From: <George.Beck@exeloncorp.com>
To: <dja1@nrc.gov>
Date: 03/08/2006 6:23:46 AM
Subject: OC LRA - Ventilation PBD

Donnie,

Follow-up to yesterday's discussion - here is the ventilation PBD. This was not previously forwarded.

George

<<PBD B.2.04 Inspection of Ventilation Systems Rev 0.doc>>

CC: <john.hufnagel@exeloncorp.com>, <donald.warfel@exeloncorp.com>, <Charles.Micklo@exeloncorp.com>, <kevin.muggleston@exeloncorp.com>

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<<PBD B.2.04 Inspection of Ventilation Systems Rev 0.doc>>

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From: <George.Beck@exeloncorp.com>

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PROGRAM BASIS DOCUMENT

PBD-AMP-B.2.04

Revision 0

PERIODIC INSPECTION OF VENTILATION SYSTEMS

Prepared By:

Reviewed By: _____

Program Owner Review: _____

Technical Lead Approval: _____

_____

Revision History:

Revision	*Prepared by:*	*Reviewed by:*	*Program Owner:*	*Approved by:*
0	*Charles Micklo*	*Kevin Muggleston*	*John Yuen*	*Don Warfel*
Date				

Summary of Revisions:

Rev. Number	Reason for the Revision(s)
0	Initial Issue

TABLE OF CONTENTS

1.0 PURPOSE AND METHODOLOGY

1.1 Purpose

The purpose of this Program Basis Document is to document and evaluate those activities of the Oyster Creek Periodic Inspection of Ventilation Systems aging management program that are credited for managing loss of material, change in material properties and reduction of heat transfer as part of Oyster Creek License Renewal to meet the requirements of the License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

This includes the following:

- The identification of the scope of the program;
- The evaluation of program elements against NUREG-1800;
- The review of Operating Experience to demonstrate program effectiveness;
- The identification of required program enhancements; and
- The identification of Oyster Creek documents required to implement the program.

1.2 Methodology

The nuclear power plant License Renewal Rule 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," describes the License Renewal process and provides requirements for the contents of License Renewal Applications. 10 CFR 54.21(a)(3) states:

"For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the Current Licensing Basis (CLB) for the period of extended operation."

The NRC and the industry identified 10 program elements that are useful in describing an aging management program and then demonstrating its effectiveness. These program elements are described in Appendix A, Section A.1.2.3 of the Standard Review Plan. NUREG-1800 uses these program elements in Appendix A to describe acceptable aging management programs.

This Program Basis Document also provides a comparison of the credited Oyster Creek program with the elements of the corresponding NUREG-1800 Appendix A, Section A.1.2.3. Project Level Instruction PLI-8 "Program Basis Documents" prescribes the methodology for evaluating Aging Management Programs. An evaluation of Oyster Creek's aging management program criteria or activities to those of the NUREG-1800 program elements is performed and a conclusion is reached concerning consistency for each individual program element. A demonstration of overall program effectiveness is made after all program elements are evaluated. Required program enhancements are documented. An overall determination is made as to consistency with the program description in NUREG-1800.

Note: The Oyster Creek License Renewal Application was prepared using "Draft NUREG-1801, Rev. 1, *Generic Aging Lessons Learned (GALL) Report*", (January 2005), which did not provide specific guidance regarding ventilation equipment aging management activities. Accordingly, the Periodic Inspection of Ventilation Systems aging management program was treated as a plant specific program, addressing the 10 elements described in NUREG-1800, Table A.1-1. Subsequently, the final version of "NUREG-1801, Rev. 1, *Generic Aging Lessons Learned (GALL) Report*", (September 2005), was issued, providing specific guidance regarding internal surfaces of piping and ducting aging management activities (XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components). This program basis document supports the LRA by directly addressing the 10 elements described in NUREG-1800, Table A.1-1. However, since the guidance provided in the latest GALL version addresses the 10 elements with more specificity, it was also reviewed with the relevant program elements highlighted below.

Relevant to this program, NUREG-1801 program XI.M38, elements 1, 3 - 5 permit visual inspections of components performed during equipment maintenance or surveillance activities. Element 4 also permits use of coatings with inspections for degradation of coatings. This Periodic Inspection of Ventilation Systems program utilizes existing ventilation maintenance visual inspections and surveillance activities with enhancements consistent with the new NUREG-1801 guidance. It does not take credit for coatings for internal surfaces, but directly inspects for loss of material.

2.0 PROGRAM DESCRIPTION

2.1 Program Description

NUREG-1800:

a) An acceptable aging management program should consist of the 10 elements described in Table A.1-1, as appropriate (Ref. 4.4.2). These program elements/attributes are discussed further in Position A.1.2.3 below.

b) All programs and activities that are credited for managing a certain aging effect for a specific structure or component should be described. These aging management programs/activities may be evaluated together for the 10 elements described in Table A.1-1, as appropriate.

c) The risk significance of a structure or component could be considered in evaluating the robustness of an aging management program. Probabilistic arguments may be used to assist in developing an approach for aging management adequacy. However, use of probabilistic arguments alone is not an acceptable basis for concluding that, for those structures and components subject to an AMR, the effects of aging will be adequately managed in the period of extended operation. Thus, risk significance may be considered in developing the details of an aging management program for the structure or component for license renewal, but may not be used to conclude that no aging management program is necessary for license renewal.

