Equipment Qualification Program

Technical Report

Non-Proprietary

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The APR1400 Equipment Qualification Program consists of two parts, which are environmental qualification and seismic qualification. These are discussed in separate parts.

Part 1

Environmental Qualification

ABSTRACT

This report describes the program used to meet the requirements of 10 CFR 50.49, NRC RG 1.89, NUREG-0588 Category I, IEEE Std. 323, and NUREG-0800 (SRP 3.11). The program described herein applies to Class 1E electrical equipment and safety-related active mechanical equipment important to safety for nuclear power plants committed to the above requirements. Description of the elements of the environmental qualification program, methodology, and technical bases are presented. Type test, analysis, and other methods of qualification compliant with NUREG-0588 are discussed. It is expected that this report may be referenced by license applicants for the scope and methods to be employed for qualification of Class 1E electrical equipment and safety-related active mechanical equipment.

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1.0 INTRODUCTION

1.1 OBJECTIVES

The intent of equipment environmental qualification is to demonstrate that equipment will perform the necessary safety-related functions during normal and accident conditions.

This report discusses the methods used to meet the requirements of 10 CFR 50.49, IEEE Std. 323, the "Category I" requirements of NUREG-0588, and the requirements of NUREG-0800 (SRP 3.11). The methods described herein apply to Class 1E electrical equipment and safety-related active mechanical equipment important to safety for use in nuclear power plants committed to the above requirements. It is expected that this report may be referenced by license applicants for the scope and methods employed herein.

Qualification documentation will be supplied by supplier and is described in detail in Section 6.0.

1.2 BACKGROUND

The environmental requirements to be considered in the design of safety-related equipment are embodied in Title 10 Code of Federal Regulation (10 CFR), Appendix A to Part 50, General Design Criteria 1, 2, 4, 23, and 50. The environmental design of the safety-related equipment is verified, documented, and controlled is required by Section III, XI, and XVII of Appendix B to 10 CFR 50.

NUREG-0588 was issued in December 1979 to promote a more orderly and systematic implementation of equipment qualification programs by the industry and to provide guidance to the NRC staff for its use in ongoing licensing reviews. The positions contained in the report provide guidance on (1) how to establish environmental service conditions, (2) how to select methods which are considered appropriate for qualifying equipment in different areas of the plant, and (3) other issues such as margin, aging, and qualification documentation.

In February 1980, the NRC requested certain near term Operating License (OL) applicants to review and evaluate the environmental qualification documentation for each item of safety-related electrical equipment and to identify the degree to which their qualification programs comply with the staff positions discussed in NUREG-0588. IE Bulletin 79-01B "Environmental Qualification of Class 1E Equipment," issued on January 14, 1980 and its supplements dated February 29, September 30, and October 24, 1980 established environmental qualification requirements for Class 1E electrical equipment in operating reactors.

A final rule on environmental qualification of electric equipment important to safety for nuclear power plants became effective on February 22, 1983. This rule, Section 50.49 of 10 CFR Part 50, specifies the requirements to be met for demonstrating the environmental qualification of electric equipment important to safety located in a harsh environment.

The qualification requirements for safety-related active mechanical equipment are principally contained in Appendices A and B of 10 CFR 50. The qualification methods defined in NUREG-0800 (SRP 3.11) can also be applied to mechanical equipment. Environmental qualification of safety-related active mechanical equipment is described in detail in Appendix J.

1.3 CRITERIA AND STANDARDS

The qualification program is designed to meet the requirements of IEEE Std. 323, IEEE Std. 627, and the "Category I" requirements of NUREG-0588. IEEE Std. 323 was issued to provide guidance for demonstrating the qualifications of Class 1E equipment for nuclear generating stations. The individual supporting standards that the A/E will employ, either in whole or in parts is listed in Section 9.0.

1.4 SUMMARY

A summary of the various sections of this report is given below:

Description of Environmental Qualification Program (Section 3.0)

The general scope of supply and the various qualification program activities are discussed. This report will cover safety-related electrical and active mechanical equipment including sensors, electrical penetration assemblies, cables, hydrogen and radiation monitoring systems, panels, MCC, SWGR, miscellaneous instrumentation, nuclear service valves and auxiliary equipment, and pump motors located in harsh and mild environments.

Equipment Qualification Requirements (Section 4.0)

Information will be included on the location of equipment, qualification environment and operating requirements.

Methods of Qualification (Section 5.0)

Type tests, analysis and other methods of qualification compliant with IEEE Std. 323, NUREG-0800 (SRP 3.11), 10 CFR 50.49, NRC RG 1.89, and the “Category I” requirement of NUREG-0588 are presented. The demonstration of conservatism of the qualification parameters will be discussed.

Documentation (Section 6.0)

This section discusses the documentation required for qualification. The qualification reports and their generation are discussed. Documentation necessary to support the review on a particular applicant's docket will be available for audit.

Quality Assurance (Section 7.0)

A/E's quality assurance practices and documentation requirements associated with equipment qualification activities are discussed.

Administrative Procedures (Section 8.0)

Supplier’s participation and responsibility coupled with qualification program technical definition, management, and control are discussed.

2.0 DEFINITIONS

2.1 Abnormal Condition - The limiting environmental condition expected following an event or transient which is not a normal operating condition but is not considered an accident.

2.2 Accident Condition - The environmental conditions expected as a direct result of an event which requires activation of emergency safeguards systems to protect the plant combined with a single active failure.

2.3 Active Components - Any component characterized by a change in state, or by mechanical motion, to perform an automatic safety function such as safe shutdown of the reactor, or mitigation of the consequences of a postulated pipe break in the reactor coolant pressure boundary.

2.4 Aging - The effects of operational, environmental and system conditions on equipment during a period of time up to, but not including, design-basis events or the process of simulating these events.

2.5 Analysis - A process of mathematical or other logical reasoning that leads from stated premises to a conclusion concerning specific capabilities of equipment and its adequacy for a particular application.

2.6 Auditable Data - Technical information which is documented and organized in a readily understandable and traceable manner and which permits independent auditing of the inferences or conclusions based on the information provided.

2.7 Class 1E - The safety classification of electrical equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and

reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment.

2.8 Common Mode Failure - Multiple failures attributable to a common cause.

2.9 Components - Individual items that are the integral parts of equipment and can not be individually operability tested, e.g., seals, gaskets, resistors, etc.

2.10 Condition Monitoring - Activities by which equipment condition is monitored to ensure that it does not degrade or age beyond the state to which it is no longer operable.

2.11 Containment - That portion of the engineered safety features designed to act as the principal barrier, beyond the reactor system pressure boundary, to prevent the release, even under conditions of a reactor accident, of unacceptable quantities of radioactive material beyond a controlled zone.

2.12 Demonstration - A course of reasoning showing that a certain result is a consequence of assumed premises; an explanation or illustration, as in teaching by use of examples.

2.13 Design Basis Events (DBE) - Postulated abnormal events used in the design to establish the performance requirements of the safety-related structures, systems, and components. (These events include abnormal operating occurrences as well as design basis accidents.)

2.14 Design Life - The time during which satisfactory performance can be expected for a specific set of service conditions.

2.15 Design Qualification - The generation and maintenance of evidence to demonstrate that equipment can perform within its specification requirements.

2.16 Engineered Safety Features - Features of a unit other than reactor trip or those used only for normal operation, that are provided to prevent, limit, or mitigate the release of radioactive material.

2.17 Equipment - An assembly of components designed and manufactured to perform specific functions.

2.18 Equipment Qualification - The generation and maintenance of auditable evidence to assure that the equipment will operate on demand to meet the performance requirements under applicable service conditions.

2.19 Failure - The loss of ability to perform a required service function by a component, equipment, or system.

2.20 Harsh Environment - Any area which experiences a significant increase in environmental parameters (pressure, temperature, relative humidity, or chemical) due to a postulated DBE, or any area with a total integrated dose (TID) greater than 10^2 Gy (greater than 10 Gy for electronic components such as semiconductors or electronic components containing organic material).

2.21 Harsh Zone - An area of the plant which is predicted to experience the conditions of a harsh environment.

2.22 Installed Life - The interval from installation to removal, during which the equipment or component may be subject to design service conditions and system demands. (Note: Equipment may have an installed life of designated life of the plant with certain components changed periodically; thus, the installed life of the components would be less than designated life of the plant.)

2.23 Interface - A junction or junctions between a Class 1E equipment and another equipment or device (Examples: connection boxes, splices, terminal boards, electrical connections, grommets, gaskets, cables, conduits, enclosures, etc.).

2.24 Margin - The difference between the most severe specified service conditions and the conditions used during equipment qualification type testing.

2.25 Mild Environment - An environment expected as a result of normal service conditions and extremes (abnormal) in service conditions where seismic is the only design basis event (DBE) of consequence.

2.26 Mild Zone - An area of the plant which is predicted to experience the conditions of a mild environment.

2.27 Nuclear Generating Station - A plant wherein electrical energy is produced from nuclear energy by means of suitable apparatus. The station may consist of one or more units which may or may not share some common auxiliaries.

2.28 Normal Conditions - The environmental conditions expected during normal plant operation with equipment performing its function, as required, on a continuous steady - state basis.

2.29 Operating Experience - Accumulation of verifiable service data for conditions equivalent to those for which particular equipment is to be qualified.

2.30 Performance Requirements - Specified range of parameters within which equipment must operate under normal and accident conditions, e.g., power, actuation time, accuracy, etc.

2.31 Qualified Life - The period of time for which satisfactory performance can be demonstrated for a

specific set of service conditions. The qualified life of a particular equipment item may be changed during its installed life where justified.

2.32 Sample Equipment - Production equipment tested to obtain data which is valid over a range of ratings and for specific services.

2.33 Service Conditions - Environmental, Power, and Signal conditions expected as a result of normal operating requirements, expected extremes (abnormal) in operating requirements, and postulated conditions appropriate for the design basis events of the stations.

2.34 Synergistic Effects - The effects which result from two or more stresses acting together, as distinguished from the effects of the stresses applied separately.

2.35 Type Tests - Tests made on one or more equipment samples to verify the adequacy of the design and manufacturing processes.

3.0 DESCRIPTION OF ENVIRONMENTAL QUALIFICATION PROGRAM

3.1 SCOPE OF SUPPLY

This report will address electrical and active mechanical equipment important to safety for nuclear power plants. These equipment are classified in four categories by 10 CFR 50.49 (b) and NUREG-0800 (SRP 3.11) as (1) safety-related electric equipment which is required to function under the postulated accident conditions, (2) non-safety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions by safety-related equipment, (3) certain post-accident monitoring equipment, and (4) safety-related active mechanical equipment. Category (1) includes Class 1E electrical equipment, as defined in the APR1400 DC Classification Criteria Document. Category (2) equipment shall be selected for environmental qualification by the respective responsible system engineers based on their evaluation of the equipment's failure under postulated environmental conditions as being detrimental to satisfactory accomplishment of equipment safety functions. Category (3) group is comprised of NRC RG 1.97 equipment identified by "note" in remark column of APR1400 DC Classification Criteria Document. Category (4) is the safety-related active mechanical equipment designated as "SR" in safety designation column of the APR1400 DC Classification Criteria Document. The environmental qualification program described in this document is based on engineering principles that ensure these components will function properly in their environments, when required during normal operation and during and after design basis events.

For APR1400 DC, the scope of supply for safety-related electrical and active mechanical equipment includes the following:

A. Load Center and Switchgear

B. Motor Control Center

C. DC Motor Control Center

D. Battery, Charger and Inverter

E. Electrical Penetration Assemblies

F. Electrical Cables

G. Monitoring System and Associated Panels

H. Process Sensor & Instrumentation

I. Power Operated Valve Assemblies

J. Check Valves

K. Safety Relief Valves

L. Pumps and Drives of Various Types

M. AHU and Cubicle Coolers

N. ACU, Fan and Duct Heaters

O. Emergency Diesel Generators

P. Dampers

Q. Chillers

3.2 QUALIFICATION PROGRAM

Applicants for operating licenses are required to demonstrate that electrical and active mechanical equipment important to safety will perform their required Class 1E functions throughout their design life under the expected normal and postulated accident conditions. Qualification programs must consider the effects of normal and accident environments, in-service and seismic vibration, radiation, temperature, pressure, chemical spray, humidity, submergence, synergistic effects, dust, as well as the natural aging process for the individual equipment.

The goal of the qualification program is to provide a reasonable assurance that the specified equipment will operate within defined limits when exposed to the conditions associated with its required service environments. In order to meet this goal, the qualification program will address the following areas, as required.

A. Performance or operating requirements for Class 1E electrical and safety-related active mechanical equipment to demonstrate qualification

B. The environmental conditions and exposure times for which the equipment must be qualified

C. Simulation of environments or effects to determine qualification of individual components

D. Effects on these components of long or short term exposure to simulated environments

E. Methods of observing or detecting these effects (Anomalies)

F. The methods for establishing a qualified life

G. The required levels of documentation and quality assurance

The integration of these areas is accomplished through a series of activities which include the following:

1. Generation of an aging analysis plan and report which defines age susceptible components of the equipment (This report also includes detailed procedures for age conditioning and define periodic replacement intervals as required.)

2. Generation of a qualification plan that incorporates the results of the aging analysis in defining the qualification methods and documentation activities of the qualification program

3. Performance of the age conditioning sub-program and preparation of an age conditioning

report, if required

4. Preparation of detailed qualification test plans and procedures

5. Performance of the qualification testing

6. Preparation of the final qualification test report and qualification data summary form

7. Development of the requirements for maintenance and surveillance activities

This report will address each one of the above areas as it applies to safety-related electrical and active mechanical equipment.

The qualification program is established to meet the requirements of IEEE Std. 323, NUREG-0800, 10 CFR 50.49, NRC RG 1.89, and the “Category I” requirements of NUREG-0588. The qualification program has two approaches that are based on the equipment's location. Equipment located in a harsh environment is not treated in the same fashion as equipment located in a mild environment. Regardless of equipment location, qualification will be demonstrated based on either type testing, accelerated age conditioning, periodic replacement, surveillance/preventive maintenance (S/PM), and/or any combination thereof. The qualification methods associated with both approaches are as follows:

A. Harsh Environments

Safety-related equipment located in a harsh environment, such as in containment and in some auxiliary building areas, required to be functional during and after the design basis event (LOCA, MSLB, which are etc.) will undergo an aging analysis and an accelerated aging program. Subsequent to age conditioning, the equipment will undergo type testing for the accident environment as specified in Section 6.0 of IEEE Std. 323 and Sections 2.0, 3.0, and 4.0 of NUREG-0588. Equipment subjected to a postulated harsh environment includes Class 1E transmitters, cables and connectors, some process instrumentation, electrical penetration assemblies, cubicle coolers, ACU, nuclear service valves and auxiliary equipment, radiation and hydrogen monitoring equipment, pump motors and damper.

B. Mild Environments

Safety-related equipment located in a mild environment, such as control areas and some areas in the plant, will be qualified for the normal local environment and a seismic event. An aging analysis will be performed prior to qualification type testing to determine whether or not known significant aging mechanisms exist for that equipment. The aging analysis will focus on the identification of known aging mechanisms that significantly increase the equipment susceptibility to its design basis event (seismic only for mild environments). Pending the results of the aging analysis, the equipment will either require an accelerated age conditioning program, periodic part replacement program, surveillance/preventive maintenance program or any combination thereof to demonstrate and maintain qualification status. This equipment will also undergo type testing as specified in IEEE Std. 323 and NUREG-0588. Equipment subjected to a mild environment includes Class 1E local control panels, some process instrumentation (indicators, converters, and recorders), Load Center, SWGR, DC Control Center, MCC, Battery, Charger and Inverter, AHU, Fan and Duct Heaters, D/G, and miscellaneous electronic modules.

3.2.1 Aging

The aging analysis and the accelerated age conditioning program will be conducted in accordance with Section 6.0 of IEEE Std. 323 and Section 4.0 of NUREG-0588.

As discussed in Section 3.2, the qualification program is determined by two approaches based on whether or not equipment is located in a harsh or mild environment. Regardless of equipment location, an aging analysis will be performed on all equipment. Thermal, radiation, humidity, cyclic operation, electromechanical and synergistic effects will be addressed as appropriate.

The methodology utilized in the determination and evaluation of the equipment age related failure modes and mechanisms will include, as appropriate, the following types of information:

A. Arrhenius and/or activation energy data

B. Aging acceleration rate data

C. Failure Mode and Effects Analysis (FMEA) data

D. Thermal stress data

E. Electrical stress data

F. Electromechanical and operational cycling data

G. Normal operating vibration data

H. Radiation component susceptibility data

I. Major industry known synergistic data

3.2.2 Seismic

A description of the seismic qualification program for Class 1E equipment will be in accordance with IEEE Std. 344.

Seismic qualification of pump motors, and nuclear service valves and auxiliary equipment is per IEEE Std. 344.

This report will not discuss seismic testing, methods, or results, other than to reference IEEE Std. 344.

3.2.3 Environmental

Equipment will be environmentally qualified to levels at least as severe as the conditions specified in the Environmental Qualification Parameters Report for normal, and accident conditions. Environmental parameters and qualification profiles for DBE (LOCA, MSLB) are provided in Environmental Qualification Parameters Report.

3.3 ENVIRONMENTAL CONDITIONS AND EFFECTS

The postulated environmental conditions, to which safety-related equipment are exposed, generally include long time periods at either moderate or low levels of temperature, pressure, humidity and radiation, followed by, for equipment located in the containment, exposure to high levels of these same parameters for relatively short periods of time. Equipment operation under

these high stress levels may be required in order to mitigate or monitor the postulated accident conditions. The level of exposure may also be affected by the location of the particular equipment.

For example, a component located in the reactor containment building may be exposed to moderate temperature, pressure, humidity, and radiation for long periods of time and then would be required to function for safety purposes under possible conditions of high temperature, pressure, humidity, radiation and chemical spray resulting from a Loss of Coolant Accident (LOCA) or Main Steam/Main Feedwater Line Break (MSLB /MFLB).

The purpose of the qualification program is to demonstrate that equipment will perform its Class 1E function.

3.3.1 Temperature

3.3.1.1 Harsh Environment

The preferred method of establishing an environmental profile for DBE testing of safety-related equipment located in harsh environmental zone is to adhere to Category I guidelines in Section 1.1 and 1.2 of NUREG 0588, Rev.1 for developing a test profile which will envelope all temperature and pressure gradients for design basis events in a superheated steam/air environment. See the APR1400 DC Containment DBA Temperature & Pressure Profiles provided in Environmental Qualification Parameters Report.

A second method of establishing a test profile is based on a thermal equivalence analysis. This method of establishing a profile will be used in lieu of the preferred method whenever the preferred method represents severe over-testing of a particular component.

3.3.1.2 Thermal Equivalence Requirements

In the event it is necessary to use thermal equivalence techniques, the following requirements must be met:

A. Application of the thermal equivalence approach shall be justified for each piece of equipment, including any judgements regarding the survivability limits of the equipment.

B. The specific heat transfer modeling of the equipment shall be described and the selection of the critical surface or surfaces shall be justified as limiting with respect to both time and

location. The test results will be used to demonstrate the conservatism of the heat transfer modeling.

C. Multiple temperature measurements of the critical surface(s) from testing shall envelope the calculated surface temperature transient(s), including the initial ramp. "Soaking" will not be permitted.

D. A margin of at least +8 ℃ (+15 °F) shall be applied between the measured surface temperature and the calculated surface temperature. This margin accounts for the uncertainties associated with design, production tolerances, testing techniques and the number of units tested. This temperature margin of +8 ℃ (+15 °F) is in accordance with the guideline of IEEE Std. 323.

E. Application of the thermal equivalence approach shall be restricted to the limiting super-heated steam harsh environment, based on a spectrum of break sizes.

3.3.1.3 Mild Environment

Equipment located in general plant areas outside containment which is not subjected to a design basis accident environment will be qualified to the normal and abnormal range of environmental conditions postulated to occur at the equipment location. Equipment that is served by safety-related support systems will be qualified per defined environmental interface requirements, to the limiting environmental conditions that are postulated for that location.

Specific environmental conditions, as described in Environmental Qualification Parameters Report (Appendix. C) will be used as appropriate, for environmental qualification of the equipment in mild environments.

3.3.2 Radiation

3.3.2.1 Harsh and Mild Environment

Equipment will be qualified for the types and levels of radiation associated with normal operation plus the radiation associated with the most severe Design Basis Events (DBE). These levels are defined in Environmental Qualification Parameters Report. If more than one type of radiation is significant, each type may be applied separately.

Equipment which is exposed to radiation greater than 10^2 Gy (greater than 10 Gy for electronic components such as semiconductors or electronic components containing organic material) will be irradiated to its anticipated Total Integrated Dose (TID) prior to type testing unless determined by analysis supported by partial type test data, that radiation does not negatively impact equipment ability to perform its required function.
Where the application of the accident dose is planned during DBE testing, it need not be included during the aging process.

Equipment which will be exposed to radiation levels of 10^2 Gy (Semiconductors or Electronic components containing organic material which are exposed to radiation greater than 10 Gy will be irradiated to its anticipated Total Integrated Dose (TID) prior to type testing unless determined by analysis that radiation does not affect its ability to perform its required function) or below will be analyzed to determine whether low level radiation could impact its ability to perform its required function. Where analysis supported by partial type test data, can not demonstrate proper operation at the required radiation levels, type testing will be performed.

Equipment will be qualified to the specific radiation environments defined in Environmental Qualification Parameters Report, as required.

3.3.2.2 Gamma

Cobalt-60 is considered an acceptable gamma radiation source. Other sources may be found acceptable, and will be justified. Equipment will be tested to specific gamma radiation levels of the reactor containment building defined in Environmental Qualification Parameters Report.

3.3.2.3 Beta

Equipment exposed to beta radiation will be identified and an analysis will be performed to determine if the operability of the equipment is affected by beta radiation ionization and heating effects. Qualification will be performed by test unless analysis demonstrates that the safety function will not be degraded by beta exposure. Equipment will be tested and/or analyzed to the beta radiation levels of the reactor containment building defined in Environmental Qualification Parameters Report. Where testing is recommended, gamma equivalent radiation source will be used.

3.3.2.4 Paints/Radiation Effects

An analysis will be performed addressing paint exposure to beta and gamma radiation, if required. Qualification of painted equipment will be performed by test, if analysis indicates that the safety function of the equipment could be impaired by paint failure due to radiation.

3.3.3 Vibration

Vibration may be externally or self induced. Safety-related piping systems (including components) are designed and observed under start-up or initial service conditions to ensure that external or self induced vibration of piping systems is in accordance with ASME Boiler and Pressure Vessel Code, Section III. Vibration effects of components (e.g., Class 1E pump motors) are addressed by periodic measurement of vibration during in-service inspection tests of pumps in accordance with ASME Boiler and Pressure Vessel Code, Section XI. For pump motors, acceptance vibration levels defined in the Hydraulic Institute Standards provide the maximum vibration levels acceptable to ensure continued qualified motor performance.

Where significant levels of continuous vibration are expected to exist during service, the effects of such vibration, either externally or self induced will be evaluated via surveillance, preventive maintenance, analysis, partial type testing, or any combination of the above.

3.3.4 Pressure

Safety-related equipment in APR1400 DC nuclear power plants are not normally exposed to high pressure environments. However, after a postulated accident, such as the LOCA or MSLB, components located in the reactor containment building may be exposed to significant external pressure from a combined steam-air mixture. Equipment will be environmentally tested to these conditions and its performance will be demonstrated during and after the test.

See Containment DBA Pressure Profile, provided in Environmental Qualification Parameters Report.

3.3.5 Humidity

Safety-related equipment in APR1400 DC nuclear power plants are not normally exposed to 100% humidity. However, after a postulated accident, such as LOCA or MSLB, components located in the reactor containment building may be exposed to 100% RH resulting from condensing steam. This equipment will be environmentally tested to short term high humidity levels and its performance will be demonstrated during and after the test.

3.3.6 Chemical Spray

Safety-related equipment in APR1400 DC nuclear power plants are not normally exposed to chemical spray environments. However, after a postulated accident, such as the LOCA or MSLB, components located in the reactor containment building may be exposed to a chemical spray by actuation of containment spray system. Equipment will be environmentally tested to conditions at least as severe as these conditions and its performance will be demonstrated during and after the test. A single failure analysis of the spray system will be performed, as described in Section 5.2.2, to determine most severe spray composition. Corrosion effects due to long term exposure will be addressed, as appropriate.

Where qualification for chemical spray environment is required, the simulated spray will be initiated at the rate and duration shown in containment spray conditions table of Environmental Qualification Parameters Report. Typical values of chemical spray composition, concentration, and pH are defined in containment spray condition table of Environmental Qualification Parameters Report.

3.3.7 Dust

Dust requirements will not be applied to indoor equipment, because indoor conditions are prevented by normal dust control in the plant ventilation systems.

