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Subject: Draft Industry Guidance for Flooding Walkdowns  
Attachments: NEI Flood Protection Walkdown Guidance - Rev L Clean.docx

Chris, Ed,

Attached is the current draft version of our flooding walkdown guidance for NRC's review. You will notice that Appendix C, "Just in Time Training for Walkdown Personnel", is incomplete. The task force has not finished this appendix.

You should have received a series of MS Outlook invitations for all the meetings and webinars that we agreed to when we talked on March 6th. Our first opportunity to discuss the attached guideline will be our webinar on March 15th.

Please call if you have any questions.

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Last Updated: 3/9/2012 1:39 PM

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DRAFT

NEI 12-xx [Revision J]

# Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features

May 2012

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DRAFT

NEI 12-xx [Revision I]

Nuclear Energy Institute

# Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features

May 2012

*Nuclear Energy Institute, 1776 I Street N.W., Suite 400, Washington D.C. (202.739.8000)*

## **ACKNOWLEDGEMENTS**

NEI appreciates the invaluable assistance of the Fukushima Flooding Task Force toward development of this guideline.

DRAFT

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## **TABLE OF CONTENTS**

1 INTRODUCTION.....	1
2 PURPOSE.....	1
3 DEFINITIONS.....	1
4 SCOPE.....	3
5 WALKDOWN METHODOLOGY.....	3
6 ACCEPTANCE CRITERIA.....	3
7 MONITORING AND MAINTENANCE OF FLOOD PROTECTION FEATURES.....	12
8 EVALUATION AND REPORTING RESULTS OF THE WALKDOWN..	11
9 REFERENCES.....	13

**APPENDIX A: EXAMPLES OF INSPECTION CONSIDERATIONS**

**APPENDIX B: WALKDOWN RECORD SHEET**

**APPENDIX C: JUST-IN-TIME TRAINING FOR WALKDOWN PERSONNEL**

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## 1 INTRODUCTION

In response to the nuclear fuel damage at Fukushima Daiichi due to earthquake and subsequent tsunami, the United States Nuclear Regulatory Commission (NRC) is requesting information pursuant to Title 10 of the Code of Federal Regulations, Section 50.54 (f). As part of this request, licensees will be required to perform walkdowns to verify that plant features credited in the current licensing basis (CLB) for protection and mitigation from external flood events are available, functional, and properly maintained.

## 2 PURPOSE

This document provides guidance for assessing External Flood Protection and Mitigation Capabilities in accordance with the NRC recommendation in item 2.3 of SECY 11-0137. It is intended that this approach be applied with any appropriate adjustments required to address plant specific differences.

The walkdowns will verify that permanent structures, systems, components (SSCs), portable flood mitigation equipment, and the procedures needed to install and or operate them during a flood are acceptable and capable of performing their design function as credited in the current licensing basis (CLB). The walkdowns will also verify that plant modifications implemented since original construction, such as security barrier installations and changes to topography, do not adversely affect plant flooding protection.

The specific request from SECY 11-0137 Item 2.3 is provided below. The SECY text is for information only. This Guideline provides the details for completing the actions pertaining to external floods:

- 1. Engage stakeholders to inform development of a methodology and acceptance criteria for seismic and flooding walkdowns; and*
- 2. Develop and issue a request for information to licensees pursuant to 10CFR50.54(f) to (1) perform seismic and flood protection walkdowns to identify and address plant specific issues (through corrective action program) and verify the adequacy of monitoring and maintenance for protection features and (2) inform the NRC of the results of the walkdowns and corrective actions taken or planned.*

In order for the walkdown effort to be as efficient as possible, it is recommended that the walkdown team be familiar with the information required to respond to SECY 11-0137 item 2.1 (new plant flooding evaluations) as well as item 2.3.

## 3 DEFINITIONS

The following definitions are provided to clarify requirements of the flood protection verification walkdowns.

### 3.1 **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.

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

### 3.2 **Inaccessible**

Inaccessible areas are areas that cannot reasonably be inspected due to significant personnel safety hazard, Very High Radiation Areas, major equipment disassembly, or no reasonable means of access (e.g., buried).

### 3.3 **Restricted Access**

Areas that are normally not accessible for direct visual inspection are classified as "Restricted Access". It is expected that flood protection features in these

areas will be inspected when conditions allow. The following represent considerations that may make an area “Restricted Access” during the walkdowns:

1. Entry into high radiation areas
2. Locations that are not accessible from normal personnel access areas (walkways, floors, platforms, etc.) due to height or distance. Generally, these items will require erection of scaffold or use of extension ladders.
3. Opening doors of panels or cabinets containing energized equipment
4. Opening junction boxes
5. Requiring heavy machinery and coordinated efforts to gain access (yard manholes, valve pits, etc.)
6. Actions that may impact on-line plant risk
7. Locations with other environmental concerns such as high heat, inadequate ventilation, or the possibility of toxic gas.
8. Flood protection features that are normally under water

### 3.4 **Deficiency**

A deficiency exists when a flood protection feature is unable to perform its intended flood protection function when subject to a CLB flooding hazard. This condition may also lead to compromising the overall ability to provide protection or mitigation.

