
INSPECTION PROCEDURE 75001 ATTACHMENT 75001.ENG

ENGINEERING, DESIGN, AND FABRICATION REQUIREMENTS

Effective Date: July 21, 2026

PROGRAM APPLICABILITY: IMC 2573

75001.ENG-01 INSPECTION OBJECTIVES

- 01.01 To verify design and fabrication activities are completed in accordance with applicable design specifications, codes and standards, and approved drawings and procedures.
- 01.02 To verify drawings, specifications, and records reflect work accomplishment consistent with the design basis, committed standards, and approved procedures.
- 01.03 To verify records establish an adequate basis for the acceptance of the design and fabrication attributes.
- 01.04 To verify changes or modifications made to the design are consistent with the original design and licensing basis.

75001.ENG-02 INSPECTION REQUIREMENTS

This IP does not contain specific inspection requirements. The inspection requirements are contained in the technical inspection procedures for the inspection area.

75001.ENG-03 INSPECTION GUIDANCE

03.01 Design Documents

Design documents should adequately define the final design and arrangement of the structures, systems, and components (SSCs). For each activity, the applicable construction specifications, installation specifications, shop and field drawings, and construction procedures should be correctly identified, and their selection should be reviewed and approved by the responsible engineering group. Design documents should address the following provisions:

- The design documents provide sufficient details to adequately support implementation and facility construction; and are adequate to support proper operation of the SSCs.
- The design documents address the methods, materials, parts, equipment, and processes, essential to the function of an SSC.
- Applicable codes and standards, as identified in the safety analysis report (SAR),

are properly incorporated into the design documents with the correct edition year and their selections are reviewed, verified, and approved.

- Regulatory guides that are applicable to the activity, as committed to in the SAR, are properly incorporated into the design documents and their selections are reviewed, verified, and approved.
 - The most current drawings are available and used by the construction organization.
 - Design documents are properly controlled, updated, revised, and managed to ensure fidelity with the as-built SSC.
- a. Design inputs are crucial to ensure that design activities are carried out in a correct manner. Consequently, design inputs must be identified and documented.
- Design inputs should consider the bases behind the approved design, including safety function, performance requirements, regulatory requirements, and applicable codes and standards.
 - Design inputs appropriately consider both normal operations and anticipated operational occurrences, maintenance and testing, external events, and postulated accident conditions.
 - Design inputs and assumptions are correctly selected, incorporated into the design, maintained, controlled and updated as required, and are readily available to the design organization.
 - Any design inputs which deviate from established industry standards are identified, controlled, and evaluated through effective design control procedures.
 - The design of risk significant SSCs are consistent with the risk analysis assumptions and include the integration of human factors engineering with human reliability analysis and the results of any human-system interface reviews.
- b. Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) acceptance criteria are included in SSC design documents or licensee procedures, and are consistent with the license, Design Control Document (DCD) and SAR.
- c. Procedures that control the content and distribution of listed materials, parts, equipment, and processes that are essential to the function of an item should require that they are properly identified and used for design, procurement, construction, and operations activities. Commercial grade items are identified with the acceptance criteria defined for such items to be verified.
- d. The appropriateness of design assumptions, boundary conditions, models, and interfaces between safety-related and non-safety related systems should also be reviewed.

03.02 Design Analysis

Design packages should contain sufficient information so that a technically qualified person can independently verify the results. Computer code names and versions (i.e. revisions) should be identified. Computer program verification should show that the program produces correct solutions for the encoded mathematical model within defined limits for each parameter employed. The encoded mathematical model produces a valid solution to the physical problem for the application.

- a. Calculations are controlled and identified by subject, originator, reviewer, approver and date such that they are readily retrievable.
- b. Changes posted to the calculations are easily retrievable and were subjected to the same rigor as the original approval.
- c. Documentation includes the objective, inputs and their sources, background data, assumptions, and computer inputs and conclusions.
- d. Computer program acceptability is verified or the results verified with the design analysis for each application.
- e. Any programs used for analysis or calculations have been properly verified in accordance with Quality Assurance (QA) program requirements.

