Appendix B
NRC Inspection Procedures 88054 – Fire Protection (Triennial) and 88055 – Fire Protection (Annual) Draft

FIRE PROTECTION (TRIENNIAL)

PROGRAM APPLICABILITY: 2600

88054-01 OBJECTIVE(S) (OR POLICY)

01.01 The objectives of this procedure are to evaluate the licensee or certificate holder's fire protection capability from a programmatic design-based and risk-informed perspective to determine whether the following meet license or certificate requirements and are adequate to preclude or mitigate the consequences of a fire.

a. Program for control of combustibles and ignition sources within the plant;

b. Program to ensure adequate fire detection and suppression capability;

c. Program to ensure that the material condition, design, and qualification testing of passive fire protection features is adequate;

d. Program to ensure that compensatory measures will be in place for out-of-service, degraded or inoperable fire protection equipment, systems or features;

e. Program to ensure that feasible and reliable emergency operating actions will be taken if required to mitigate the adverse affects of a fire.

f. Program to assure that maintenance and facility changes continue to meet applicable codes and standards and license or certificate basis.

Inspection Procedure 88055, "Fire Protection (Annual)" complements the triennial inspection by focusing on the design basis and operational status of the fire protection program specifically in the areas of active fire detection/suppression systems and passive fire confinement features including the adequacy of their design, maintenance, and operational performance. However, the inspector should consider the need for additional evaluations in these areas based on previous inspections and potential issues.

88054-02 INSPECTION REQUIREMENTS

02.01 Inspection Preparation. Fire protection requirements for licensees vary greatly because of the significant differences in operations, structures, and process materials at

regulated facilities. As a result, the inspector should, as part of inspection preparation, review fire protection program documentation specific for the licensee or certificate holder to be inspected. This review should include a review of changes to the program since the last inspection. Specific requirements are documented in the regulations, the license or certificate, the Safety Analysis Report (SAR), the Integrated Safety Analysis (ISA), and licensee or certificate holder policies and procedures.

Select approximately three risk-significant fire areas containing safety controls and items relied on for safety (IROFS) (for Part 70 licensees) (not necessarily limited to the top few contributors to overall plant fire risk) and conduct a risk-informed inspection of selected aspects of the licensee's fire protection program. The number of fire areas inspected can be adjusted during the course of the inspection based on the complexity of developing issues being inspected.

For each area, the selection process will consider but will not be limited to the following from the ISA Summary or other documentation. The review should focus on the programmatic aspects of the selected areas:

a. Review the Hazard and Operability (HAZOP) analysis or other analyses for systems hardware and procedures as appropriate to determine which safety controls are assumed to be capable and reliable based on the fire protection associated with the controls.

b. Potential ignition sources that could affect these controls.

c. Configuration and characteristics of combustible materials in the areas.

d. Routing of circuits important to assure availability of safety controls.

e. Licensee's or certificate holder's fire protection and fire fighting capability.

02.02 Inspection Activities. The inspection is designed to verify that the programs required to assure the availability and reliability of fire protection features protecting safety controls are adequate. The inspection should also verify that the licensee's engineering and licensing documents (e.g., license amendments, ISA, exemptions, deviations) continue to support the selection of the fire protection systems and equipment. The verification of fixed passive fire confinement features and active fire protection systems including installation, design, testing, and adequacy to control and/or suppress fires associated with the hazards of each selected area will be done against the code of record. Specific inspection requirements include:

a. Fire Hazard Analysis. Review changes in the facility fire hazard analysis (if required by license condition) made since the previous triennial fire protection inspection and determine if appropriate changes have been made to the ISA and safety controls as a result.

b. Pre-Fire Plans. Review changes in the facility pre-fire plans for the selected areas (if required by license condition) made since the previous triennial fire protection inspection and determine if the changes are consistent with the fire hazard analysis.

c. Control of Transient Combustibles and Ignition Sources. Determine whether programs and procedures remain in place and are adequate to:

1. Control transient combustible materials in accordance with the licensee's or certificate holder's procedures.

2. Conduct hot work, welding, or cutting in accordance with the licensee's or certificate holder's procedures.

3. Ensure that the facility work planning organization has an adequate familiarity of locations where changes in plant conditions have occurred in areas that require fire protection compensatory measures (e.g. for inoperability of fire detection or suppression systems) to allow adjustments in work planning to minimize the introduction of combustibles or ignition sources (that could increase the likelihood of a fire or increase fire severity) into those plant areas where degraded fire protection features system exist.

4. Ensure that the work planning organization work control process accepts responsibility for storage and handling of pre-staged work materials when issued, including flammable and hazardous materials that are included in the pre-stage request.

5. Ensure that the licensee maintains a process in place to assure that designated flammable/combustible liquid storage areas and floor drain systems (in selected plant areas in or adjacent to the areas selected for inspection) would not affect plant safety controls and IROFS process functions in the case of a fire in those areas.

d. Passive Fire Protection. Determine whether programs and procedures remain in place and are adequate to:

1. Assure that the fire ratings of fire area boundaries and equipment fire barriers are appropriate for the credible fire hazards in the area.

2. Assure that material of an appropriate fire rating (equal to the overall rating of the barrier itself) has been used to fill openings and penetrations and that the installation meets engineering design.

3. Assure whether material of an appropriate fire rating has been used as fire protection wraps and that the installation meets engineering design.

4. Assure that fire test data are appropriate for unusual installation configurations and/or application of unusual materials.

e. Active Fire Protection. Assure that programs and procedures remain in place and are adequate to:

1. Ensure that the material condition, operational lineup, operational effectiveness, design for fire detection systems, fire water supply and distribution system, fire suppression system, manual fire fighting equipment, and fire brigade capabilities meet the code of record and/or the criteria of the ISA.

2. Ensure that automatic and manual detection and suppression systems are installed, tested, and maintained in accordance with the code of record.

3. Ensure that the design capability of gaseous suppression agent delivery systems meet the requirements of the fire hazards and code of record.

f. Protection From Damage From Fire Suppression Activities. Assure that the licensee/certificate holder maintains programs and procedures adequate to:

1. Determine whether safety controls which are located in the same fire area are subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.

2. Determine if a fire in a single location could, indirectly, through the production of smoke, heat, or hot gases, cause activation of automatic fire suppression which could potentially damage other safety controls (e.g., sprinkler-caused flooding of other controls).

3. Determine if adequate drainage and environmental protection is provided in areas protected by water suppression systems.

g. Undesired Consequences. Assure that the licensee/certificate holder maintains programs and procedures adequate to:

1. Determine whether fire suppression agents (water or gaseous based) could impact nuclear criticality safety controls and whether controls to prohibit such impacts meet requirements and are adequate.

2. Determine whether the potential consequence(s) of cable failures, as a result of the fire suppression activities, has been adequately considered for safety controls in the area including instrumentation and control cabling.

h. Environmental Issues and Water Based Suppression Systems. Assure that the licensee/certificate holder maintains programs and procedures adequate to:

1. Preclude release of any hazardous effluents as a result of fire fighting efforts.

02.03 Communications. Determine that the licensee/certificate holder maintains programs and procedures adequate to:

a. Assure that portable radio communications and/or fixed emergency communications systems are available, operable, adequate, and reliable for their required performance in fire response activities.

b. Assure that communication equipment such as repeaters, transmitters etc. would not be affected by a credible fire in the selected areas.

