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## INSPECTION PROCEDURE 69020 APPENDIX L

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### INSPECTION OF FIRE PROTECTION SYSTEMS UNDER CONSTRUCTION AT NON-POWER PRODUCTION AND UTILIZATION FACILITIES

Effective Date: March 25, 2025

PROGRAM APPLICABILITY: IMC 2550

#### 69020.L-01 INSPECTION OBJECTIVES

- 01.01 To determine if construction/modification work and related quality control activities associated with safety-related fire protection systems are being performed in accordance with the licensing basis, specifications, drawings, and work procedures.
- 01.02 To determine if the applicant/licensee's system for preparing, reviewing, and maintaining records relative to safety-related fire protection systems is functioning properly, and to determine if the records reflect work accomplishment consistent with specifications and procedures.
- 01.03 To verify the as-built condition of safety-related fire protection systems meets the specified design requirements, specifications, and drawings.
- 01.04 To determine that the implementation of the quality assurance program (QAP) related to construction/modification work activities for safety-related fire protection systems is effective and to verify that deviations from requirements are appropriately resolved.

#### 69020.L-02 INSPECTION REQUIREMENTS

- 02.01 For the safety-related fire protection systems selected for inspection, determine if appropriate and adequate procedures in the following areas are compatible with the QAP and prescribe adequate methods to meet the specifications:
  - a. procurement
  - b. receipt inspection.
  - c. storage.
  - d. installation
  - e. construction quality control inspection
  - f. construction testing and calibration
- 02.02 Determine if the applicant/licensee has an established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements for fire protection systems. Determine if the audit program ensures that examination, inspection, and test personnel associated with performing tests and inspections of fire protection systems are qualified and/or certified to perform their assigned work.

02.03 Determine if the following safety-related fire protection systems are being controlled and accomplished in accordance with the requirements of the documents reviewed in Section 02.01, above:

- a. receipt
- b. storage
- c. installation (in-process and as-built verification)
- d. construction testing
- e. construction quality control inspection
- f. configuration management

02.04 Review the documentation generated for the safety-related fire protection systems. Determine if the applicant/licensee/contractor system for documenting safety-related work is functioning properly. Records should be complete, reviewed by quality control, engineering personnel, or designee, and readily retrievable. Review safety-related records in the following areas:

- a. receipt and storage inspection
- b. installation inspection
- c. construction testing
- d. construction quality control inspection
- e. nonconformance/deviation record(s)
- f. training/qualification records of craft, and quality inspection personnel (as required)
- g. configuration management records

### 69020.L-03 INSPECTION GUIDANCE

#### General Guidance

Inspectors should review the facility description in the safety analysis report (SAR) or equivalent and be familiar with the safety-related fire protection systems being constructed at the site. The purpose of these as-built inspections is to verify that the assumptions and critical attributes reviewed during the licensing review process remain valid; the design was appropriately translated to construction specifications; the licensee/applicant constructed the facility in accordance with these specifications; and any changes made to the design described in the SAR comply with the licensee's configuration management program.

Inspectors should also be familiar with the licensee's QAP and use IP 69021, "Inspections of Quality Assurance Program Implementation During Construction of Non-Power Production and Utilization Facilities," to perform "vertical slice" inspections as described in the body of this IP. Inspectors should complete this appendix by inspecting the attributes listed in this appendix for fire protection systems with a focus on safety-related items (and services).

Inspectors should contact the applicant/licensee prior to the on-site inspection to help determine which fire protection systems are to be inspected. Observation during in-progress construction of the fire protection systems is desirable but not required. If necessary, inspectors may select completed fire protection systems for inspection. Inspectors should not attempt to inspect all of the fire protection systems on the site but may expand if significant concerns with the applicant/licensee's control of fire protection systems arise.

Inspectors should collect applicant/licensee procedures, building specifications, and work completion records in advance, if possible. If unable to review these documents in advance of the on-site inspection, then the licensee should be notified that these documents, and any other relevant documents, should be available when the inspector(s) arrives at the site.

Applicable portions of the license, amendment, or application should be reviewed to determine licensee commitments relative to construction and inspection requirements, before review in this area. Inspectors should determine which versions of the industry codes and standards the licensee has committed to in the license.

