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APPROVED

South Texas Project - Nuclear Operating Company
STP Units 3&4

Project Requirements Document

Title: Equipment Qualification Program

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Project Name	STP-34
Item Name	N/A
Item Number	N/A
Job Number	B03974-05
Applicable Plant	STP Units 3&4

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Contributors

Asif Mohiuddin (Sargent & Lundy /EQ)

Atsushi Tanaka (Toshiba America Nuclear Energy Corporation /Electrical)

Caroline S. Schlaseman (MPR Associates/Licensing)

Daisuke Oshima (Toshiba/QA)

Hirohide Oikawa (Toshiba/Safety Design)

Hiroyuki Torigoe (Toshiba/Pump Design)

Ismail T. Kisisel (Sargent & Lundy /EQ)

Koji Nishino (Toshiba/Valve Design)

Koichi Sekiguchi (Toshiba/CRD System Design)

Ron Wessel (Westinghouse/EQ)

Ryuji Iwasaki (Toshiba/Licensing)

Scott Steele (Sargent & Lundy /Electrical)

Shigeki Yokoyama (Toshiba/Plant Design)

James Parello (Toshiba America Nuclear Energy Corporation)

Takashi Ueki (Toshiba/Seismic Design)

Toshiaki Ito (Toshiba/I&C)

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Nomenclature

Acronyms	Definition
ABWR	Advanced Boiling Water Reactor
AC	Alternate Current
AISC	American Institute of Steel Construction
ANSI	American National Standard Institute
AOO	Anticipated Operational Occurrences
ASME	American Society of Mechanical Engineers
ASME B&PV Code	American Society of Mechanical Engineer Boiler & Pressure Vessel Code
CFR	Code of Federal Regulation
COLA	Construction Operation Licensing Application
C of C	Certificate of Conformance
CO_2	Carbon Dioxide
DBA	Design Basis Accident
DBE	Design Basis Event
DC	Direct Current
DCD	Design Control Document
E	Activation Energy
ELCS	Engineered safety features Logic and Control System
EMC	Electro Magnetic Compatibility
EPRI	Electrical Power Research Institute
EQ	Equipment Qualification
EQD	Environmental Qualification Document
ETS	Engineering Technical Specification
EUT	Equipment Under Test
FMEA	Failure Modes and Effects Analysis
FPGA	Field Programmable Gate Array
GDC	General Design Criteria
GDD	General Design Document
GL	Generic Letter

Nomenclature (Cont'd)

Acronyms	Definition
GMRS	Ground Motion Response Spectra
HELB	High Energy Line Break
Hz	Hertz (Cycle/Sec)
H_2	Hydrogen
H_2O	Water
IEB	Information and Enforcement Bulletin
IEEE	Institute of Electrical and Electronics Engineers
IEN	Information and Enforcement Notice
IN	Information Notice
ISI	In Service Inspection
I&C	Instrumentation & Control
K	Kelvin
LOCA	Loss of Coolant Accident
EQ-MEL	EQ Master Equipment List
M&S	Maintenance & Surveillance
N/A	Not Applicable
NEMA	National Electrical Manufacturers Association
NMS	Neutron Monitoring System
NNR	Non-Conformance Notice Report
NRC	Nuclear Regulatory Commission
NUREG	Nuclear Regulatory Commission Regulatory Guide
OBE	Operating Basis Earthquake
OEQP	Operating Equipment Qualification Program
O_2	Oxygen
PM	Preventive Maintenance
PPM	Parts Per Million
PPB	Parts Per Billion
QA	Quality Assurance

Nomenclature (Cont'd)

Acronyms	Definition
RG	Regulatory Guide
RIM	Required Input Motion
RRS	Required Response Spectra
RTIS	Reactor Trip and Isolation System
SCEW	System Component Evaluation Worksheet
S/cm	Siemens per centimeter
SRP	Standard Review Plan
SRSS	Square Root of the Sum of the Squares
SRV	Safety Relief Valve
SSC	System, Structures and Components
SSE	Safe Shutdown Earthquake
STP	South Texas Project
STPNOC	South Texas Project Nuclear Operating Company
TID	Total Integrated Dose
TRS	Test Response Spectra
UPS	Uninterruptible Power Supply
U.S.	United States
ZPA	Zero Period Acceleration