03.03 Design Verification

- a. Licensee design verification should be performed by methods which include, but are not limited to, one or a combination of design reviews, alternate calculations, or qualification testing. These activities should be performed by competent individuals separate from those who developed or performed the original design. These verifiers may be part of the same organization.
- b. If used, qualification testing demonstrates the adequacy of performance under conditions that simulate the most adverse design conditions and verify the design provides reasonable assurance that the SSC can meet the acceptance criteria. This includes the most adverse external hazards applicable to the facility. Verification should include analysis or qualification testing for non-seismic external hazards such as flooding, fire, and wind loads, as appropriate. Where qualification testing is used, test conditions should simulate these hazards to demonstrate compliance with design requirements.
- c. The design demonstrates by analysis or testing or a combination of both that the provisions of Standard Review Plan (SRP) Section 3.7.II.8, "Interaction of Non-Category I Structures with Category I SSCs" are met for Seismic Category II and non-safety SSCs.
- d. The extent of design verification should be a function of the importance to safety, the complexity of the design, the degree of standardization, the state of the art, and the similarity with previously approved designs.
 - Some of the documents that could require design verification by the licensee, or its contractors are the following: seismic analyses, various software plans

required for development through installation and testing, equipment qualification reports, American Society of Mechanical Engineers (ASME) Code stress reports, pipe break analyses, and human factors analyses and plans.

- As an example, for an SSC requiring a seismic margin analysis, the engineering analysis report should include:
 - (1) related fragilities and high confidence low probability of failure (HCLPF) analysis,
 - (2) adequate information consistent with the requirements of SAR, and the guidance of DC/COL-ISG-03, "Probabilistic Risk Assessment Information to Support Design Certification and Combined License Applications," and DC/COL-ISG-020, "Seismic Margin Analysis for New Reactors Based on Probabilistic Risk Assessment,"
 - (3) methodology, assumptions, modeling, and material properties which comply with relevant requirements of the SAR and consistent with applicable provisions of SRP Sections 3.7, 3.8, and 19 as well as DC/COL-ISG-03 and DC/COL-ISG-020 guidance, and
 - (4) the HCLPF values evaluated in the analysis, which should be equal to or greater than the review level earthquake.

03.04 Fabrication Records

Fabrication specifications include, but are not limited to, component material specifications, fabrication techniques, examination techniques, and required dimensions and tolerances.

- a. Fabrication records are adequate to furnish evidence of activities affecting quality:
 - SSCs conform to applicable codes, standards, regulations, quality and technical requirements.
 - Purchase orders appropriately specify acceptable quality, technical, and 10 CFR Part 21/10 CFR 50.55(e) requirements.
 - ASME materials code data reports furnished by the vendor are acceptable.
 - The markings on the item(s) are in accordance with the applicable quality and technical requirements. NOTE: For ASME pressure boundary items, the ASME Code specifies material marking requirements, including the location of markings, and the method used to make the markings.
 - The licensee, vendor, and fabrication personnel have established an effective method for tracking completion of design and test acceptance criteria at vendor and manufacturing facilities.
- b. Previously identified problems related to component fabrication include:
 - incomplete documentation of actual fabrication activities in fabrication traveler

documents for example failure to explicitly state required critical component dimensions, such as minimum allowable wall thickness;

- failure to require verification of critical component dimensions using a specified non-destructive examination technique as required in the design documentation; design changes made outside the approved design change process;
 - inadequate oversight of fabrication activities by the licensee; and
 - fabrication of a component to a different safety classification than that shown in design specifications.
- c. The licensee, vendor and fabrication personnel have established an effective method for tracking, evaluating, and dispositioning changes or modifications that demonstrate that changes and modifications are appropriately implemented, including completion of any changes to design and test acceptance criteria.
- d. See ASME Nuclear Quality Assurance (NQA)-1, "Quality Assurance Requirements for Nuclear Facility Applications" for NRC-endorsed definitions of "repair" and "use-as-is." For nonconformance reports and other design deviation documents associated with SSCs that were dispositioned as "repair" or "use-as-is":
1. "Repair" item reports and associated documents demonstrate that the repair was performed in accordance with applicable design documents, codes, standards, regulations, and quality and technical requirements.
 2. "Use-as-is" item reports and associated documents demonstrate that the condition was adequately evaluated by the responsible design organizations and that any design change was completed in accordance the approved design change process.