For the purpose of this appendix, a "Fire Loop" is a main water-piping loop for fire protection, usually feeding hydrants, standpipes, and other fire-protection systems and components. Fire loops are provided to permit feeding hydrants and other components and systems, from at least two directions, for redundancy.

Inspectors should choose one or more safety-related fire protection systems and review the areas listed in Sections 02.01 through 02.04 to the extent practical and may use their judgment in determining which areas to concentrate on if time is limited. However, inspectors should gain an understanding of the applicant/licensee's program to the extent necessary to determine if the licensee conforms to regulatory requirements. Not all items in the inspection requirements section will be applicable or required in all situations for all safety-related structures, systems, and components.

### 03.01 Inspection Requirement 02.01

- a. Review construction specifications related to safety-related fire protection systems and determine if the specified technical requirements conform to the commitments contained in the licensing basis. Review fire protection systems procedures and verify that they specify provisions for adequate on-site engineering direction, are appropriate and adequate related to procurement and use of materials, specify adequate control of hold points, and provide adequate controls for design changes and incorporation of design changes into as-built drawings.
- b. Review the IPs and compare with the requirements in the applicable codes and construction specifications. Evaluation should indicate if adequate quality-related IPs are established and are based on appropriate criteria, and further, if the results of the licensee's inspection will be transmitted to responsible quality assurance and management personnel.
- c. Procedures should be reviewed to ensure that technical requirements in the licensing document are reflected in construction specifications, drawings, work instructions, and work procedures. Verify that specifications, drawings, work instructions and IPs have been established that will assure the technical adequacy of the following activities pertaining to fire protection systems. Verify that these documents comply with licensee commitments. Areas to review should include, but are not limited to, the following:
  1. Procurement. Review the design and purchase specifications and drawings to assure that specific technical requirements and commitments contained in the licensing basis documents have been translated into vendor purchase documents. Verify the following:

- (a) Fire protection equipment associated with the fire-suppression systems specified in the license and associated requirements have been identified and specified in procurement documents:
    - (1) Water-based suppression systems (pre-action, wet-pipe, dry-pipe, water-spray, and deluge systems);
    - (2) carbon-dioxide systems;
    - (3) standpipe systems; and/or
    - (4) portable fire extinguishers.
  - (b) Materials, such as pipes, pipe joints, mains, anchors, valves, and clamps meet specifications.
  - (c) Fire pump(s) and associated controls and wiring conform to National Fire Protection Association (NFPA) 20 standards, and/or other licensing basis commitments.
  - (d) Appropriate design and fabrication codes and standards [NFPA; American Water Works Association (AWWA); American National Standards Institute; American Society for Mechanical Engineers] requirements have been identified or specified in procurement documents.
  - (e) Critical dimensions are specified. (Size and location of water supplies, size and location of all piping, and the depth to which they are to be buried, etc.)
  - (f) Fire hydrants comply with NFPA or AWWA criteria, and/or other licensing basis commitments.
2. Receipt inspection. Receiving inspection and related procedures provide means to ensure the following:
- Received components are as specified, properly identified, and controlled or otherwise noted.
- (a) Verify that requirements contained in the approved QAP document, or other applicable licensing commitments, have been adequately translated into the licensee's receipt inspection procedures.
  - (b) Adequate marking and identification are provided.
  - (c) As-received cleanliness and protection are adequate.
  - (d) Receiving inspection reports are complete.
  - (e) Control and disposition of non-conforming items are adequate.

3. Storage

Storage procedures provide means to ensure the following:

- (a) The proper storage environments (as specified by the construction specifications and the manufacturers) are established for the various types of fire protection system components and meet applicable storage-classification levels, regardless of the location of the stored component.
  - (b) Storage-inspection procedures require initial verification of storage conditions and periodic verifications for the duration of the storage period. They should also ensure that special and in-place storage requirements are met.
4. Installation. Verify that the fire suppression systems, as specified in the licensing basis, have installation work procedures that provide adequate instructions for the following:
- (a) There are procedural controls of rigging and handling activities, to prevent damage to pipes, fittings, valves, and other equipment.
  - (b) Proper locations of valves, hydrants, mains, etc., are clearly identified.
  - (c) Fire-pump installation instructions comply with NFPA20. Separation and protection are in accordance with licensing requirements, and/or other licensing basis commitments.
  - (d) Dimensional checks are specified for levelness, alignment, clearances, etc.
  - (e) Installation instructions of hydrants is in compliance with NFPA 24 and/or other licensing basis commitments.
  - (f) Proper backfill methods are specified.
  - (g) Water-tank installation instructions are in accordance with NFPA 22 standards and/or other licensing basis commitments.
  - (h) Proper flushing and hydrostatic testing of the fire-loop water piping are specified.
5. Construction quality control inspections.
- (a) The licensee or contractor procedures involved will differ between facilities and may take various forms, such as formal procedures, instructions, checklists, drawings, etc. Review the construction quality control inspection procedures and compare with the applicable requirements and construction specifications. Evaluation should indicate if adequate quality-related procedures are established and are based on appropriate criteria, and further, if the results of the licensee's inspection will be transmitted to responsible quality control and management personnel.
  - (b) Provisions should include procedures for monitoring or surveillance of installed fire protection systems by construction quality control inspection personnel. They should ensure that maintenance requirements are satisfied and that adequate protection is provided against possible damage from adjacent construction activities, including construction traffic. (Where protective means

used during construction may affect proper operation, provisions should be provided for timely removal.)

- (c) Inspection procedures have been established to ensure the following:
  - (1) All safety-related aspects of construction specifications, drawings, and work instructions are included in the scope of planned inspections.
  - (2) The technical aspects of inspection requirements and acceptance criteria are sufficient to determine if the components and their installation, testing, maintenance, and protection conform to applicable design and construction specifications.
  - (3) Records of initial and follow-up inspections include the specific results of the inspection. This should include the specific characteristics being inspected (or the actual measured values), the inspectors' determination of acceptability, and identification of any nonconformance's found.

6. Construction testing.

- (a) This item does not include preoperational testing. Construction testing generally verifies that certain fire protection components or systems pass specific tests but is not a test of system capability.
- (b) The intent of this requirement is to determine if adequate procedures have been established to assure that the required testing is satisfactorily completed and corrective action is properly performed. Procedures are established to ensure that special conditions of testing components (prerequisites, sequence, special handling, removal, precautions, etc.) are included and described in proper detail to conduct and monitor the work performed, including the following:
  - (1) Equipment and systems to be tested and the related test procedures are properly identified and controlled. Procedures specify which construction tests are to be performed on each component requiring testing.
  - (2) Proper type of test equipment (range, accuracy, etc.) is specified.
  - (3) Type of data to be recorded and method of reporting results.
  - (4) Review and evaluation of test results by qualified personnel.
  - (5) Testing techniques are appropriate for the component to be tested.
  - (6) Controls are included for removal and handling of components during testing activities.
  - (7) Process for resolution of discrepancies.

### 03.02 Inspection Requirement 02.02

- a. Review applicant/licensee's established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements for safety-related fire protection systems.
- b. Review audit program to verify if examination, inspection, and test personnel associated with performing tests and inspections of fire protection systems are qualified and/or certified to perform their assigned work.
- c. Verify records establish that the required audits were performed and that deficiencies identified during audits were appropriately resolved.