Oyster Creek:

a) The new Periodic Inspection of Ventilation Systems aging management program incorporates the 10 elements described in Section A.1.2.3 and Table A.1-1 of NUREG-1800 as applicable. The Periodic Inspection of Ventilation Systems aging management program includes periodic visual inspections of the Oyster Creek ventilation systems in the scope of license renewal. Periodic visual inspections are performed during system preventive maintenance activities on a frequency not exceeding five years. Components subject to visual inspections include buried ventilation ductwork, flexible connections, fan, filter and heater housings, damper housings, access door seals, valves, piping and fittings, cooling coils, thermowells, flow elements and restricting orifices. The exterior surfaces of ventilation ducts, damper housings and the closure bolting of ventilation ductwork and components will be inspected by the Structures Monitoring Program, B.1.31. The closure bolting of the Reactor Building Ventilation System containment

penetrations will be managed by the Bolting Integrity program, B.1.12.

b) The program inspects internal and external surfaces of ventilation system components to identify and assess aging effects that may be occurring. The program includes surface inspections for indications of loss of material, such as rust, corrosion and pitting. Flexible connection and door seal elastomer materials are inspected for detrimental changes in material properties, as evidenced by cracking, perforations in the material or leakage and for loss of material due to wear. Heat transfer surfaces are inspected for fouling. Existing maintenance activities will be enhanced to include duct exposed to soil, instrument piping and valves, including restricting orifices, flow elements, and thermowells. The activities will also be enhanced to include inspection guidance for detection of the applicable aging effects. Enhancements will be incorporated prior to the period of extended operation. The pressure boundary integrity of ventilation systems required for post-accident radiological containment or control room habitability is confirmed by periodic system surveillance tests.

   Evaluations are performed for inspection results that identify penetrating corrosion or elastomer degradation, or test results that do not satisfy established criteria, and a condition report is initiated to document the concern in accordance with plant administrative procedures. Identified aging effects are evaluated by engineering to determine a) if loss of material or aging is occurring, and if so, b) the rate at which the material is being lost or degraded. Engineering evaluations of the inspection results also c) determine the need for follow-up examinations to monitor the progression of aging degradation, and d) identify appropriate corrective actions to mitigate any excessive rates of degradation discovered. Corrective actions, if necessary, include additional component examinations or tests.

c) Probabilistic arguments were not used in the development of the Periodic Inspection of Ventilation Systems aging management program. Aging effects are managed by a condition monitoring program. In addition, the results of inspections of ventilation systems required for post-accident radiological containment or control room habitability are confirmed by periodic system surveillance tests.

2.2 Overall NUREG-1800 Consistency

The Oyster Creek Periodic Inspection of Ventilation Systems is an existing program that is consistent with NUREG-1800 aging management program.

2.3 Summary of Exceptions to NUREG-1800

None. The existing Oyster Creek Periodic Inspection of Ventilation Systems is found to be adequate to support the extended period of operation with no exceptions.

2.4 Summary of Enhancements to NUREG-1800

The existing Oyster Creek Periodic Inspection of Ventilation Systems aging management program is found to be adequate to support the extended period of operation with the following enhancements.

- Instrument piping and valves, restricting orifices and flow elements, thermowells, and Standby Gas Treatment System duct exposed to soil will be added to the scope of the plant implementing documents.

Specific guidance to inspect for aging effects will be added to the preventative maintenance procedures:

- Loss of Material: Inspect for corrosion, rust, pitting or wear
- Change in Material Properties: Inspect for, cracking, perforations or other damage

3.0 EVALUATIONS AND TECHNICAL BASIS

Note

This section is organized by quoting the relevant NUREG-1800 Chapter XI program element (September 2005 version) followed by the related Oyster Creek program attributes and a conclusion of the comparison. Where applicable, the NUREG-1800 program element was separated into logical sub-elements and addressed accordingly.

Implementing procedure references are included in ( ) for information purposes. This information from the source procedure has been either directly extracted from the procedure or summarized for inclusion into this PBD.

3.0 Scope of Program

NUREG-1800:

The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

Oyster Creek:

Oyster Creek performs visual inspections of ventilation systems in the scope of license renewal. The scope of existing inspections includes flexible connections, fan and filter housings, heat transfer surfaces and access door seals. The program will be enhanced to include ducts exposed to soil, instrument piping and valves, restricting orifices and flow elements, and thermowells. Inspections of carbon steel fan and filter housings are considered representative of the internal surfaces of the carbon steel damper housings in the system. If aging degradation is identified on the fan or filter housing internal carbon steel surfaces, the condition will be evaluated to determine if the carbon steel damper housings internal surfaces will require inspection. The exterior surfaces of ventilation ducts and damper housings will be inspected by the Structures Monitoring Program, B.1.31.

The Oyster Creek Periodic Inspection of Ventilation Systems aging management program manages the aging effect of loss of material, change in material properties and reduction of heat transfer for the systems, components, and environments listed in Table 5.2. The implementing documents for this aging management program are listed in Table 5.1 and are described throughout the individual program element discussions. The commitment numbers under which these implementing documents are being revised are contained within the listings in Table 5.1.

Exceptions to NUREG-1800, Element 1:

None.

Enhancements to NUREG-1800, Element 1:

This element is consistent with NUREG-1800, Element 1 with the following enhancement:

- Instrument piping and valves, restricting orifices and flow elements, thermowells, and Standby Gas Treatment System duct exposed to soil will be added to the scope of the plant

implementing documents.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 1, Scope of Program.

3.1 Preventive Actions

NUREG-1800:

a) The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation.

b) For condition or performance monitoring programs, they do not rely on preventive actions and thus, this information need not be provided. More than one type of aging management program may be implemented to ensure that aging effects are managed.

Oyster Creek:

a) The ventilation system inspections do not provide any preventive actions.

b) The inspections provide for condition monitoring to detect degradation prior to a loss of system intended function. Loss of material and elastomer degradation are evaluated for continued operation or repaired. Heat transfer surfaces are inspected for loss of material, damage and cleaned as required.