03.05 Observation of Fabrication Activities

Fabrication activities meet applicable quality and technical requirements established by the procurement documents.

- a. Fabrication and procurement specifications are consistent with the design commitments and requirements documented in the licensing basis (i.e. SAR, DCD and, if applicable, technical specifications).
- b. Corrective actions for identified fabrication deficiencies are implemented in a timeframe commensurate with their significance, and nonconformance reports document that the deficiencies are resolved.
- c. Individuals performing the quality-related activities are trained and certified where required.
- d. Materials, components and other equipment received by the fabricator meet design procurement specifications.
- e. Nondestructive Examination (NDE) personnel qualifications, NDE procedures, NDE records of welds, certification of applied NDE materials penetrants and cleaners used, etc. are consistent with the applicable construction codes and design specifications.

- f. Protective coating procedures, coating inspection records, coating personnel qualifications, and certification of applied coating materials used are consistent with the applicable construction codes and design specifications.
- g. The final acceptance pressure test for completed pressure boundary components and the final radiographs for welded components conform to Code requirements.
- h. Supervision and quality control (QC)/QA personnel perform appropriate oversight during fabrication activities. The number and basis for selection of the QA/QC hold points in the fabrication work control document (e.g., traveler) is adequate. For example, an appropriate selection criterion for a QC observation hold point could be to observe critical fabrication steps that cannot be verified after final component assembly.
- i. Requirements are satisfied for the preparation of certified material test reports for the various components.
- j. The records of all required examinations and tests are traceable by work control travelers to procedures and revisions to which they were performed.
- k. The required electrical component characteristics, material, performance tests, environmental and seismic qualification tests, nondestructive tests, and other specification requirements are met or are properly dispositioned.
- l. Adequate foreign material exclusion controls exist.
- m. Applicants and licensees have established programs for ensuring that all craft, NDE, and inspection personnel (including contractors) associated with the installation of safety-related SSCs are trained or otherwise qualified to the work procedures involved.

03.06 Design Procedures

- a. Changes or modifications to the design are consistent with the original design and licensing basis.
- b. Design change documents are consistent with related calculations and design changes are consistent with the applicable design basis for the affected SSCs.
- c. Changes made to the design after initial approval remain consistent with the licensing basis and are made consistent with licensee procedures and regulatory requirements.
- d. Departures from the licensing basis are screened properly and, if applicable, license amendments are obtained prior to implementation of the change.
- e. For a certified design, changes are evaluated to determine if they meet the requirements of 10 CFR Part 52, Section VIII "Processes for Changes and Departures" of the applicable appendix.

75001.ENG-04 REFERENCES

DC/COL-ISG-020, Seismic Margin Analysis for New Reactors Based on Probabilistic Risk Assessment

DC/COL-ISG-03, Probabilistic Risk Assessment Information to Support Design Certification and Combined License Applications

IMC 2572, Assessment of Advanced Reactor Construction Projects

IP 75001, Inspection of Manufacturing and Construction Quality for Advanced Power Reactor Structures, Systems, And Components

Regulatory Guide (RG) 1.84, Design, Fabrication, and Materials Code Case Acceptability, ASME Section III.

RG 1.54, Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants

SRP Section 3.7.II.8, Interaction of Non-Category I Structures with Category I SSCs

END

List of Attachments:

Revision History for IP 75001.ENG

Attachment 1: Revision History for IP 75001.ENG

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional Non-Public Information)
N/A	ML26141A226 07/21/26 CN 26-034	Initial Issuance.	None	Issued as Final