Introduction

U.S. Nuclear Regulatory Commission (NRC) Code of Federal Regulation 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 4 (Reference 4.1.A (6)) states, in part, that "Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents." In addition, 10 CFR 50.49 (Reference 4.1.B (1)) contains specific requirements regarding the environmental qualification of electrical equipment important to safety that is located in a harsh environment. Regulatory Guide 1.89 Revision 1,"Environmental Qualification of Certain Electric Equipment Important to Safety in Nuclear Power Plants" (Reference 4.1.B (2)) provides guidance for implementing the requirements and criteria of 10 CFR 50.49 (Reference 4.1.B (1)) for environmental qualification of electrical equipment that is important to safety and located in a harsh environment. In Regulatory guide 1.89 Revision 1 the NRC concluded that the provisions of Institute of Electrical and Electronics Engineers (IEEE) Std 323-1974 (Reference 4.2.A (1) A)) were acceptable and provided supplementary guidance for satisfying Nuclear Regulatory Commission's regulations regarding the environmental qualification of electrical equipment including acceptable methods of meeting 10CFR 50 Appendix A GDC 1, 2, 4 & 23.

Section 3.11 of Standard Review Plan (SRP) NUREG-0800 Revision 2,"Environmental Qualification Of Mechanical And Electrical Equipment" (Reference 4.1.F (3)) provides guidance for environmental qualification of equipment located in harsh and mild environments. Additionally, IEEE Std 344-1987 (Reference 4.2.C (1)), as endorsed by Regulatory Guide 1.100 Revision 2, "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants" (Reference 4.1.B (3) A)) provides requirements for seismic and hydrodynamic qualification. Regulatory Guide 1.97 Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environmental Condition During and Following an Accident" (Reference 4.1.B (4)), provides guidance for implementing the requirements and criteria of 10 CFR 50.49 (Reference 4.1.B (1)) for environmental qualification of post-accident monitoring equipment.

Appendix A provides the compliance traceability matrix of this EQ Program with IEEE Std 323-1974 (Reference 4.2.A (1) A)), IEEE Std 344-1987 (Reference (4.2.C (1)), Regulatory Guide 1.89 Revision 1 (Reference 4.1.B (2)) and Regulatory Guide 1.100 Revision 2 (Reference 4.1.B (3) A)). Appendix A also provides the compliance traceability matrix of this EQ Program with Applicable elements of 10 CFR50 Appendix A (Reference 4.1.A (6)) and 10 CFR50 Appendix B (Reference 4.1.A (1)). Appendix B provides equipment voltage margin.

Equipment Qualification activities shall be performed under a quality assurance/quality control program consistent with 10 CFR Part 50, Appendix B (Reference 4.1.A (1)) and 10 CFR Part 21 (Reference 4.1.A (5)).

This document provides guidelines, acceptable methods and procedures for the environmental and dynamic qualification of equipment for the South Texas Project (STP) 3&4 Advanced Boiling Water Reactor (ABWR) plants. Equipment qualification for STP 3&4 ABWR plant applications shall be conducted in accordance with this document.

Since assessment of equipment survivability during severe accident is beyond design basis, the assessment is not conducted under this document. Instead, relevant information is included in the "General Design Document Requirements for Severe Accident Countermeasure System Design Specification" (7A21-0501-0001) (Reference 4.3.B (8)).

1. Purpose

This document provides the equipment qualification methodology to be used for STP 3&4 to demonstrate compliance with US NRC Code of Federal Regulation 10 CFR 50.49 (Reference 4.1.B (1), Regulatory Guide 1.89 Revision 1, (Reference 4.1.B (2)), Regulatory Guide 1.100 Revision 2, (Reference 4.1.B (3) A)), NUREG-0588, Revision 1 (Reference 4.1.B (5)) and NUREG-0800 Revision 2 (Reference 4.1.F (3 and 4)). IEEE Std 323-1974 (Reference 4.2.A (1) A)) and IEEE Std 344-1987 (Reference 4.2.C (1)) provide guidance and are endorsed by Regulatory Guide 1.89, Revision 1 and Regulatory Guide 1.100 Revision 2, respectively. This document also addresses the environmental qualification of the post accident monitoring equipment, as provided by Regulatory Guide 1.97 Revision 3 (Reference 4.1.B (4)) that is endorsed by 10 CFR 50.49 (Reference 4.1.B (1)).

