INSPECTION PROCEDURE 37551

ONSITE ENGINEERING

PROGRAM APPLICABILITY: 2515

SALP FUNCTIONAL AREA: ENGINEERING (ENG)

37551-01 INSPECTION OBJECTIVE

To provide periodic engineering evaluations for regional assessment of the effectiveness of the onsite engineering staff.

37551-02 INSPECTION REQUIREMENTS

02.01 Periodically investigate engineering problems or incidents to determine the root causes of the selected engineering problem. Evaluate the effectiveness of licensee's controls in identifying, resolving, and preventing problems by reviewing such areas as corrective action systems, root cause analysis, safety committees, and self assessment in the area of engineering.

02.02 Evaluation of Licensee's Controls and Self-Assessment Activities. Semiannually, perform an overall evaluation of the licensee's controls and self-assessment of engineering activities. Determine whether there are strengths or weaknesses in the licensee's controls for the identification and resolution of the reviewed issues that could enhance or degrade plant operations or safety.

02.03 Use of risk insights. Consider risk significance as one input in the selection of a sample of inspection items.

37551-03 INSPECTION GUIDANCE

General Guidance

This inspection procedure (IP) will provide frequent examinations of specific routine and reactive onsite engineering activities. The consolidation of these periodic inspection findings with other inspections in this area will assist in identifying relative strengths and weaknesses within the onsite engineering area.

The pertinent regulations and guidance that define the regulatory expectations in the engineering area are located in several places including:

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

---, Appendix B, Criterion III, "Design Control," Criterion IV, "Procurement Document Control," and Criterion V, "Instructions, Procedures and Drawings"

10 CFR 50.59, "Changes, Tests and Experiments"

ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants"

ANSI N45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plants"

ANSI N45.2.13-1976, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants"

Specific Guidance

03.01 The engineering evaluation will consist of a limited assessment of the design and engineering processes to determine the root cause of the problem and evaluate the adequacy of engineering support. Generally, extensive followup inspection needed at the offsite location will be performed under IP 37550, "Engineering."

When safety issues, events, or problems are reviewed, the adequacy of the results of licensee controls may be assessed by determining how effective the licensee was in performing the following:

1. Initial identification of the problem.

2. Elevation of problems to the proper level of management for resolution (internal communications and procedures).

3. Root cause analysis.

5. Disposition of any operability issues.

5. Implementation of corrective actions.

6. Expansion of the scope of corrective actions to include applicable related systems, equipment, procedures, and personnel actions.

It is recommended that responsible regional staff or the inspector maintain a matrix of noted strengths and weaknesses identified for the specific engineering areas listed in the guidance section below. The matrix also could include results from other inspections (such as special and team inspections) and would be useful for identifying potential weak areas that could be examined during the more detailed regional inspection of engineering (IP 37550).

The five engineering areas listed below, along with typical activities within each engineering area, are listed for use when evaluating engineering activities. This guidance will help standardize classification of inspection findings within each engineering area. This is not an exhaustive list nor is it intended that all items be addressed for each area.

a. Design Control

Design control involves effectively coordinating the design process through initial design planning to final design implementation. The licensee must control the interfaces between various utility organizations (e.g., the technical disciplines in the plant design organization, licensing, operation, maintenance, design change, administration, and management) with the end result that the as-built facility is continuously maintained and operated in accordance with its design bases.

Typical activities within this area include:

1. New design modifications must ensure that the original design basis is not altered without proper NRC notification.

2. Design modifications include adequate post-modification testing instructions.

3. To ensure consistency of designs, the licensee may have design guides for such significant areas as thermal overload sizing or breaker sizing. The licensee also may have a set point document that includes set point methodology for electrical equipment (e.g., relays).

4. Possible indications of the quality of the design package include the number of corrections identified by technical review, independent design verification, or field changes.

5. Prior to issuing a design change for installation, the licensee may conduct a review of the modification by designers from interfacing disciplines and potential users, and by the licensee's risk assessment organization.

6. The licensee has established effective interface controls between corporate and the onsite engineering staff, if applicable, and between the licensee and contract engineering. These interface controls usually include specific responsibilities, communication channels, and requirements for utility approval of contractor work.

7. A relatively large number of field-initiated engineering changes incorporated after the design package was

approved to correct design installation instructions may indicate one of several weaknesses in design control. For example,

(a) The reference engineering documentation used to generate the design package may have had incorrect information or it may have been overly difficult to retrieve the correct information.

(b) The design package generation and independent review were rushed or incomplete so that existing omissions or errors were not detected.

b. Design and Installation of Plant Modifications

An effective plant modification package will accomplish the desired objective and contain clear and accurate design change installation instructions.

Typical activities in this area include:

- Approval of the design change and procurement package should allow sufficient time to schedule the design change without adversely affecting the outage plan.

- Materials and components should be staged and accepted prior to the outage.

- The design change package should have clear installation instructions. Quality control (QC) inspections should verify critical installation details.

- Installation of the design change will be in accordance with the installation instructions.

- Post-modification testing must be completed with acceptable results after installation of the design change. Acceptance criteria are clearly defined.

- The design change should accomplish its intended purpose.

c. Engineering and Technical Support in Other Organizations

An indication of the effectiveness of engineering is the extent of engineering involvement in other organizations and the responsiveness of the engineering staff to provide support.

Engineering staff should actively seek out opportunities to participate in resolving in-plant problems before their presence is requested by the organization experiencing the problems. Frequent reviews of maintenance work and work

orders by the engineering staff should assure that the plant design basis is being maintained.

