ATTACHMENT 65001.21

INSPECTION OF PIPE RUPTURE HAZARDS ANALYSES (INSIDE AND OUTSIDE CONTAINMENT) DESIGN ACCEPTANCE CRITERIA (DAC)-RELATED ITAAC

PROGRAM APPLICABILITY: 2503

65001.21-01 INSPECTION OBJECTIVES

01.01 To verify that the pipe break hazard analysis report, as defined in the Design Certification Document (DCD) was completed in accordance with the methodology called out in the DCD, and any additional requirements provided in license conditions in the COL FSAR.

01.02 To determine whether licensee records establish an adequate basis for the acceptance for closure of Inspection, Test, Analysis and Acceptance Criteria (ITAAC) for the as-designed pipe rupture hazards analysis report.

65001.21-02 INSPECTION REQUIREMENTS AND GUIDANCE

Background: Design Acceptance Criteria (DAC) are a set of prescribed limits, parameters, procedures, and attributes upon which the NRC relies, in a limited number of technical areas, in making a final safety determination to support a design certification. DAC is to be objective (measurable, testable, or subject to analysis using pre-approved methods), and must be verified as a part of the ITAAC performed to demonstrate that the as-built facility conforms to the certified design (SECY 92-053).

There are three process options for DAC/ITAAC resolution:

- Resolve during the design certification or amendment to the design certification
- Resolve as part of COL review
- Resolve after COL is issued

In the first two options, the applicant will submit the design information and the NRC will document its review in a safety evaluation. In the third option, the COL holder notifies the NRC of availability of design information and the staff will document its review in an inspection report.

Should the third option be implemented for a first standard plant design, subsequent COL applicants may reference the first standard plant closure documentation and close the DAC/ITAAC under the concept of “one issue, one review, one position,” identified in NRC guidance.

Description of the Pipe Rupture Hazards Analysis Report ITAAC: The as designed pipe rupture hazards analysis report ITAAC is a set of methodology and criteria pertaining to protection of essential systems or components inside and outside containment from the adverse effects of postulated failures in high and moderate energy piping (HELB and MELB). However, this ITAAC cannot be completed until after the piping design has been completed and the piping DAC has been met. After the plant is built, the as built pipe rupture hazards analysis report ITAAC will verify that the as designed pipe rupture hazards analysis inside and outside containment is still valid.

02.01 Inspection Plan/Scoping.

The scope of piping Pipe Rupture Hazards Analysis Report ITAAC encompasses all high-energy and moderate-energy fluid systems in the proximity of essential systems, structures, and components (SSCs) inside and outside containment.

The design commitment is as follows: "Systems, structures and components (SSCs) that are required to be functional during and following a design basis event shall be protected against, or qualified to withstand, the dynamic and environmental effects associated with analyses of postulated failures in high and moderate energy piping."

02.02 Design Inspections. The following tasks should be performed across a representative sample of high and moderate energy piping systems:

a) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify that each space containing structures, systems, and components (SSCs) important to safety is addressed.

b) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify for each chosen piping segment that the methodology called out for determination of postulated pipe break and crack types and locations in the license is followed. Aspects that should be verified include:

    - Criteria for determining the pipe breaks/cracks location including their associated pipe stress and cumulative usage factor
    - Criteria for determining the pipe break types and crack sizes
    - Computer codes used in analyses are approved for use in the DCD/license

c) Review the As-Designed Pipe Rupture Hazards Analysis Report to ensure the methodology called out for the evaluation of dynamic effects and environmental effects of postulated pipe breaks/cracks in the license is followed. Aspects that should be verified include:

- Criteria for determining the jet expansion modeling and the jet impingement force
- Design of the mitigation features (i.e., pipe whip restraints and jet impingement barriers)
- Design of the SSCs for which mitigation features are not provided.
- Criteria for the protection of flooding and other adverse environmental effects

d) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify that SSCs which are identified to be the potential targets will be protected as required in the license by the associated mitigation features as-designed. This includes the review of the sketches of applicable high energy piping systems showing the location, size and orientation of postulated pipe breaks and the location of pipe whip restraints, jet impingement barriers, and the SSCs important to safety which are in close proximity to the postulated pipe rupture locations. It also includes review of the isolation and separation provided in the plant design. The level of review should be guided by inspector experience, risk significance of the SSCs, operating experience in determining the design of physical protection provided to the SSCs important to safety.

e) Review the As-Designed Pipe Rupture Hazards Analysis Report to verify the report addresses all of the information required in the license.

