concrete floor slabs, structural steel floors, and platforms are provided inside the drywell as required. Support for these structures is provided by the drywell or by concrete or structural steel columns, supported by the drywell base slab.

Threaded fasteners are steel commodities required to secure or hold structural components in place. Examples are reactor vessel support bolting, torus external support bolting and piping restraint bolting. The bolted joints or bolted connections encompass such constituents as bolts, studs, screws, nuts, washers, and member facing surfaces (i.e., mating surfaces of the bolted parts).

Anchors and embedments are steel commodities, such as angles and anchor studs, that are embedded in concrete and serve to anchor the support steel for various components. In addition, other anchors and embedments are provided that serve to transfer loads into the concrete cylinder wall or foundation mat from attachments to the drywall liner. These anchors are shown on VYNPS Drawings G-191707 through G-191710.

The design of the primary containment structure conforms to applicable codes and specifications listed in UFSAR, Section 12.2 (Ref. 9):

The major structural components of the VYNPS drywell are described below.

Bellows (Reactor vessel and Drywell)

The refueling bulkhead assembly has two bellows, backing plates, and removable guard rings. The bellows are constructed of stainless steel **(Ref. 9)**. The backing plate surrounds the bellows outer circumference for protection and is equipped with a tap for testing and for monitoring leakage. A self energizing spring seal is between the refueling bulkhead and the backing plate. The guard ring attaches to the assembly and protects the bellows inner circumference. The assembly is welded to the reactor bellows support skirt and the reactor well seal bulkhead plate. The reactor refueling bellows assembly is welded to the reactor vessel shell flange. The reactor well seal bulkhead plate bridges the distance to the primary containment drywell wall. Watertight hinged covers are bolted in place for refueling operation. For normal operation, these covers are opened to permit ventilation in the region above the reactor well seal. The drywell to reactor building bellows assembly is similar to the RPV bellows assembly. Bellows components are subject to fatigue due to cyclic loadings. Refer to UFSAR Section C.2.5.3 for description of fatigue transients **(Ref. 9)**.

Sacrificial Shield Wall

The sacrificial shield wall attenuates neutron and gamma radiation from the reactor to allow access and maintenance of the drywell. It also reduces exposure to drywell components that could be damaged by gamma radiation. The sacrificial shield is a high density, concrete filled cylindrical structure surrounding the vessel. The concrete is contained by inner and outer steel liner plates and structural beams that are also used to attach various system supports.

The sacrificial shield wall provides lateral support for the reactor vessel to accommodate both seismic forces and jet forces resulting from the breakage of any pipe attached to the reactor vessel. Lateral support for the sacrificial shield wall is provided by eight pairs of stabilizers. The stabilizers consist of steel pipes welded to the top of the sacrificial shield and bolted to fittings on the primary containment wall. **(Ref. 38c)**

Drywell

The drywell is a carbon steel structure that houses the reactor vessel and its associated components. A reinforced concrete support structure, founded on bedrock, is an integral part of the drywell support system. Above the transition zone between the spherical and cylindrical portions, the drywell is separated from the reactor building reinforced concrete by a 2 inch gap. This gap allows for drywell thermal expansion. Shielding over the top of the drywell is provided by removable, segmented, reinforced concrete shield plugs located on the reactor building refuel floor. The reinforced concrete drywell floor contains the drywell floor drain and equipment drain sumps, and supports the reactor pedestal. Drywell mechanical penetrations are subject to fatigue due to cyclic loading. **(Ref.9).**

Torus

The torus (suppression chamber) is a torus-shaped carbon steel pressure vessel below and encircling the drywell. The torus is anchored to the reinforced concrete foundation slab of the reactor building.

1.3 Intended Functions

The primary containment is designed to safely house and support safety-related equipment during normal and accident conditions including external events (tornadoes, earthquakes, floods, missiles) and internal events (LOCA, pipe breaks). Specifically, the drywell intended functions include the following.

Intended Function	Abbreviations	Definition
Flood barrier	FLB	Provide flood protection barrier (internal and external flooding event)
Heat sink	HS	Provide heat sink during SBO or design basis accidents (includes source of cooling water for plant shutdown)
Missile barrier	MB	Provide missile barrier (internally or externally generated)
Pressure boundary	PB	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of postulated design basis events
Support for Criterion (a)(2) equipment	SNS	Provide structural or functional support to nonsafety-related equipment whose failure could prevent satisfactory accomplishment of required safety-related functions (includes II/I considerations)
Shelter or protection	EN	Provide shelter or protection to safety-related equipment (includes HELB, radiation shielding and pipe whip restraint)
Support for Criterion (a)(1) equipment	SSR	Provide structural or functional support to safety-related equipment

2.0 Screening

Structural commodities are structural members that support or protect system components, mechanical piping or electrical lines. Structural commodities that are unique to the drywell structure are evaluated in this report. Those that are common to VYNPS in-scope systems and structures (i.e. consumables, anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits) are evaluated in the bulk commodities AMR.**(Ref. 14b)**

For this report, passive, long-lived structural components or commodities subject to AMR are identified in accordance with LRPG-06 **(Ref. 13)**. Long-lived components and commodities are those that are not replaced based on a qualified life or specified period. Long-lived, passive structural components and commodities are divided into structural material groups. This report will examine the aging effects based on materials of construction rather than on a specific component or commodity basis. The following structural materials are relevant to VYNPS.

- steel
- threaded fasteners
- concrete
- fire barriers
- elastomers
- flouropolymers and lubrite sliding surfaces

Sub-materials for structural components or commodities are grouped into one or more of the overall structural material groups (e.g., non-shrink grout, brick and block are grouped with concrete, aluminum is grouped with steel, and roofing material is grouped with elastomers.)

