

3.4 Qualification

Order Requirement:

The level instrument channels shall be reliable at temperature, humidity and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period. This reliability shall be established through the use of an augmented quality assurance process (e.g. a process similar to that applied to the site fire protection program).

Guidance:

The instrument channel reliability shall be demonstrated via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters, as described in the paragraphs below:

- conditions in the area of instrument channel component use for all instrument components,
- effects of shock and vibration in the area of instrument channel component use during a potential seismic event for only installed components, and
- seismic effects in the area of instrument channel component use during a potential seismic event for only installed components.

These qualifications do not apply to any plant systems, components or structures that are not part of the SPF instrumentation channel, even if such plant systems, components, or structures are connected, attached or otherwise relied upon for the SPF instrumentation channel to remain functional.

Selection of instrument channel components shall consider ease and simplicity of design and replacement after the event. Readily available commercial components shall be considered. See section 4.2, Procedures, for guidance on replacement instrument channel component replacement at the time of an event or thereafter until the unit is returned to normal service.

The temperature, humidity and radiation levels consistent with conditions in the area of use considering normal operational, event and post-event conditions for no fewer than seven days post-event or until off-site resources can be deployed by the mitigating strategies resulting from Order EA-12-049 should be considered. Examples of post-event (beyond-design-basis) conditions to be considered are:

- radiological conditions for a normal refueling quantity of freshly discharged (100 hours) fuel with the SFP water Level 3 as described in this order,
- temperatures of 212 degrees F and 100% relative humidity environment,
- boiling water and/or steam environment,
- a concentrated borated water environment, and
- the impact of FLEX mitigating strategies.

For the effects of shock and vibration in the area of instrument channel component use after a potential seismic event for only installed components (with the exception of replaceable batteries and battery chargers), the following measures are acceptable to verify that the design and installation is adequate, except for the mounting of components which is discussed in section 3.3.

All components of the instrument channels are rated by the manufacturer (or otherwise tested) for shock and vibration at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one, or more, of the following methods:

- instrument channel components that use known operating principles, parts supplied by manufacturers with commercial quality programs, such as ISO9001, and commercial design and testing for operation in environments where significant shock and vibration loadings are common, such as for portable hand-held devices or transportation applications;
- substantial history of operational reliability in environments with significant shock and vibration loading, such as transportation applications; or
- use of components inherently resistant to shock and vibration loadings, such as cables.

For the effects of seismic loading in the area of instrument channel component use after a potential seismic event for only installed components (with the exception of replaceable batteries and battery chargers), the following measures are acceptable to verify that the design and installation is adequate, except for the mounting of components which is discussed in section 3.3.

All components of the instrument channels are rated by the manufacturer (or otherwise tested) for seismic loading at levels commensurate with those of postulated design basis event conditions in the area of instrument channel component use using one, or more, of the following methods:

- instrument channel components that use known operating principles, parts supplied by manufacturers with commercial quality programs, such as ISO9001, and commercial design and testing for operation in environments where significant seismic loading is common;
- substantial history of operational reliability in environments with significant vibration, such as for portable hand-held devices or transportation applications;
- demonstration of successful seismic reliability using methods that predict the equipment's performance by analysis, testing of the equipment under simulated seismic conditions, a combination of test and analysis, or the use of experience data. Guidance for this method is derived based on related discussion in Regulatory Guide 1.100, Revision 3, September 2009, "Seismic Qualification of Electrical and Active Mechanical Equipment and Function Qualification of Active Mechanical Equipment for Nuclear Power Plants" (Reference 8) and sections 7, 8, 9, and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations" (Reference 9). However, the

requirements of Regulatory Guide 1.100 do not directly apply with seismic reliability requirements addressed directly herein. For example, quality assurance is covered directly in Appendix A-1 of this guidance document;

- demonstration that proposed devices are substantially similar in design to models that have been previously tested to seismic loading levels in excess of the plant design basis at the location where the instrument is to be installed, (g-levels and frequency ranges). Such testing should be substantially similar to the process described in Regulatory Guide 1.100, Revision 3; or
- seismic qualification considering seismic motion consistent with that of existing design basis loading at the installation location.

The basis for the seismic qualification for instrument channel components shall be the unit seismic design basis at the time of submittal of the Integrated Plan for implementing NRC Order EA-12-051 (See Appendix A-2-2). Should the unit seismic design basis change, changes to the instrument channel component qualifications will be processed in accordance with the procedures for such changes at the unit.

The instrument channel components do not have to be qualified for missile impact. Meeting the arrangement requirements in Section 3.2 will satisfy the missile protection requirements of Order EA-12-051.

The quality assurance process to be applied is provided in Appendix A-1.

3.3 Mounting

Order Requirement:

Installed instrument channel equipment within the spent fuel pool shall be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure.

Guidance:

These order requirements apply to any SFP level instrument channel equipment that is permanently installed in the SFP. Consideration shall be given to the maximum seismic ground motion to the design basis of the SFP structure.

The mounting shall be designed consistent with the highest seismic or safety classification of the SFP. An evaluation of other hardware stored in the SFP shall be conducted to ensure it will not create adverse interaction with the fixed instrument location(s).

The basis for the seismic design for mountings in the SFP shall be the unit seismic design basis at the time of submittal of the Integrated Plan for implementing NRC Order EA-12-051 (See Appendix A-2-2). Should the unit seismic design basis change, changes to the seismic design for mountings in the SFP will be processed in accordance with the procedures for such changes at the unit.

4.2 Procedures

Order Requirement:

Procedures shall be established and maintained for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels.

Guidance:

Procedures will be developed using guidelines and vendor instructions to address the maintenance, operation, and abnormal response issues associated with the new SFP instrumentation. For portable instruments, the procedures will also specify storage location and installation activities.

If, at the time of an event or thereafter until the unit is returned to normal service, an instrument channel component must be replaced, it is acceptable to use commercially available components that may not meet all, or any, of the qualifications (Section 3.4) to maintain the instrument channel functionality.

All licensees shall have a strategy to ensure SFP water level addition is initiated at an appropriate time consistent with the implementation of NEI 12-06.