VERIFICATION OF VYNPS LICENSE RENEWAL PROJECT REPORT

Title of Report: **Aging Management Review of the Primary Containment Atmosphere Control and Containment Atmosphere Dilution Systems**

Report Number: **AMRM-08**

Revision: **1**

This report documents evaluations 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.

Other document(s) impacted by this revision: ____Yes, See Attachment ___X___No

License Renewal Project Team

Prepared by Lori Ann Potts Date: 4/11/06
Lori Ann Potts

Reviewed by Don E Fronabarger Date: 4-11-06
Don Fronabarger

Approved by D. J. Lach Date: 4/11/06
David J. Lach, ENI LR Project Manager

VYNPS Approval

Reviewed by Stephen A. Vehec Jeffrey K. Melvin Date: 4/11/06

Approved by [signature] Date: 4-11-06
VYNPS Manager, Engineering Projects

REVISION DESCRIPTION SHEET

Revision Number	Description	Pages and/or Sections Revised
0	Initial Issue	
1	As a result of ER 04-1115, CAD was removed from TS and weekly containment sampling is now completed by alternate means. Removed statement that CAD is in service during plant operation. Updated table of contents page numbers.	Pages 4 and 5, Section 1.2 Page 3, table of contents

TABLE OF CONTENTS

1.0 Introduction

1.1 Purpose

This report is part of the aging management review (AMR) of the integrated plant assessment (IPA) performed to extend the operating license of Vermont Yankee Nuclear Power Station (VYNPS). This report demonstrates the effects of aging on primary containment atmosphere control and containment atmosphere dilution (PCAC and CAD) system passive mechanical components will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis as required by 10 CFR 54.21(a)(3). This report also demonstrates the effects of aging on post-accident sampling system (PASS) sample line passive mechanical components will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis as required by 10 CFR 54.21(a)(3). For additional information on the license renewal project and associated documentation, refer to the License Renewal Project Plan.

The purpose of this report is to demonstrate that aging effects for passive mechanical components will be adequately managed for the period of extended operation associated with license renewal. The approach for demonstrating management of aging effects is to first identify the components that are subject to aging management review in Section 2.0. The next step is to define the aging effects requiring management for the system components in Section 3.0. Section 4.0 then evaluates if existing programs and commitments adequately manage those effects.

Applicable aging effects were determined using EPRI report 1003056 *Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools* **(Ref. 1)**. This EPRI report provides the bases for identification of aging effects based on specific materials and environments and documents confirmation of the validity of the aging effects through review of industry experience. This aging management review report (AMRR), in conjunction with EPRI report 1003056, documents the identification and evaluation of aging effects requiring management for mechanical components in the PCAC, CAD and PASS systems.

1.2 System Description

As described in UFSAR Sections 5.2.6 and 5.2.7, the PCAC and CAD systems consist of the equipment required to perform primary containment vent, purge, inerting, and H_2/O_2 monitoring. The PCAC and CAD systems consist of two H_2/O_2 analyzers and the associated piping and valves used to establish and maintain the atmosphere within primary containment at desired values of pressure and gas concentration. Each H_2/O_2 analyzer uses two parallel sample pumps to draw samples from the torus and drywell and return sample gas to the torus. **(Ref. 2, 10)**

As described in UFSAR Section 10.20, PASS sample lines provide reactor coolant system samples to the sample panel. Samples may be taken from either of two sampling points located on the jet pump sensing lines (instrumentation nozzles) for JP1 and JP11. **(Ref. 2, 10)**

During plant startup, primary containment is normally inerted with nitrogen and make-up nitrogen is provided during normal operation as required. The CAD system is in service

following an accident to determine the oxygen level in the primary containment. The PASS system is normally in standby. **(Ref. 2, 10)**

For additional description of the system and its components, see the PCAC and CAD system design basis document. **(Ref. 3)**

1.3 System and Component Intended Functions

As described in UFSAR Sections 5.2.6 and 5.2.7, the PCAC and CAD systems provide the ability to operate the primary containment with an inert atmosphere in accordance with licensing commitments. The systems provide for purging of primary containment, a supply of makeup gas and a means to monitor primary containment pressure and temperature. The torus vent rupture disc provides the capability to prevent exceeding primary containment design pressure. **(Ref. 2, 3, 4)**

The CAD system provides the ability to monitor radiation and H_2/O_2 concentrations in primary containment, limit H_2/O_2 concentrations in primary containment, and inject nitrogen into primary containment following an accident. The source of this nitrogen is not the nitrogen supply subsystem, but rather a nitrogen manifold outside the reactor building supplied by various temporary sources, both on-site and off-site. **(Ref. 2, 4)**

As described in UFSAR Section 10.20, the PASS system provides representative samples of reactor coolant for analysis which would be indicative of the extent and development of core damage and the course it is taking. PASS return (purge) lines are reviewed in AMRM-05, Aging Management Review of the High Pressure Coolant Injection System. **(Ref. 2)**

The PCAC and CAD system passive mechanical components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for anticipated transients without scram (10CFR50.62), fire protection (10CFR50.48), environmental qualification (10CFR50.49), pressurized thermal shock (10CFR50.61 – not applicable for BWRs), or station blackout (10CFR50.63). **(Ref. 4, 5, 6, 7)**

The PASS system passive mechanical components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for anticipated transients without scram (10CFR50.62), fire protection (10CFR50.48), environmental qualification (10CFR50.49), pressurized thermal shock (10CFR50.61 – not applicable for BWRs), or station blackout (10CFR50.63). **(Ref. 4, 5, 6, 7)**

For license renewal, the primary intended function of the PCAC, CAD and PASS system components and piping is to maintain system pressure boundary integrity. The orifices required to limit flow rates have the function of flow control. The heat exchangers have the function of heat transfer. For additional information on system and component functions, see the PCAC and CAD system design basis document **(Ref. 3)**.