Outdoor dust environments will be considered when establishing service conditions and qualification requirements. The potential effects of dust exposure will be evaluated relative to effects upon equipment safety function performance. Where dust could have a degrading effect on equipment safety function performance, it will be addressed in the qualification program through the upgrading of equipment interface requirements. The following factors will be considered as appropriate when evaluating the effects of outdoor dust.

A. Interface requirements and limits for the environmental control systems

B. Equipment filtering capabilities

C. Dust density, composition, and accumulation rate

D. Equipment utilizing high voltages or performing electromechanical functions

3.3.8 Submergence

Equipment locations and operability requirements will be reviewed to establish whether or not specific equipment could be subject to submergence during its required operating time. Flood levels both inside and outside containment will be reviewed and potential impacts on equipment qualification appropriately addressed. Where operability during submergence is required, qualification will be demonstrated by type test and/or analysis supported by partial type test data. See Section 5.2.1 for additional discussion.

If simulation of hydrostatic pressure is required for submergence testing, it will include the maximum vapor pressure in that environment plus margin and the pressure due to its level of submergence. The duration of the test will be as specified in equipment specific qualification test procedures.

3.3.9 Power Supply Voltage and Frequency Variation

Power supply voltage and frequency variation is addressed in several areas throughout the equipment design and verification process. During the design process interface requirements dictate the acceptable range of power supply variation. Equipment specifications incorporate these interface requirements into the design to ensure acceptable operation within the defined range of power supply voltage and frequency variation. Upon equipment fabrication and completion, design verification tests are performed to demonstrate design adequacy. Class 1E pump motors are designed and qualified to operate successfully under normal operating condition at rated load with a variation in the voltage or frequency up to the following typical values:

A. ±10% of rated voltage with rated frequency

B. ±5% of rated frequency with rated voltage

C. A combined variation in voltage and frequency of ±10% of the rated values, provided the frequency variation does not exceed ±5% of rated frequency

3.3.10 Other Environmental Effects

A. Heat rise due to I^2R

B. Heat rise produced by conduction

C. Contact of component with process fluids

4.0 EQUIPMENT QUALIFICATION REQUIREMENTS

Qualification requirements for safety-related equipment in the scope of supply are contained in APR1400 DC procurement specifications. These requirements include equipment specific DBE's, location, normal and accident environments and operating time required under accident environments.

4.1 LOCATION

The location will determine the harsh or mild environment for the equipment. Equipment located in the containment building may be exposed to a normal, moderate temperature and radiation environment as well as a high temperature, pressure, radiation, humidity, and chemical spray accident environment, including a possible seismic event. Most equipment located outside of containment would only be subjected to a possible seismic event or a limited temperature/humidity excursion.

If it is determined that a particular piece of equipment is located in an area that exposes it to a defined environmental condition (e.g., HELB, flooding, or radiation due to recirculation fluids), then these conditions will be incorporated into the qualification program.

4.2 ENVIRONMENT

The environment to which equipment is exposed is contingent on its location as discussed above, as well as on the type of accident. For example, a LOCA would expose equipment to a different accident environment in the containment building than a Main Steam Line Break or a Seismic Event. The qualification requirements will impose the worst-case environment for each component, as applicable.

4.3 DESIGN BASIS EVENTS

Design Basis Events (DBE) are established for each piece of equipment based on the requirements of the safety analysis. To demonstrate that the equipment is qualified to function during and/or after a DBE, it will be qualified to a simulated test environment that exceeds, with appropriate margin, the defined environmental condition associated with that event.

4.4 OPERATING REQUIREMENTS

Operating requirements for specific equipment are established by the safety analysis of each accident. Some equipment may be required to function during and after the accident and others

may only be required to maintain structural integrity so as not to affect the operation of safety equipment.

5.0 METHODS OF QUALIFICATION

This section discusses type tests, analysis, and other methods of qualification consistent with the requirements of NUREG-0588. The analysis used to establish the environmental conditions for design basis events are discussed. The methodology used to perform an aging analysis is also discussed.

The qualification methods defined in IEEE Std. 323 will be used.

They are as follows:

A. Type testing

B. Operating experience

C. Analysis

D. Combined methods
(Any combination of type testing, operating experience, and analysis)

5.1 TYPE TESTING

The goal of type testing is to demonstrate that the equipment performance meets or exceeds the requirements of equipment performance specifications under the normal, abnormal and accident conditions specified in APR1400 DC Project equipment procurement specifications.

Type testing is the preferred method and will be employed to the maximum extent practical. Where operating experience or analysis is used, partial type testing will be used to support assumptions made and conclusions reached.

5.1.1 Equipment Procurement Specification

Safety-related equipment specifications include a description of the equipment, the safety-related performance characteristics, design environmental conditions and where appropriate, the effect of changes in environmental conditions upon safety-related performance characteristics. Safety-related performance characteristics will be specified with nominal, maximum, and minimum values, where applicable. Design environmental conditions are specified with normal, design

basis event and post-design basis event ranges or conditions, where applicable. Miscellaneous data, such as significant sequences, rate of change, and combinations of environmental conditions, operating, energy and environmental cycles, qualified life and unusual environmental conditions are specified as required.

The environmental qualification checklists that are filled in for each piece of equipment undergoing qualification, will address in checklist format the safety-related equipment qualification and environmental parameters. The specific equipment documentation provides the customer special installation requirements and the manner and frequency of maintenance requirements to maintain qualification.

5.1.2 Type Test Methods

The type test demonstrates that the equipment performance characteristics meet or exceed its specified safety-related performance requirements. The type test will consist of a planned sequence of test conditions that meet or exceed the expected or specified service conditions, including margin, per IEEE Std. 323, and will take into account both normal and accident service conditions.

Prior to performing the type test, a written qualification test plan, aging analysis report, age conditioning report and qualification test procedures are prepared in accordance with IEEE Std. 323, NUREG-0588.

The safety-related equipment is mounted in a manner and position which simulates its in-plant installation.

The safety-related performance characteristics of the equipment are determined at the nominal controlled environmental and energy supply operating conditions. Equipment is operated at rated load conditions over the range of its input and output parameters or other safety functions.

The safety-related performance characteristics of the equipment are determined for the significant portions of the design range of each of the significant environmental parameters or each significant combination thereof.

The test is monitored using equipment that provides sufficient resolution for detecting meaningful changes in the measured variables. The test equipment is calibrated against auditable calibration standards and will have documentation to support such calibrations. The monitoring of performance characteristics and environmental parameters are of sufficient frequency as to provide an assured basis for evaluation of the safety-related performance characteristics of the equipment.

Performance characteristics will be monitored and recorded (as appropriate) before, during and after type testing.

Operability status of the equipment will be monitored and recorded (as appropriate) continuously during testing. For long term testing (greater than one day) monitoring at discrete intervals is performed with justification provided.

5.1.3 Margin

The purpose of margin in qualification testing is to account for reasonable uncertainties while demonstrating satisfactory performance.

The qualification type testing includes provisions to verify that margin exists. In defining the type test, increasing levels of testing, number of test cycles, or test duration are considered as methods of assuring that adequate margin does exist.

Margins provided in Section 6.3.1.6 of IEEE Std. 323 will be used as a guide. These margins will be applied in addition to any conservatism applied during derivation of local environmental conditions unless the conservatism can be quantified and shown to contain appropriate margins.

Equipment specific qualification test procedures will define all margins and will utilize the environmental parameters and profiles of the Environmental Qualification Parameters Report, as service conditions.

Typical margins which are applied, as appropriate, to service conditions for type testing are as follows:

A. Peak Temperature: +15 for °F, +8 for ℃ (Notes 2, 3, and 4)

B. Peak Pressure: +10% of gauge pressure but not more than 10 psi (Notes 2 and 3)

C. Radiation: +10% of accident dose (Note 5)

D. Voltage: ±10% of rated value unless otherwise specified (Note 7)

E. Frequency: ±5% of rated value unless otherwise specified (Note 7)

F. Time: +10% of the period of time the equipment is required to be operational following the DBE (Note 6)

G. Vibration: +10% added to the acceleration of the response spectrum at the mounting point of the equipment

H. Normal Service Condition (Note 1)

Notes

1. To be applied to equipment located in general plant areas outside containment where it is not subjected to a DBE.

2. To be applied only to DBE and for a minimum of 4 days following the DBE.

3. Margin need not be applied if double peak is used.

4. Under saturated steam conditions, margin on temperature shall be such that test pressure will not exceed the saturated steam pressure corresponding to peak temperature by more than 10 psi.

5. Additional 10% margin is not required if the radiation calculations are done per methods outlined in NUREG-0588 Rev. 1, or if calculated values are quantifiable margins.

6. See Sections 5.1.3.1 and 5.1.3.2 of this report for detailed information.

7. Negative factors shall be applied if by lowering the value of the service conditions, the severity of the test is increased.

8. If margins are not adequate, the report can be acceptable if justification can be made.

9. Other margins for unique items must be applied as called for in the applicable IEEE.

5.1.3.1 Time Margin

A one hour test margin will be normally included in the minimum test time requirement for the following two cases:

A. Where equipment needs to be operational to perform its safety function for a period of time less than one hour (i.e., within seconds or minutes), and, once its function is complete, subsequent failures are shown not to be detrimental to plant safety.

B. Where equipment is not required to function during a design basis event but must not fail within a short period of time into the event, and subsequent failures are also shown not to be detrimental to plant safety.

Time margins of less than one hour are included in the minimum required test time typically for equipment whose operability time is seconds or minutes and when severe overtesting may result by applying the one hour time margin.

The minimum required test time is the sum of the maximum operability time and the time margin. The maximum operability time is comprised of the time that the specific trip function is required for the full spectrum of break sizes which establish the particular trip function needed and includes an additional quantity of time which accounts for calculational uncertainties. The maximum operability time is determined as follows.

Maximum operability times are obtained as a function of break area by evaluating each of the design basis events (e.g., Steam Line Break and Feedwater Line Break) for a full spectrum of break area. To assure that these times are bounding, the initial conditions and trip set points which are used in these evaluations are chosen to maximize the time the equipment would be needed. For example, minimum initial containment pressure is coupled with the upper limit on the High Containment Pressure trip set point and maximum initial steam generator pressure is coupled with the lower limit on the Low Steam Generator Pressure trip set point. Protection

System trips whose set points might not be reached for certain plant operating conditions, will not be credited with limiting the bounding time to trip. Thus, for each design basis event, this process yields a bounding time to trip as a function of break area for use in the qualification of Protection System trips.

Margins are incorporated by adding a percentage increment to the bounding time to trip versus break area using the method identified in Section 6.3.1.6 of IEEE Std. 323.

5.1.3.2 Unusual Time Margin:

In the event it is necessary to use time margin evaluation techniques, the following requirements shall be met.

A. Application of time margins less than one hour will be justified for each piece of equipment, including any judgements regarding the survivability limits of the equipment.

B. The maximum operability time will be justified with consideration for a spectrum of breaks and the potential need for the equipment later in an event or during recovery operations.

C. Demonstration that failure of the equipment after performance of its safety function will neither mislead the operator to take an improper action nor be detrimental to plant safety.

D. The margin applied to the minimum operability time when combined with the other test margins will account for the uncertainties associated with the equipment design, production tolerances and test equipment inaccuracies.

The minimum time margin is determined by multiplying the maximum operability time by a time margin factor. This factor is determined by considering the margins applied to all other test parameters, along with equipment manufacturing tolerances and test sample variations. The magnitude of the factor is modified by the amount of detailed empirical information available associated with manufacturing tolerances, test sample variation and excess margin available from other parameters.

A quantitative test profile margin comparison may demonstrate equipment qualification by addressing an excessive margin requirement (i.e., temperature or pressure, etc.) as compared to an inadequate time margin requirement.

5.1.4 Test Sequence

Type tests are performed on the equipment in a specified sequence which shall be justified as the most severe for the equipment being tested. The same test samples will be exposed to the full testing sequence. For most equipment and applications, the following constitutes the most severe sequence:

A. Inspection is performed to assure that a test item has not been damaged due to handling since manufacture and to determine basic dimensions.

B. The equipment is then operated under normal conditions to provide a functional data base for comparison with performance under more highly stressed conditions. Certain measurements such as rate of change with time of a parameter may be made at this time.

C. The equipment is operated at the extremes of performance characteristics given the equipment specifications excluding design basis event and post design basis event conditions unless these data are available from other tests on identical or essentially similar equipment.

D. Accelerated age conditioning is performed next (if required). Key measurements are made following the aging process and compared with the data base of information gathered prior to aging. This comparison is performed to determine if the equipment is performing satisfactorily prior to subsequent testing and to verify the existence of potential age related failure mechanisms. Section 5.3.1 provides additional discussion regarding the methods and procedures utilized in accelerated age conditioning program.

E. Normal and abnormal environmental tests such as radiation exposure, thermal aging, electromechanical cycling and vibration aging are performed next.

F. The equipment is subjected to simulated seismic vibration. Where it is determined that significant levels of external or internally induced vibration exists, qualification will be demonstrated based upon the methodology presented in Section 3.3.3.

G. The equipment is next operated while exposed to the simulated design basis event test (radiation may be excluded if incorporated during the normal aging test above). Those safety functions which must be performed during the simulated design basis event are continuously monitored.

H. The equipment is then operated while exposed to the simulated post accident conditions (following exposure to accident conditions). Those safety functions which must be performed during this simulation are monitored. Submergence testing, if required, will be performed following DBE testing per the methodology of Section 3.3.8.

The temperature to which equipment is qualified, when exposed to the simulated accident environment will be monitored and verified by thermocouple readings located as close as practical to the surface of the components being qualified.

Caustic spray will be incorporated during the simulated event testing at the maximum pressure and the limiting temperature condition that would occur when the onsite spray systems actuate.

Equipment is inspected or disassembled to the extent necessary for the determination of the status and condition of the equipment and the findings recorded.

Depending on equipment categorization (see Section 6.2) one of the following type test sequences will be utilized.

Equipment in category 'A' and 'B'

A. Pre-Test Inspection

B. Performance Testing (Baseline Testing)

C. Accelerated Aging (Thermal, Operational Cycles, Radiation, Vibration)

D. Performance Testing

E. Seismic Testing

F. Performance Testing

G. DBE Testing

H. Performance Testing

I. Post-Test Inspection

Notes

1. Radiation aging is to precede thermal aging if synergistic effects are not identified.

2. Radiation aging need not be done if it is shown that the required radiation level would not affect the equipment safety-related function.

3. Vibration aging may be included as part of seismic testing.

The following tests and monitoring are performed, as applicable, in addition to the sequence specified above.

i) Performance testing and/or monitoring of operability status during (E) and (G) will be performed to the extent practical.

ii) Submergence test following (G), if required.

Equipment in category 'C' and 'D'

A. Pre-Test Inspection

B. Performance Testing (Baseline Testing)

C. Aging

D. Performance Testing

E. Normal and Abnormal Environmental Testing

F. Performance Testing

G. Seismic Testing

H. Performance Testing

I. Post-Test Inspection

Notes:
The following tests and monitoring are performed, as applicable, in addition to the sequence specified above.

i) Performance testing and/or monitoring of operability status during (E) and (G) will be performed to the extent practicable.

The test sequence for Class 1E pump motors will utilize a similar test sequence as outlined above. The aging analysis and accelerated age conditioning procedures will utilize the guidelines of IEEE Std. 334 and IEEE Std. 117 as appropriate. All thermal and radiation age conditioning will be performed on motorettes or formettes made of same insulating material as the actual full scale motor that is being qualified.

5.1.5 Type Test Report

Type test data used to verify the qualification of the equipment will be organized in an auditable form. The type test report will be consistent with the requirements of IEEE Std. 323 and NUREG-0588.

Data for safety-related equipment will be compiled in reports prepared at the completion of the qualification program, and will be available for audit as discussed in Section 6.0.

5.1.6 Environmental Test Profiles

Containment DBA environmental test profile for equipment which is required to perform a safety-related function during or after a design basis accident is shown in the Environmental Qualification Parameters Report. For environmental qualification test purposes, margin including additional peak transients, as required by Section 6.3.1.2 and 6.3.1.6 of IEEE Std. 323 shall be applied to the DBA Temperature and Pressure Profiles. Equipment will be exercised or monitored for its safety function.

5.1.7 Acceptance Criteria

Testing, or testing and analysis, will demonstrate that the equipment is qualified to perform its required safety function for all required service conditions with margin at the end of its qualified life.

Acceptance criteria is established prior to the start of type testing and is included as part of the qualification test procedure document. The following is a list of typical acceptance criteria:

A. Test environments are at least as severe as, and representative of, the required environmental profile.

B. Operation of the equipment under normal environmental conditions to the extremes of performance and electrical characteristics is within the limits of accuracy required in the equipment specifications.

C. Equipment has been aged, as appropriate, and has been exposed to the expected end-of-life radiation dose if applicable prior to design basis accident testing.

D. Equipment has been subjected to seismic DBA testing.

E. Operation of the equipment in its safety-related functions, while exposed to the design basis event environment is within the limits of accuracy required in the equipment specifications.

F. Operation of the equipment in its safety-related functions, while exposed to the post-design basis event environment if applicable, are within the limits of accuracy required in the equipment specifications.

G. Post-test examination of the equipment reveals no conditions which might have interfered with the ability of the equipment to perform its safety-related functions.

H. Instrument accuracy requirements are established from the assumptions used in the

particular safety analysis for which the equipment performs its safety function. These requirements are reflected in the equipment specifications, and where applicable, in the safety system set points. The most conservative limits on time and accuracy requirements would be used for qualification. However, it may be necessary to qualify several instruments to various levels based on the particular applications.

Equipment which is required to function for post-accident monitoring would be tested to the profile shown in Figures of Environmental Qualification Parameters Report, since long-term cooling extends for at least the time period of the profile.

Documentation that the acceptance criteria was properly defined and successfully met will be recorded in the equipment specific qualification documentation package and highlighted in the qualification data summary form.

5.1.8 Test Anomalies

In the event that anomalies are observed during qualification testing that violate defined acceptance criteria the following actions will be taken, as appropriate, prior to further qualification testing to ensure complete and satisfactory resolution:

A. Verify operability status of monitoring and data acquisition equipment involved

B. Re-evaluate acceptance criteria requirements, if appropriate

C. Establish the type of failure (random or common-mode)

D. Formal notification submittal to A/E describing and evaluating the failure

E. A/E's review and approval of recommended corrective action for continuing qualification

5.1.8.1 Random Failures

If it is determined that the failure was random, appropriate corrective action will be taken to eliminate the problem.

Replacement parts may be utilized to replace those that have failed. All replacement parts used will have experienced the same accelerated age conditioning and qualification testing as did the original failed part prior to continuation of the qualification program. All corrective actions taken will be documented and fully justified.

5.1.8.2 Common Mode Failures

If it is determined that the failure was common mode, appropriate corrective action will be taken to eliminate the problem. Possible corrective action may include equipment / component redesign, part replacement, equipment relocation, additional analysis and/or any combination thereof. Part replacement or redesign will be in accordance with the pre-conditioning requirements of random failures. Upon discovery of such a failure, A/E will be notified prior to taking corrective action. All corrective actions taken will be documented and fully justified.

5.2 ANALYSIS

As stated in Section 5.1, type testing is the preferred method of qualification and will be employed to the extent practical. If analysis is chosen as the primary method for qualification, partial type test data will be provided to support the analytical assumptions and conclusions reached.

The analytical methods used for calculating and establishing pressure and temperature envelopes and radiation levels to which equipment is to be qualified will be compliant with the methods defined in NUREG-0588.

5.2.1 Analyses based on Partial Type Test Data and Equipment Specific Qualification Requirements

If analysis is chosen as the primary method for qualification, partial type test data will be provided to adequately demonstrate functional operability. An example demonstrating this approach is as follows:

If analysis is being used to demonstrate submergence capabilities for a particular piece of equipment, type test data on a similar unit may be employed as evidence used to demonstrate qualification for the equipment in question. A structural and functional similarity evaluation between the "equipment being qualified" and the "similar unit" will be performed to adequately demonstrate the applicability of the partial type test data.

Equipment specific analyses may be utilized to justify elimination of submergence qualification if it can be shown that

A. Equipment safety function is completed prior to submergence.

B. Adequate operability time margin is incorporated.

C. Subsequent failure will not degrade other equipment.

Where type testing is the preferred method of qualification, analysis may be used to support and justify the qualification test sequence and/or test makeup. An example demonstrating this approach is as follows:
Low level radiation qualification testing (to levels below 10^2 Gy or to level below 10 Gy for electronic components such as semiconductors or electronic components containing organic material) may be deleted from the qualification type test sequence if it can be demonstrated via a radiation susceptibility analysis, that low level radiation does not impact the equipment's ability to perform its required safety function.

5.2.2 FMEA

A single failure analysis on the containment spray system per Section 1.3 of NUREG-0588 will be performed to determine the resulting most severe chemical composition of the caustic spray. The results of this analysis will be incorporated into the qualification program. Where qualification has been completed utilizing chemical spray composition parameters less severe than as those required by NUREG-0588, an analysis may be performed, in lieu of retesting, for the purpose of demonstration that the new, more severe chemical composition, has no adverse impact on the equipments ability to perform its safety function. Justification for analysis in lieu of retesting will be provided.

Some components of safety-related equipment do not perform a safety-related function but due to a particular hardware configuration must be classified as safety-related.
For this type of component, a FMEA will be performed that demonstrates by analysis that failure of that component, for a defined set of worst case failure modes, does not have a degrading impact on all other interfacing safety-related components.

An evaluation will also be performed defining whether or not test circuitry should be classified as safety-related components. Test circuitry will be classified as safety-related if it could fail in a manner that results in perturbations exceeding defined acceptance criteria.

5.3 Operating Experience

Performance data from equipment of similar design that has successfully operated under known service conditions may be used in qualifying other equipment to equal or less severe conditions. Applicability of this data depends on the adequacy of documentation establishing past service conditions, equipment performance, and similarity against the equipment to be qualified and upon which operating experience exists. A demonstration of required operability during applicable design basis event(s) shall be included in equipment qualification programs based on operating experience, when design basis event qualification is required.

5.4 Aging

As stated in Section 3.2.1, the aging portion of the qualification program is defined based upon whether or not equipment is located in a harsh or a mild environment. Equipment located in a harsh environment will undergo an aging analysis and an accelerated age conditioning program. Equipment located in a mild environment will undergo an aging analysis that focuses on the identification of known aging mechanisms that significantly increase the equipment susceptibility to its design bases event (seismic only for mild environments). If no known significant aging mechanisms are found, a Surveillance/Preventive Maintenance (S/PM) Program will be developed to monitor for degradation trends that suggest increasing seismic susceptibility. If an aging mechanism is found that is known to significantly increase the equipment's seismic susceptibility with time, then that mechanism will be analyzed to determine whether an accelerated aging program or a periodic part replacement program is appropriate.

The following sections discuss in detail the methods and documentation requirements associated with the development of an aging analysis and the resulting age conditioning program, periodic replacement program and/or the Surveillance/ Preventive Maintenance Program, as appropriate, for the purpose of demonstrating qualification of the respective equipment/component.

5.4.1 Aging Analysis and Conditioning

For equipment located in a harsh environment the following discussion defines the methodology for the development of an aging analysis and an accelerated age conditioning program.

This section may also be applicable for equipment and/or components located in mild environments where it has been determined that known significant aging mechanisms exist and where accelerated age conditioning is appropriate.

The following is a listing of the major efforts that are required in the performance of an aging analysis:

A. Preparation of a complete bill of material consisting of all components, subassemblies, or assemblies (as required) of the equipment

B. Identification of those components performing a safety-related function

C. Analysis of those components identified in B above for age-related failure modes and mechanisms

D. Development of an accelerated age conditioning procedure, that when implemented, will result in the equipment being aged to a projected end of life condition

Thermal, radiation, low level vibration, cyclic operation, electromechanical and synergistic aging effects will be considered.

Component/Failure Matrix

For each component identified as performing a safety-related function, corresponding information, as identified in Section 3.2.1 will be defined in an appropriate summary component/failure matrix format.

An evaluation of this information will be performed to define dominant age related failure modes and mechanisms. An accelerated age conditioning procedure or a periodic part replacement program will be prepared based on this evaluation.

Qualified Life Estimation

A goal of the qualification program is to demonstrate that the equipment has a designated qualified life. If a designated qualified life is not obtainable due to material or schedule constraints, then the age analysis will establish various age conditioning procedures that define the efforts and parameters necessary to age the equipment. The selection of the lesser qualified life times is partially a function of the analysis and the physical properties of the equipment. A review will next be made to select one procedure to be implemented.

If qualification is to be based on periodic replacement of a life limiting component(s), that component(s) will specifically be identified and a periodic replacement program defined as part of the aging analysis, and included in the appropriate interface criteria.

Thermal Aging

Arrhenius methodology will be used to address accelerated thermal aging, where appropriate; however if other methods are used, justification will be provided.