Although consumables may be part of components or commodities subject to AMR and important in maintaining the integrity of the component or commodity (i.e. support the component or commodity function), they are not subject to AMR since they are either periodically replaced or inspected and replaced as needed during preventive maintenance activities.

As discussed in **Section 1.3**, a structure is within the scope of license renewal if it performs an intended function as identified in 10 CFR 54.4(b). An in-scope structure's structural components and commodities that perform one or more structural functions associated with the structure's intended function are subject to aging management review if they are passive and long-lived.

Structural components and commodities of the primary containment are listed in **Tables 2.1-1 through 2.1-5** along with the identification of whether they are subject to aging management review. Justification for the determination is included in the tables.

Table 2.1-1
Steel and Other Metals Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Anchorage/ embedments	NA	NA	Addressed in the bulk commodities AMR (**Ref. 14b**)	NA
Base plates	NA	NA	Addressed in bulk commodities AMR (**Ref. 14b**)	NA
Bellows (reactor vessel and drywell)	PB,SSR	Yes	Maintains pressure boundary for dry well. (**Ref. 9,38v**)	Stainless steel
Cable trays and conduits	NA	NA	Addressed in bulk commodities AMR (**Ref. 14b**)	NA
Component and piping supports for ASME Class 1, 2, 3 and MC	NA	NA	Addressed in the bulk commodities AMR. (**Ref. 14b**)	NA
Component and piping supports	NA	NA	Addressed in bulk commodities AMR (**Ref. 14b**)	NA
CRD removal hatch	EN, FLB, MB,PB,SSR,	Yes	Provides missile and flood protection for CRD and PCS components. (**Ref. 38r**)	Carbon steel
Drywell head	EN,FLB, MB, PB, SSR	Yes	The drywell head maintains the pressure boundary of the drywell. (**Ref. 38c,r**)	Carbon steel
Drywell shell	EN,FLB, MB,PB, SSR,	Yes	Maintains the pressure boundary of the drywell. (**Ref. 38c, r**)	Carbon steel
Drywell shell protection panels (jet deflectors)	EN, MB	Yes	Panels prevent possible damage to the vent pipes from jet forces. (**Ref 9**)	Carbon steel
Drywell sump liner	SSR	Yes	Provides functional support of drywell components. (**Ref. 38p**)	Carbon steel
Drywell to torus vent line bellows	PB, SSR	Yes	The bellows allow for the relative movement between the piping penetration and the drywell shell during normal operations and for design basis events maintaining the drywell pressure boundary. (**Ref. 9 & 38q**)	Stainless steel
Drywell to torus vent system	PB, SSR	Yes	Relieves drywell pressure to torus providing pressure boundary for drywell and torus (**Ref 9 &38q**)	Carbon steel
Equipment hatch	EN,FLB, MB,PB, SSR,	Yes	Hatch cover maintains pressure boundary of drywell. Safety related (**Ref. 9 & 38r**)	Carbon steel
Monorails	NA	NA	Addressed in bulk commodities AMR (**Ref. 14b**)	NA

Table 2.1-1
Steel and Other Metals Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Personnel airlock	EN, FLB, MB, PB, SSR	Yes	Maintains drywell pressure boundary (**Ref. 9 &38r**)	Carbon steel
Primary containment electrical penetrations	PB, SSR	Yes	Mechanical penetrations through the drywell wall provide the means for process piping to enter the drywell while maintaining the essentially leak-tight barrier. (**Ref . 9, 38r**)	Carbon steel
Primary containment mechanical penetrations (includes those w/bellows)	PB, SSR	Yes	Mechanical penetrations through the drywell wall provide the means for process piping to enter the drywell while maintaining the essentially leak-tight barrier. (**Ref . 9 & 38r**)	Carbon steel
Reactor vessel support assembly	SSR	Yes	Provide structural support of the reactor vessel. (**Ref . 9**)	Carbon steel
Reactor vessel stabilizer supports	SSR	Yes	Provide structural support of the reactor vessel. (**Ref . 9**)	Carbon steel
Refueling bulkhead assembly	NA	No	The drywell-to-reactor building refueling seal and the reactor pressure vessel (RPV)-to-drywell refueling seal, in conjunction with the refueling bulkhead provides a watertight barrier to permit flooding above the RPV flange while preventing water from entering the drywell. This is not a license renewal intended function. **(Ref.9,38u)**	NA
Sacrificial shield wall lateral supports	EN, MB,SSR	Yes	Class I component that provides lateral support for the sacrificial shield wall. **(Ref.38e)**	Carbon steel
Sacrificial shield wall (steel portion)	EN, MB,SSR	Yes	The sacrificial shield liner plate provides protection and support of the high density, steel embedded, concrete cylindrical structure surrounding the vessel. **(Ref. 9, 38e)**	Carbon steel
Stairway, handrail, platform, decking, and ladder (including torus catwalks)	NA	NA	Addressed in bulk commodities AMR (Ref. **14b)**	NA
Structural steel: plates, columns and beams	SSR	Yes	Provide structural support.	Carbon steel

Table 2.1-1
Steel and Other Metals Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Torus electrical penetrations	PB, SSR	Yes	Maintains drywell pressure boundary. **(Ref. 38h)**	Carbon steel
Torus external supports (columns, saddles)	SSR	Yes	Provides support of the torus for design events **(Ref. 38i,j)**	Carbon steel
Torus manway	PB, SSR	Yes	Maintains drywell pressure boundary. **(Ref. 38o)**	Carbon steel
Torus mechanical penetrations	PB, SSR	Yes	Maintains drywell pressure boundary. **(Ref. 38h)**	Carbon steel
Torus ring girder	SSR	Yes	Provides support of the torus for design events **(Ref. 38i,j)**	Carbon steel
Torus shell	PB, SSR	Yes	Maintains drywell pressure boundary.	Carbon steel
Torus thermowells	PB, SNS	Yes	Maintains torus pressure boundary. **(Ref. 38k)**	Carbon steel
Vent header support	SSR	Yes	Provides support of vent headers during design basis events. **(Ref. 38q)**	Carbon steel

Notes:
1. See **Section 1.3** for intended function descriptions. Functions also apply to welds. Welds are a sub-materials of steel.