System components outside of the safety class boundary of the PCAC, CAD and PASS systems whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] that are not reviewed in this AMRR are reviewed in AMRM-30, Aging Management Review of Nonsafety-related Systems and Components Affecting Safety-related Systems. For VYNPS this includes items such as piping, valves, pumps, and support elements outside of the

safety class pressure boundary, that are required to be structurally sound in order to maintain the integrity of the safety class piping.

Refer to VYNPS Report LRPD-01, System and Structure Scoping Results, for additional information on scoping of systems and structures for license renewal.

2.0 Screening

Passive, long-lived components that perform a license renewal component intended function are subject to aging management review. Bolting, diaphragms, dryers, filter housings, heat exchangers, orifices, piping, pump casings, tanks, traps, tubing, and valve bodies in the PCAC, CAD and PASS systems are passive, long-lived components.

Components in the PCAC system included in this AMRR are the primary containment vent and purge piping and valves, torus to drywell vacuum breakers, torus to reactor building vacuum breakers, torus level instrument root valves and tubing, primary containment pressure instrument root valves and tubing, nitrogen supply subsystem containment isolation valves, and drywell airlock equalization valves and associated piping.

The drywell to torus vent system is reviewed in AMRC-01, Aging Management Review of the Primary Containment.

The torus vent rupture disk is replaced every five years. Therefore, this component is short-lived and not subject to aging management review. **(Ref. 17)**

The PCAC system utilizes safety-related solenoid valves to bleed air off of actuators so the associated valves achieve the desired position. Pressure boundary integrity is not required for these valves since the associated components fail to the desired position on a loss of air pressure. Therefore, these safety-related valves do not require aging management review. A list of these valves is provided below.

SE-16-19-6B
SE-16-19-7B
SE-16-19-8
SE-16-19-9
SE-16-19-10
SE-16-19-11A
SE-16-19-11B
SE-16-19-23

CAD system components in this AMRR include the H_2/O_2 analyzers and the nitrogen injection piping and valves from the reactor building wall to the primary containment, including the air receiver tanks and flow control orifices. The piping and valves to vent containment atmosphere to the standby gas treatment system are also included in this AMRR.

The nitrogen sources used by the CAD system to inject nitrogen following an accident are short-lived, temporary sources and are therefore not subject to aging management review. **(Ref. 3, 10)**

PASS system components in this AMRR include the tubing and valves in the sample lines from the class 1 boundary up to and including the second isolation valve on each sample line. PASS return (purge) lines are reviewed in AMRM-05, Aging Management Review of the High Pressure Coolant Injection System.

Insulation is installed on some equipment in this AMRR. For the evaluation of insulation, refer to LRPD-01, System and Structure Scoping Results, and AMRC-06, Aging Management Review of Bulk Commodities.

A list of the PCAC, CAD and PASS system passive mechanical components subject to aging management review is included as Attachment 1. Flow diagrams associated with these systems, highlighted to identify components requiring aging management review, are available as drawings LRA-G-191165, LRA-G-191172, LRA-G-191175 Sh 1, LRA-G-191238, and LRA-VY-E-75-002. **(Ref. 10)**

3.0 Aging Effects Requiring Management

EPRI report 1003056 is used in this section to identify and evaluate aging effects requiring management. Aging effects that may result in loss of intended functions for non-Class 1 mechanical components are cracking (i.e., crack initiation, crack growth, and through-wall cracking), change in material properties, loss of material, and fouling. For additional information on aging effects, refer to EPRI report 1003056. **(Ref. 1)**

Attachment 1 is a list of PCAC, CAD and PASS system components that require aging management review in this AMRR and are highlighted on the associated LRA drawings.

The PCAC, CAD and PASS systems are located in the reactor building where the air temperature is maintained between 55 and 100°F. Some components are inside primary containment, where the air temperature is maintained between 135 and 165°F. **(Ref. 2, 10)**

The following sections document the determination of aging effects requiring management for specific component materials and environments. Since the primary containment is inerted with nitrogen during power operation, portions of the PCAC and CAD systems are exposed internally to nitrogen during power operation. However, when the primary containment atmosphere is de-inerted, the components are exposed to indoor air. Since moisture or other contaminants are more likely to be entrained in air than in nitrogen, the aging effects for carbon and stainless steel exposed to indoor air are evaluated. **(Ref. 16)**

3.1 Carbon Steel Components Exposed to Indoor Air on the Internal Surface and Indoor Air on the External Surface

The majority of the PCAC system piping components and valves are carbon steel (pipe code CS-1). The CAD air receiver tanks and trap are carbon steel. See Attachment 1 for a list of the carbon steel components. These components are exposed to indoor air on internal and external surfaces. **(Ref. 2, 10, 11, 20)**

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel internal and external surfaces exposed to indoor air.

Cracking due to thermal fatigue is not an aging effect requiring management since the system temperature remains below the 220°F threshold for carbon steel thermal fatigue.

3.2 Carbon Steel Components Exposed to Treated Water on the Internal Surface and Indoor Air on the External Surface

Valves to the lower tap of the torus wide range level instruments are exposed to water on internal surfaces. Also, valves to the torus narrow range water level instruments are conservatively assumed to be exposed to water on internal surfaces. Therefore, carbon steel piping components and valves are exposed to low temperature (< 100°F) treated water on internal surfaces and indoor air on external surfaces. See Attachment 1 for a list of the carbon steel components. **(Ref. 10, 12, 14, 19)**

Loss of material due to microbiologically induced corrosion (MIC) and general, pitting and crevice corrosion is an aging effect requiring management for carbon steel surfaces exposed to

treated water. Localized galvanic corrosion is also possible at interfaces between carbon steel and stainless steel components. Erosion is not a concern because the flow rates are low.

Cracking due to thermal fatigue is not an aging effect requiring management since the system temperature remains below the 220°F threshold for carbon steel thermal fatigue.

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel external surfaces exposed to indoor air.