Electromechanical Cyclic Aging

Electromechanical cyclic aging will be applied prior to qualification testing for the expected number of cycles plus margin under rated load.

The "cycle" and number of cycles plus margin will be defined and justified.

The cycle rate will be defined and will not result in excessive component heating beyond the manufacturer's suggested limits.

Cycling will be performed while under electrical load if so required by the aging analysis. Both current and voltage loading parameters will be specified.

The method for cycling components (e.g., electrical or mechanical actuation) will be defined.

An explicit definition of the term "cycle," as related to electromechanical cyclic operation, will be provided.

Components undergoing cycling will be mounted in a manner that simulates or is conservative with respect to actual in-service mounting.

Electromechanical components being tested will not be cleaned, calibrated, or adjusted during or after the cycling unless this action is part of the component's normal maintenance procedure and schedule. Normal maintenance procedures and schedules will be identified and included as part of the aging analysis and included in the respective interface criteria.

Acceptance criteria will be defined to establish the bases for acceptable operation for the specified number of cycles and loading.
Test measurement procedures will be defined. Test measurements will be taken and documented before, during and after cyclic aging.

Power On and Off Cycling

The number of power on and off cycles anticipated to occur plus margin will be defined and applied, where significant. Power on and off cycling will be considered significant when the

number of cycles is large or where there are significant stresses associated with power on and off cycling. The number of power on and off cycles to be used during age conditioning will be justified.

Radiation Aging

Radiation information and profiles utilized as input data to the radiation aging analysis will be in accordance with the typical radiation types, levels, and rates and in accordance with equipment specific requirements.

All component radiation susceptibility analyses will be supported by test data.

Electrical Energization

The effects of electrical energization during the accelerated age conditioning process will be addressed as part of the aging analysis. Electrical energization will only be applied if this analysis indicates that inclusion of this effect, during the accelerated aging process, will have a significant effect on material degradation.

Synergistic Effects

Major industry recognized age related synergistic effects will be addressed in the aging analysis.

Aging Sequence

The determination and justification of the accelerated age conditioning sequence will be defined in the aging analysis.

Aging Rate

The basis for all thermal, radiation, electromechanical and operational accelerated aging rates will be defined and justified in the aging analysis.

Equipment Storage Requirements

Equipment qualification related storage requirements will be identified within the qualification documentation. These requirements will be based on known significant storage related aging mechanisms.

Documentation

The results of the aging analysis will be documented and summarized in an aging analysis report. This report will contain all appropriate information used as listed in Section 5.2.1.

Accelerated Age Conditioning

The results of the accelerated age conditioning will be presented in an age conditioning report. The accelerated age conditioning report will identify and analyze all equipment failures occurring during the accelerated age conditioning process to determine whether the failure was random or common mode.

5.4.2 Periodic Replacement

As discussed in Section 5.3, equipment located in mild environments will either undergo an accelerated age conditioning program, periodic part replacement program, surveillance/preventive maintenance program or any combination thereof. For such equipment, the conclusions of the aging analysis will state the recommended approach.

The aging analysis associated with mild environments will be based on the same type of input data and methodology utilized for harsh environment equipment. It is the correlation of this data with known significant aging mechanisms and with in-plant equipment accessibility that may result in recommendations stressing periodic part replacement. Where periodic replacement is recommended for specific components, these components will be clearly identified in the age analysis and a replacement program defined and justified.

5.4.3 Surveillance/Preventative Maintenance

For mild environment equipment, if it is determined that no known aging mechanisms exist that significantly increase the equipment's susceptibility to its design bases event (seismic only for mild equipment), then a S/PM program will be developed.

The purpose of the S/PM program, which includes scheduled periodic surveillance testing under normal service conditions, is to monitor for degradation trends that suggest increasing susceptibility to a possible common mode failure due to a seismic event. The basis for the S/PM program is that for equipment located in environments which are unchanged during design basis accidents, having adequate capability for periodic testing and maintenance, and where no known significant age related failure mechanisms exist, then advanced age conditioning prior to qualification type testing may not be required if justified. For equipment located in harsh

environments, a S/PM program may be established, as appropriate to provide actual in-service trending data to support the qualified life established during qualification type testing.

This program will include guidelines and schedules for calibration and preventative maintenance. The requirements for the calibration and preventative maintenance will be based upon the plant's normal in-service inspection tests, and maintenance program.

The preventative maintenance will include, as appropriate:

A. Visual inspection

B. Mechanical inspection

C. Electrical testing

D. Periodic tests

E. Failure trending

F. Incipient failure detection

It is anticipated that most of these tests are already included in Technical Specifications requirements.

Data maintenance and storage, in a central file and evaluation activities such as the surveillance/preventative maintenance program are the responsibility of the utility.

Because of its location, access to equipment in the Containment Building may be limited for surveillance/preventive maintenance or periodic calibration.

5.5 CONSERVATISM OF QUALIFICATION PARAMETERS

The levels of environmental qualification required are specified in Environmental Qualification Parameters Report. Accident conditions of these requirements are established based on the methods recommended by NRC RG 1.89 and NUREG-0588. Margins utilized per Section 6.3.1.6 of IEEE Std. 323, Section 3 of NUREG-0588, and as discussed in Section 5.1.3 will be documented in the appropriate qualification document. Comparison of the qualification requirements to the environmental test parameters will demonstrate conservatism of the parameters. Margin identification and verification will be performed.

6.0 DOCUMENTATION

This section discusses qualification documentation. Qualification documentation will verify that the equipment is qualified for its application and meets its specified performance requirements. Equipment specific documentation is discussed below.

6.1 EQUIPMENT SPECIFIC QUALIFICATION DOCUMENTATION

In order to demonstrate that the equipment qualification program has adequately addressed all pertinent qualification requirements, the following equipment specific qualification reports will be developed, as appropriate. The documentation will be organized in an auditable form and in accordance with the guidelines set forth in Sections 6.0 & 7.0 of IEEE Std. 323 and in Section 5.0 & Appendix E of NUREG-0588.

6.1.1 Aging Analysis Report

The aging analysis report, as discussed in Section 5.3 will contain the following types of information:

A. Identification of the equipment qualified

B. The equipment specification

C. The qualification program

D. Identification of any scheduled surveillance/maintenance, periodic testing, and any parts replacement required to maintain qualification

E. The specific safety function(s), postulated failure mode, or the failure effects to be demonstrated by analysis

F. Description of analytical methods, computer program or mathematical model used, and the method of verification

G. The assumptions and empirically derived values used, with appropriate justification

H. Summary of analytically established performance characteristics and their acceptability

I. Conclusions, including limitations or qualified life or periodic surveillance/ maintenance interval determination

J. Approval signature and date

6.1.2 Qualification Plan

The qualification plan outlines the necessary testing and documentation activities required in order to demonstrate qualification. The qualification plan will incorporate the results obtained in the aging analysis and any previous qualification testing into the overall qualification plan. The following information will be included in the plan:

A. Scope of Responsibility

B. Overview and Objective

C. Equipment Description

D. Test Sequence and Makeup (Overview)

E. Seismic and Environmental Test Parameters

F. Acceptance Criteria (Overview)

G. Documentation Submittal Requirements

H. Approval Signature and Date

6.1.3 Age Conditioning Report

The results of the accelerated age conditioning process will be presented in an age conditioning report either as a separate document or as part of the final qualification test report. The purpose of this report is to identify and analyze all equipment failures occurring during the accelerated age conditioning process to determine whether the failure(s) were random or common mode. Approval signature and date will be obtained.

6.1.4 Qualification Test Procedure

Detailed qualification test procedures and associated acceptance criteria will be defined prior to actual qualification testing. The following types of procedural information will be addressed, as appropriate:

A. Overview and Objective

B. Equipment Description

C. Detailed Test Sequence

D. Monitoring and Operability Check Procedures

E. Baseline Performance Test Procedures

F. Environmental and Seismic Test Profile Definition and Procedures

G. Margin Verification

H. Detailed Test Set Up Schematics and/or Description

I. Required Test Instrumentation and Equipment

J. Detailed Acceptance Criteria

K. Equipment Mounting and Cable Connection Schematics and/or Description

L. Approval Signature and Date

6.1.5 Qualification Test Report

Upon completion of qualification testing an equipment specific test report will be prepared summarizing the test results, conclusions, and recommendations. The following types of information will be addressed and included, as appropriate:

A. Identification of the equipment qualified

B. The equipment specification

C. The qualification program

D. Identification of any scheduled surveillance/maintenance, periodic testing, and any parts replacement required to maintain qualification

E. Identification of safety function(s) to be demonstrated by test data.

F. Test plan

G. The report of test results shall include

(a) Test Objective
(b) Detailed description of test sample
(c) Description of test setup, instrumentation and calibration data
(d) Test procedure
(e) Summary of test data, accuracy, and anomalies

H. Summary and conclusions, including limitations and qualified life or periodic surveillance/maintenance interval determination

I. Approval Signature and date

6.1.6 Operating Experience Data

A. Identification of equipment qualified

B. The equipment specification

C. The qualification program

D. Identification of any scheduled surveillance/maintenance, periodic testing and any part replacement required to maintain qualification

E. Identification of the safety function(s) to be demonstrated by operating experience

F. The specification of the equipment for which operating experience is available

G. Comparison of specifications and functions of equipment with operating experience and new equipment to be qualified

H. Summary of operating experience data, including service conditions, maintenance records, operating history, etc.

I. Conclusions, including limitations and qualified life or periodic surveillance/ maintenance interval determination

J. Approval signature and date

6.1.7 Equipment for Mild Environment

A. Identification of the equipment qualified

B. The equipment specification

C. Identification of any scheduled surveillance/maintenance, periodic testing, and any parts replacement required to maintain qualification

D. Identification of the equipment's safety function(s)

E. Certificate of compliance that the equipment supplied meets the requirements of the equipment specification with approval signature and date

6.2 EQUIPMENT CATEGORIZATION

Per the requirements of Appendix E of NUREG-0588, the equipment is grouped into one of the following categories based on its functional requirements and location:

Category	Definition
A.	Equipment exposed to the harsh environments of design basis accidents, which must function to mitigate or monitor those events.
B.	Equipment exposed to the harsh environments of design basis accidents which need not function for mitigation of said accidents but must not fail in a manner detrimental to plant safety during those events.
C.	Equipment exposed to the harsh environments of design basis accidents which need not function during those events and whose failure (in any mode) is deemed not detrimental to plant safety.
D.	Equipment not exposed to the harsh environments of design basis accidents.

6.3 QUALIFICATION DATA SUMMARY AND EVALUATION

In addition to the information identified in Appendix E of NUREG-0588, the following information will be provided, as required:

A. Discussion of how equipment qualification review was performed including consideration of quality assurance.

B. How the accident environmental profiles were developed.

C. How safety-related equipment required for accident mitigation and safe shutdown of the plant was identified.

6.4 SUPPORTING DOCUMENTATION

All supporting raw test data and analyses generated during equipment qualification for the appropriate equipment specific qualification document will be attached or the location provided.

All other publications (e.g., reports, books, standards, etc.) used to support the qualification program will be appropriately referenced to insure data traceability.

7.0 QUALITY ASSURANCE

Equipment qualified per this report will be in accordance with the following:

A. All supplier and/or test labs directly utilized by A/E and/or KHNP for performing safety-related qualification services will be formally reviewed for their quality assurance practices. Results of this review will be maintained.

B. For qualification tests, A/E and/or KHNP quality control surveillance practices will be applied.

C. A/E standard hardware procurement practices will be applied when procuring test samples.

D. Test procedures and analyses will be prepared to ensure repeatability of the qualification test program.

E. Qualification documentation will be reviewed in accordance with standard A/E review practices and quality assurance requirements.

8.0 ADMINISTRATIVE PROCEDURES

8.1 EQUIPMENT SPECIFICATION

Performance requirements are set forth in equipment specifications which are generally prepared by the A/E. The requirements include nominal maximum and minimum values of performance parameters, and environmental conditions for normal and design basis event operation. The applicable standards for qualification are referenced by the specification. The specification is included in the engineering package which is sent to prospective suppliers for bidding.

8.2 SUPPLIER DESIGN AND QUALIFICATION PROGRAM

After the contract has been awarded, the supplier submits his design and qualification program to A/E for approval. The design is reviewed to ensure the equipment is capable of meeting performance and environmental requirements. The qualification program is reviewed for compliance with the requirements of the equipment specification and the referenced standards. In most cases, the qualification program is written by the qualification facility which has been retained by the supplier.

8.3 QUALIFICATION TASK

Although the task of qualification is normally performed by the supplier, the A/E follows the progress of the qualification effort and, in a conjunction with the supplier interfaces with the qualification facility to insure that the equipment will be exposed to the proper qualification environment. The supplier is responsible for insuring that the electrical and operational performance of the equipment meets the acceptance criteria. For the more involved tests, A/E and/or KHNP may have witnesses present during testing.

8.4 QUALIFICATION DOCUMENTATION AND SUBMITTALS

Throughout the qualification program various defined documentation products (see Section 6.0) are generated. The A/E will review and approve all documentation products to insure proper program definition and control.

The aging analysis report is prepared first defining all age conditioning results and procedures and part replacement recommendations, as appropriate. Next, the qualification plan is submitted outlining the overall program and verifies to supplier/test lab understanding of services to be prepared, if required. In parallel with age conditioning, detailed qualification test procedures and

acceptance criteria are developed. After completion of age conditioning and test procedure development, actual qualification type testing is performed.

Upon completion of qualification testing, a test report will be prepared and submitted to A/E for approval. When the report is approved, it is maintained by A/E as a qualification report which contains sufficient information to allow QA traceability and repeatability. Qualification documentation will be available for audit.

9.0 REFERENCES

9.1 NUREG-0588, Rev. 1 - "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," Published July 1981

9.2 NUREG-0800, SRP 3.11 - "Environmental Qualification of Mechanical and Electrical Equipment"

9.3 10 CFR 50.49 - "Environmental Qualification of Electric Equipment important to safety for Nuclear Power Plants"

9.4 IEEE Std. 98, "Standard for the Preparation of Test Procedures for the Thermal Evaluation, of Solid Electrical Insulating Materials"

9.5 IEEE Std. 99, "Recommended practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electric Equipment"

9.6 IEEE Std. 101, "Guide for the Statistical Analysis of Thermal Life Test Data"

9.7 IEEE Std. 117, "Standard Test Procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery"

9.8 IEEE Std. 317, "Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations"

9.9 IEEE Std. 323, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

9.10 IEEE Std. 334, "Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations"

9.11 IEEE Std. 344, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

9.12 IEEE Std. 381, "Standard Criteria for Type Tests of Class 1E Modules Used in Nuclear Power Generating Stations"

9.13 IEEE Std. 382, "Standard Qualification of Actuators for Power-Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants"

9.14 IEEE Std. 383, "Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations"

9.15 IEEE Std. 420, "Standard for Design and Qualification of Class 1E Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations"

9.16 IEEE Std. 535, "Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations"

9.17 IEEE Std. 572, "Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations"

9.18 IEEE Std. 603, "Standard Criteria for Safety Systems for Nuclear Power Generating Stations"

9.19 IEEE Std. 649, "Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations"

9.20 IEEE Std. 627, "Standard for Qualification of Equipment used in Nuclear Facilities"

9.21 IEEE Std. 650, "Standard for Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations"

9.22 NRC RG 1.63, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants"

9.23 NRC RG 1.73, "Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants"

9.24 NRC RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants"

9.25 NRC RG 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants"

9.26 NRC RG 1.100, "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants"

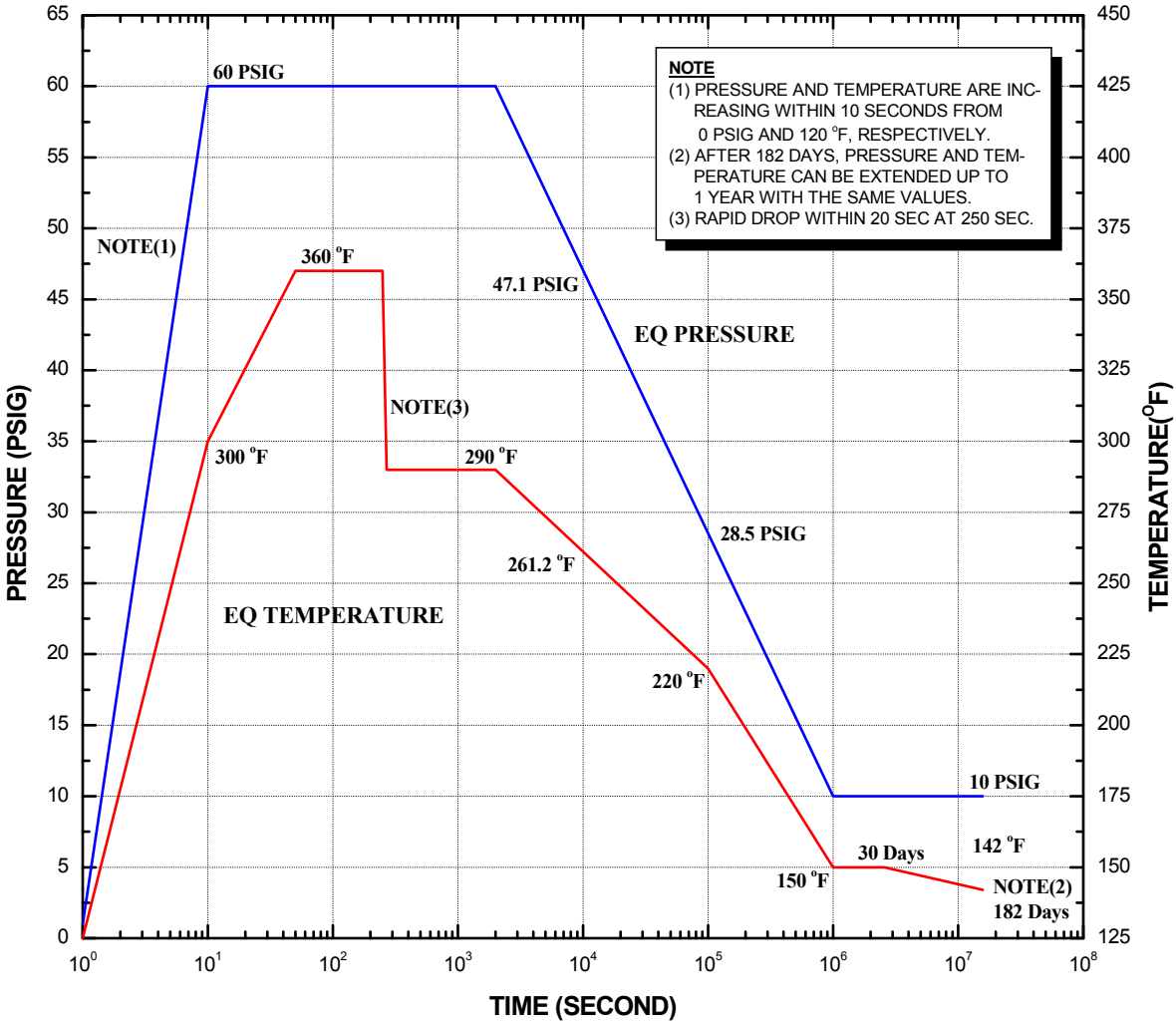
9.27 NRC RG 1.156, "Environmental Qualification of Connection Assemblies for Nuclear Power Plants"

9.28 NRC RG 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants"

9.29 NRC RG 1.211, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants"

9.30 EPRI NP-1588, "Research Project 890-1, Final Report, "A Review of Equipment Aging Theory and Technology," September 1980

9.31 ASME Boiler and Pressure Vessel Code



(1) Pressure and temperature are increasing within 10 seconds from 0 psig and 49°C (120 °F) respectively.
(2) Rapid drop within 20 seconds at 250 seconds
(3) After 182 days, pressure and temperature can be extended up to 1 year with the same values.

Figure 1 Design Basis Containment Atmosphere Temperature and Pressure EQ Profile for Accident

Table 1

Ventilation Areas

Area	Safety-Related		Area Temperature Alarm in Control Room	Remark
	Yes	No		
Control Room Area				
1. Control Room and Adjacent Offices	O		O	
2. Computer Room		O	O	
Auxiliary Building Clean Area				
1. Turbine Driven AFP Room		O	O	
2. Motor Driven AFP Room	O		O	
3. Essential Chiller and Pump	O		O	
Auxiliary Building Controlled Area				
1. SC Heat Exchanger Room	O		O	
2. SI Pump Room	O		O	
3. CS Pump Room	O		O	
4. CS Heat Exchanger Room	O		O	
5. Penetration Room	O		O	
6. CCW Pump Room	O		O	
Electrical Equipment Room				
1. Vital Instrument & Equipment	O		O	
2. Class 1E Switchgear Room	O		O	
3. Class 1E Battery Room	O		O	
4. Remote Shutdown Console Room	O		O	
Fuel Handling Area				
1. Spent Fuel Pool Heat Exchanger Room and Pump Room	O		O	
2. Emergency ACU Room	O		O	
Emergency Diesel Generator Area	O		O	
Containment Building		O	O	

Table 2

Environmental Data

Environmental Parameters [2]	Range and Duration
Containment Building – Category A-1 (LOCA)	
Temperature, °C (°F)	Figure 3.11-1
Pressure, psig	Figure 3.11-1
Relative humidity, %	100, saturated/superheated steam/air mixture
Radiation, 60-yr TID Gy plus LOCA[1), (3), (4)]	$< 3.2 \times 10^5$ gamma $< 1 \times 10^6$ beta
Chemical spray	4,400 ppm Boron as H_3BO_3 pH of 7.0 to 8.5 after 4 hours using trisodium phosphate
Containment Building – Category A-2 (MSLB)	
Temperature, °C (°F)	Figure 3.11-1
Pressure, psig	Figure 3.11-1
Relative humidity, %	100 saturated/superheated steam/air mixture
Radiation, 60-yr TID Gy plus Non-LOCA[1), (3)]	Bounded by Category A-1
Chemical spray	4,400 ppm boron as H_3BO_3 pH of 7.0 to 8.5 after 4 hours using trisodium phosphate
Containment Building – Category B (Normal)	
Temperature, °C (°F)	10 – 49 (50 – 120)
Pressure, psig	atmospheric, continuous
Relative humidity, %	5 – 90
Radiation, 60-yr TID Gy [3]	$< 6.3 \times 10^3$ gamma
Chemical spray	N/A
Auxiliary Building – Category C (Normal)	
Temperature, °C (°F)	10 – 40 (50 – 104)
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90

Table 2

Environmental Parameters [2]	Range and Duration
Radiation, 60-yr TID Gy	$< 1.6 \times 10^{1}$ gamma (accessible areas and I&C equipment) $< 6.3 \times 10^{-1}$ gamma (RTSG, CEDMCS) $< 1.9 \times 10^{4}$ gamma (VCT) $< 2.5 \times 10^{8}$ gamma (purification ion exchanger)
Chemical spray	N/A
Auxiliary Building – Category D (LOCA/MSLB)	
Temperature, °C (°F)	10 – 40 (50 – 104)
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90, limited to 8 hours Outside normal range of Category C
Radiation, 60-yr TID Gy plus LOCA/MSLB[1, 4]	$< 1.0 \times 10^{2}$ gamma (accessible areas and I&C equipment) $< 6.3 \times 10^{-1}$ gamma (RTSG, CEDMCS) $< 1.9 \times 10^{4}$ gamma (VCT) $< 2.5 \times 10^{8}$ gamma (purification ion exchanger)
Chemical spray	N/A
Auxiliary Building – Category E (HELB)	
Temperature, °C (°F)	65 – 171 (150 – 340), 0 – 2 hours 10 – 40 (50 – 104), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	100, 0 ~ 3 minutes; 7 – 90, after 3 minutes (limited to 8 hours outside the normal range of Category C unless otherwise specified)
Radiation, 60-yr TID Gy	same as Category C
Chemical spray	N/A
Fuel Handling Area – Category F (Normal)	
Temperature, °C (°F)	10 – 40 (50 – 104), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90, continuous
Radiation, 60-yr TID Gy	$< 1.6 \times 10^{1}$ gamma
Chemical spray	N/A

Table 2

Environmental Parameters [2]	Range and Duration
Fuel Handling Area – Category G (LOCA/MSLB)	
Temperature, °C (°F)	10 – 40 (50 – 104) continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	20 – 90, continuous
Radiation, 60-yr TID Gy [1]	$< 1.0 \times 10^{3}$ gamma
Chemical spray	N/A
Emergency Diesel Generator Area – Category H (Normal)	
Temperature, °C (°F)	10 – 50 (50 – 122), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90, continuous
Radiation, 60-yr TID Gy	$< 6.3 \times 10^{-1}$ gamma
Chemical spray	N/A
Emergency Diesel Generator Area – Category I (LOCA/MSLB)	
Temperature, °C (°F)	10 – 50 (50 – 122), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90, continuous
Radiation, 60-yr TID Gy	$< 6.3 \times 10^{-1}$ gamma
Chemical spray	N/A
Control Room Area – Category J (Normal/DBA)	
Temperature, °C (°F)	21 – 25 (70 – 77), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	40 – 60, continuous
Radiation, 60-yr TID Gy	$< 6.3 \times 10^{-1}$ gamma (control room and electrical equipment room)
Chemical spray	N/A
Outside Areas – Category K (Normal/DBA)	
Temperature, °C (°F)	-40 – 46 (-40 – 115), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	3 – 100, continuous
Radiation, 60-yr TID Gy	$< 6.3 \times 10^{-1}$ gamma
Chemical spray	N/A

Table 2

Environmental Parameters [2]	Range and Duration
Main Steam Valve House – Category L (Normal)	
Temperature, °C (°F)	10 – 49 (50 – 120), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	20 – 90, continuous
Radiation, 60-yr TID Gy	$< 6.3 \times 10^{-1}$ gamma
Chemical spray	N/A
Main Steam Valve House – Category M (MSLB)	
Temperature, °C (°F)	49 – 206 (120 – 403), 0 – 15 minutes 10 – 48 (50 – 120), continuous
Pressure, psig	3, continuous
Relative humidity, %	20 – 100, continuous
Radiation, 60-yr TID Gy	$< 9.0 \times 10^{3}$ gamma
Chemical spray	N/A
Turbine Building – Category N (Normal)	
Temperature, °C (°F)	16 – 40 (60 – 104), continuous
Pressure, psig	atmospheric, continuous
Relative humidity, %	7 – 90, continuous
Radiation, 60-yr TID Gy	N/A
Chemical spray	N/A
Turbine Building – Category O (LOCA/MSLB)	
Temperature, °C (°F)	166 (330), 0 – 3 minutes; 49 (120), 3 minutes to 4 hours; 16 – 40 (60~104), continuous after 4 hours
Pressure, psig	atmospheric, continuous after 3 minutes
Relative humidity, %	Relative humidity for the temperature range 60 °F – 80 °F is 95 % Relative humidity for temperatures above 80 °F is a fixed moisture content equivalent to 95 % relative humidity at 80 °F
Radiation, 60-yr TID Gy [1]	N/A
Chemical spray	N/A

Table 2

(1) Accident condition gamma radiation dose includes the normal external gamma dose plus that external dose due to the limiting DBA since these are total integrated dose values. The component design dose is the sum of internal (if applicable) plus external radiation doses.