Potential deficiencies should be evaluated in accordance with station processes and entered into the Corrective Action Program.

Examples:

- During the walkdown of an external flooding penetration seal, the visual inspection determines that the sealing material is missing and the evaluation of the condition determines that the seal **cannot meet** its required function. – This **should** be reported as a Deficiency.
- During the procedure walk-through, an identified “flood protection feature” procedure step requires connection of a temporary pump to a piping connection that has been removed by a modification 2 years earlier. The step **cannot** be performed as written. – This **should** be reported as a Deficiency.
- During the walkdown of an active “flood protection feature” it is identified that the feature does not have an active preventive maintenance task assigned to it. Through evaluation it is determined the feature **can meet** its required function. This observation should be placed in the CAP, but **should not** be reported as a Deficiency unless it is required by the CLB.

### 3.5 **Flood Protection Features**

For the purposes of this walkdown guidance, flood protection features include both permanent and temporary structures, systems, and components and applicable procedures that are credited to protect against or mitigate the effects of CLB external floods. The features that protect against or mitigate the effects of external floods are defined in the station's CLB. These features can have either an active or passive flood protection function. Some examples follow:

- Passive permanently installed or temporary items. These include (but are not limited to) dikes, berms, sumps, drains, basins, yard drainage systems, walls, removable wall and roof panels, floors, structures, penetration seals, temporary water tight barriers, and cork seals.
- Active permanently-installed or temporary equipment or components. These include (but are not limited to) credited sump pumps, portable pumps, isolation and check valves, flood detection (e.g., level switches), and flood doors (e.g., watertight doors).
- Procedures and/or guidelines intended to prevent or mitigate the effects of an external flooding event.

### 3.6 **Reasonable Simulation**

Reasonable simulation is a walk-through of a procedure or activity to verify the procedure or activity can be executed as specified/written. This simulation would require; verification that:

- any credited time dependent activities can be complete in the time required,
- specified equipment/tools are properly staged and in good working condition,
- connection/installation points are accessible,
- the execution of the activity will not be impeded by the event it is intended to mitigate or prevent or by other adverse conditions that could reasonably be expected to simultaneously occur (for example winds and lightning).

Reasonable simulation does not require for example; the building of temporary barriers, the actual installation of stop logs, connection of temporary equipment to permanent plant equipment, pumping of water, etc. Reasonable simulation may require the actual performance of these activities if there has never been a demonstration that the activity can be completed in the credited time.

### 3.7 **Visual Inspection**

A visual inspection is a visual comparison of the physical condition of a structure, system, or component (SSC) to an acceptance criteria.

## 4 SCOPE

The following section establishes the flood protection features that require walkdown in accordance with this document.

### 4.1 **Basis for Establishing Walkdown Scope**

The following criteria are used to establish the bases for the scope of the external flood protection feature walkdowns:

1. Plant configuration and procedures will be compared to the flood protection features credited in the existing licensing basis documents for flooding events (e.g., UFSAR, current drawings, and procedures).
2. Only flooding events originating from external sources are to be considered.
3. Procedures necessary to ensure function of external flood protection features are within the walkdown scope.
4. Procedures and processes to monitor onsite above grade reservoirs that are under the control of the licensee are within the walkdown scope.
5. This guidance does not require inspecting the initiators that may cause the floods (e.g., inspection or verification of inspection reports of upstream dams are not within the scope of this walkdown process).

### 4.2 **Identify Flood Protection Features (Walkdown List)**

Each licensee shall review existing (current) design and licensing documents including flood response procedures to identify site-specific features credited for protection and mitigation against external flooding events.

Using the CLB for the plant site:

1. Determine current site topography and any changes that may have affected the topography assumed by the licensing basis flood evaluation. Topographical changes will affect water flow on site and should have been evaluated for their effect on flooding.
2. Determine site building elevations and which buildings have been added since the current licensing basis flood evaluation was completed.
3. Determine the barriers important to resisting the effects of external flooding (e.g., structures, walls, floors, doors, , etc.).
4. Identify penetrations through barriers, such as trenches and cable openings, that could provide a path for flood water to enter buildings and the means to seal these penetrations

5. Identify instrumentation relied upon to detect water in rooms and the associated warning system
6. Identify any features or pathways credited for flood water relief (e.g., surface drainage swales, subsurface drainage system, culverts, floor/yard drains, etc.). Include these features in the verification walkdown to ensure pathways are clear and capable of performing their function, i.e. passage of water along the path assumed or described in the documents.
7. Review plant external flooding response procedures and identify any permanently installed equipment that is credited for flood protection or mitigation. Include this equipment in the verification walkdowns.
8. Identify any situations for which temporary plant equipment (e.g., portable pumps, sandbags, temporary barriers, etc.) is credited to protect or mitigate the effects of the external flooding event. Include this equipment in the verification walkdowns.
9. Include the flood response procedures assessed in items 5 and 6 above among the documents that will be reviewed to evaluate the practicality of the associated actions performed by site personnel.
10. Review the training provided to support implementation of plant flood procedures to determine if it is adequate and reflects any time sensitive actions.