### 03.03 Inspection Requirement 02.03

- a. Determine if the following safety-related fire protection systems are being controlled and accomplished in accordance with the requirements of the documents reviewed in Section 02.01, above:
- b. Inspection of selected fire protection systems listed below may be accomplished by observation, record review and/or independent evaluation of in-process and/or completed work. Sample selection should be based on importance to operational safety and should include redundant components and a diversity of components and locations if practical. Before inspection of selected items, review the specifications, drawings, work procedures, and work schedules applicable to the activities selected for inspection.
- c. By direct observation, record review, and/or independent evaluation of work performance, work-in-progress, and/or completed work, determine if activities regarding fire protection systems are being accomplished in accordance with NRC requirements, the licensing basis, and licensee procedures and specifications.
- d. During the field observations, the inspectors should interview and obtain the names of a sample of the craft and construction quality control personnel performing the observed activities, to assess if their knowledge of the job and procedures is satisfactory.
  - 1. Receipt. Review a sample of receipt-inspection reports for major components of fire protection systems and verify receipt-inspection requirements have been implemented. The inspectors should select a sample of procurement documents regarding: specifications and drawings, various components such as ductwork, fans, motors, dampers, HEPA filters, air handling units (AHU), instrumentation, and radiation, smoke, and toxic chemical monitors. Verify that these documents specify the shape, size, dimension, and material type and grade, and the certificate of conformance certifies the components meets the construction, material, test, and qualification requirements.
  - 2. Storage. Verify conformance with storage administrative controls and technical requirements for various components such as ductwork, fans, motors, dampers, HEPA filters, air handling units (AHU), instrumentation, and radiation, smoke, and toxic chemical monitors. The inspectors should ensure storage and warehousing procedures for fire protection system components, and/or the procurement documents reviewed require the following:

- (a) Access is controlled to the storage area to maintain the quality of the materials received.
- (b) An adequate marking system is used to maintain the identity of material in storage.
- (c) Material is protected from the environment and weather, as appropriate. Structural steel for supports is protected from corrosion.
- (d) Nonconforming material is segregated.
- (e) Motors, dampers, and heaters are checked to ensure wrappings are not disturbed and items are not removed from storage without proper authority.
- (f) HEPA filters are stored in their original cartons in an environmentally controlled room.

### 3. Installation

- (a) In-Progress Activities. If work is in progress at the time of the inspection, witness a sample of the installation activities of safety-related fire protection systems, to verify the following: the latest issue (revision) of applicable drawings or procedures is available to the installers and is being used; and modifications to supports are approved by appropriate personnel before implementation. Verify that the fire suppression systems, as specified in the licensing basis, have been properly installed for the following:
  - (1) Installation work is to be done by fully experienced responsible persons.
  - (2) There are controls of rigging and handling activities, to prevent damage to pipes, fittings, valves, and other equipment.
  - (3) Proper locations of valves, hydrants, mains, etc., are clearly identified.
  - (4) Dimensional checks are completed for levelness, alignment, clearances, etc.
  - (5) Proper restraints are provided for all tees, plugs, caps, bends, and hydrant branches.
  - (6) Proper backfill methods are performed.
  - (7) Visually examine a sample of pipes, fittings, valves, and hydrants before installation. Plain ends should be inspected with special attention, since these ends are most susceptible to damage. Verify that commitments in the licensing basis are being met in the following areas:
    - Configuration of loop and appurtenances, relative to drawings;
    - Obvious defects, such as cracks and dents, are identified and evaluated for suitability for use; and
    - There are provisions for proper identification of components.



(b) As-Built Verification

- (1) Observe a sample of the completed installation of the following equipment for proper location, configuration, identification, and damage. The basis for this determination should be the licensing bases documents, piping and instrumentation diagrams (P&IDs), specifications, and installation drawings. Select from the list below:
  - seismic support for ductwork;
  - ductwork;
  - isolation dampers;
  - recirculation test loops around fans and isolation dampers;
  - radiation, smoke, and toxic chemical monitor;
  - pressure-drop instrumentation across filter banks;
  - instrumentation for the detection of excess ambient temperature;
  - fresh air intake elevation from grade level;
  - fans and motors;
  - air handling units;
  - exhaust vents; and
  - filters.
- (2) Observe completed installation of the fire loop (if applicable). Verify the following items:
  - Components are installed with proper location and orientation.
  - All specified anchors are in proper places.
  - No apparent damage was done to fire-loop components during installation.
  - There is adequate construction quality control inspection coverage.
  - Fire-pump installation complies with NFPA 20. Separation and protection are in accordance with licensing requirements, and/or other licensing basis commitments.
  - Installation of hydrants is in compliance with NFPA 24 and/or other licensing basis commitments.
  - Water-tank installation is in accordance with NFPA 22 standards and/or other licensing basis commitments.