(2) Environment as used in this Table is defined as those conditions surrounding equipment. Equipment specifications take into consideration both the environment and those process conditions internal to the equipment.

(3) Outside the biological shield.

(4) The post-LOCA radiation environment in this region will vary depending on whether or not emergency core cooling operates within its design basis. If emergency core cooling operates as designed, there will be little core damage and a conservative estimate of the radiological release would be 100 percentage of the core gap activity. If emergency core cooling is assumed to fail in the short-term but is restored to operation resulting in an “arrested core damage” scenario (to be consistent with the “substantial” core melt accident postulated to satisfy 10 CFR 50.34), the radiological release is assumed to be 100 percent of the core gap activity as well as the early in-vessel core release as discussed in NRC RG 1.183. Table 3.11-1 assumes an arrested core melt scenario integrated over six months and is intended to provide an upper bound radiation environment for the region.

Table 3

`Environmental Qualification Equipment List

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
Auxiliary Feedwater System									
AFW-PP01A	Turbine Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AFW-PP01B	Turbine Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AFW-PP02A	Motor Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AFW-PP02B	Motor Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AFW-V0035	Globe Valve and Actuator, AFW Modulating	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0036	Globe Valve and Actuator, AFW Modulating	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0037	Globe Valve and Actuator, AFW Modulating	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0038	Globe Valve and Actuator, AFW Modulating	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0043	Gate Valve and Actuator, AFW Isolation, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0044	Gate Valve and Actuator, AFW Isolation, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0045	Gate Valve and Actuator, AFW Isolation, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
AFW-V0046	Gate Valve and Actuator, AFW Isolation, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
Aux Feedwater Pump Turbine System									
AT-V0007	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	AB	D	Varies	Mild	Harsh	No	(b)	
AT-V0008	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	AB	D	Varies	Mild	Harsh	No	(b)	
AT-V0009	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	AB	D	Varies	Mild	Harsh	No	(b)	
AT-V0010	Globe Valve and Actuator, AFW Pump Turbine Steam Line Drain	AB	D	Varies	Mild	Harsh	No	(b)	
AT-TA01A	Turbine Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AT-TA01B	Turbine Driven Aux. Feedwater Pumps	AB	D	Continuous	Mild	N/A	No	(b)	
AT-LP01C	AF Pump Turbine Control Panel	AB	D	Continuous	Mild	N/A	No	(a)	
AT-LP01D	AF Pump Turbine Control Panel	AB	D	Continuous	Mild	N/A	No	(a)	
Auxiliary Feedwater Storage and Transfer									
AX-LI003A	Field Indicator Device, AFWST 1	AB	D	Continuous	N/A	N/A	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
AX-LI004B	Field Indicator Device, AFWST2	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI005A	Field Indicator Device, AFWST 2	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI005C	Field Indicator Device, AFWST 2	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI005D	Field Indicator Device, AFWST 2	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI006B	Field Indicator Device, AFWST 1	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI006C	Field Indicator Device, AFWST 1	AB	D	Continuous	N/A	N/A	No	(a)	
AX-LI006D	Field Indicator Device, AFWST 1	AB	D	Continuous	N/A	N/A	No	(a)	
Component Cooling Water System									
CC-PP03A	Component Cooling Water Make-up Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-PP03B	Component Cooling Water Make-up Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-PP01A	Component Cooling Water Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-PP01B	Component Cooling Water Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-PP02A	Component Cooling Water Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-PP02B	Component Cooling Water Pumps	AB	D	Continuous	Mild	Mild	No	(b)	
CC-HE01A	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-HE01B	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-HE02A	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-HE02B	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-HE03A	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-HE03B	Component Cooling Water Heat Exchanger	CCWHX	K	Continuous	Mild	Mild	No	(b)	
CC-TK01A	Component Cooling Water Surge Tank	AB	D	Continuous	Mild	Mild	No	(b)	
CC-TK01B	Component Cooling Water Surge Tank	AB	D	Continuous	Mild	Mild	No	(b)	
CC-V0097	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0098	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0143	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
CC-V0144	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
CC-V0145	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
CC-V0146	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
CC-V0149	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
CC-V0150	Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
CC-V0231	Butterfly Valve and Actuator, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0249	Butterfly Valve and Actuator, CIV	RCB	A-1, A-2	Varies	Harsh	Harsh	No	(b)	
CC-V0250	Butterfly Valve and Actuator, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0296	Butterfly Valve and Actuator, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0297	Butterfly Valve and Actuator, CIV	RCB	A-1, A-2	Varies	Harsh	Harsh	No	(b)	
CC-V0301	Butterfly Valve and Actuator, CIV	RCB	A-1, A-2	Varies	Harsh	Harsh	No	(b)	
CC-V0302	Butterfly Valve and Actuator, CIV	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0351	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0352	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0389	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
CC-V0390	Butterfly Valve and Actuator	AB	D	Varies	Mild	Harsh	No	(b)	
Containment Spray System									
CS-PP01A	Containment Spray Pump & Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
CS-PP01B	Containment Spray Pump & Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
CS-HE01A	Containment Spray Heat Exchanger	AB	D	Continuous	Mild	Harsh	No	(b)	
CS-HE01B	Containment Spray Heat Exchanger	AB	D	Continuous	Mild	Harsh	No	(b)	
CS-HE02A	Containment Spray Miniflow Heat Exchanger	AB	D	Continuous	Mild	Harsh	No	(b)	
CS-HE02B	Containment Spray Miniflow Heat Exchanger	AB	D	Continuous	Mild	Harsh	No	(b)	
CS- V0003	Gate Valve and Actuator, Containment Spray Header Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CS- V0004	Gate Valve and Actuator, Containment Spray Header Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
CS-V0671	Gate Valve and Actuator, Containment Spray Header Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CS-V0672	Gate Valve and Actuator, Containment Spray Header Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
Chemical and Volume Control System									
CV-V0505	Globe Valve and Actuator, RCP Bleed-off, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CV-V0506	Globe Valve and Actuator, RCP Bleed-off, CIV	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
CV-V0509	Gate Valve and Actuator, IRWST Makeup Line, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CV-V0515	Globe Valve and Actuator, Letdown Isolation	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
CV-V0516	Globe Valve and Actuator, Letdown Isolation	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
CV-V0522	Globe Valve and Actuator, Letdown Isolation, CIV	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
CV-V0523	Globe Valve and Actuator, Letdown Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CV-V0524	Globe Valve and Actuator, Charging Line Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CV-V0255	Globe Valve and Actuator, Seal Injection CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
CV-V0560	Globe Valve and Actuator, RDT Suction Isolation, CIV	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
CV-V0561	Globe Valve and Actuator, RDT Suction Isolation, CIV	AB	D,	Short-Term	Mild	Harsh	No	(b)	
CV-V0580	Gate Valve and Actuator, RMW Supply to RDT Isolation, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
Emergency Diesel Generator System									
DG-DG01A	Class 1E Diesel Generator including Engine	DGB	I	Continuous	Mild	Mild	No	(a)	
DG-DG01B	Class 1E Diesel Generator including Engine	DGB	I	Continuous	Mild	Mild	No	(a)	
DG-DG01C	Class 1E Diesel Generator including Engine	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DG01D	Class 1E Diesel Generator including Engine	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP01A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP02A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP03A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP04A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP05A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-DP06A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP07A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP08A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP09A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP10A	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP01B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP02B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP03B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP04B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP05B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP06B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP07B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP08B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP09B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-DP10B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LP01A	Control Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LP02A	Control Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LP01B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LP02B	Control Panels & Cubicles	AB	I	Continuous	Mild	Mild	No	(a)	
Emergency Diesel Engine Cooling Water System									
DG-TK01A	HT Water Expansion Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK01B	HT Water Expansion Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK01C	HT Water Expansion Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK01D	HT Water Expansion Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK10A	LT Water Expansion Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-TK10B	LT Water Expansion Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK10C	LT Water Expansion Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK10D	LT Water Expansion Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DG-HE02A	LT/CC Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE02B	LT/CC Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE02C	LT/CC Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-HE02D	LT/CC Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-HE03A	HT/CC Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE03B	HT/CC Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE03C	HT/CC Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-HE03D	HT/CC Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4217A	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4217B	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4217C	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
DG-V4217D	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
DG-V4250A	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4250B	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4250C	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
DG-V4250D	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
Emergency Diesel Engine Starting Air System									
DG-TK40A	Starting Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK40B	Starting Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK40C	Starting Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK40D	Starting Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK41A	Starting Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-TK41B	Starting Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK41C	Starting Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK41D	Starting Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK42A	Over Speed Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK42B	Over Speed Air Receiver	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-TK42C	Over Speed Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-TK42D	Over Speed Air Receiver	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4022A	Starting Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4022B	Starting Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4022C	Starting Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4022D	Starting Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4030A	Starting Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4030B	Starting Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4030C	Starting Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4030D	Starting Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4048A	Starting Air Receiver Outlet Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4048B	Starting Air Receiver Outlet Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4048C	Starting Air Receiver Outlet Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4048D	Starting Air Receiver Outlet Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4049A	Starting Air Receiver Outlet Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4049B	Starting Air Receiver Outlet Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4049C	Starting Air Receiver Outlet Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4049D	Starting Air Receiver Outlet Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4308A	Starting Air Common Header Check Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4308B	Starting Air Common Header Check Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-V4308C	Starting Air Common Header Check Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4308D	Starting Air Common Header Check Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4309A	Starting Air Common Header Check Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4309B	Starting Air Common Header Check Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4309C	Starting Air Common Header Check Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4309D	Starting Air Common Header Check Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4042A	Starting Air Common Header Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4042B	Starting Air Common Header Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4042C	Starting Air Common Header Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4042D	Starting Air Common Header Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4314A	Starting Air Common Header Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4314B	Starting Air Common Header Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4314C	Starting Air Common Header Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4314D	Starting Air Common Header Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4312A	Starting Air Common Header Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4312B	Starting Air Common Header Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4312C	Starting Air Common Header Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4312D	Starting Air Common Header Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043A	Starting Air Common Header Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043B	Starting Air Common Header Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043C	Starting Air Common Header Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043D	Starting Air Common Header Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4039A	Starting Air Outlet Regulating Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4039B	Starting Air Outlet Regulating Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4039C	Starting Air Outlet Regulating Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-V4039D	Starting Air Outlet Regulating Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4040A	Starting Air Outlet Regulating Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4040B	Starting Air Outlet Regulating Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4040C	Starting Air Outlet Regulating Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4040D	Starting Air Outlet Regulating Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5023A	Starting Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5023B	Starting Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5023C	Starting Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5023D	Starting Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5031A	Starting Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5031B	Starting Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5031C	Starting Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V5031D	Starting Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4041A	Over Speed Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4041B	Over Speed Air Receiver Relief Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4041C	Over Speed Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4041D	Over Speed Air Receiver Relief Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4315A	Over Speed Air Receiver Inlet Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4315B	Over Speed Air Receiver Inlet Isolation Globe Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4315C	Over Speed Air Receiver Inlet Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4315D	Over Speed Air Receiver Inlet Isolation Globe Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4043A	Over Speed Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043B	Over Speed Air Receiver Inlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043C	Over Speed Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4043D	Over Speed Air Receiver Inlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
Emergency Diesel Engine Lube Oil System									
DG-HE30A	Lube Oil/LT Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE30B	Lube Oil/LT Water Heat Exchanger	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-HE30C	Lube Oil/LT Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-HE30D	Lube Oil/LT Water Heat Exchanger	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4114A	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4114B	3-Way Thermostatic Control Valve	EDGB	I	Varies	Mild	Mild	No	(b)	
DG-V4114C	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
DG-V4114D	3-Way Thermostatic Control Valve	AB	I	Varies	Mild	Mild	No	(b)	
DG-V4111A	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4111B	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4111C	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4111D	Lube Oil/Preheating Water Heat Exchanger Outlet Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4112A	Lube Oil/Preheating Water Heat Exchanger Outlet Isolation Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4112B	Lube Oil/Preheating Water Heat Exchanger Outlet Isolation Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4112C	Lube Oil/Preheating Water Heat Exchanger Outlet Isolation Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4112D	Lube Oil/Preheating Water Heat Exchanger Outlet Isolation Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4059A	Lube Oil Regulating Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4059B	Lube Oil Regulating Gate Valve	EDGB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4059C	Lube Oil Regulating Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4059D	Lube Oil Regulating Gate Valve	AB	I	Short-Term	Mild	Mild	No	(b)	
DG-V4140A	Lube Oil Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-V4140B	Lube Oil Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-V4140C	Lube Oil Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DG-V4140D	Lube Oil Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
Emergency Diesel Engine Combustion Air Intake & Exhaust System									
DG-SL01A	Air Intake Silencer	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-SL01B	Air Intake Silencer	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-SL01C	Air Intake Silencer	AB	I	Continuous	Mild	Mild	No	(b)	
DG-SL01D	Air Intake Silencer	AB	I	Continuous	Mild	Mild	No	(b)	
DG-SL03A	Exhaust Gas Silencer	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-SL03B	Exhaust Gas Silencer	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-SL03C	Exhaust Gas Silencer	AB	I	Continuous	Mild	Mild	No	(b)	
DG-SL03D	Exhaust Gas Silencer	AB	I	Continuous	Mild	Mild	No	(b)	
DG-FT50A	Air Intake Filter	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-FT50B	Air Intake Filter	EDGB	I	Continuous	Mild	Mild	No	(b)	
DG-FT50C	Air Intake Filter	AB	I	Continuous	Mild	Mild	No	(b)	
DG-FT50D	Air Intake Filter	AB	I	Continuous	Mild	Mild	No	(b)	
Emergency Diesel Engine Fuel Oil System									
DO-PP01A	Emergency Diesel Fuel Oil Transfer Pumps	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-PP01B	Emergency Diesel Fuel Oil Transfer Pumps	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-PP01C	Emergency Diesel Fuel Oil Transfer Pumps	AB	I	Continuous	Mild	Mild	No	(b)	
DO-PP01D	Emergency Diesel Fuel Oil Transfer Pumps	AB	I	Continuous	Mild	Mild	No	(b)	
DO-PP02A	Emergency Diesel Fuel Oil Transfer Pumps	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-PP02B	Emergency Diesel Fuel Oil Transfer Pumps	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-PP02C	Emergency Diesel Fuel Oil Transfer Pumps	AB	I	Continuous	Mild	Mild	No	(b)	
DO-PP02D	Emergency Diesel Fuel Oil Transfer Pumps	AB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DO-TK01A	Diesel Fuel Oil Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-TK01B	Diesel Fuel Oil Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-TK01C	Diesel Fuel Oil Storage Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-TK01D	Diesel Fuel Oil Storage Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-TK02A	Diesel Fuel Oil Day Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-TK02B	Diesel Fuel Oil Day Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-TK02C	Diesel Fuel Oil Day Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-TK02D	Diesel Fuel Oil Day Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-ST02A	Strainers	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-ST02B	Strainers	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-ST02B	Strainers	AB	I	Continuous	Mild	Mild	No	(b)	
DO-ST02B	Strainers	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1001A	Diesel Fuel Oil Storage Tank Filling Inlet Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1001B	Diesel Fuel Oil Storage Tank Filling Inlet Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1001C	Diesel Fuel Oil Storage Tank Filling Inlet Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1001D	Diesel Fuel Oil Storage Tank Filling Inlet Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2027A	Diesel Fuel Return Valves from Day Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2027B	Diesel Fuel Return Valves from Day Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2027C	Diesel Fuel Return Valves from Day Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2027D	Diesel Fuel Return Valves from Day Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1002A	Diesel Fuel Oil Storage Tank Outlet Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1002B	Diesel Fuel Oil Storage Tank Outlet Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1002C	Diesel Fuel Oil Storage Tank Outlet Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1002D	Diesel Fuel Oil Storage Tank Outlet Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1009A	Strainer Maintenance Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DO-V1009B	Strainer Maintenance Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1009C	Strainer Maintenance Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1009D	Strainer Maintenance Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1010A	Strainer Maintenance Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1010B	Strainer Maintenance Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1010C	Strainer Maintenance Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1010D	Strainer Maintenance Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2013A	Pressure Differential Gage Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2013B	Pressure Differential Gage Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2013C	Pressure Differential Gage Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2013D	Pressure Differential Gage Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2014A	Pressure Differential Gage Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2014B	Pressure Differential Gage Valves	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2014C	Pressure Differential Gage Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2014D	Pressure Differential Gage Valves	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1003A	Diesel Fuel Transfer Pump Suction Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1003B	Diesel Fuel Transfer Pump Suction Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1003C	Diesel Fuel Transfer Pump Suction Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1003D	Diesel Fuel Transfer Pump Suction Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1004A	Diesel Fuel Transfer Pump Suction Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1004B	Diesel Fuel Transfer Pump Suction Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1004C	Diesel Fuel Transfer Pump Suction Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1004D	Diesel Fuel Transfer Pump Suction Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1005A	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1005B	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DO-V1005C	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1005D	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1006A	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1006B	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1006C	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1006D	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1007A	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1007B	Diesel Fuel Transfer Pump Discharge Check Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1007C	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1007D	Diesel Fuel Transfer Pump Discharge Check Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1008A	Diesel Fuel Transfer Pump Discharge Gate Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1008B	Diesel Fuel Transfer Pump Discharge Gate Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V1008C	Diesel Fuel Transfer Pump Discharge Gate Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V1008D	Diesel Fuel Transfer Pump Discharge Gate Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2009A	Pressure Indicator Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2009B	Pressure Indicator Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2009C	Pressure Indicator Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2009D	Pressure Indicator Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2010A	Emergency Fuel Fill Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2010B	Emergency Fuel Fill Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2010C	Emergency Fuel Fill Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2010D	Emergency Fuel Fill Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V2011A	Pressure Switch Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2011B	Pressure Switch Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V2011C	Pressure Switch Valve	AB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DO-V2011D	Pressure Switch Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4011A	Diesel Fuel Oil Day Tank Inlet Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4011B	Diesel Fuel Oil Day Tank Inlet Valve	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4011C	Diesel Fuel Oil Day Tank Inlet Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4011D	Diesel Fuel Oil Day Tank Inlet Valve	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4019A	Return Valve (LC) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4019B	Return Valve (LC) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4019C	Return Valve (LC) from Day Tank to Storage Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4019D	Return Valve (LC) from Day Tank to Storage Tank	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4101A	Supply Valve (LO) from Day Tank to EDG Engine	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4101B	Supply Valve (LO) from Day Tank to EDG Engine	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4101C	Supply Valve (LO) from Day Tank to EDG Engine	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4101D	Supply Valve (LO) from Day Tank to EDG Engine	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4102A	Supply Valve (LO) from Day Tank to EDG Engine Aux. Skid	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4102B	Supply Valve (LO) from Day Tank to EDG Engine Aux. Skid	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4102C	Supply Valve (LO) from Day Tank to EDG Engine Aux. Skid	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4102D	Supply Valve (LO) from Day Tank to EDG Engine Aux. Skid	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4034A	Supply Glove Valve (LO) from Day Tank to EDG Engine	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4034B	Supply Glove Valve (LO) from Day Tank to EDG Engine	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4034C	Supply Glove Valve (LO) from Day Tank to EDG Engine	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4034D	Supply Glove Valve (LO) from Day Tank to EDG Engine	AB	I	Continuous	Mild	Mild	No	(b)	
DO-V4103A	Return Valve (LO) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4103B	Return Valve (LO) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4103C	Return Valve (LO) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	
DO-V4103D	Return Valve (LO) from Day Tank to Storage Tank	EDGB	I	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
Spent Fuel Pool Cooling System									
	Pump and Motor	AB	D	Continuous	Mild	Mild	No	(b)	
FC-PP01A	Spent Fuel Pool Cooling Pump	AB	D	Continuous	Mild	Mild	No	(b)	
FC-PP01B	Spent Fuel Pool Cooling Pump	AB	D	Continuous	Mild	Mild	No	(b)	
FC-HE02A	Spent Fuel Pool Cooling Heat Exchanger	AB	D	Continuous	N/A	Mild	No	(b)	
FC-HE02B	Spent Fuel Pool Cooling Heat Exchanger	AB	D	Continuous	N/A	Mild	No	(b)	
Main Feedwater System									
FW-V0121	Economizer Main Feedwater Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0122	Economizer Main Feedwater Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0123	Economizer Main Feedwater Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0124	Economizer Main Feedwater Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0131	Downcomer Main Feedwater Isolation Valves	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0132	Downcomer Main Feedwater Isolation Valves	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0133	Downcomer Main Feedwater Isolation Valves	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0134	Downcomer Main Feedwater Isolation Valves	AB	M	Short Time	Harsh	Harsh	No	(b)	
FW-V0138	Feedwater Chemical Injection Isolation Valve	AB	M		Harsh	Harsh	No	(b)	
FW-V0139	Feedwater Chemical Injection Isolation Valve	AB	M		Harsh	Harsh	No	(b)	
Containment Hydrogen Control System									
	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HI01	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI02	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI03	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI04	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI05	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI06	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
HG-HI07	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HI08	Hydrogen Igniter	RCB	A-1, A-2	Short Time	Harsh	Harsh	No	(b)	
HG-HR01A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR01B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR02A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR02B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR03A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR03B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR04A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR04B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR05A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR05B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR06A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR06B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR07A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR07B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR08A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR08B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR09A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR09B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR10A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR10B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR11A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR11B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR12A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
HG-HR12B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR13A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR13B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR14A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR14B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR15A	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
HG-HR15B	Passive Autocatalytic Recombiner	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
Instrument Air System									
IA-V0020	Cylinder Valve and Actuator, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
In-Containment Water Storage System									
IW-ST01A	IRWST Sump Strainer	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
IW-ST01B	IRWST Sump Strainer	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
IW-ST01C	IRWST Sump Strainer	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
IW-ST01D	IRWST Sump Strainer	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
Main Steam System									
MS-V0011	Main Steam Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0012	Main Steam Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0013	Main Steam Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0014	Main Steam Isolation Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0015	Main Steam Isolation Bypass Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0016	Main Steam Isolation Bypass Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0017	Main Steam Isolation Bypass Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0018	Main Steam Isolation Bypass Valve	AB	M	Short Time	Harsh	Harsh	No	(b)	
MS-V0090	Main Steam Drip Leg Isolation Valve	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0091	Main Steam Drip Leg Isolation Valve	AB	M	Intermittent	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
MS-V0092	Main Steam Drip Leg Isolation Valve	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0093	Main Steam Drip Leg Isolation Valve	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0101	MSADV and Actuator	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0102	MSADV and Actuator	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0103	MSADV and Actuator	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0104	MSADV and Actuator	AB	M	Intermittent	Harsh	Harsh	No	(b)	
MS-V0105	MSADV Isolation Valve and Actuator	AB	M	Varies	Harsh	Harsh	No	(b)	
MS-V0106	MSADV Isolation Valve and Actuator	AB	M	Varies	Harsh	Harsh	No	(b)	
MS-V0107	MSADV Isolation Valve and Actuator	AB	M	Varies	Harsh	Harsh	No	(b)	
MS-V0108	MSADV Isolation Valve and Actuator	AB	M	Varies	Harsh	Harsh	No	(b)	
MS-V1301	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1302	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1303	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1304	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1305	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1306	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1307	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1308	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
MS-V1309	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1310	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1311	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1312	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1313	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1314	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1315	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1316	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1317	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1318	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1319	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
MS-V1320	Main Steam Safety Valve	AB	M	N/A(LOCA) Cont(MSLB)	Harsh	Harsh	No	(b)	
Compressed Gas System									
NT-V0004	Nitrogen Supply to SITs and RDT CIV, Globe Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Radiation Monitoring System									