Exceptions to NUREG-1800, Element 2:

None.

Enhancements to NUREG-1800, Element 2:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 2, Preventive Actions.

3.2 Parameters Monitored or Inspected

NUREG-1800:

a) The parameters to be monitored or inspected should be identified and linked to the degradation of the particular

structure and component intended function(s).

b) For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. Some examples are measurements of wall thickness and detection and sizing of cracks.

c) For a performance monitoring program, a link should be established between the degradation of the particular structure or component intended function(s) and the parameter(s) being monitored. An example of linking the degradation of a passive component intended function with the performance being monitored is linking the fouling of heat exchanger tubes with the heat transfer intended function. This could be monitored by periodic heat balances. Since this example deals only with one intended function of the tubes, heat transfer, additional programs may be necessary to manage other intended function(s) of the tubes, such as pressure boundary.

A performance monitoring program may not ensure the structure and component intended function(s) without linking the degradation of passive intended functions with the performance being monitored. For example, a periodic diesel generator test alone would not provide assurance that the diesel will start and run properly under all applicable design conditions. While the test verifies that the diesel will perform if all the support systems function, it provides little information related to the material condition of the support components and their ability to withstand DBE loads. Thus, a DBE, such as a seismic event, could cause the diesel supports, such as the diesel embedment plate anchors or the fuel oil tank, to fail if the effects of aging on these components are not managed during the period of extended operation.

d) For prevention and mitigation programs, the parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects. An example is the coolant oxygen level that is being controlled in a water chemistry program to mitigate pipe cracking.

Oyster Creek:

a) The parameters inspected consist of the pressure retaining components and the heat transfer surfaces of ventilation systems. They are inspected for loss of material, degradation of elastomers and cleanliness thus assuring that the components within the scope of the program remain capable of performing their intended function. The parameters monitored

are specifically addressed in Section 3.3 b) for condition monitoring activities.

b) Visual inspections of the ventilation system ductwork and components determine if penetrating corrosion indicating a loss of material aging degradation is occurring. Heat transfer surfaces are also inspected for fouling. Flexible connections are inspected to ensure they are free of cracking, damage and loss of material. Door seals are inspected for cracking or damage when the associated access door is opened, or are inspected for leakage when the door in closed and the system is in service. The flexible connections and door seals are evaluated if cracking, damage or leakage is identified. **(Reference: Table 5.1 documents 10 – 30)**

   Existing plant implementing documents will be enhanced to ensure that ventilation system components are properly inspected for age related degradation. For the Standby Gas Treatment, Reactor Building Ventilation and Control Room Ventilation Systems, the results of the inspections are further verified by the performance of system leakage tests and filter efficiency tests. **(Reference: Table 5.1 documents 1 - 9)**

   These inspections manage the aging effects that could impact system and component pressure boundary integrity, providing reasonable assurance that ventilation system intended functions will be maintained consistent with the current licensing basis, for the period of extended operation.

c) The Oyster Creek Periodic Inspection of Ventilation Systems is a condition monitoring program, not a performance monitoring program. System leakage tests confirm the results of but do not replace inspections for pressure retaining components.

d) The Oyster Creek Periodic Inspection of Ventilation Systems is a condition monitoring program, not a prevention and mitigation program.

Exceptions to NUREG-1800, Element 3:

None.

Enhancements to NUREG-1800, Element 3:

This element is consistent with NUREG-1800, Element 3 with the following enhancement:

The preventive maintenance procedures will be enhanced to

provide the following specific guidance to inspect for aging effects:

- Loss of Material: Inspect for corrosion, rust, pitting or wear
- Change in Material Properties: Inspect for cracking, perforations or other damage

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 3, Parameters Monitored or Inspected, with the above enhancements.

3.3 Detection of Aging Effects

NUREG-1800:

a) *Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed.*

b) *Nuclear power plants are licensed based on redundancy, diversity, and defense-in-depth principles. A degraded or failed component reduces the reliability of the system, challenges safety systems, and contributes to plant risk. Thus, the effects of aging on a structure or component should be managed to ensure its availability to perform its intended function(s) as designed when called upon. In this way, all system level intended function(s), including redundancy, diversity, and defense-in-depth consistent with the plant's CLB, would be maintained for license renewal. A program based solely on detecting structure and component failure should not be considered as an effective aging management program for license renewal.*

c) *This program element describes "when," "where," and "how" program data are collected (i.e., all aspects of activities to collect data as part of the program).*

d) *The method or technique and frequency may be linked to plant-specific or industry-wide operating experience. Provide*

justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC intended function. A program based solely on detecting SC failures is not considered an effective aging management program.

e) When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects. The sample size should be based on such aspects of the SCs as the specific aging effect, location, existing technical information, system and structure design, materials of construction, service environment, or previous failure history. The samples should be biased toward locations most susceptible to the specific aging effect of concern in the period of extended operation. Provisions should also be included on expanding the sample size when degradation is detected in the initial sample.