02.04 Emergency Lighting. Assure that the licensee/certificate holder maintains programs and procedures adequate to assure that emergency lighting would be available and operable when needed by:

a. Determining whether the power distribution system contains protective devices so that a fire in the area will not cause loss of emergency lighting in any unaffected area needing lighting.

b. Determining whether battery power supplies are rated with the hour capacity required by the code of record.

c. Determining whether the operability testing and maintenance of the lighting units follow licensee procedures and manufactures recommendations.

d. Determining whether sufficient illumination is provided to permit access to and operation or verification of components for safety controls.

e. Determining whether emergency lighting unit batteries are being maintained consistent with the manufacturer's recommendations.

02.05 Fire Brigade Training and Offsite Fire Support Orientation. Assure that the licensee/certificate holder maintains programs and procedures adequate to maintain fire response capabilities by:

a. Determining whether the fire brigade qualifications and training (including drills) meets the requirements of the license or certificate and procedures.

b. Determining whether offsite fire support organizations are offered the opportunity for site orientation and if they have received such orientation.

02.06 Identification and Resolution of Problems. Assure that the licensee/certificate holder maintains programs and procedures adequate to maintain fire response capabilities by:

a. Determining whether the licensee or certificate holder is identifying safety control or IROFS fire protection problems at an appropriate threshold and entering them into the corrective action program.

b. Determining, for selected licensee or certificate holder identified items, whether effective corrective actions have been taken.

88054-03 INSPECTION GUIDANCE

03.01 Inspection Preparation. The inspector should review the license, license condition(s), license application, or technical safety requirements (TSRs) specific for fire protection at the licensee or certificate holder to be inspected. In addition, the inspector should review the parts of the ISA Summary applicable to fire safety as well as the associated Fire Hazard Analysis (FHA). In preparing for the inspection, the inspector should also discuss with the project inspector and resident inspection staff, where applicable, any programmatic fire protection equipment availability or reliability problems (such as recurring failures or failures resulting in reportable events) the licensee or certificate holder has experienced since the last annual inspection.

The licensee or certificate holder should have a well developed and documented fire protection program. The program should describe, as a minimum, the following elements:

a. Identification of the management person who is given the authority to implement the program. Identification of a supervisory person responsible for day to day implementation of the program.

b. FHA and periodic reviews.

c. Program for identification and resolutions of problems identified by the FHA, periodic audit, and inspections.

d. Fire protection equipment maintenance and testing program. Fire protection equipment includes passive controls and automatic/manual suppression systems.

e. Program to control combustible/flammable materials and hot work activities (i.e. welding, cutting, and grinding). Typically permits are issued and a fire watch is maintained during such work.

f. Fire brigade training program. Details, such as training subjects, frequency of training classes and drills, and qualification standards.

03.02 Inspection Activities.

a. Fire Hazard Analysis. The selections of changes to be reviewed should be based

on the risk-significance of the modifications. Consideration should be given to modifications which impact IROFS, as well as systems not part of the ISA, but important to safety. The number of modifications to be reviewed should be based on the number and significance of modifications made by the licensee or certificate holder since the last triennial inspection.

The purpose of the FHA is to assess the risk from fire within individual fire areas in the facility. In the consideration of credible fire scenarios, FHAs should include an evaluation (prediction) of all direct and indirect effects of potential fires.

The evaluation should consider:

1. The effects of a fire on the structures, systems, and components (especially sensitive safety controls and IROFS components) within the fire area through thermal damage caused by direct flame impingement, indirect or secondary lower level thermal exposures, smoke, the interaction between smoke and moisture; and corrosive compounds generated during a fire.

2. During fire suppression activities (i.e. sprinkler systems and hose streams), the analysis should be particularly cognizant of high humidity, water sprays, and flooding during suppression activities; and, to extremely low temperatures, high thermal gradients, high room pressures, and high static charge levels when gaseous flooding suppression systems are involved.

3. Malfunction of an automatic fire protection system (i.e. suppression system). If redundant systems are available in the area, only the system that causes the most vulnerable condition should be assumed to fail.

4. The effect of fire spread and the potential for spread of contamination or smoke through the facility ventilation system and malfunctioning passive fire system (i.e. dampers and doors).

5. The presence of transient combustible and flammable materials that could be present in the area associated with storage and maintenance activities.

6. Outside fire department and onsite fire brigade response including response time and resources.

7. Life safety considerations (i.e. personal evacuation and egress capability).

b. Pre-Fire Plan. Sometimes the Pre-Fire plan is part of the general radiological emergency plan required by the license or certificate. However, the Pre-Fire plan is different from a Radiological Contingency Plan in that it requires information needed by fire-fighting personnel responding to an emergency. Often, the same team of employees is trained to respond to both fires and radiological emergencies. This is acceptable since a fire emergency may turn out to be a radiological

emergency as well.

The inspector should determine that the Pre-Fire plans continue to include these elements:

1. The most favorable direction to attack a fire in each area, in view of the ventilation direction, access to hallways, stairs and doors which are most likely to be fire-free, and the best station or elevation for fighting the fire.

2. Designation of plant systems that should have plans in place to reduce the damage potential from a local fire which could affect a greater area (e.g., any hydraulic or electrical systems in the area covered by the specific fire fighting procedure that could increase the hazards in the area because of over pressurization or electrical hazards).

3. Designation of vital heat-sensitive [safety controls and IROFS] system components that should be kept cool while fighting a local fire. Critical equipment which contains particularly hazardous combustible material should be designated to receive cooling.

4. Identification of radiological and toxic hazards in fire zones.

5. Ventilation system operation that assures desired plant pressure distribution when the ventilation flow is modified for fire containment or smoke clearing operations.

6. Indication of the areas of concentration of combustibles, storage of flammable or combustibles liquids, and areas where the use of water for fire suppression is restricted due to criticality safety concerns.

7. Description of the offsite fire department's resources and estimated response time by the offsite fire department to provide assistance to the facility.

8. Identification of, preferably with the help of site plans and drawings, the location of fire fighting equipment such as portable extinguishers, automatic fire suppression systems, stand-pipes, hydrants, hoses, and manual pull stations for the fire alarm. In addition, passive features like fire walls and fire doors should be clearly indicated.

9 Identification of evacuation routes and emergency lighting should be clearly identified.

10. Identification of fire suppression system and flammable gas isolation valves.

c. <u>Control of Transient Combustibles/Flammable Materials and Ignition Sources</u>. During facilities tours and walkdowns, the inspector should assess whether or not

combustible/flammable materials are controlled in accordance with the licensee's or certificate holder's procedures.

Licensee's or certificate holder's procedures, as a minimum, should include:

1. Controls related to the quantity and handling of combustibles in and around the facility so that the potential for a significant, damaging fire is minimized.

2. Requirements that storage of combustible materials should not be allowed in locations where accumulation of combustible materials could occur, i.e. above suspended ceilings or below raised floors, under glove boxes or other process equipment, under stairs and/or in stairwells.

3. Requirements for handling of waste, scrap, rags, trash, and other combustible material resulting from work activity. These materials shall be disposed of in approved waste receptacles, or removed from the building at least once per day at the end of the work shift.

4. Controls for storage of materials susceptible to spontaneous ignition, such as oily rags. In addition, metals such as uranium and zirconium, are known to be combustible, especially when divided in a finely form.

5. Requirements that prevent the storage of unnecessary combustible materials near ducts and HEPA filters in housings/ducts of filter rooms that are in service.

6. Requirements to prevent accumulation of combustible materials in mechanical rooms, electrical rooms, or process areas.