Guidance: The inspection should involve a review of the pipe rupture hazard analysis report to verify those aspects required to be covered in the DCD are fully addressed in accordance with the methodology described in the DCD. Inspectors should be prepared to refer to the acceptance criteria defined in Sections 3.6.1 and 3.6.2 of NUREG-0800 during the reviews of the As-Designed Pipe Rupture Hazards Analysis Report.

Branch Technical Position (BTP) 3-4 in the SRP would be a good reference for this review. This could include, but may not be limited to:

- Review the pipe break locations in high energy piping to verify that the DCD methodology was followed to identify the locations and that no locations were missed;
- Review through-wall crack locations in high and moderate energy piping to verify that the DCD methodology was followed to identify the locations and that no locations were missed;
- Review essential structures, systems, and components to ensure that all were addressed in the report;
- Review evaluation of consequences of pipe whip and jet impingement (for rooms with both high energy breaks and essential items, confirm that there is no adverse interaction between the essential items and the whipping pipe or jet and that the plant layout is modified as required to provide separation to protect essential systems); evaluate consequences of flooding, environment, and compartment pressurization;
- Evaluate consequences of flooding, environment, and compartment

pressurization in the break exclusion zones in the vicinity of containment penetrations due to 1.0 square foot breaks in the main steam and feedwater lines evaluate the design and location of protective hardware;

- Review isometric piping sketches that identify the break locations, the basis for these locations and the protective hardware which mitigates the consequences of these breaks;

The system selection criteria for inspection should consider risk significance, operating experience, new design, complexity of system transients, and safety significance of the essential SSCs. As a minimum, the pipe rupture hazard analysis report should be completed prior to beginning the inspection. If not completed, the report portions applicable to the spaces the licensee claims are ready for review should be complete. The inspectors should review the design-appropriate "Risk Insights" document during selection of essential SSCs. (e.g., Risk Insights for the Review of the AP1000 Design, Rev 1.)

Inspection Sample Guidance: The Pipe Rupture Hazards Analysis Report ITAAC inspection should verify at least 10 to 15 isolation and/or physical protection mechanisms with different characteristics.

During the preparations for the inspection, the team should select a sample of 15 to 20 piping HELB and MELB design packages and identify those packages to the licensee and piping design contractor/vendor. The final sample selection of 10 to 15 packages for review will be done when the team arrives at the location of the inspection. For the purpose of this inspection, a design package is defined as all of the design information involved with a particular HELB or MELB location, and the isolation and/or physical protection mechanisms associated with that particular location.

02.03 As-Built Inspections: Once construction and the reconciliation of the pipe rupture hazard analysis are complete, inspection for this ITAAC can commence. On a sampling basis, review systems in the field after they are constructed to observe the protective hardware installed to mitigate consequences of pipe breaks and verify that they were installed in accordance with the design and the reconciliation analysis. Confirm by walk down that a sample of installed piping configuration and support hardware is installed per the piping design and piping ISOs.

Review the pipe rupture hazard analysis report to determine where the report was reconciled for changes made to the plant with regard to placement of mitigation features such as pipe whip restraints, jet impingement barriers, drainage systems, and physical separation of piping, equipment, and instrumentation, etc. Verify that the changes were done in accordance with the methodology called out in the DCD and the COL FSAR.

The guidance above can be followed in verifying that the changes were handled in accordance with the regulations and license.

65001.21-03 RESOURCE ESTIMATE

The estimated hours for completing the piping DAC inspection are 210 to 280 staff hours based on a two weeks audit/inspection by three or four NRC staff members. In addition, the estimated hours for preparation and documentation are 70 hours and 120

hours respectively. Additional hours may be required if the inspection is performed in parts.

65001.21-04 REFERENCES

ASME B&PV Code Section III, Applicable Revision

Facility Final Safety Analysis Report (FSAR) and Design Certification Document (DCD)

Facility Final Safety Evaluation Report (SER)

10 CFR 50, Appendix A, General Design Criterion 4 – Environmental and Dynamic Effects Design Bases

NUREG-0800, Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants, Section 3.6.1 “Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment”

NUREG-0800, Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants, Section 3.6.2 “Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping”

NRC Branch Technical Position 3-3, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."

NRC Branch Technical Position 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment."

END

Attachment 1

Revision History For 65001.21

Commitment Tracking Number	Document Accession Number and Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	11/07/11 CN 11-029 ML112231754	Initial issuance. This IP has been developed by Region II staff to address inspection of Design Acceptance Criteria (DAC) related to pipe break hazard analysis. The DAC are sometimes referred to as "design ITAAC" and are intended to be inspected in a manner similar to other ITAAC that are part of a COL. It is anticipated that inspections of DAC will generally be conducted by NRO technical staff in a support role to Region II Center for Construction Inspection.	N/A	N/A	N/A