This document defines the basis on which the detailed qualification plans are established together with the intended methods of documenting the results.

The basic aim of Equipment Qualification (EQ) of safety-related and certain non-safety related equipment, including Post Accident Monitoring equipment, during normal, abnormal, Design Basis Accident (DBA), and post-DBA conditions are:

- To reduce the potential for common mode failures due to environmental effects.
- To demonstrate that safety-related electrical and mechanical equipment are capable of performing their designated safety-related functions before, during and after a Design Basis Event (DBE) as defined in the specifications.

2. Scope

This program is applied throughout the STP 3&4 Project, to assure that qualification of safety-related equipment, certain non-safety related equipment, including post accident monitoring equipment are carried out in complying with applicable Regulations Codes, Standards and licensing documents to meet contractual requirements of the STP 3&4 Units. The equipment to be qualified under this document includes both electrical and mechanical equipment.

The qualification specified herein covers both environmental qualification in accordance with Regulatory Guide 1.89 Revision 1 (Reference 4.1.B (2)) and dynamic qualification in accordance with Regulatory Guide 1.100 Revision 2 (Reference 4.1.B (3) A)).

3. Responsibility

Toshiba has overall responsibility to implement and oversee qualification activities for equipment of STP 3&4 ABWR plants in accordance with this program. Toshiba has the responsibility to control and maintain all required documents and submit them to South Texas Project Nuclear Operating Company (STPNOC). Toshiba will also develop and maintain Equipment Qualification electronic database. STPNOC has the responsibility to maintain required documents after turnover.

Toshiba system engineers who are responsible to design the system have the responsibility to identify equipment to be qualified and enter into the EQ Master Equipment List (EQ-MEL) including information regarding safety-related functions.

The equipment design engineers are responsible to specify equipment qualification requirements based on the requirements of this document and include into the Equipment Requirements/Design Specifications. The equipment designers are also responsible to ensure the equipment design has considered lesson's learned in past designs, U.S. NRC Information and Enforcement Bulletins (IEB), Information and Enforcement Notices (IEN) and Generic Letters (GL).

Equipment qualification engineers have the responsibility to implement equipment qualification programs based on the requirements of this document. The equipment qualification engineers are also responsible to ensure IEBs, IENs and GLs in regard to qualification are considered in the qualification programs.

4. Applicable Regulatory Requirements, Codes and Standards, and Project Document (References)

Regulatory Requirements, Codes and Standards, and Project Document references provided in the following subsections 4.1 through 4.3 are applicable to equipment qualification activities in the contexts hereof. The documents listed in Reference 4.4 are not licensing basis documents but may be used in the equipment qualification program as applicable. If there is any conflict between these and documents listed in Sections 4.1, 4.2 and 4.3, it should be brought to the notice of responsible equipment design engineer to reconcile any differences before start of the equipment qualification program.

4.1. CFR, NRC Regulatory Guide (RG) and NUREG

A. Generic Quality Assurance CFR, RG and ASME Code

(1) 10 CFR 50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"

(2) RG 1.28, "Quality Assurance Program Requirements (Design and Construction)," Revision 3

(3) ASME (American Society of Mechanical Engineers) NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications"

(4) ASME Boiler & Pressure Vessel Code Section III, Division I, 1989 Edition

Note: ASME Boiler and Pressure Code Section III, 2001 including 2003 Addenda is used for the site specific plant portions in accordance with the Construction Operation Licensing Application (COLA).

(5) 10 CFR Part 21, "Reporting Of Defects And Noncompliance"

(6) 10 CFR 50 Appendix A, "General Design Criteria for Nuclear Power Plants"

B. CFR, Generic Equipment Qualification RG and NUREG

(1) 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety Nuclear for Nuclear Power Plants"

(2) RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 1

(3) A) RG 1.100, "Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants," Revision 2

B) RG 1.100, "Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," Revision 3

(4) RG 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environmental Condition During and Following an Accident," Revision 3

(5) NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," Revision 1

(6) Standard Review Plan (SRP) NUREG-0800 Revision 2,"Environmental Qualification Of Mechanical And Electrical Equipment"

C. Equipment Qualification RG for specific equipment

(1) RG 1.40, "Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants," Revision 0

