

ATTACHMENT 65001.15
INSPECTION OF ITAAC-RELATED INSTALLATION OF
FIRE PROTECTION EQUIPMENT

PROGRAM APPLICABILITY: 2503

65001.15-01 INSPECTION OBJECTIVES

01.01 To determine whether fire protection equipment is being installed in accordance with design specifications and approved procedures.

01.02 To evaluate the performance of ITAAC-related fire protection equipment installation, testing, documentation, and verification activities.

01.03 To determine whether fire protection equipment configuration and records reflect work accomplishment consistent with the design specifications and approved procedures.

01.04 To evaluate the adequacy of the implementation of the specific quality assurance program requirements related to fire protection equipment installation activities and records control and assure that any identified problems are entered into the corrective action process.

65001.15-02 INSPECTION REQUIREMENTS AND GUIDANCE

General Guidance: The commitments for Fire Protection Equipment (FPE) for 10 CFR part 52 licensees will be found in the Design Control Documents (DCD) submitted to the NRC to support each power plant design certification. In the DCD, Tier 1 material contains a brief description of the fire protection equipment and the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) that the fire protection equipment must meet. Tier 2 material contains a more detailed description of the design basis of the fire protection equipment. In preparation for this inspection the inspector should obtain a copy of the final NRC approved version of the DCD and review the Tier 1 and 2 material for fire protection equipment to gain an understanding of the design basis, configuration, operation, and expected performance of the fire protection equipment. Fire protection requirements in the DCD are located not only in sections labeled as such but in sections on electrical distribution, sections on buildings or structures, and potentially elsewhere. During inspection preparation the inspector shall perform an electronic search of the DCD to attempt to locate all the fire protection ITAAC requirements. Suggested search words or combination of words include fire, protection, hazards, zones, ignition sources, detection, suppression, barriers, manual actions, safe shutdown, alternate shutdown capability, hot-shorts, circuit faults, separation, NFPA, etc.

The ITAAC for fire protection equipment to be inspected will be generally described in the following paragraphs followed by guidance as to how to perform the inspections of the ITAAC. The inspector should adapt the guidance as needed to the specific plant design being inspected and the Tier 1 ITAAC for that design. If any discrepancies are identified

during these inspections they should be brought to the attention of licensee and NRC management as potential ITAAC inspection findings and resolved.

02.01 Fire Protection Equipment Functional Arrangement. An ITAAC will require that the functional arrangement of the FPE is as described in a referenced figure in the Tier 1 DCD. The inspector should perform a visual walkdown inspection of all of the FPE presented in the ITAAC to confirm that the functional arrangement is correct.

Guidance: For efficiency of the field walkdowns, task 02.01, equipment functional arrangement, task 02.02, confirm seismic considerations, and task 02.03, confirm isolation capability of liquid fire protection, should be performed at the same time. Obtain a copy of the licensee's final as-built piping and instrumentation diagram (P&ID) and a copy of the FPE figure from the Tier 1 DCD. In preparation for a field walkdown, do a comparison of the two drawings to detect any differences. Then using both drawings, perform a field walkdown of all the FPE on the Tier 1 drawing to confirm that the as-installed functional arrangement matches the Tier 1 drawing. Any discrepancies should be brought to the attention of licensee and NRC management as potential ITAAC inspection findings and resolved. There will be much more detail on the P&ID than the Tier 1 drawing and there may be some differences. That should not be a concern as the Tier 1 drawing is the ITAAC acceptance criteria. Any discrepancies between the P&ID and the as-built configuration should be brought to the attention of the licensee and NRC management.

02.02 Fire Protection Equipment Seismic Considerations. An ITAAC will typically require that certain FPE described in the Tier 1 document will remain functional following a safe shutdown earthquake. This feature may be directly specified in the Tier 1 as an ITAAC requiring that certain FPE piping exists and a structural analysis has been performed on the as-built configuration to demonstrate that the FPE piping is capable of remaining functional following a safe shutdown earthquake. In that case, while performing inspection task 02.01, the inspector should also confirm that the FPE piping listed in the Tier 1 table is installed in the as-built plant.

