Draft 4

Seismic Walkdown Guidance

For Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic

This document does **NOT** meet the requirements of 10CFR50 Appendix B, 10CFR Part 21, ANSI N45.2-1977 and/or the intent of ISO-9001 (1994).

EPRI Project Manager
R. Kassawara

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

3420 Hillview Avenue
Palo Alto, CA 94304-1338
USA

PO Box 10412
Palo Alto, CA 94303-0813
USA

800.313.3774
650.855.2121

askepri@epri.com

www.epri.com

1025286
Draft 4 Report, May 2012

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITIES

THE FOLLOWING ORGANIZATION(S), UNDER CONTRACT TO EPRI, PREPARED THIS REPORT:

MPR Associates, Inc.

NOTE

For further information about EPRI, call the EPRI Customer Assistance Center at 800.313.3774 or e-mail askepri@epri.com.

Acknowledgments

The following organization, under contract to the Electric Power Research Institute (EPRI), prepared this report:

MPR Associates, Inc.

Principal Investigators:
Richard G. Starck and Caroline S. Schlaseman

This report describes research sponsored by EPRI.

This publication is a corporate document that should be cited in the literature in the following manner:

Seismic Walkdown Guidance: For Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic EPRI, Palo Alto, CA: 2012. 1025286.

Product Description

Following the accident at the Fukushima Daiichi nuclear power plant resulting from the March 11, 2011, Great Tohoku Earthquake and subsequent tsunami, the NRC established the Near Term Task Force (NTTF) in response to Commission direction. The NTTF issued a report that made a series of recommendations, some of which were to be acted upon "without unnecessary delay". Subsequently, the USNRC issued a 50.54(f) Letter [1] that requests information to assure that these recommendations are addressed by all U.S. nuclear power plants. This report provides guidance for conducting a seismic walkdown as required in the 50.54(f) Letter, Enclosure 3, Recommendation 2.3: Seismic. Every U.S. nuclear power plant is required to perform a seismic walkdown to identify and address degraded, non-conforming or unanalyzed conditions and to verify the current plant configuration with the current seismic licensing basis. The nuclear power industry and the ~~US~~NRC agreed to cooperate in the development of guidelines and procedures to perform these walkdowns.

Formatted: Highlight

Results and Findings

This report provides guidance and procedures to perform the Recommendation 2.3: Seismic Walkdowns including selection of personnel, selection of a sample of SSCs that ~~contain~~ represent diversity of component types and assures inclusion of components from critical systems/functions ~~defined~~ discussed in the NRC letter, conduct of the walkdowns, evaluation against the plant seismic licensing basis, and reporting requirements. The report includes checklists to be used by the seismic walkdown engineers for seismic evaluations.

Challenges and Objectives

The objective of the work reported in this document is to provide guidance on the performance of plant seismic walkdowns to satisfy the requirements of NTTF Recommendation 2.3: Seismic.

Applications, Value and Use

The guidance in this report is intended for use by all U.S. nuclear power plants to meet the requirements of NTTF Recommendation 2.3: Seismic. The primary value in this guidance is that it has been reviewed with the NRC and can be applied by all plants to provide a uniform and acceptable industry response to the NRC. The guidance

will also be used as the basis for development of an industry training course to further assure its proper application.

Perspective

The ~~scope and~~ schedule for satisfying the requirements of Recommendation 2.3: Seismic is ~~very~~ aggressive. The guidance therefore must be generic and pre-approved by the NRC so that it can be applied uniformly across the U.S. industry. This report was produced with extensive input and participation from utility seismic engineers and similarly extensive review by the NRC.

Approach

The approach taken to formulate guidance for the walkdowns was to devise a sampling procedure to align the scope of the effort with the required schedule while achieving the objectives of the walkdowns as described in the NRC 50.54(f) Letter. The sample includes representative items of equipment needed to safely shut down the reactor and maintain containment integrity. Equipment lists from the Individual Plant Examination for External Events (IPEEE) that were developed for all plants in the early 1990's can be used in identifying the scope of items from which the sample is developed. The sample ~~also~~ needs to satisfy the requirements of the NRC 50.54(f) Letter such as maintaining ultimate heat sink, spent fuel pool water inventory and availability of support systems and must be suitably diverse across a spectrum of plant safety related equipment including different classes of equipment. In keeping with the lessons learned by over thirty years of industry investigation of earthquake effects on mechanical and electrical equipment, the ~~focus of this~~ Seismic Walkdown Guidance ~~is~~ includes a focus on equipment anchorage and seismic spatial interactions that are ~~the~~ two ~~most~~ important considerations in assessing component seismic ruggedness. However, other important considerations, such as the identification of potential sources of seismically-induced fire and seismically-induced flood, are also incorporated.

Table of Contents

List of Figures

List of Tables

Section 1: Purpose and Approach

[This section is still under development. Changes shown in this section should NOT be considered final at this time.]

Purpose

Enclosure 3 to the NRC 50.54(f) Letter [1] states the following purposes of the NRC request:

- To gather information with respect to Near-Term Task Force (NTTF) Recommendation 2.3, as amended by staff requirements memorandum (SRM) associated with SECY-11-0124 and SECY-11-0137,
- To request licensees to develop a methodology and acceptance criteria for seismic walkdowns to be endorsed by the NRC staff,
- To request licensees to perform seismic walkdowns using the NRC-endorsed walkdown methodology, as defined herein,
- To identify and address degraded, nonconforming, or unanalyzed conditions through the corrective action program, and
- To verify the adequacy of licensee monitoring and maintenance procedures.

Additionally, the NRC 50.54(f) Letter includes under "Requested Actions" the request that the walkdown "verify current plant configuration with the current license basis."

The 50.54(f) Letter also requests that the procedures used by licensees to conduct the walkdown include the following characteristics:

a. Determination of the seismic walkdown scope and any combined effects

b. Consideration of NUREG-1742, EPRI Report NP-6041, GIP, and common issues and findings discussed in the responses to TI 2515/183

c. Pre-walkdown actions (e.g., data collection, review of drawings and procedures, identification of the plant licensing basis, identification of current seismic protection levels)

d. Identification of SSCs requiring seismic protection and used in the protection of the reactor and spent fuel pool, including the ultimate ~~heatsink~~heat sink (UHS)

e. Description of the walkdown team composition and qualifications

f. Details of the information to be collected during the walkdown including equipment access considerations

g. Documentation and peer review requirements

The guidance contained in this document is intended to meet the above objectives. The remainder of this Section 1 provides an overview of the guidance; details for implementing this guidance are included in the remaining sections of this document.

Overview of Approach

The overall approach for addressing the actions and information requested in the 50.54(f) Letter includes the following activities, as shown in Figure 1-1~~Figure 1-1~~ through Figure 1-3:

Selection of a Seismic Walkdown Equipment List (SWEL)

Two groups of items are identified for the Seismic Walkdown Equipment List:

1. Equipment or Systems Sample needed to bring the reactor to a safe shutdown condition and maintain containment function. In Figure 1-1~~Figure 1-1~~, the items from this sample are labeled as SWEL 1.
2. Spent Fuel Pool equipment sample and features that could potentially cause rapid drain-down of the pool. In Figure 1-2, these items are labeled as SWEL 2.

Seismic Walkdowns and Area Walk-Bys

Seismic walkdowns of the three groups of items on the SWEL described above and walk-bys of the areas containing the SWEL items are illustrated as Screen #1 in Figure 1-3**Error! Reference source not found.**.

Licensing Basis Evaluation

Detailed evaluations of the items identified as having potential adverse seismic conditions are performed to determine whether the plant seismic

licensing basis is met, as illustrated as Screen #2 in Figure 1-3**Error! Reference source not found.**

The key activities for implementing the overall approach in addressing the 50.54(f) Letter are summarized below and described in more detail in the remaining sections of this document.

Section 2: Personnel Qualifications

The qualifications of personnel who will perform the key activities required to fulfill the requirements and expectations of the 50.54(f) Letter are described in Section 2: Personnel Qualifications. These personnel are responsible for:

- Identification of the items to be walked down,
- Performance of the seismic walkdowns and walk-bys, and
- Performance of the licensing basis evaluations.

The reviews conducted during each of these activities satisfy the Peer Review activities requested in the 50.54(f) Letter. Additionally, a Peer Review will be performed of the overall report to ensure that the objectives are met.

Section 3: Selection of SSCs

The process used to select the items that will be included in the overall Seismic Walkdown Equipment List (SWEL) is described in detail in Section 3: Selection of SSCs. In general, the SWEL is comprised of three groups of items, which are described at a high level in the following subsections.

Sample of Required Items – SWEL 1

As shown in Figure 1-1~~Figure 1-1~~Figure 1-1, Screen #1 is used to select Seismic Category (SC) I structures, systems, and components (SSCs) (because they have a seismic licensing basis).

Some SC I SSCs already have existing evaluations and regularly undergo inspections. Those items covered by other such programs are not evaluated further as shown by Screen #2 and described below:

- Seismic Category I structures are typically confirmed to meet their seismic licensing bases through analyses. Periodic inspections of SC I structures for degradation (e.g., concrete spalling) that might undermine their licensing basis are conducted in accordance with plant Maintenance Rule structural inspections.
- Containment penetrations are typically confirmed to meet their seismic licensing bases through analyses. Periodic

inspections and/or testing to ensure penetrations are not degraded are required by ASME Section XI.

- Seismic Category I piping systems have been confirmed to meet their licensing bases through several NRC programs, e.g., IE Bulletin 79-14. Periodic walkdowns by plant system engineers and ASME Section XI In-service Inspections ensure SC I piping systems are maintained in accordance with their licensing bases.

Cable/conduit raceways and HVAC ductwork, although not included as "equipment" in the SWEL, are reviewed during area walk-bys of the spaces containing items on the SWEL.

In Figure 1-1~~Figure 1-1~~Figure 1-1, Screen #3 identifies equipment from systems required for safe shutdown. The four safe shutdown functions (reactor reactivity control, reactor coolant pressure control, reactor coolant inventory control, and decay heat removal, which includes the Ultimate Heat Sink), plus containment functions, must be maintained by frontline and supporting system equipment.

In Figure 1-1~~Figure 1-1~~Figure 1-1, Screen #4 represents the sample selections made to ensure that SWEL 1 includes:

- Equipment in various frontline and supporting systems
- Major new or replacement equipment installed within the past 15 years (i.e., from the approximate completion of seismic IPEEE evaluations)
- Diverse types of equipment, e.g., the 21 classes of equipment considered in seismic IPEEE and USI A-46 programs
- Equipment located in different environments, e.g., dry/cool vs. hot/damp

Spent Fuel Pool Related Items – SWEL 2

As shown in Figure 1-2**Error! Reference source not found.**, the first screen is to determine whether the Spent Fuel Pool (SFP) SSCs are Seismic Category I and therefore have a seismic licensing basis against which to evaluate their adequacy. All plants are expected to have a SC I spent fuel pool because it is integral to the SC I Reactor Building (BWR) or Auxiliary Building (PWR). However, as noted above, SC I structures are not included in the SWEL scope because they are addressed by other existing programs. The additional input to SWEL 2 would be features of the SFP that could potentially cause a rapid drain-down of the pool, even if such features are not Seismic Category I items.

Improvements to Address IPEEE Seismic Vulnerabilities ~~– SWEL 3~~

[Fix this subsection]

Error! Reference source not found.Error! Reference source not found. outlines the approach for responding to the 50.54(f) request that "improvements made as part of the licensees' response to the individual plant examination of external events (IPEEE) program for seismic issues should be reported." As shown in **Error! Reference source not found.Error! Reference source not found.**, if review of the IPEEE documentation and licensing correspondence determines that physical modifications were made to plant equipment, such equipment would be added to the scope of the walkdowns through SWEL 3.

Section 4: Seismic Walkdowns and Area Walk-Bys

Details of the process for conducting the seismic walkdowns of items of equipment and systems on the SWEL (which includes all items in SWELs 1, 2 and 3) are described in Section 4: Seismic Walkdowns and Area Walk-Bys. Additionally, the process for conducting walk-bys of each area of the plant that includes an item on the SWEL is included in Section 4: Seismic Walkdowns and Area Walk-Bys. Overviews of these two key activities are discussed in the following two subsections.

Seismic Walkdowns

Seismic walkdowns are examinations to identify potential adverse seismic conditions for items of equipment and systems included in the SWEL. If a potential adverse condition is identified during the equipment walkdown, the potential adverse condition is evaluated with respect to the current licensing basis (CLB), as described in Section 5: Seismic Licensing Basis Evaluations. As discussed in detail in Section 4: Seismic Walkdowns and Area Walk-Bys, the equipment walkdowns should:

- Examine anchorage conditions and evaluate compliance with the CLB,
- Look for adverse seismic spatial interactions that could directly affect the ability of the equipment to perform its safety functions, and
- Look for other degradation that may affect the ability of the SWEL item to perform its safety function or raise questions regarding compliance with the CLB.

Area Walk-Bys

The area walk-bys are to be conducted in each area of the plant that contains an item on the SWEL. The area walk-by will consider the overall condition of the area with respect to seismic concerns that are not captured during the seismic walkdown of the SWEL item. If a potential adverse condition is identified during the walk-bys, the potential adverse condition is evaluated with respect to the current licensing basis (CLB), as described in Section 5: Seismic Licensing Basis Evaluations. As discussed

in detail in Section 4: Seismic Walkdowns and Area Walk-Bys, the key examination factors that should be considered in walk-bys include:

- Anchorage conditions (if visible without opening equipment),
- Significantly degraded equipment in the area,
- A visual assessment (from the floor) of cable/conduit raceways and HVAC ducting (e.g., condition of supports or fill conditions of a cable tray),
- Potential adverse seismic spatial interactions.
- Potential adverse interactions that could cause flooding/spray and fire in the area, and
- Other seismic housekeeping items, including temporary installations.