Table 2.1-2
Threaded Fasteners Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Anchor bolts	NA	NA	Addressed in bulk commodities AMR **(Ref. 14b)**	NA
ASME Class 1, 2, 3 and MC support bolting	NA	NA	Addressed in bulk commodities AMR **(Ref. 14b)**	NA
Structural bolting	NA	NA	Addressed in bulk commodities AMR **(Ref. 14b)**	NA

1. See **Section 1.3** for intended function descriptions.

Table 2.1-3
Concrete Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Drywell sump	SSR	Yes	Provides functional support of drywell components.	Reinforced concrete
Equipment hatch concrete plug	EN, MB, SSR	Yes	Provides missile protection for the drywell access leak-tight barrier.	Reinforced concrete
Floor slabs, walls	EN, FLB, MB, SSR,	Yes	Provides functional support for reactor pedestal and protection of drywell shell.	Reinforced concrete
Foundation	EN, FLB, PB, SSR,	Yes	Serves as the structural foundation support for the primary containment.	Reinforced concrete
Reactor vessel support pedestal	SSR	Yes	The reactor pedestal is a cylindrical reinforced concrete structure which provides support for the reactor pressure vessel **(Ref. 38g)**	Reinforced concrete
Sacrificial shield wall (concrete portion)	EN, MB, SSR	Yes	Supports primary shield wall encased by steel cylinders providing support of various system components as well as shielding.	Concrete

1. See **Section 1.3** for intended function descriptions.

Table 2.1-4
Elastomers Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Drywell floor liner seal	EN, SSR	Yes	Provides protection for drywell liner plate at its intersection with the concrete boundary.	Elastomer
Seals and gaskets (doors, manways and hatches)	NA	NA	Addressed in bulk commodities AMR (**Ref. 14b**).	NA
Primary containment electrical penetration sealant	PB, SSR	Yes	Provide pressure boundary for primary containment electrical penetrations.	Elastomer

1. See **Section 1.3** for intended function descriptions.

Table 2.1-5
Flouropolymers and Lubrite Sliding Surfaces Subject to AMR

Component/ Commodity	Intended Function[1]	Subject to AMR	Remarks	Material
Lubrite plates	SSR	Yes	Lubrite plates support intended function of torus supports. **(Ref.38i,j,s,t)**	Lubrite

1. See **Section 1.3** for intended function descriptions.

3.0 Aging Effects Requiring Management

The Structural Tools (**Ref. 4**), EPRI Report #TR-103842 (**Ref. 3**), NUREG-1557 (**Ref. 6**), and NUREG-1801 (**Ref. 5**) are utilized to identify and evaluate potential aging effects. The conclusions reached by these documents are summarized in LRPG-06, Structural Screening and Aging Management Reviews (**Ref. 13**). The materials and environments that were evaluated by these reports contain various aging effects which were found applicable to structural components. For the evaluated materials and environments found at VYNPS, the conclusions reached for those materials and environments are applicable.

The identified aging effects for the primary containment structure are addressed in the following subsections.

3.1 Steel

3.1.1 Description and Scope

The carbon and stainless steel components of the primary containment must be capable of resisting the forces and environmental conditions resulting from normal operation, design basis accident conditions, and natural phenomena. This capability is ensured in the design phase by component design specifications, structural analysis for the postulated loads, and material specification commensurate with the expected condition.

The structural components subject to AMR as indicated in **Table 2.1-1** are addressed in this section.

3.1.2 Environments

Carbon and stainless steel associated with the drywell and torus structure and subject to aging management review is exposed to environmental conditions in the general categories of

- protected from weather
- exposed to fluid environments.

3.1.2.1 Protected from Weather

Steel protected from weather may be exposed to interior ambient temperature up to 165°F, relative humidity up to 100 percent (%), and neutron and gamma radiation (**Ref. 9**). Steel components attached to high temperature systems in buildings protected from weather may be subjected to a maximum operating temperature of 575°F **(Ref. 9)**. Steel protected from weather may temporarily be in contact with aggressive chemicals resulting from accidental spills. However, since spills are cleaned relatively quickly in accordance with plant housekeeping procedures, this is not an environmental factor.

3.1.2.2 Exposed to Fluid Environments

The torus contains a large volume of treated water. This water has a high oxygen concentration **(Ref. 4, 9).**

3.1.3 Aging Effects

The information used to determine aging effects for accessible and inaccessible steel (including welds) is discussed in LRPG-06, Structural Screening and Aging Management Reviews **(Ref. 13).** Referring to Appendix 2 of LRPG-06, *potential* aging effects and associated aging mechanisms for carbon steel and stainless steel exposed to the environments discussed above are shown in **Table 3.1-1**.