4. Construction Testing.

- (a) Observe a sample of construction testing and calibration activities for applicable components from the sample selected in subsections of Section 02.03. If possible, observe portions of construction-completion testing (hydrostatic testing and fire-pump performance testing). If testing cannot be observed, examine records of completed tests. Determine if:
- (b) The latest revisions of applicable procedures and/or specifications are available at the work location and used by personnel performing the testing and calibration.
- (c) Properly identified, traceable and calibrated measuring and test equipment are used.

- (d) Equipment or components calibrated are able to obtain the set point, degree of accuracy, and/or tolerance specified or otherwise noted.
  - (e) Required testing and calibration results are recorded during the activity, not after the work has been completed.
  - (f) Components are adequately identified as having been tested or calibrated.
  - (g) Personnel performing the testing and calibration are properly qualified.
  - (h) Test and calibration personnel adhere to any special handling or removal requirements.
  - (i) Proper flushing and hydrostatic testing of the fire-loop water piping are completed.
5. Construction quality control inspection. For the activities observed during Inspection Requirement 02.03., items 3–5 for in-process installation, as-built verification, and construction testing verify if construction quality control inspectors are properly qualified and are present and performing their assigned tasks during handling and installation activities. Verify construction quality control inspections documentation is complete and accurately reflects the inspection performed and results. Nonconformances are appropriately documented and resolved.
6. Configuration management. For the activities observed during Inspection Requirement 02.03., verify if changes occurred during these construction activities, the applicant/licensee properly controlled and documented these changes for engineering review, approval, and subsequent incorporation into the final as-built drawings. Verify these actions were completed in accordance with their procedures and QAP.

#### 03.04 Inspection Requirement 02.04

- a. Determine if the fire protection systems, the applicant/licensee/contractor system for documenting safety-related work is functioning properly.
- b. Review licensee and contractor requirements covering the scope of records for safety-related activities to (1) determine who prepares each quality-related record, who reviews the records for accuracy and who ensures that the recorded information meets requirements; and (2) evaluate the information obtained above and determine if the established record management system satisfies QAP and licensing requirements.
- c. Verify that a sampling of the following records indicate that applicable commitments have been met:
  - 1. Receiving and Storage Inspection Records
    - (a) Receipt inspection documents properly and uniquely identified received instrument components and associated items.
    - (b) Applicable engineering and functional specifications (regarding size, type, material, etc.) of received items were met or otherwise noted.

- (c) The required instrument component characteristics, material, performance tests, environmental and seismic qualification tests, nondestructive tests, and other specification requirements were met or otherwise noted.
- (d) Original records or certification system met requirements of applicable criteria.
- (e) Required storage conditions were maintained. (Note: Verification of these conditions may require verification of log sheets recording the ambient conditions or through the use of recorders.
- (f) Storage inspections were properly made at specified intervals.
- (g) Records of nonconforming items in storage areas were properly maintained.

## 2. Installation Records

- (a) Installation records include:
  - (1) leveling, alignment, clearances;
  - (2) anchoring installation;
  - (3) backfill and soil composition;
  - (4) cleanliness; and
  - (5) flushing.
- (b) Most recent and approved design and construction documents were used during installation.
  - (1) Specified instrument components and associated items were installed in the location specified or otherwise noted.
  - (2) Materials and methods used for supports and anchors (including welds) met applicable specifications.
  - (3) Required inspections were performed, recorded, reviewed, and evaluated by qualified personnel.
  - (4) Inspection records were complete and satisfied documentation requirements.

## 3. Construction Testing Records.

- (a) Calibration data records for process instruments should include information and data specified by industry standards which the licensee is committed to such as:
  - (1) The specific identity of the measuring and test equipment used to perform the calibration.
  - (2) The “as-left” calibration data.

- (3) Date of calibration.
  - (4) Identity of the technician performing the calibration.
  - (5) Approval signature of a responsible individual.
  - (6) Certificates of calibration should be available at the site for measuring and testing equipment used to perform these calibrations. These certificates should show that the standards used to establish the accuracy of the test equipment are traceable to a nationally recognized standard.
- (b) Construction testing records include hydrostatic tests; and fire pump full load operational and automatic starting tests.
  - (c) Required tests were performed and results meet acceptance criteria.
    - (1) Records indicate that approved procedures and equipment were used.
    - (2) Test equipment was periodically checked and calibrated as specified.
    - (3) Test data and results were properly documented and evaluated, and corrective action was taken.