Section 5: Seismic Licensing Basis Evaluations

Items of concern from both the equipment seismic walkdowns and area walk-bys are evaluated with respect to their seismic licensing basis, as described in detail in Section 5: Seismic Licensing Basis Evaluations. If the equipment or item of concern cannot be readily shown to meet its seismic licensing basis, then the issue will be evaluated further under the plant's Corrective Action Program (CAP). Under the CAP, if the item is found not to meet its seismic licensing basis, it is expected that an assessment of the extent of condition would be performed.

Section 6: Peer Review

[Under development]

Section 7: IPEEE Vulnerabilities

[Under development]

Section 8: Submittal Report

Requirements of the submittal report are described in detail in Section 8: Submittal Report. In accordance with the 50.54(f) Letter, the final submittal report will include the following:

a. Information on the plant-specific hazard licensing bases and a description of the protection and mitigation features considered in the licensing basis evaluation

b. Information related to the implementation of the walkdown process

c. A list of plant-specific vulnerabilities (including any seismic anomalies, outliers, or other findings) identified by the IPEEE

and a description of the actions taken to eliminate or reduce them (including their completion dates)

d. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using the guidance in Regulatory Issues Summary 2005-20, Revision, 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program

e. Any planned or newly installed protection and mitigation features

f. Results and any subsequent actions taken in response to the peer review

Clarifications

Peer Review

The reviews conducted during each of the three key activities (SWEL preparation, seismic walkdowns and walk-bys, and licensing basis evaluation) satisfy the Peer Review activities requested in the 50.54(f) Letter. Additionally, a Peer Review will be performed of the overall report to ensure that the objectives are met.

Seismic Protection

The term “seismic protection” is used in several places in the 50.54(f) Letter, including Requested Information Item 1.d “Identification of SSCs requiring seismic protection . . .” SSCs that must function during and/or following an earthquake are designed for the displacements, velocities, or accelerations associated with the seismic event; therefore the term “protection” is more appropriate when used with respect to flooding or high wind events.

Licensee Monitoring and Maintenance Procedures

The 50.54(f) Letter requires the seismic walkdown activity to “verify the adequacy of licensee monitoring and maintenance procedures.” This will not be done directly by the walkdown, but it will be indirectly verified based on the findings from the walkdown, e.g., if degraded conditions are found, the issue, along with the underlying cause, will be evaluated under the plant’s CAP.

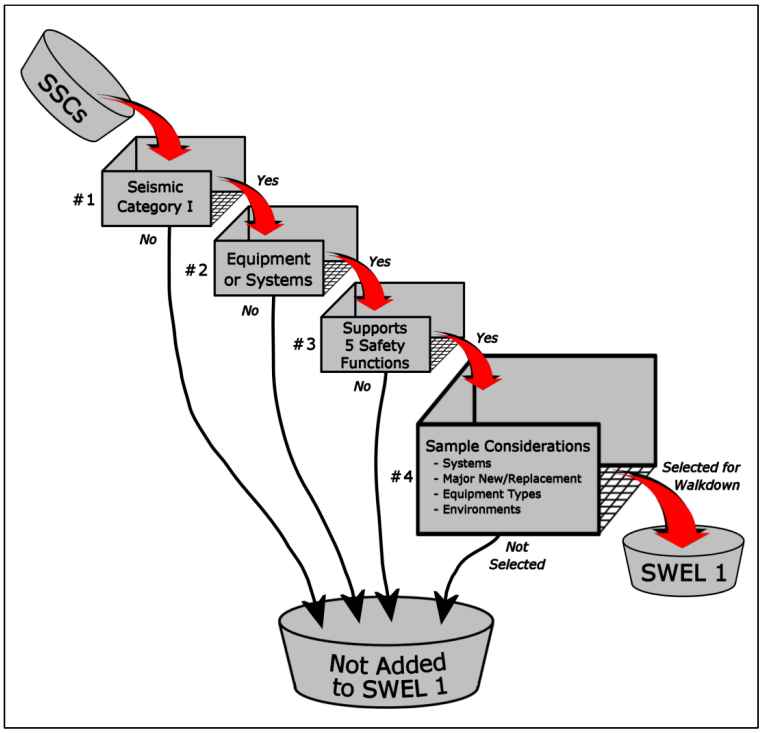

Figure 1-1
Sample of Required Items for the 5 Safety Functions– SWEL 1

Comment [AMK1]: Remember to incorporate the IPEEE into this slide.

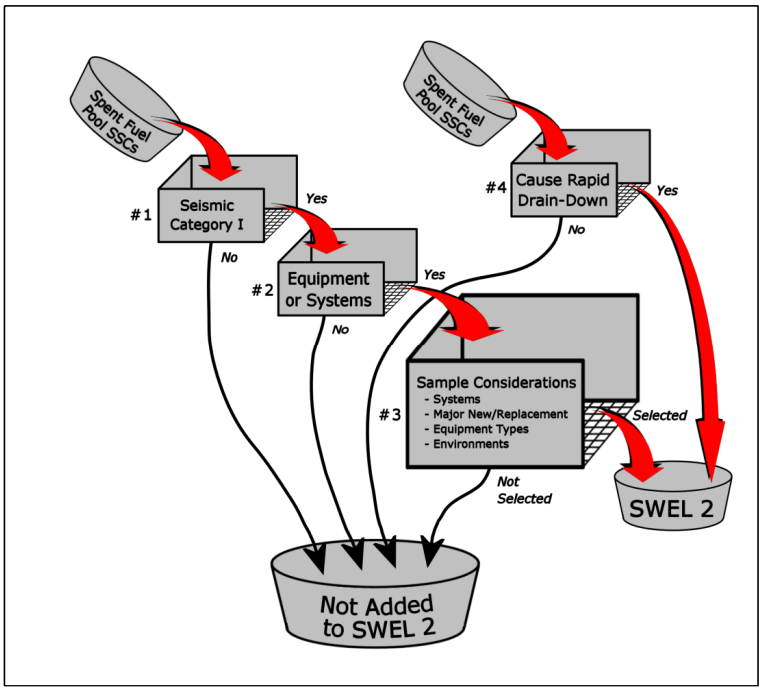

Figure 1-2
Spent Fuel Pool Related Items – SWEL 2

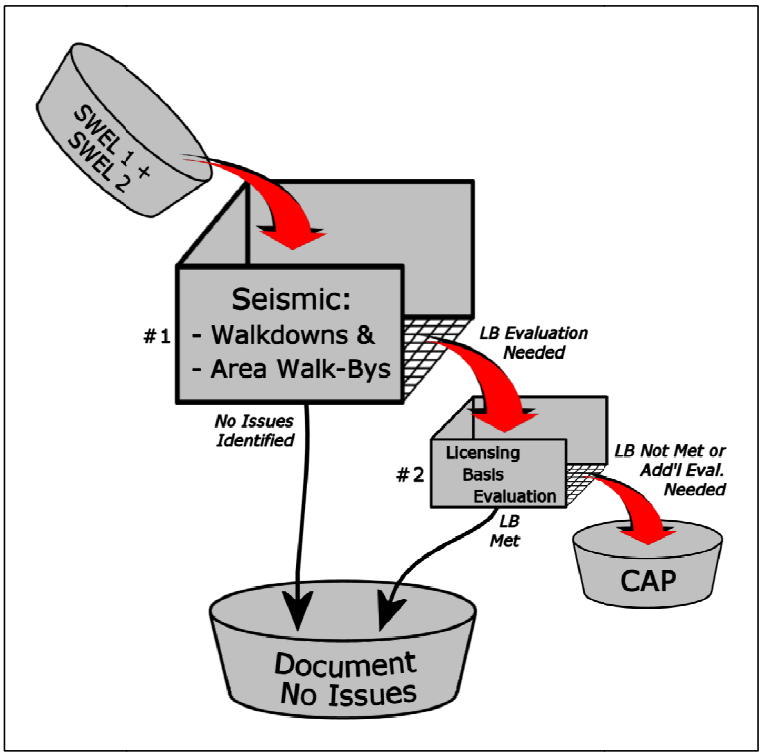

Figure 1-3
Seismic Walkdowns, Area Walk-Bys, and Licensing Basis Evaluations

Section 2: Personnel Qualifications

This section defines the qualifications for personnel who will be involved in performing the activities described in this Seismic Walkdown Guidance. These personnel are responsible for:

- Selecting the SSCs that should be placed on the Seismic walkdown Equipment List, as described in Section 3: Selection of SSCs;
- Performing the Seismic Walkdowns and Area Walk-Bys, as described in Section 4: Seismic Walkdowns and Area Walk-Bys;
- Performing the seismic licensing basis evaluations, as described in Section 5: Seismic Licensing Basis Evaluations; and
- Identifying the list of plant-specific vulnerabilities identified by the IPEEE and reporting the status of actions taken to eliminate or reduce them, as described in Section 7: IPEEE Vulnerabilities.

Guidance is also provided for how personnel should interact with each other while performing the above scope of work.

Equipment Selection Personnel

The equipment selection personnel are responsible for identifying the sample of SSCs to be walked down in accordance with Section 4: Seismic Walkdowns and Area Walk-Bys. This list of SSCs is called the Seismic Walkdown Equipment List (SWEL). Guidelines for developing the SWEL are included in Section 3: Selection of SSCs.

The Equipment Selection Personnel should have knowledge of plant operations, plant documentation, and associated SSCs. They should also have the capability to select a broad distribution of SSCs for the SWEL. ~~It would also be beneficial for the~~The Equipment Selection Personnel ~~to~~ should also have knowledge of the SSCs identified during the IPEEE program (and the USI A-46 program, if applicable).

The Equipment Selection Personnel may request support from others to help develop the SWEL. In particular, input from Plant Operations Personnel may be useful for identifying (1) major equipment and systems that may have been added or changed, (2) equipment and systems located in different environments, and (3) equipment and systems that may be accessible for inspection during the plant walkdown.

Plant Operations Personnel

Plant operations personnel have two types of responsibilities during implementation of this Seismic Walkdown Procedure.

First, they are responsible, on an as-needed basis, for providing information to the Equipment Selection Personnel as they develop the SWEL, as described in Section 3: Selection of SSCs. For example, plant operations personnel may be able to point to major changes or additions to the plant since the IPEEE program had been completed (as illustrated by Screen #3 in Figure 1-1~~Figure 1-1~~Figure 1-1). Their input may also be useful in identifying SSCs that are in ~~different~~ various environments and that are accessible for inspection during the plant walkdown.

Second, plant operations personnel are responsible, on an as-needed basis, for providing information and support to the Seismic Walkdown Engineers (SWEs) during the seismic walkdowns and evaluations (as illustrated by Screen #4 in Figure 1-1~~Figure 1-1~~Figure 1-1). In particular, the plant operations personnel should be available to answer questions on the function and operation of equipment so the SWEs can decide whether malfunction of certain features of an item of equipment will affect its safety-related function. In addition, the plant operations personnel should be available to give the SWEs access to and facilitate inspection of equipment, including its anchorage.

To fulfill these responsibilities, the plant operations personnel should have knowledge of and experience with the specific plant systems being evaluated for potential adverse seismic conditions. This knowledge should cover both steady state and transient operations of various systems and the associated plant-specific operating procedures. They should also be able to supply information on the consequences of, and operator recovery from, functional anomalies.

Seismic Walkdown Engineers

The Seismic Walkdown Engineers (SWEs) are responsible for performing the Seismic Walkdowns and Area Walk-Bys, as described in Section 4: Seismic Walkdowns and Area Walk-Bys. The SWEs should have:

- A degree~~, or equivalent,~~ in mechanical or civil/structural engineering, or equivalent; and
- Experience in seismic engineering, as it applies to nuclear power plants.

In addition, the SWEs must successfully complete one of the following two training courses:

- NTTF 2.3 Seismic Walkdown Training Course,[1] or

[1] The NTTF 2.3 Seismic Walkdown Training Course is a 2-day course ~~sponsored~~ developed by EPRI. This course is based on this Seismic Walkdown Procedure.

- SQUG Walkdown Training Course[2]

The Seismic Walkdowns and Area Walk-Bys may be conducted by one or more Seismic Review Teams (SRTs), each of which must include at least two SWEs. The SWEs are expected to conduct the Seismic Walkdowns and Area Walk-Bys together. During these evaluations, the SWEs are expected to actively discuss their observations and judgments with each other. Additionally, the SWEs are expected to come to agreement on the results of their Seismic Walkdowns and Area Walk-Bys before reporting the results of their review.

The SWEs may be assisted by other individuals while conducting the Seismic Walkdowns and Area Walk-Bys. For example, systems engineers or Plant Operations Personnel may accompany the SWEs during the Seismic Walkdowns and Area Walk-Bys to facilitate access to and inspection of equipment and systems. They may also provide additional information about the safety-related functions of the SWEL items as well as nearby equipment and systems that could cause adverse seismic interactions.

Nevertheless, regardless of what help the SWEs receive from others, they are responsible for the seismic evaluations, engineering judgments, and documentation necessary to complete the Seismic Walkdowns and Area Walk-Bys.

The qualifications and experience of the SWEs should be documented as described in Section 8: Submittal Report.

Licensing Basis Reviewer

The Licensing Basis Reviewer is responsible for determining whether the potential adverse seismic conditions identified by the SWEs meet the plant seismic licensing basis for those items, as described in Section 5: Seismic Licensing Basis Evaluations.