Oyster Creek:

a) Visual inspections, with enhancements, will be included as part of the preventive maintenance activities that are performed on the various ventilation systems that are in the scope of license renewal at Oyster Creek. Ventilation system components are subject to the following aging effects:

- Loss of Material (Inspect for corrosion, rust, pitting or wear)
- Change in Material Properties (Inspect for cracking, perforations or other damage in elastomers)
- Reduction of Heat Transfer (Fouling of cooling coils)

Aging effects are detected by periodic visual inspections and confirmed by system tests. These preventive maintenance activities are focused on the ventilation system fans, filters, dampers, fan flexible connections and door seals. These activities will be enhanced to include inspection of instrument piping and valves, restricting orifices and flow elements, thermowells, and Standby Gas Treatment System duct exposed to soil. Inspections are performed at a frequency not to exceed five years, to detect aging prior to loss of system function. **(Reference: Table 5.1 documents 10 – 30)**

b) The Oyster Creek Periodic Inspection of Ventilation Systems

aging management program will manage the effects of aging by performing visual inspections on all ventilation systems within the scope of license renewal to identify loss of material, change in material properties and reduction of heat transfer prior to loss of intended function. **(Reference: Table 5.1 documents 1 – 30)**

c) The periodic ventilation systems inspections are performed at a frequency not exceeding every fifth year along with component maintenance using approved plant procedures. **(Reference: Table 5.1 documents 10 – 30)**

d) The visual inspection techniques and the inspections performed along with component maintenance is consistent with industry recommendations for inspection of component materials and is adequate to detect aging prior to loss of system intended functions. **(Reference: EPRI 1007933)** Visual inspections of the ventilation systems components are performed by qualified and experienced maintenance personnel. The preventive maintenance procedures will be enhanced to provide the following specific guidance to inspect for aging effects:

- Loss of Material: Inspect for corrosion, rust, pitting or wear
- Change in Material Properties: Inspect for cracking, perforations or other damage

e) Sampling is not used in the Oyster Creek Periodic Inspection of Ventilation Systems aging management program except for the internal surfaces of carbon steel damper enclosures. All of the ventilation system components are routinely inspected including carbon steel equipment housings which are considered representative of the internal surfaces of carbon steel damper housings. If aging degradation is identified on a fan or filter housing inspected during maintenance, the condition will be evaluated to determine if the carbon steel damper housings will require inspection. **(Reference: Table 5.1 documents 10 - 14, 16 – 20, 24, 25, 28 - 30)**

Exceptions to NUREG-1800, Element 4:

None.

Enhancements to NUREG-1800, Element 4:

This element is consistent with NUREG-1800, Element 3 with the following enhancement:

The preventive maintenance procedures will be enhanced to provide the following specific guidance to inspect for aging effects:

- Loss of Material: Inspect for corrosion, rust, pitting or wear
- Change in Material Properties: Inspect for, cracking, perforations or other damage

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 4, Detection of Aging Effects, with the above enhancements.

3.4 Monitoring and Trending

NUREG-1800:

a) *Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.*

b) *This program element describes "how" the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. Although aging indicators may be quantitative or qualitative, aging indicators should be quantified, to the extent possible, to allow trending. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described. Trending is a comparison of the current monitoring results with previous monitoring results in order to make predictions for the future.*

Oyster Creek:

a) Visual inspection techniques are performed at a frequency not exceeding every fifth year are appropriate for detecting the loss of material, change in material properties and reduction of heat transfer aging effects prior to loss of function, based on plant specific and industry operating experience. The results of the periodic inspection of ventilation systems are monitored but not trended. Results of inspections and any actions taken are

documented. Corrective actions taken as necessary ensure component function if degraded condition is identified. Preventative maintenance frequencies are established based on Operating Experience, to detect aging effects prior to loss of intended functions. **(Reference: Table 5.1 documents 10 – 30)**

b) The periodic inspection of ventilation systems inspections are performed using approved plant procedures. Results are recorded and deficiencies are corrected. Trending is not performed as the components are inspected and repaired or replaced as necessary to function between scheduled inspections. **(Reference: Table 5.1 documents 10 – 30)**

Evaluations are performed for inspection results that identify penetrating corrosion or elastomer degradation, or test results that do not satisfy established criteria, and a condition report is initiated to document the concern in accordance with plant administrative procedures. Identified aging effects are evaluated by engineering to determine a) if penetrating corrosion indicating a loss of material or degradation aging is occurring, and if so, b) the rate at which the material is being lost or degraded. Engineering evaluations will also c) determine the need for follow-up examinations to monitor the progression of aging degradation, and d) identify appropriate corrective actions to mitigate any excessive rates of degradation discovered.

Exceptions to NUREG-1800, Element 5:

None.

Enhancements to NUREG-1800, Element 5:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 5, Monitoring and Trending.

3.5 Acceptance Criteria

NUREG-1800:

a) The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for

corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria.

For example, carbon steel pipe wall thinning may occur under certain conditions due to erosion-corrosion. An aging management program for erosion-corrosion may consist of periodically measuring the pipe wall thickness and comparing that to a specific minimum wall acceptance criterion. Corrective action is taken, such as piping replacement, before reaching this acceptance criterion. This piping may be designed for thermal, pressure, deadweight, seismic, and other loads, and this acceptance criterion must be appropriate to ensure that the thinned piping would be able to carry these CLB design loads. This acceptance criterion should provide for timely corrective action before loss of intended function under these CLB design loads.

b) *Acceptance criteria could be specific numerical values, or could consist of a discussion of the process for calculating specific numerical values of conditional acceptance criteria to ensure that the structure and component intended function(s) will be maintained under all CLB design conditions. Information from available references may be cited.*

c) *It is not necessary to justify any acceptance criteria taken directly from the design basis information that is included in the FSAR because that is a part of the CLB. Also, it is not necessary to discuss CLB design loads if the acceptance criteria do not permit degradation because a structure and component without degradation should continue to function as originally designed. Acceptance criteria, which do permit degradation, are based on maintaining the intended function under all CLB design loads*

d) *Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site programs.*

Oyster Creek:

a) Ventilation duct and components are checked for signs of penetrating corrosion. Elastomers are inspected for cracking, damage and loss of material. Elastomers are repaired or replaced if a degraded condition is found. Heat transfer

surfaces are inspected for corrosion and fouling and cleaned as necessary. Acceptance criteria is based on previous plant and industry experience for these components. Degradation is identified and repaired before loss of function. **(Reference: Table 5.1 documents 10 – 30)**

b) Identified aging effects are evaluated by engineering to determine a) if penetrating corrosion indicating a loss of material aging or material degradation is occurring, and if so, b) the rate at which the material is being lost or degraded. Engineering evaluations will also c) determine the need for follow-up examinations to monitor the progression of aging degradation, and d) identify appropriate corrective actions to mitigate any excessive rates of degradation discovered.