(2) RG 1.63, "Electrical Penetration Assemblies in Containment Structures for Nuclear Power Plants," Revision 3

(3) RG 1.73, "Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants," Revision 0

(4) RG 1.131, "Qualification Tests of Electric Cables and Field Splices for Light-Water-Cooled Nuclear Power Plants," Revision 0

(5) RG 1.148, "Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants," Revision 0

D. Seismic Design and Analysis RG

(1) RG 1.29, "Seismic Design Classification," Revision 3

(2) RG 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Revision 1

(3) RG 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Revision 0

Note: Revision 1 of the RG 1.61 is used for the site specific plant portions in accordance with the COLA.

(4) RG 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis ," Revision 1

(5) RG 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components," Revision 1

E. Radiological Source term RG and NUREG

(1) NUREG-0737, Section II.B.2 , "Clarification of TMI Action Plan Requirements"

F. Referred other RG and Standard Review Plan (SRP)

(1) RG 1.151, "Instrument Sensing Lines (Task 1C 126-5)," Revision 0

(2) RG 1.152, "Criteria for Programmable Digital Computer System Software in Safety-Related Systems of Nuclear Power Plants," Revision 0

(3) NUREG-0800, Section 3.11, Revision 2, "Environmental Qualification of Mechanical And Electrical Equipment"

(4) NUREG-0800, Section 3.10, Revision 2. "Seismic Qualification of Category I Instrumentation and Electrical Equipment"

(5) IN 79-22, "Qualification of Systems", September 14, 1979

(6) IN 89-63, "Possible Submergence of Electrical Circuits Located above the Flood Level Because of Water Intrusion and Lack of Drainage", September 5, 1989

4.2. IEEE, ASME, AISC and EPRI Standard

A. Generic Equipment Qualification Standard

(1) A) IEEE Std 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

B) IEEE Std 323-2003, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

Note: IEEE Std 323-2003 is used for qualifying the Engineered safety features Logic and Control System (ELCS), Reactor Trip and Isolation System (RTIS) and Neutron Monitoring System (NMS) Instrumentation & Control (I&C) platforms only.

(2) IEEE Std 627-1980, "IEEE Standard for Design Qualification of Safety Systems Equipment Used in Nuclear Power Generating Stations"
(3) ASME QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants"
(4) American Institute of Steel Construction (AISC), 1984 Edition

B. Equipment Qualification Standard for Specific Equipment (Required by Licensing Commitments)

(1) IEEE Std 317-1983 (Reaffirmed 1996), "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations"
(2) IEEE Std 334-1974, "IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations"
(3) IEEE Std 382-1985, "IEEE Standard for Qualification of Actuators for Power-Operated Valve Assemblies with Safety-Related Functions for Nuclear Power Plants"
(4) IEEE Std 383-1974 (Reaffirmed 1992), "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations"
(5) IEEE Std 384-1992, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits"
(6) IEEE Std 387-1984, "IEEE Standard Criteria for Diesel-Generator Units Applied as Power Standby Supplies for Nuclear Power Generating Stations"
(7) IEEE Std 535-1979, "Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations"
(8) IEEE Std 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations"
(9) IEEE Std 649-1980, "IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations"
(10) IEEE Std 650-1979, "Standard for Qualification of Class 1E Static Battery Chargers and Inverters for Nuclear Power Generating Stations"
(11) A) IEEE Std 7-4.3.2-1982, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations"
B) IEEE Std 7-4.3.2-2003, "IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations"

Note: IEEE Std 7-4.3.2-2003 is used for qualifying the Engineered safety features Logic and Control System (ELCS), Reactor Trip and Isolation System (RTIS) and Neutron Monitoring System (NMS) Instrumentation & Control (I&C) platforms only.