The Licensing Basis Reviewer should have knowledge and experience in the following areas:

- Seismic licensing basis for the SSCs in the plant
- Seismic qualification methods and documentation for the plant
- Requirements and procedures for entering the Corrective Action Program (CAP) for the plant

The Licensing Basis Reviewer is expected to interface with the SWEs to understand the bases for the SWEs' concerns regarding the identified potentially adverse seismic conditions. The SWE and the Licensing Basis Reviewer may be the same person.

---

[2] The SQUG Walkdown Training Course is a 5-day course sponsored by EPRI based on the Generic Implementation Procedure (GIP) [10].

Formatted: Highlight

More than one Licensing Basis Reviewer may be used to evaluate whether conditions identified by the SWEs meet the plant seismic licensing basis.

IPEEE Reviewers

Personnel performing the activities described in Section 7: IPEEE Vulnerabilities should have adequate engineering experience to review and understand the results of the IPEEE program.

Section 3: Selection of SSCs

This section provides guidance for selecting the structures, systems, and components (SSCs) that should be placed on the Seismic Walkdown Equipment List (SWEL) so that they can be walked down by the Seismic Walkdown Engineers (SWE), as described in Section 4: Seismic Walkdowns and Area Walk-Bys. A SWEL should be developed for each unit.

Guidance is provided in this section for selecting SSCs in each of the following two groups:

- The process for selecting a sample of items to safely shut down the reactor and maintain containment integrity is illustrated in Figure 1-1~~Figure 1-1~~Figure 1-1. This process produces the first Seismic Walkdown Equipment List (SWEL 1).
- The process for selecting spent fuel pool related items is illustrated in Figure 1-2**Error! Reference source not found.**. This process produces the second Seismic Walkdown Equipment List (SWEL 2).

The SWELs from these two groups are combined into a single SWEL. Details for selecting the SSCs in each of these two groups are provided below.

The equipment selection process described in this section is to be performed by Equipment Selection Personnel, as described in Section 2: Personnel Qualifications. The Equipment Selection Personnel should be identified in and sign off on the documentation of the SWELs, as described in Section 8: Submittal Report.

Sample of Required Items

The process for selecting a sample of the SSCs for shutting down the reactor and maintaining containment integrity includes the following four screens, as shown in Figure 1-1~~Figure 1-1~~Figure 1-1:

- Screen #1 – Seismic Category I
- Screen #2 – Equipment or Systems
- Screen #3 – Support for the 5 Safety Functions
- Screen #4 – Sample Considerations

The process for selecting SSCs using each of these four screens is described below. This will result in the first Seismic Walkdown Equipment List (SWEL 1).

Screen #1 – Seismic Category I

Screen #1 in Figure 1-1~~Figure 1-1~~Figure 1-1 narrows the scope of SSCs in the plant to those that are classified as Seismic Category (SC) I. This is done because only such items have a defined seismic licensing basis against which to evaluate the as-installed configuration. Selecting these items is intended to comply with the request in the NRC 50.54(f) Letter, under the "Requested Actions" section, to "verify current plant configuration with the current license basis." Typically, the plants have equipment lists that define the SSCs that are Seismic Category I.

Screen #2 – Equipment or Systems

Screen #2 in Figure 1-1~~Figure 1-1~~Figure 1-1 narrows the scope of SSCs by selecting only those that do not regularly undergo inspections to confirm that their configuration continues to be consistent with the plant licensing basis. The types of SSCs not selected for addition to the SWEL 1 are those described below.

- Seismic Category I Structures are typically confirmed to meet their seismic licensing bases through analyses. Periodic inspections of SC I structures are routinely performed to confirm that degradation (e.g., concrete spalling) has not occurred, which could cause the structures to fall outside their licensing basis. Inspections to identify structural degradation are included in plant programs designed to address the Maintenance Rule. Therefore, SC I structures are not included on SWEL 1.
- Containment Penetrations are typically confirmed to meet their seismic licensing bases through analyses. Periodic inspections and/or testing are performed, as required by ASME Section XI, to verify that these penetrations have not degraded. Therefore, containment penetrations are not included on the SWEL. Other containment integrity systems, such as the containment spray system, the containment isolation valves, and the support systems and components required to accomplish the isolation function may be considered for inclusion on SWEL 1.
- Seismic Category I Piping Systems have been confirmed to meet their licensing bases through several generic NRC programs, e.g., IE Bulletin 79-14. Periodic walkdowns by plant system engineers and ASME Section XI In-service Inspections ensure that SC I piping systems are maintained in accordance with their licensing bases. Therefore, SC I piping systems are not included on SWEL 1.

The potential for distribution system seismic interaction (i.e., cable/conduit raceways and HVAC ductwork) to affect SWEL items is evaluated during the equipment walkdowns. A general review of distribution systems is performed during the Area Walk-Bys as described in Section 4: Seismic Walkdowns and Area Walk-Bys.

After applying the above selection criteria, it is expected that the SWEL will typically include mechanical and electrical equipment plus tanks and heat exchangers. Examples of these types of equipment are listed in Appendix B: Classes of Equipment. Note that Equipment Class 0 (Other) is included in this list. This catchall category includes other types of equipment not in any of the other 21 classes on that list.

Screen #3 – Support for the 5 Safety Functions

Screen #3 in Figure 1-1~~Figure 1-1~~Figure 1-1 narrows the scope of SSCs to be included on SWEL 1 to those associated with maintaining the following five safety functions.

- Reactor reactivity control
- Reactor coolant pressure control
- Reactor coolant inventory control
- Decay heat removal
- Containment function

The first four functions are associated with bringing the reactor to a safe shutdown condition. The fifth function is associated with maintaining containment integrity.

The recommended approach for selecting SSCs associated with these five safety functions is to develop a list of equipment in various systems associated with these five safety functions. Details for implementing this approach are provided in the following subsections.

Previous Equipment List

Previous programs that ~~could be used to define~~may have developed a base list of SSCs~~-~~ include the IPEEE program and, for some plants, the USI A-46 program. These base lists ~~that~~ may be appropriate for use in the 50.54(f) seismic walkdown~~s~~ activities. ~~include the IPEEE program and, for some plants, the USI A-46 program.~~ The IPEEE program was intended to address the seismic margin of SSCs associated with all of the above five safety functions. For plants that used the Seismic Probability Risk Assessment (SPRA) method, SSCs from the dominant functional/systemic sequences can be used for the base list. For plants that used the NRC Seismic Margins Assessment (NRC SMA) method, SSCs from the important sequences and cut sets could be used for the base list. For

plants that used the EPRI Seismic Margins Assessment (EPRI SMA) method, SSCs from the success paths could be used for the base list.

The USI A-46 program was intended to address the seismic adequacy of mechanical and electrical equipment in about 60 of the older nuclear power reactors in the U.S. SSCs from the walkdown Safe Shutdown Equipment List (SSEL) developed in this program address the first four safe shutdown functions listed above.

Systems Typically Used for Safety Functions

The frontline and support systems that are typically used to accomplish the five safety functions are listed in Appendix B of EPRI NP-6041 [13]. The frontline systems for Pressurized Water Reactors (PWRs) are shown in Table B-1 of this reference. The frontline systems for Boiling Water Reactors (BWRs) are shown in Table B-2 of this reference. The support systems for both PWRs and BWRs are shown in Table B-3 of this reference. Copies of these tables are included in Appendix E: Systems to Support Safety Functions.

Note that in some cases, more than one type of system can be used to accomplish a safety function. Also, some systems can be used to accomplish more than one safety function.

The major pieces of equipment in the Nuclear Steam Supply System (NSSS) that are located inside the containment are excluded from the scope of this program. Also excluded are the supports for this equipment along with all the components mounted in or on this NSSS equipment. The technical basis for excluding such equipment from the scope of this program is summarized below:

- Primary reactor components such as reactor vessels, reactor fuel and internals, pressurizers, steam generators, steam separators, recirculation pumps, reactor coolant pumps, and associated piping in domestic nuclear plants are designed for seismic loadings. The requirements for seismic design of these components and their supports are specified in the Safety Analysis Reports for each plant and in the ASME codes.
- The primary reactor components and supports are subject to formal, periodic in-service inspection under Section XI of the ASME Boiler and Pressure Vessel Code. As a result, any deficiencies in the installation, support, and anchorage of this equipment would have been detected and corrected and are not current concerns.
- The adequacy of the seismic design of primary reactor components and supports has been reviewed and verified for a number of older operating plants in the NRC's Systematic Evaluation Program (SEP) and for all operating nuclear plants under USI A-2, Asymmetric Loads. These program reviews

confirmed that seismic design and installation of NSSS equipment is not a significant seismic-safety issue.

Screen #4 – Sample Considerations

Screens #1 to #3, discussed above, describe a process ~~of exclusion of items~~ that narrows the list of candidate items to those of most significance. By contrast, ~~s~~Screen #4 represents a process intended to result in a SWEL that ~~is~~ sufficiently represent~~atives~~ ~~of~~ the broader population of plant Seismic Category ~~1~~I equipment and systems to meet the objectives of the NRC 50.54(f) Letter. Screen #4 in Figure 1-1~~Figure 1-1~~Figure 1-1 ~~narrows the scope of SSCs to be included on SWEL 1 to a sample that~~ considers the following five selection attributes that are to be ~~sufficiently~~ represented in the SWEL:

- A variety of types of systems
- Major new and replacement equipment
- A variety of types of equipment
- A variety of environments
- Equipment enhanced due to findings identified during the IPEEE program

~~Instead, it~~It is expected that the SWEL, taken as a whole, will include representative items from some of the variations within each of the above five attributes.

The size of the sample should be sufficiently large to include a variety of items that collectively include all of the above five attributes. It is anticipated that SWEL 1 will ~~typically~~ include from about 90 to 120 items.

It is not expected that the sample will include every permutation from every variation within the above attributes. For example, some of the systems in the plant will not have had installation of major new and replacement equipment.

Further, some systems may have only a limited number of different types of equipment. For example, certain fluid systems may not have batteries on racks.

Similarly, not all plants have all of the various types of equipment classes within the plant. For example, some plants generate DC power using inverters and therefore do not have motor generators.

~~Instead, it is expected that the SWEL, taken as a whole, will include representative items from some of the variations within each of the above five attributes.~~

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Comment [c2]: should be one paragraph

In the process of selecting equipment for the sample, it is recommended that the Equipment Selection Personnel consult with and obtain advice from plant operators and others (e.g., systems engineers, maintenance personnel, etc.). For example, operators may be able to identify equipment with operational issues or that have been exposed to repeated maintenance activities. Such activity may have left the equipment in a state that no longer conforms to its seismic licensing basis.

Each of the above listed attributes is discussed below in more detail.

Various types of systems

Equipment from various types of systems should be selected for the sample. The types of systems to be considered include frontline and support systems such as the types listed in Appendix B of EPRI NP-6041 [13] (copies of these lists are included in Appendix E: Systems to Support Safety Functions).

Major new and replacement equipment

~~Some~~ A robust sampling of the major new or replacement equipment installed within the past 15 years (i.e., since the approximate completion of the seismic IPEEE evaluations) should be selected for the ~~sample~~SWEL. This equipment would not have been ~~as a result of its not being~~ included in the earlier IPEEE or A-46 programs.

In addition, it is recommended that the Equipment Selection Personnel consult with and obtain advice from plant operators and others (e.g., systems engineers, maintenance personnel, etc.) to identify equipment that has recently (e.g., within the past year or so) been modified or upgraded. Such equipment may be more susceptible to potential housekeeping issues such having portable equipment stored nearby within a zone of influence where earthquake motions could cause adverse seismic interactions.

Various types of equipment

Various types of equipment should be selected for the sample. This may be accomplished by including ~~an~~ at least one item from each of the classes of equipment listed in Appendix B: Classes of Equipment.

Various environments

The equipment to be selected for the sample should be from different locations in the plant that have different operating environments. For example, this could include equipment in environments that are dry and hot, wet and cold, mild and harsh, and inside and outside buildings.

Equipment Enhanced from IPEEE

During the IPEEE program, plant-specific seismic vulnerabilities (including anomalies, outliers, or other findings) were identified. Some of this equipment should be included in SWEL 1.

Note that the status of all IPEEE vulnerabilities will be identified as described in Section 7: IPEEE Vulnerabilities.

Spent Fuel Pool Related Items

The process for selecting a sample of the SSCs associated with the Spent Fuel Pool (SFP) includes the following four screens, as shown in Figure 1-2**Error! Reference source not found.**. These screens narrow the scope of SSCs to be included in the second Seismic Walkdown Equipment List (SWEL-2):

- Screen #1 – Seismic Category I
- Screen #2 – Equipment or Systems
- Screen #3 – Sample Considerations
- Screen #4 – Rapid Drain-Down

The process for selecting SSCs using these screens is similar to the approach described above for SWEL 1~~, with the following exceptions~~.

Screen #1, Seismic Category ~~1~~I, limits the items to those that have a seismic licensing basis.

Screen #2, Equipment or Systems, considers only those items associated with the spent fuel pool that are appropriate for an equipment walkdown process.

Screen #3, Sample Considerations, represents a process intended to result in a SWEL that sufficiently represents the broader population of SFP Seismic Category I equipment and systems to meet the objectives of the NRC 50.54(f) Letter. Screen #3 in Figure 1-1~~Figure 1-2~~Figure 1-1 considers the following four selection attributes that are to be represented in the SWEL~~includes in and inclusion criteria that encompasses the following four sample selection attributes~~[3]~~:~~:

- A variety of types of systems
- Major new and replacement equipment
- A variety of types of equipment

[3] The four sample selection attributes used for SWEL 2 are the same as the first four attributes used for SWEL 1. The fifth attribute used in SWEL 1 (equipment enhancements that were made as a result of IPEEE) is not used for SWEL 2 ~~since~~ because such items are already included in SWEL 1.