## 5 METHODOLOGY

The following methodology is provided as guidance for performing the walkdowns.

### 5.1 **Develop Walkdown Scope**

Using the guidance provided in Section 4, develop a list of flood protection features and related operating or flood mitigation procedures credited in CLB documents for protection and mitigation against external flooding events. These items constitute the scope of the walkdowns and it is the expectation that all of these items will be subject to visual inspection, reasonable simulation, or, if necessary, functional tests.

This guidance does not require testing of any active component. For active components it is only necessary to confirm that no concerns are identified during the walkdown inspection, that they are included in a maintenance program that periodically checks their function and that the testing performed under the program is acceptable (see sections 5.7 and 6).

For temporary flood protection features and permanent features that require operator action, the walkdown shall also include verification through reasonable

simulation that the procedures that cover implementation of the protection strategy can be implemented as written. Verifications completed since March 2011 are acceptable provided they meet the guidance in Appendix A and appropriate documentation can be obtained to support the conclusion.

Justification for delaying walkdown of a flood protection SSC that has “Restricted Access” shall be provided in the response to the 10CFR50.54(f) letter, with a schedule for when walkdown of the flood protection item will be accomplished.

Under very rare circumstances, an item will be “inaccessible” and cannot be visually inspected. Any items classified as “inaccessible” shall be identified in the response to the NRC 10CFR50.54(f) letter. These items shall be evaluated and justification shall be provided that there is reasonable assurance that the feature is available and functional to perform the external flood protection or mitigation function. If reasonable assurance cannot be provided, then an evaluation of the potential impact of the loss of function of the flood protection feature will be provided. If more than one “inaccessible” flood protection feature with potential loss of function is reported, then an evaluation of the aggregate effect flood protection features must be provided.

The walkdown process should also include an assessment of any manual actions that are credited for external flood protection to ensure the actions can be performed as required considering the conditions expected during a licensing basis external flood (see Section 5.8). For multi-unit sites this includes an assessment of whether all the manual actions that are credited for external flood protection at all units on the site can be performed simultaneously in response to a single flood event with the available staff and within the timeframe required.

## 5.2 **Prepare Walkdown Packages**

Guidance and documentation for the conduct of the walkdowns should be developed to incorporate both generic and site-specific information. Each licensee should review design and licensing documents and site procedures to establish the flood protection CLB for each items identified in Section 5.1 (Develop Walkdown Scope).

If an existing site procedure is provided for inspection of an item and the inspection acceptance criteria is sufficient to establish that the item is capable of meeting its flood protection and mitigation requirements, the site procedure can be used to perform the walkdown. Note that this guidance has been endorsed by the NRC; if a site procedure is used in lieu of this guidance, it should meet the attributes provided in this guideline and the utility should be prepared to justify any substantive differences as compared to this document.

The following list of elements that should be considered in preparing a walkdown package:

1. Pre-Job Brief
2. Walkdown Guidance and Acceptance Criteria
3. Walkdown Record
4. Design Drawings (for Reference)
5. General Arrangement Drawings (for Reference)
6. Flood Protection Strategy Implementation Procedures

### 5.3 **Select Walkdown Personnel**

Personnel selected to perform the walkdown inspections should satisfy the following requirements:

1. Be experienced personnel trained to perform visual inspections of plant structures, systems, and components. Expectations for this training are at the discretion of the utility, but must be documented.
2. Be trained to this guidance and to the flooding related guidance in SECY 11-0137 items 2.1 and 2.3.
3. Be familiar with the walkdown packages they will be performing

Walkdown Personnel may be supported by craft personnel who do not need to meet the above requirements. Additional personnel assigned to review the walkdown results and perform any other related assessments should be trained to item 2 above. Note that the number of personnel on each walk down team is at the discretion of the utility.

A sample Just-In-Time Training Form is provided in Appendix C as an aide to developing the training.

### 5.4 **Perform Pre-Job Briefs**

It is recommended that a pre-job brief be performed prior to conducting the walkdowns. A pre-job brief from existing plant human performance procedures and tailored to the walkdown task may be utilized.

The form should include the following items for discussion during the brief:

1. Positive Component Verification
2. Inspection Methodology
3. Acceptance Criteria
4. Field Documentation Requirements
5. Reporting Degraded Conditions



## 5.6 **Inspection of Flood Protection and Mitigation Features**

For each item on the walkdown list, perform the specified inspection to assess the capability of the item to perform its required function. Conduct of the inspection should conform to the following generic guidance. If another approach is used, the utility should be prepared to justify any substantive differences between it and this document.