7. Requirements to prevent blockage of access to active fire protection equipment and emergency exit paths from facilities.

8. Controls on the use of non-combustible containers for storage of combustible trash.

9. Provisions to clean spills of flammable or combustible liquids.

In addition, the program should require routine housekeeping and control of combustible materials inspections. The inspections should consist of a walkdown of the facility to identify all unnecessary combustible materials. Material identified during the inspection should be documented.

d. Storage and Handling of Flammable and Combustible Liquids and Gases. The construction, installation, operation, and maintenance of combustible liquid storage and the related loading and dispensing systems should comply with National Fire Protection Agency (NFPA) 30, Flammable and Combustible Liquids Code. The

construction, installation, operation, and maintenance of bulk gas (including liquefied gas) storage and the related loading and dispensing systems should comply with good industry practice and the relevant NFPA standards, as applicable, for example, NFPA 50, Bulk Oxygen Systems at Consumer Sites; NFPA 50B, Liquefied Hydrogen Systems at Consumer Sites; and NFPA 54, National Fuel Gas Code.

Licensee's or certificate holder's procedures, as a minimum, should address:

1. The use of approved containers and tanks (NFPA 30) to store and handle flammable and combustible liquids.

2. Requirements to ensure that connections on drums and combustible liquid and gas piping are not leaking.

3. Proper storage practice to minimize the risk of fire, including spontaneous combustion.

4. Storage of flammable liquids in closed containers when not in use.

5. Grounding of bulk drums of flammable liquids during dispensing.

6. Use of fire-resistant barriers to separate fuel gas cylinders and oxygen cylinders while in storage.

7. Ventilation of storage tanks to prevent the development of excessive vacuum or pressure as a result of filling, emptying or atmosphere temperature changes.

8. Installation of combustible gas analyzers for enclosed spaces in which flammable mixtures of combustible gas could accumulate outside of the storage vessels, piping, and utilization equipment. The analyzer shall be set to alarm at a concentration no higher than 25 percent of the lower explosive limit.

9. Installation of combustible gas analyzers for enclosed spaces in which flammable mixtures of vapors have the potential to accumulate outside of the storage vessels, piping, and utilization equipment. The analyzer shall be set to alarm at a concentration no higher than 25 percent of the lower explosive limit.

10. Use of fire-resistant hydraulic fluid in presses or other hydraulic equipment.

11. Systems that do not allow uncontrolled release of vapors when flammable or combustible solvent are used.

12 Operations involving metals, such as uranium and zirconium, to prevent combustible dust cloud formation and combustible scrap and swarf accumulation. Examples of these type of operations involve sawing, grinding, machining, and abrasive cutting.

13. Stationary Combustion Engines (i.e. emergency diesel generators) if located in part of a structure housing fuel process(es), the engine should be in an enclosure having a fire resistance of at least 1 hour. Fuel storage tanks, except for day tanks, should be located outside the room.

e. Ignition Sources. The inspector should verify implementation and adequacy of the hot work program by observing any welding, grinding, brazing, or flame cutting being performed in any of the process areas. The licensee's or certificate holder's hot work program, as a minimum, should address the following precautions during hot work:

1. Hot work must not be permitted in flammable (explosive) atmospheres; near large quantities of exposed, readily ignitable materials; in areas not authorized by management; or on metal partitions, walls, or roofs with a combustible covering or with combustible sandwich-type panel construction.

2. Floor must be free of combustibles, such as wood shaving. If the floor is of combustible material, it must be kept wet or otherwise protected.

3. If combustibles are closer than 35 feet to the welding or cutting process and the work cannot be moved or the combustibles relocated at least 35 feet away, they must be protected with flame-resistant covers or metal guards or curtains. This also applies to walls, partitions, ceilings, or roofs of combustible construction.

4. Openings in walls, floors, or ducts must be covered if within 35 feet of the work. Be alert for cutting conditions that could propel sparks overhead or downward, where combustibles are within a 35 foot sphere of the point of operation.

5. Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs must not be performed if close enough to cause ignition by heat conduction.

6. Charged and operable fire extinguishers must be readily available. Trained fire watchers must be posted. In general, the posted fire watchers should not be engaged in any other activities and should remain posted for at least 30 minutes after the hot work is complete.

f. Passive Fire Protection. The inspector should walk down passive fire protection features to determine whether inspection, testing, and maintenance (ITM)

procedures and programs remain in place to ensure adequate performance of passive fire protection features.

1. Fire Doors.

   (a) Fire door assemblies shall be inspected and tested not less than annually.

   (b) No open holes or breaks should exist in surfaces of either the door or frame.

   (c) Glazing, vision light frames, and glazing beads should be intact and securely fastened in place, if so equipped.

   (d) The door, frame, hinges, hardware, and noncombustible threshold should be secured, aligned, and in working order with no visible signs of damage.

   (e) Door clearances at the door edge to the frame, on the pull side of the door, should not exceed clearances listed in NFPA 80.

   (f) The self-closing device is operational, that is, the active door completely closes when operated from the full open position.

   (g) If a coordinator is installed, the inactive leaf should closed before active leaf.

   (h) Latching hardware operates and secures the door when it is in the closed position [Generally for the metal doors encountered during inspections, a 3 hour door needs a 5/8 inch latch throw, and a 1 hour door needs 12 inches. (Refer to NFPA 80 if an issue arises)].

   (i) Slats, endlocks, bottom bar, guide assembly, curtain entry hood, and flame baffle should be correctly installed and intact.

   (j) Drop release arms and weights should not be blocked or wedged.

   (k) Fusible links, if equipped, are in the proper location; chain/ cable, s-hooks, eyes, and so forth, are in good condition (i.e., no kinked or pinched cable, no twisted or inflexible chain); and links are not painted or coated with dust or grease.

   (l) Inspection shall include an operational test for automatic closing doors to verify that the assembly will close under fire conditions. Assembly shall be reset after a successful test.

(m) Door openings and the surrounding areas shall be kept clear of anything that could obstruct or interfere with the free operation of the door. In addition, blocking or wedging of doors in the open position shall be prohibited.

(n) Doors normally held in the open position and equipped with automatic-closing devices shall be operated at frequent intervals to ensure operation.

2. Fire Dampers.

(a) Dampers should be tested and inspected one year after installation. The test and inspection frequency should then be every four years.

(b) Full unobstructed access to the fire or combination fire/ smoke damper should be verified and corrected as required.

(c) If the damper is equipped with a fusible link, the link should be removed for testing to ensure full closure and lock-in place if so equipped. The fusible link shall be reinstalled after testing is complete. If the link is damaged or painted, it should be replaced with a link of the same size, temperature, and load rating.

(d) The operational test of the damper should verify that there is no damper interference due to rusted, bent, misaligned, or damaged frame or blades, or defective hinges or other moving parts. The damper frame should not be penetrated by any foreign objects that would affect fire damper operations.

(e) The damper should not be blocked from closure in any way.

3. Fire Walls, Ceilings, and Floor Barriers. All through-penetration protection systems should be tested and rated in accordance with ASTM E 814, “Standard Test Method for Fire Tests of Through-Penetration Fire Stops”, or ANSI/UL 1479, “Fire Test of Through Penetration Fire Stops.”

During walkdown of fire walls, the inspector should verify that the aggregate width of openings in each floor level does not exceed 25 percent of the wall length. The inspector should review installation or repair records to determine whether or not material of an appropriate fire rating (equal to the overall rating of the barrier itself) has been used to fill openings and penetrations and that the installation meets the fire hazard analysis and/or qualification test specifications.

g. Active Fire Protection. The inspector should walk down systems, review ITM records, and procedures to determine whether or not an adequate program

remains in place.