- A variety of environments

It is anticipated that the number of equipment samples selected for SWEL 2 will include a much smaller number of items than for SWEL 1 because there are not as many systems and items of equipment associated with the Spent Fuel Pool as there are for bringing the plant to a safe shutdown condition and maintaining containment integrity.

Screen #4, Rapid Drain-Down, identifies equipment that could allow the spent fuel pool (SFP) to drain rapidly. Based on ~~performance of SSCs during past earthquakes and~~ typical designs of spent fuel pools at nuclear power plants, the scope of SSCs ~~should~~ would be typically limited to hydraulic lines connected to the SFP and the equipment connected to those lines. The spent fuel pool structure is assumed to be seismically adequate because it is ~~typically classified~~designed as Seismic Category I.

The SSCs that should be identified are not limited to SC1 items, but may be limited to those that could allow rapid drain-down of the SFP. Rapid drain-down is defined as lowering the water level to the top of the fuel assemblies within 72 hours after the earthquake.

Assessment of potential drain-down features could include the following:

- The assessment should determine if there are penetrations within 10 feet of the top of the fuel assemblies. If no penetrations exist, then no rapid drain-down items would be added to SWEL 2.
- An assessment of the potential for rapid drain-down should be performed for pools with penetrations within 10 feet of the top of the fuel assembly. This assessment should include consideration how pool sloshing would reduce the initial volume of water in the spent fuel pool during the seismic event. Alternatively, these features would be added to SWEL 2.

~~However~~T~~,~~ the basis for both inclusion and exclusion of items should be provided in the submittal report. It is only necessary to consider drain-down caused by gravity loading; it is not necessary to consider mechanisms in which the water is pumped out of the SFP.

~~Since~~ Because gravity is the driving force, the minimum size of the leak path can be estimated for each elevation in SSCs below the top of the spent fuel assemblies.

Any items identified as having the potential for rapidly draining the SFP should be added to SWEL 2.

Comment [AMK3]: Question: How is the initial level defined? Does it already account for loss of water due to sloshing? If not, we should state that.

Formatted: Bulleted + Level: 1 + Aligned at: 1.75" + Indent at: 2"

Formatted: Highlight

Comment [c4]: Universal search on "since" to assure it is always time related.

Comment [c5]: one paragraph

Equipment Access

The purpose for preparing lists of equipment to be included on the SWELs is to allow those items to be walked down, as described in Section 4: Seismic Walkdowns and Area Walk-Bys. Of course, to be able to perform the Seismic Walkdown on these items, it is necessary to have access to them and to be able to view their anchorage. However, in some cases ~~it is recognized that~~ it may not be possible to gain access to the equipment or view the anchorage within the 180-day response period because the equipment is located in inaccessible areas of the plant (e.g., high radiation areas) or the anchorage cannot be seen since it is inside an electrically energized cabinet.

It is recommended that when selecting equipment for the sample that those items that are accessible and have visible anchorage be selected wherever possible, while at the same time addressing all the sample selection attributes described above.

For example, assume that two trains of equipment are located in areas of the plant with significantly different background radiation levels. It is recommended that the equipment in the lower radiation area be placed on the SWEL.

Another example is that to be able to view the anchorage of a switchgear cabinet in a line-up of similar cabinets, it is recommended that a cabinet that is out of service (e.g., a breaker has been temporarily removed from the switchgear cabinet) be placed on the SWEL. This may make it possible to view the anchorage for a switchgear cabinet and avoid adverse electrical safety issues.

It is recognized that it may not be possible to select only accessible equipment with visible anchorage for all the items on the SWEL, while at the same time addressing all the sample selection attributes. For example, if the plant is at power, it may not be possible to access equipment inside the containment. Under these circumstances, the inaccessible sample item on the SWEL should be identified as being inaccessible and a plan developed for walking down that item in the future. This inaccessible condition and the plan for a future walkdown should be included in the submittal report.

Section 4: Seismic Walkdowns and Area Walk-Bys

This section provides guidance for conducting Seismic Walkdowns and Area Walk-Bys. These are represented as Screen #1 in Figure 1-3**Error! Reference source not found.**.

The seismic walkdowns described in this section are to be conducted by at least two Seismic Walkdown Engineers (SWEs), whose qualifications are described in Section 2: Personnel Qualifications. It is expected that the SWEs will be using their engineering judgment, based on their experience and training, to identify potential adverse seismic conditions. These engineers may also rely upon new or existing analyses, where needed, to inform their judgment.

Formatted: Indent: Left: 0"

Seismic Walkdowns

Seismic Walkdowns focus on the seismic adequacy of the items on the SWEL and those nearby SSCs that could cause potential adverse seismic interactions for those SWEL items. The Seismic Walkdown focuses on the following adverse seismic conditions associated with the subject item of equipment:

- Adverse anchorage conditions
- Adverse seismic spatial interactions
- Other adverse seismic conditions

If items on the SWEL or those nearby SSCs are judged not to have potential adverse seismic conditions, then it is not necessary to conduct a licensing basis evaluation of those SSCs. However, if potential adverse seismic conditions are identified, then further evaluations should be performed, as described in Section 5: Seismic Licensing Basis Evaluations.

Comment [AMK6]: There are several cases where sentences on the same subject are made new paragraphs, making the document hard to read. This should be avoided. Single sentences should only be broken out if they are different thoughts.

~~However, if potential adverse seismic conditions are identified, then further evaluations should be performed, as described in Section 5: Seismic Licensing Basis Evaluations.~~

Field Code Changed

Field Code Changed

The results of the Seismic Walkdowns should be documented on the Seismic Walkdown Checklist (SWC) shown in Appendix C: Checklists.

Details for identifying potential adverse anchorage conditions, adverse seismic interactions, and other adverse seismic conditions during the Seismic Walkdowns are described in the following subsections. Preparations for conducting the Seismic Walkdowns are also described.

Adverse Anchorage Conditions

Guidance for identifying anchorage that could be degraded, non-conforming, or unanalyzed relies on visual inspections of the anchorage and verification of anchorage configuration. Details for these two types of evaluations are provided in the following two subsections.

The evaluation of potential adverse anchorage conditions described in this subsection applies to the anchorage connections that attach the identified item of equipment to the civil structure on which it is mounted. For example, the anchor bolts that secure the base of a Motor Control Center to the concrete floor are evaluated in this subsection. Evaluation of the connections that secure components within the MCC is covered in the subsection: **Other Adverse Seismic Conditions**.

Visual Inspections

The purpose of the visual inspections is to identify whether any of the following potential adverse anchorage conditions are present:

- Bent, broken, missing, or loose hardware,
- Corrosion that is more than mild surface oxidation,
- Visible cracks in the concrete near the anchors, and
- Other potential adverse seismic conditions.

Based on the results of the visual inspection, the SWEs should judge whether the anchorage ~~is~~ is potentially degraded, non-conforming, or unanalyzed. The results of this visual inspection should be documented on the Seismic Walkdown Checklist (SWC), shown in Appendix C: Checklists. If there is no evidence of degraded, nonconforming, or unanalyzed conditions, then this is indicated on the checklist and a licensing basis evaluation is not necessary. However, if it is not possible to judge whether the anchorage is degraded, non-conforming, or unanalyzed, then further evaluations of the anchorage should be performed, as described in Section 5: Seismic Licensing Basis Evaluations.

~~However, if it is not possible to judge whether the anchorage is degraded, non-conforming, or unanalyzed, then further evaluations of the anchorage should be performed, as described in Section 5, Seismic Licensing Basis Evaluations.~~

Field Code Changed

Field Code Changed

Configuration Verifications

In addition to the visual inspections of the anchorage as described above, the configuration of the installed anchorage should be verified to be consistent with existing plant documentation for at least 50% of the items on the SWEL (i.e., SWEL 1 plus SWEL 2).

Line-mounted equipment (e.g., valves without anchorages) need not be evaluated for anchorage adequacy and should not be counted in establishing the 50% sample size.

Examples of documentation that can be used for verifying that the anchorage installation configurations are consistent with the plant documentation include:

- Design drawings
- Seismic qualification reports of analyses or shake table tests
- IPEEE or USI A-46 documentation

If plant documentation showing the characteristics of the anchorage for a particular item of equipment cannot be located, then that item should be evaluated further, as described in Section 5: Seismic Licensing Basis Evaluations.

Adverse Seismic Spatial Interactions

An adverse seismic spatial interaction is the physical interaction between a nearby SSC and the item on the SWEL caused by relative motions between the two during an earthquake. An inspection should be performed in the area adjacent to and surrounding the equipment on the SWEL to identify any seismic interaction condition that could adversely affect the capability of that SWEL item to perform any of its intended safety-related functions.

The three types of seismic spatial interaction effects that should be considered are:

- Proximity
- Structural failure and falling
- Flexibility of attached lines and cables

Guidance for evaluating each of these types of seismic spatial interactions is described in Appendix D: Seismic Spatial Interaction.

The Seismic Walkdown Engineers should exercise judgment to identify credible seismic interaction hazards.

Other Adverse Seismic Conditions

In addition to adverse anchorage conditions and adverse seismic interactions, described above, there may be other potential adverse seismic conditions that could challenge the seismic adequacy of SSCs. Examples of the types of conditions that could pose potential adverse seismic conditions include the following:

- Degraded conditions
- Loose or missing fasteners that secure internal or external components to equipment
- Large, heavy items, not typically included by the original equipment manufacturer, mounted on a cabinet
- Cabinet doors or panels that are not latched or fastened
- Other adverse conditions

Any identified other adverse conditions should be documented on the Seismic Walkdown Checklist (SWC), shown in Appendix C: Checklists.

Preparations for Seismic Walkdowns

The following pre-walkdown activities are recommended:

- Obtain the Seismic Walkdown Equipment List (SWEL)
- Enter available data for each item of equipment onto the Seismic Walkdown Checklist (SWC) including:
  - Tag number or equipment ID
  - Equipment/System description
  - Location in the plant
  - Floor elevation
  - Whether a configuration verification of the anchorage for that item is needed
- Obtain drawings showing area layouts and equipment locations
- Obtain in-structure response spectra for applicable equipment locations
- Obtain the plant documentation showing the anchorage for 50% of the items on the SWEL
- Obtain available documents from prior seismic walkdowns, e.g., IPEEE and USI A-46 checklists and data sheets
- Obtain plant documentation for IE Bulletin 80-11 masonry block walls

- Arrange for badging and dosimetry
- Arrange for plant operations and/or maintenance personnel to open cabinets and other equipment for anchorage inspection
- Arrange for plant operations/systems personnel to provide answers to operations/systems questions than may arise during the Seismic Walkdowns and Area Walk-Bys
- Obtain current operability evaluations[4] affecting items on the SWEL or dependent upon those items on the SWEL

Area Walk-Bys

The purpose of the Area Walk-Bys is to identify potential adverse seismic conditions associated with other SSCs located in the vicinity of the items on the SWEL.

Vicinity is defined as the same room and elevation containing the SWEL item. If the room is very large (e.g., Turbine Hall), then the vicinity should be identified based on judgment, e.g., on the order of about ~~20~~ 35 feet from the SWEL item. This vicinity should be described on the Area Walk-By Checklist, shown in Appendix C: Checklists.

The key examination factors that should be considered during Area Walk-Bys include the following:

- Anchorage conditions (if visible without opening equipment)
- Significantly degraded equipment in the area
- A visual assessment (from the floor) of cable/conduit raceways and HVAC ducting (e.g., condition of supports or fill conditions of cable trays)
- Potential adverse seismic interactions including those that could cause flood/spray and fire in the area
- Other housekeeping items that could cause adverse seismic interaction (including temporary installations and equipment storage)

The Area Walk-Bys are intended to identify adverse seismic conditions that can be readily identified by visual inspection without necessarily stopping to open cabinets or to take an extended look. Therefore, it is expected that the Area Walk-By will take significantly less time than it takes to conduct the Seismic Walkdowns described above for an item of equipment on the SWEL. If a potential adverse seismic condition is identified during the Area Walk-By, then additional time will be needed to evaluate adequately that adverse condition and document the finding.

[4] It is recognized that the condition of plant equipment could change between the point in time when the SWEL is developed and when the Seismic Walkdown is performed.

The results of the Area Walk-Bys should be documented on the Area Walk-By Checklist (AWC) shown in Appendix C: Checklists. A separate AWC should be filled out for each area inspected. It is necessary to describe only those adverse seismic conditions found during the Area Walk-By.

Additional details for evaluating the potential for adverse seismic interactions that could cause flood/spray or fire in the area are provided in the following two subsections.

Seismically Induced Flooding/Spray Interactions[5]

Seismically induced flooding/spray interactions are the effect of possible ruptures of vessels or piping systems that could spray, flood or cascade water into the area where SWEL items are located. This type of seismic interaction was considered during the IPEEE program. Those prior evaluations may be considered for information during the Area Walk-Bys.

One area of particular concern is threaded fire protection piping with long unsupported spans. If adequate seismic supports are present or there are isolation valves near the tanks or charging sources, flooding may not be a credible concern. Numerous failures have been observed in past earthquakes resulting from sprinkler head impact. Less frequent but commonly observed failures have occurred due to flexible headers and stiff branch pipes, non-ductile mechanical couplings, seismic anchor motion and failed supports.