#### 4. Construction Quality Control Inspection Records

Review and evaluate a sample of pertinent quality records. Determine if:

(1) adequate preparation, control, review, and evaluation of these records have been made; (2) they reflect that regulatory requirements have been met and (3) the system of records is functioning properly. The selection should include records of components in safety control subsystems, emergency control system, sensors, and safety parameter displays.

#### 5. Nonconformance/Deviation Reports

Review and evaluate a sample of nonconformance and deviation reports, and determine if:

- (a) Records are complete and promptly reviewed by qualified personnel.
- (b) Appropriate reporting requirements were recognized during evaluation and appropriate action was taken where necessary.
- (c) Records have been routinely processed, timely evaluated, and controlled through established channels for resolution of the root cause as well as the immediate problem.
- (d) Records are properly identified, stored, indicate current status, and can be retrieved in a reasonable time.
- (e) Nonconformance reports include the status of corrective action or resolution, and adequate justification is provided for use-as-is disposition.

#### 6. Training/Qualification Records of Craft, and Quality Inspection Personnel

Review and evaluate a sample of personnel qualification records and determine if:

- (a) A system of craft and inspection personnel qualification records meets stated requirements and is being maintained in a current status.
- (b) The records are sufficient to reasonably support qualification in terms of certification, experience, proficiency, training, testing, etc.
- (c) Action has been taken by responsible licensee organizations to independently authenticate the record material.
- (d) Verify that the manufacturer has a workable system for maintaining a continuous record of the qualification status of all welders and welding operators and that this system is effectively utilized and accurate.
- (e) Verify by review of a sample of qualification status records that welders and welding operators performing production welding have been and are currently qualified to weld under the respective procedures.

#### 7. Configuration Management Records.

Review and evaluate a selected sample of configuration management records, and determine if:

- (a) Records associated with design and field changes, as well as related work and IP changes, reflect that timely review and evaluation of design and field change documents have been performed by personnel who are qualified.
- (b) Records of periodic inspections ensure that only the most recent approved documents, including design changes, were used in the field.
- (c) Design changes are subject to adequate design control, including consideration of the impact of the change on the overall design and on as-built records.
- (d) Records of nonconformance's to design requirements include preparation of a nonconformance report even if the nonconformance is resolved through the design-change process.

#### 03.05 Additional Guidance

Note: Determine if enough adequately qualified quality control inspection personnel are at the construction site, commensurate with the work in progress, and adequately performing their assigned duties through the established organizational structure.

#### 69020.L-04 RESOURCE ESTIMATE

The appendices, or sections of the appendices, and inspection samples and hours, applicable to a specific facility should be in the range of 40–80 hours. Inspection preparation, including

review of licensing basis, safety analysis report (SAR), and applicable codes and standards, is not included in this estimate.

#### 69020.L-05 PROCEDURE COMPLETION

This inspection procedure appendix is complete when one inspection sample is complete. Refer to Section 69020-05, "Procedure Completion," of IP 69020, "Inspection of Safety Related Items (and Services) During Construction of Non-Power Production and Utilization Facilities," for details on what constitutes a completed inspection sample. Inspectors are not expected to complete every activity in the appendices of this IP. Instead, inspectors should prioritize inspection activities based on 1) importance of the activity to safety, 2) availability of the onsite activity at the time of the inspection, and 3) available inspection resources. An appendix to this IP need not be completed if there are no safety-related items (or services) covered by that appendix at an NPUF.

#### 69020.L-06 REFERENCES

National Fire Protection Association, (NFPA), NFPA 13, 14, 20, 22, and 25, and/or other applicable referenced NFPA standards, American Water Works Association, American National Standards Institute and American Society for Testing and Materials codes.

END

List of Attachments:

Revision History for IP 69020 Appendix L

Attachment 1: Revision History for IP 69020 Appendix L

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number (Pre-Decisional, Non-Public)
N/A	ML24264A204 03/25/25 CN 25-005	Procedure was rewritten for conformance with changes to IMC 2550 and is now a standalone appendix to IP 69020.	N/A	N/A