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PR-431	Containment Radiation Monitor (Inside) CIV, Gate Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
PR-432	Containment Radiation Monitor (Outside) CIV, Gate Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
PR-434	Cont. Radiation Monitor (Outside) CIV, Gate Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
PR-RE/RT-037	Containment Purge Effluent Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-039A	Containment Air Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-040B	Containment Air Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-071A	Control Room Air Intake Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-072B	Control Room Air Intake Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-073A	Control Room Air Intake Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-074B	Control Room Air Intake Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-217	Main Steam Line /16 N Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-218	Main Steam Line /16 N Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-219	Main Steam Line /16 N Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-220	Main Steam Line /16 N Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-231A	Containment Operating Area Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-232B	Containment Operating Area Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-233A	Containment Upper Operating Area Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-234B	Containment Upper Operating Area Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
PR-RE/RT-241	Spent Fuel Pool Area Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
PR-RE/RT-242	Spent Fuel Pool Area Monitor	AB	D	Continuous	Mild	Mild	No	(a)	
Process Sampling System									
PS-V0031	Steam Generator 1 Sample Line from Blowdown Hot Leg CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PS-V0032	Steam Generator 2 Sample Line from Blowdown Hot Leg CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0033	Steam Generator 1 Sample Line from Downcomer CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0034	Steam Generator 2 Sample Line from Downcomer CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0035	Steam Generator 1 Sample Line from Blowdown Cold Leg CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0036	Steam Generator 2 Sample Line from Blowdown Cold Leg CIV, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0257	Steam Generator 1 Primary Sample and Cooler Rack ISO Valve, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
PS-V0258	Steam Generator 2 Primary Sample and Cooler Rack ISO Valve, Gate Valve and Actuator	AB	D	Continuous	Harsh	Harsh	No	(b)	
Primary Sampling System									
PX-V0005	Pressurizer Steam Space Sampling Line CIV, Globe Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
PX-V0006	Pressurizer Steam Space Sampling Line CIV, Globe Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
PX-V0001	Hot Leg 1 Sample Line CIV, Globe and Actuator	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
PX-V0002	Hot Leg 1 Sample Line CIV, Globe and Actuator	AB	D	Continuous	Mild	Harsh	No	(b)	
	Holdup Volume Line 1 Sample Line CIV, Globe Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
PX-V1005	Holdup Volume Line 2 Sample Line CIV, Check Valve	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
PX-V0003	Pressurizer Surge Line Sample Line CIV, Globe Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
PX-V0004	Pressurizer Surge Line Sample Line CIV, Globe Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
PX-V0053	Holdup Volume Combined Sample Line CIV, Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Reactor Coolant System									
RC-V0200	POSRV and Actuator	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
RC-V0201	POSRV and Actuator	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
RC-V0202	POSRV and Actuator	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
RC-V0203	POSRV and Actuator	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
	RCP Oil Fill Line CIV, Gate Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
	RCP Oil Fill Line CIV, Gate Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Service Air System									
SA-V0001	Cylinder Valve and Actuator, CIV	AB	D	Short-Term	Mild	Harsh	No	(b)	
S/G Blowdown System									
SD-V0005	S/G Blowdown Line CIV, Gate and Actuator	AB	D	Intermittent	Mild	Harsh	No	(b)	
SD-V0006	S/G Blowdown Line CIV, Gate and Actuator	AB	D	Intermittent	Mild	Harsh	No	(b)	
Safety Injection System									
SI-PP02A	Safety Injection Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-PP02B	Safety Injection Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-PP02C	Safety Injection Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-PP02D	Safety Injection Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0302	Gate Valve and Actuator, SI Miniflow Return to IRWST, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0303	Gate Valve and Actuator, SI Miniflow Return to IRWST, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0304	Gate Valve and Actuator, IRWST Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0305	Gate Valve and Actuator, IRWST Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0308	Gate Valve and Actuator, IRWST Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0309	Gate Valve and Actuator, IRWST Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0321	Globe Valve and Actuator, Hot Leg Injection Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0322	Globe Valve and Actuator, Hot Leg Check Valve Leakage Isolation	RCB	A-1,A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0331	Globe Valve and Actuator, Hot Leg Injection Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0332	Globe Valve and Actuator, Hot Leg Check Valve Leakage Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0602	Globe Valve and Actuator, Throttle, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
SI-V0603	Globe Valve and Actuator, Throttle, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0604	Gate Valve and Actuator, Hot Leg Injection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0605	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0606	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0607	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0608	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0609	Gate Valve and Actuator, Hot Leg Injection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0611	Globe Valve and Actuator, SIT Fill/Drain	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0613	Gate Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0614	Gate Valve and Actuator, SIT Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0616	Globe Valve and Actuator, SI Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0618	Globe and Actuator, Check Valve Leakage Line Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0621	Globe Valve and Actuator, SIT Fill/Drain	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0623	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0624	Gate Valve and Actuator, SIT Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0626	Globe Valve and Actuator, SI Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0628	Globe Valve and Actuator, Check Valve Leakage Line Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0631	Globe Valve and Actuator, SIT Fill/Drain	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0633	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0634	Gate Valve and Actuator, SIT Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0636	Globe Valve and Actuator, SI Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0638	Globe Valve and Actuator, Check Valve Leakage Line Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0641	Globe Valve and Actuator, SIT Fill/Drain	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0643	Globe Valve and Actuator, SIT Vent	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0644	, Gate Valve and Actuator, SIT Isolation.	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
SI-V0646	Globe Valve and Actuator, SI Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0648	Globe Valve and Actuator, Check Valve Leakage Line Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0682	Glove Valve and Actuator, SIT Fill, CIV	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
Shutdown Cooling System									
SI-PP01A	Shutdown Cooling Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-PP01B	Shutdown Cooling Pump and Motor	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0300	Gate Valve and Actuator, CS/SCS IRWST Recirculation Line Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0301	Gate Valve and Actuator, CS/SCS IRWST Recirculation Line Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0310	Globe Valve and Actuator, SDCHX Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0311	Globe Valve and Actuator, SDCHX Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0312	Globe Valve and Actuator, SDCHX Bypass Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0313	Globe Valve and Actuator, SDCHX Bypass Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0314	SCS IRWST Recirculation Line Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0315	SCS IRWST Recirculation Line Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0340	SC/CS Pump Suction Cross Connection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0342	SC/CS Pump Suction Cross Connection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0341	SC/CS Pump Discharge Cross Connection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0343	SC/CS Pump Discharge Cross Connection	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0344	SCP Suction Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0346	SCP Suction Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0347	CSP Suction Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0348	CSP Suction Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0391	Gate Valve and Actuator, Reactor Cavity Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0393	Gate Valve and Actuator, Reactor Cavity Isolation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
SI-V0600	Globe Valve and Actuator, SCS Train 2 Discharge Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0601	Globe Valve and Actuator, SCS Train 1 Discharge Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0651	Gate Valve and Actuator, SCS Suction Isolation, CIV	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0652	Gate Valve and Actuator, SCS Suction Isolation, CIV	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0653	Gate Valve and Actuator, SCS Suction Isolation, CIV	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0654	Gate Valve and Actuator, SCS Suction Isolation, CIV	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(b)	
SI-V0655	Gate Valve and Actuator, SCS Suction Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0656	Gate Valve and Actuator, SCS Suction Isolation, CIV	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0688	SCS IRWST Recirculation Line Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0691	Globe Valve and Actuator, SCS Warm-Up Line Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0693	SCS IRWST Recirculation Line Flow Control	AB	D	Continuous	Mild	Harsh	No	(b)	
SI-V0690	Globe Valve and Actuator, SCS Warm-Up Line Isolation	AB	D	Continuous	Mild	Harsh	No	(b)	
Essential Service Water System									
SX-PP01A	Essential Service Water Pump	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PP01B	Essential Service Water Pump	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PP02A	Essential Service Water Pump	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PP02B	Essential Service Water Pump	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PM01A	Essential Service Water Pump Motors	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PM01B	Essential Service Water Pump Motors	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PM02A	Essential Service Water Pump Motors	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-PM02B	Essential Service Water Pump Motors	ESWPS	K	Continuous	Mild	N/A	No	(b)	
SX-FT01A	Essential Service Water Debris Filter	ESWPS	K	**Intermittent**	Mild	N/A	No	(b)	
SX-FT01B	Essential Service Water Debris Filter	ESWPS	K	**Intermittent**	Mild	N/A	No	(b)	
SX-FT02A	Essential Service Water Debris Filter	ESWPS	K	**Intermittent**	Mild	N/A	No	(b)	
SX-FT02B	Essential Service Water Debris Filter	ESWPS	K	**Intermittent**	Mild	N/A	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
SX-FT03A	Essential Service Water Debris Filter	ESWPS	K	Intermittent	Mild	N/A	No	(b)	
SX-FT03B	Essential Service Water Debris Filter	ESWPS	K	Intermittent	Mild	N/A	No	(b)	
SX-V0067	Butterfly Valve and Actuator	ESWPS	K	Varies	Mild	N/A	No	(b)	
SX-V0068	Butterfly Valve and Actuator	ESWPS	K	Varies	Mild	N/A	No	(b)	
Equipment and Floor Drainage System									
PP-A	Auxiliary Building Radioactive Floor Drain Sump Pumps	AB	D	Varies	Mild	Harsh	No	(b)	
PP-B	Auxiliary Building Radioactive Floor Drain Sump Pumps	AB	D	Varies	Mild	Harsh	No	(b)	
PP-C	Auxiliary Building Radioactive Floor Drain Sump Pumps	AB	D	Varies	Mild	Harsh	No	(b)	
PP-D	Auxiliary Building Radioactive Floor Drain Sump Pumps	AB	D	Varies	Mild	Harsh	No	(b)	
	Containment Drain Sump Pump Discharge Line, CIV, Globe Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
	Containment Sump Pump Discharge Line CIV, Globe Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
	Reactor Drain Tank Gas Space To GWMS CIV, Globe Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
	Reactor Drain Tank Gas Space to GWMS CIV, Globe Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Control Room Area HVAC System									
VC-HV01A	Supply AHU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-HV01B	Supply AHU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-HV01C	Supply AHU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-HV01D	Supply AHU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-AU01A	Emergency Makeup ACU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-AU01B	Emergency Makeup ACU	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0011A	Air Intake Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0011B	Air Intake Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VC-Y0012A	Air Intake Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0012B	Air Intake Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0013A	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0013C	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0014B	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0014D	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0015A	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0015C	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0016B	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0016D	AHU Inlet Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0017A	ACU Inlet Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0017C	ACU Inlet Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0018B	ACU Inlet Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0018D	ACU Inlet Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0019A	ACU Return Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0019C	ACU Return Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0020B	ACU Return Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0020D	ACU Return Isolation Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0021A	AHU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0021C	AHU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0022B	AHU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0022D	AHU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0023A	ACU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0023C	ACU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0024B	ACU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VC-Y0024D	ACU Discharge Flow Control Damper (ESR)	AB	J	Continuous	Mild	Mild	No	(b)	
VC-Y0027	Kitchen & Toilet Flow Control Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0028	Kitchen & Toilet Flow Control Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0029	Smoke Removal Duct Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
VC-Y0030	Smoke Removal Duct Isolation Damper (PSR)	AB	J	Short-Term	Mild	Mild	No	(b)	
Emergency Diesel Generator Area HVAC System									
VD-HV10A	EDG Control Room Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV10B	EDG Control Room Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV10C	EDG Control Room Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV10D	EDG Control Room Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV11A	EDG Room Normal Supply AHU	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV11B	EDG Room Normal Supply AHU	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV11C	EDG Room Normal Supply AHU	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV11D	EDG Room Normal Supply AHU	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV12A	EDG Room Emergency Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV13A	EDG Room Emergency Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV12B	EDG Room Emergency Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV13B	EDG Room Emergency Cubicle Cooler	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HV12C	EDG Room Emergency Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV13C	EDG Room Emergency Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV12D	EDG Room Emergency Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HV13D	EDG Room Emergency Cubicle Cooler	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH02A	EDG Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH02B	EDG Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH02C	EDG Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VD-AH02D	EDG Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH05A	Diesel Fuel Oil Storage Tank Room Supply Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH05B	Diesel Fuel Oil Storage Tank Room Supply Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH05C	Diesel Fuel Oil Storage Tank Room Supply Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH05D	Diesel Fuel Oil Storage Tank Room Supply Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH06A	Diesel Fuel Oil Storage Tank Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH06B	Diesel Fuel Oil Storage Tank Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH06C	Diesel Fuel Oil Storage Tank Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH06D	Diesel Fuel Oil Storage Tank Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH07A	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH07B	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-AH07C	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-AH07D	Diesel Fuel Oil Day Tank & L.O. Makeup Tank Room Exhaust Fan	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HC01A	EDG Room Electric Duct Heater	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HC01B	EDG Room Electric Duct Heater	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HC01A	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HC01B	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	DGA	H	Continuous	Mild	Mild	No	(b)	
VD-HC01C	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	AB	H	Continuous	Mild	Mild	No	(b)	
VD-HC01D	Diesel Fuel Oil Storage Tank Room Electric Duct Heater	AB	H	Continuous	Mild	Mild	No	(b)	
Electrical and I&C Equipment Areas HVAC System									
VE-HV01A	Class 1E Switchgear 01C Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV01B	Class 1E Switchgear 1D Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV02A	Class 1E Load Center 01C Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV02B	Class 1E Load Center 1D Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV03A	Channel A DC&IP Equip. Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VE-HV03B	Channel B DC&IP Equip. Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV04A	Channel C DC&IP Equip. Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV04B	Channel D DC&IP Equip. Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV06A	Class 1E MCC 01A Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV06B	Class 1E MCC 01B Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV07A	Class 1E Switchgear 01A Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV07B	Class 1E Switchgear 01B Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV08B	Swing Load Center Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV09A	Electrical Penetration Room C Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV09B	Electrical Penetration Room D Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV10A	Class 1E MCC 03C Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV10B	Class 1E MCC 03D Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV11A	Electrical Penetration Room C Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV11B	Electrical Penetration Room D Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV12A	Penetration. Mux Room A Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV12B	Penetration Mux Room B Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV01A	Class 1E Switchgear 01C Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV01B	Class 1E Switchgear 1D Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV13A	Electrical Penetration Room A Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV13B	Electrical Penetration Room B Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV14A	Class 1E MCC 03A Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV14B	Class 1E MCC 03B Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV15A	Class 1E MCC 04A Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV15B	Class 1E MCC 04B Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV16A	I&C Equipment Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VE-HV16B	I&C Equipment Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV17A	I&C Equipment Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV17B	I&C Equipment Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV18A	RSR Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HV18B	RSR Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH20A	Class 1E Battery A Room Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH20B	Class 1E Battery B Room Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH20C	Class 1E Battery C Room Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH20D	Class 1E Battery D Room Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH21A	Class 1E Battery A Room Exhaust Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH21B	Class 1E Battery B Room Exhaust Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH21C	Class 1E Battery C Room Exhaust Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH21D	Class 1E Battery D Room Exhaust Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH22C	RSR Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH22D	RSR Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH22C	RSR Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH22D	RSR Supply Fan	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC01A	Class 1E Battery A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC01B	Class 1E Battery B Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC01C	Class 1E Battery C Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC01D	Class 1E Battery D Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC02A	Class 1E Switchgear 01A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC02B	Class 1E Switchgear 01B Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC03C	RSR Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC03D	RSR Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VE-HC04C	I&C Equipment Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC04D	I&C Equipment Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC05C	I&C Equipment Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC05D	I&C Equipment Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC06A	Elect Penetration A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC06B	Elect Penetration B Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC07A	Class 1E MCC 03A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC07B	Class 1E MCC 03B Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-HC08A	Class 1E 04A MCC 04A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH09A	Penetration Mux A Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH09B	Penetration Mux B Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
VE-AH10B	Swing Load Center Room Electrical Duct Heater	AB	C	Continuous	Mild	Mild	No	(b)	
Fuel Handling Area HVAC System									
VF-AU02A	Emergency Exhaust ACU	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-AU02B	Emergency Exhaust ACU	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-HV02A	SFP HX Room Cubicle Cooler	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-HV02B	SFP HX Room Cubicle Cooler	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-Y0001A	Air Intake Isolation Damper (PSR)	FHA	G	Short-Term	Mild	Harsh	No	(b)	
VF-Y0002B	Air Intake Isolation Damper (PSR)	FHA	G	Short-Term	Mild	Harsh	No	(b)	
VF-Y0003A	Normal Exhaust ACU Isolation Damper (PSR)	FHA	G	Short-Term	Mild	Harsh	No	(b)	
VF-Y0004B	Normal Exhaust ACU Isolation Damper (PSR)	FHA	G	Short-Term	Mild	Harsh	No	(b)	
VF-Y0005A	Emergency Exhaust ACU Isolation Damper (ESR)	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-Y0006B	Emergency Exhaust ACU Isolation Damper (ESR)	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-Y0007A	Emergency Exhaust Flow Control Damper (ESR)	FHA	G	Continuous	Mild	Harsh	No	(b)	
VF-Y0008B	Emergency Exhaust Flow Control Damper (ESR)	FHA	G	Continuous	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
Auxiliary Building Controlled Area HVAC System									
VK-AU01A	Aux. Bldg Controlled Area I Emergency Exhaust ACU	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-AU01C	Aux. Bldg Controlled Area I Emergency Exhaust ACU	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-AU01B	Aux. Bldg Controlled Area II Emergency Exhaust ACU	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-AU01D	Aux. Bldg Controlled Area II Emergency Exhaust ACU	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV10A	CS Pump & Miniflow Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV10B	CS Pump & Miniflow Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV11A	SI Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV11B	SI Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV12A	SI Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV12B	SI Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV13A	CCW Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV13B	CCW Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV14A	CCW Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV14B	CCW Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV15A	CS Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV15B	CS Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV16A	SC Pump & Miniflow Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV16B	SC Pump & Miniflow Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV17A	SC Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV17B	SC Heat Exchanger Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV18A	Charging Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV18B	Charging Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV19A	Mechanical Penetration Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV19B	Mechanical Penetration Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VK-HV20A	Mechanical Penetration Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV20B	Mechanical Penetration Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV21B	Aux. Charging Pump Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV22A	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV22B	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV23A	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-HV23B	Aux. Bldg Controlled Area Emergency Exhaust ACU Room Cubicle Cooler	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0001A	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0001B	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0001C	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0001D	Aux. Bldg Controlled Area Emergency Exhaust ACU Flow Control Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0002A	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0002B	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0002C	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0002D	Aux. Bldg Controlled Area Emergency Exhaust ACU Isolation Damper (ESR)	AB	D	Continuous	Mild	Harsh	No	(b)	
VK-Y0017A	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0018A	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VK-Y0019B	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0020B	Aux. Bldg Controlled Area Supply AHU Outlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0021A	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0022A	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0023B	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0024B	Aux. Bldg Controlled Area Normal Exhaust ACU Inlet Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0050A	Post Accident Sample Room Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0050B	Post Accident Sample Room Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0050C	Post Accident Sample Room Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
VK-Y0050D	Post Accident Sample Room Isolation Damper (PSR)	AB	D	Short-Term	Mild	Mild	No	(b)	
Auxiliary Building Clean Area HVAC System									
VO-HV31A	Essential Chiller Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VO-HV31B	Essential Chiller Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VO-HV32A	Essential Chiller Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VO-HV32B	Essential Chiller Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VO-HV33A	Motor- Driven AFW Pump Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
VO-HV33B	Motor- Driven AFW Pump Room Cubicle Cooler	AB	C	Continuous	Mild	Mild	No	(b)	
Reactor Containment Purge System									
VQ-V0012	High Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
VQ-V0011	High Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
VQ-V0013	High Volume Containment Purge System Exhaust CIV, Butterfly Valve Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
VQ-V0014	High Volume Containment Purge System Exhaust CIV, Butterfly Valve Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
VQ-V0031	Low Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
VQ-V0032	Low Volume Containment Purge System Supply CIV, Butterfly Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
VQ-V0033	Low Volume Cont. Purge System Exhaust CIV, Butterfly Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
VQ-V0034	Low Volume Cont. Purge System Exhaust CIV, Butterfly Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Hydrogen Monitoring System									
Various	Hydrogen Analyzers	AB	D	Continuous	Mild	Harsh	No	(b)	
Plant Chilled Water System									
WI-V013	PCW Supply to Containment Ventilation Units CIV, Gate Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
WI-V1043	PCW Supply to Containment Ventilation Units CIV, Check Valve	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
WI-V015	PCW Return from Containment Ventilation Units CIV, Gate Valve and Actuator	RCB	A-1, A-2	Short-Term	Harsh	Harsh	No	(b)	
WI-V012	PCW Return from Containment Ventilation Units CIV, Gate Valve and Actuator	AB	D	Short-Term	Mild	Harsh	No	(b)	
Essential Chilled Water System									
WO-CH01A	Essential Water Chillers	AB	C	Continuous	Mild	Mild	No	(b)	
WO-CH01B	Essential Water Chillers	AB	C	Continuous	Mild	Mild	No	(b)	
WO-CH02A	Essential Water Chillers	AB	C	Continuous	Mild	Mild	No	(b)	
WO-CH02B	Essential Water Chillers	AB	C	Continuous	Mild	Mild	No	(b)	
WO-PP01A	Essential Chilled Water Pumps	AB	C	Continuous	Mild	Mild	No	(b)	
WO-PP01B	Essential Chilled Water Pumps	AB	C	Continuous	Mild	Mild	No	(b)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
WO-PP02A	Essential Chilled Water Pumps	AB	C	Continuous	Mild	Mild	No	(b)	
WO-PP02B	Essential Chilled Water Pumps	AB	C	Continuous	Mild	Mild	No	(b)	
WO-PP03A	Essential Chilled Water Make-up Pumps	AB	C	Continuous	Mild	Mild	No	(b)	
WO-PP03B	Essential Chilled Water Make-up Pumps	AB	C	Continuous	Mild	Mild	No	(b)	
WO-TK01A	Essential Chilled Water Compression Tank	AB	C	Continuous	N/A	Harsh	No	(b)	
WO-TK01B	Essential Chilled Water Compression Tank	AB	C	Continuous	N/A	Harsh	No	(b)	
WO-TK02A	Essential Chilled Water Air Separator	AB	C	Continuous	N/A	Harsh	No	(b)	
WO-TK02B	Essential Chilled Water Air Separator	AB	C	Continuous	N/A	Harsh	No	(b)	
WO-V1001A	ECW Compression Tank Relief valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V1001B	ECW Compression Tank Relief valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0906A	Control Room Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0906B	Control Room Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0906C	Control Room Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0906D	Control Room Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0917A	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0917B	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0918A	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-V0918B	EDG Room Normal Supply AHU Chilled Water 3-Way Valve	AB	C	Continuous	Mild	Mild	No	(b)	
WO-LP01A	Essential Chilled Water System Control Panel	AB	C	Continuous	Mild	N/A	No	(a)	
WO-LP01B	Essential Chilled Water System Control Panel	AB	C	Continuous	Mild	N/A	No	(a)	
WO-LP01C	Essential Chilled Water System Control Panel	AB	C	Continuous	Mild	N/A	No	(a)	
WO-LP01D	Essential Chilled Water System Control Panel	AB	C	Continuous	Mild	N/A	No	(a)	
WO-LI003C	Field Indicator Device	AB	C	Continuous	Mild	N/A	No	(a)	
WO-LI003D	Field Indicator Device	AB	C	Continuous	Mild	N/A	No	(a)	
Electric System									