Examples where seismically induced flooding/spray interactions could occur include the following:

- Fire protection piping with inadequate clearance around fusible-link sprinkler heads
- Non-ductile mechanical and threaded piping couplings can fail and lead to flooding or spray of equipment
- Long, unsupported spans of threaded fire protection piping
- Flexible headers with stiffly supported branch lines
- Non-Seismic Category I tanks

The Seismic Walkdown Engineers should exercise judgment to identify credible seismically induced interactions that could lead to flooding or spray.

[5] Guidance for seismically induced flooding/spray interactions was adapted from Appendix F of [13].

Seismically Induced Fire Interactions

Comment [AMK7]: This section omits discussion of seismically induced fires that could occur due to electrical problems such as high voltage components arcing to ground, etc.

This additional scope needs to be mentioned here both in the initial paragraph and in the "Examples" list.

Seismically induced fire interactions can occur when equipment or systems containing hazardous/flammable material fail or rupture. This type of seismic interaction was considered during the IPEEE program. Those prior evaluations may be considered for information during the Area Walk-By.

Examples where seismically induced fire interactions could occur include the following:

- Hazardous/flammable material stored in inadequately anchored drums, inadequately anchored shelves, or unlocked cabinets
- Natural gas lines and their attachment to equipment or buildings
- Bottles containing acetylene or similar flammable chemicals
- Hydrogen lines and bottles
- High voltage equipment

Formatted: Highlight

The Seismic Walkdown Engineers should exercise judgment to identify credible seismically induced interactions that could lead to fires.

Section 5: Seismic Licensing Basis Evaluations

This section provides guidance and criteria for performing seismic licensing basis evaluations of the SSCs identified when potentially adverse seismic conditions are identified during the Seismic Walkdowns and Area Walk-Bys. This activity is illustrated as Screen #2 in Figure 1-3**Error! Reference source not found.**.

For the conditions found to meet the plant seismic licensing basis, no further action is warranted, except to document that result, as described in Section 8: Submittal Report.

For the conditions that do not appear to meet the plant seismic licensing basis or for which additional licensing basis evaluations are necessary, the identified condition should be entered into the plant Corrective Action Program (CAP) in accordance with the plant's existing processes and procedures. This activity is illustrated as the CAP bucket in Figure 1-3**Error! Reference source not found.**.

Seismic Category I equipment that cannot perform its intended safety function during or after the design basis ground motion is, by definition, not in compliance with its seismic licensing basis.

The seismic licensing basis evaluations described in this section are to be conducted by Licensing Basis Reviewers, as described in Section 2: Personnel Qualifications.

The results of the seismic licensing basis evaluations should be documented as described in Section 8: Submittal Report.

Approach

When a potentially adverse seismic condition is identified it will be evaluated against its seismic licensing basis. This is done by:

- Determining the Current Licensing Basis (CLB) for the plant as it relates to the seismic adequacy of the equipment,
- Identifying what seismic qualification documentation may exist for the equipment, and

- Evaluating whether the as-installed condition of the equipment is consistent with the CLB and the existing seismic documentation.

Current Licensing Basis

The Current Licensing Basis (CLB) is the set of Nuclear Regulatory Commission (NRC) requirements applicable to a specific plant, plus a licensee's docketed and currently effective written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific licensing basis, including all modifications and additions to such commitments over the life of the facility operating license[6].

The set of NRC requirements applicable to a specified plant CLB includes:

- NRC regulations in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 54, 55, 70, 72, 73 and 100 and appendices there-to
- Commission Orders
- License Conditions
- Exemptions
- Technical Specifications
- Plant-specific design basis information defined in 10 CFR 50.2 and documented in the most recent UFSAR (as required by 10 CFR 50.71).
- Licensee Commitments remaining in effect that were made in docketed licensing correspondence (such as licensee responses to NRC bulletins, License Event Reports, Generic Letters and Enforcement Actions)
- Licensee Commitments documented in NRC safety evaluations

Formatted: Highlight

Seismic Qualification Documentation

Depending upon the requirements defined in the CLB, several different methods may have been used to demonstrate that Seismic Category I equipment will perform their intended safety-related functions during and/or after an earthquake. These typically include seismic analyses, shake table testing, and for some plants use of earthquake experience data based on the GIP [10] for new and replacement equipment.

Seismic Licensing Basis Evaluations

It may be possible to easily show that the installation of a particular item of equipment either meets or violates the seismic licensing basis using previous evaluations. For example, the IPEEE and USI A-46 programs addressed the seismic adequacy of equipment anchorage and adverse seismic interactions for each item of equipment on their safe shutdown

[6] Current Licensing Basis is defined in NRC Inspection Manual Part 9900.

equipment lists. The documentation from these programs can be useful in assessing those potential adverse seismic conditions identified during the seismic walkdowns and area walk-bys.~~in Section 4: Seismic Walkdowns and Area Walk-Bys~~.

An example where it can be shown that the licensing basis is met is a motor control center (MCC) that contains essential relays and is found to have a minimum gap of 1 inch~~"~~ with an adjacent MCC. If the seismic analyses of these MCCs show that the maximum relative displacement under SSE conditions between the two MCCs is at most 0.5~~"~~ inches at any height considering in-phase and out-of-phase motions, then the MCC is considered seismically adequate and need not be bolted or tied to the adjacent MCC to avoid potential relay chatter due to impact.

Comment [AMK8]: Even if the change to "inch" is not made due to EPRI style requirements, it should be the right mark.

An example where it is easy to show that the seismic licensing basis is not ~~likely to be~~ met is a tall, narrow unanchored MCC, located on an upper elevation in the plant. ~~If the seismic walkdown found this MCC without any anchors securing it to the floor or to a wall,~~In this case, under the design level ground motion the MCC would likely tip over, become damaged, and render the MCC unable to fulfill its safety-related function. Such an MCC would not ~~likely~~ meet its seismic licensing basis. In this case, the potentially adverse condition would be submitted to the plant CAP for further review and disposition.

If it cannot be easily determined that a potentially adverse condition meets the plant seismic licensing basis, then that condition would be submitted to the plant CAP for further review and disposition in accordance with the plant's existing processes and procedures.

The principal purpose for entering the plant CAP is to determine whether potential adverse conditions~~,~~ identified during the Seismic Walkdown and Area Walk-Bys meet the plant seismic licensing basis. If it is determined that the licensing basis is not met for that one item of equipment, then ~~it is expected~~ an extent of condition evaluation ~~will~~ should be initiated as appropriate to identify instances where such a violation could occur in other similar equipment.

Section 6: Peer Review

[This section is still under development. Changes shown in this section should NOT be considered final at this time.]

This section describes Peer Review requirements for the activities performed to meet the 50.54(f) Letter [1].

[The peer review team should consist of a minimum of two individuals, one of which has seismic engineering experience, as it applies to nuclear power plants.

The peer review team should provide an overview of the effort from start to finish including:

- Add bullets from NRC comment box here. See Bob Whorton's words in email to me.]

[Scrub out peer reviewers in other sections of document and include them all here in this section.]

Selection of SSCs

The process for selecting the items included on the Seismic Walkdown Equipment List (SWEL) is described in detail in Section 3: Selection of SSCs. This work should be reviewed by a Peer Reviewer who has knowledge of plant operations, plant documentation, and associated SSCs.

The Peer Reviewer should review the SWEL to ensure the items on the SWEL adequately represent a diverse sample of the equipment required to perform the five safety functions discussed in Section 3: Selection of SSCs, including diversity of normal operating environment. The Peer Reviewer should document his review of the SWEL on the checklist shown in Appendix F: Checklist for Peer Review of SSC Selection.

Seismic Walkdowns and Area Walk-bys

Section 4: Seismic Walkdowns and Area Walk-Bys describes the process for both the Seismic Walkdown of items on the SWEL and Area Walk-Bys

of the locations of the SWEL items. As part of this process, the two Seismic Walkdown Engineers should discuss their observations while in the plant and document their consensus decision about the seismic adequacy of conditions they find on the checklists shown in Appendix C: Checklists. If a consensus is not reached, the more conservative judgment is documented on the checklist, thus ensuring a conservative decision about whether an additional evaluation is required to confirm the observed condition meets the seismic licensing basis.

This in-process review of the work of each other's work by the Seismic Walkdown Engineers meets Peer Review requirements for the Seismic Walkdown and Area Walk-Bys.

Seismic Licensing Basis Evaluations

If the Seismic Walkdown Engineers identify a condition in the plant that potentially would inhibit the equipment or system from performing its safety-related function during and/or following a seismic event, and thus not meet its seismic licensing basis, the condition is identified as requiring a licensing basis evaluation.

If the potentially adverse condition can be shown to be acceptable with respect to its seismic licensing basis with limited effort, then this evaluation should be documented by the personnel performing the evaluation, and independently reviewed by a Peer Reviewer. The Peer Reviewer should have a degree, or equivalent, in mechanical or civil/structural engineering and have experience in seismic engineering, as it applies to nuclear power plants.

If the SWEs identified a potential for seismically induced flooding from a tank in the area on their Area Walk-By Checklist, and the personnel performing the licensing basis evaluation identifies a seismic qualification calculation of the tank, then the result of this evaluation would be documented by the preparers and reviewed by the Peer Reviewer, who would also sign the evaluation document.

If more than a limited effort is needed to evaluate a potentially adverse seismic condition, then the issue should be entered into the plant's Corrective Action Program (CAP), which includes accepted review processes.

Final Submittal Report

A review of the final submittal report by members of the Peer Review Team should be preformed to ensure that all the objectives and requirements of the 50.54(f) Letter are met. Specific reviews should include:

- Qualifications of personnel, as defined in Section 2: Personnel Qualifications`

- SWEL preparation checklist, as shown in Appendix F: Checklist for Peer Review of SSC Selection
- SWC and AWC checklists, as shown in Appendix C: Checklists
- Licensing basis evaluation documentation, or records of entry into CAP, of potentially adverse seismic conditions identified during the Seismic Walkdowns and Area Walk-Bys
- Overall report, including the status of IPEEE enhancements

The signature of the Peer Reviewer who reviewed the report should be included on the final report.

Section 7: IPEEE Vulnerabilities

This section provides guidance for reporting the plant-specific vulnerabilities identified during the IPEEE program and the actions taken to eliminate or reduce them as required in the 50.54(f) Letter [1], under Requested Information, Item 2.c:

> "A list of plant-specific vulnerabilities (including any seismic anomalies, outliers, or other findings) identified by the IPEEE and a description of the actions taken to eliminate or reduce them (including their completion dates)"

To address this request for information, it is not necessary to repeat or update any of the IPEEE evaluations.

The activity to identify ~~identification of~~ the seismic vulnerabilities and actions taken to eliminate or reduce them ~~are~~ is to be conducted by IPEEE Reviewers, as described in Section 2: Personnel Qualifications.

Identification of Seismic Vulnerabilities

Several different external events were evaluated in the IPEEE program including those associated with seismic events, internal fires, high winds, tornadoes, external floods, transportation accidents, and nearby facility accidents. The IPEEE vulnerabilities that should be reported in response to the 50.54(f) Letter are only those associated with seismic events.

Several different methods were used by licensees for conducting the seismic evaluations in the IPEEE program. Consequently, the types of seismic vulnerabilities reported in their IPEEE reports also varied.

Similarly, since the criterion for identifying "vulnerabilities" was not precisely defined for the IPEEE program, licensees used several different terms to describe the conditions found, including, for example:

- Anomalies
- Outliers
- Findings

Those seismic vulnerabilities that were identified during the IPEEE program should be listed in the submittal report, as described in Section 8: Submittal Report.

Actions Taken to Eliminate/Reduce IPEEE Seismic Vulnerabilities

Generic Letter No. 88-20, Supplement 4 [9] states that the staff "expected that the licensee will move expeditiously to correct any vulnerabilities that it determines warrant correction." It also states that the "changes should also be reported in the IPEEE submittal." This generic letter also recognized that changes to the plant may not be warranted if "the plant design and operation meet NRC regulations and that further safety improvements are not substantial or are not cost effective."

Because the IPEEE program did not require licensees to report when the changes identified in the IPEEE program had been completed, the 50.54(f) Letter asks licensees to report the current status of such changes.

To fulfill this request, the submittal report should describe:

- Actions taken to eliminate or reduce the IPEEE seismic vulnerabilities identified above,
- Date the actions were completed, and
- Current status of the actions taken and how the current status was determined.

There were a range of actions that could have been taken to eliminate or reduce seismic vulnerabilities. Therefore, the methods for verifying the current status of these changes will vary also.

For example, a change may have been made to a plant operational or maintenance procedure. A review of the current revision of that procedure could be made to verify that the change remains effective for addressing the identified seismic vulnerability.

Another example is a change to the design or installation of an item of equipment. In this case, plant records may be reviewed to verify that the change was completed and when that occurred. In addition, it is recommended that the equipment be inspected to verify that the subject change remains in place.

Those actions taken to eliminate or reduce the IPEEE seismic vulnerabilities, along with the date the actions were completed and their current status should be listed in the submittal report, as described in Section 8: Submittal Report.

Sample Selection for Seismic Walkdown

In addition to identifying and reporting the status of IPEEE vulnerabilities described above, a sample of IPEEE enhancements should be included in SWEL 1, as described in Section 3: Selection of SSCs.

Section 8: Submittal Report

This section provides guidance for preparing the submittal report to ~~meet~~ provide the information requested in the Recommendation 2.3 Seismic Walkdown portion of the 50.54(f) Letter [1]. Ultimately, the controls for responding to the 50.54(f) Letter should be governed by the process used by the licensee for responding to NRC requests for information "under oath and affirmation.".