The results of the walkdowns conducted in response to INPO IER 11-1, "Fukushima Daiichi Nuclear Station Fuel Damage caused by Earthquake and Tsunami", may be used to satisfy the walkdown requirement for a flood protection feature if the IER 11-1 walkdown performance and documentation meets the expectations in this guideline. This determination is at the discretion of the utility. If the IER 11-1 results are used for any feature, the walkdown record form (Appendix B) for the associated flood protection feature should state that the IER 11-1 inspection was the source of the information.

### 5.6.1 General

Sections 5.6.2 through 5.6.6 describe the general approach for inspecting in-scope features. These four sections are organized as follows to describe the applicable expected inspection activities.

- Permanently Installed Passive Flood Protection Features
- Permanently Installed Active Flood Protection Features
- Temporarily Installed Passive Flood Protection Features
- Temporarily Installed Active Flood Protection Features

Appendix A provides some examples for illustrative purposes.

Note that any walkdown observation that cannot be immediately judged as acceptable must be entered into the Corrective Action Program for disposition.

### 5.6.2 Permanently Installed Passive Flood Protection Features

1. Prior to conducting the walkdown, determine if visual inspection of the flood protection feature is relevant. For example, visual inspection of instrumentation and controls may be of no value.
2. If visual inspection of the flood protection feature is relevant, perform an external visual inspection for indications of degradation that would prevent its credited function from being performed. Conditions that should be recorded include (but are not limited to) missing flood protection feature, severe corrosion, missing fittings, missing fasteners or structural anchors, pathways through barriers, degraded/missing penetration seals, degraded/missing door seals, etc.
3. If visual inspection is not relevant, determine if some other form of inspection (such as a functional check or verification that the function of

the component is determined by a preventive maintenance program) should be performed.

4. Perform physical measurements of required heights
5. Verify by observation or by review of other documentation that the feature is functional.
6. Determine whether the feature is included in a controlled preventive maintenance (PM) program, testing program, or technical specification surveillance procedure.
7. If the feature is subject to controlled PM programs providing reasonable assurance of continuing functionality, document this observation and the relevant program in the walkdown records. Use section 5.7 to guide the assessment of the flood protection feature testing done in accordance with this program.
8. If a passive feature is not subject to a controlled PM program that provides reasonable assurance of continuing functionality, evaluate whether this is acceptable. Enter any concerns in the Corrective Action Program

#### 5.6.3 Permanently Installed Active Flood Protection Features

In addition to the activities described in 5.6.2:

1. Assess the manual actions required to operate the feature to ensure they can be performed within the required time considering the conditions expected during a design basis flood.
2. Assess the associated training to ensure its adequacy.
3. Identify the procedures used to operate this equipment in the records used to document the walkdown results.

NOTE: It is not necessary to verify function of active components by operating the system or individual component. Components with an active function can be assumed to function properly if included in a routine PM or surveillance program and the testing performed under the program is acceptable (see sections 5.7 and 6). If credit is being taken for such activities, identify the credited program in the walkdown records. If there are open issues with the feature that could preclude its function during an external flood event, enter the observation into the Corrective Action Program.

#### 5.6.4 Temporarily Installed Passive Flood Protection Features

In addition to the activities described in 5.6.2:

1. Verify that the equipment is properly staged and in a condition that would allow its use should it be needed for its intended purpose, or that sufficient time is available after a flood warning to move the equipment to an appropriate location.
2. Confirm that all connections necessary to hook up the temporary equipment to allow performance of its flood protection function will work in their intended application and that any supplies, seals, fasteners, etc. are

of sufficient quantity, in good condition, properly staged, inventoried regularly and subject to periodic condition assessment.

3. Assess the equipment/tools (forklifts, cranes, carts, slings, wrenches etc.) necessary to transport and install the flood protection feature are identified and available.
4. Assess transportability and accessibility of any credited temporary equipment to ensure that it is possible, considering the conditions expected during a licensing basis flood, to access the equipment and to readily transport the equipment to the desired location (e.g., nothing blocks or prohibits access).
5. Determine whether plant lay down requirements contain provisions to assure that equipment transport pathways remain free of obstructions
6. Assess the manual actions required to install the feature to ensure they can be completed within the required time considering the conditions expected during a licensing basis flood (i.e., concurrent adverse weather conditions).
7. Identify the procedures used to install this equipment in the document used to capture the walkdown results.

#### 5.6.5 Temporarily Installed Active Flood Protection Features

In addition to the activities described in 5.6.2, 5.6.3, and 5.6.4:

1. Verify that any needed support equipment is staged, available, and appropriate for completing the function.

#### 5.6.6 Other Flood Protection Features

Inspecting flood protection features that are not credited in the licensing basis for external flooding is at the discretion of the licensee. In general, the following guidance is applicable:

1. If practical, a visual inspection of flood protection features should be performed to verify material condition and design configuration.
2. Any condition that could prevent function of the flood protection feature should be recorded.
3. Any operator actions required to operate or install the equipment should be verified to be performable considering the conditions that are expected to exist during an external flood event.
4. For permanently installed SSCs, functional testing is not required if an existing PM, surveillance, or periodic monitoring program exists for the feature and the testing performed under the program is acceptable (see sections 5.7 and 6).