Or in the case of other new reactor designs, this feature may be confirmed by verification that the as-built FPE conforms to the functional arrangement described in the Tier 1 DCD drawing. In that case, performing inspection task 02.01 adequately ensures that the FPE will remain functional following a safe shutdown earthquake.

The inspector should obtain from the licensee a copy of their structural analysis report which demonstrates that the as-built FPE piping is capable of remaining functional following a safe shutdown earthquake and review it for adequacy.

Guidance: For either case described above, as inspection preparation the inspector should review all the available Tier 1 and Tier 2 fire protection information to gain an understanding of what are the engineering design features of the installed FPE that make it capable to remain functional following a safe shutdown earthquake. Then during walkdown inspections, the inspector should verify that those important engineering design features are installed on the as-built FPE.

The licensee piping structural analysis report which supports the ITAAC will probably be a summary of a much larger seismic analysis. It should not be necessary to perform an in

depth technical review of the larger analysis. The inspector should review the summary document for clarity, consistency, and to verify that it concludes that the as-built FPE piping is capable of remaining functional following a safe shutdown earthquake. If the inspector finds problems with the report, he may ask for support to refer it to an NRC specialist inspector for deeper review of acceptability

02.03 Fire Protection Equipment Containment Isolation. An ITAAC will typically require that certain fire protection water supply systems that penetrate the containment building be capable of providing the safety related function of automatic isolation on demand to maintain containment integrity. In one design, that feature will be directly specified as an ITAAC described in the Tier 1 document. The ITAAC will typically refer to another section of the Tier 1 document having to do with Containment and there certain ITAAC will specify the requirements for containment isolation valves with redundancy, diversity and leak tightness. In another design, there is no direct fire protection ITAAC for containment isolation, and fire protection is treated as just one of many liquid systems that penetrate containment and must have isolation capability. In all cases, while performing inspection task 02.01, the inspector should verify that liquid fire protection systems that penetrate containment have the required isolation capability.

Guidance: In preparation for this inspection, the inspector should review all the available Tier 1 and Tier 2 fire protection information to gain an understanding of the requirements for fire protection liquid systems that penetrate containment to have containment isolation capability. The fire protection information will typically point toward the containment section which will describe the requirements for containment isolation capability for the fire protection systems.

02.04 Capability of Hose Stations for Manual Fire Fighting Capability. An ITAAC typically will require that there be installed a system of manual fire hose stations and associated water supply to provide manual fire fighting capability in plant areas containing safety related equipment. The ITAAC will typically specify a minimum capacity for the water supply tank and specify that the volume be verified. The ITAAC will typically require testing to demonstrate that the system can provide a minimum required flow at a minimum allowed discharge pressure from the most remote and/or highest elevation hose stations. The inspector should request and review for acceptability the licensee's records of as-built water source useable volume verification and records of flow tests that demonstrate the ITAAC have been met. If the opportunity exists to witness the flow testing the inspector should do so, but records review is sufficient to complete this IP.

Guidance: In preparation for this inspection, the inspector should review all the available Tier 1 and Tier 2 fire protection information to gain an understanding of the preparation for this inspection, the inspector should review all the available Tier 1 requirements for hose stations for manual fire fighting capability. The ITAAC will describe the dedicated source of water supply and the minimum volume needed, which the licensee should verify by confirming as-built dimensions and performing calculations of the useable volume. The system test should be either a construction test or preoperational test to demonstrate the system capability. The test should be a flow test to demonstrate that the system can provide a minimum required flow at a minimum allowed discharge pressure from the most remote and/or highest elevation hose stations. During the test the flow and discharge

pressure should be measured and confirmed to exceed the minimum of each simultaneously.

02.05 Main Control Room (MCR) Instrumentation and Controls. The ITAAC will typically require that the instrumentation and controls described in the Tier 1 document actually exist in the MCR. The inspector should obtain a list of the instrumentation and controls described in the Tier 1 document and visually verify that that equipment is installed in the MCR and that the equipment is operable.