3.3 Stainless Steel Components Exposed to Indoor Air on the Internal Surface and Indoor Air or Silicone on the External Surface

CAD system tubing, valves and orifices are stainless steel. PCAC system instrument tubing is stainless steel. Stainless steel piping components and tubing are exposed to indoor air on internal surfaces and indoor air on external surfaces. Diaphragm seals in the upper taps of the torus wide range level instruments are stainless steel. The diaphragm seals are exposed to air on internal surfaces and silicone on external surfaces (diaphragm surfaces closest to the transmitter). H_2O_2 analyzer components (pump casings, valve bodies, dryers, traps, filter housings, and piping) are stainless steel exposed to indoor air on internal and external surfaces. See Attachment 1 for a list of the stainless steel components. **(Ref. 2, 10, 11, 13, 15, 21)**

There are no aging effects requiring management for internal stainless steel surfaces exposed to indoor air due to the inherent resistance of stainless steel to aging effects when not wetted or exposed to aggressive chemicals.

Cracking due to stress corrosion and intergranular attack is not an aging effect requiring management since system temperature remains below the 140°F threshold for these mechanisms in stainless steel.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 270°F threshold for stainless steel thermal fatigue.

There are no aging effects requiring management for external stainless steel surfaces exposed to indoor air or silicone due to the inherent resistance of stainless steel to aging effects when not wetted or exposed to aggressive chemicals. Insulation, if used on PCAC and CAD components, is free of contaminants that could cause cracking of stainless steel.

3.4 Stainless Steel Components Exposed to Treated Water on the Internal Surface and Indoor Air or Silicone on the External Surface

Tubing to the lower tap of the torus wide range level instruments is exposed to water on internal surfaces. Also, tubing to the torus narrow range water level instruments is conservatively assumed to be exposed to water on internal surfaces. The outboard isolation valves on the narrow range water level instruments are stainless steel and are also assumed to be exposed to water on internal surfaces. Therefore, stainless steel piping components and tubing are exposed to low temperature treated water on internal surfaces and indoor air on external surfaces. Diaphragm seals in the lower taps of the torus wide range level instruments are stainless steel. The diaphragm seals are exposed to low temperature (< 100°F) treated water

on internal surfaces and silicone on external surfaces (diaphragm surfaces closest to the transmitter). See Attachment 1 for a list of the stainless steel components. **(Ref. 10, 12, 14, 15, 19, 21)**

Stainless steel is inherently resistant to general corrosion and erosion. Stainless steel internal surfaces are susceptible to loss of material due to MIC, pitting and crevice corrosion in the presence of high oxygen levels and contaminants. Therefore, loss of material is an aging effect requiring management for internal wetted surfaces of stainless steel components.

Cracking due to stress corrosion and intergranular attack is not an aging effect requiring management since system temperature remains below the 140°F threshold for these mechanisms in stainless steel.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 270°F threshold for stainless steel thermal fatigue.

There are no aging effects requiring management for external stainless steel surfaces exposed to indoor air or silicone due to the inherent resistance of stainless steel to aging effects when not wetted or exposed to aggressive chemicals. Insulation, if used on PCAC and CAD components, is free of contaminants that could cause cracking of stainless steel.

3.5 Stainless Steel Components Exposed to High Temperature Treated Water on the Internal Surface and Indoor Air on the External Surface

PASS sample line tubing and valves are stainless steel exposed to treated water or steam from the reactor coolant system on internal surfaces. See Attachment 1 for a list of the stainless steel components. These components are exposed to high temperature treated water on internal surfaces and indoor air on external surfaces. **(Ref. 2, 12, 18)**

Stainless steel is inherently resistant to general corrosion and erosion. Stainless steel internal surfaces are susceptible to loss of material due to MIC, pitting and crevice corrosion in the presence of high oxygen levels and contaminants. Therefore, loss of material is an aging effect requiring management for internal wetted surfaces of stainless steel components.

Cracking due to stress corrosion and intergranular attack is an aging effect requiring management since system temperature is above the 140°F threshold for these mechanisms in stainless steel.

Cracking due to thermal fatigue is an aging effect requiring management since system temperature is above the 270°F threshold for stainless steel thermal fatigue.

There are no aging effects requiring management for external stainless steel surfaces due to the inherent resistance of stainless steel to aging effects when not wetted or exposed to aggressive chemicals. Insulation, if used on PASS components, is free of contaminants that could cause cracking of stainless steel.

3.6 Heat Exchangers

The H_2O_2 analyzers have a stainless steel tube formed into a coil that acts as a heat exchanger to remove heat from the gas sample. The coil is exposed to indoor air on internal and external surfaces. **(Ref. 10, 13)**

Loss of material is not an aging effect requiring management for stainless steel internal or external surfaces due to the inherent resistance of stainless steel to aging effects when not wet or exposed to aggressive chemicals.

Cracking due to thermal fatigue is not an aging effect requiring management since the majority of system components are at ambient temperature during normal plant operation. There is a "hot box" internal to the cabinet that is maintained at approximately 275^{0}F, but these components do not experience significant temperature swings or high stresses such that cracking due to thermal fatigue would be an aging effect requiring management. **(Ref. 13)**

Fouling from dust or dirt accumulation on the external surface of the heat exchanger tube is an aging effect requiring management. Fouling on the internal surface is not an aging effect requiring management since the internal surface environment does not contain significant dust or dirt and the equipment is only operated for short periods.

3.7 Bolting

Pressure retaining bolting in this system may be carbon steel or stainless steel and is exposed to indoor air.

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel bolting exposed to indoor air. Loss of material is not an aging effect requiring management for stainless steel bolting that is not wetted.

3.8 Operating Experience

The review of site specific operating experience and recent industry operating experience completed in VYNPS Report LRPD-05, Operating Experience Review Results, did not identify aging effects applicable to the PCAC, CAD and PASS system passive mechanical components not addressed in this aging management review report. **(Ref. 9)**

4.0 Demonstration That Aging Effects Will Be Managed

The components of the PCAC, CAD and PASS systems that are subject to aging management review were described in Section 2.0. For those components, Section 3.0 documented the determination of aging effects requiring management. The aging management review is completed by demonstrating that existing programs, when continued into the period of extended operation, can manage the aging effects identified in Section 3.0. No further action is required for license renewal when the evaluation of an existing program demonstrates that it is adequate to manage the aging effect such that corrective action may be taken prior to loss of the system intended functions. Alternately, if existing programs cannot be shown to manage the aging effects for the period of extended operation, then action will be proposed to augment existing or create new programs to manage the identified effects of aging.