C. Seismic Qualification Standard (Required by Licensing Commitments)

(1) IEEE Std 344-1987, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

4.3. STP 3&4 Project Document

A. Customer Requirement Document

(1) ETS, "SOUTH TEXAS PROJECT Units 3 & 4 Engineering Technical Specification", (U7-PROJ-G-SPEC-ETS-0001), Revision 2
(2) ABWR "Design Control Document" (DCD), Revision 4
(3) STP 3&4 "COL Application", Revision 4

B. ABWR System and Function General Design Document

(1) GDD, "Seismic Design Classification (7A25-0501-0001), Latest Revision
(2) GDD, "Guideline for Seismic Design (7A25-0501-0002), Latest Revision
(3) GDD, "Classification Summary" (7A10-0501-0013), Latest Revision
(4) GDD, "Post Accident Monitoring System Functional Specification" (7A21-0501-0005), Latest Revision
(5) Not Used
(6) GDD, "Flooding Protection Requirement" (A12-0501-0001), Latest Revision
(7) GDD, "Protection against Dynamic Effect Associated with the Postulated Piping Failure" (7A31-0501-0002), Latest Revision
(8) GDD, "Requirements for Severe Accident Countermeasure System Design Specification" (7A21-0501-0001), Latest Revision
(9) GDD, "I&C System Basic Design Plan"(7A32-0501-0003), Latest Revision
(10) GDD, "I&C Equipment Separation" (7A32-0501-0006), Latest Revision

C. Environmental and Dynamic Condition General Design Document

(1) GDD, "Equipment Qualification Environmental Interface Data" (7A10-0501-0010), Latest Revision
(2) "Calculation/Analysis Report STP 3&4 Seismic and Reactor Building Vibration Response Spectra Report" (7A25-0501-0015), Latest Revision
(3) "Calculation For Turbine Building Design Response Spectra Curves" (U72-3809-0002), Latest Revision
(4) SDD, "EMC Qualification Plan" (7A32-3701-0001), Latest Revision

D. Project Requirement Document

(1) PRD, "Division of Responsibility Among EPC Team" (7A10-2505-0002), Latest Revision
(2) PRD, "Requirement of Calibration for Measuring and Test Equipment using for STP Project" (7A70-0301-0030) Latest Revision
(3) "Nuclear Energy QA Program Description" (4401-4), Latest Revision

4.4. Supplemental Guidance Related Document

Documents listed in this subsection are not part of licensing commitment, but may be used as applicable.

A. IEEE Standards and EPRI Document

(1) IEEE Std 420-2001, "IEEE Standard for the Design and Qualification of Class 1E

Control Boards, Panels, and Racks Used in Nuclear Power Generating Stations"

(2) IEEE Std 572-1985 (Reaffirmed 1992), "IEEE Standard for Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations"

(3) IEEE Std 628-2001, "IEEE Standard Criteria for the Design, Installation, and Qualification of Raceway Systems for Class 1E Circuits for Nuclear Power Generating Stations"

(4) IEEE Std 638-1992 (Reaffirmed 1999), "IEEE Standard for Qualification of Class 1E Transformers for Nuclear Power Generating Stations"

(5) IEEE Std 1205-2000, "IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Generating Stations"

(6) IEEE Std C37.81-1989 (Reaffirmed 1994), "IEEE Guide for Seismic Qualification of Class 1E Metal-Enclosed Power Switchgear Assemblies"

(7) IEEE Std C37.82-1987 (Reaffirmed 1998), "IEEE Standard for the Qualification of Switchgear Assemblies for Class 1E Applications in Nuclear Power Generating Stations"

(8) IEEE Std C37.98-1987 (Reaffirmed 1999), "IEEE Standard Seismic Testing of Relays"

(9) IEEE Std C37.105-1987 (Reaffirmed 1999), "IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations"

(10) IEEE Std C57.114-1990 (W 1996), "IEEE Seismic Guide for Power Transformers and Reactors"

(11) EPRI (Electrical Power Research Institute) TR-107330 (December 1996), "Generic Requirements Specification for Qualifying a Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants"

B. Regulatory Guide (Not Required by Licensing Commitments but may be used as applicable)

(1) RG 1.156, "Environmental Qualification of Connection Assemblies for Nuclear Power Plants," Revision 0

(2) RG 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants," Revision 0

(3) RG 1.209, "Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants," Revision 0

5. Definitions

- **Abnormal Operating Condition:**

Abnormal operating conditions refer to the extreme ranges of normal plant conditions for which the equipment is designed to operate for a period of time without any special calibration or maintenance efforts. Abnormal environments are defined to recognize possible plant service abnormalities that lead to short-term changes in environments at various equipment locations. Abnormal events may occur multiple times during the life of the plant.