Guidance: In preparation for this inspection, the inspector should review all the available Tier 1 and Tier 2 fire protection information to gain an understanding of what instrumentation and controls are committed to be installed in the MCR and what are the equipment attributes such as range, number, redundancy, diversity, etc. Then the inspector should go to the MCR and visually verify that the required equipment is installed. The inspector should obtain and review records of the construction or preoperational testing of the equipment to confirm that it has been tested and demonstrated to work properly.

02.06 Fire Protection System Water Supply. The ITAAC will typically require that there be a water supply available. The inspector should review all the available Tier 1 and Tier 2 fire protection information to determine the exact requirements and visually inspect the equipment to confirm that all the requirements are met

Guidance: An example of a typical ITAAC requirement would be that the fire protection system provides two fire water storage tanks, each capable of holding at least 300,000 gallons of water. The inspector should obtain a copy of the as-built drawings and the design specifications for the tanks. Review those documents to verify that they support that the installed tank size will meet the required minimum useable water volume. Then visually inspect the tanks to verify their installation is acceptable and agrees with the as-built drawings.

02.07 Fire Pumps. The ITAAC will typically require that there be installed a number of fire pumps and that they are each capable of delivering a certain minimum flow at a certain minimum developed head differential pressure. The inspector should obtain a copy of the test and/or analysis documents that support the ITAAC completion and verify their adequacy. If vendor, construction or preoperational testing of the pumps was performed, review the records of those tests to verify that they show that the pumps can meet minimum flow and differential pressure requirements. If there were no verification tests, methods of validating capability should be discussed and resolved. Visually inspect the pumps to verify that the required number exists and they are adequately installed. If the opportunity exists to witness the pump testing the inspector should do so, but records review is sufficient to complete this IP.

Guidance: Records of pump testing are more reliable than a system design analysis so the inspector should obtain and review records of whatever testing was done. The tests may be vendor tests performed at the pump manufacturer's facility and/or construction or preoperational testing of the pumps performed on site. If the opportunity exists to witness all or part of the pump testing the inspector should do so, but records review is sufficient to verify the pumps' capabilities.

02.08 Fire Detection and Alarm Systems. The ITAAC will typically require that fire detection and alarm systems are installed in the plant and will initiate fire alarms in the areas specified in the Tier 1 documents. The inspector should review all the available Tier 1 and Tier 2 fire protection information to determine the exact requirements and visually inspect the installed fire detection and alarm equipment to confirm that all the requirements are met. The ITAAC may require that the equipment be powered from an uninterruptible power supply. If so, the inspector should obtain and review as-built electrical drawings to confirm that the power supply requirements are met. The inspector should obtain and review records of the fire detection and alarm systems construction or preoperational testing to verify that the equipment is functional and performs correctly. If the opportunity exists to witness portions of the construction or preoperational testing of the fire detection and alarm systems the inspector should do so, but records review is sufficient to complete this IP

Guidance: By review of the Tier 1 and 2 documentation the inspector can determine exactly what attributes the fire detection and alarm systems are required to have. Detectors are typically located in many places but the most important ones are where safety related equipment is located. The inspector can confirm by plant walkdown that all the required equipment is in place. A review of the records of construction and/or preoperational testing is the most reliable way to confirm that the equipment is functional. Such testing may include a test confirmation of the source of system power.

02.09 Automatic Fire Extinguishing Systems. An ITAAC may require an installed automatic fire extinguishing system in various locations e.g. diesel generator, fuel oil day tank, cable spreading, battery room, etc. If such an ITAAC is to be inspected, the inspector should review all the available Tier 1 and Tier 2 fire protection information to determine the exact requirements and visually inspect the installed fire extinguishing equipment to confirm that all the requirements are met. The inspector should obtain and review records of the fire extinguishing systems construction or preoperational testing to verify that the equipment is functional and performs correctly. If the opportunity exists to witness portions of the construction or preoperational testing of the fire extinguishing systems the inspector should do so, but records review is sufficient to complete this IP.

In the case of automatic sprinkler systems, design calculations should be verified to ensure proper flow, pressures, restrictions and sprinkler head limitations are accounted for. Additionally, for non-liquid fixed-suppression methods i.e. Halon, CO₂ etc, subsystem integration should be verified to ensure proper concentration levels and duration. Such subsystems might include: damper response, valve position, alarm, ventilation etc.