1. Water Based Fire Suppression System. The licensee's or certificate holder's ITM program should ensure that:

   (a) Sprinklers do not show signs of leakage; are free of corrosion, foreign materials, paint, and physical damage; and are installed in the proper orientation (e.g., upright, pendent, or sidewall).

   (b) There is a minimum clearance distance of 18 inches from the sprinkler head to ensure adequate spray pattern development.

   (c) Pipe and fittings are in good condition and free of mechanical damage, leakage, corrosion, and misalignment.

   (d) Hangers and seismic braces are not damaged or loose.

   (e) Gauges on wet pipe sprinkler systems are in good condition and that normal water supply pressure is being maintained. Gauges on dry, preaction, and deluge systems are in good condition to ensure that normal air and water pressures are being maintained.

   (f) Water flow alarms are functional.

   (g) There is not a major reduction in water flow to the system, such as could be caused by a major obstruction, a dropped gate, a valve that is almost fully closed, or a check valve clapper stuck to the valve seat.

   (h) System control valves are secured by means of a seal or a lock or electrically supervised.

   (i) The fire water supply and pumping capability is operable and capable of supplying the designed water supply demand for the system.

   (j) Functionality of the system during freezing weather.

2. Gaseous Fire Suppression System. The licensee's or certificate holder's ITM program should ensure that:

   (a) Discharge nozzles are free of corrosion, foreign materials, paint, obstruction, and physical damage; and are installed in the proper orientation such that gas dispersal could be significantly impacted.

   (b) Suppression agent charge pressure is within the normal band as required by the design basis, extinguishing agent control system actuation supply valves are open, extinguishing agent main supply

valves are open, and the system is in the appropriate standby mode.

(c) Suppression agent storage containers are free of corrosion and the containers are properly fastened and secured.

(d) For total flooding systems, the room enclosure's ability to maintain gas concentration is not degraded (e.g., worn-out fire door weather stripping, minimal penetration seal degradation — minor cracks, no ventilation system isolation, removed or missing dampers), or more leakage paths than originally tested.

3. Fire Detection System. The licensee's or certificate holder's ITM program should ensure that:

(a) The main power supply is capable of supporting the design current load during fire conditions. In addition, the secondary power supply should be able to support the full current load of the fire alarm system if the primary supply is lost.

(b) Batteries are fully charged and free of any terminal corrosion, looseness in terminals connections, or electrolyte leakage. This condition could cause an increase in the series resistance of the battery set, thus depriving the fire alarm system of the necessary operating potential under large current loads.

(c) Initiating devices (i.e., heat, smoke, and beam detectors) are able to sense the condition for which they were designed. For example, a smoke detector attains the alarm state at the smoke concentration for which the detector was listed. In the case of manual fire alarm pull stations, the actuation of the device should trigger the fire alarm.

(d) Heat detectors are free of any extraneous insulating material (i.e., paint) that could retard or prevent response.

(e) Smoke detectors are free of any condition (i.e obstruction) that could prevent smoke from enter the sensing chamber of the detector.

(f) All fire detection circuits are electronically supervised to provide indication (trouble alarm) of any identified faulted condition.

(g) All functions of the fire alarm system are operational. These functions include supervision of all signaling line circuits, initiating devices circuits, notification appliances circuits, and signal transmission circuits.

4. Protection From Damage From Fire Suppression Activities. No specific

guidance.

5. Undesired Consequences. No specific guidance provided.

6. Environmental Issues and Water Based Suppression Systems. Facilities used for the storage and dispensing of flammable and combustible liquids should have installed a containment system to catch any hazardous effluent as a result of the system activation and water runoff. When the sprinkler system activates, there is the possibility that the water mixes with the hazardous substance in the facility and if unchecked can flow into nearby bodies of water or soak into nearby soil, threatening drinking water, etc. Depending on the type of fire, the run-off may be seriously contaminated, and threaten nearby areas.

   The problem of backflow to the city water source that the suppression system draws its water from is also an issue. Pollutants can pass from the system to the water supply through the normal backflow permitted by check valves. The pollutants come from the water pumped into the system through the fire department connection. If non-potable water (for example chemically-treated water) used in the system backflows into the drinking water supply there could be negative environmental and health effects on the surrounding area.

   Another area of concern is when water, which has been sitting for years in a system and may contain microbes and corrosion products backflow into the public water supply. This is a health concern in that the stagnant water could cause illness if consumed. To safeguard this from happening, the system should have backflow preventers on suppression systems. This keeps the water in the system from going back into the public water supply.

   Another issue is chemical used in the systems such as antifreeze solution. Antifreeze solutions are water solutions of ethylene glycol, diethylene glycol, glycerine, or propylene glycol. Most of them are hazardous to the environment and human health. When the system activates, the water mixed with hazardous chemicals in antifreeze solution can flow into the sewer system or to a water source (i.e. river), if no proper containment systems is provided. This can cause water pollution. It also can create land pollution if run-off flows into nearby soil. It might backflow into the water supply system and present a serious issue.

   Mold may result from water-based fire protection equipment if not properly maintained. Mold can grow inside system piping and, once discharged these microbes can cause environmental and health problems. If furniture and other items exposed to the water dousing are not dried properly, mold and bacteria can fester and grow, especially in porous materials such as flooring materials.

3.03 Communications. Assess the capability of the communication systems to support the operators in the conduct and coordination of their required actions (e.g., consider ambient noise levels, clarity of reception, reliability, and coverage patterns). If specific issues arise relating to fire brigade and incident commander communications adequacy, then, observe that a licensee or certificate holder conducted communications tests in the subject plant area or areas using a realistic scenario such as during audible alarm conditions. Review the battery use characteristics and duration for the fire brigade radios and verify that the batteries are at least one hour rated (full charge) for "talk" and "receive" use. (If not the radio batteries may be under-rated for use for normal fire brigade response (nominal 20 minutes response time to place an effective fire suppression agent on simulated fires) and during a severe long-duration event.)

03.04 Emergency Lighting. Review emergency lighting provided, either in fixed or portable form, to determine whether the material condition of the equipment is being maintained and that any changes are appropriately reviewed with respect to the consequences of the change. Determine if battery-powered backup lighting units (ELUs) are provided at the fire brigade storage locations and response assembly areas and whether that lighting is adequate to support fire brigade assembly and dress-out operations.

03.05 Fire Brigade Training and Offsite Fire Support Orientation. The inspector should determine if the organization, training, qualifications, and equipment of the fire brigade is adequate to respond to the credible fire scenarios identified in the Radiological Contingency Emergency Plan, with assistance from offsite fire departments.

NFPA 600, Standard on Industrial Fire Brigades, and NFPA 1081, Standard for Industrial Fire Brigade Member Professional Qualifications describes the requirements for the organization, training, and personal protective equipment (PPE) of fire brigades whenever they are established by the employer. NFPA 600 and 1081 should be used for guidance.