Table 3.1-1
Summary of Potential Aging Effects For Steel

Aging Effect	Potential Aging Mechanism	Protected from Weather	Exposed to Fluid Environments
Loss of material	General corrosion	CS	CS
	Galvanic corrosion		CS
	Crevice corrosion		SS
	Pitting corrosion		CS,SS
	Erosion corrosion		CS
	Microbiologically induced corrosion		CS, SS
	Wear		
	Aggressive environment		
Cracking	Hydrogen damage		
	Stress corrosion		
	Fatigue	CS,SS	
	IGA		
Mechanical distortion	Creep		
	Fatigue		
Change in material properties	Elevated temperature	CS	
	Thermal aging		
	Irradiation embrittlement[3]	CS	
	Intermetallic embrittlement		

Notes:
(1) CS = carbon steel and low alloy steel
(2) SS = stainless steel
(3) For fluence levels greater than 10^{18} n/cm2 (E>1Mev).

For the primary containment structure carbon and stainless steel components and commodities in the environments indicated in Table 3.1-1 above, the following subsections identify the aging effects requiring management.

3.1.3.1 Protected from Weather

Loss of material due to general corrosion is an aging effect requiring management for carbon steel protected from weather.

Cracking due to fatigue is an aging effect requiring management for the stainless steel bellows and carbon steel torus protected from weather.

Change in material properties due to elevated temperatures within the drywell is not an aging effect requiring management. Temperatures within the drywell are maintained well below the threshold where material property changes would occur. **(Ref. 9)**

Change in material properties of carbon steel may result from irradiation embrittlement. The location inside the drywell where radiation may approach a level to initiate degradation is protected by a sacrificial shield wall around the reactor vessel. This shield wall is provided to limit the effects of radiation outside this wall. Therefore, change in material properties of the drywell steel due to irradiation embrittlement is not an aging effect requiring management. **(Ref. 9)**

3.1.3.2 Exposed to Fluid Environments

Loss of material due to general corrosion is an aging effects requiring management for carbon steel exposed to treated water.

Loss of material due to crevice corrosion and pitting corrosion is an aging effects requiring management for carbon and stainless steel in treated water with oxygen levels >100 ppb.

Loss of material due to galvanic corrosion is not an aging effect requiring management because carbon steel components of the drywell structure in treated water are not in contact with metals of different potential.

Loss of material due to erosion is not an aging effect requiring management because flow rates in the torus are well below the threshold value.

Loss of material due to microbiologically induced corrosion is an aging effect requiring management for carbon steel in treated water because there is potential for impurities to exist in the torus treated water.

3.1.3.3 Summary

Table 3.1-2 summarizes the aging effects requiring management for the VYNPS primary containment steel components and commodities.

Table 3.1-2
Summary of Aging Effects Requiring Management For Steel

Aging Effect	Aging Mechanism	Protected from Weather				Exposed to Fluid Environments			
		CS			SS	CS			SS
Loss of material	General corrosion	Y				Y			
	Galvanic corrosion								
	Crevice corrosion					Y			Y
	Pitting corrosion					Y			Y
	Erosion corrosion								
	Microbiologically induced corrosion					Y			Y
Cracking	Hydrogen damage								
	Stress corrosion								
	Fatigue	Y			Y				
	IGA								

Notes:
(1) CS = carbon steel
(2) SS = stainless steel

3.2 Threaded Fasteners

Structural component bolting applications within the primary containment structure include bolted joints and threaded connections, collectively referred to as threaded fasteners. Threaded fasteners include bolts, studs, screws, nuts, washers, expansion anchors, undercut anchors, drywell head bolts and member facing surfaces (i.e., mating surfaces to the bolted parts) of a bolted joint.

Threaded fasteners contained within the primary containment structure are addressed in the bulk commodities AMR **(Ref. 14b)**.

3.3 Concrete

3.3.1 Description and Scope

This section evaluates the drywell concrete components that include the drywell structural foundation, floor slabs (including associated beams), sacrificial shield wall, drywell sump, equipment hatch concrete plug and reactor vessel pedestal. Non-shrink grout, epoxy grout, embedments (i.e., plates and grouted anchors below the concrete surface), and reinforcement (i.e., embedded bars, wires, and strands) are subcomponents of concrete.

Table 2.1-3 provides a list of drywell concrete components and their intended functions. To accomplish the functions identified in **Table 2.1-3**, the drywell concrete components must be capable of resisting the forces and environmental conditions resulting from normal operation and design basis accident conditions. The capability of drywell concrete components is ensured in the design phase by component design specifications, structural analysis for postulated loads, and

material specifications commensurate with expected conditions. The concrete components subject to AMR as indicated in **Table 2.1-3** are addressed in this section.

3.3.2 Environment

The environment applicable to concrete components is

- protected from weather.

3.3.2.1 Protected From Weather

Concrete within the drywell general area is located in the lower portion of the drywell and is typically exposed to ambient temperatures below 150°F and relative humidity up to 100% (**Ref. 9**).

Concrete protected from weather may temporarily be in contact with aggressive chemicals resulting from accidental spills. However, the resulting aging effect from accidental chemical spills is considered negligible since spills are cleaned-up quickly in accordance with plant housekeeping procedures. The drywell concrete is not exposed to an above grade or below grade environment.

3.3.3 Aging Effects

The information used to determine the aging effects and associated aging mechanisms for accessible and inaccessible concrete (including subcomponents) is discussed in LRPG-06, Structural Screening and Aging Management Reviews **(Ref. 13).** Referring to Appendix 2 of LRPG-06 **(Ref. 13)**, the *potential* aging effects and associated aging mechanisms for concrete exposed to the environments discussed above are shown in **Table 3.3-1**.