Demonstration for the purposes of this license renewal technical evaluation is accomplished by establishing a clear relationship among

1) the components under review,

2) the aging effects on these items caused by the material-environment-stress combinations which, if undetected, could result in loss of the intended function such that the system could not perform its function(s) within the scope of license renewal in the period of extended operation, and

3) the credited aging management programs whose actions serve to preserve the system intended function(s) for the period of extended operation.

Attachment 2 lists component types and identifies the aging effects requiring management for each material and environment combination. The Periodic Surveillance and Preventive Maintenance Program, System Walkdown Program, and Water Chemistry Control – BWR Program in combination will manage the effects of aging, thereby precluding loss of the intended functions of the system. Sections 4.1 through 4.3 provide the clear relationship between the component, the aging effect, and the aging management program actions which preserve the intended functions for the period of extended operation. Section 4.4 identifies applicable time-limited aging analyses. For a comprehensive review of programs credited for license renewal of VYNPS and a demonstration of how these programs will manage aging effects, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.1 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance Program includes periodic visual inspections to manage fouling on the H_2O_2 monitor pre-cooler (heat exchanger) external surface.

This program applies to component types indicated on Attachment 2. For additional information on this program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.2 System Walkdown Program

Under the System Walkdown Program, visual inspections are conducted to manage aging effects on components. For the PCAC, CAD and PASS systems, the System Walkdown Program manages loss of material for external carbon steel components by visual inspection of surfaces. Since some internal carbon steel surfaces in this system are exposed to the same environment as the external surfaces, the external surfaces will be representative of the internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown Program.

This program applies to component types indicated on Attachment 2. For additional information on this program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.3 Water Chemistry Control - BWR Program

To manage loss of material on PASS, PCAC and CAD system carbon steel and stainless steel components and cracking of stainless steel components, levels of contaminants in the systems' water are minimized by the Water Chemistry Control - BWR Program. The Water Chemistry Control – One-Time Inspection Program utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – BWR Program has been effective at managing loss of material for carbon steel components and loss of material and cracking for stainless steel components in the PASS, PCAC and CAD systems.

This program applies to component types indicated on Attachment 2. For additional information on this program and the Water Chemistry Control – One-Time Inspection Program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.4 Time-Limited Aging Analyses

The PCAC and CAD systems are not exposed to elevated temperatures and the associated metal fatigue. Therefore, metal fatigue analyses are not TLAA applicable to PCAC and CAD components.

Metal fatigue is a TLAA applicable to PASS sample line components subjected to elevated temperatures.

See VYNPS Reports LRPD-03, TLAA and Exemption Evaluation Results, and LRPD-04, TLAA – Mechanical Fatigue, for further review of time-limited aging analyses.

5.0 Summary and Conclusions

The following aging management programs address the aging effects requiring management for the PCAC, CAD and PASS systems.

- Periodic Surveillance and Preventive Maintenance Program
- System Walkdown Program
- Water Chemistry Control – BWR Program

For additional review of programs credited for license renewal of VYNPS, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results.

Attachment 2 contains the aging management review results for the PCAC, CAD and PASS Systems.

In conclusion, programs described in Section 4.0 will provide reasonable assurance that the effects of aging on the PCAC, CAD and PASS systems will be managed such that the intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

6.0 References

1. EPRI Report 1003056, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 3, (The Mechanical Tools)

2. VYNPS Updated Final Safety Analysis Report (UFSAR), Rev. 19-1 Sections 3.8.3, 5.2.3.7, 5.2.6, 5.2.7 and 10.20

3. Document N2_CAD_PCAC, VYNPS Design Basis Document for Nitrogen Supply, Primary Containment Atmosphere Control and Containment Atmosphere Dilution Systems, Rev. 4, 10/17/05

4. ENN-MS-S-009-VY, Vermont Yankee Site Specific Guidance and System Safety Function Sheets, Rev. 0, 3/22/05

5. Document SADBD, Topical Design Basis Document for Safety Analysis, Rev. 4

6. VYNPP Safe Shutdown Capability Analysis, Rev. 7, 6/26/04

7. VY Environmental Qualification Program Manual, Volume 1, Section 6.0, Rev. 18

8. VYNPS Report LRPD-02, Aging Management Program Evaluation Results

9. VYNPS Report LRPD-05, Operating Experience Review Results

10. Flow Diagrams

    G-191164, Rev. 23, Sampling System – Sheet 1

    G-191165, Rev. 44, Sampling System – Sheet 2

    G-191172, Rev. 64, Residual Heat Removal System

    G-191175, Sh. 1, Rev. 70, Primary Containment Atmosphere Control System

    G-191238, Rev. 33, HVAC – Flow Diagram, Reactor Building

    VY-E-75-002, Rev. 20, Containment Atmosphere Dilution System (CAD)

11. BWR QC-10, Ebasco Piping Specification, 3/15/70

12. Drawing B-191261, Rev. 6, Instrument Installation Details

13. VYEM 0077, Rev. 5, Containment H2O2 Monitor System – Instruction Manual, 11/24/04

14. Memorandum VYS 97-062, Torus Temperature Limit During Testing

15. VYEM 0051, Rev. 3, Rosemount Model 1151DP Pressure Transmitter w/Remote 1199 Diaphragm Seals – Instruction Manual, 1/26/05

16. OP 2115, Rev. 45 lpc02, Primary Containment, 10/27/05

17. PM Basis M022, Rev. 5; Disc, Rupture

18. VYNPS Technical Specifications, Amendment 228, Figure 3.6.3, Reactor Vessel Pressure-Temperature Limitations Normal Operation, Core Critical