- **Active Mechanical Equipment:**

Mechanical equipment containing moving parts, which, in order to accomplish its required function as defined in the Qualification Specification, must undergo or prevent mechanical movement. This includes any internal components or appurtenances whose failure degrades the required function of the equipment.

- **Aging:**

The effect 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.

- **Auditable Data:**

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

- **Class 1E:**

The safety classification of the electric 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.

Note: The terms Class 1E equipment and safety-related electric equipment are synonymous.

- **Components:**

Items from which the equipment is assembled, for example, resistors, capacitors, wires, connectors, transistors, switch etc.

- **Containment:**

That portion of the engineered safety features designed to act as the principal barrier, after 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.

- **Cutoff Frequency:**

The frequency in the response spectrum where the zero period acceleration asymptote begins. This is the frequency beyond which single degree of freedom oscillators exhibit no amplification of motion, and indicates the upper limit of the frequency content of the waveform being analyzed.

- **Damping:**

An energy dissipation mechanism that reduces the amplification and broadens the vibratory response in the region of response. 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.

- **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.

- **Design Basis Accident (DBA):**

Those plant conditions resulting from various postulated equipment and piping failures during which safety-related equipment shall operate without impairment of the safety- related function in a harsh environment. A design basis accident is a subset of a design basis event.

- **Design Basis Event (DBE):**

Postulated events used in the design to establish the acceptable performance requirements for the structures, systems, and components.

- **Design Life:**

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

- **Electromagnetic Compatibility (EMC):**

The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

- **Equipment:**

An assembly of components designed and manufactured to perform specific functions.
Note: Examples of equipment are motors, transformers, valve operators, and instrumentation and control devices.

- **Equipment Qualification:**

The generation and maintenance of evidence to assure that equipment will operate on demand to meet the system performance requirements.

- **Equivalent Static Load:**

A statically applied load that is based on the peak of the applicable response spectrum multiplied by a coefficient to approximate the dynamic loading.

- **Flexible Equipment:**

Equipment, structures and components whose lowest resonant frequency is less than the cutoff frequency on the response spectrum.

- **Floor Acceleration:**

The acceleration of a particular building floor (or equipment mounting) resulting from the motion of a given earthquake. The maximum floor acceleration is the zero period acceleration of the floor response spectrum.

- **Functionality:**

Ability of an active component or equipment to perform the mechanical and electrical motion required to fulfill its specified function when subjected to the prescribed service conditions.

- **Harsh Environment:**

An Environment defined as an environment resulting from a design basis event, i.e., loss of coolant accident (LOCA) and high energy line break (HELB) where the temperatures ≥ 125°F and/or radiation ≥1e+4 rads (1e+3 rads for solid state equipment) total integrated normal plus accident dose or an environment during normal condition that be equivalent or grater than the threshold values stated above.

- **Installed Life:**

The interval from installation to removal, during which the equipment or component thereof may be subject to design service conditions and system demands.

Note: Equipment may have an installed life of 60 years with certain components changed periodically; thus, the installed life of the components would be less than 60 years.

- **Interface:**

A junction or junctions between Class 1E equipment and equipment or devices. (Examples: connection boxes, splices, terminal board's electrical connections, grommets, gaskets, cables, conduits, enclosures, etc.).

- **Maintenance:**

Work performed on an item to keep it operable or restore it to operable condition.

- **Margin:**

The difference between service conditions and the conditions used for equipment qualification.

- **Mild Environment:**

An environment that would at no time is significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences (AOO) where the threshold values given under "harsh environment" definition are not exceeded.

- **Natural Frequency:**

The frequency(s), at which body vibrates due to its own physical characteristics (mass and stiffness) when the body is distorted in a specific direction and then released.

- **Normal Operating Condition:**

Normal conditions are those sets and ranges of the plant conditions that are expected to occur regularly and for which the plant equipment is expected to perform its safety function, as required, on a continuous basis.

- **Nuclear Generating Station:**

A plant wherein electric 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.

- **Qualified Life:**

The period of time for which the equipment was demonstrated to meet the design requirements for the specified service conditions.

Notes: At the end of the qualified life, the equipment shall be capable of performing the safety function(s) required for the postulated design basis and post-design basis events. The qualified life of a particular equipment item may be changed during its installed life where justified.

