
INSPECTION PROCEDURE 88072

PLANT MODIFICATIONS (TRIENNIAL)

PROGRAM APPLICABILITY: 2600B

88072-01 INSPECTION OBJECTIVES

The purpose of the inspection is to conduct an extensive review into the licensee's configuration management system for plant modifications or plant modifications program to ensure that safety-related systems and components (i.e., Items Relied on for Safety (IROFS)) can adequately perform their intended safety function and that system changes have not adversely impacted plant safety and operability. This inspection will be performed on a triennial basis in place of the standard plant modifications inspection conducted annually under Inspection Procedure 88070, "Plant Modifications (Annual)."

The objectives of this inspection procedure are to determine whether:

01.01 Modifications were adequately implemented in accordance with the licensee's configuration control/management program.

01.02 The cumulative impact of all modifications over a specified time period did not adversely impact system operation and/or the Integrated Safety Analysis (ISA)/safety basis.

01.03 System or plant engineers have an adequate understanding of their assigned systems and are properly trained/qualified according to the requirements of the license application.

01.04 Outstanding design and maintenance issues have not adversely impacted system operability or the safety basis.

88072-02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Selection of Modifications.

- a. Inspection Requirements. The U.S. Nuclear Regulatory Commission (NRC) inspection team leader shall conduct a site preparation visit to review potential samples approximately 3 months prior to the team inspection. The team leader shall compile and share the information collected with the inspection team prior to final sample selection.
- b. Inspection Guidance.
 1. The team leader should select a single system or process area with nuclear or chemical safety risk to conduct an extensive review into the licensee's plant

modifications program. Typically this review should cover all changes with an emphasis on physical, hardware, and procedural changes since the system was placed in service. This duration may be decreased depending on the number of modifications performed, availability of information, and assigned inspection resources.

2. The team leader should consult with the inspection team members, project inspectors, project managers, and resident inspector (if applicable) to select two to three systems or process areas to serve as potential samples for the inspection. The following types of plant modifications should be considered: changes made to the ISA Summary, hardware/physical changes, minor modifications, like-for-like replacements, temporary modifications, operational/procedure changes, and set point changes. In addition, consideration should be given to significant modifications made to systems that interface or interconnect with the selected system(s) to ensure that changes have not adversely impacted the ISA or design bases for the system under review. The team leader shall compile and share this information with the inspection team in preparation for final sample selection. When making the final selection, the team should consider criteria such as the (1) number of modifications performed, (2) time period covered, (3) system risk/safety significance, (4) size/complexity of the modifications, and (5) modification type. Final selection should occur approximately 2 months prior to the inspection. The team should ensure that there are enough modifications to make the inspection meaningful.
3. The team leader should make appropriate arrangements with the licensee's staff, in advance of the inspection, to have relevant documents available for review as part of inspection preparation. Depending on the amount of material needed for preparation, the team leader should obtain the material as part of an inspection preparation trip to the site, or by requesting that the licensee transmit it for in-office review. If neither of these approaches are feasible, the time the team is allotted to spend on site could be expanded beyond those hours estimated in this procedure to include time to review information related to the selected modifications.

02.02 Design Process Review.

- a. Inspection Requirement: Review the modifications selected with respect to their design process. For the selected modifications:
 1. Determine if the licensee is implementing their plant modifications program as described in the license application, supporting procedures, and as required by Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Section 70.72, "Facility Changes and Change Process," and 70.62(d), "Management Measures."
 2. For Part 70 licensees, review the ISA, the ISA Summary, Safety Analysis Report, and other safety analyses or program information to determine compliance with 10 CFR 70.62, 10 CFR 70.72, the baseline design criteria of 10 CFR 70.64, where applicable, and whether the safety system designs will meet the performance requirements of 10 CFR 70.61.

NOTE: The baseline criteria in 10 CFR 70.64 is only applied to new facilities and new processes at existing licensees, and does not require retrofits to existing facilities or existing processes (e.g., those housing or adjacent to the new processes). For existing facilities and processes, review design information and safety analyses to determine compliance with required design criteria.