All members of the fire brigade should receive adequate training. The inspector should review documentation of the meetings held, subjects taught, examinations given, and names of the attendees. The training should include:

a. Use of thermal protective clothing during firefighting operations, given thermal protective clothing, so that the clothing is correctly donned, worn, and doffed.

b. Use of self contained breathing apparatus (SCBA).

c. Implementation of the site-specific Pre-Fire plan.

d. Manual fire suppression activities.

e. Forced entry into a structure or confined space.

f. Overhaul of a fire scene, so that structural integrity is not compromised, all hidden

fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

g. Exit of a hazardous area.

h. Establishment of a water supply for fire-fighting operations.

i. Interface with offsite fire departments

j. Emergency medical care.

k. Search and rescue operations.

l. Fire fighting techniques for different hazards that might be present at the facility.

m. Participation in a drill at least semiannually.

n. Live fire training should be conducted at least annually. Live fire training shall include props that are representative of and that simulate as closely as possible the hazards and conditions that could be encountered by the industrial fire brigade member.

03.06 Identification and Resolution of Problems. Review the results of fire protection internal audits and external reviews by organizations such as insurance companies. Review selective corrective actions from fire brigade drill critiques. Determine whether corrective actions are being adequately prioritized and completed in a timely manner.

88054-04 INSPECTION RESOURCES

Approximately 68 hours of actual inspection time will be required to perform this procedure. The normal frequency of inspection is triennial.

88054-05 REFERENCES

05.01 National Fire Protection Association (NFPA) Codes.

NFPA 10, “Portable Fire Extinguishers.”

NFPA 11, “Low Expansion Foam and Combined Agent Systems.”

NFPA 11A, “Medium- and High-Expansion Foam Systems.”

NFPA 12, “Carbon Dioxide Extinguishing Systems.”

NFPA 12A, “Halon 1301 Fire Extinguishing Systems.”

NFPA 12B, “Halon 1211 Fire Extinguishing Systems.”

NFPA 13, “Sprinkler Systems.”

NFPA 14, “Standpipe and Hose Systems.”

NFPA 15, “Water Spray Fixed Systems for Fire Protection.”

NFPA 16, “Deluge Foam-Water Sprinkler and Foam-Water Spray Systems.”

NFPA 20, “Centrifugal Fire Pumps.”

NFPA 24, “Private Fire Service Mains and Their Appurtenances.”

NFPA 30, “Flammable and Combustible Liquids Code.”

NFPA 31, “Oil Burning Equipment.”

NFPA 37, “Stationary Combustion Engines and Gas Turbines.”

NFPA 45, “Laboratories Using Chemicals.”

NFPA 50, “Bulk Oxygen Systems at Consumer Sites.”

NFPA 50B, “Liquified Hydrogen Systems at Consumer Sites.”

NFPA 51B, “Fire Prevention in Use of Cutting and Welding Processes.”

NFPA 54, “ANSI Z223.1-1984, National Fuel Gas Code.”

NFPA 69, “Explosion Prevention Systems.”

NFPA 70, “National Electrical Code.”

NFPA 70B, “Electrical Equipment Maintenance.”

NFPA 70E, “Electrical Safety Requirements for Employee Workplaces.”

NFPA 72D, “Proprietary Protective Signaling Systems.”

NFPA 72E, “Automatic Fire Detectors.”

NFPA 75, “Electronic Computer/Data Processing Equipment.”

NFPA 77, “Static Electricity.”

NFPA 78, “Lightning Protection Code.”

NFPA 79, “Industrial Machinery.”

NFPA 80, “Fire Doors and Windows.”

NFPA 80A, “Protection of Buildings from Exterior Fire Exposures.”

NFPA 85D, “Fuel Oil-Fired Multiple Burner Boiler-Furnaces.”

NFPA 86C, “Industrial Furnaces Using a Special Processing Atmosphere.”

NFPA 90A, “Air Conditioning and Ventilating Systems.”

NFPA 90B, “Warm Air Heating and Air Conditioning Systems.”

NFPA 101, “Life Safety Code.”

NFPA 204M, “Smoke and Heat Venting.”

NFPA 220, “Types of Building Construction.”

NFPA 251, “Fire Tests of Building Construction and Materials.”

NFPA 321, “Basic Classification of Flammable and Combustible Liquids.”

NFPA 482, “Production, Processing, Handling and Storage of Zirconium.”

NFPA 600, “Private Fire Brigades.”

NFPA 801, “Facilities Handling Radioactive Materials.”

NFPA 803, “Light Water-Cooled Nuclear Reactors.”

05.02 U.S. Nuclear Regulatory Commission Documents.

U.S. Nuclear Regulatory Commission, “Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities,” NUREG 0762, Rev. 1, November 1987.

U.S. Nuclear Regulatory Commission, Standard Review Plan 9.5.1, “Guidelines for Fire Protection for Nuclear Power Plants,” NUREG 0800, Rev. 2, July 1981.

U.S. Nuclear Regulatory Commission, “Guidance on Management Controls/Quality Assurance, Requirements for Operation, Chemical Safety, and Fire Protection for Fuel Cycle Facilities,” Federal Register, Vol, 54, No. 53, March 1989.

05.03 Other Documents.

American National Standards Institute, N665-1985, “Facilities for Fabricating Fuel for Light Water Reactors (LWR) - Fire Protection.”

American National Standards Institute/American Society of Heating, Refrigeration, and Air Conditioning Engineers, ANSI/ASHRAE 15, “Safety Code for Mechanical Refrigeration.”

American Society for Testing and Materials, ASTM E-84, “Surface Burning Characteristics of Building Materials,” 1976.

American Society for Testing and Materials, ASTM E-119, “Fire Test of Building Construction and Materials,” 1976.

Factory Mutual System Approval Guide, “Equipment, Materials, Services for Conservation of Property.”

National Fire Protection Association, Fire Protection Handbook.

Underwriters Laboratories Standard UL 555, “Standard for Fire Dampers and Ceiling Dampers.”

Underwriters Laboratories Standard UL 586, (ANSI B 132.1), “High-Efficiency Air Filtration Units.”

Underwriters Laboratories, Building Materials Directory.

END

ATTACHMENT 1
Revision History for IP 88054

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	09/11/08 CN 08-026	Researched commitments for 4 years and found none. IP 88054 has been issued because of the need for a new Inspection Procedure for the Fire Protection Program.	No	N/A	ML082330199

INSPECTION PROCEDURE 88055

FIRE PROTECTION (ANNUAL)

PROGRAM APPLICABILITY: 2600

88055-01 INSPECTION OBJECTIVES

01.01 The objectives of this procedure are to evaluate the operational status and material condition of the licensee or certificate holder's fire protection systems to determine whether the following are adequate:

a. Effectiveness of controls for combustibles and ignition sources within the plant;

b. Operability of fire detection and suppression equipment and systems;

c. The material condition of passive fire protection features; and

d. Effectiveness of compensatory measures in place for out-of-service, degraded or inoperable fire protection equipment, systems or features.

01.02 To assess the performance of the fire brigade.

88055-02 INSPECTION REQUIREMENTS

Selection of Fire Protection Features to be Reviewed. Fire protection requirements for license or certificate holders vary greatly because of the significant differences in operations at fuel cycle facilities and thus any safety or security impact from fire. As a result, the inspector should, as part of inspection preparation, review fire protection program documentation specific for the licensee or certificate holder to be inspected. This review should include a review of changes to the program since the last inspection. Specific requirements are documented in the regulations, the license or certificate, the Safety Analysis Report (SAR), the Integrated Safety Analysis (ISA), and licensee or certificate holder policies and procedures.