c) Qualitative acceptance criteria evaluate for penetrating corrosion and degradation or tears of elastomers. Acceptance criteria is based on previous plant and industry experience for these components. Degradation is identified and repaired before loss of function. Heat exchangers surfaces are inspected for loss of material and cleaned. Component function is maintained by the periodic monitoring of the ventilation components. Flow and leak tests confirm inspection results. **(Reference: Table 5.1 documents 1 - 30)**

d) Inspections are not performed to ASME or related criteria for ventilation equipment. Qualitative inspections will identify penetrating corrosion in ductwork and enclosures or visible degradation of elastomer. Any debris is removed from heat exchangers surfaces. **(Reference: Table 5.1 documents 10 – 30)**

Exceptions to NUREG-1800, Element 6:

None.

Enhancements to NUREG-1800, Element 6:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 6, Acceptance Criteria.

3.6 Corrective Actions

NUREG-1800:

a) Actions to be taken when the acceptance criteria are not met should be described. Corrective actions, including root cause determination and prevention of recurrence, should be timely.

b) If corrective actions permit analysis without repair or replacement, the analysis should ensure that the structure and component intended function(s) will be maintained consistent with the CLB.

Oyster Creek:

a) Evaluations are performed for inspection results that identify penetrating corrosion or elastomer degradation, or test results that do not satisfy established criteria, and a condition report is initiated to document the concern in accordance with plant administrative procedures. The corrective actions program ensures that the conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to preclude recurrence.

b) Evaluations for equipment and ductwork are performed if penetrating corrosion is found to determine if repairs are necessary. Elastomer degradation is evaluated by qualified personnel in accordance with plant procedures. **(Reference: Table 5.1 documents 10 – 30)** Engineering analysis of the identified degradation will confirm that the components intended function will be maintained consistent with the current licensing basis.

Exceptions to NUREG-1800, Element 7:

None.

Enhancements to NUREG-1800, Element 7:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 7, Corrective Actions.

3.7 Confirmation Process

NUREG-1800:

a) The confirmation process should be described. It should ensure

that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

b) The effectiveness of prevention and mitigation programs should be verified periodically. For example, in managing internal corrosion of piping, a mitigation program (water chemistry) may be used to minimize susceptibility to corrosion. However, it may also be necessary to have a condition monitoring program (ultrasonic inspection) to verify that corrosion is indeed insignificant.

c) When corrective actions are necessary, there should be follow-up activities to confirm that the corrective actions were completed, the root cause determination was performed, and recurrence is prevented.

Oyster Creek:

a) The Oyster Creek corrective action process ensures that required corrective actions are complete and effective. Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

b) The Oyster Creek Periodic Inspection of Ventilation Systems is a condition monitoring program, not a prevention and mitigation program.

c) When corrective actions are necessary, the corrective actions process is defined by procedure (Reference: LS-AA-125) which determines when and what types of analyses are to be performed based on the level of severity. The corrective actions assure that the cause of the adverse condition is determined and they are effective in precluding repetition. This procedure defines how the effectiveness of corrective actions are monitored to prevent recurrence.

Exceptions to NUREG-1800, Element 8:

None.

Enhancements to NUREG-1800, Element 8:

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 8, Confirmation Process.

3.8 Administrative Controls

NUREG-1800:

a) The administrative controls of the program should be described. They should provide a formal review and approval process.

b) Any aging management programs to be relied on for license renewal should have regulatory and administrative controls. That is the basis for 10 CFR 54.21(d) to require that the FSAR supplement includes a summary description of the programs and activities for managing the effects of aging for license renewal. Thus, any informal programs relied on to manage aging for license renewal must be administratively controlled and included in the FSAR supplement.

Oyster Creek:

a) The procedures used to implement this aging management program are included in the Oyster Creek quality assurance program that provides for formal reviews and approvals. Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B.

b) The Periodic Inspection of Ventilation Systems Program consists of administratively controlled procedures, which are controlled as stated in item (a) above. The aging management program is included in the Oyster Creek License Renewal FSAR Supplement.

Exceptions to NUREG-1800, Element 9:

None.

Enhancements to NUREG-1800, Element 9

None.

Comparison and Evaluation Conclusion:

This element is consistent with NUREG-1800, Element 9, Administrative Controls.

3.9 Operating Experience

NUREG-1800:

Operating experience with existing programs should be discussed. The operating experience of aging management programs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an aging management program because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

An applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness.

Oyster Creek:

Review of industry operating experience in EPRI Aging Assessment Field Guide provides guidance for techniques used for and the frequency of inspections. The guidance discusses performing visual inspections during maintenance activities. **(Reference: EPRI 1007933)** These techniques are consistent with the existing in place maintenance activities for ventilation equipment at Oyster Creek. The program will continue to utilize inspections during maintenance consistent with NUREG-1801, program XI.M38.

A review of plant operating experience at Oyster Creek shows that loss of material in carbon steel ventilation components and change in material properties have occurred in several systems. In these cases, the components have been repaired and the existing Periodic Inspection of Ventilation Systems aging management program revised as necessary to preclude further occurrences. Additionally, there have been some cases where leaks did occur in a section not normally inspected. This occurred in the buried SGTS duct. An inspection procedure is being developed for this component. The experience at Oyster Creek with the inspection and maintenance of ventilation systems program shows that the Periodic Inspection of Ventilation Systems program as enhanced will be effective in managing loss of material, change in material properties and reduction of heat transfer.