Optimum plant performance levels are defined thorough baseline data, design parameters, and modeling. Performance trending programs are implemented to routinely monitor, collect, trend, and analyze performance data on systems to detect degradation, before they result in equipment outages, by comparing real time performance data to optimum plant performance levels.

To assist in evaluating the effectiveness of the engineering organization, determine the extent of engineering involvement in the following areas:

- performance trending
- maintenance
- post-modification testing
- NRC documents (e.g., information notices, generic letters, and bulletins)
- vendor information
- licensee event reports
- set point changes
- specifications and acceptance criteria for procurement of safety- related and commercial grade parts
- identified deficiencies in plant components or operations
- initiation and oversight of temporary design changes
- design reviews, including 10 CFR 50.59 evaluations, 10 CFR Part 21 reports, and Appendix R to 10 CFR Part 50 fire hazard analysis

d. Configuration Management

Configuration management is the integrated management process to ensure (1) that the plant's physical and functional characteristics are maintained in conformance with the plant's design and licensing bases; (2) that operating, training, modification, and maintenance processes are consistent with the conditions prescribed by the design and the current licensing bases; and (3) that the plant is operated and maintained within these conditions.

For the licensee's as-built program to be effective, design-basis information must be available, utilized, and current. The licensee must maintain drawings current for the operators to properly operate the plant and for the engineers to accurately evaluate design modifications.

Elements of configuration control include:

1. Controlled drawings in use are the latest revision and superseded drawings are eliminated.

2. Completed design changes are reflected in control room drawings or records used for operation, and are identified for incorporation into as-built drawings.

3. Before a design change is closed out, the following documents are revised, if necessary, to reflect the actual plant configuration:

   - plant drawing
   - station procedures
   - equipment and installation specifications
   - plant safety analysis (FSAR or USAR)
   - plant technical specifications
   - equipment lists
   - set point documents
   - equipment qualification data packages
   - fire hazards analysis
   - system descriptions
   - training materials
   - licensing action
   - simulator
   - design basis documents

e. Engineering Training and Staffing

An effective engineering organization will carefully consider engineering staffing levels and initial and ongoing training. Evaluate engineering resources and staffing levels based on assigned responsibilities and the ability to perform engineering support in a timely manner. Review training only if warranted based on weaknesses identified by previous inspections.

Some indications of well-trained and sufficiently staffed engineering group include:

1. Licensee engineers regularly contact industry peers and are aware of emerging technical issues.

2. Engineering positions are staffed with multi-disciplined and knowledgeable personnel consistent with assigned responsibilities.

3. A relatively few number of

   - approved modification requests awaiting design review
   - completed modifications awaiting closeout
   - outstanding requests for engineering assistance
   - unincorporated drawing change requests
   - design change packages that were approved shortly before an outage began

NOTE: A large proportion of packages being approved just before the start of an outage may complicate outage planning and may indicate an engineering staff shortage. Relatively few modification requests awaiting design review and few outstanding requests for engineering assistance may not be indicative of a well-trained and staffed engineering group. Other factors that may result in a small backlog of engineering work include few requests for

engineering support or management cancellation of specific projects.

03.02 Evaluation of Licensee's Controls and Self-Assessment Activities

Compare engineering strengths and weaknesses identified during NRC engineering inspections to the licensee's self-assessment findings. For engineering problems which the inspector reviewed, evaluate the thoroughness of licensee self-assessment efforts to identify engineering process weaknesses.

Consider the timeliness and the adequacy of the licensee's corrective actions to address the root-cause problem. Also, consider the effectiveness of independent safety evaluations including the performance of the safety review committees, quality assurance audits, and surveillances, if applicable. Report any persistent engineering process weaknesses to NRC management.

The determination of whether there are strengths or weaknesses in the licensee's controls will be limited to those issues, events, or problems reviewed in detail. The evaluation will not draw sweeping conclusions about the licensee's overall control programs but will be very specific in identifying any licensee strengths or weaknesses encountered with the individual items reviewed.

For additional inspection guidance on licensee controls, refer to IP 40500, "Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems."

The answers to the following questions will provide some indication of the degree of thoroughness of the licensee's self-assessment findings.

a. Was the self-assessment performed by appropriately trained personnel?

b. Does the individual performing the self-assessment have independence from the organization being evaluated?

c. Are self-assessment findings addressed in a timely manner based on the significance of the self-assessment finding?

- Are the normal response times appropriate?

- Are dispositions thorough?

- Are corrective actions implemented in timely manner?

- Did the self-assessment determine the root cause of identified problems?

- Are completed corrective actions reviewed to assure they solved the initial problem?

d. How often does quality assurance (QA) and QC personnel visit the engineering group? Are audits performed of the design-engineering program controls? Do the audits include a re-review of calculations? Do the audits have negative findings?

e. How does the engineering organization interface with QA/QC? Does QA/QC review engineering output? If so, what type of a review is performed (i.e., does QA/QC ensure all signatures are there and legibility is maintained or do they perform meaningful engineering reviews)? Are the QA/QC individuals qualified (and certified) to perform engineering reviews? If not, are qualified engineers independent of the discipline being audited, assigned to the QA/QC function to perform needed technical reviews?

03.03 Use of risk insights

The inspector should refer to IMC 2515 Appendix C for guidance on the use of PRA insights to help in the selection and prioritization of items to inspect. If necessary, contact NRC PRA specialists (e.g., Senior Reactor Analysts or the NRR Probabilistic Safety Assessment Branch) for assistance.

37551-04 INSPECTION RESOURCES

Approximately 13 hours of direct inspection are estimated to be required to implement this inspection procedure at a single-unit site. Multi-unit sites are provided an additional 6 hours of direct inspection for each additional unit.

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