02.01 Program Implementation. The inspector will tour plant areas containing safety controls and items relied on for safety (IROFS) (for Part 70 licensees) (not necessarily limited to the top few contributors to overall plant fire risk) to assess the material condition of active and passive fire protection equipment, systems, and features and their operational lineup and readiness. For the areas selected, as applicable, evaluate the following:

a. Control of Transient Combustibles and Ignition Sources. Determine whether:

1. Transient combustible materials are being controlled in accordance with the licensee or certificate holder's procedures.

2. Hot work, welding, or cutting is being done in accordance with the licensee or certificate holder's procedures.

3. The facility work planning process organization has specific familiarity of locations where changes in plant conditions have occurred that require fire protection compensatory measures to be put in place (e.g., for inoperability of fire detection or suppression systems) to allow adjustments in planned work to minimize the introduction of combustibles or ignition sources (that could increase the likelihood of a fire or increase fire severity) into plant areas where degraded fire protection features or systems exist.

4. The work planning organization and associated work control process accepts responsibility for storage and handling of pre-staged work materials, including flammable and hazardous materials that are included in the pre-stage request.

5. Designated flammable/combustible liquid storage areas and floor drain systems in selected plant areas could affect plant safety controls and IROFS.

6. Flammable/combustible liquid spills, leakage or explosions associated with oil storage areas, large oil-filled transformers or batteries in or adjacent to the areas selected for inspection could affect safe operation of the facility.

b. Fire Detection Systems. Determine whether the physical condition of the fire detection devices is adequate and note any that show physical damage, blockage, or potential interference with functionality (see Subsection 02.01.g).

c. Water-based Fire Suppression Systems. Determine whether:

1. Sprinkler heads and nozzles are not obstructed by major overhead equipment (e.g., ventilation ducts).

2. Water supply control valves to the system are open and the fire water supply and pumping capability is operable and capable of supplying the water supply demand of the system. (Verify through visual observation or surveillance record.)

3. Material conditions such as mechanical damage, painted sprinkler heads, corrosion, etc., will not affect performance of the system.

d. Gaseous Fire Suppression Systems. Determine whether:

1. Gaseous suppression system (e.g., Halon or carbon dioxide (CO_2)) nozzles are obstructed or blocked by plant equipment such that gas dispersal would be significantly impeded.

2. Suppression agent charge pressure is within the normal band, extinguishing agent supply valves are open, and the system is in the appropriate mode.

3. Fire damper doors, where applicable, are unobstructed so that they will be permitted to close automatically upon actuation of the gaseous system.

4. Fire barrier penetration seals, where applicable, are sealed and in good condition.

5. Material conditions such as mechanical damage, corrosion, damage to doors or dampers, open penetrations, or nozzles blocked by plant equipment that may affect performance of the system are adequate.

e. Manual Firefighting Equipment and Capability. Determine whether:

1. Portable fire extinguishers are provided at their designated locations in or near the area being inspected, and access to the fire extinguishers is unobstructed by plant equipment or other work related activities.

2. The general condition of fire extinguishers is satisfactory (e.g., pressure gauge reads in the acceptable range, nozzles are clear and unobstructed, charge test records indicate testing within the normal periodicity).

3. Fire hoses are installed at their designated locations and the general condition of hoses and hose stations is satisfactory (e.g., no holes in or chafing of the hose, nozzle not mechanically damaged and not obstructed, valve hand wheels in place and operable).

4. The fire hoses are installed at their designated locations. The attached 100 feet of fire hose (plus the 30 feet for water stream) cover the complete area including the overhead. Verify that the hose is properly connected to the standpipe hose connection and is properly placed on the hose rack. Verify that the shutoff valve is closed, hand wheel is in place, and valve is not leaking (e. g., compress the first hose section from hose connection to rack for signs of water in the hose).

5. There is a properly calibrated/adjusted pressure reduction device, if installed (25 percent or less calibration/adjustment error).

6. Any fire hoses in the hose rack are damaged. Verify that the exterior of the hose jacket is dry with no signs of excessive dirt, debris, cuts, abrasions, or other obvious damage.

7. The hose rack swings freely. Verify that hose rack, hose station piping, and supports in the general area have no excessive rust and corrosion.

8. Damaged, missing, clogged, or incorrect nozzles (non Underwriters Laboratories/Factory Mutual (UL/FM) electric safe nozzles) are attached to

the system.

9. Water supply control valves to the standpipe system are open and the fire water supply and pumping capability is operable and capable of supplying the water flow and pressure demand.

10. Access to the hose stations is unobstructed by plant equipment or work-related activities.

f. Passive Fire Protection Features. Determine whether:

1. Blanket material for electrical raceway fire barriers in systems required to provide necessary power for safety controls or IROFS, such as cable tray fire wraps for cables, are in good condition with no cracks, gouges, or holes in the barrier material, and no gaps in the material at joints or seams, and that banding, wire tie, and other fastener pattern and spacing appears appropriate.

2. Fire doors close without dragging or sticking (e.g., due to fire door damage from previous obstructions), and that the door latching hardware engages and functions securely.

3. Material conditions of ventilation system fire dampers including fusible links, where applicable, ensure unobstructed operability. For those dampers which can not be readily observed in the selected plant areas, review the licensee or certificate holder's surveillance efforts directed towards verifying the continuing operability of ventilation fire dampers.

4. Structural steel fire proofing, such as fibrous or concrete encapsulation, is installed in such a way that the structural steel is uniformly covered (no bare areas).

5. Fire barrier and electrical and piping penetration seals are not missing from locations in which they appear to be needed to complete a fire barrier wall, floor, or ceiling and seals appear to be properly installed and in good condition.

6. Oil collection systems designed to collect oil leakage and spray have been installed and properly maintained.

g. Compensatory Measures. Determine whether:

1. Compensatory measures are put in place by the licensee or certificate holder for out-of-service, degraded or inoperable required fire protection equipment, systems or features (e.g., detection and suppression systems and equipment, passive fire barrier features, etc.).

2. Compensatory measures are adequate to provide at least the same reduction in fire risk (considering the out of service time) as the fire protection

item(s) being compensated for.

3. Licensee or certificate holder's plans for permanent corrective actions, including effectiveness in returning the equipment to service in a reasonable period of time, are adequate.

02.02 Annual Inspection.[1] During the annual observation of a fire brigade drill in a plant area important to safety, evaluate the readiness of the licensee or certificate holder's personnel to prevent and fight fires, including the following aspects:

a. Protective clothing/turnout gear is properly donned.

b. Self-contained breathing apparatus (SCBA) equipment is properly worn and used.

c. Fire hose lines are capable of reaching all necessary fire hazard locations, the lines are laid out without flow constrictions, the hose is simulated being charged with water, and the nozzle is pattern (flow stream) tested prior to entering the fire area of concern.

d. The fire area of concern is entered in a controlled manner (e.g., fire brigade members stay low to the floor and feel the door for heat prior to entry into the fire area of concern).

e. Sufficient fire fighting equipment is brought to the scene by the fire brigade to properly perform their firefighting duties.

f. The fire brigade leader's fire fighting directions are thorough, clear, and effective.

g. Radio communications with the plant operators and between fire brigade members are efficient and effective.

h. Members of the fire brigade check for fire victims and propagation into other plant areas.

i. Effective smoke removal operations were simulated.

j. The fire fighting pre-plan strategies were used.

k. The licensee or certificate holder's pre-planned drill scenario was followed, and the drill objectives acceptance criteria were met.

02.03 Identification and Resolution of Problems. Determine whether the licensee or certificate holder is identifying safety control or IROFS fire protection operability problems at an appropriate threshold and entering them into the corrective action program. Determine, for selected licensee or certificate holder identified items, whether effective corrective actions have been taken to ensure the operability of fire protection systems.