Operating experience, both internal and external, is used in two

ways at Oyster Creek to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants from occurring at Oyster Creek. The first way in which operating experience is used is through the Oyster Creek Operating Experience process. The Operating Experience process screens, evaluates, and acts on operating experience documents and information to prevent or mitigate the consequences of similar events. The second way is through the process for managing programs. This process requires the review of program related operating experience by the program owner.

Both of these processes review operating experience from both external and internal (also referred to as in-house) sources. External operating experience may include such things as INPO documents (e.g., SOERs, SERs, SENs, etc.), NRC documents (e.g., GLs, LERs, INs, etc.), General Electric documents (e.g., RCSILs, SILs, TILs, etc.), and other documents (e.g., 10CFR Part 21 Reports, NERs, etc.). Internal operating experience may include such things as event investigations, trending reports, and lessons learned from in-house events as captured in program notebooks, self-assessments, and in the 10 CFR Part 50, Appendix B corrective action process.

Demonstration that the effects of aging are effectively managed is achieved through objective evidence that shows that loss of material, change in material properties and reduction of heat transfer is being adequately managed in Ventilation Systems. The following examples of operating experience provide objective evidence that the Periodic Inspection of Ventilation Systems program is effective in assuring that intended function(s) will be maintained consistent with the CLB for the period of extended operation:

1. Oyster Creek has experienced surface corrosion of outdoor equipment housings and damage to elastomers and deterioration of flexible connections that resulted in leakage of ventilation systems. These conditions were identified and corrected prior to loss of function of the systems. Maintenance procedures were revised to include steps to inspect for corrosion of outdoor equipment housings. Periodic preventive maintenance inspections of ventilation system components, including specific guidance to identify applicable aging effects, will effectively monitor the condition of system components such that degradation will continue to be identified prior to loss of intended functions. **(Reference; CAPs O2001-0162, O1998-**

0737; CAPs O2003-1281, O2003-1704) This example provides objective evidence that loss of material will be detected prior to loss of intended function and adequate corrective actions are taken to prevent recurrence.

2. A buried section of Standby Gas Treatment system duct failed due to external corrosion of the aluminum duct exposed to a soil environment. The failure occurred after approximately thirty years in service. The failed section was repaired with a sleeve. Periodic inspections of the buried duct section will be performed. **(SE-000822-023, CAP O2005-2288)** This example provides objective evidence of an enhancement to the program to provide detection of penetrating corrosion prior to loss of intended function.

3. In 1991 an SGTS duct panel separated at the top and bottom corners. This failure, which occurred indoors in the exhaust tunnel was determined to be a weld defect and not due to aging as the repaired areas and adjacent duct were identified to be in good condition. **(Reference: TDR 1048)** No new aging mechanism was identified from this event. This example provides objective evidence that adequate root cause evaluation is performed and action plans are developed as required.

The operating experience of the ventilation systems does not show any adverse trend in performance. Problems identified would not cause significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. There is sufficient confidence that the implementation of the Periodic Inspection of Ventilation Systems program will effectively determine loss of material, change in material properties and reduction of heat transfer. Appropriate guidance for evaluation, repair or replacement is provided for locations where loss of material, change in material properties or reduction of heat transfer occur.

3.10 Conclusion

The Oyster Creek Periodic Inspection of Ventilation Systems aging management program is credited for managing loss of material, change in material properties and reduction of heat transfer for the systems, components, and environments listed in Table 5.2. The Oyster Creek Periodic Inspection of Ventilation Systems program's elements have been evaluated against NUREG-1800 in Section 3.0. Program exceptions have been identified in Section 2.3.

Program enhancements have been identified in Section 2.4. The implementing documents for this aging management program are listed in Table 5.1. The relevant operating experience has been reviewed and a demonstration of program effectiveness is provided in Section 3.10.

Based on the above, the implementation of the Oyster Creek Periodic Inspection of Ventilation Systems aging management program with enhancements will provide reasonable assurance that loss of material, change in material properties and reduction of heat transfer will be adequately managed so that the intended functions of components within the scope of license renewal will be maintained during the period of extended operation.

4.0 REFERENCES

4.1 Generic to Aging Management Programs

4.1.1 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*

4.1.2 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*

4.1.3 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,* Revision 1, dated September 2005

4.1.4 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 1, dated September 2005