3. Verify that the system and components will function as required and support proper operation of associated systems. Verify the appropriateness of design assumptions contained in the modification package and associated design documents. Verify that the licensee has established an adequate technical basis for each change as required by 10 CFR 70.72.
4. Ensure that modifications made to interfacing or interconnecting systems have not adversely impacted system operation or the Integrated Safety Analysis (ISA) or safety program information as required by 10 CFR 70.72(a)(6).
5. Review outstanding design issues, including open/deferred or canceled engineering action items, temporary modifications, operator workarounds, and items that are tracked by operations, maintenance, or engineering departments. Identify any instances of when and why these systems were operated out of their normal configuration by interviewing operations, maintenance, and engineering department personnel.
6. Determine whether management measures (10 CFR 70.62 (d)) are adequately developed and graded commensurate with the reduction to risk for each item, to ensure that IROFS are available and reliable to perform their function when needed.
7. Determine the adequacy of the 10 CFR 70.72 screenings and evaluations performed for the selected modifications including whether or not NRC pre-approval of the change was required.
8. As required by 10 CFR 70.62(c), verify that modifications do not invalidate the Natural Phenomena Hazards (NPH) structural analysis for the buildings or engineered equipment.
9. Ensure the proper classification of minor or administrative modifications in accordance with license application requirements.
10. Ensure that modifications involving instrumentation & controls (I&C) have established bases for set points and associated uncertainties.
11. Verify that like-for-like changes do not negatively impact the fit, form, or function of a component.
12. Verify that temporary modifications are properly implemented and do not adversely impact the safety basis.
13. Ensure that system/responsible engineers have an adequate understanding of their assigned systems.

14. Verify that the licensee is identifying engineering design issues and problems and entering them into their corrective action program.
 15. Verify that design bases, licensing bases, and performance capability of IROFS have not been degraded through modifications.
- b. Inspection Guidance. Use the licensee's required plant modification process as the basis for review of the selected modifications.
1. Review the license application and suite of engineering and configuration management procedures that govern the plant modifications program. Ensure that the procedures are followed with particular emphasis on the following topics: (1) technical justification, (2) interdisciplinary safety reviews and approvals, (3) 10 CFR 70.72 screening and evaluation, (4) authorization/approval, (5) modification classification, (6) validity of design assumptions, (7) post-modification testing, (8) document/ISA updates, and (9) training of operators.
 2. Review the process safety information developed and evaluated in accordance with the licensee's safety program as it relates to the changes being evaluated under the inspection sample, and compare identified hazards with the actual installed equipment to determine whether other hazards should have been considered. Consider using a generic process hazard analysis (PHA) checklist to ensure that all applicable hazards were considered. Review PHA revisions performed in support of the modification. Verify that all license requirements with respect to the performance of PHAs were followed such as team/team leader qualifications, proper use of hazards analysis techniques, and team composition.
 3. For the selected modifications, review the modification package and related design documentation such as technical descriptions, specifications, nuclear criticality safety evaluations (NCSEs), PHAs, boundary definition documents, research/test reports, design reviews/reports, set point documents, drawings, codes and standards, vendor manuals, company engineering standards, and calculations to determine if design assumptions were properly justified. In general, the licensee should not be relying solely on engineering judgement as the basis for the change. The inspectors should determine whether the licensee provided an adequate technical basis for the change as required by 10 CFR 70.72(a)(1). Examples of items that should be addressed include: (1) an explanation of the proposed change, (2) what is to be changed and how, and (3) is the change safe to make. At a minimum, there should be enough information available to allow appropriate supervisory, management, technical, and regulatory review of the change to ensure that the change will not adversely impact nuclear or chemical safety. If necessary, the inspectors should interview system engineering and ISA engineers to discuss any design assumptions that are not properly justified.
 4. The inspectors should review P&IDs, NCSEs, technical descriptions, and other technical documents to identify systems that interface with the system selected for review. The inspectors should review any significant changes made to interfacing systems to ensure that changes have not adversely impacted system operation or introduced any new or unanalyzed accident sequences.

For example, the licensee may have implemented a modification to reroute the air supply source for a process enclosure from instrument air (dry air) to plant air (moist air) which significantly increases the potential for moisture carryover and criticality in the enclosure. The licensee should have evaluated this potential accident scenario in the NCSE and provided the necessary controls to ensure that a criticality will not occur under both normal and credible abnormal conditions. Another potential downstream consideration includes potential HEPA filter breakthrough due to excessive moisture which could result in high airborne contamination in the process area. Specific to design assumptions, the licensee may have made an argument that no significant carryover was expected as a result of the change. This is an example where the licensee needs to provide objective evidence to substantiate this assumption such as by calculation, test, system configuration, or operational history. Simply stating that carryover is not expected does not provide an adequate technical basis for the change.