1This inspection will be performed by resident inspectors at sites with resident inspectors, otherwise by regional inspectors.

88055-03 INSPECTION GUIDANCE

General Guidance. The inspector should note the material condition and operational status (rather than the design) of fire detection and suppression systems and fire barriers used to prevent fire damage or fire propagation.

For those fire protection structures, systems, and components installed to satisfy U.S. Nuclear Regulatory Commission (NRC) requirements designed to National Fire Protection Association (NFPA) codes and standards, the code edition in force at the time of the design and installation is the code of record to which the design is evaluated. Normally the license application identified the Code and date required of each licensee or certificate holder.

Deviations from the codes should be identified and justified in the license application or Fire Hazards Analysis (FHA). A licensee or certificate holder may apply the equivalency concept in meeting the provisions of the NFPA codes and standards. When the licensee or certificate holder states that its design "meets the NFPA code(s), " or "meets the intent of the NFPA code(s) " and does not identify any deviations from such codes, the NRC expects that the design conforms to the codes and the design is subject to inspection against the NFPA codes.

The "Authority Having Jurisdiction" as described in NFPA documents refers to the Director, Office of Nuclear Materials Safety and Safeguards (NMSS), NRC, or designee, consistent with the authority specified in 10 CFR 1.42.

Selection of Fire Protection Features to be Reviewed. The inspector should, as part of inspection preparation, review license, license condition, license application, or technical safety requirements (TSR) specific to the licensee or certificate holder to be inspected. In addition, in preparation for the inspection, the inspector should discuss with the project inspector and resident inspection staff, where applicable, any fire protection equipment availability or reliability problems (such as recurring failures or failures resulting in reportable events) the licensee or certificate holder has experienced since the last annual inspection. Select from this list the fire protection issues that could impact the more risk-significant operations to review during the inspection. In addition, once on site, the inspector should initially determine what hot work, welding, or cutting is scheduled to be performed by the licensee or certificate holder during the period of the inspection. From this, the inspector should select sample activities to observe during the inspection. The inspector should use the ISA Summary or other safety analysis to determine the risk-significant operations. Inform a licensee or certificate holder representative that you would like to be kept informed of any change in the schedule of this work to assure that an inspector observes them.

03.01 Program Implementation.

a. Control of Transient Combustibles and Ignition Sources. Metals such as uranium and zirconium, and their alloys, are known to be combustible, especially when in a finely divided form. Through interviews with personnel, review of maintenance and

operational logs, and observation of fire protection equipment as well as work in progress, determine that :

1. Machining Operations of Combustible Metals.

   (a) Machining operations in the facility such as sawing, grinding, machining, and abrasive cutting which have the potential for combustible dust cloud formation and combustible scrap and swarf accumulation, are adequately controlled. Fire protection measures for these metals are similar. NFPA 484, "Standard for Combustibles Metals," provides guidance.

   (b) No open flames are permitted in the areas where machining operations of combustible metals are performed. If maintenance operations, such as welding, are to be performed in the vicinity, machining operations should be halted, and metal scraps should be removed.

   (c) Machining operations on combustible metals are performed in enclosures with a dust-collection system in operation. The collected dust should be ducted to a dust collector and also a HEPA filter, if required, for removal of radioactive particles. The collection hood and duct leading to the filter should be designed to minimize deposition of the fines and to facilitate cleaning.

   (d) Scrap and swarf generated by machining operations and accumulated in the immediate area are swept as frequently as necessary and collected under water in covered metal containers. Such collections should be removed daily from the process areas. Dust and sludge collected in the dust separators and ducts should be removed as often as necessary.

   (e) Extinguishing agents suitable for the particular metal fire, as well as suitable scoops or applicators, are readily available to the operator performing the machining.

2. Incinerators.

   (a) Incinerators are separated from the remainder of the facility by fire barriers having a minimum 1-hour fire resistance rating.

   (b) The exhaust from an incinerator that is used to burn radioactive contaminated waste is ducted to a filtration system before release to the environment. The exhaust may also be ducted to the facility off-gas system.

3. Boilers and Boiler Furnaces.

   (a) Boilers for the supply of steam for process operation and boiler

furnaces are separated from the remainder of the facility by fire barriers having a minimum 1-hour fire resistance rating.

(b) The fuel storage tanks are separated from the furnace area by fire barriers having a minimum 1-hour fire resistance rating and the fuel lines are laid out to minimize possibility of damage.

4. Stationary Combustion Engines.

(a) Stationary combustion engines located in part of a structure housing fuel processes are in enclosures having a fire resistance rating of at least 1 hour.

(b) Fuel storage tanks, except for day tanks are located outside the room.

(c) The engine exhaust system will prevent ignition of any combustible material by contact with hot metal surfaces or by leaking exhaust gases or sparks.

5. Storage and Handling of Flammable and Combustible Liquids and Gases.

(a) Indoor storage of flammable and combustible liquids are only permitted in limited quantities in approved closed containers for the purpose of day-use (such as for diesel engine operation) and maintenance work.

(b) Appropriate portable fire extinguishers are available in the affected area.

b. Fire Detection Systems.

1. Operators receive visual and audible indication, either from a control room or at a central staffed location, that a fire detection system has been activated.

2. Operators receive indication of where the activated fire detection system is located.

3. Each fire detection panel receives power from two different sources.

4. All fire detection circuits are electronically supervised to provide indication (trouble alarm) of any identified faulted condition.

c. Water-based Fire Suppression Systems.

1. Operators receive visual and audible indication, either from a control room or at a central staffed location, that the water-based fire suppression system has been activated.

2. Operators receive indication of where the activated water-based fire

suppression system is located.

3. Operators have written procedures available to indicate what actions are required to manually place the water-based fire suppression systems into operation.

4. The operation of the water-based fire suppression system is not unacceptably impaired if the system is actuated by the fire detection system and the fire detection system is inoperable, reacts too slowly, or its critical detection attributes (See Subsection 02.01.b.) are degraded.

5. Water supply control valves to the system are open and the fire water supply and pumping capability is operable and capable of supplying the water supply demand of the system. (Verify through visual observation or surveillance record.)

6. The system provides adequate water spray/sprinkler coverage for the in situ hazard the system is protecting.

7. Sprinkler heads and nozzles are not missing, not the wrong type, or are not obstructed by major overhead equipment (e.g., ventilation ducts). A minimum of 18 inches of clear space below the sprinkler deflector shall be maintained.

8. Material conditions such as mechanical damage, painted sprinkler heads, corrosion, etc., will not affect performance of the system.

9. Adequate drainage is provided in areas protected by water suppression systems. Verify that a protected room or area has a proper floor drainage system (floor drains are not restricted with debris, plugged, or blanked off) in areas where either water-based fixed suppression systems and manual fire brigade hose streams are expected. Determine whether these fire suppression activities could impact operation of critical equipment safety controls (e.g., sprinkler-caused flooding of other safety controls).

10. Building modifications to the fire have not compromised the effectiveness of the suppression system.

11. Any modifications to the sprinkler system (i.e. additional sprinklers to cover an additional hazard) do not degrade the hydraulic performance of the original designed system. (Review hydraulic analysis of modification.)

d. Gaseous Fire Suppression Systems.

1. Operators receive visual and audible indication, either from a control room or at a central staffed location, that the gaseous fire suppression system has been activated.

2. Operators receive indication of where the activated gaseous fire suppression

system is located.