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PF-SW01A	4.16kV Metal Clad Switchgear	AB	C	Continuous	Mild	Mild	No	(a)	
PF-SW01B	4.16kV Metal Clad Switchgear	AB	C	Continuous	Mild	Mild	No	(a)	
PF-SW01C	4.16kV Metal Clad Switchgear	AB	C	Continuous	Mild	Mild	No	(a)	
PF-SW01D	4.16kV Metal Clad Switchgear	AB	C	Continuous	Mild	Mild	No	(a)	
PG-LC01A	480V Load Center	AB	C	Continuous	Mild	Mild	No	(a)	
PG-LC01B	480V Load Center	AB	C	Continuous	Mild	Mild	No	(a)	
PG -LC01C	480V Load Center	AB	C	Continuous	Mild	Mild	No	(a)	
PG -LC01D	480V Load Center	AB	C	Continuous	Mild	Mild	No	(a)	
PG -LC02	480V Load Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH-MC01A	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC02A	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC03A	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC04A	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC05A	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC01B	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC02B	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC03B	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC04B	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC05B	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC01C	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC02C	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC03C	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC04C	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC01D	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC02D	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PH -MC03D	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
PH -MC04D	480V Motor Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ01A	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ01B	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ01C	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ01D	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ02A	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ02B	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ02C	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
RC-SQ02D	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
SI-SQ01C	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
SI-SQ01D	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
IW-SQ01C	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
IW-SQ01D	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
IW-SQ02C	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
IW-SQ02D	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
CV-SQ01	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
VK-SQ01	Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
Various	Local Control Station	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BT01A	125Vdc Battery with Rack	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BT01B	125Vdc Battery with Rack	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BT01C	125Vdc Battery with Rack	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BT01D	125Vdc Battery with Rack	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC01A	480Vac/125Vdc Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DC-BC01B	480Vac/125Vdc Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC01C	480Vac/125Vdc Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC01D	480Vac/125Vdc Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC02A	480Vac/125Vdc Standby Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC02B	480Vac/125Vdc Standby Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC02C	480Vac/125Vdc Standby Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-BC02D	480Vac/125Vdc Standby Battery Charger	AB	C	Continuous	Mild	Mild	No	(a)	
DC-MC01A	125Vdc Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
DC-MC01B	125Vdc Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
DC-MC01C	125Vdc Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
DC-MC01D	125Vdc Control Center	AB	C	Continuous	Mild	Mild	No	(a)	
IP-TR01A	480Vac/120Vac Regulating Transformer	AB	C	Continuous	Mild	Mild	No	(a)	
IP-TR01B	480Vac/120Vac Regulating Transformer	AB	C	Continuous	Mild	Mild	No	(a)	
IP-TR01C	480Vac/120Vac Regulating Transformer	AB	C	Continuous	Mild	Mild	No	(a)	
IP-TR01D	480Vac/120Vac Regulating Transformer	AB	C	Continuous	Mild	Mild	No	(a)	
IP-IN01A	125Vdc/120Vac Inverter	AB	C	Continuous	Mild	Mild	No	(a)	
IP-IN01B	125Vdc/120Vac Inverter	AB	C	Continuous	Mild	Mild	No	(a)	
IP-IN01C	125Vdc/120Vac Inverter	AB	C	Continuous	Mild	Mild	No	(a)	
IP-IN01D	125Vdc/120Vac Inverter	AB	C	Continuous	Mild	Mild	No	(a)	
SI-SQ02C	125Vdc Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
SI-SQ02D	125Vdc Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
AF-SQ01C	125Vdc Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
AF-SQ01D	125Vdc Local Starter	AB	C	Continuous	Mild	Mild	No	(a)	
DC-DP01A	125Vdc Distribution Panel	AB	C	Continuous	Mild	Mild	No	(a)	
DC-DP01B	125Vdc Distribution Panel	AB	C	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
Various	Electrical Penetration Assemblies - Medium Voltage Power	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
Various	Electrical Penetration Assemblies - Low Voltage Power & Control	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
Various	Electrical Penetration Assemblies – Low Voltage Instrumentation	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
Various	Electrical Conductor Sealing Assemblies	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	5kV Power Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	600V Power Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	600V Control Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	600V Instrumentation Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	Thermocouple Extension Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	Coaxial Cables	Various	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
N/A	RSPT Type I & II Cable Assemblies	Various	A-1	Continuous	Harsh	Harsh	No	(a)	
N/A	ICI Cable Assemblies	Various	A-1	Continuous	Harsh	Harsh	No	(a)	
N/A	HJTC Cable Assemblies	Various	A-1	Continuous	Harsh	Harsh	No	(a)	
Instrumentation and Control System									
AFW-FT-0035A	AFW Flow Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-FT-0036B	AFW Flow Transmitter, Channel B	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-FT-0037C	AFW Flow Transmitter, Channel C	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-FT-0038D	AFW Flow Transmitter, Channel D	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-TI-0053A	AFW Line Back Leakage Temperature Element, Channel A	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-TI-0054B	AFW Line Back Leakage Temperature Element, Channel B	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-TI-0053C	AFW Line Back Leakage Temperature Element, Channel C	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-TI-0054D	AFW Line Back Leakage Temperature Element, Channel D	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-PT-0005A	AFW Pump Suction Pressure Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0006B	AFW Pump Suction Pressure Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0007C	AFW Pump Suction Pressure Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
AFW-PT-0008D	AFW Pump Suction Pressure Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0023A	AFW Pump Discharge Pressure Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0024B	AFW Pump Discharge Pressure Transmitter, Channel B	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0025C	AFW Pump Discharge Pressure Transmitter, Channel C	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-PT-0026D	AFW Pump Discharge Pressure Transmitter, Channel D	AB	D	Continuous	Mild	Harsh	No	(a)	
AFW-Z-0035A	AFW Flow Modulating Valve Position Transmitter, Channel A	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-Z-0036B	AFW Flow Modulating Valve Position Transmitter, Channel B	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-Z-0037C	AFW Flow Modulating Valve Position Transmitter, Channel C	AB	E	Continuous	Harsh	Harsh	No	(a)	
AFW-Z-0038D	AFW Flow Modulating Valve Position Transmitter, Channel D	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-LT-0003C	AFW Turbine Steam Drip Leg Level Transmitter, Channel C	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-LT-0004D	AFW Turbine Steam Drip Leg Level, Channel D	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-PT-0013C	AFW Turbine Inlet Steam Pressure Transmitter, Channel C	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-PT-0014D	AFW Turbine Inlet Steam Pressure Transmitter, Channel D	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-S-3035C	AFW Pump Turbine Speed Transmitter, Channel C	AB	E	Continuous	Harsh	Harsh	No	(a)	
AT-S-3036D	AFW Pump Turbine Speed Transmitter, Channel D	AB	E	Continuous	Harsh	Harsh	No	(a)	
AX-LT-0003A	AFWST 1 Level Transmitter Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0004B	AFWST 2 Level Transmitter, Channel B	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0005A	AFWST 2 Level Transmitter, Channel A	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0005C	AFWST 2 Level Transmitter, Channel C	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0005D	AFWST 2 Level Transmitter, Channel D	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0006B	AFWST 1 Level Transmitter Channel B	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0006C	AFWST 1 Level Transmitter, Channel C	AB	D	Continuous	Mild	Harsh	No	(a)	
AX-LT-0006D	AFWST 1 Level Transmitter, Channel D	AB	D	Continuous	Mild	Harsh	No	(a)	
CC-FT-0071A	CCW Flow Transmitter, Channel A	CCW Hx	K	Continuous	Mild	Mild	No	(a)	
CC-FT-0071B	CCW Flow Transmitter, Channel B	CCW Hx	K	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
CC-TE-069A	CCW Temperature Element, Channel A	CCW Hx	K	Continuous	Mild	Mild	No	(a)	
CC-TE-070B	CCW Temperature Element, Channel B	CCW Hx	K	Continuous	Mild	Mild	No	(a)	
CE-CEDM 1-101	CEDM Position Indication Reed Switch and Cable	RCB/MS	(Note 8)	Continuous	Mild	Harsh	No	(a)	
CE-SW-01A	RTSS Cabinet, Channel A	AB	C	Continuous	Mild	Harsh	No	(a)	
CE-SW-01B	RTSS Cabinet, Channel B	AB	C	Continuous	Mild	Harsh	No	(a)	
CE-SW-01C	RTSS Cabinet, Channel C	AB	C	Continuous	Mild	Harsh	No	(a)	
CE-SW-01D	RTSS Cabinet, Channel D	AB	C	Continuous	Mild	Harsh	No	(a)	
CM-LP01A	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-LP01B	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-LP02A	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-LP02B	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-LP03A	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-LP03B	Hydrogen Monitoring System Panel	AB	C	Continuous	Mild	Mild	No	(a)	
CM-PR-351	Containment Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
CM-PR-352	Containment Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
CM-PT-351A	Containment Pressure Protective (NR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-351B	Containment Pressure Protective (NR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-351C	Containment Pressure Protective (NR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-351D	Containment Pressure Protective (NR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-352A	Containment Pressure Protective (WR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-352B	Containment Pressure Protective (WR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-352C	Containment Pressure Protective (WR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-PT-352D	Containment Pressure Protective (WR) Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CM-TE-031A	Containment Temperature Element	RCB	A-1,A-2	Continuous	Harsh	Harsh	No	(a)	
CS-FT-338C	Containment Spray Pump Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
CS-FT-348D	Containment Spray Pump Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CS-PT-71	CS Pressure Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CS-PT-81	CS Pressure Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
CS-TE-071C	Containment Spray Temperature Element, HX	AB	D	Continuous	Mild	Harsh	No	(a)	
CS-TE-072D	Containment Spray Temperature Element, HX	AB	D	Continuous	Mild	Harsh	No	(a)	
DG-LI-3001A	HT Water Expansion Tank Level Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3001B	HT Water Expansion Tank Level Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3001C	HT Water Expansion Tank Level Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3001D	HT Water Expansion Tank Level Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3010A	LT Water Expansion Tank Level Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3010B	LT Water Expansion Tank Level Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3010C	LT Water Expansion Tank Level Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LI-3010D	LT Water Expansion Tank Level Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001A01	HT Water Expansion Tank Level Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001B01	HT Water Expansion Tank Level Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001C01	HT Water Expansion Tank Level Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001D01	HT Water Expansion Tank Level Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001A02	HT Water Expansion Tank Level Switch High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001B02	HT Water Expansion Tank Level Switch High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001C02	HT Water Expansion Tank Level Switch High	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3001D02	HT Water Expansion Tank Level Switch High	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010A01	LT Water Expansion Tank Level Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010B01	LT Water Expansion Tank Level Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010C01	LT Water Expansion Tank Level Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010D01	LT Water Expansion Tank Level Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-LS-3010A02	LT Water Expansion Tank Level Switchl High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010B02	LT Water Expansion Tank Level Switch High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010C02	LT Water Expansion Tank Level Switch High	AB	I	Continuous	Mild	Mild	No	(a)	
DG-LS-3010D02	LT Water Expansion Tank Level Switch High	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3086A	Over Speed Air Receiver Pressure Indicator Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3086B	Over Speed Air Receiver Pressure Indicator Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3086C	Over Speed Air Receiver Pressure Indicator Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3086D	Over Speed Air Receiver Pressure Indicator Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3142A	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicatior	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3142B	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicatior	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3142C	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicatior	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3142D	Lube Oil/Preheating Water Heat Exchanger Inlet Pressure Indicatior	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3176A	Starting Air Receiver Pressure Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3176B	Starting Air Receiver Pressure Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3176C	Starting Air Receiver Pressure Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3176D	Starting Air Receiver Pressure Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3177A	Starting Air Receiver Pressure Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3177B	Starting Air Receiver Pressure Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3177C	Starting Air Receiver Pressure Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PI-3177D	Starting Air Receiver Pressure Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3041A	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3041B	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3041C	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3041D	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3042A	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-PS-3042B	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3042C	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3042D	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3046A	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3046B	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3046C	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3046D	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3047A	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3047B	Engine Inlet Lube Oil Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3047C	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3047D	Engine Inlet Lube Oil Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3060A	Crankcase Gas Pressure Measurement Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3060B	Crankcase Gas Pressure Measurement Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3060C	Crankcase Gas Pressure Measurement Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3060D	Crankcase Gas Pressure Measurement Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3182A	Starting Air Receiver Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3182B	Starting Air Receiver Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3182C	Starting Air Receiver Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3182D	Starting Air Receiver Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3183A	Starting Air Receiver Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3183B	Starting Air Receiver Pressure Switch Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3183C	Starting Air Receiver Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PS-3183D	Starting Air Receiver Pressure Switch Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PT-3110A	LT Water Pump Discharge Pressure Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-PT-3110B	LT Water Pump Discharge Pressure Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-PT-3110C	LT Water Pump Discharge Pressure Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-PT-3110D	LT Water Pump Discharge Pressure Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3005A	HT Water Outlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3005B	HT Water Outlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3005C	HT Water Outlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3005D	HT Water Outlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3010A	LT Water Pump Discharge Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3010B	LT Water Pump Discharge Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3010C	LT Water Pump Discharge Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3010D	LT Water Pump Discharge Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3011A	HT/CC Water Heat Exchanger Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3011B	HT/CC Water Heat Exchanger Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3011C	HT/CC Water Heat Exchanger Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3011D	HT/CC Water Heat Exchanger Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3016A	Air Cooler LT Water Inlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3016B	Air Cooler LT Water Inlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3016C	Air Cooler LT Water Inlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3016D	Air Cooler LT Water Inlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3112A	CC/LT Water Heat Exchanger Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3112B	CC/LT Water Heat Exchanger Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3112C	CC/LT Water Heat Exchanger Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3112D	CC/LT Water Heat Exchanger Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3113A	Air Cooler LT Water Outlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3113B	Air Cooler LT Water Outlet Temperature Indicator	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TI-3113C	Air Cooler LT Water Outlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
DG-TI-3113D	Air Cooler LT Water Outlet Temperature Indicator	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3004A	HT Water Pump Suction Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3004B	HT Water Pump Suction Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3004C	HT Water Pump Suction Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3004D	HT Water Pump Suction Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3007A	HT Water Outlet Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3007B	HT Water Outlet Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3007C	HT Water Outlet Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3007D	HT Water Outlet Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3008A	HT Water Outlet Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3008B	HT Water Outlet Temperature Transmitter	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3008C	HT Water Outlet Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3008D	HT Water Outlet Temperature Transmitter	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3044A	Lube Oil Engine Inlet Temperature Transmiiter Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3044B	Lube Oil Engine Inlet Temperature Transmiiter Low	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3044C	Lube Oil Engine Inlet Temperature Transmiiter Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3044D	Lube Oil Engine Inlet Temperature Transmiiter Low	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3045A	Lube Oil Engine Inlet Temperature Transmiiter High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3045B	Lube Oil Engine Inlet Temperature Transmiiter High	EDGB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3045C	Lube Oil Engine Inlet Temperature Transmiiter High	AB	I	Continuous	Mild	Mild	No	(a)	
DG-TT-3045D	Lube Oil Engine Inlet Temperature Transmiiter High	AB	I	Continuous	Mild	Mild	No	(a)	
EM-VT-0001	Seismic Sensor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
EM -VT-0002	Seismic Sensor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
EM -VT-0003	Seismic Sensor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
EM -VT-0004	Seismic Sensor	AB	D	Continuous	Harsh	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
EM -VT-0005	Seismic Sensor	CCW HX	K	Continuous	Mild	N/A	No	(a)	
EM -VT-0006	Seismic Sensor	Yard	K	Continuous	Mild	N/A	No	(a)	
EM -VT-0007	Seismic Sensor	Yard	K	Continuous	Mild	N/A	No	(a)	
IW-TE-350	IRWST Temperature Element	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
IW-TE- 351	IRWST Temperature Element	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PR-1013A	Steam Generator Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
MS-PR-1023A	Steam Generator Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
MS-PT-1013A	SG 1 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1013B	SG 1 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1013C	SG 1 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1013D	SG 1 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1023A	SG 2 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1023B	SG 2 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1023C	SG 2 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
MS-PT-1023D	SG 2 Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
NR-RW-001A	ENFMS Safety Channel Detector, Channel A	RCB/MS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
NR-RW-001B	ENFMS Safety Channel Detector, Channel B	RCB/MS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
NR-RW-001C	ENFMS Safety Channel Detector, Channel C	RCB/MS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
NR-RW-001D	ENFMS Safety Channel Detector, Channel D	RCB/MS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
PA-PA03A	ESF-CCS GC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA03B	ESF-CCS GC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA03C	ESF-CCS GC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA03D	ESF-CCS GC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA04A	MTP/ITP Cabinet, Channel A	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA04B	MTP/ITP Cabinet, Channel B	AB	C	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PA-PA04C	MTP/ITP Cabinet, Channel C	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA04D	MTP/ITP Cabinet, Channel D	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA05M	DPS Cabinet, Channel N1	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA05N	DPS Cabinet, Channel N2	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA06C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA06D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA14A	PPS Cabinet, Channel A	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA14B	PPS Cabinet, Channel B	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA14C	PPS Cabinet, Channel C	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA14D	PPS Cabinet, Channel D	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA15A	CPCS Cabinet, Channel A	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA15B	CPCS Cabinet, Channel B	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA15C	CPCS Cabinet, Channel C	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA15D	CPCS Cabinet, Channel D	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA18A	APC Cabinet, Channel A	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA18B	APC Cabinet, Channel B	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA18C	APC Cabinet, Channel C	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA18D	APC Cabinet, Channel D	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA29C	DRCS Remote I/O Cabinets (Associated Circuit)	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA29D	DRCS Remote I/O Cabinets (Associated Circuit)	CR	J	Continuous	Mild	Mild	No	(a)	
PA-PA38M	Seismic Monitoring System Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA47A	BOP Radiation Monitoring Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA47B	BOP Radiation Monitoring Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PA-PA48A	ENFMS Cabinet, Channel A	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA48B	ENFMS Cabinet, Channel B	AB	C	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PA-PA48C	ENFMS Cabinet, Channel C	AB	C	Continuous	Mild	Mild	No	(a)	
PA-PA48D	ENFMS Cabinet, Channel D	AB	C	Continuous	Mild	Mild	No	(a)	
PE-LX01A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX01B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX01C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX01D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX02A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX02B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX02C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX02D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX03A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX03B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX03C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX03D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE-LX04A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX04B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX04C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX04D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX05A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX05B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX05C	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX05D	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX06A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX06B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX07A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PE -LX07B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX08A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX08B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX09A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX09B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX10A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX10B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX11A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX11B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX12A	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX12B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PE -LX13B	ESF-CCS LC Cabinet	AB	J	Continuous	Mild	Mild	No	(a)	
PM-PM01	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
PM -PM02	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
PM -PM03	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
PM -PM04	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
PM -PM05	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
PM-UC-19	PPS/CPCS/ESF-CCS Operator Module, Channel A	AB	C	Continuous	Mild	Mild	No	(a)	
PM-UC-19	PPS/CPCS/ESF-CCS Operator Module, Channel B	AB	C	Continuous	Mild	Mild	No	(a)	
PM-UC-19	PPS/CPCS/ESF-CCS Operator Module, Channel C	AB	C	Continuous	Mild	Mild	No	(a)	
PM-UC-19	PPS/CPCS/ESF-CCS Operator Module, Channel D	AB	C	Continuous	Mild	Mild	No	(a)	
PR-RE-217	Main Steam Line Radiation Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE-218	Main Steam Line Radiation Monitor	AB	M	Continuous	Harsh	Harsh	No	(a)	
PR-RE-219	Unit Vent Radiation Monitor	AB	D	Continuous	Mild	Harsh	No	(a)	
PR-RE-220	Unit Vent Post-Accident Radiation Monitor	AB	D	Continuous	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
PR-RE-233A	High Range Containment Area Radiation Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
PR-RE-234B	High Range Containment Area Radiation Monitor	RCB	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-LR-110A	Pressurizer Level Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
RC-PDT-115A	SG 1 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-115B	SG 1 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-115C	SG 1 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-115D	SG 1 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-125A	SG 2 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-125B	SG 2 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-125C	SG 2 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PDT-125D	SG 2 Differential Pressure Differential Transmitter	RCB/SS	A-1, A-2	Short-Term	Harsh	Harsh	No	(a)	
RC-PR-190A	RCS Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
RC-PR-190B	RCS Pressure Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
RC-PT-102A	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-102B	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-102C	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-102D	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-103A	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-104B	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-105C	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-106D	Pressurizer Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-190A	RCS Pressure (Cold Leg-Pump Discharge)Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-PT-190B	RCS Pressure (Cold Leg-Pump Discharge)Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-SE-113A	RCP 1A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-113B	RCP 1A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
RC-SE-113C	RCP 1A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-113D	RCP 1A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-123A	RCP 1B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-123B	RCP 1B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-123C	RCP 1B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-123D	RCP 1B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-133A	RCP 2A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-133B	RCP 2A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-133C	RCP 2A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-133D	RCP 2A Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-143A	RCP 2B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-143B	RCP 2B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-143C	RCP 2B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-SE-143D	RCP 2B Speed Sensor and Cable	RCB/PS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-113A	RCP 1A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-113B	RCP 1A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-113C	RCP 1A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-113D	RCP 1A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-123A	RCP 1B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-123B	RCP 1B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-123C	RCP 1B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-123D	RCP 1B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-133A	RCP 2A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-133B	RCP 2A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-133C	RCP 2A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
RC-ST-133D	RCP 2A Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-143A	RCP 2B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-143B	RCP 2B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-143C	RCP 2B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-ST-143D	RCP 2B Speed Transmitter	RCB/SS	B (Note 8)	Short-Term	Mild	Harsh	No	(a)	
RC-TE-112A	RCS, T/H Temperature (NR) Element (note 10)	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-112B	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-112C	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-112D	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-113A	RCS, T/H Temperature (NR) Element (note 10)	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-113B	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-113C	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-113D	RCS, T/H Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-122A	RCS, T/C Temperature (NR) Element (note 10)	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-122B	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-122C	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-122D	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-123A	RCS, T/C Temperature (NR) Element (note 10)	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-123B	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-123C	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-123D	RCS, T/C Temperature (NR) Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-132A	RCS, T/H Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-132B	RCS, T/H Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-133A	RCS, T/H Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-133B	RCS, T/H Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
RC-TE-142A	RCS, T/C Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-142B	RCS, T/C Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-143A	RCS, T/C Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TE-143B	RCS, T/C Temperature Element	RCB/PS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
RC-TR-132A	RCS, T/H Temperature Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
RC-TR-133A	RCS, T/H Temperature Display	CR/MCB	J	Continuous	Mild	Mild	No	(a)	
RS-RU01	MMIS-BOP MCR (RO, TO/EO, SS, STA, Safety, RSC) Console	AB	J	Continuous	Mild	Mild	No	(a)	
SI-FT-302A	SCS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-305B	SCS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-311D	SIS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-321B	SIS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT- 331C	SIS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-341A	SIS Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-390D	Hot Leg Injection Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-FT-391C	Hot Leg Injection Flow Transmitter	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-PT-302	SC Pump Discharge Pressure Transmitter	AB	C	Continuous	Mild	Harsh	No	(a)	
SI-PT-305	SC Pump Discharge Pressure Transmitter	AB	C	Continuous	Mild	Harsh	No	(a)	
SI-PT-311D	SI Tank Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
SI-PT- 321B	SI Tank Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
SI-PT-331C	SI Tank Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
SI-PT-341A	SI Tank Pressure Transmitter	RCB/SS	A-1, A-2	Continuous	Harsh	Harsh	No	(a)	
SI-TE-300A	SDCHX 1 Inlet and Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-TE-301A	SDCHX 1 Inlet and Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-TE-302A	SDCHX Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-TE-303B	SDCHX 2 Inlet and Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	

Equipment Identification		Location		Required Durational Operation (1)	Environmental Condition (2)	Radiation Condition (11)	Influence of Immersion (Yes/No)	Qualification Basis (a) IEEE 323 (b) IEEE 344	Remark
		Building	Category						
SI-TE-304B	SDCHX 2 Inlet and Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	
SI-TE-305B	SDCHX Outlet Temperature Element	AB	D	Continuous	Mild	Harsh	No	(a)	
SX-TE-065	ESW Pump, Discharge Common Header Temperature Element	ESWPS	K	Continuous	Mild	Mild	No	(a)	
SX-TE-066	ESW Pump, Discharge Common Header Temperature Element	ESWPS	K	Continuous	Mild	Mild	No	(a)	
Various	Containment Hydrogen Concentration Monitor	AB	D	Continuous	Mild	Harsh	No	(a)	

Abbreviations	
Item	Description
AB	Auxiliary Building
ACU	Air Cleaning Unit
AFW	Auxiliary Feedwater
AFWST	Auxiliary Feedwater Storage Tank
AHU	Air Handling Unit
APC	Auxiliary Process Cabinet
RCB	Reactor Containment Building
CEAC	CEA Calculator
CEDM	Control Element Drive Mechanism
CCW Hx	Component Cooling Water Heat Exchanger Structure
CCWS	Component Cooling Water System
CPC	Core Protection Calculator
CPCSC	Core Protection Calculator System Cabinet
CR	Control Room or similar area with Class 1E Air Conditioning
CS	Containment Spray System
DGA	Diesel Generator Area
DPS	Diverse Projection System
DRCS	Digital Rod Control System
ECCSC	ESF Component Control System Cabinet
ENFMS	Ex-Core Neutron Flux Monitoring System
ESFAS	Engineered Safety Features Actuation System
ESF-CCS	Engineered Safety Feature-Component Control System
ESR	Electro Hydraulic Spring Return
ESWPS	Essential Service Water Pump Structure
FHA	Fuel handling Area
HJTC	Heated Junction Thermocouple
IPS	Information Processing System
IRWST	In-containment Refueling Water Storage Tank
LO	Local
MCR	Main Control Room
MS	Inside Missile Shield and Primary Shield
NR	Narrow Range

Abbreviations	
Item	Description
PAMI	Post-Accident Monitoring Instrumentation
PPS	Plant Protection System
PPSC	Plant Protection System Cabinet
PS	Outside Primary Shield and Inside Secondary Shield
PSR	Pneumatic Spring Return
RCPSSSS	Reactor Coolant Pump Shaft Speed Sensing System
RCS	Reactor Coolant System
RSR	Remote Shutdown Room
RSPT	Reed Switch Position Transmitter
SCS	Shutdown Cooling System
SDS	Safety Depressurization System
SDCHX	Shutdown Cooling Heat Exchanger
SG	Steam Generator
SI	Safety Injection
SS	Outside Secondary Shield
T/C	Reactor Inlet Temperature, T(cold)
T/H	Reactor Outlet Temperature, T(hot)
WR	Wide Range

(1) See Table 3.11-2 for definition of environmental categories.