19. Drawing 5920-12716, Rev. 4, Fabrication and Installation Details Torus Level Instrument Taps Narrow Range, 2/11/05

20. Walkdown information provided by David A Maidrand in emails dated December, 2004

21. VYEM 0055, Rev. 3, Rosemount Nuclear Service Pressure Transmitters – Instruction Manual

ENVIRONMENT: AIR - INDOOR (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
CAD-BOLTING	bolting	CAD SYSTEM BOLTING	carbon steel
CAD-BOLTING	bolting	CAD SYSTEM BOLTING	stainless steel
PASS-BOLTING	bolting	PASS SYSTEM BOLTING	carbon steel
PASS-BOLTING	bolting	PASS SYSTEM BOLTING	stainless steel
PCAC-BOLTING	bolting	PCAC SYSTEM BOLTING	carbon steel
PCAC-BOLTING	bolting	PCAC SYSTEM BOLTING	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
AC-51	valve body	DPT-1-158-6 BYPASS VALVE	carbon steel
CAD-PIPING	piping	CAD SYSTEM PIPING	stainless steel
CAD-TUBING	tubing	CAD SYSTEM TUBING	stainless steel
FEE-NG-10A	orifice	ORIFICE PLATE	stainless steel
FEE-NG-10B	orifice	ORIFICE PLATE	stainless steel
FSO-109-75A-1	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75A-2	valve body	SAMPLE SYSTEM(CONTAINMENT)	stainless steel
FSO-109-75A-3	valve body	SAMPLE SYSTEM	stainless steel
FSO-109-75A-4	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75B-1	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75B-2	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75C-1	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75C-2	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
FSO-109-75D-1	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-75D-2	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-76A	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
FSO-109-76B	valve body	SAMPLE SYSTEM (CONTAINMENT)	stainless steel
H2O2-109-1	pump casing	H2O2 SAMPLE UNIT	stainless steel
H2O2-109-2	pump casing	H2O2 SAMPLE UNIT	stainless steel
H2O2-109-3	pump casing	H2O2 SAMPLE UNIT	stainless steel
H2O2-109-4	pump casing	H2O2 SAMPLE UNIT	stainless steel
LT-16-19-10A	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10B	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10C	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
NG-10A-1	valve body	MANUAL VALVE	stainless steel
NG-10A-4	valve body	MANUAL VALVE	stainless steel
NG-10B-1	valve body	MANUAL VALVE	stainless steel
NG-10B-4	valve body	MANUAL VALVE	stainless steel
NG-11A	valve body	CAD INJECTION	stainless steel
NG-11B	valve body	CAD INJECTION	stainless steel
NG-12A	valve body	CAD INJECTION	stainless steel
NG-12B	valve body	CAD INJECTION	stainless steel
NG-13A	valve body	CAD INJECTION	stainless steel
NG-13B	valve body	CAD INJECTION	stainless steel
NG-15	valve body	CAD INJECTION TO DRYWELL (BY AC-8) (X-26)	stainless steel
NG-16	valve body	VALVE	stainless steel
NG-19	valve body	MANUAL VALVE	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
NG-20	valve body	MANUAL VALVE	stainless steel
NG-37A	valve body	MANUAL VALVE	stainless steel
NG-37B	valve body	MANUAL VALVE	stainless steel
NG-41	valve body	MANUAL VALVE	stainless steel
NG-42	valve body	MANUAL VALVE	stainless steel
PCAC-PIPING	piping	PCAC SYSTEM PIPING	carbon steel
PCAC-PIPING	piping	PCAC SYSTEM PIPING	stainless steel
PCAC-TUBING	tubing	PCAC SYSTEM TUBING	stainless steel
PSV-NG-34A	valve body	PRESSURE RELIEF VALVE	stainless steel
PSV-NG-34B	valve body	PRESSURE RELIEF VALVE	stainless steel
SAH-VG-5A CHECK VALVE	valve body	SAH-VG-5A CHECK VALVE	stainless steel
SAH-VG-5A DRYER	dryer	SAH-VG-5A DRYER	stainless steel
SAH-VG-5A FILTER HOUSING	filter housing	SAH-VG-5A FILTER HOUSING	stainless steel
SAH-VG-5A PRE-COOLER	heat exchanger	SAH-VG-5A PRE-COOLER	stainless steel
SAH-VG-5A SV-1	valve body	SAH-VG-5A SV-1 SOLENOID VALVE	stainless steel
SAH-VG-5A SV-2	valve body	SAH-VG-5A SV-2 SOLENOID VALVE	stainless steel
SAH-VG-5A SV-3	valve body	SAH-VG-5A SV-3 SOLENOID VALVE	stainless steel
SAH-VG-5A SV-4	valve body	SAH-VG-5A SV-4 SOLENOID VALVE	stainless steel
SAH-VG-5A SV-5	valve body	SAH-VG-5A SV-5 SOLENOID VALVE	stainless steel
SAH-VG-5A SV-6	valve body	SAH-VG-5A SV-6 SOLENOID VALVE	stainless steel
SAH-VG-5A WATER TRAP	trap	SAH-VG-5A WATER TRAP	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
SAH-VG-5B CHECK VALVE	valve body	SAH-VG-5B CHECK VALVE	stainless steel
SAH-VG-5B DRYER	dryer	SAH-VG-5B DRYER	stainless steel
SAH-VG-5B FILTER HOUSING	filter housing	SAH-VG-5B FILTER HOUSING	stainless steel
SAH-VG-5B PRE-COOLER	heat exchanger	SAH-VG-5B PRE-COOLER	stainless steel
SAH-VG-5B SV-1	valve body	SAH-VG-5B SV-1 SOLENOID VALVE	stainless steel