Table 3.3-1
Summary of Potential Aging Effects For Concrete

Aging Effect	Potential Aging Mechanism	Protected from Weather	Exposed to Weather[4]	
			Above Grade	Below Grade
Loss of material	Freeze-thaw			
	Abrasion and cavitation			RC
	Elevated temperature	RC	RC	RC
	Aggressive chemicals			
	Corrosion of embedded steel *reinforcement*			
Cracking	Freeze-thaw			
	Reaction with aggregates			
	Shrinkage	M[3]	M[3]	
	Settlement			
	Elevated temperature	RC,M[3]	RC	RC
	Irradiation			
	Fatigue			
	Restraint against expansion/contraction	M[3]	M[3]	
	Aggressive environment			
	Creep	M[3]	M[3]	
Change in material properties	Leaching of calcium hydroxide			
	Aggressive chemicals			
	Elevated temperature	RC	RC,M[3]	RC
	Irradiation	RC,M[3]		
	Creep	M[3]		
	Cathodic protection effect			
	Restraints			
	Shrinkage			
	Freezing			

Notes:
(1) RC = reinforced concrete
(2) M = masonry or block wall
(3) Masonry walls are not are not applicable to the PCS.
(4) Concrete of the PCS is not exposed to this environment.

3.3.3.1 Protected From Weather

Loss of material, cracking, and change in material properties due to elevated temperature are not aging effects requiring management for the drywell structure's concrete components. The general area temperatures in primary containment average 150°F. **(Ref. 9)** Concrete in the drywell is located in the lower portion, i.e. floor slab, where temperature exposure limits are below the thresholds of 150°F **(Ref. 4, 17)** for significant aging effects. Piping within the drywell is generally insulated and the area is cooled by local HVAC systems and not in contact with concrete surfaces.

Change in material properties due to irradiation is not an aging effect requiring management for the primary containment concrete components. The effect of radiation generated heat in the drywell has been considered in the design of the sacrificial shield walls. The shield wall thicknesses were determined on the basis of the radiation shielding requirements and are much greater than those required for structural purposes. This additional thickness, in addition to being encased by a steel liner, provides for strength greater than that required to offset radiation concerns. Additional provisions are in place to maintain a constant temperature in the area through ventilation. The ventilation within the drywell cools the area surrounding the shield walls to prevent appreciable loss of structural strength due to gamma and neutron heating.

3.3.3.2 Summary

Table 3.3-2 summarizes the aging effects requiring management for the VYNPS primary containment concrete components.

Table 3.3-2
Summary of Aging Effects Requiring Management For Concrete

Aging Effect	Potential Aging Mechanism	Protected from Weather
None	None	

No aging effects were identified which would prevent the VYNPS drywell concrete components from performing their intended functions consistent with the CLB for the period of extended operation.

Although aging effects requiring management are not expected, concrete is conservatively included in an aging management program for the period of extended operation. For accessible concrete, the structures monitoring program will provide confirmation of the absence of aging effects requiring management.

3.4 Fire Barriers

Per the Structural Tools **(Ref. 4)**, fire barriers include both fire wraps and fire stops. Fire wrap refers to applied fireproofing. Fire stop refers to fireproofing used in penetrations between fire zones. Fire barriers are typically passive materials which have specific fire ratings and fire resistance ratings.

Floors, ceilings, and load bearing and non-load bearing walls made of concrete, masonry, or steel may serve as fire barriers. Fire barriers also include fire doors, fire dampers, and water curtains **(Ref. 10)**. Fire barriers, with the exception of fire doors, fire walls, and floor slabs, are structural commodities that are common to various in-scope structures. Therefore, fire barrier commodities are evaluated in the bulk commodities AMR **(Ref. 14b)**.

3.5 Elastomers

3.5.1 Description and Scope

Elastomers are rubber or polymer having properties similar to rubber, such as neoprene and silicone. Although gaskets and seals support the functions of the components and commodities that they are associated with, they are consumable and are not subject to AMR. Other gaskets and seals, including moisture barriers, hatch seals etc. associated with components and commodities common to the primary containment structure and other in-scope structures are addressed in bulk commodities AMRC-06 **(Ref.** Error! Reference source not found.**)**.

3.5.2 Environments

The environment applicable to primary containment elastomer components is

- protected from weather.

3.5.2.1 Protected From Weather

Primary containment elastomers protected from weather may be exposed to interior ambient temperature up to 148°F and relative humidity up to 100 percent (%). Elastomers may also be subjected to ionization radiation.

3.5.3 Aging Effects

3.5.3.1 Protected From Weather

Cracking and change in material properties due to ionizing radiation are applicable aging effects for elastomers for the primary containment penetrations.

3.5.3.2 Summary

Table 3.5-1 summarizes the aging effects requiring management for elastomers of the primary containment.

Table 3.5-1
Aging Effects Requiring Management for Elastomers

Aging Effect	Aging Mechanism	Protected from Weather
Cracking and Change in material properties		Elastomer
	Ionizing radiation	Y
	Thermal exposure	Y
	Ultraviolet radiation	Y

3.6 Flouropolymers and Lubrite Sliding Surfaces

There are no structural components or commodities associated with the drywell or torus that are constructed of fluoropolymer materials such as Teflon or Tefzel. However, lubrite plate saddle assemblies are used in the torus supports at VYNPS. Lubrite is the trade name for a low friction lubricant material used in applications where relative motion (sliding) is desired. The lubrite proprietary lubricant is a custom compound mixture of metals, metal oxides, minerals, and other lubricating materials combined with a lubricating binder. Lubrite material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. Additionally, lubrite products are solid, permanent, completely self lubricating, and require no maintenance for the design life of the product. The lubrite lubricants used in nuclear applications are designed for the environments to which they are exposed. There are no known aging effects that would lead to a loss of intended function. Therefore, there are no aging effects requiring management for lubrite plates.

3.7 Operating Experience

Industry operating experience is documented in the Structural Tools and the Mechanical Tools, EPRI reports 1002950 and 1003056, respectively (**Ref. 4, 7**). The review included NRC generic communications such as Information Notices, IE Bulletins and Generic Letters dating back to 1973.