4.2 Industry Standards

4.2.1 EPRI Report 1007933, Aging Assessment Field Guide, December 2003

4.2.2 NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," Nuclear Energy Institute, March 2001

4.3 Oyster Creek Program References

4.3.1 SE-000822-023, Repair of SGTS duct at the stack

4.3.2 CAP O2005-2288, SGTS stack debris

4.3.3 CAPs O2001-0162, O1998-0737, degradation of fan

housings

4.3.4 CAPs O2003-1281, O2003-1704, elastomer degradation

4.3.5 TDR 1048, SGTS Duct failure in the tunnel

5.0 TABLES

5.1 Aging Management Program Implementing Documents

	Procedure Number	Procedure Title	Commitment No.	Status
1.	Surveillance Test 665.5.002	Secondary Containment Leak Rate Test	330592.40.01	ACC/AGS
2.	RTWO R0804097	Secondary Containment Leak Rate Test	330592.40.02	ACC/AGS
3.	Surveillance Test 654.3.004	CR HVAC System A Flow and Differential Pressure Test	330592.40.03	ACC/AGS
4.	PM ST54304A RTWO R0803989	CR HVAC System A Flow and Differential Pressure Test	330592.40.04	ACC/AGS
5.	Surveillance Test 654.3.006	CR HVAC System B Flow and Differential Pressure Test	330592.40.05	ACC/AGS
6.	PM ST54304A RTWO R0803991	CR HVAC System B Flow and Differential Pressure Test	330592.40.06	ACC/AGS
7.	Surveillance Test 651.4.001	Standby Gas Treatment System Test	330592.40.07	ACC/AGS
8.	R0803939 ST51401C	Standby Gas Treatment System 2 Test	330592.40.08	ACC/AGS
9.	R0803938 ST51401B	Standby Gas Treatment System 1 Test	330592.40.08	ACC/AGS
10.	PM 01203M (RTWO R0802188)	CR HVAC A Inspection (internals & elastomers) quarterly	330592.40.09	ACC/AGS
11.	PM 00235M (RTWO R0800805) / PM0001AC	CR HVAC B Inspection (internals & elastomers) yearly	330592.40.10	ACC/AGS
12.	PM 00280M (WO R0800895)	Radwaste Area Heat & Vent Lube & Inspect EF-1-16	330592.40.11	ACC/AGS
13.	PM 00794M (WO R0801689)	Radwaste Area Heat & Vent Lube & Inspect EF-1-17	330592.40.12	ACC/AGS
14.	PM013180O (RTWO R0802324)	Reactor Bldg/Radwaste Fans Stack Pad Exhaust Fans Inspection	330592.40.13	ACC/AGS
15.	PM 82203I (RTWO R0804286)	Reactor Building Vent Systems Visually Inspect Secondary Containment Isolation Valve Seats (currently 5 yr) (revise to VT-1 internal/external)	330592.40.14	ACC/AGS
16.	PM 01263M (RTWO R0802257)	Radwaste Area Heat & Vent NRW Exhaust Fan Inspection including Valve HV-AOD-30	330592.40.15	ACC/AGS

17.	PM 01200O (RTWO R0802186)	SGTS Fan EF-1-8 Inspection	330592.40.16	ACC/AGS
18.	PM 01201O (RTWO R0802187)	SGTS Fan EF-1-9 Inspection	330592.40.17	ACC/AGS
19.	PM 01279M (RTWO R0802279)	SGTS Lubricate Fan EF-1-8	330592.40.18	ACC/AGS
20.	PM 01280M (RTWO R0802281)	SGTS Lubricate Fan EF-1-9	330592.40.19	ACC/AGS
21.	PMXXXXXXX	SGTS Confirm wall thickness buried SGTS ducts	330592.40.20	ACC/AGS
22.	PM XXXXX RTWO	SGTS Identify PM filter train A	330592.40.21	ACC/AGS
23.	PM XXXXX RTWO	SGTS Identify PM filter train B	330592.40.22	ACC/AGS
24.	PM 00490M RTWO R0801296	480V Ventilation Fan Insp, Lube & Filter Change FN-56-004 & 007	330592.40.23	ACC/AGS
25.	PM 01242M RTWO R0802232	480V Ventilation Fan Insp, Lube & Filter Change SF-1-21	330592.40.24	ACC/AGS
26.	PM 00795M RTWO R2005050	480V Ventilation Lube & Inspect Fan FN-56-8	330592.40.25	ACC/AGS
27.	PM 00729M (RTWO R0801685)	480V Ventilation EF-1-21 Inspection & Lubrication	330592.40.26	ACC/AGS
28.	PM 00195M RTWO R0800700	C Battery Room Ventilation System Service	330592.40.27	ACC/AGS
29.	PM 00791M RTWO R0801684	MG Set & Battery Room Lube & Inspection EF-1-20	330592.40.28	ACC/AGS
30.	PM 01241M RTWO R0802229	M/G Set Room Supply Fan SF-1-20	330592.40.29	ACC/AGS

5.2 Aging Management Review Results

SSC Name	Structure and/or Component	Material	Environment	Aging Effect
480V Switchgear Room Ventilation	Door Seal	Elastomer	Indoor Air (External)	Change in Material Properties
480V Switchgear Room Ventilation	Door Seal	Elastomer	Indoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
480V Switchgear Room Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
480V Switchgear Room Ventilation	Door Seal	Elastomer	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Door Seal	Elastomer	Outdoor Air (External)	Change in Material Properties
480V Switchgear Room Ventilation	Fan Housing	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
480V Switchgear Room Ventilation	Filter Housing	Galvanized Steel	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
480V Switchgear Room Ventilation	Flexible Connection	Elastomer	Outdoor Air (External)	Change in Material Properties
480V Switchgear Room Ventilation	Piping and fittings	Brass	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Piping and fittings	Copper	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Sensor Element	Stainless Steel	Outdoor Air (External)	Loss of Material
480V Switchgear Room Ventilation	Valve Body	Brass	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
Battery and MG Set Room Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties

Battery and MG Set Room Ventilation	Door Seal	Elastomer	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Door Seal	Elastomer	Outdoor Air (External)	Change in Material Properties
Battery and MG Set Room Ventilation	Fan Housing	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Battery and MG Set Room Ventilation	Filter Housing	Galvanized Steel	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Flexible Connection	Elastomer	Outdoor Air (External)	Change in Material Properties
Battery and MG Set Room Ventilation	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
Battery and MG Set Room Ventilation	Piping and fittings	Brass	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Piping and fittings	Copper	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Sensor Element (Temperature)	Copper	Outdoor Air (External)	Loss of Material
Battery and MG Set Room Ventilation	Valve Body	Brass	Outdoor Air (External)	Loss of Material
C Battery Room Heating & Ventilation	Door Seal	Elastomer	Indoor Air (External)	Loss of Material
C Battery Room Heating & Ventilation	Door Seal	Elastomer	Indoor Air (External)	Change in Material Properties
C Battery Room Heating & Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
C Battery Room Heating & Ventilation	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
C Battery Room Heating & Ventilation	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
C Battery Room Heating & Ventilation	Fan Housing	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
C Battery Room Heating & Ventilation	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
C Battery Room Heating & Ventilation	Flexible Connection	Elastomer	Indoor Air (External)	Change in Material Properties