(2) Equipment located within a cabinet will be qualified allowing for temperature increase inside cabinet.

(3) Not used.

(4) Not used.

(5) Ex-vessel portion of the instrument.

(6) Instrument design life of 6 years.

(7) Instrument design life of 10 years.

(8) Not qualified for accident environment.

(9) There is one core exit thermocouple for each ICI assembly.

(10) Only Channels A and B are qualified for accident environment.

(11) Radiation environmental qualification requirements for individual components are developed as discussed in Subsection 3.11.5. Table 3.11-2 provides the worst case upper bound radiation environment in the region where the component is located.

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Part 2

Seismic Qualification

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TABLE

SKETCH

ANNEX

1.0 GENERAL

This program is to establish the seismic and dynamic qualification procedure and criteria for Safety-Related mechanical equipment, controls and instrumentation and Class 1E electrical equipment in APR1400. This program is a part of the overall APR1400 EQ Program(EQP). In APR1400, the seismic and dynamic qualification is performed by the equipment supplier and the COLA reviews the qualification reports which are performed and provided by the supplier. This program provides the seismic and dynamic qualification requirements and general procedures to qualify safety-related equipment in accordance with IEEE Std. 344 and NRC RG 1.100 and indicates the responsibility of the supplier.

2.0 DEFINITIONS

2.1 Safe Shutdown Earthquake (SSE): An earthquake that is based upon an eva1uation of the maximum earthquake potentia1 considering the regiona1 and local geology and seismology and specific characteristics of loca1 subsurface materia1. It is that earthquake that produces the maximum vibratory ground motion for which certain structures, systems, and components are designed to remain functional.

2.2 Operating Basis Earthquake (OBE): An earthquake that could reasonably be expected to occur at the plant site during the operating life of the plant considering the regional and 1ocal geology and seismology and specific characteristics of local subsurface material. It is that earthquake that produces the vibratory ground motion for which those features of the nuclear power plant, necessary for continued operation without undue risk to the health and safety of the public, are designed to remain functional.

2.3 Safety-Related Equipment: (Seismic Category I Equipment)

2.3.1 The equipment necessary to assure:

a. The integrity of the reactor coolant pressure boundary,

b. The capability to shutdown the reactor and maintain it in a safe shutdown condition, or

c. The capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposures in excess of the limits stated in 10 CFR 100.

2.3.2 Electrical equipment falling in this category is called Class 1E equipment.

2.3.3 All Safety-Related equipment shall be either active or passive.

2.3.4 Active Equipment: Equipment containing moving parts, which in order to accomplish its function, must undergo mechanical movement of those parts, or must prevent a movement of those parts to ensure that the equipment will remain in its last position.

2.3.5 Passive Equipment: Equipment that must maintain its pressure boundary and/or structural integrity (but not necessarily perform mechanical motion or have certain deflection limits) during the course of accomplishing a system safety function.

2.3.6 Any equipment that is not designated as safety-related but could degrade the integrity of a safety-related component shall be treated the same as a passive equipment.

2.4 Seismic Loads: The additional loads that may be imposed on the equipment due to the occurrence of an earthquake.

2.5 Floor Acceleration:
The maximum acceleration of a particular building floor (or equipment mounting) resulting from a given dynamic excitation applied to the building. The maximum floor acceleration can be obtained from the floor response spectrum as the acceleration at high frequencies (the flat portion of the response spectrum curve) and sometimes referred to as the zero period acceleration (ZPA).

2.6 Response Spectrum: A plot of maximum responses of a family of idealized single-degree of freedom linear elastic oscillators subjected to transient vibratory base input motion. Each damping value produces a different response spectrum.

2.6.1 Floor Response Spectrum: The response spectrum when the transient base excitation is the floor motion rather than the ground motion. The response spectra at the elevations where the equipment will be located are included with the purchase specification and are called required response spectrum (RRS).

2.6.2 Test Response Spectrum: The response spectrum resulting from the actual motion of the shake table for specified damping values. They may be derived by analytical techniques or by using spectrum analysis equipment, i.e., real time analyzer.

2.7 Dynamic Characteristics: The characteristics that are needed to determine the dynamic behavior of the equipment due to any forcing function. These characteristics are:

2.7.1 Natural Frequencies: Free vibration frequencies of the system.

2.7.2 Mode Shapes: The vibrational shape of the system when vibrating at one of its natural frequencies. Each natural frequency has a different mode shape.

2.7.3 Damping: An energy dissipation mechanism that reduces the amplification and broadens the vibratory response in the region of resonance. Damping is usually expressed as a percentage of critical damping. Critical damping is defined as the least amount of viscous damping that causes a single-degree-of-freedom system to return to its original position without oscillation after initial disturbance.

2.8 Resonance: The condition that exists when the equipment has the same predominant period as does the applied forcing function.

2.9 Mathematical Model: The idealization of a component/structure/equipment as an assemblage of linear systems suitable for detailed dynamic analyses.

2.10 Dynamic Analysis: An analysis procedure for multi-degree of freedom systems where the responses are obtained for each normal mode and then combined to predict the true response and the associated stress and deflection due to any forcing function.

2.11 Static (coefficient) Analysis: An analysis that evaluates the stresses and deflections due to equivalent steady state forces acting through the center of gravity of the equipment. These forces shall be chosen conservatively such that it results in stresses and deflections higher than those predicted by dynamic analyses.

2.12 Supporting Tests: Tests that are conducted to determine the properties and characteristics of the equipment and to provide data needed for the analysis or qualification tests. These tests are either dynamic or static.

2.13 Qualification Tests: Tests that are conducted to prove that the equipment shall perform its safety function when subjected to the loading combinations associated with different postulated plant conditions.

2.14 Device: An item of electric equipment that is used in connection with, or as an auxiliary to, other pieces of equipment.

2.15 Assembly: Two or more devices (or elements) sharing a common mounting or supporting structure.

2.16 Failure: The condition when an equipment can no longer perform its intended safety function.

2.17 Malfunction: Improper performance of mechanical or electrical equipment.

3 Scope of Equipment Seismic and dynamic Qualification

3.1 Safety- related equipment(Seismic category I equipment)

Seismic category I equipment is required to be seismically and dynamically qualified by demonstrating that its structural integrity and safety function during and after a postulated earthquake in conjunction with the full range of applicable normal and accident loads and conditions.
Seismic category I equipment requiring qualification in accordance with the APR1400 EQP is described as follows:

a. Equipment associated with systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment reactor heat removal.

b. Equipment and systems used to power, control or monitor other SSC important to safety

c. Equipment essential to preventing significant release of radioactive material to the environment.

d. Instrumentation (including accident and post-accident monitoring) needed to assess plant and environmental conditions during and after an accident, as described in USNRC RG (RG) 1.97 "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants."

The equipment seismic qualification program criteria define specific technical requirements for seismic and dynamic qualification of seismic Category I, safety-related mechanical equipment (excluding piping), and seismic Category I (class 1E) electrical and instrumentation equipment, including associated supports and mountings. The program includes qualification of Category I tanks and reservoirs for hydrodynamic seismic loads, where applicable. All such equipment that is required to perform functionally or maintain its structural integrity, as described above, is subject to rigorous seismic/dynamic qualification. A detailed listing of APR1400 standard plant seismic Category I equipment, requiring seismic qualification, is given in Table 3.2-1 in Tier 2 of the APR1400 DCD.

It should be noted that detailed criteria for functionality testing and inspection of mechanical and electrical equipment such as performance tests, hydrostatic tests, leakage tests, etc. are not within the scope of the equipment seismic qualification program. Also, qualification through dedication of commercial grade items (i.e., those items which are available commercially and not designed and manufactured under a quality assurance program complying with 10 CFR 50 Appendix B) is not within the scope of the equipment seismic qualification program or the overall generic EQP.

For commercial grade items that will be used in safety-related and important to safety applications, a commercial grade dedication plan and special technical evaluations are required which account for the critical design and acceptance characteristics of the items.
The COL applicant may utilize commercial grade dedication as appropriate for the project specific EQP.

3.2 Important to Safety(Seismic category Ⅱ equipment)

The equipment seismic qualification program criteria also define technical requirements for seismic and dynamic qualification of important to safety equipment whose failure could prevent satisfactory accomplishment of one or more of the safety-related functions.
This includes seismic category II equipment, defined as that equipment which performs non- safety-related function, and whose continued function is not required, but whose structural or functional failure or interaction could degrade the function or integrity of a seismic category I SSC to an unacceptable level, or could result in incapacitating injury to occupants of the control room.
Therefore, seismic category II equipment can be seismically qualified by demonstrating that it retains its position sufficiently in the event of an SSE to the extent that it will not cause unacceptable structural interaction with or failure of seismic category I SSCs. For fluid systems, this requires an appropriate level of pressure boundary integrity to prevent seismically-induced flooding that may cause adverse effects on safety-related SSCs.

In cases where it is not possible or practical to isolate the seismic category I equipment, non-seismic equipment that is adjacent to seismic category I equipment is classified as seismic category II and analyzed and supported such that an SSE event does not cause an unacceptable interaction with the seismic category I equipment.

4.0 BIDDER REQUIREMENTS AND SUPPLIER'S RESPONSIBILITIES

4.1 The Bidder shall submit a summary of the proposed seismic and dynamic qualification program, as a part of the proposal.

4.2 The Bidder shall be responsible for resolving any uncertainties regarding the procurement specifications and requirements of dynamic qualification, prior to award of contract.

4.3 The dynamic qualification of the equipment shall be achieved by testing, analysis or a combination of testing and analysis. When testing is employed, the Supplier shall submit to the COLA a detailed test plan for review, 8 weeks prior to conducting the test. When analysis is employed, the Supplier shall submit to the COLA a detailed analysis procedure showing the

methodology, approval, and description of the computer program used. If the COLA is not satisfied, the test plan or analysis procedure shall be modified accordingly.

4.4 The choice between testing and analysis may be made by the Supplier. However, the selected qualification program shall satisfy the requirements of NRC RG 1.100 and IEEE Std. 344.

4.5 After the Supplier submits the equipment drawings for final review, the Supplier is required to submit the dynamic qualification report for the test results and/or dynamic calculations. The drawings, test results and analytical calculations will be reviewed for acceptability by the COLA.

4.6 The Supplier shall answer all appropriate questions which the COLA may require after reviewing the dynamic qualification report. If the answers given are not acceptable to the COLA, the Supplier shall modify the method of dynamic testing and/or the analytical procedure to satisfy the requirements of NRC RG 1.100 and IEEE Std. 344..

4.7 In cases where the equipment fails to withstand the loads associated with the postulated plant condition under the dynamic qualification program, the Supplier shall be responsible for making all necessary changes to his equipment, at his own expense, so that the dynamic test results and/or the analytical calculations meet the dynamic qualification criteria requirements.

4.8 In some cases the supporting structure is flexible. The Supplier shall be responsible for determining whether the supporting structure (including any in-place steel provided by the COLA) is a rigid or a flexible support.

5.0 QUALIFICATION REQUIREMENTS

5.1 The dynamic qualification of Safety-Related equipment is achieved by assuring its structural integrity and verifying the operability of active equipment when subjected to equivalent conditions which would be seen during the postulated plant conditions. The Supplier may select one of the following qualification programs:

5.1.1 Qualification by tests only.

5.1.2 Qualification by analytical methods only.

5.1.3 Qualification by the use of experience data.

5.1.4 Qualification by any combination of supporting tests, supporting calculations, qualification tests, analytical calculations and experience.

5.2 Regardless of the equipment qualification programs chosen, the conditions and requirements for those portions of the program are stated in the following sections and shall be met.

6.0 QUALIFICATION PROGRAMS

6.1 Many factors control the design of a qualification program. If qualification is to be achieved by analysis only, all assumptions used in the analysis shall be given and justified. If testing alone is used for qualification, all applicable loads shall be simulated during the test unless it can be shown that the simultaneous application of certain loads is not necessary for assuring the equipment's safety function.

6.2 Qualification by Testing Only: Qualification by testing only is recommended when the following conditions are fulfilled:

6.2.1 The test machine is capable of producing the required motion in accordance with the conditions stated in Section 8 of this program.

6.2.2 The applicable loads are of a simple nature or it is possible to simulate them.

6.2.3 The test table allows the simulation of actual mounting.

6.2.4 It is possible to monitor the functional capability of active equipment during the test.

6.2.5 The structural configuration of the equipment is extremely complex and beyond the capability of mathematical modeling techniques.

6.2.6 The response of the equipment is expected to be extremely nonlinear.

6.3 Qualification by analytical methods only: Analytical calculations only may be used as a qualification method in the following cases:

6.3.1 When maintaining the structural integrity is an assurance for the safety function.

6.3.2 When the equipment is structurally simple.

6.3.3 When the response of the equipment is linear or is a simple nonlinear behavior.

6.3.4 When the effect of attached components and the superposition of load conditions are too complex for testing.

6.4 Qualification by the use of experience data: experience data may be used for a qualification of the equipment as followings:

6.4.1 When qualifying equipment in function and physical characteristics is similar to the equipment that have been previously qualified by testing, analysis or a combination of testing and analysis.

6.4.2 When the equipment type is similar to the equipment that has been in-service for various periods of time and has been exposed to in-plant vibration and natural seismic disturbances.

6.5 Qualification by supporting tests and analytical calculations (combination):

6.5.1 Supporting tests may be used to determine:

a. Deflection limits within which operability is maintained.

b. Dynamic parameters needed for constructing or verifying mathematical models.

c. Damping values.

d. Assumption to be used in the analysis.

e. The amount of nonlinearity involved.

6.5.2 Supporting tests may be static or dynamic. The dynamic test may be conducted using shake tables or single point exciters.

6.5.3 After collecting the required information from supporting tests, analytical techniques may be used to show that the structural integrity and/or operability of equipment is maintained without undertaking a complete test program. It must be noted that without performing some supporting tests, analytical calculations alone is weak evidence for assuring operability.

6.6 Supporting tests supplemented with qualification tests:

6.6.1 Supporting tests for these programs may lead to the following type of information:

a. Natural frequencies.

b. Amount of cross-coupling.

c. Significance of simultaneous application of all applicable loads and possibility of decoupling them without affecting the reliability of the equipment.

6.6.2 Such supporting tests may simplify the qualification tests as they may permit justification for single axis excitation, the use of a less complex wave form to simulate the forcing function, and a reduced number of loading conditions.

6.7 Supporting analysis and qualification tests: This approach may be used for qualification of complex and simple assemblies such as control boards, switchgear assemblies, vertical pumps

and motors, diesel-generator units, etc. An analysis approach may be used to determine the overall equipment integrity and response at the subassembly or component locations and the subassemblies may be tested to the response levels that are predicted analytically.

7.0 SUPPORTING TESTS

7.1 Supporting tests may be either dynamic or static in nature.

7.1.1 Dynamic supporting tests: In these tests, the equipment may be excited by using a shake table, or single-point exciters applied at a sufficient number of points to simulate the forcing function. The excitations shall be of sufficient strength to excite all significant modes of the equipment. Typical data obtained from such tests are:

a. Dynamic characteristics of the equipment (natural frequencies, mode shapes and damping factors).

b. Cross-coupling effects, i.e., the response in any direction due to the excitation in any other direction (in situations where installing accelerometers in some locations is impractical, cross-coupling may be estimated based on the response of the available accelerometer locations).

c. The significance of the response of the equipment to vibratory motion to determine the necessity of combining equipment nozzle loads with other dynamic loads.

7.1.2 Static supporting tests: These tests are conducted by applying static forces on the equipment. Typical data obtained from these tests are:

a. Static deflections and flexibility parameters that are needed for constructing a mathmatical model.

b. Distortion in the equipment casing, due to nozzle loads, and the deformation limits within which the equipment would maintain its functionality.

8.0 QUALIFICATION TESTS

Active equipment shall be tested under operating conditions in accordance with the requirements of IEEE Std. 344 and US NRC Regulatory Guide 1.100. Equivalent operating loads shall be simulated to act on passive equipment, but the equipment itself need not be under an operating condition. The following requirements are conditions for a proper qualification test and shall be fulfilled:

8.1 Dynamic Input: The input for dynamic testing shall be determined from the floor motion and shall be modified, as necessary, by the test procedure and setup. The input for dynamic testing

shall include non-seismic vibratory loads as well as seismic loads.

When single-axis excitation is used, cross-coupling shall be considered as follows:

a. When performing the supporting tests the extent of the response in any other direction shall be determined. To explain, let r_{ij} be the ratio of the response in the j direction to the excitation in the i direction, and determine r_{xy}, r_{xz}, r_{yx}, r_{yz}, r_{zx} and r_{zy}. Where x, y, z are the three principal directions of the equipment or any other set of orthogonal axes which may produce higher response.

b. The dynamic coefficients to be used in qualification tests shall be based on the values obtained from the design response spectrum increased by the cross-coupling factors, r_{ij}, obtained from the supporting tests or estimated by other acceptable means.

8.2 Mounting: The equipment shall be mounted to simulate the recommended service mounting. If this cannot be done, the effect of the actual supporting structure shall be considered in determining the input motion.

8.3 Nozzle Loads: The expected (or calculated) piping reaction loads on the equipment shall be used in the qualification.

8.4 Other Loads: Any other loads that may act on the equipment (Mechanical, electrical or instrument) during the postulated dynamic event shall be simulated during the test, unless the supporting tests (or calculations) show that they are insignificant.

8.5 Basis of Acceptability: Inspection shall be made by the test conductor to assure that no structural damage has occurred. For active equipment, sufficient monitoring devices shall be used to evaluate the performance of the tested equipment during the test. The equipment shall demonstrate its ability to perform its intended safety function when subjected to all applicable loads. A test report, which includes all test data, results and conclusions, shall be submitted to the COLA for review. A suggested format for the test report is presented in Section 16. It is recommended that the Supplier follow the outline of Section 15 for documenting the dynamic testing. This will facilitate the review of the material in the report and ensure its completeness.

9.0 ANALYTICAL TECHNIQUES

Analytical calculations may be used for one of the three purposes:

a. To develop supporting data for performing qualification tests.

b. To qualify the equipment using the data obtained from supporting tests.

c. To qualify the equipment without tests.

10.0 SUPPORTING CALCULATIONS FOR QUALIFICATION TESTS

Calculations may be used to evaluate the effect of the floor motion on the base of the equipment. This would be in such cases as a device installed in a panel or cabinet, equipment mounted on a complex structure, a valve mounted on a piping system, etc. Calculations may also be used to justify reducing the requirements for qualification testing.

11.0 ANALYTICAL QUALIFICATION

11.1 The methods to be used for qualification, by calculations only or by calculations based on supporting test results, are stated in this section. These methods will depend on the type of equipment and supporting structure. The following defines some of the possible cases and associated analytical methods which may be used in each case:

11.1.1 Rigid Equipment and Rigid Support:

a. The equipment, as well as its support can be considered rigid if it can be shown that its fundamental natural frequency does not fall in the frequency range below the high frequency asymptote (ZPA) of the RRS.

b. For rigid equipment supported by a rigid structure (including any in-place supporting steel provided by the Buyer), the equipment motion shall be the same as the floor motion without amplification. The horizontal and vertical dynamic accelerations shall be taken as the zero period acceleration (ZPA) from the floor response spectrum, for the elevation at which the equipment is located, as provided by the COLA.

c. The acceleration values obtained shall be used to perform a static analysis as described in Section 11.7.1 of this report.

11.1.2 Rigid Equipment and Flexible Support:

a. In cases where the equipment itself is a rigid body whereas its supporting system is flexible (including any in-place steel or concrete provided by the COLA), the overall system may be idealized as a single-degree of freedom system consisting of an equivalent mass and spring system.

b. In cases where the equipment and support systems' natural frequency falls in the frequency range below the high frequency asymptote (ZPA), the system shall be remodeled using a multi-degree of freedom idealization. A dynamic analysis shall be performed using an

appropriate damping factor. If the natural frequency is greater than or equal to the ZPA, a static analysis shall be performed using the acceleration value corresponding to the ZPA of the RRS. A conservative static analysis may use the peak acceleration from the RRS.

c. The selection of damping values to be used with the response spectrum curves in determining the acceleration is a significant factor. Unless any specific value is given for analysis, damping factors of 2% for Upset/Service Level B and 3% for Emergency/Faulted/Service Levels C and D shall be accepted. Higher damping values may be accepted only if they can be justified.

11.1.3 Flexible Equipment:

a. In cases where the equipment cannot be considered as a rigid body and where the equipment cannot be modeled as a single-degree of freedom system, it shall be modeled as a multi-degree of freedom system.

b. A dynamic analysis shall be performed and the natural frequencies, mode shapes and modal participation factors for each mode shall be computed.

c. Finally, by combining all the significant modes, the resultant stresses and deflections shall be determined using a detailed (modal) dynamic analysis method.

11.1.4 Equipment supplied with attached piping:

a. For equipment supplied with attached piping, due to construction requirements, the Supplier shall perform an analysis for the attached piping as well as the equipment.

b. The analysis shall satisfy the piping design criteria specified in each procurement Specification.

c. The procedure for analysis shall be determined according to the situation. If the equipment is attached to the floor, then the equipment shall be analyzed first to determine the input to the piping. However, if the equipment is attached to the piping only, (pipe-mounted) the analysis of the piping shall yield the loads to be used in the analysis of the equipment.

11.1.5 Equipment supported by different buildings or different elevations within the same building:

a. This is usually the case for piping, HVAC ducts and cable trays.

b. Stresses resulting from relative displacements at various support locations for systems identified above shall be superimposed to the stresses produced in the system due to inertia effects.

c. Additional restraints, supports or other means shall be employed to limit or reduce the high response loads.

11.2 Plant Conditions/Service Levels/Loading Combinations:
The loading combinations are defined in accordance with different real and postulated plant conditions and equipment service levels for ASME Sec. III components. These plant conditions/equipment service levels shall be classified as stated in the ASME Boiler and Pressure Vessel Code, Section III, Division 1. The same concept of plant condition/equipment service levels shall be applied on all mechanical and electrical equipment, as well as control and instrumentation. However, if the stresses and deflections of the more severe loading condition/service level meets the design limits of the less severe loading condition/service level, it may not be required to check the additional loading conditions/service levels. The loading combinations for the same plant condition/service level shall depend on whether the equipment is a pressure retaining (fluid system component) or a non-pressure retaining (non-fluid system component). In addition, the design stress limits shall depend on whether the equipment is classified as active or passive.

11.3 Service/Design Limits: Unless otherwise stated in procurement Specification, there shall be no deflection limits required for passive equipment. However, for active equipment the deflection limits shall be those maximum deflections that would not impair the operability of the equipment. These limits shall be determined from supporting tests. Engineering judgment shall only be accepted in simple and clear cases. The stress limits for ASME III and non-ASME equipment and supports are summarized in Table I.

11.4 Dynamic Loads: The dynamic loads shall be obtained, in the horizontal and vertical directions, from the corresponding response spectra provided by the COLA for the two postulated accidents, upset and emergency conditions. The horizontal dynamic loads shall be applied in the two horizontal principal directions simultaneously along with the vertical dynamic loads.

11.5 Nozzle Loads: The procurement Specification will specify the nozzle loads that shall be used in the qualification.

11.6 Operating Loads: All loads resulting from the operation of the equipment such as torque due to rotating parts, vibratory loads due to eccentricities, etc.

11.7 Methods of analysis: Acceptable analytical procedures, for the various conditions, are described in the following sections:

11.7.1 Static (coefficient) Analysis: If it can be shown that the equipment and its support are rigid, a static analysis may be performed to determine the stresses and deflections due to dynamic loads. In this case, the dynamic forces shall be determined by multiplying the mass of the subassembly or parts of the equipment times the maximum floor dynamic acceleration at the base of the equipment (zero period acceleration from the response spectra). If the fundamental natural

frequency is not known, a static analysis using 1.5 times the maximum peak of the applicable floor response spectra, is acceptable. These forces shall be applied through the center of gravity of the subassembly or the part of the equipment. The stresses resulting from each force (in each of the three directions) shall be combined by taking the square root of the sum of the squares (SRSS) to yield the dynamic stresses. The dynamic deflections (deflections due to dynamic loads) shall be calculated in the same manner. These dynamic stresses and deflections shall be added to all stresses and deflections resulting from all applicable loads, to obtain the final resultant stresses and deflections, which shall be compared with the design limits stated in Section 11.3. Furthermore, deflections are verified by the assuring operability.