Guidance: By review of the Tier 1 and 2 documentation the inspector can determine exactly what attributes the fire extinguishing systems are supposed to have. There are various kinds of systems such as water sprinklers, foam-water, CO₂ flooding and others so the inspector may have to do some research to determine the critical characteristics of a given type of system. The inspector can confirm by plant walkdown that all the required equipment is in place. A review of the records of construction and/or preoperational testing is the most reliable way to confirm that the equipment is functional. Such testing should be devised to verify that the system will actuate in response to the appropriate signals and will actually perform its intended function e.g. flood the room with CO₂ to a concentration of

XXX in YYY minutes. These performance criteria may be found in the Tier 2 documents but may have to be obtained from more detailed plant design documents.

02.10 FPE Secondary Functions. An ITAAC may specify a secondary function for FPE such as “provides safety-related containment spray for severe accident management”. For plants with secondary functions, the inspector should review all the available Tier 1 and Tier 2 fire protection information to determine the exact requirements and visually inspect the installed FPE to confirm that all the requirements are met. The inspector should determine if any construction or preoperational testing was performed on the secondary equipment. If testing was done, obtain the records and review them to confirm that the equipment is functional.

Guidance: For secondary function, it may not be possible or practical to perform full performance testing, as it may be destructive to plant equipment. In the example of secondary containment spray, the acceptance criteria is spray headers are installed and they contain the correct number of nozzles at the correct elevation. The inspector can confirm that the acceptance criteria are met by a combination of visual inspection and review of as-built drawings.

02.11 FPE Capacities. An ITAAC may require various capacities such as “the fuel tank for the diesel-driven fire pump is capable of holding at least 240 gallons”. The inspector should obtain a copy of the as built drawings and compare them to visual examination of the installed equipment. The dimensions of the tank will confirm that the useable volume acceptance criteria are met.

Guidance: Review of the design drawings will allow the inspector to determine that FPE capacities should be adequate. The inspector should confirm that the FPE installed in the plant matches the design drawings.

02.12 Fire Hazards Analysis. An ITAAC may require “a Fire Hazards Report exists for the as-built plant and concludes that for each postulated fire, the plant can be shutdown and maintained in a safe, cold shutdown condition”. The inspector should obtain a copy of the current Fire Hazards Report and review it on a sampling basis for accuracy and fidelity to the as-built plant.

Guidance: The Fire Hazards Report will be submitted to the NRC as part of the application for the plant Combined License and will receive a detailed review as part of the licensing process. There may be numerous changes to the Fire Hazards Report by the licensee during the review process as a result of NRC interaction. The inspector should ensure that he has the latest and final approved version of the report for the inspection.

The acceptability of the final Fire Hazards Report and its contained analysis and the means and method of achieving and maintaining cold shutdown for any fire situation will be approved by the NRC as part of the licensing process. The inspector's role is to verify that the Fire Hazards Report is consistent with the actual plant as-built configuration. The inspector should review the Fire Hazards Report to understand its organization and content. Then on a sampling basis, the inspector should visually verify that FPE as installed in the plant agree with their description in the Fire Hazards Report and that the

actions and performance of the FPE is consistent with their description in the Fire Hazards Report.

02.13 Electrical Distribution. An ITAAC will typically require for safety related electrical distribution that redundant safety related equipment is powered from their respective class 1E division. Also, ITAAC will typically require for safety related electrical distribution that there is separation between the multiple class 1E divisions and between the class 1E divisions and non-class 1E electrical cable. ITAAC may require that certain specified physical separation is maintained between class 1E divisions and class 1E to non-class 1E cables in accordance with certain fire areas identified in a table in the Tier 1 documents.

Guidance: This inspection should be performed by an inspector knowledgeable of electrical distribution design practices that apply to new reactor designs. The inspector should determine from site specific engineering design documents what electrical industry standards the plant is committed to meet. Obtain a copy and review those standards to understand the intended design requirements. Then obtain as-built one line electrical drawings for the plant electrical distribution. For one division, trace the electrical distribution path from source to powered equipment and verify that other divisions are identical layouts or verify that divisional differences if any exist are acceptable arrangements. Confirm that division designated equipment is powered only from its designated divisional source.