5. Request a list of corrective maintenance work requests/orders for the selected review period to determine if the licensee is adequately addressing maintenance and/or design issues. The description of the corrective maintenance work performed should be sufficient to allow understanding of the type of work performed. Pay particular attention to repetitive or similar maintenance work requests which could be an indicator of a design deficiency and could affect the ability of the components to perform their intended functions. Determine through review of these corrective work orders whether the licensee's preventive maintenance is being reasonably effective in preventing component failures. In some cases, the licensee may keep a list of deferred maintenance in their maintenance management software system. The inspectors should review this list and ensure that significant maintenance items are not being indefinitely deferred without proper justification and approval. Confirm that operator workarounds or temporary modifications are not being improperly used to address long-standing maintenance and/or design issues.
6. Review the ISA Summary to determine the applicable management measures for any modifications involving IROFS. Ensure that the licensee has selected the necessary suite of management measures to ensure that the IROFS can perform their intended safety function. In most cases, the licensee has generated a table in the ISA Summary stating which management measures are applicable for the various types of controls including administrative, active engineered, and passive engineered controls. Review this list to ensure that the selected management measures are sufficient to ensure that IROFS can perform their intended safety function. The review should include an assessment of the IROFS boundary (consideration for all the components necessary for the IROFS to operate) to ensure that the selected management measures are appropriate for all aspects of the IROFS (e.g., administrative IROFS with hardware components).
7. Determine whether the requirements for evaluation of changes and the need for prior NRC-approval are properly documented prior to implementation of the change. Refer to NRC Regulatory Guide 3.74, "Guidance for Fuel Cycle Facility Change Processes," for additional guidance on this topic.
8. Ensure that modifications involving building structures or risk-significant process equipment were properly reviewed for potential impact on the NPH structural

analysis. The licensee should have guidance in their existing engineering or configuration management procedures to perform this review. Examples of items that could impact the analysis include building additions or retrofits, installation of new equipment, changes that impact pipe routing or pipe supports, changes to equipment mounting, or any other changes that have the potential to substantially impact the mass or stiffness of the facility structure or equipment. If needed, the inspectors should contact staff from the Division of Fuel Cycle Safety, Safeguards, and Environmental Review in the Office of Nuclear Material Safety and Safeguards for additional technical support in the area of structural/seismic analysis.

9. For minor/administrative modifications, verify that the scope of the modification was minor in nature and consistent with the licensee's definition and does not in any way involve IROFS/safety controls, or impact the ISA. The purpose of this review is to make sure that licensees are properly classifying changes as minor since these changes do not typically receive the same level of interdisciplinary reviews or documentation as other types of modifications.
10. For changes to IROFS instrumentation and controls, verify that the range, accuracy, and set points are sufficient to ensure that a safety limit could not be exceeded. This may be documented in a set-point document or similar calculation. If operator intervention is required (e.g., part of an administrative or enhanced administrative IROFS), the inspectors should determine if appropriate alarms and indications were provided. Verify that the specified surveillance and calibrations of such instrumentation was acceptable.
11. For like-for-like changes, verify that the change does not impact the fit, form, or function of the component being modified. An item can be considered like-for-like if it was procured from the original part manufacturer and has not been subjected to design, materials, manufacturing, or nomenclature changes. **NOTE:** Licensees do not typically treat like-for-like changes as modifications and may implement them through work orders or other simplified work control processes. This is an acceptable practice provided that the change was properly classified as like-for-like.
12. For temporary modifications, verify that the modification was properly evaluated to ensure that the change has not adversely impacted the ISA or safety basis. Licensees are required to perform 70.72 reviews for temporary changes. Verify that temporary modifications did not place safety systems or IROFS into high-risk configurations that were not properly evaluated. In some cases, licensees may be required to develop a temporary operations procedure/authorization including additional IROFS or safety controls if existing IROFS can no longer perform their intended safety function. Verify that the licensee followed their program procedure including verification that the modification was removed prior to the established expiration date, and if extended, proper approval was obtained. Determine if the licensee has placed a limit on the number of extensions that can be granted. Verify that operations is aware of temporary modifications by conducting interviews and performing walk downs. Verify that temporary modifications were properly implemented in the field according to the modification package requirements.