The information to be included in the submittal report for each of the main activities described in this Seismic Walkdown Guidance is given below. Appendix H: Documentation Requirements in 50.54(f) Letter, includes a summary of how the documentation requirements defined in the 50.54(f) Letter are met in this Seismic Walkdown Guidance.

A separate submittal report should be provided for each unit.

Seismic Licensing Basis

A summary of the licensing basis for the Seismic Category I SSCs in the plant should be provided. This would include a summary description of the Safe Shutdown Earthquake (SSE) and which codes, standards, and methods were used in the design of the Seismic Category I SSCs for meeting the plant-specific seismic licensing basis requirements.

Personnel Qualifications

The Equipment Selection Personnel who perform the equipment selection process should be identified along with a summary of their background and experience.

The Seismic Walkdown Engineers (SWEs) who perform the Seismic Walkdowns and Area Walk-Bys should be identified along with a summary of their background and experience. The training certificate (from the NTTF 2.3 Seismic Walkdown Training Course or the SQUG Walkdown Training Course) should also be included in the submittal report for each SWE.

The Licensing Basis Reviewers who perform the seismic licensing basis evaluations should be identified along with a summary of their background and experience.

Comment [AMK9]: It would be very helpful to add the headers as a bulleted list so that they are used as a TOC, or to just provide a "standard" TOC.

Comment [AMK10]: Will certificates be issued? We don't think that submitting the training certificates is necessary.

For those activities performed under the plant Corrective Action Program (CAP), personnel qualifications for those involved in the CAP are generally covered in plant-specific CAP procedures and therefore need not be described in the submittal report.

The IPEEE Reviewers who identify the IPEEE vulnerabilities and the actions taken to eliminate or reduce them should be identified along with a summary of their background and experience.

The Peer Review Team members who perform the peer review should be identified along with a summary of their background and experience.

Selection of SSCs

A summary of the process used to select the SSCs that were included in each of the SWELs should be provided. This discussion should note how the process met the objectives of the guidance, particularly as it relates to incorporating the appropriate variety of classes of equipment, environments, primary and secondary systems, new equipment, ~~etc.~~and other elements discussed in Section 3.

Several lists of equipment from the SSCs selection process should be identified in the submittal report. The lists that should be included in the submittal report for those processes shown in Figure 1-1~~Figure 1-1~~Figure 1-1 and Figure 1-2**Error! Reference source not found.** are described below. The SWEL lists should include information on each item of equipment and its relevant attributes, including those attributes that led to its inclusion in the SWEL.

Sample of Required Items for the ~~5~~Five Safety Functions

The following two lists of equipment should be included in the submittal report for the equipment selection process shown in Figure 1-1~~Figure 1-1~~Figure 1-1 for "Sample of Required Items":

- Base List 1. The equipment coming out of Screen #3 and entering Screen #4 in Figure 1-1~~Figure 1-1~~Figure 1-1 is defined as "Base List 1.". This list of equipment should be included in the submittal report.
- SWEL 1. The equipment coming out of Screen #4 and entering the SWEL 1 bucket in Figure 1-1~~Figure 1-1~~Figure 1-1 is the first Seismic Walkdown Equipment List. This list of equipment should be included in the submittal report.

Spent Fuel Pool Related Items

The following three lists of equipment should be included in the submittal report for the equipment selection process shown in Figure 1-2**Error! Reference source not found.** for "Spent Fuel Pool Related Items":

- Base List 2. The equipment coming out of Screen #2 and entering Screen #3 in Figure 1-2**Error! Reference source not found.** is defined as "Base List 2.". This list of equipment should be included in the submittal report.
- Rapid Drain-Down. The equipment coming out of Screen #4 and entering the SWEL 2 bucket in Figure 1-2**Error! Reference source not found.** is the equipment that could potentially cause the SFP to drain rapidly. This list of equipment should be included in the submittal report. The basis for determining whether or not SSCs were included in SWEL 2 should be documented in the submittal report.

  ~~The basis for SSCs that could potentially allow the SFP to drain rapidly should also be described in the submittal report. Documentation should be provided to support the exclusion of from SWEL 2 as a result of Screen #4 of Figure 1-2.~~
- SWEL 2. The equipment coming out of Screens #3 and #4 and entering the SWEL 2 bucket in Figure 1-2**Error! Reference source not found.** is the second Seismic Walkdown Equipment List. This list of equipment should be included in the submittal report.

  The distribution of the various sample selection attributes among the items on SWEL 2 should also be described in the submittal report.

Inaccessible Items

Equipment and areas that are inaccessible during the 180-day period should be listed, along with a schedule for completion of the walkdowns. An updated final report should be submitted after the completion of all Seismic Walkdowns and Area Walk-bys.

Seismic Walkdowns and Area Walk-Bys

A summary of the approach used by the licensee to implement the Seismic Walkdown and Area Walk-Bys should be included in the submittal report.

The results of the Seismic Walkdowns of each item of equipment on SWEL 1 and SWEL 2 should be documented on a Seismic Walkdown Checklist (SWC) (template shown in Appendix C: Checklists) and included in the submittal report.

The results of the Area Walk-Bys in areas of the plant near the equipment on SWEL 1 and SWEL 2 should be documented on an Area Walk-By Checklist (AWC) (template shown in Appendix C: Checklists) and included in the submittal report.

Comment [c11]: One paragraph

A summary of the walkdown and walk-by results should be included in the main body of the report. This summary should include an overview of the number of items walked down and the number of areas walked-by. The number of potential adverse conditions identified and a summary of the nature of the potential adverse conditions should be provided.

A table should be provided that lists c~~A summary of adverse conditions should be provided. E~~ach potential adverse seismic condition identified during the ~~Seismic W~~walkdowns and the ~~Area W~~walk-~~Bys~~bys ~~should also be summarized by listing themlisted in a table in the submittal report~~. This table should describe how the item has been handled (e.g., placement in the CAP) and its current status.

Licensing Basis Evaluations

The results of the seismic licensing basis evaluations of the potential adverse conditions identified during the Seismic Walkdown and Area Walk-Bys should be included in the submittal report. Any use of the plant Corrective Action Program (CAP) to evaluate the seismic licensing basis for these potential adverse conditions should also be included in the submittal report.

If some of the seismic licensing basis evaluations are not completed by the time the report of this program must be submitted to the NRC, then a schedule for completing them should be included in the submittal report.

Any planned or newly installed changes to the plant as a result of implementing this Seismic Walkdown Guidance should also be described in the submittal report.

IPEEE Vulnerabilities

The list of seismic vulnerabilities identified during the IPEEE program should be included in the submittal report. The 50.54(f) Letter calls these "plant-specific vulnerabilities (including any seismic anomalies, outliers, or other findings)."~~.~~

A description of the actions taken to eliminate or reduce these seismic vulnerabilities and when these actions were completed should also be included in the submittal report. The report should also describe the current status of the equipment or change, and the method used to determine the current status (e.g., through review of paperwork or by visual inspection).

Peer Review

Each element of and the entire process in this Seismic Walkdown Guidance should be reviewed by the Peer Review Team, as described in

Section 6: Peer Review. The results of these peer reviews and how these reviews affected the work described in this Seismic Walkdown Guidance should be documented in the submittal report.

Submittal Report

The submittal report should include a cover page that documents the licensee management review of the entire document.

Section 9: References

1. NRC (E Leeds and M Johnson) Letter to All Power Reactor Licensees et al., "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident."
2. Summary of Observations; Temporary Instruction 2515/183, "~~Followup~~Follow up to the Fukushima Daiichi Nuclear Station Fuel Damage Event."
3. Resolution of Generic Safety Issues: Issue 156: Systematic Evaluation Program (Rev. 8) (NUREG-0933, Main Report with Supplements 1–34). [http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0933/sec3/156r8.html]
4. IE Bulletin No. 79-02, Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts. [http://www.nrc.gov/reading-rm/doc-collections/gen-comm/bulletins/1979/bl79002.html]
5. IE Bulletin No. 79-07, Seismic Analysis of As-Built Safety-Related Piping Systems. [http://pbadupws.nrc.gov/docs/ML0312/ML031220050.pdf]
6. IE Bulletin No. 79-14, Seismic Analyses for As-Built Safety-Related Piping Systems. [http://www.nrc.gov/reading-rm/doc-collections/gen-comm/bulletins/1979/bl79014.html]
7. IE Bulletin No. 80-11, Masonry Wall Design. [http://www.nrc.gov/reading-rm/doc-collections/gen-comm/bulletins/1980/bl80011.html]
8. Generic Letter 87-02, Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46. [http://www.nrc.gov/reading-rm/doc-collections/gen-comm/gen-letters/1987/gl87002.html]
9. Generic Letter No. 88-20, Supplement 4, Individual Plant Examination of External Events (IPEEE) For Severe Accident Vulnerabilities - 10CFR 50.54(f). [http://www.nrc.gov/reading-rm/doc-collections/gen-comm/gen-letters/1988/gl88020s4.html]
10. Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment, Revision 3A, December 2001, Seismic Qualification Utility Group (SQUG). [http://pbadupws.nrc.gov/docs/ML0405/ML040560253.html]

11. EPRI NP-7149-D, Summary of the Seismic Adequacy of Twenty Classes of Equipment Required for the Safe Shutdown of Nuclear Plants, Electric Power Research Institute, March 1991.
12. NUREG-1407, "Procedure and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," U.S. Nuclear Regulatory Commission, June 1991.
13. EPRI NP-6041-SL, Revision 1, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin (Revision 1)," Electric Power Research Institute, August 1991.

Appendix A: Initializations and Acronyms

The initializations and acronyms used in this report are defined in this appendix.

AWC	-	Area Walkdown Checklist
ASME		
BWR	-	Boiling Water Reactor
CAP	-	Corrective Action Program
CLB		
EPRI	-	Electric Power Research Institute
GIP	-	Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment
HCLPF	-	High Confidence, Low Probability of Failure
HVAC		
IPEEE	-	Individual Plant Examination for External Events
LB	-	Licensing Basis
MCC		
MEL	-	Master Equipment List
NRC	-	Nuclear Regulatory Commission
NSSS		
NTTF	-	Near-Term Task Force
PRA	-	Probabilistic Risk Assessment
PRT	-	Peer review team

PWR - Pressurized Water Reactor

SC - Seismic Category

SFP - Spent Fuel Pool

SMA - Seismic Margin Assessment

SPEL - Success Path Equipment List (used in IPEEE SMA)

SPRA - Seismic Probabilistic Risk Assessment

SQUG - Seismic Qualification Utility Group

SRT - Seismic Review Team

SSC - Structure, System, and Component

SSEL - Safe Shutdown Equipment List (used in USI A-46)

SWC - Seismic Walkdown Checklist

SWE - Seismic Walkdown Engineer

SWEL - Seismic Walkdown Equipment List

UHS

USI A-02 - Asymmetric Loads

USI A-46 - Unresolved Safety Issue A-46, Seismic Qualification of Equipment in Operating Plants

Appendix B: Classes of Equipment

The following list of classes of mechanical and electrical equipment is adapted from Table A-1 of EPRI NP-6041 [13]. This list of equipment classes is based on the GIP [10].

Table B-1
Classes of Equipment

0. Other	11. Chillers
1. Motor Control Centers and Wall-Mounted Contactors	12. Air Compressors
2. Low Voltage Switchgear and Breaker Panels	13. Motor Generators
3. Medium Voltage, Metal-Clad Switchgear	14. Distribution Panels and Automatic Transfer Switches
4. Transformers	15. Battery Racks
5. Horizontal Pumps	16. Battery Chargers and Inverters
6. Vertical Pumps	17. Engine Generators
7. Pneumatic-Operated Valves	18. Instrument Racks
8. Motor-Operated and Solenoid-Operated Valves	19 Temperature Sensors
9. Fans	20. Instrument and Control Panels
10. Air Handlers	21. Tanks and Heat Exchangers

Appendix C: Checklists

[This section is still under development. Changes shown in this section should NOT be considered final at this time.]

This appendix included the following two types of checklists:

- Seismic Walkdown Checklist (SWC)
- Area Walk-By Checklist (AWC)

Seismic Walkdown Checklist (SWC)

Equipment ID No. _____ Equip. Class_____

Equipment Description _____

Location: Bldg. _____ Floor El. _____ Room, Area _____

Manufacturer, Model, Etc. (optional but recommended) _____

Anchorage

1. Is anchorage configuration verification required for this item of equipment? Y☐ N☐

2. Is the anchorage free of bent, broken, missing or loose hardware Y☐ N☐ U☐ N/A☐

3. Is the anchorage free of corrosion that is more than mild surface oxidation Y☐ N☐ U☐ N/A☐

4. Is the anchorage free of visible cracks in the concrete near the anchors Y☐ N☐ U☐ N/A☐

5. Is the anchorage configuration consistent with plant documentation? Y☐ N☐ U☐ N/A☐

Is the anchorage free of potential adverse seismic conditions? Y☐ N☐ U☐

Interaction Effects

1. Are soft targets free from impact by nearby equipment or structures? Y☐ N☐ U☐ N/A☐

Seismic Walkdown Checklist (SWC)

Equipment ID No. _____ Equip. Class_____

Equipment Description _____

2. Are overhead equipment, distribution systems, and masonry block walls not likely to collapse onto the equipment? Y☐ N☐ U☐ N/A☐

3. Do attached lines have adequate flexibility? Y☐ N☐ U☐ N/A☐

Is equipment free of adverse seismic interaction effects? Y☐ N☐ U☐

Have you looked for and found no adverse seismic conditions that could affect the safety functions of the equipment? Y☐ N☐ U☐

Comments

Evaluated by: _____ Date: _____

_____ _____

Area Walk-By Checklist (AWC)

Location: Bldg. _____ Floor El. _____ Room, Area[7] _____

1. Does anchorage of equipment in the area appear to be free of potential adverse seismic conditions (if visible without opening equipment)? Y☐ N☐ U☐ N/A☐

   [add explanation of how to fill out this checklist]

2. Does anchorage of equipment in the area appear to be free of significant degraded conditions? Y☐ N☐ U☐ N/A☐

3. Based on a visual inspection from the floor, do the cable/conduit raceways and HVAC ducting appear to be free of adverse seismic conditions (e.g., condition of supports and fill conditions of cable trays)? Y☐ N☐ U☐ N/A☐

4. Does it appear that the area is free of adverse seismic spatial interactions with other equipment in the area? Y☐ N☐ U☐ N/A☐

[7] If the room in which the SWEL item is located is very large (e.g., Turbine Hall), the area selected should be described. This selected area should be based on judgment, e.g., on the order of about 20 feet from the SWEL item.