#### 5.6.7 Procedure Walk-through and Reasonable Simulation

Procedures that have been identified as implementing procedures for flood protection features will require a procedure walk-through. This activity includes the following:

1. Walk-through of a procedure or activity to verify the procedure or activity can be executed as specified/written.
2. Verify that any credited time dependent activities can be complete in the time required.
3. Verify that specified equipment/tools are properly staged and in good working condition, verification that connection/installation points are accessible.
4. Verify that the execution of the activity will not be impeded by the event it is intended to mitigate or prevent.
5. Review the reliance on the station staff to execute required flood protection features. If during the review several activities are identified to rely on station staff, then perform and document an evaluation of the aggregate effect of the station staff to assure all actions can be completed as required.

Note: Reasonable simulation does not require for example; the building of temporary barriers, the actual installation of stop logs, connection of temporary equipment to permanent plant equipment, pumping of water, etc.

## **5.7 Review of the Status and Adequacy of Flood Protection Features**

Flood protection features, whether permanent or temporary, must be checked by a program to ensure that their flood protection function is adequately maintained. The review performed in accordance with this guidance should:

- Ensure that the feature is included in a periodic test, monitoring, or inspection program,
- Verify that the testing, monitoring, or inspection is being performed, and
- Determine if the scope of the test, monitoring, or inspection is adequate to confirm the credited flood protection function of the feature. (This is not intended to be a design review of the component or a review of the adequacy of all aspects of the testing/inspection/monitoring performed.)

Any questionable observations should be entered into the Corrective Action Program for disposition.

## **5.8 Review of Operating Procedures**

Equipment operating and flood mitigation procedures should be reviewed to ensure they will work as planned considering the conditions expected during a licensing basis flood combined with other adverse natural conditions (such as

lightening, hail, high winds, etc.) that could reasonably be expected to simultaneously occur. The following guidance should be used.

- Ensure that appropriate procedures exist for the operation of all active flood protection features, that the procedures will work under the conditions expected during a licensing basis flood (including other concurrent adverse weather events, such as high winds) and that the procedure steps can be completed within the time allotted. Reasonable Simulation can be used for this review.
- The instructions in the procedure should be verified for adequacy and reviewed to ensure that any needed support equipment is staged, available, inventoried, periodically assessed for functionality, and appropriate for completing the function.
- Ensure that training on the procedures is appropriate to assure continuing proficiency in their implementation.
- Verify that any procedures governing site preparation for an expected flood event are adequate and can be completed within the warning time expected for a licensing basis flood event.
- Verify that processes are in place to revise the procedures when changes occur to the associated flood protection features, plant staffing requirements, or flood hazard assessments.
- Verify that operator staff is trained to the procedures.

### **5.9 Documenting Possible Deficiencies**

All observations should be documented in the Walkdown record forms, and when the observation cannot be immediately judged as acceptable, also documented in the licensee Corrective Action Program in accordance with site procedures.

### **5.10 Restricted Access, or Inaccessible**

If access to an item is not available to walkdown personnel, it will be identified as such on the record form and the reason documented. Subsequent actions will be taken to either gain access for inspection of the item, or (if the item is “inaccessible”) an evaluation will be performed to verify flood protection capability. Any inspections that cannot be completed will be reported in the utility response to the 50.54(f) letter.

## **6 ACCEPTANCE CRITERIA**

It is not practical or desirable for this guidance to contain specific acceptance criteria for flood protection features. The large variety of protection features and

functions make it impossible to capture all the possibilities. For example, some of the considerations that should be taken into account when flood protection features are reviewed include the following:

- Flood protection configuration is in accordance with as-built drawings
- Visual inspection does not identify any material degradation
- Instructions contained within implementation procedures can be implemented as written and within allowed time
- When applicable, PMs or periodic inspections are in place, within their required periodicity, and of adequate scope.
- There are not unresolved adverse PM or periodic inspection implementation results.
- No topography changes, or barrier installations adversely affect the site drainage plan.

Rather, than attempt to list all the considerations, it is the intent of this guidance to have all observations that cannot be immediately judged as acceptable entered into the licensee Corrective Action Program (CAP) where an evaluation of the observation can be made. CAP disposition should use the following thought process to guide the assessment of implications.

**Flood protection features are considered acceptable if no conditions adverse to quality were identified during walkdowns, verification activities, or program reviews as determined by the licensee's Corrective Action Program. Conditions adverse to quality that prevent the flood protection feature from performing its credited function during a design basis external flooding event are "deficiencies" and must be reported to the NRC in the response to the 50.54(f) letter.**

Note that the use of site-specific acceptance criteria (procedural, design documents, etc.) for flood protection features in lieu of the above generic guidance is at the discretion of the licensee.