- **Radiation-harsh Environment:**

An environment where equipment is required to operate above a total integrated radiation threshold dose of 1+e4 rads (1+e3 rads for solid state equipment) but where other environmental parameters remain bounded by normal or abnormal conditions.

- **Required Response Spectrum (RRS):**

The response spectrum issued by the user or agent as part of the equipment specifications for seismic qualification purposes. The RRS is a plot of acceleration versus frequency describing the energy content of the earthquake time history. The RRS constitutes a requirement to be met during qualification activities.

- **Resonant Frequency:**

A frequency at which a response peak occurs in a system subjected to forced vibration. This frequency is accompanied by a phase shift of response relative to the excitation.

- **Response Spectrum:**

A plot of the maximum response, as a function of oscillator frequency, of an array of single-degree-of-freedom damped oscillators subjected to the same base excitation.

- **Rigid Equipment:**

Equipment, assemblies, and components whose lowest resonant frequency is greater than the cutoff frequency on the response spectrum.

- **Safe Shutdown Earthquake (SSE):**

An earthquake that is based on an evaluation of the maximum earthquake potential considering the regional and local geology, seismology and specific characteristic of local subsurface materials. It is that earthquake that produces the maximum vibratory ground motion response spectra (GMRS) for which certain structures, systems and components are designed to remain functional. These structures are those necessary to ensure the integrity of the reactor coolant pressure boundary; the capability to shutdown the reactor and maintain it in a safe shutdown condition; and the capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposure comparable to the 10 CFR Part 100 guidelines.

- **Safety Function:**

One of the processes or conditions (e.g., emergency negative insertion, post-accident heat removal, emergency core cooling, and post-accident radioactivity removal and containment isolation) essential to maintain plant parameters within acceptable limits established for a design basis event.

- **Safety-Related:**

Equipment that is relied upon to remain functional during and following design basis event to ensure the integrity of the reactor coolant pressure boundary; the capability to shut down the reactor and maintain it in a safe shutdown condition; and, the capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposures comparable to the 10 CFR Part 100 guidelines.

- **Sample Equipment:**

Production equipment tested to obtain data that are valid over a range of ratings and for specific services.

- **Seismic Category I:**

A classification of structures, systems and components that shall be designed to withstand the effects of the SSE and maintain the specified design function and integrity.

- **Seismic Category II:**

Seismic Category II system, structures and components (SSC) are defined as SSC whose failure could result in a loss of required function for Seismic Category I structures, systems or components which are required for a safe shutdown. These SSC shall be evaluated to determine that they will not fail and would not otherwise prevent Seismic Category I SSC from performing its safety-related function during a SSE.

- **Service Conditions:**

Environmental, loading, power, and signal conditions expected as a result of normal operating requirements, expected extremes in operating requirements, and postulated conditions appropriate for the design basis events of the station.

- **Shall:**

An expression of requirement.

- **Significant Aging Mechanism:**

An aging mechanism that, under normal and abnormal service conditions, causes degradation of equipment and materials that progressively and appreciably renders the equipment vulnerable to failure to perform its safety function(s) during the design basis event conditions.

- **Shelf Life:**

The maximum period of storage prior to installation, as specified by the vendor.

- **Structural Integrity:**

A condition describing an assembly or grouping of equipment relative to their ability to carry applicable loads within the limits of acceptable structural behavior.

- **Supplier:**

Any individual or organization who furnishes items or services according to a procurement document. (Supplier is synonymous with the following: vendor, seller, contractor, subcontractor, fabrication, consultant, and their sub tier levels.)

- **Synergistic Effects:**

Those effects that result from two or more stresses acting together, rather than separately.

- **System Engineer:**

System engineers are responsible for the system design and/or responsible for the equipment for that system.

- **Test Response Spectrum (TRS):**

The response spectrum that is developed from the actual time history of motion of shake table.

- **Type Tests:**

Tests made on one or more sample equipments to verify adequacy of design and the manufacturing processes.

- **Transmissibility Function:**

The output to input ratio versus frequency.

- **Zero Period Acceleration (ZPA):**

The acceleration level of high frequency, non amplified portion of the response spectrum. This acceleration corresponds to the maximum peak acceleration of the time history used to derive the response spectrum.

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Note: The remaining pages in this document contain proprietary information, and are therefore omitted from this Non-Proprietary version of the report.