13. Conduct an interview with the engineering manager to gain additional insight into the organizational structure. Determine how system and design responsibilities are assigned within the organization. Review the license application to determine if there are any specific requirements with respect to organization, training, and qualification of engineering personnel. For the selected system or modifications, conduct an interview with the responsible/system engineer(s) to determine if they have sufficient knowledge of their assigned system including the applicable design and safety basis requirements. Specific items of interest to discuss include education, overall experience, training/qualification, system knowledge/experience, safety bases, turnover process, current design/maintenance issues, future design changes, and use of engineering procedures. If applicable, verify that the engineer has met the necessary training requirements for the position.
14. Obtain a brief description of all corrective action documents written regarding the system selected for the inspection. Have the licensee sort by system and significance followed by an adequate description of the deficiency to determine whether a copy of the full corrective action document is desired for additional review by the team. The team should review selected corrective action documents since the system/equipment was put in service including those resulting from events and degraded/deficient conditions. Review reports of NRC inspections to evaluate adequacy of licensee corrective actions. Review adequacy of licensee technical evaluation and determine if operability was justified and problems were properly identified and corrected. Consider the effectiveness of corrective actions taken by the licensee.
15. Perform a holistic assessment of all selected modifications including modifications made to interfacing or interconnecting systems to ensure that the changes have not adversely impacted system operability or the design/safety bases.

For example, a process design change in the pellet grinding area that results in additional grinding dust could result in the potential for additional material holdup in the process ventilation system. As needed, the inspectors should interview system/design engineers to discuss the scope of the modifications and their impact on the design/safety bases. Interview operations personnel to determine if there are any problems with system operation. Review applicable process safety information and conduct walk downs as necessary. The inspectors should conduct an NRC inspection team final caucus to discuss any significant modifications reviewed throughout the week. The purpose of the review is to discuss each of the significant modifications and its overall impact on system operation and the safety basis. The inspectors should review a generic process hazards checklist to ensure that the cumulative impact of the changes has not introduced any new unanalyzed conditions or safety concerns.

02.03 System Condition and Capability Review.

- a. Inspection Requirements. Determine whether the system condition and tested capability are consistent with the design basis and are appropriate. For the selected modifications:

1. Determine whether the modification (including IROFS and other safety controls) was adequately implemented consistent with the modification package details and associated design.
 2. Determine whether assumptions in the ISA or safety basis applicable to the modification were valid based on the actual configuration and operation of the modified processes.
 3. Determine whether management measures were properly implemented to ensure that IROFS or other safety controls were available, capable, and reliable to perform their function when needed.
 4. Verify that administrative controls that involve operator action could be accomplished as assumed in the licensee's ISA.
- b. Inspection Guidance.
1. For the selected modifications, determine through walk downs, reviews, and discussions with licensee staff, whether:
 - (1) Installed equipment/system configuration is consistent with the process and instrumentation diagrams (P&IDs);
 - (2) Equipment and instrumentation elevations, including the adequate sloping for piping and instrument tubing, support the design function of the component/system;
 - (3) Floor flatness was adversely impacted (e.g., fissile solution can no longer spread out in the event of a leak);
 - (4) Motor operated valve operators and check valves are installed in the orientation required by the manufacturer;
 - (5) Location of equipment is not susceptible to flooding, fire, high-energy line breaks, or other environmental concerns;
 - (6) Physical separation/electrical isolation exists for redundant IROFS or safety controls as specified in the ISA or other safety analyses to allow for independent failures;
 - (7) Baseplates, hangers, supports and struts are installed properly. Ensure piping spans meet applicable code requirements and piping is not supported by other piping;
 - (8) Equipment installation is consistent with vendor manual recommendations;
 - (9) Modification did not result in any II/I (failure of non-safety equipment that could impact safety equipment) seismic interaction concerns;
 - (10) Fire protection systems are installed according to design requirements as specified in the licensing basis; and