## 7 MONITORING AND MAINTENANCE OF FLOOD PROTECTION FEATURES

One of the expectations for this walkdown is an overall assessment of the maintenance and monitoring of flood protection/mitigation features, both active and passive. This should be done by assessing the results of all the walkdowns to evaluate whether the features are being adequately maintained and whether any changes to plant procedures and processes (such as design modification procedures) should be processed to prevent future concerns. Any identified gaps should be addressed in the Corrective Action Program.

Programs can be credited to assure that active components covered by them will adequately perform their intended function as long as the testing performed under the maintenance program satisfies the guidance in section 5.7. Any observations that indicate that this may not be the case should be entered into the Corrective Action Program.

Observations related to inadequate monitoring and maintenance of the flood protection features, and actions taken or planned to address them, are to be reported to the NRC in response to the 50.54(f) letter.

## 8 EVALUATION AND REPORTING RESULTS OF THE WALKDOWN

Walkdown results shall be documented.

1. Documentation of field observations shall be recorded on a form provided in the walkdown package. A sample generic record form is provided in Appendix B.
2. All failures to meet acceptance criteria will be entered into the CAP.
3. All flood protection features that could not be inspected because of access limitations (inaccessible or restricted access) will be evaluated using the guidance in section 5.1 and reported in the response to the 50.54(f) letter.
4. The 10CFR50.54(f) letter enclosure entitled "Recommendation 2.3: Flooding" contains a "Requested Information" section that lists all the information that must be included in licensee responses.

At the conclusion of the walkdown, the record forms should be processed in accordance with plant procedures.

## 9 RELATED INFORMATION SOURCES

- 9.1 INPO Event Report Level 1 11-1, *Fukushima Daiichi Nuclear Station Fuel Damage Caused by Earthquake and Tsunami*
- 9.2 NRC Inspection Manual, Temporary Instruction 2515/183, *Follow-up to the Fukushima Daiichi Nuclear Station Fuel Damage Event*, November 2011, ML113220407.
- 9.3 NRC Inspection Manual, Inspection Procedure 62002, *Inspection of Structures, Passive Components, and Civil Engineering Features at Nuclear Power Plants*, Section 03.01(h), *Dams, Embankments and Canals*

- 9.4 NRC Inspection Procedures, Attachment 71111.01, *Adverse Weather Protection*, Section 02.04, *Evaluate Readiness to Cope with External Flooding*
- 9.5 NUREG/BR-0326, Rev. 1 (August 2009), *NRC Inspector Field Observation Best Practices*
- 9.6 Regulatory Guide 1.102, *Flood Protection for Nuclear Power Plants*

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# APPENDIX A

## Examples

## A. Examples

The following examples of inspection considerations are provided for illustration only. The list of characteristics included and the attributes inspected for each should not be considered all inclusive. This section is organized in a manner similar to section 5.6 (permanent passive, permanent active, temporary passive, temporary active).

### A.1 Permanent Passive Features

#### A.1.1 Site Elevations and Topography

- Compare the current site topography with the topography assumed in the current licensing basis flood evaluation.
- Assess differences to determine if they could affect water flow or flood levels and create vulnerabilities in existing flood protection features.

##### A.1.1.1 Earthen Features (i.e., flood protection berm)

- Verify that earthen features are in place as designed correct height (with no allowance for dimensional tolerances that reduce its protection function) and width, rip-rap in place if included, etc.
- No signs of leakage

#### A.1.2 Concrete and Steel Structures

The exterior surfaces of Category I (Safety-Related) structures are generally credited to prevent flooding of the interior spaces and to withstand the hydrostatic forces during a flood event. Adjoining non safety related structures must be included if those structures communicate with safety related buildings and structures through access openings or penetrations.

- Verify that the structure is in place and in accordance with its design configuration. Perform physical measurement or required height. Minimum required height must be met with no allowance for dimensional tolerance.
- Visually inspect all exterior exposed surfaces of the building below the analyzed maximum flood height for significant indications of structural degradation or any openings that might permit flooding of the interior spaces.
- Visible penetrations are sealed.
- Required relief paths are in place and unobstructed
- No signs of leakage on interior surfaces

- If conditions will not allow close examination, use of binoculars is permitted if 100% of the surface area below the maximum flood height can be inspected in a manner sufficient to meet the intent of this section.
- No apparent degradation in structural members that challenges their ability to withstand forces from flooding, i.e. reinforced concrete, concrete block or steel barriers, such as surface cracks greater than 0.04 inches in width.
- Interior surfaces of the structure should be inspected for signs of leakage that may be occurring as a result of non-detectible leakage thru external surfaces. Refer to the note below.
- Concrete structures should not show water stains/stalactites emanating from their surfaces.
- Surfaces of the structure/building that are buried are considered inaccessible and not subject to inspection. A visual inspection of interior surface is acceptable if the exterior surface is inaccessible.
- If a PM/surveillance exists that inspects the structure, then it is not necessary to specifically inspect individual barriers for this review (although the surface (e.g., wall), in accessible areas, must still be visually scanned for any unexpected conditions). If credit is being taken for a PM, then identify the PM number in the walkdown records.