SAH-VG-5B SV-2	valve body	SAH-VG-5B SV-2 SOLENOID VALVE	stainless steel
SAH-VG-5B SV-3	valve body	SAH-VG-5B SV-3 SOLENOID VALVE	stainless steel
SAH-VG-5B SV-4	valve body	SAH-VG-5B SV-4 SOLENOID VALVE	stainless steel
SAH-VG-5B SV-5	valve body	SAH-VG-5B SV-5 SOLENOID VALVE	stainless steel
SAH-VG-5B SV-6	valve body	SAH-VG-5B SV-6 SOLENOID VALVE	stainless steel
SAH-VG-5B WATER TRAP	trap	SAH-VG-5B WATER TRAP	stainless steel
SB-16-19-10	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-11A	valve body	PCAC BUTTERFLY VALVE VACUUM BKR FROM REACTOR BLDG	carbon steel
SB-16-19-11B	valve body	PCAC BUTTE	carbon steel
SB-16-19-23	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-6	valve body	PRI CONTAINMENT VENT TO SGT	carbon steel
SB-16-19-6A	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-6B	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-7	valve body	HVAC BUTTERFLY VALVE VENT TO RTF-5	carbon steel
SB-16-19-7A	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-7B	valve body	PCAC BUTTERFLY VALVE	carbon steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
SB-16-19-8	valve body	PCAC BUTTERFLY VALVE	carbon steel
SB-16-19-9	valve body	PCAC BUTTERFLY VALVE	carbon steel
SS-77A	valve body	VALVE	stainless steel
SS-78A	valve body	ISOLATION VALVE	stainless steel
TK-115A	tank	PCAC AIR RECEIVER	carbon steel
TK-115B	tank	PCAC AIR RECEIVER	carbon steel
TRAP-VG-120-T1	trap	TRAP IN LINE VG-120-T1	carbon steel
V16-19-1	valve body	DRYWELL PRESS PT-1-156-3 CONN F PENETRATION X-52 EL 266' 7 ABOVE EQUIPMENT HATCH	carbon steel
V16-19-100	valve body	NITROGEN SUPPLY UNION BONNET VALVE	carbon steel
V16-19-1103A	valve body	TORUS LEVEL CONTROL ROOT VALVE TORUS LEVEL INSTR LT-16-19-10A HIGH CONN RX BLDG 239' TORUS CATWALK NORTH BY ENTRANCE LADDER	carbon steel
V16-19-1103B	valve body	TORUS LEVEL CONTROL ROOT VALVE TORUS PRESS INSTR PT-16-19-36A CONN RX BLDG 239' TORUS CATWALK NORTH BY ENTRANCE LADDER	carbon steel
V16-19-1103C	valve body	S LEVEL CONTROL ROOT VALVE TORUS LEVEL INSTR LT-16-19-10B HIGH CONN RX BLDG 239' TORUS CATWALK WEST	carbon steel
V16-19-12A	valve body	PCAC CHECK VALVE RX BLDG TO TORUS VACUUM BREAKER VLV	carbon steel
V16-19-12B	valve body	PCAC CHECK VALVE RX BLDG TO TORUS VACUUM BREAKER VLV	carbon steel
V16-19-13A	valve body	AIRLOCK BALL VALVE DRYWELL EQUALIZING VENT DRYWELL AIR LOCK	carbon steel
V16-19-13B	valve body	AIRLOCK BALL VALVE DRYWELL AIR LOCK VENT DRYWELL AIR LOCK	carbon steel
V16-19-19B	valve body	PCAC GLOBE VALVE AC-11B TEST CONN RX BLDG 239' TORUS CATWALK SOUTH BOTTOM OF ENTRANCE LADDER	carbon steel
V16-19-20A	valve body	PCAC GLOBE VALVE AC-11A TEST CONN RX BLDG 239' TORUS CATWALK SOUTH BOTTOM OF ENTRANCE LADDER	carbon steel
V16-19-21A	valve body	PCAC GLOBE VALVE AC-7B TEST CONN TORUS CATWALK NORTH ABOVE CATWALK	carbon steel
V16-19-23B	valve body	PCAC GLOBE VALVE	carbon steel
V16-19-25	valve body	GLOBE VALVE TORUS INSTRUMENTS (X-217) (BY AC-10) RX BLDG 239' TORUS CATWALK SOUTH	carbon steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
V16-19-26A	valve body	DRYWELL FLOOD LS-26 ROOT VLV RX BLDG 239' TORUS CATWALK WEST	carbon steel
V16-19-26B	valve body	VALVE DRYWELL FLOOD LS-26 (TORUS) SECOND FLOOR Rx BLDG BEHIND B RCW PUMP	carbon steel
V16-19-26C	valve body	DRYWELL FLOOD LS-26 ROOT VLV RX BLDG 239' TORUS CATWALK WEST	carbon steel
V16-19-26D	valve body	VALVE DRYWELL FLOOD LS-26 (TORUS) SECOND FLOOR Rx BLDG BEHIND B RCW PUMP	carbon steel
V16-19-37	valve body	VALVE	carbon steel
V16-19-37A	valve body	VALVE	carbon steel
V16-19-38	valve body	VALVE	carbon steel
V16-19-39	valve body	PCAC GLOBE VALVE	carbon steel
V16-19-39A	valve body	VALVE	carbon steel
V16-19-40	valve body	PCAC GLOBE VALVE	carbon steel
V16-19-41	valve body	PCAC GLOBE VALVE	carbon steel
V16-19-42	valve body	VALVE	carbon steel
V16-19-43	valve body	VALVE	carbon steel
V16-19-44	valve body	VALVE	carbon steel
V16-19-45	valve body	VALVE	carbon steel
V16-19-46	valve body	VALVE	carbon steel
V16-19-47	valve body	VALVE	carbon steel
V16-19-48	valve body	VALVE	carbon steel
V16-19-49	valve body	PCAC GLOBE VALVE	carbon steel
V16-19-50	valve body	PCAC GLOBE VALVE DRYWELL INST INLET CONN "E" PENETRATION X-52 EL 266' 7 ABOVE EQUIPMENT HATCH	carbon steel
V16-19-50A	valve body	DPT-1-158-6 HI SIDE ISOLATION VALVE	carbon steel
V16-19-53A	valve body	VALVE DRYWELL PRESSURE TO PS-5-12A, PS-10-119C, PS-10-119A, PS-5-16 PENETRATION X-40A EL 275' SOUTH SIDE Rx BLDG ABOVE JET PUMP RAC	carbon steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