The review of site specific operating experience and recent industry operating experience is documented in LRPD-05, Operating Experience Review (**Ref. 14f**). The review did not identify aging effects different from those addressed in this aging management review report

4.0 Demonstration That Aging Effects Will Be Managed

The aging assessment in **Section 3.0** determined that some aging effects for the primary containment structural components and commodities require management. The following sections evaluate the adequacy of VYNPS programs to manage aging effects for the period of extended operation.

The aging of components in inaccessible areas is not expected to be different from that of components in accessible areas exposed to the same environments. Since inaccessible areas were determined to be no more susceptible to aging than accessible areas, no unique aging management programs are required for inaccessible areas.

The following subsections provide an overview of plant programs and activities credited for managing the effects of aging on the primary containment system and its components and commodities. More detailed program descriptions are provided in LRPD-02, "Aging Management Program Evaluation Results" (**Ref. 14d**).

4.1 Containment In-service Inspection - (CII)

For steel, the Containment In-service Inspection Program – IWE manages loss of material and cracking for the ASME Code Class MC pressure retaining steel components and their integral attachments. This aging effect will be managed by visual inspections and testing required by ASME Code, Section XI, Subsection IWE.

For additional information on the Containment In-service Inspection Program – IWE, refer to LRPD-02, "Aging Management Program Evaluation Results" (**Ref. 14d**).

4.2 In-service Inspection – (ISI)

For steel, the In-service Inspection Program – IWF manages loss of material through visual inspection and examinations for the ASME Class MC and Class 1, 2, and 3 piping supports and component supports.

For lubrite, the In-service Inspection Program provides confirmation that there are no aging effects requiring management.

For additional information on the In-service Inspection Program – IWF, refer to LRPD-02, "Aging Management Program Evaluation Results" (**Ref. 14d**).

4.3 Containment Leak Rate

For steel, the Containment Leak Rate Program manages loss of material and cracking by verifying by test that PCS penetrations are effective in maintaining primary containment pressure boundary.

For additional information on containment leak rate, refer to LRPD-02, "Aging Management Program Evaluation Results" **(Ref. 14d)**.

4.4 Structures Monitoring Program

For the primary containment steel not covered by ASME Section XI, IWE, the structures monitoring program manages loss of material due to corrosion by visual inspection of components and their coatings.

For concrete, the structures monitoring program provides confirmation that there are no aging effects requiring management for the primary containment structure concrete.

For lubrite, the structures monitoring program provides confirmation that there are no aging effects requiring management.

For additional information on the structures monitoring program, refer to LRPD-02, "Aging Management Program Evaluation Results" **(Ref. 14d)**.

4.5 Time-Limited Aging Analyses

TLAA are defined in 10 CFR 54.3. An evaluation of TLAA is required by 10 CFR 54.21. Some components of the drywell and torus as identified in Attachment 1 are exposed to fatigue loading that could result in cracking. Therefore components meeting this requirement will be addressed as a TLAA.

For further discussion and conclusions regarding TLAA, refer to VYNPS Report LRPD-03, TLAA and Exemption Evaluation Results **(Ref. 14e).**

5.0 Summary and Conclusions

In conjunction with the Structural Tools (**Ref. 4**), this report documents the aging management review of the primary containment structural components and commodities. Potential aging effects based on materials and environments were identified for PCS components and commodities. Based on specific materials and environments, aging effects requiring management were determined for the VYNPS primary containment structural components and commodities.

Results of the aging management review for the primary containment structural components and commodities are summarized in Attachment 1.

Programs identified in **Section 4.0** will provide reasonable assurance that the effects of aging on VYNPS primary containment structural components and commodities will be managed such that the intended functions can be maintained consistent with the current licensing basis throughout the period of extended operation.

6.0 References

1. Federal Register, Monday, May 8, 1995, (60 FR 22461) Final Rules, 10 CFR Part 54

2. NEI 95-10, NEI 95-10 (Rev. 3), *Industry Guideline for Implementing the Requirements of 10 CFR Part 54, The License Renewal Rule,* April 2001.

3. TR-103842, *Class I Structures License Renewal Industry Report*, Revision 1, EPRI

4. EPRI 1002950, *Aging Effects for Structures and Structural Components (Structural Tools) Revision 1:* EPRI, Palo Alto, CA: 2003

5. NUREG-1801, Generic Aging Lesson Learned (GALL) Report, Revision 0, Volumes 1 and 2, July 2001

6. NUREG 1557, *Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal*

7. EPRI Report # 1003056, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 3

8. Report on Aging of Nuclear Power Plant Reinforced Concrete Structures, NUREG/CR-6424, Oak Ridge National Laboratory, March 1996

9. VYNPS Updated Final Safety Analysis Report (UFSAR)

10. VYNPS-Fire Hazards Analysis

11. License Renewal Project Guideline LRPG-01, "VY License Renewal Project Plan"

12. License Renewal Project Guideline LRPG-03, "System and Structure Scoping"

13. License Renewal Project Guideline LRPG-06, "Structural Screening and Aging Management Reviews"

14. Engineering Reports:

    a. AMRC-02, "Aging Management Review of the Reactor Building"
    b. AMRC-06, "Bulk Commodities"
    c. LRPD-01, "System and Structure Scoping Results"
    d. LRPD-02, "Aging Management Program Evaluation Results".
    e. LRPD-03, "TLAA and Exemption Evaluation Results"
    f. LRPD-05, "Operating Experience Review"

15. *Guide for Making a Condition Survey of Concrete in Service*, ACI 201.1R-92, American Concrete Institute, Detroit, Michigan

16. *Specifications for Structural Concrete for Buildings*, ACI 301, American Concrete Institute, Detroit Michigan