- (11) Components do not contain deficient conditions such as corrosion, missing fasteners, cracks, or degraded insulation.
2. Review the ISA and supporting documentation to determine whether assumptions in the ISA or safety basis applicable to the modification were valid based on the actual configuration and operation of the modified processes. For example, replacing a fail-closed valve with a fail-open or fail-as-is could impact the ability of the valve to perform its safety function to prevent moderator from entering a dry powder uranium dioxide system.
3. For modifications that involve IROFS, determine whether management measures as specified in the ISA and other safety analyses are adequately implemented. Refer to IP 88020, Operational Safety, for additional guidance on inspecting management measures.
4. Verify that administrative controls that involve operator action can be accomplished as assumed in the licensee's ISA. For example, a chemical release inside the process area could adversely impact the ability of the operator to perform the required actions. Other considerations include ingress/egress paths and lighting, required training, need for additional support personnel or equipment, control room involvement and instrumentation, and time available to complete the required actions.

02.04 Post-Modification Testing

- a. Inspection Requirements. Determine whether the plant was in a safe configuration during post-modification testing. Determine whether post-modification testing ensured adequate implementation of design and safety system functionality.
- b. Inspection Guidance. Review post-modification test procedures and test results. Determine whether test procedures adequately tested the intended functions and have appropriate acceptance criteria. Determine whether deviations from acceptance criteria are resolved appropriately. Determine whether:
 1. Acceptance criteria for tested parameters were supported by the appropriate calculations or other engineering documents.
 2. Unintended system interactions did not occur.
 3. IROFS and safety controls could perform their required safety functions.
 4. The modification test acceptance criteria were met.

NOTE: Licensees often use existing procedures, such as surveillance procedures, for post-modification testing. Although the performance of existing procedures may have been reviewed by NRC inspectors previously, the inspection team still needs to determine the appropriateness of using the existing procedures for validating the modification (as opposed to simply confirming continued operability).

02.05 Documentation Review.

- a. Inspection Requirements. Determine whether design and licensing documents have either been updated or are in the process of being updated to reflect the modifications in accordance with the licensee's requirements.
- b. Inspection Guidance. Determine whether revisions were necessary for the ISA Summary or other applicable design basis documents, and if so, that the revisions were adequate. Examples of design documents which could be affected by modifications include: license amendments, ISA Summary, safety analysis report, IROFS lists, drawings, supporting calculations and analyses, plant equipment lists, set-point lists, boundary definition documents, and vendor manuals. Determine whether normal, abnormal, and emergency operating procedures, testing and surveillance procedures, and operator training manuals were updated prior to being used.

88072-03 RESOURCE ESTIMATE

The estimated number of hours to complete this inspection is 96 hours based on three inspectors at 32 hours per inspector. The size of the inspection team formed to implement this inspection procedure can vary depending on the number of modifications performed over the selected review period. Engineering, chemical safety, radiation protection, fire protection, and/or nuclear criticality safety inspectors, as well as the facility's project manager, should be selected as appropriate for the team.

88072-04 REFERENCES

10 CFR 70, Domestic Licensing of Special Nuclear Material

10 CFR 70.61, Performance Requirements

10 CFR 70.62, Safety Program and Integrated Safety Analysis

10 CFR 70.64, Requirements for New Facilities or New Processes at Existing Facilities

10 CFR 70.72, Facility Changes and Change Process

10 CFR 70, Appendix A, "Reportable Safety Events."

Regulatory Guide 3.74, "Guidance for Fuel Cycle Facility Change Processes"

NUREG-1513 "Integrated Safety Analysis Guidance Document"

NUREG-1520 "Standard Review Plan for the Review of License Application for a Fuel Cycle Facility"

American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.1-2014, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," American Nuclear Society, La Grange Park, IL, 2014

Inspection Procedure 88070, Plant Modifications (Annual)

IP 88020, Operational Safety

88072-05 PROCEDURE COMPLETION

Implementation of each applicable inspection requirement will constitute completion of this procedure. Individual inspection samples and breadth of review will be determined by the inspectors based on the inspectors' evaluation of licensee compliance with requirements, the risk-significance of the activities, and the extent of the records available for the activities, when specific sample sizes were not provided in the inspection guidance section.

END

Attachment:

Revision History for IP 88072

Attachment 1 - Revision History for IP 88072

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	ML18102A536 08/21/18 CN 18-027	This is a new document. Much of the content was pulled out of Inspection Procedure 88070 as it was split into two inspection procedures.	Training for inspectors on the revision by end of September 2018.	ML18100A646