V16-19-53B	valve body	VALVE DRYWELL PRESSURE ROOT VALVE TO PS-5-12D, PS-10-119D, PS-10-119B PENETRATION X-40C EL 275' ABOVE CRD TEMPERATURE RECORDERS	carbon steel
V16-19-53C	valve body	VALVE DRYWELL PRESSURE TO PS-5-12B PENETRATION X-40B EL 275' SOUTH SIDE Rx BLDG ABOVE JET PUMP RAC	carbon steel
V16-19-53D	valve body	VALVE DRYWELL PRESSURE ROOT VALVE TO PS-5-12C PENETRATION X-40D EL 275' ABOVE CRD TEMPERATURE RECORDERS	carbon steel
V16-19-56	valve body	PCAC GLOBE VALVE AIR LOCK PRESSURIZATION DRYWELL AIR LOCK	carbon steel
V16-19-5A	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5B	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5C	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5D	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5E	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5F	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5G	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5H	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5I	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-5J	valve body	TORUS TO DRYWELL VACUUM BREAKER	carbon steel
V16-19-60A	valve body	VALVE DRYWELL PRESSURE TO PS-10-100A PS-10-101A PENETRATION X-40A EL 275' SOUTH SIDE Rx BLDG ABOVE JET PUMP RAC	carbon steel
V16-19-60B	valve body	VALVE DRYWELL PRESSURE ROOT VALVE TO PS-10-100B, PS-10-101B PENETRATION X-40C EL 275' ABOVE CRD TEMPERATURE RECORDERS	carbon steel
V16-19-60C	valve body	VALVE DRYWELL PRESSURE TO PS-10-100C, PS-10-101C PENETRATION X-40B EL 275' SOUTH SIDE Rx BLDG ABOVE JET PUMP RAC	carbon steel
V16-19-60D	valve body	VALVE DRYWELL PRESSURE ROOT VALVE TO PS-10-100D, PS-10-101D PENETRATION X-40D EL 275' ABOVE CRD TEMPERATURE RECORDERS	carbon steel
V16-19-86	valve body	TORUS VENT SHUTOFF VALVE, FED FROM MCC-7A-1F, THIS EQUIPMENT INCLUDES THE VALVE, OPERATOR, AND MOTOR	carbon steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
V16-19-87A	valve body	TORUS VENT DRAIN LINE	carbon steel
V16-20-20	valve body	PCAC/CAD SOLENOID VALVE	carbon steel
V16-20-22A	valve body	PCAC/CAD SOLENOID VALVE	carbon steel
V16-20-22B	valve body	PCAC/CAD SOLENOID VALVE	carbon steel
V16-20-22C	valve body	TORUS MAKEUP RX BLDG 239' TORUS CATWALK SOUTH	carbon steel
V16-20-22D	valve body	DRYWELL MAKEUP RX BLDG 239' TORUS CATWALK WEST	carbon steel
V16-20-28	valve body	TORUS MAKEUP TEST CONN RX BLDG 239' TORUS CATWALK SOUTH	carbon steel
V16-20-30	valve body	DRYWELL MAKEUP TEST CONN RX BLDG 239' TORUS CATWALK WEST	carbon steel
VG-12A	valve body	MANUAL VALVE	stainless steel
VG-12B	valve body	MANUAL VALVE	stainless steel
VG-13	valve body	VALVE	stainless steel
VG-14	valve body	VALVE	stainless steel
VG-17A	valve body	MANUAL VALVE	stainless steel
VG-17B	valve body	MANUAL VALVE	stainless steel
VG-18	valve body	MANUAL VALVE	stainless steel
VG-19	valve body	MANUAL VALVE	stainless steel
VG-20	valve body	MANUAL VALVE	stainless steel
VG-21	valve body	MANUAL VALVE	stainless steel
VG-22A	valve body	DRYWELL CAD VENT CONTROL VALVE -FED FROM MCC-8B-9K	stainless steel
VG-22B	valve body	TORUS CAD VENT CONTROL VALVE -FED FROM MCC-9B-4M	stainless steel
VG-23	valve body	CAM SUPPLY INBD ISOL	stainless steel
VG-24	valve body	H202 MON RETURN OUTBRD ISOL	stainless steel
VG-25	valve body	H202 MON RETURN INBD ISOL	stainless steel
VG-26	valve body	CAM SUPPLY INBD ISOL	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
VG-29A	valve body	ISOLATION VALVE	stainless steel
VG-29B	valve body	ISOLATION VALVE	stainless steel
VG-30A	valve body	ISOLATION VALVE	stainless steel
VG-30B	valve body	ISOLATION VALVE	stainless steel
VG-32	valve body	CHECK VALVE	stainless steel
VG-33	valve body	H202 MON RETURN OUTBRD ISOL	stainless steel
VG-34	valve body	H202 MON RETURN INBRD ISOL	stainless steel
VG-35	valve body	VALVE	stainless steel
VG-36	valve body	BYPASS FLOW	stainless steel
VG-37	valve body	SAMPLE STATION INLET ISOL RW BLDG 252' RADWASTE HALLWAY IN OVERHEAD	stainless steel
VG-38	valve body	OUTLET RETURN	stainless steel
VG-39	valve body	OUTLET ISOLATION	stainless steel
VG-41	valve body	H2/O2 MONS RETURN TO RX BLDG VENTILATION SYSTEM RX BLDG 252' CRD FLOW CONTROL STATION AREA	stainless steel
VG-4A-1	valve body	TEST CONN	stainless steel
VG-4B-1	valve body	VALVE	stainless steel
VG-77	valve body	ISOLATION VALVE	stainless steel
VG-78	valve body	ISOLATION VALVE	stainless steel
VG-79	valve body	ISOLATION VALVE	stainless steel
VG-80	valve body	ISOLATION VALVE	stainless steel
VG-81	valve body	ISOLATION VALVE	stainless steel
VG-8A	valve body	VALVE	stainless steel
VG-8B	valve body	TORUS CAD VENT	stainless steel
VG-9A	valve body	SOLENOID VALVE	stainless steel