17. *Building Code Requirements for Reinforced Concrete*, ACI-318-63, American Concrete Institute, Detroit, Michigan

18. *Code Requirements for Nuclear Safety Related Concrete Structures*, ACI 349-85, American Concrete Institute, Detroit, Michigan

19. *Guide For Durable Concrete*, ACI 201.2R-77, American Concrete Institute, Detroit, Michigan

20. *Guide to the Use of Waterproofing, Damproofing, Protective, and Decorative Barrier Systems for Concrete*, ACI 515.1R-79, American Concrete Institute, Detroit, Michigan

21. *Prediction of Creep, Shrinkage, and Temperature Effects in Concrete Structures*, ACI 209R-82, American Concrete Institute, Detroit, Michigan

22. *Control of Cracking in Concrete Structures*, ACI 224R-89, American Concrete Institute, Detroit, Michigan

23. *Evaluation of Existing Nuclear Safety-Related Concrete Structures*, ACI 349.3R-95, American Concrete Institute, Detroit, Michigan

24. Causes, Evaluation, and Repair of Cracks in Concrete Structures, ACI 224.1R-89, American Concrete Institute, Detroit, Michigan

25. ASME Boiler And Pressure Vessel Code, Section III, Division 2, "Code for Concrete Reactor Vessels and Containments", 1986

26. ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Vessel", 1965

27. ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE and IWL, 1992 ED through 1992 Addenda

28. Hilsdorf, H.R., Kropp, J., and Koch, H.J., *The effects of Nuclear Radiation on the Mechanical Properties of Concrete*, Douglas McHenry International Symposium on Concrete and Concrete Structures, American Concrete Institute SP-55, 1978

29. ANSI N6.2-1965, "Safety Standard for the Design, Fabrication and Maintenance of Steel Containment Structures for Stationary Nuclear Power Reactors"

30. "Specification for The Design Fabrication and Erection of Structural Steel For Buildings", American Institute of Steel Construction, 1963

31. Federal Register, January 7,1994, (59 FR 979), "Proposal Rulemaking to Incorporate by Reference into 10 CFR 50.55a Subsection IWE and Subsection IWL, Section XI, Division I, of the ASME Boiler and Pressure Vessel Code

32. 10 CFR Part 50.55a, *Codes and Standards*

33. Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program", U.S. Regulatory Commission, Dated September 1995

34. VYNPS Procedure:

    a. PP 7006 – Rev 7 LPC 2, Primary Containment Leakage Rate Testing Program
    b. OP 4030 - Rev 35 LPC 11, Type B and C Primary Containment Leak Rate Testing
    c. OP 4115 – Rev 43 LPC 7, Primary Containment Surveillance
    d. OP 4116 - Rev. 22 LPC 14, Secondary Containment Surveillance
    e. OP 0046 – Rev 7 LPC 1, Installation and Repair of Fire Barriers, Penetration Seals, Fire Breaks and Flood Seals
    f. OP 4019 – Rev 15 LPC 4, Surveillance of Plant Fire Barriers and Fire Rated Assemblies
    g. PP 7015 –Rev. 3, Vermont Yankee Inservice Inspection Program
    h. PP 7024 – Rev 2, Containment Inservice Inspection Program (IWE)
    i. PP 7030– Rev 0 LPC 1, Structures Monitoring Program Procedure
    j. PP 7037 – Rev 0 LPC 2, Safety-Related Coatings Program

35. Information Notice 98-26 "Settlement Monitoring and Inspection of Plant Structures affected by Degradation of Porous Concrete Sub-foundations", July 24, 1998

36. ANSI B30.2-1976, Overhead and Gantry Cranes

37. NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants", January 1980

38. VYNPS Drawings:

    a. G-191149R21, "General Arrangement Reactor Building Plans-Sht. 1"
    b. G-191149R25, "General Arrangement Reactor Building Plans-Sht. 2"
    c. G-191150R19, "General Arrangement Reactor Building Sections"
    d. G-191154R2, "Reactor Building Exterior Walls Mech. Penetration Seals"
    e. G-191707R6, "Reactor Building Shield Wall & Trusses, Sht. 1"
    f. G-191709R5, "Reactor Building Shield Wall & Trusses, Sht. 3"
    g. G-191710R2, "Reactor Building Reactor Pedestal-Embedded Steel Sht. 1"
    h. 5920-1578R0, "Torus Penetration X-224 – X-227
    i. 5920-9132R0, "Right Torus Saddle Support"
    j. 5920-6042R2, "Assembly of Torus Column Supports"
    k. 5920-5528R0, "Thermowell"
       5920-5525R1, "RTD Details"
    l. 5920-451R3, "90" Diameter Exp Bellows for Vent Line"
    m. 5920-42R14, Suppression Chamber Spec Control Primary Containment Penetrations
    n. 5920-44R3, Vessel Support Arrangement
    o. 5920-45R11, Primary Containment Vessel Arrangement
    p. 5920-FS-610R1 Sht. 1, "Sump Pit Liner [Drywell Eqpt and Floor Drain Sump]"
    q. 6202-0200R1, "Suppression Chamber General Arrangement and Field Assembly"
    r. 5920-41R12, "Drywell Primary Containment Penetrations"
    s. 6202-23R0,"Drywell Lower Beam Seats"
    t. 6202-24R0,"Drywell Upper Beam Seats"
    u. 5920-4586R5, "Drywell to Reactor Well Seal"
    v. 5920-232R0, "Reactor Well Seal Arrangement"