#### A.1.3 Wall, Ceiling, and Floor Seals (e.g., Penetration Seals, Cork Seals)

- Perform a visual inspection of credited wall, ceiling, and floor penetration seals for indications of degradation that would allow flood waters to penetrate into the flood protected area. Conditions that should be recorded include (but are not limited to) damage, undocumented openings or holes, etc.
- Only the credited side(s) (surface) of a seal need be inspected. For example, if the exterior side of a wall penetration seal is examined and found to be acceptable, the interior side does not need to be examined if only the exterior side is credited.
- Visible penetrations are sealed and there are no visible through wall holes.
- Penetration sleeves, link seals, piping, and conduit should have an absence or corrosion on the exposed steel surface other than minor surface corrosion.
  1. Conduit seal material should have an absence of water stains below penetrations.

#### A.1.4 Passive Flood Barriers or Water Diversion Structures

- Perform an external visual inspection of passive structural barriers and water diversion structures for any condition that would prevent function of the flood protection feature. Conditions that should be recorded include (but are not limited to) severe corrosion, erosion, indications of significant structural damage, missing fasteners and anchors, undocumented holes or openings, etc.
- Critical dimensions of the structure (e.g., minimum height of a flood wall) shall be verified. Measurement of these dimensions is recommended; however, estimation is permitted when measurement is not practical and margin at least as large as the uncertainty of the estimate is available.
- The need for a land survey for elevations will depend upon the accuracy of the applicable drawings and site topographical documents.

#### A.1.5 Drains and Catch Basins

- Verify by visual inspection that there are no obstructions or obvious blockage to drains and catch basins credited for protection against licensing basis external flood events.
- Verify that the drains and catch basins are in the location shown on design drawings.
- Verify that any back flow prevention features (such as check valves) are functional as required.
- Verify that controls are in place to assure drains will not be unintentionally obstructed during plant laydown activities or vehicle parking.
- Inspection of the interior surface of drains, catch basins, and pipes is not required. Drain systems can be assumed to function properly if they are tested as part of a routine Preventative Maintenance (PM) program. If there are open issues with the drainage system that could prevent function during an external flood event, enter that condition into the CAP.

#### A.1.6 Plugs and Manhole Covers

- Verify Material Condition. Specifically, visually inspect the material condition of the plug and seal materials to determine if there is any damage that would prevent the device from performing the flood protection function. Note: Generally, the seals around plugs do not need to be watertight.
- Caulking should not have any apparent cracks or gaps.
- Only one side (surface) of a plug need be inspected. For example, if the exterior side of a concrete plug is examined and found to be acceptable, the interior side does not need to be examined.

#### A.1.7 Drainage Pathways (Swales, Subsurface Drainage System, Etc.)

- Verify the feature is in place and configured as designed
- Visually inspect the material condition to determine if there is any damage that might prevent the feature from performing its flood protection function.
- Verify that the plant swales are free of obstructions which could prevent the feature from performing the flood protection function and controls are in place to assure they remain obstruction free.
- Back flow prevention devices are functional

#### A.1.8 Piping and Cable Vaults and Tunnels, Electrical Cable Conduit

Water ingress into tunnels, vaults, and cable conduit is not a concern in the short term unless there are components in these structures with an active flood protection function that might be damaged by submergence. The concern that must be addressed during the walkdown is the possibility that these features might provide a flooding pathway into buildings and other structures.

- Visually inspect all seals or other devices that are credited to prevent water intrusion into a space that contains safety related equipment or equipment credited for flood protection during a flooding event.
- Determine if there is any damage that would prevent the seals or other devices from performing their flood protection function. See item A.1.3 above for more guidance on seal inspection.

#### A.1.9 Floor Hatches

- Visually inspect floor hatches that are below the analyzed maximum flood height for indications of structural degradation or any openings that might permit flooding of the interior spaces.
- Confirm any hatches in the floor of a flood barrier are capable of limiting the passage of water either above or below the barrier to an acceptable level. The basis for acceptance must be an actual test or an evaluation that includes a review of the design and walkdown of the material condition..
- Only one side (surface) of a hatch need be inspected. For example, if the exterior side of a concrete hatch is examined and found to be acceptable, the interior side does not need to be examined.

### **A.2 Permanent Active Features**

#### A.2.1 Doors

- Perform an external visual inspection of doors for indications of degradation that would prevent satisfactory performance of the flood protection function of the door. Conditions that should be recorded

include (but are not limited to) severe corrosion, missing fittings, missing fasteners, undocumented holes or openings, damaged jams or seals, obstructions, etc.

- Confirm that the doors are closed (or can be closed) and have the proper door swing (i.e., swing in the direction shown on design drawings).