ENVIRONMENT: AIR - INDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
VG-9B	valve body	SOLENOID VALVE	stainless steel

ENVIRONMENT: SILICONE (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
LT-16-19-10A	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10B	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10C	diaphragm	TORUS WATER LEVEL WIDE	stainless steel

ENVIRONMENT: TREATED WATER (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
LT-16-19-10A	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10B	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
LT-16-19-10C	diaphragm	TORUS WATER LEVEL WIDE	stainless steel
PCAC-PIPING	piping	PCAC SYSTEM PIPING	carbon steel
PCAC-PIPING	piping	PCAC SYSTEM PIPING	stainless steel
PCAC-TUBING	tubing	PCAC SYSTEM TUBING	stainless steel
SB-16-19-836	valve body	TORUS ISOLATION GATE VALVE TORUS PENETRATION X-206C, ISOL VLV TO LT-16-19-38A, LOWER LEVEL TORUS BY RCIC DOOR	carbon steel
SB-16-19-837	valve body	TORUS ISOLATION GATE VALVE LOWER LEVEL TORUS	carbon steel
SB-16-19-900A	valve body	TORUS ISOLATION GATE VALVE RX BLDG 239' TORUS CATWALK SW UNDER CATWALK	carbon steel

ENVIRONMENT: TREATED WATER (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
SB-16-19-900B	valve body	TORUS ISOLATION GATE VALVE TORUS PENETRATION X-206B ISOL VLV TO LT-16-19-38B LOWER LEVEL TORUS	carbon steel
SB-16-19-900C	valve body	TORUS LEVEL CONTROL ROOT VALVE TORUS PENETRATION X-206E ISOL VLV TO LT-16-19-10B LOWER LEVEL TORUS	carbon steel
SB-16-19-900D	valve body	TORUS LEVEL CONTROL ROOT VALVE TORUS PENETRATION X-206F, ISOL VLV TO LT-16-19-10A LOWER LEVEL TORUS BY RCIC DOOR	carbon steel
V16-19-120A	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-120B	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-120C	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-120D	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-130A	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-130B	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-130C	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-130D	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-140A	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-140B	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-140C	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-140D	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-150A	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-150B	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	carbon steel
V16-19-150C	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel
V16-19-150D	valve body	TORUS WATER LEVEL INSTRUMENT ISOLATION VALVE	stainless steel

ENVIRONMENT: TREATED WATER >482°F (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
PAS-101	valve body	OUTBOARD SAMPLE VALVE - (SW-1, SOL S-1)	stainless steel
PAS-102	valve body	INBOARD SAMPLE VALVE - JET PUMP #1 (SW-2, SOL S-1)	stainless steel
PAS-103	valve body	OUTBOARD SAMPLE VALVE - (SW-1, SOL S-2)	stainless steel
PAS-104	valve body	INBOARD SAMPLE VALVE - JET PUMP #11 (SW-2 SOL S-1)	stainless steel
PAS-108C	valve body	PAS INBOARD FLUSH CHECK VALVE	stainless steel
PAS-109C	valve body	PAS INBOARD FLUSH CHECK VALVE	stainless steel
PAS-114	valve body	DRAIN LINE ISOLATION	stainless steel
PAS-115	valve body	DRAIN LINE ISOLATION	stainless steel
PAS-117	valve body	JET PUMP 1 SAMPLE LINE/PENETRATION X-40B-B TEST CONNECTION.	stainless steel
PAS-118	valve body	JET PUMP 1 SAMPLE LINE/PENETRATION X-40B-B TEST CONNECTION.	stainless steel
PAS-120	valve body	JET PUMP 11 SAMPLE LINE/PENETRATION X-40D-B TEST CONNECTION.	stainless steel
PAS-121	valve body	JET PUMP 11 SAMPLE LINE/PENETRATION X-40D-B TEST CONNECTION.	stainless steel
PASS-TUBING	tubing	PASS SYSTEM TUBING	stainless steel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
		Stainless steel	Air - indoor (ext)	None	None
Diaphragm	Pressure boundary	Stainless steel	Air - indoor (int)	None	None
			Silicone (ext)	None	None
			Treated water (int)	Loss of material	Water chemistry control - BWR
Dryer	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
Filter housing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
Heat exchanger	Heat transfer	Stainless steel	Air - indoor (ext)	Fouling	Periodic surveillance and preventive maintenance
			Air - indoor (int)	None	None
	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Orifice	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
	Pressure boundary & flow control	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - indoor (int)	Loss of material	System walkdown
			Treated water (int)	Loss of material	Water chemistry control - BWR
		Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
			Treated water (int)	Loss of material	Water chemistry control - BWR
Pump casing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - indoor (int)	Loss of material	System walkdown
Trap	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - indoor (int)	Loss of material	System walkdown
		Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
Tubing	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
			Treated water (int)	Loss of material	Water chemistry control - BWR
			Treated water >482°f (int)	Cracking	Water chemistry control - BWR
				Cracking-fatigue	Metal fatigue TLAA
				Loss of material	Water chemistry control - BWR

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - indoor (int)	Loss of material	System walkdown
			Treated water (int)	Loss of material	Water chemistry control - BWR
		Stainless steel	Air - indoor (ext)	None	None
			Air - indoor (int)	None	None
			Treated water (int)	Loss of material	Water chemistry control - BWR
			Treated water >482°f (int)	Cracking	Water chemistry control - BWR
				Cracking-fatigue	Metal fatigue TLAA
				Loss of material	Water chemistry control - BWR