Control Room HVAC	Damper housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Control Room HVAC	Door Seal	Elastomer	Indoor Air (External)	Loss of Material
Control Room HVAC	Door Seal	Elastomer	Outdoor Air (External)	Change in Material Properties
Control Room HVAC	Door Seal	Elastomer	Outdoor Air (External)	Loss of Material
Control Room HVAC	Door Seal	Elastomer	Indoor Air (External)	Change in Material Properties
Control Room HVAC	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
Control Room HVAC	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
Control Room HVAC	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Control Room HVAC	Fan Housing	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Control Room HVAC	Fan Housing	Galvanized Steel	Outdoor Air (External)	Loss of Material
Control Room HVAC	Filter Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Control Room HVAC	Filter Housing	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Control Room HVAC	Filter Housing	Galvanized Steel	Outdoor Air (External)	Loss of Material
Control Room HVAC	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
Control Room HVAC	Flexible Connection	Elastomer	Indoor Air (External)	Change in Material Properties
Control Room HVAC	Heat Exchangers (Condensing Coil)	Copper (fins)	Outdoor Air (External)	Reduction of Heat Transfer
Control Room HVAC	Heat Exchangers (Condensing Coil)	Copper (coils)	Outdoor Air (External)	Reduction of Heat Transfer
Control Room HVAC	Heat Exchangers (Condensing Coil)	Copper (coils)	Outdoor Air (External)	Loss of Material
Control Room HVAC	Heat Exchangers (Evaporator Coil)	Copper (coils)	Indoor Air (External)	Reduction of Heat Transfer
Control Room HVAC	Heat Exchangers (Evaporator Coil)	Copper (coils)	Indoor Air (External)	Loss of Material

Control Room HVAC	Heat Exchangers (Evaporator Coil)	Aluminum (fins)	Indoor Air (External)	Reduction of Heat Transfer
Control Room HVAC	Heater Housing	Galvanized Steel	Outdoor Air (External)	Loss of Material
Control Room HVAC	Piping and fittings	Stainless Steel	Outdoor Air (External)	Loss of Material
Control Room HVAC	Piping and fittings	Polyvinyl Chloride (PVC, CPVC)	Outdoor Air (External)	Change in Material Properties
Control Room HVAC	Piping and fittings	Brass	Outdoor Air (External)	Loss of Material
Control Room HVAC	Piping and fittings	Copper	Outdoor Air (External)	Loss of Material
Radwaste Area Heating and Ventilation System	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
Radwaste Area Heating and Ventilation System	Door Seal	Elastomer	Outdoor Air (External)	Loss of Material
Radwaste Area Heating and Ventilation System	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
Radwaste Area Heating and Ventilation System	Door Seal	Elastomer	Outdoor Air (External)	Change in Material Properties
Radwaste Area Heating and Ventilation System	Fan Housing	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Radwaste Area Heating and Ventilation System	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Radwaste Area Heating and Ventilation System	Flexible Connection	Elastomer	Outdoor Air (External)	Change in Material Properties
Radwaste Area Heating and Ventilation System	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
Reactor Building Ventilation System	Door Seal	Elastomer	Indoor Air (External)	Loss of Material
Reactor Building Ventilation System	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
Reactor Building Ventilation System	Door Seal	Elastomer	Indoor Air (External)	Change in Material Properties
Reactor Building Ventilation System	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
Reactor Building Ventilation System	Piping and fittings	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Reactor Building Ventilation System	Piping and fittings	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material

Reactor Building Ventilation System	Valve Body	Cast Iron	Indoor Air (Internal)	Loss of Material
Reactor Building Ventilation System	Valve Body	Cast Iron	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Damper Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Outdoor Air (External)	Change in Material Properties
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Indoor Air (External)	Change in Material Properties
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Indoor Air (Internal)	Loss of Material
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Indoor Air (Internal)	Change in Material Properties
Standby Gas Treatment System (SGTS)	Door Seal	Elastomer	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Ductwork	Aluminum	Soil (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Fan Housing	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Standby Gas Treatment System (SGTS)	Fan Housing	Carbon and low alloy steel	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Flexible Connection	Elastomer	Indoor Air (Internal)	Change in Material Properties
Standby Gas Treatment System (SGTS)	Flexible Connection	Elastomer	Outdoor Air (External)	Change in Material Properties
Standby Gas Treatment System (SGTS)	Flow Element	Stainless Steel	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Piping and fittings	Brass	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Piping and fittings	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Piping and fittings	Copper	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Piping and fittings	Stainless Steel	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Piping and fittings	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material

Standby Gas Treatment System (SGTS)	Restricting Orifice	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Standby Gas Treatment System (SGTS)	Restricting Orifice	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Restricting Orifice	Carbon and low alloy steel	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Restricting Orifice	Carbon and low alloy steel	Indoor Air (Internal)	Loss of Material
Standby Gas Treatment System (SGTS)	Thermowell	Stainless Steel	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Valve Body	Brass	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Valve Body	Cast Iron	Outdoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Valve Body	Cast Iron	Indoor Air (External)	Loss of Material
Standby Gas Treatment System (SGTS)	Valve Body	Cast Iron	Indoor Air (Internal)	Loss of Material

6.0 ATTACHMENTS

6.1 LRA Appendix A

6.2 LRA Appendix B