#### A.2.1.1 Credited Water Tight Doors

- Verify that the door appears to be water tight (constructed in a consistent manner) and
- Door jams, fittings and fasteners are in place and functional
- Door are seals in place and with no degradation that would affect function

#### A.2.1.2 Credited Non-Watertight Doors

- Verify presence with acceptable gaps
- No degradation that would prevent function
- Door jams, fittings and fasteners in place and functional

#### A.2.2 Pumps

- Perform an external visual inspection for indications of degradation that would prevent function of the pump. Conditions that should be recorded include (but are not limited to) severe corrosion, missing fittings, etc.
- Verify by means of Reasonable Simulation that plant staff can operate the pump in the manner credited for its function
- Verify that the pump is included in a plant maintenance/testing program that periodically assesses its function

#### A.2.3 Water Level Indication

Certain rooms may have instrumentation or switches that are credited to indicate the presence of water during an external flood event. For those instruments:

- Verify Material Condition. Specifically, visually inspect the material condition of the instrument to determine if there is any damage that would prevent the device from performing its flood protection function or any obstructions to the sensing element that would prevent accurate readings.
- Verify that the instrument is included in a plant maintenance/testing program that periodically assesses its function

### **A.3 Temporary Passive Features**

#### **A.3.1 Portable Flood Barriers**

- Verify that credited temporary barriers are stored as expected and in sufficient quantity, and are subject to periodic inventory and condition assessment
- Visually inspect a representative sample to ensure no physical damage or degradation that would impede their function
- Verify that the barriers can be accessed and transported to the location where they will be needed, considering the conditions that might be expected at the time of their use
- Determine if controls are in place to prevent obstruction of transport routes and whether the capability exists to clear flood induced obstructions.
- Verify that the barriers can be installed and if necessary, inflated, in the manner credited for their function
- If the barriers are subject to age related degradation, verify that they are included in a plant maintenance program that periodically assesses their condition

### **A.4 Temporary Active Features**

#### **A.4.1 Pumps**

- Perform an external visual inspection for indications of degradation that would prevent function of the pump. Conditions that should be recorded include (but are not limited to) severe corrosion, missing fittings, missing connections, etc.
- Verify that the pumps can be accessed and transported to the location where they will be needed, considering the conditions that might be expected at the time of its use
- Determine if controls are in place to prevent obstruction of transport routes and whether the capability exists to clear flood induced obstructions.
- Verify by means of Reasonable Simulation that plant staff can install and operate the pump in the manner credited for its function
- Verify that the pump is included in a plant maintenance program that periodically assesses its condition



**APPENDIX B**

**WALKDOWN  
RECORD SHEET**

**WALKDOWN RECORD SHEET**

Plant Name: \_\_\_\_\_ Unit: \_\_\_\_\_

**PART A. DESCRIPTION:**

Flood Protection Feature (Equipment) ID Number: \_\_\_\_\_

Description: \_\_\_\_\_

Location: Bldg. or Area \_\_\_\_\_  
Elevation \_\_\_\_\_  
Room \_\_\_\_\_ Column \_\_\_\_\_

References: 1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

**PART B. VISUAL INSPECTION:**

1. Is a visual inspection required? Y N  
If No, Explain \_\_\_\_\_

If Yes, answer questions 2 – 4 below.

2. Is the feature accessible? Y N N/A  
If No, Explain \_\_\_\_\_

3. Is the Material Condition Acceptable? Y N N/A

4. Are the Critical Physical Dimensions Per Design? Y N N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PART C. FUNCTIONAL TEST:**

1. Is a functional test required? Y N  
If No, Explain \_\_\_\_\_

If Yes, answer question 2 below.

2. Was the functional test satisfactory? Y N N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PART D. ACTIVITY OR PROCEDURE WALK-THROUGH (REASONABLE SIMULATION):**

1. Is a procedure walk-through (reasonable simulation) applicable? Y N

If No, Explain \_\_\_\_\_

If Yes, list the applicable procedure(s) and answer questions 2 – 5 below.

Procedure(s) \_\_\_\_\_  
\_\_\_\_\_

2. Can credited time-dependent activities be completed in the time required, including manual actions? Y N N/A

3. Are specified equipment/tools properly staged and in good working condition? Y N N/A

4. Are connection/installation points accessible? Y N N/A

5. Can the activity be executed such that it will not be impeded by the event it is intended to mitigate or prevent? Y N N/A

6. If equipment is necessary to move materials or install the flood protection feature, is this equipment identified in the procedure, available, and the transport pathway is clear? Y N N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PART E. MAINTENANCE AND MONITORING:**

1. Is the flood protection feature covered by a maintenance, surveillance, or monitoring program? Y N N/A

If N/A, Explain \_\_\_\_\_

If No, generate appropriate plant notification/assignment to assess this apparent programmatic deficiency..

If Yes, list the applicable maintenance, surveillance or monitoring program:





## **APPENDIX C**

# SAMPLE JUST-IN-TIME TRAINING FOR WALKDOWN PERSONNEL

**\*\*\*\*\* FUTURE \*\*\*\*\***

[Editorial Note – Provide guidance on this

ID threats