Attachment 1
Primary Containment Structural Components and Commodities

Structure and/or Component/Commodity	Intended Function	Material	Environment	Aging Effect	Aging Management Program	GALL Item	LRA Table 1 Item	Notes
Bellows (reactor vessel and drywell)	PB,SSR	Stainless steel	Protected from weather	Cracking (cyclic loading)	CII-IWE Containment leak rate	II.B1.1-3 (C-20)	3.5.1-13	C
CRD removal hatch	EN, FLB, MB, PB,SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4.-6 (C-16)	3.5.1-18	E
Drywell head	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell shell	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell shell protection panels (jet deflectors)	EN, MB	Carbon steel	Protected from weather	Loss of material (corrosion)	Structures monitoring	III.B5-7 (T-30)	3.5.1-39	C
Drywell sump liner	SSR	Carbon steel	Exposed to fluid environment	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Drywell to torus vent line bellows	PB, SSR	Stainless steel	Protected from weather	Cracking (cyclic loading)	CII-IWE Containment leak rate	II.B1.1-3 (C-20)	3.5.1-13	E
Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Cracking (fatigue)	TLAA	II.B1.1-4 (C-21)	3.5.1-8	A

Attachment 1
Primary Containment Structural Components and Commodities

Structure and/or Component/Commodity	Intended Function	Material	Environment	Aging Effect	Aging Management Program	GALL Item	LRA Table 1 Item	Notes
Drywell to torus vent system	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Equipment hatch	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4-6 (C-16)	3.5.1-18	E
Personnel airlock	EN, FLB, MB, PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4-6 (C-16)	3.5.1-18	E
Primary containment electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4-1 (C-12)	3.5.1-18	E
Primary containment mechanical penetrations (includes those w/bellows)	PB, SSR	Carbon steel	Protected from weather	Cracking (cyclic loading)	CII-IWE Containment leak rate	II.B4-3 (C-14)	3.5.1-12	E
Reactor vessel support assembly	SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Reactor vessel stabilizer supports	SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Sacrificial shield wall lateral supports	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	Structures monitoring	II.B5-7 (T-30)	3.5.1-39	C

Attachment 1
Primary Containment Structural Components and Commodities

Structure and/or Component/Commodity	Intended Function	Material	Environment	Aging Effect	Aging Management Program	GALL Item	LRA Table 1 Item	Notes
Sacrificial shield wall (steel portion)	EN, MB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	Structures monitoring	II.B5-7 (T-30)	3.5.1-39	C
Structural steel: plate, columns and beams	SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	Structures monitoring	II.B5-7 (T-30)	3.5.1-39	C
Torus electrical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4-1 (C-12)	3.5.1-18	E
Torus external supports (columns, saddles)	SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Torus manway	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus mechanical penetrations	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B4-1 (C-12)	3.5.1-18	E
Torus ring girder	SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus ring girder	SSR	Carbon steel	Exposed to fluid environment	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E

Attachment 1
Primary Containment Structural Components and Commodities

Structure and/or Component/Commodity	Intended Function	Material	Environment	Aging Effect	Aging Management Program	GALL Item	LRA Table 1 Item	Notes
Torus shell	HS, PB, SSR,	Carbon steel	Protected from weather	Cracking (fatigue)	TLAA	II.B1.1-4 (C-21)	3.5.1-8	E
Torus shell	HS, PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus shell	HS, PB, SSR	Carbon steel	Exposed to fluid environment	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Torus thermowells	PB, SSR	Carbon steel	Protected from weather	Loss of material (corrosion)	CII-IWE Containment leak rate	II.B1.1-2 (C-19)	3.5.1-5	E
Vent header support	SSR	Carbon steel	Exposed to fluid environment	Loss of material (corrosion)	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Drywell sumps	SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501
Equipment hatch concrete plug	EN, MB, SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501
floor slabs, walls	EN, FLB, MB, SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501
Foundation	EN, FLB, MB, PB, SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501
Reactor vessel support pedestal	SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501

Attachment 1
Primary Containment Structural Components and Commodities

Structure and/or Component/Commodity	Intended Function	Material	Environment	Aging Effect	Aging Management Program	GALL Item	LRA Table 1 Item	Notes
Sacrificial shield wall (concrete portion)	EN, MB, SSR	Concrete	Protected from weather	NA	Structures monitoring	NA		I, 501
Drywell floor liner seal	EN, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Structures monitoring	II.B4-7 (C-18)	3.5.1-16	E
Primary containment electrical penetration sealant	PB, SSR	Elastomer	Protected from weather	Cracking Change in material properties	Structures monitoring	II.B4-7 (C-18)	3.5.1-16	E
Lubrite sliding supports	SSR	Lubrite	Protected from weather	NA	ISI-IWF Structures monitoring	NA		I, 501

Isn't this IWE?

Attachment 1
Primary Containment Structure Structural Components and Commodities - Notes

Notes: (all listed notes may not be applicable)

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.
B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.
C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description..
D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.
E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.
F. Material not in NUREG-1801 for this component.
G. Environment not in NUREG-1801 for this component and material.
H. Aging effect not in NUREG-1801 for this component, material and environment combination.
I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.
J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Note:

501. The VYNPS environment is not conducive to the listed aging effects. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.
502. Loss of insulating characteristics due to insulation degradation is not an aging effect requiring management for insulation material. Insulation products, which are made from fiberglass fiber, calcium silicate, stainless steel, and similar materials, that are protected from weather do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at VYNPS.
503. The ambient environment at VYNPS is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chloride content. Therefore aging management is not required for aluminum, stainless steel and galvanized steel components exposed to the external environment.
504. Steel piles driven in undisturbed soils show no significant effects due to corrosion, regardless of the soil type or soil properties. Likewise, piles driven in disturbed soil above the water table zone do not reflect any significant corrosion. Therefore aging management is not required