11.7.2 Dynamic Analysis: When acceptable justification for static (coefficient) analysis cannot be provided, a dynamic analysis shall be required, and unless a conservative factor is used to account for the participation of higher modes, a detailed dynamic analysis shall be performed. A mathematical model may be constructed to represent the dynamic behavior of the equipment. The model can be analyzed using the response spectrum modal analysis or time-history (modal or step-by-step) analysis. The maximum inertia forces, at each mass point, from each mode, shall be applied at that point, to calculate the modal stresses and modal deflections. The various modal contributions shall be combined by taking the square root of the sum of the squares of the individual modal stresses or deflections. Closely spaced modes shall be combined by using an approach from US NRC RG 1.92, "Combining Modal Responses and Spatial Components In Seismic Response Analysis". The stresses and deflections resulting from each of the three directions shall be combined by taking the square root of the sum of the squares, to obtain the dynamic stresses and deflections. These dynamic stresses and deflections shall be added to all stresses and deflections resulting from all applicable loads and then compared with the design limits stated in Section 11.3.

11.8 Basis of Acceptability: The resultant stresses and deflections, due to all loads included in the loading combinations stated in the procurement Specification, shall be within the design limits stated also in the procurement Specification. Any deviation from these criteria shall be justified and the calculations shall show that the structural integrity of all safety-related equipment, as well as the operability of active equipment, is maintained when subjected to the specified loading combinations. The Supplier shall submit to the COLA a report, which includes the data, calculations, results and conclusions of the analysis. A suggested form for the report is presented in Section 14.

12.0 EXPERIENCE DATA

12.1 The method to be used for qualification, by the use of experience data, is stated in this section. This method may be accomplished by justifying similarity with the previously qualified equipment or with equipment that have experienced earthquakes. Experience data may be derived from the following sources.

12.1.1 Previous Qualifications: Analysis or test data from previous equipment qualification programs.

12.1.2 Earthquakes: Documented performance for similar equipment in facilities that have been subjected to earthquakes.

12.1.3 Other Experience: Data from operating dynamic loading or other dynamic environments.

12.2 Similarity: Qualification by the use of experience data shall be based on the concept of dynamic similarity for excitation, physical system, dynamic response and operability as followings.

12.2.1 Similarity of excitation such as spectral characteristics, duration, directions of excitation axes, and location of measurement, for the motions relative to the equipment mounting.

12.2.2 Similarity of the equipment configuration shall be established.

12.2.3 A physical system dynamic response can be described through the same quantities as those applied to excitation or through a physical system description.

12.2.4 The experience data shall provide documented evidence to support the demonstration of proper operability.

13.0 OPERABILITY OF ACTIVE EQUIPMENT

The methods and guidance in ASME QME-1-2007 including Appendix QRA, with exceptions provided in NRC RG 1.100, are used for seismic qualification of active mechanical equipment. The seismic and dynamic testing portion of the qualification program is performed in a sequence consistent with the requirements of Section 6 of IEEE Std. 323-2003 .

The Supplier shall prove by test and/or analysis the operability of all active equipment before, during, and after (if required) Design Basis Events including Seismic and provide the test or analysis report as a part of the dynamic qualification report.

13.1 Electrical and Instrumentation
The Supplier shall use the qualification test methods described in Section 8.0 of this report to prove the operability of active electrical and instrumentation equipment.

13.2 Mechanical Equipment
For mechanical equipment, the Supplier should prove the operability by analysis and/or tests as follows:

13.2.1 Pumps
A static deflection analysis and/or test for the shaft and rotor (if applicable) should be performed

under design base loading, including the maximum allowable nozzle loads specified in the procurement Specification. The deflection shall be less than the allowable/ recommended deflection by the Supplier.

13.2.2 Valves

The operability requirements stated in Reference 17.7 shall be followed by the Supplier and are considered part of this report.

13.2.2.1 Acceptable Methods to Prove Valve Operability

The following are the acceptable methods that can be applied by the Supplier to demonstrate valve operability:

13.2.2.1.1 Manual Valves

Active manual valves are those that should be opened, or closed, after DBA. In this case, Supplier shall prove by analysis and/or test that the valve moving parts (stem, disc, etc.) are not permanently damaged due to DBA along with the maximum operating and nozzle loads.

13.2.2.1.2 Check Valves

Supplier shall prove by test and/or analysis the integrity of the valve and its parts, including disc, disc support, hinge, hinge-pin, hinge-arm, and seat. Valve has to undergo in-shop hydrostatic tests. Impact loading may, or may not, be of concern depending on the design and flow condition of the check valve. Supplier should demonstrate that the impact of valve's disc does not damage its seat or other parts of the valve.

The valve's operability verification document should address by test and/or analysis all possible worst loading conditions on the valve during and after seismic events including any applicable impact loading.

13.2.2.1.3 Other Active Valves

All other active valves (except manual, and check valves) should be subjected to the following tests and/or analyses to demonstrate operability:

a. Backseat and main seat leakage, and disc hydrostatic tests that verify the functionality of the valve within the specified time limits, when subjected to the design differential pressure and design base loads. Three full stroke operations, as a minimum, are required.

b. Test and/or analysis should be performed for static equivalent seismic loads applied at the center of gravity (CG) of valve's extended structure.

13.2.3 Mechanical Drive Turbines

The operability of the mechanical drive turbine should focus primarily on the operability of auxiliary active components (valves, pumps, instruments) associated with or mounted on the turbine. The operability should be performed by analysis and/or test.

13.2.4 Fans

The Supplier shall demonstrate the operability of fans by performing an analysis and/or test to determine the shaft and bearing deflections when the fan is subjected to the external design base loads. The resulting clearance between the shaft and bearing as a result of these loads shall be smaller than the recommended clearance by the manufacturer.

13.2.5 Diesel Engine

For the operability of the diesel engine and its auxiliary active components (valves, pumps, instruments), the Supplier shall follow the methods described in IEEE Std. 387 and NRC RG 1.9.

14.0 BUILDING STRUCTURE LOADS

14.1 Regardless of the qualification method(s) used, the Supplier shall be required to provide the COLA with all the loads transmitted to the building structure. The following loads shall be included in the calculations and the results for each shall be given separately:

14.1.1 Dead load

14.1.2 Operating loads

14.1.3 Nozzle Loads (if applicable)

14.1.4 Pressure and thermal loads (if applicable)

14.1.5 Additional loads due to dynamic excitations (if applicable)

14.1.6 Any other loads which may be transmitted to the foundation during the dynamic event.

14.2 The Supplier shall fill the Building Structure Load Summary Form (Attachment 1) for each equipment. And, detailed load and stress calculation of mounting connection shall be included in Building Structure Load Summary.

14.3 When the purchase specification requires the Supplier to design the mounting connection to the building structure, calculations may be included in the Building Structure Load Summary. If these calculations are provided as a separate document, they shall be referenced in the Building Structure Load Summary. Table II and Table III indicate load combinations and stress limits and strength limits for design of bolted and anchor bolted connections to the building structure.

15.0 DOCUMENTATION

The dynamic qualification report shall include all the information stated in Section 16 and shall

be submitted to the COLA for review and approval. The Seismic Qualification Supplier Checklist (Attachment 2) shall be included in the dynamic qualification report.

16.0 FORMAT OF THE DYNAMIC QUALIFICATION REPORTS

The dynamic qualification reports shall include both information suggested below and IEEE 344 Section 10.3., and should present a clear, logical explanation of how the data has been used to achieve qualification.

Title Page

The following information should be shown on the Title Page:

A. Buyer
B. Supplier and Equipment Name
C. Specification Number
D. Revision Number
E. Date
F. Equipment Tag No.

I - General

This section shall include a description of the equipment, its safety function(s) and the qualification program used to verify the safety function(s). In addition, the following information shall be provided:

A. Project and the Buyer Names
B. Specification and Purchase Order Numbers
C. Equipment Name and Number
D. Organization(s) performing qualification program
E. Similarity analysis showing the similarity between the equipment being qualified and the equipment purchased from Supplier.

II - Data and Assumptions

A. Testing Section

The following data shall be included:

1) Type of testing machine
2) Loads considered and attempts made to idealize them during the test
3) Methods used to simulate the supporting structure
4) Position and orientation of setting equipment

5) Steps taken to monitor the function of equipment during the test and tentative accelerometer locations (photographs are recommended).
6) Means of generating test response spectra (if applicable)
7) Calibration dates and results for all instruments used in the dynamic test.
8) Approved test plan.

B. Analytical Section

The following data shall be presented:

1) Loads considered
2) Damping values used in the analysis
3) Codes and Standards used as bases for the analysis
4) Assumptions made for idealizing boundary conditions, converting the load criteria to actual loads used for calculations and converting the design criteria to actual stress, deformation and stability limits.
5) A list of the computer programs used in the analysis and the documentation, which establish the validity of any computer program used, if not included in the public domain.
6) Input and output data of the computer program to verify the loading criteria and analysis result.

III - Qualification Procedure

A. Testing Section: State type of test, wave form, frequency range, acceleration levels, axes of excitation, phase between inputs, equipment mounting details during testing, and any other data to completely describe the input motion and show how it is applied.

B. Analytical Section: State the method used in the analysis, analytical equations and their derivation from basic principles. The calculations should be mentioned, if any.

IV - Results

A. Testing Section: This section shall include the measurements obtained from the test and their interpretations. Findings and observations from monitoring the function of the equipment and/or inspection shall be presented. The generated test response spectra curves superimposed on the required response spectra curve shall be shown in this section, when applicable. All results should be presented in either numerical or graphical form.

B. Analytical Section: Show actual design calculations and sketches for the mathematical models, including numbering used for the node points and numbers. If possible, show loads, resultant forces, moments, stresses and deformation on the mathematical model of the equipment.

C. For Active equipment: Demonstrate the method used and results of equipment operability during and/or after design basis events, as required in procurement specification.

V - Conclusions

Give a brief summary of the results obtained from the qualification program. A concise statement of the conclusion reached, which should satisfy the qualification requirements, shall be stated in this section.

VI - Drawings

Submit design drawings of the equipment and its supports. All necessary dimensions shall be shown on these drawings.

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17.0 REFERENCES

17.1 US NRC Reg. Guide 1.100 "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants." 2009.

17.2 US NRC Reg. Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis."

17.3 NUREG-0800 (SRP 3.7, 9, 10), "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. "

17.4 IEEE Std 323, " Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations." 2003

17.5 IEEE Std 344, "Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations." 2004

17.6 ASME QME-1, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants " 1-2007

17.7 US NRC Generic letter No. 89-10, "Safety-Related MOV testing and Surveillance."

17.8 IEEE Std. 387, "Standard Criteria for Diesel-Generator Units Applied as Standby Power Suppliers for Nuclear Power Generating Stations."

17.9 US NRC Reg. Guide 1.9 "Application and Testing of Safety-Related Diesel Generators in Nuclear Power Plants."

17.10 ACI 349, "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-01) and Commentary."

17.11 ANSI/AISC N690, "Specification for Safety-Related Steel Structures for Nuclear Facilities."

TABLE I – STRESS LIMITS FOR EQUIPMENT & SUPPORTS

(EXCLUDING ITEMS ASSOCIATED WITH BUILDING STRUCTURE – REFER TO SKETCH1)

Plant Operating Condition	Loading Combination	Stress Limits for ASME Section III Equipment and Supports (use Appropriate class and subsections)		Stress Limits for Non – ASME Section III Equipment and Supports[4)]
		Active Equipt.	Passive Equipt.	
Normal	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)]	Service Limit A	Service Limit A	AISC N690-94 Section Q1.5
Upset	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)] + Upset Condition Dynamic Loads[2)]	* Service Limit B	Service Limit B	* AISC N690-94 Section Q1.5
Emergency And Faulted	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)] + Emergency / Faulted Condition Dynamic Loads[3)]	* Service Limit B	Service Limit C and D respectively	* AISC N690-94 Section Q1.5 multiplied by 1.6 but not to exceed 0.95 F_y for tension; and multiplied by 1.4 but not to exceed 0.95 $F_y/\sqrt{3}$ for shear

* For active components, shaft(rotor) deflection analysis shall be performed for verifying operability.

TABLE II – STRESS LIMITS FOR BOLTING TO STEEL BUILDING STRUCTURE *

(INDEPENDENT OF EQUIPMENT CLASSIFICATION – REFER TO SKETCH 1)

Plant Operating Condition	Loading Combination	Stress Limits
Normal	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)]	AISC N690-94 Section Q1.5/Q1.6/ Q1.16/Q1.23
Upset	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)] + Upset Condition Dynamic Loads[2)]	AISC N690-94 Section Q1.5/Q1.6/ Q1.16/Q1.23
Emergency and Faulted	Dead Loads + Pressure Loads + Thermal Expansion Loads + Equip. Operation Loads[1)] + Emergency / Faulted Condition Dynamic Loads[3)]	AISC N690-94 Section Q1.5/Q1.6/ Q1.16/Q1.23 multiplied by 1.6 and 1.4 for tension and shear stress limits respectively

* BUILDING STRUCTURE REFER TO A/E DESIGNED COMPONENT(REFER TO SKETCH 1)

TABLE III – STRENGTH LIMITS FOR ANCHORING TO BUILDING STRUCTURE *

(INDEPENDENT OF EQUIPMENT CLASSIFICATION – REFER TO SKETCH 1)

<table>
<tr><th>Plant Operating Condition</th><th>Loading Combination</th><th>Strength Limits per
ACI 349-01
Appendix B</th></tr>
<tr><td>Normal</td><td>(0.9) Dead Loads[5)]
+ (1.7) Pressure Loads
+ (1.3) Thermal Expansion Loads
+ (1.4) Equip. Operation Loads[1)]</td><td rowspan="2">Tensile Strength
$\phi_n N_s = \phi_n A_{se} f_{ut} \geq N_u$
where, f_{ut} shall not be taken greater than $1.9 f_y$ or 125,000 psi.

Shear Strength
$\phi_s V_s = \phi_s (0.6) A_{se} f_{ut} \geq V_u$
where, f_{ut} shall not be taken greater than $1.9 f_y$ or 125,000 psi.

Tension / Shear Interaction
$\frac{N_u}{\phi_n \cdot N_s} + \frac{V_u}{\phi_s \cdot V_s} \leq 1.2$
where,
$\phi_n = 0.80$, $\phi_s = 0.75$</td></tr>
<tr><td>Upset</td><td>(0.9) Dead Loads[5)]
+ (1.7) Pressure Loads
+ (1.3) Thermal Expansion Loads
+ (1.4) Equip. Operation Loads[1)]
+ (1.7) Upset Condition Dynamic Loads[2)]</td></tr>
</table>

Emergency And Faulted	(0.9) Dead Loads + (1.0) Pressure Loads + (1.0) Thermal Expansion Loads + (1.0) Equip. Operation Loads[1)] + (1.0) Emergency / faulted Condition Dynamic Loads[3)]	Note) ■ The tensile & shear stress area for anchor shall be taken as $A_{se} = 0.7854[D - \frac{0.9743}{n}]^2$ where, D : Major thread diameter n : Number of threads per inch ■ Minimum center-to-center spacing For untorqued anchors : $4d_o$ For torqued anchors : $6d_o$ Maximum anchor diameter Anchor diameter(d_o) ≤ 2 in where, d_o : Outside diameter of anchor ■ If the concrete strength of the equipment foundation, as designed by A/E, does not meet the anchor bolt ductile failure requirements of ACI 349-01 Appendix B, Vendor shall modify anchor bolt details including bolt diameter, number of bolt, bolt material and bolt arrangement as recommended by A/E ■ See ACI 349-01 Appendix B for nomenclatures shown on this table.

* BUILDING STRUCTURE REFER TO A/E DESIGNED COMPONENT (REFER TO SKETCH 1)

Notes:

1) Equipment operating loads are those loads associated with the operation of the equipment being qualified. Equipment operating loads include but are not limited to :

   a) Piping nozzle reactions
   b) Motor start-up and running torque
   c) Valve seating torque and/or thrust
   d) Thrust load on fans and pumps

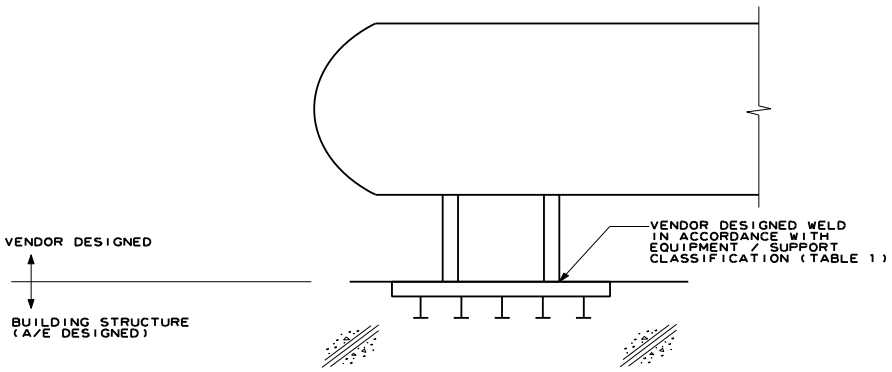
2) Upset condition dynamic loads include the postulated dynamic loads as identified in the Purchase Specification.

3) Faulted condition dynamic loads include the safe shutdown earthquake plus other postulated dynamic loads as identified in the Purchase Specification.

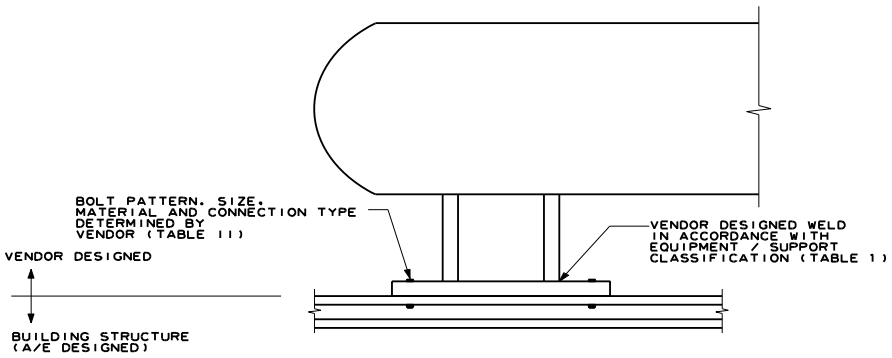
4) Weld allowable stresses shall be per AISC N690-94 Q1.5.3 for Normal & Upset Load Cases. For Emergency and Faulted Load Cases, the allowable stresses per AISC N690-94 Table Q1.5.3 may be increased by 1.6 but shall not exceed 0.95 F_y for tension and by 1.4 but shall not exceed 0.95 $F_y/\sqrt{3}$ for shear.

5) a) When calculating the overturning moments induced from eccentricity between weight center and anchor group center, the load factor of dead load shall be 1.4 instead of 0.9.

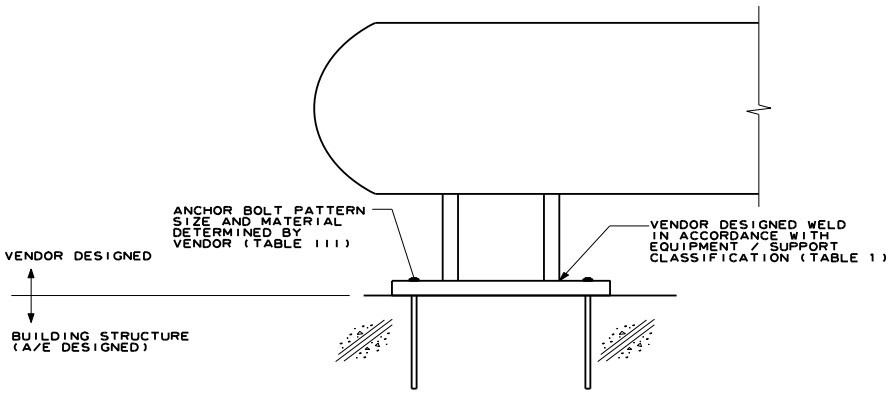
   b) When calculating the horizontal forces and overturning moments induced from seismic condition, the load factor of dead load shall be 1.4 instead of 0.9.



(a) EQUIPMENT SUPPORT DIRECTLY WELDED TO BUILDING STRUCTURE



(b) EQUIPMENT SUPPORT BOLTED TO STEEL BUILDING STRUCTURE



(c) EQUIPMENT SUPPORT ANCHOR BOLTED TO CONCRETE BUILDING STRUCTURE

SKETCH 1 - TYPICAL EXAMPLES OF EQUIPMENT ATTACHMENTS TO BUILDING STRUCTURE

Annex 1

BUILDING STRUCTURE LOAD SUMMARY FORM

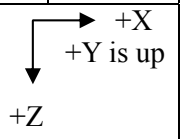
BUILDING STRUCTURE LOAD SUMMARY FORM

(Seismic Category I Equipment Foundation)

Client: KHNP		Prepared by :	Date :
Project :	Project No. :	Reviewed by :	Date :
Equip. Name :		Approved by :	Date :
Equip. No. :		Drawing No. :	
Building Location :		☐ Safety Related Equipment	
Building Elevation :		☐ Non-Safety Related Equipment	

Building Structure Loads		Forces (kips)			Moments (ft-kips)		
		F_X	F_Y	F_Z	M_X	M_Y	M_Z
Dead Loads							
Operating Loads (Except Nozzle Loads)							
Pressure Loads							
Nozzle Loads	Service Level B (Upset)						
	Service Level D (Faulted)						
Dynamic Loads	Service Level B (Upset) [4]						
	Service Level D (Faulted) [5]						

Foundation Plan Sketch [1], [2]



Note 1) The above building structure loads are the resultant directional forces and moments at the geometric center of the foundation bolt group or weld group. Indicate the geometric center of the foundation bolt group or weld group on the foundation plan sketch.

2) Global axes X, Y & Z are mutually perpendicular at the equipment base/foundation, where axis Y coincides with the vertical direction

3) The resultant directional moments at the foundation are a summation of applicable local moments and transferred local force contributions.

4) Postulated dynamic loads (as applicable)

5) SSE plus other dynamic loads (as applicable)

Annex 2

SEISMIC QUALIFICATION SUPPLIER CHECKLIST

INSTRUCTIONS

In the space provided for comments after each question, the supplier shall

a. indicate the applicable sections of the dynamic qualification report (where such information can be found) in “comments” column if answer to the question is "YES."

b. indicate if the exclusion of information is acceptable or unacceptable and provide justification, if answer to the question is "NO."

Seismic Qualification Supplier Checklist

PNS No. : _____ Date : _____

Supplier Doc. No. : _____ Page : ___ of ___

Item #	Description	Yes	No	N/A	Comments
1	Did you adequately describe the qualified equipment (Manufacturer, Model, Equipment ID, Weight / Dimensions, etc.)?				
2	Did you identify the equipment mounting location (Building, Elevation)?				
3	Did you adequately describe all safety components installed in the qualified equipment?				
4	Did you describe equipment's function?				
5	Did you compile RRS and corresponding damping values, or Seismic Coefficients (Required Acceleration)?				
6	Did you consider other non-seismic loads specified for the equipment and the method of combining all loads?				
7	Did you contain finalized outline drawing including dimension and foundation?				
8	If the qualification is performed by a test, did you identify the following?				
	a – Applicable codes and standards				
	b – Test input with margins including the mounting condition				
	c – All safety components installed in the equipment? (In case of electrical equipment, did you test in accordance with the Daughter standard? Component list(Q, Non-Q)				
	d – If applicable, required aging prior to seismic testing				
	e – If any, similarity between tested and installed equipment				
	f – Acceptance criteria (Mounting method, material, size, torque, welding size etc.)				
	g – Operability requirements and test results				
	h – Test methods and procedures				
	i – Equipment performance before/during/after test				
	j – Monitoring of the equipment to evaluate its performance				
	k – Natural frequencies				
	l – the test results for 5 OBE and 1SSE tests				

Seismic Qualification Supplier Checklist

PNS No. : _____ Date : _____

Supplier Doc. No. : _____ Page : ___ of ___

Item No.	Description	Yes	No	N/A	Comments
	m – Anomalies and its dispositions				
	n – Test equipment, its accuracy and date of calibration				
	o – Coherence check				
	p – Time history provided				
9	If the qualification is performed by an analysis, did you identify the following?				
	a – Analysis methods and assumptions				
	b – Applicable codes and standards				
	c – If Computer-Aided Calculation, programs used with validation information				
	d – Postulated Static Loads to be considered (weight, pressure, thermal loads, startup torque for rotating equipment etc.)				
	e – Natural frequencies				
	f – Adequacy of the analysis method				
	g– Materials and mechanical properties for each members				
	h – Comparisons between the calculated and allowable stresses				
	i – the deflections for critical elements				
	j – Demonstration for operability of active equipment				
	k – Model adequacy (Weight comparison, Boundary Condition, Effective mass, Material property)				
	l – Check the input loads (Pressure, Nozzle loads, Torque, Thrust, Seismic load, Non-seismic loads if applicable)				
	m – Check whether the output stress values in the report is equal to the values of being described in the body of the report. Are the output stress results attached adequately?				