Area Walk-By Checklist (AWC)

5. Does it appear that the area is free of potential adverse seismic interactions that could cause flooding or spray in the area? Y☐ N☐ U☐ N/A☐

6. Does it appear that the area is free of potential adverse seismic interactions that could cause a fire in the area? Y☐ N☐ U☐ N/A☐

7. Does it appear that the area is free of adverse seismic interactions associated with seismic housekeeping practices and temporary installations? Y☐ N☐ U☐ N/A☐

Have you looked for and found no adverse seismic conditions that could affect the safety functions of the equipment in the area? Y☐ N☐ U☐

Comments

Area Walk-By Checklist (AWC)

Evaluated by: _____ Date: _____

_____ _____

Appendix D: Seismic Spatial Interaction

[This section is still under development. Changes shown in this section should NOT be considered final at this time.]

An adverse seismic spatial interaction is the physical interaction of any nearby SSC with the subject item of equipment caused by relative motions between the two during an earthquake. An inspection should be performed in the area adjacent to and surrounding the equipment on the SWEL to identify any seismic interaction condition that could adversely affect the capability of that SWEL item to perform any of its intended safety-related functions.

The three types of seismic spatial interaction effects that should be considered are:

- Proximity
- Structural failure and falling
- Flexibility of attached lines

Guidance for evaluating each of these types of seismic spatial interactions is described in below.[8]

Proximity

Seismic proximity interaction is the impact of adjacent equipment or structures on SWEL items due to their relative motion during seismic excitation. This relative motion can be the result of the vibration and movement of the SWEL item itself or any adjacent SSCs. When sufficient anchorage, bracing, or other means are provided to preclude large deflections, seismic proximity effects are not typically a concern.

Even if there is impact between adjacent equipment and structures, there may not be any significant damage to the SWEL item. In such cases, this

[8] Seismic spatial interaction guidance is adapted from Appendix D of [8].

seismic interaction would not be considered a reason for concern, provided the equipment can still accomplish its safety-related functions.

Guidance for evaluating proximity effects for distributed systems and for mechanical and electrical equipment are provided below

Proximity Effects for Distributed Systems

The motion of piping, conduit, cable raceways, and other distribution lines may result in impact interactions with SWEL items. Non-safety-related piping is commonly supported with rod hangers or other forms of flexible dead load support, with little or no lateral restraint. Where adequate clearance with SWEL items is not provided, potential impact interaction may result. The integrity of the piping is typically not a concern. (Threaded fittings, cast iron pipes and fittings, and Victaulic couplings may be exceptions where large anchor movement is possible.) In general, impacts between distribution systems (piping, conduit, ducts, raceways) and SWEL items of comparable size are not a cause for concern; the potential for large relative motions between dissimilar size systems should be carefully evaluated to assure that a large system cannot carry away a smaller one.

Engineering judgment should be exercised by the Seismic Walkdown Engineers in estimating potential motions of distribution systems in proximity to the SWEL item under evaluation. For screening purposes, a clearance of 2 inches for relatively rigid cable tray and conduit raceway systems and 6 inches for relatively flexible systems would normally be adequate to prevent impacts, subject to the judgment of the Seismic Walkdown Engineers.

Where potential interaction may involve systems with significant thermal movements during plant normal operating conditions, the thermal displacements should be evaluated along with those resulting from seismic deflections. Inter-equipment displacement limits may be developed from the applicable floor response spectra to assist in this effort.

Proximity Effects for Mechanical and Electrical Equipment

Inadequately anchored or inadequately braced mechanical and electrical equipment such as pumps, valves, vessels, cabinets, and switchgear may deflect or overturn during seismic loadings resulting in impact with nearby SWEL items. Certain items, such as tanks with high height-to-diameter aspect ratios, can deflect and impact nearby equipment. Electrical cabinets in proximity to each other may pound against each other.

The Seismic Walkdown Engineers should use judgment in such cases to evaluate the potential displacements and their potential effect on nearby SWEL items.

Structural Failure and Falling

SEL items can be damaged and unable to accomplish their safe-related function due to impact caused by failure of overhead or adjacent SSCs. (This interaction hazard is commonly referred to as a Category II over Category I concern.) This seismic interaction effect can occur from nearby or overhead:

- Mechanical and electrical equipment;
- Piping, raceways, and HVAC systems;
- Architectural features; and
- Operations, maintenance, and safety equipment.

The seismic interaction effects that are of concern for these types of SSCs are described below. It is the intent of this evaluation that realistic hazards be identified; failure of non-seismically supported equipment and systems located over a SWEL item should not be arbitrarily assumed. The judgment of the Seismic Walkdown Engineers should be used to differentiate between likely and unlikely interaction hazards.

Mechanical and Electrical Equipment

Equipment such as tanks, heat exchangers, and electrical cabinets that are inadequately anchored or inadequately braced have historically overturned and/or slid due to earthquake excitation. In some cases this has resulted in damage to nearby equipment or systems.

Piping, Raceways, and HVAC Systems

Falling of non-seismically designed piping, raceways, and HVAC systems have been observed in very limited numbers during earthquakes due to unique circumstances. Most commonly reported are falling of inadequately secured louvers and diffusers on lightweight HVAC ducting. Damage from piping systems is less common and usually is limited to component failures that have rarely compromised system structural integrity. Typical damage is attributed to differential motions of systems resulting from movement of unanchored equipment, attachment of systems between buildings, or extremely flexible long runs of unrestrained piping. Very long runs of raceway systems pose a potential falling hazard when the runs are resting on, but not attached to, cantilever supports.

Architectural Features

Architectural features include such items as ceilings, light fixtures, platform grating, unreinforced masonry walls, and non-seismic Category I structures. The seismic interaction effects for these are described below:

- Ceilings. T-bar suspended tiles, recessed fixtures, and sheet rock are used in some plant areas (such as the control room). Seismic capabilities of these ceilings may be low. The Seismic Walkdown Engineers should check for details that are known to lead to failure such as open hooks, no lateral wire bracing, etc.
- Light Fixtures. Normal and emergency light fixtures are used throughout the plant. Fixture designs and anchorage details vary widely. Light fixtures may possess a wide range of seismic capabilities. Pendant-hung fluorescent fixtures and tubes pose the highest risk of failure and damage to sensitive equipment. The Seismic Walkdown Engineers should check for positive anchorage, such as closed hooks and properly twisted wires. Typically this problem is not caused by lack of strength; it is usually due to poor connections. Emergency lighting units and batteries can fall and damage SWEL equipment due to impact or spillage of acid.
- Platform Gratings. Unrestrained platform gratings and similar personnel access provisions may pose hazards to impact-sensitive SWEL items or components mounted on these items. Some reasonable positive attachment is necessary, if the grating can fall.
- Unreinforced Masonry Walls. Unreinforced, masonry block walls should be evaluated for possible failure and potential seismic interaction with nearby SWEL items unless the wall has been seismically shown to be adequate as part of the IE Bulletin 80-11 program. The Seismic Walkdown Engineers should review the plant documentation for IE Bulletin 80-11 masonry walls to determine which walls have and which walls have not been shown to be seismically adequate during that program.
- Non-Seismic Category I Structures. If any SWEL item is located in a non-Seismic Category I structure, then potential structural vulnerabilities of the building should be identified; however, nuclear plant structures (including non-seismic structures) are typically seismically adequate.

Operations, Maintenance, and Safety Equipment

Nuclear plant operations and maintenance require specialized equipment, some of which may be permanently located or stored in locations near SWEL items.

Some operations, maintenance, and safety equipment is designed so that it may be easily relocated by plant personnel. Where equipment design or plant operating procedures do not consider anchorage for permanently located equipment, this equipment may slide, fall, overturn, or cause impact with SWEL items. Typically such equipment includes the following:

- Cabinets and Lockers. Inadequately restrained floor and wall-mounted filing cabinets and equipment storage lockers may result in overturning or falling and impact.
- Gas Storage Bottles. Unrestrained or inadequately restrained gas bottles may result in overturning and rolling and cause impact.
- Refueling Equipment. Refueling equipment such as lifting equipment and servicing and refueling tools may be stored in proximity to SWEL items. Inadequately restrained equipment may pose hazards.
- Monorails, Hoists, and Cranes. Monorails and service cranes are permanently located over heavy equipment requiring movement for service. Falling of service crane appurtenances such as tools and equipment boxes may result from inadequate component anchorage. They should be restrained from falling. Judgment by the Seismic Walkdown Engineers should be used to assess the potential for and consequences of such equipment falling.
- Radiation Shields, Fire Protection, and Miscellaneous Equipment. Temporary and permanent radiation shielding may pose hazards. Miscellaneous maintenance tools, such as chains and dollies, test equipment, and fire protection equipment such as fire extinguishers and hose reels may fall if inadequately restrained. Equipment carts may roll into SWEL items.

Flexibility of Attached Lines

Distribution lines, such as small bore piping, tubing, conduit, or cable, which are connected to SWEL items, can potentially fail if there is insufficient flexibility to accommodate relative motion between the SWEL item and the adjacent equipment or structures. Straight, in-line connections in particular are prone to failure. The scope of review for flexibility of these lines extends from the item of equipment being evaluated to the first support on the building or nearby structure.

Evaluation of Seismic Spatial Interaction Effects

The Seismic Walkdown Engineers should identify and evaluate all credible and significant interactions in the immediate vicinity of the

SWEL item. This includes consideration of seismic interactions on the equipment itself and on any connected distribution lines (e.g., instrument air lines, electrical cable, and instrumentation cabling) that are in the vicinity of the item of equipment. Evaluation of interaction effects should consider detrimental effects on the capability of equipment and systems to function, taking into account equipment attributes such as mass, size, support configuration, and material hardness in conjunction with the physical relationships of interacting equipment, systems, and structures. In the evaluation of proximity effects and overhead or adjacent equipment failure and interactions, the effects of intervening structures and equipment that would preclude impact should be considered.

Damage from interaction in earthquakes is from unusual circumstances or from generic, simple details such as open hooks on suspended lights. The Seismic Walkdown Engineers should spend most of their time looking for:

- Unusual impact situations and
- Lack of proper anchorage or bracing.

There should not be much concern with piping and other system or structural component failures.

Summary of Seismic Spatial Interaction Effects Examples

This section briefly summarizes examples of possible seismic spatial interaction effects that may adversely affect an item of equipment on the SWEL.

- Unreinforced masonry walls adjacent to equipment may spall or fall and impact equipment or cause loss of support of equipment. The wall does not have to be evaluated if it has already been addressed as part of an IE Bulletin 80-11 program.
- Emergency lighting units and batteries used for emergency lighting can fall or overturn and damage equipment by impact or spilling of acid.
- Fire extinguishers may fall and impact or roll into equipment.
- Intercom speakers can fall and impact equipment.
- Equipment carts, dollies, chains, air bottles, welding equipment, etc., may roll into, slide, overturn, or otherwise impact equipment.
- Piping, cable trays, conduit, and HVAC may deflect and impact equipment.

- Cable trays, conduit systems, and HVAC systems, including HVAC louvers and diffusers, may fall and impact equipment.
- Structures or structural elements may deform or fall and impact equipment.
- Anchor movement may cause breaks in piping, cable trays, conduit, HVAC, etc., which may fall or deflect and impact adjacent equipment.
- Mechanical piping couplings can fail and lead to pipe deflection or falling and impact on equipment.
- Electrical cabinets that deflect and impact walls, structural members, another cabinet, etc., may damage devices in the cabinet or cause devices to trip or chatter.
- Storage cabinets, office cabinets, files, bookcases, wall lockers, and medicine cabinets may fall or tip into equipment.
- The doors on electrical cabinets may swing and impact devices or cause relays to chatter.
- Inadequately anchored or braced equipment such as pumps, vessels, tanks, heat exchangers, cabinets, and switchgear may deflect or overturn and impact equipment.
- Architectural features such as suspended ceilings, ceiling components such as T-bars and acoustical panels, light fixtures, fluorescent tubes, partition walls, and plate glass may deflect, overturn or break and fall and impact equipment.
- Grating may slide or fall and impact equipment.
- Sheetrock may fall and impact equipment if it was previously water-damaged or if there is severe distortion of the building.
- Unanchored room heaters, air conditioning units, sinks, and water fountains may fall or slide into equipment.

Appendix E: Systems to Support Safety Functions

EPRI Report NP-6041 [13], Appendix B includes lists of systems typically used to support PWR and BWR frontline safety functions and the associated support functions. Copies of the following tables from this report are reproduced in this appendix.