With the help of licensee engineers, obtain access to the electrical cable routing record system for the plant. From the electrical drawings, select for inspection sample cable runs from source to risk significant equipment. From cable routing records, confirm that those runs are isolated from other 1E division cables and from any non-class 1E cable runs. For the sample cable runs, perform a visual inspection in the plant to confirm that cable routing records are accurate and the specified separations exist.

02.14 Remote Shutdown Equipment. One or more ITAAC will typically exist on remote shutdown equipment which would be used to shutdown the plant from outside the main control room (MCR) if the MCR were to become inaccessible. An ITAAC will typically require that the remote shutdown room or station contain controls and displays and alarms specified in a Tier 1 table. There may also be ITAAC on the location and characteristics of the enclosure in which the equipment is located, e.g. fire proof barriers, ventilation, separation, security etc.

Guidance: The inspector should review the Tier 1 and Tier 2 documents to determine the ITAAC requirements for the remote shutdown equipment (RSE) and enclosures. The inspectors should obtain as-built plant drawings of the RSE and enclosures and then perform a visual inspection of all of the ITAAC specified attributes to verify that the drawings conform to the as-built plant and both fully conform to the ITAAC requirements.

02.15 Structures. An ITAAC will typically require for various structures containing safety related equipment that the inter-divisional walls, floors, doors, penetrations and external wall penetrations have a three-hour fire rating capability. This is the typical requirement for the control building, reactor containment building, auxiliary equipment building, diesel generator building, and possibly the turbine building and other buildings.

Guidance: Concrete walls will typically provide adequate fire barrier protection so inspections should focus on doors and penetrations. Obtain as-built structural drawings of the plant and determine if a three hour fire rating is specified for doors and penetrations into areas containing safety related equipment. Select a sample of doors and penetrations for inspection and verify by procurement records review that the equipment possesses the specified fire rating. For that same sample, visually inspect the equipment in the plant to verify that it conforms to the drawings and procurement records and provides the required fire resistance.

02.16 Integration with other Systems. During walkdowns, observe if the fire protection water systems are vulnerable to voiding or water hammers. Also observe if fire protection water system piping were to rupture could this make other risk significant systems inoperable. Also observe if activated, could the Halon system affect personnel routes for manual actions or to the alternate safe shutdown system equipment.

Guidance: During walkdowns inspectors should be alert to detect any potential negative interactions between fire protection water systems and other risk significant equipment in the same area.

02.17 Problem Identification and Resolution. Those problems identified by the inspector shall be discussed with the licensee and the licensee shall enter the problems into a corrective action system.

Guidance: The inspector shall ensure that the licensee is entering problems into a corrective action system and appropriate corrective actions are being developed.

65001.15-03 RESOURCE ESTIMATE

Inspection resources necessary to complete this inspection procedure are estimated to be 80 hours of direct inspection effort over the course of plant construction.

65001.15-04 REFERENCES

10 CFR 50 Appendix A, Criterion 3, "Fire Protection"

10 CFR 50.48 "Fire Protection"

10 CFR 50 Appendix R "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979."

National Fire Protection Association (NFPA) NFPA 1 "Uniform Fire Code", 2006 Edition or the Revision/ Edition to which the licensee is committed

NFPA 805 "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition

NFPA 804 "Standard for Fire Protection for Advanced Light Reactor Electric Generating Plants, 2006 Edition

NUREG-800, Revision 3, "Standard Review Plan for the Review for Nuclear Power Plants,
" March, 2007

Inspection Procedure 40504, "Part 52, Identification and Resolution of Construction
Problems"

END

Attachment 1: Revision History for IP 65001.15

Attachment 1
Revision History For 65001.15

| Commitment Tracking Number | Issue Date | Description of Change | Training Needed | Training Completion Date | Comment Resolution Accession Number |
|----------------------------|-----------------------|---|-----------------|--------------------------|-------------------------------------|
| | 07/01/08 CN 08-019 | 1. Initial issue to support ITAAC related New Reactor Construction Inspections under 10CFR52 2. Researched commitments for 4 years and found none. | None | N/A | N/A |