- Table B-1, Safety Function-System Matrix for PWRs
- Table B-2, Safety Function-System Matrix for BWRs
- Table ~~b~~B-3, Major Component in Support Systems

Table B-1

SAFETY FUNCTION-SYSTEM MATRIX FOR PWRs

Safety Functions	Frontline Systems That Perform a Safety Function	Important Components in Frontline System
A. Reactivity Control	Reactor Trip System	• Reactor Trip Switchgear • Manual Actuation Circuit • Control Rod Drive Assemblies
	Chemical and Volume Control System (emergency boration)	• Charging Pumps • Boron Injection Tanks (BIT) • Heaters; Heat Tracing • Motor-Operated Valves for Suction and Injection Alignment
B. RCS Pressure Control	Turbine Trip	• Turbine Stops Valves • Turbine Control Valves • Electric Trip Solenoid Valves • Electric Trip Valves • Mechanical Trip Pilot Valves
	Main Steam Isolation Valves	
	Auxiliary Feedwater System	• Turbine-Driven Feedwater Pumps (including turbine auxiliaries and steam supply) • Motor-Driven Feedwater Pumps • Motor-Operated Valves for Suction and Injection Alignment • Condensate Storage Tank
	Steam Generator Power-Operated Atmospheric Relief Valves	
	Pressurizer Power-Operated Relief Valves	
C. RCS Inventory Control	High Pressure Injection System	• High Pressure Safety Injection Pumps • Motor-Operated Valves for Suction and Injection Alignment • Refueling Water Storage Tank (i.e., borated water)

NOTE: This matrix was developed assuming that offsite power is unavailable.

Table B-1 (Continued)

SAFETY FUNCTION-SYSTEM MATRIX FOR PWRs

Safety Functions	Frontline Systems That Perform a Safety Function	Important Components in Frontline System
	Chemical and Volume Control System (operating in the ECCS mode)	• Charging Pumps • Motor-Operated Valves for Suction and Injection Alignment • RWST
	High Pressure Recirculation System	• High Pressure Safety Injection Pumps • Charging Pumps • Motor-Operated Valves for Suction and Injection Alignment • Sump Recirculation Valves • RHR Pumps
	Low Pressure Injection System	• RHR Pumps • Motor-Operated Valves for Suction and Injection Alignment • RWST
	Low Pressure Recirculation System	• RHR Pumps • Motor-Operated Valves for Suction and Injection Alignment • Sump Recirculation Vent
D. RCS Heat Removal	Auxiliary Feedwater	• See Above
	Steam Generator Power-Operated Atmospheric Relief Valves	
	Pressurizer Power-Operated Relief Valves	
	High Pressure Injection or Recirculation System	• See Above
	Residual Heat Removal System	• RHR Pumps • RHR Heat Exchangers • Motor-Operated Valves for Suction and Injection Alignment

NOTE: This matrix was developed assuming that offsite power is unavailable.

Table B-2

SAFETY FUNCTION-SYSTEM MATRIX FOR BWRs

Safety Functions	Frontline Systems That Perform a Safety Function	Important Components in Frontline System
A. Reactivity Control	Reactor Scram System	• Scram Valves • Control Rod Drive Assemblies • Control Rod Drive Pumps • Condensate Storage Tank • Strainers and Filters • Manual Valves • Check Valves
	Standby Liquid Control System (SLCS) (liquid poison)	• SLCS Pumps • Liquid Poison Tanks • Heaters and Heat Tracing • Explosive Actuated Valves
B. RCS Pressure Control	Steam Line SRVs and Automatic De-pressurization System	• Dual Action Safety and Relief Valves
	Main Steam Line Isolation Valves	
C. RCS Inventory Control	High Pressure Coolant Injection System	• Turbine-Driven Pump and Auxiliaries • Motor-Operated Valves for Suction and Injection Alignment • Condensate Storage Tank • Suppression Pool
	High Pressure Core Spray System	• Turbine-Driven Pump and Auxiliaries • Motor-Operated Valves for Suction and Injection Alignment • Condensate Storage Tank • Suppression Pool

NOTE: This matrix was developed assuming that offsite power is unavailable.

Table B-2 (Continued)

SAFETY FUNCTION-SYSTEM MATRIX FOR BWRs

Safety Functions	Frontline Systems That Perform a Safety Function	Important Components in Frontline System
	Control Rod Drive (CRD) Injection	• CRD Hydraulic Pump • Scram Valves
	Feedwater Coolant Injection (FWCI)	(information not available on FWCI)
	Automatic De-pressurization	• See Above
	Low Pressure Coolant Injection	• Electric Driven RHR Pumps • Motor-Operated Valves for Suction and Injection Alignment • Suppression Pool
	Low Pressure Core Spray (LPCS)	• Electric Driven LPCS Pumps • Motor-Operated Valves for Suction and Injection Alignment • Suppression Pool
D. RCS Suppression Pool Heat Removal	Isolation (emergency) Condenser	(information not available on isolation condenser)
	Suppression Pool Cooling Mode of RHR	• Electric Driven RHR Pumps • Motor-Operated Valves for Suction and Injection Alignment • Suppression Pool • RHR Heat Exchangers
	Shutdown Cooling Mode of RHR	• Electric Driven RHR Pumps • RHR Heat Exchangers • Motor-Operated Valves for Suction and Injection Alignment
	Steam Condensing Mode of RHR	• RHR Heat Exchangers • RCICS

NOTE: This matrix was developed assuming that offsite power is unavailable.

B-11

Table B-3

MAJOR COMPONENTS IN SUPPORT SYSTEMS

Support System	Major Components
1. AC Power	4-kV Buses Diesel Generators Diesel Generator Auxiliaries, Fuel Oil Supply, and Air-Start Systems Transformers Automatic Fast Transfer Switchgear Emergency Power Sequencer Other Switchgear (including relays and breakers) Power Cables Cable Trays 480V Unit Substations 480V Buses Motor Control Centers Load Centers Distribution Panels 120V Instrument Buses Inverters Fuses
2. DC Power	125V Buses Batteries Battery Racks Battery Chargers Distribution Panels DC Power Cables Cable Trays Ground Detection Equipment
3. Engineered Safety Features Actuation System	Sensors Cabling from the Sensors to the Signal Processing Equipment Signal Processing Equipment Actuation Subsystems Cabinets (and associated HVAC) Control Boards Relays Bistables Breakers

B-14

Table B-3 (Continued)

MAJOR COMPONENTS IN SUPPORT SYSTEMS

	Support System	Major Components
4.	Service Water and Component Cooling Water Systems	Horizontal Pumps Vertical Pumps Motor-Operated Valves Air-Operated Valves Check Valves Manual Valves Relief Valves Piping Heat Exchangers Surge Tanks Makeup Pumps HVAC Systems Traveling Screens and Screen Wash Pumps Strainers Intake Bay Gates Cooling Towers Cooling Tower Pumps Cooling Tower Fans
5.	Compressed Air System	Compressors Receivers Solenoid-Operated Valves Check Valves Dryers Filters
6.	HVAC Systems	Fans Dampers Chillers and Refrigeration Units Heaters Ductwork

B-15

Appendix F: Checklist for Peer Review of SSC Selection

Appendix G: Definition of Terms

Comment [AMK12]: Not reviewed...it seemed that the earlier comments weren't included

Anomaly – SSC identified with deficiencies, e.g., missing or loose anchorage component

Area Walk-By – A visual examination that considers the overall condition of areas that contain items on the Seismic Walkdown Equipment List

Area Walk-By Checklist – A generic checklist that can be used to document the results of the Area Walk-Bys

Current Licensing Basis (CLB) – As defined in NRC Inspection Manual Part 9900, the Current Licensing Basis (CLB) is the set of Nuclear Regulatory Commission (NRC) requirements applicable to a specific plant, plus a licensee's docketed and currently effective written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis, including all modifications and additions to such commitments over the life of the facility operating license. Design basis information, defined by 10 CFR 50.2, is documented in the UFSAR as required by 10 CFR 50.71. The design basis of safety related SSCs is established initially during the original plant licensing and relates primarily to the accident prevention and mitigation functions of safety - related SSCs. The design basis of a safety related SSC is a subset of the CLB.

Enhancement – SSC identified as fully meeting design requirements for the SSE, yet strengthened to prevent seismic interaction, e.g., structurally tying electrical cabinets together

Five Safety Functions – The Seismic Walkdown Equipment List selection process is designed to ensure that the walkdowns include a sample of equipment needed for five safety functions, which include four safe shutdown functions (reactor reactivity control, reactor coolant pressure control, reactor coolant inventory control, and decay heat removal, which includes the ultimate heat sink) and containment functions.

Equipment Selection Personnel – Personnel responsible for identifying the sample of equipment to be examined during a Seismic Walkdown

Inaccessible – Inaccessible areas are areas that cannot reasonably be inspected due to significant personnel safety hazard or high radiation areas

Formatted: Highlight

Licensing Basis Evaluations – Licensing Basis Evaluations are more detailed reviews performed to determine whether an SSC is consistent with the seismic licensing basis if potential adverse seismic conditions are identified during the Seismic Walkdowns or Area Walk-Bys.

Licensing Basis Reviewer – Personnel responsible for performing the Licensing Basis Evaluations

Near-Term Task Force (NTTF) – The NRC Near-Term Task Force was established in response to Commission direction to conduct a systematic and methodical review of NRC processes and regulations to determine whether the agency should make additional improvements to its regulatory system and to make recommendations to the Commission for its policy direction, in light of the accident at the Fukushima Dai-ichi Nuclear Power Plant.

NTTF 2.3 Seismic Walkdown Training Course – A 2-day course sponsored by EPRI to prepare plant personnel to perform Seismic Walkdowns and Area Walk-Bys needed to support responding to the March 12, 2012 50.54(f) letter

Outlier – SSC identified with HCLPF below the Review Level Earthquake (RLE), while meeting the Safe Shutdown Earthquake (SSE)

Rapid Drain Down – In this document, a Rapid Drain Down refers to seismically-induced failure(s) that result in spent fuel pool water inventory loss at a rate that could uncover the fuel within 72 hours.

Seismically Induced Fire Interactions – The potential for fires to occur when equipment or systems containing flammable material fails or ruptures

Formatted: Highlight

Seismically Induced Flooding/Spray Interactions – The effect of possible ruptures of vessels or piping systems that could spray, flood, or cascade water into the area where items on the Seismic Walkdown Equipment List are located

Seismic Review Team – A team consisting of at least two Seismic Walkdown Engineers that perform the Seismic Walkdowns and Area Walk-Bys

Seismic Spatial Interaction – The physical interaction between a nearby SSC and the item on the Seismic Walkdown List caused by relative motions between the two during an earthquake

Seismic Walkdown – A visual examination of equipment to identify potential adverse seismic conditions

Seismic Walkdown Checklist – A generic checklist that can be used to document the results of the Seismic Walkdown

Seismic Walkdown Engineers – Personnel responsible for performing the Seismic Walkdowns and Area Walk-Bys as described in Section 4

Seismic Walkdown Equipment List (SWEL) – The items to be examined during the Seismic Walkdown

SQUG Walkdown Training Course – A 5-day training course sponsored by EPRI based on the Generic Implementation Program (GIP)

Vicinity – Vicinity is defined as the same room and elevation containing the Seismic Walkdown Equipment List item. If the room housing the item is very large, then vicinity should be identified based on judgment, e.g., on the order of about ~~20~~ 35 feet from the SWEL item.

(IPEEE) Vulnerability – SSC identified in IPEEE as a vulnerability, ~~a~~ outlier, anomaly, or enhancement

Appendix H: Documentation Requirements in 50.54(f) Letter

Enclosure 3 of the NRC 50.54(f) Letter [1] contains a request for information related to the results of the seismic walkdown. The purpose of this appendix is to describe how the specific documentation requirements included Section 2 of the "Requested Information" section of the 50.54(f) Letter are met by the recommended documentation described in this Seismic Walkdown Guidance.

The specific information requested in the 50.54(f) Letter is repeated in the sections below followed by an explanation of the intent for fulfilling each requirement as described in detail in Section 8: Submittal Report.

a. Information on the plant-specific hazard licensing bases and a description of the protection and mitigation features considered in the licensing basis evaluation

- Summarize the seismic licensing basis for the SSCs in the plant
- List the codes, standards, and other methods used in the design of the Seismic Category I SSCs for meeting the plant-specific seismic licensing basis

b. Information related to the implementation of the walkdown process

- Summarize the approach used by the licensee to implement the Seismic Walkdown Guidance

c. A list of plant-specific vulnerabilities (including any seismic anomalies, outliers, or other findings) identified by the IPEEE and a description of the actions taken to eliminate or reduce them (including their completion dates)

- List the adverse seismic vulnerabilities identified during the IPEEE program
- Describe the actions taken to eliminate or reduce these seismic vulnerabilities
- Provide the date when these actions were completed

d. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using the guidance in Regulatory Issues Summary 2005-20, Revision, 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program

- Summarize key findings and d~~D~~escribe the results of the Seismic Walkdowns and Area Walk-bys using the checklists included in Appendix C: Checklists
- Describe each potential adverse seismic condition~~s~~ identified during the Seismic Walkdown and the Area Walk-Bys
- Describe the results of the seismic licensing basis evaluations of these potential adverse conditions including any use of the plant Corrective Action Program (CAP)
- Provide a schedule for completing any licensing basis evaluations not finished by the time the report of this program must be submitted to the NRC

e. Any planned or newly installed protection and mitigation features

- Describe any planned or newly installed changes to the plant as a result of implementing this Seismic Walkdown Guidance

f. Results and any subsequent actions taken in response to the peer review

- Describe how the ~~results of the~~ peer review process affected implementation of ~~this~~ the Seismic Walkdown program conducted to meet the request in the 50.54(f) Letter.