3. Operators have written procedures available to indicate what actions are required to manually place the gaseous fire suppression system into operation and know how to use them.

4. The system design ensures that if the gaseous fire suppression system is actuated by the fire detection system and the fire detection system is inoperable, reacts too slowly, or its critical detection attributes (See Subsection 02.01.b.) are degraded, compensatory actions are in place to ensure that the operation of the associated gaseous fire suppression system is not impaired.

5. Gaseous suppression system (e.g., Halon or CO2) nozzles are not missing, obstructed, or blocked by plant equipment such that gas dispersal would be significantly impeded.

6. Suppression agent charge pressure is within the normal band, extinguishing agent control system actuation supply valves are open, extinguishing agent main supply valves are open, and the system is in the appropriate standby mode.

7. Where applicable, dampers/doors are unobstructed so that they will be permitted to close automatically upon actuation of the gaseous system.

8. The room enclosure's ability to maintain gas concentration is not degraded (e.g., worn-out fire door weather stripping, minimal penetration seal degradation — minor cracks, no ventilation system isolation, removed or missing dampers), or more leakage paths than originally tested.

9. Material conditions such as mechanical damage, corrosion, damage to fire doors; electric thermal or pneumatic link actuators; fire dampers; or open penetrations, that may affect the performance of the system will not hinder safe operation of the plant.

e. Manual Firefighting Equipment and Capability. Yard fire hydrants and hydrant hose houses. Visually inspect the physical condition and structural integrity of each hydrant hose house listed in the licensee or certificate holder's fire protection program. Observe and visually verify that equipment required by the licensee or certificate holder's program procedures is present in each hydrant hose house and is in place and in proper working condition. Determine that:

1. Hoses have a hydrostatic test date which will not exceed one year.

2. Fire fighting foam containers have a shelf life date which has not be exceeded or expired.

3. Hoses do not have signs of damage or deterioration.

4. The fire hydrant and equipment stored with the Fire Fighting Foam is in proper working condition (i.e., visually inspect, operates smoothly, free of obstructions).

f. Passive Fire Protection Features.

1. Fireproofing.

(a) Evaluations and/or fire tests that were performed to verify that each type of fireproofing will maintain the integrity of structural members for the time specified have not been invalidated by plant changes. (See the UL Fire Resistance Directory.)

(b) Fire ratings of fireproofing systems are compatible with the anticipated fire duration and intensity. Verify through observation that no physical damage exists which affects the structural integrity of the fire proof material allowing a direct path for flame/hot gas travel to the protected component (i.e., loose or sagging fire proof material wrap, water damage, loose bands, etc.).

2. Fire Doors.

(a) Evaluations and/or fire tests were performed to verify that each type of fire door will maintain the integrity of structural members for the time specified. (See the UL Fire Resistance Directory.)

(b) Fire doors and frames are UL labeled and the label fire ratings of door assemblies are compatible with the fire ratings of their associated fire barriers.

(c) Fire doors close freely and door latch hardware engages and latches securely. [Generally, for the metal doors encountered during inspections, a 3 hour door needs a 5/8 inch latch throw and a 1 hour door needs 1/2 inch." (Refer to NFPA 80 if an issue arises)].

(d) The fire door frame and door to floor clearance gaps are not excessive (they exceed the criteria of NFPA 80).

3. Ventilation Fire Dampers.

(a) Accessible fire dampers are UL labeled and the label fire ratings of dampers are compatible with the fire ratings of their associated fire barriers.

(b) The fire damper has no obvious signs of damage by visual verification. Verify through observation that the fire damper fusible link is properly installed and the fire damper has no obstruction which would prevent closure.

(c) The fire damper has no buildup of dirt, dust, oil, rust, or other items on the track or coiled springs that would interfere with proper operation.

4. Penetration Seals. Fire ratings for accessible fire penetration seals should be compatible with the fire ratings of their associated fire barriers. Visually inspect the physical condition and structural integrity of each penetration within a fire wall, floor, or ceiling for the following. Verify by observation that:

(a) The penetration has a seal installed and there is NO passage of light or air movement through the sealant.

(b) The foamed penetration seal surface has no cracks greater then 1/8 inch in width in the functional portion of the sealant.

(c) The foamed penetration seal surface has no holes greater then 1 inch in depth in the functional portion of the sealant.

(d) There are no tears or rips in the functional portion of the sealant. Cables pulled away from the seal do not result in cracks >1/8 inch in width, holes > 1 inch in depth or tears or rips in the functional portion of the sealant.

(e) There are no open (unsealed) conduits or open pipes protruding through the seal and terminating on either side of the fire barrier.

(f) The damming boards, when installed, such as Carborundum, Duraboard, Durablanket, or Masonite board are an integral part of the seal. Verify that the damming boards and seams or TSI material is undamaged and in its originally installed condition.

5. Electrical Raceway Fire Barrier Systems (ERFBS). Determine by observation that ERFBS required to provide necessary power for safety controls or IROFS, such as cable tray fire wraps for cables and blanket material are in good condition. Visually inspect the physical condition and structural integrity of each ERFBS for the following:

(a) Wrap materials are continuous and attached securely in place, particularly check that material joints or seams are not separated from attachments or have gaps at the fire wall structure.

(b) No exposed metal which might act as an thermal short-circuit from structural supports (i.e., all attachment supports, stud bolts, nuts, and washers are properly covered with the fireproofing material).

(c) Banding, wire tie, and other fastener pattern and spacing appears appropriate.

(d) No breaks, tears, cracks, or holes.

(e) No crumbling of material.

(f) No water damage.

(g) No sagging.

(h) No blisters or bubbles.

6. Oil Spill, Leakage and Containment/Collection Systems. Oil leakage and containment/collection systems are fire protection features designed to collect oil leakage, spills, and spray from equipment and/or storage tanks that contain flammable or combustible liquids (See NFPA 30, "Flammable and Combustible Liquids Code"). Visually inspect the physical condition and structural integrity of each oil leakage and containment/collection system for the following:

(a) The oil leakage and containment/collection system has sufficient containment volume for the largest container allowed to prevent overflow from endangering important structures, facilities, or safety systems.

(b) The containment/collection containment dike is liquid-tight.

(c) Any piping passing through the dike walls have closed isolation block valves installed. Verify that the valve(s) access under fire conditions is permitted without entering the diked area. Where provision is made for draining water from diked areas, the drains should be controlled to prevent combustible liquids from entering areas where they would constitute a hazard to important structures, facilities, or safety systems.

g. Compensatory Measures. Each echelon of fire protection defense in depth (i.e., prevent fires, detect and suppress fires, and the design of safety systems to limit fire damage), should meet certain minimum requirements; however, strengthening any one can compensate in some measure for weaknesses, known or unknown, in others. In some cases, reductions in defense in depth can be immediately corrected. For example, combustibles can be removed if found in a combustible free zone. In other cases, more time is needed to correct the problem (e.g., repair an inoperable fire detection system or install a missing fire barrier). In still other cases, fire protection features are purposefully removed from service (e.g., a fire barrier penetration seal may be removed to allow a new cable run). When immediate corrective actions cannot be taken, compensatory measures are implemented to mitigate the increased fire risk created by the degraded, inoperable, or nonconforming condition until permanent corrective actions can be implemented. The use of compensatory measures, on a short term basis, is an integral part of licensee's or certificate holder's fire protection programs. In most cases, such measures can effectively compensate for the reduction in fire protection defense-in-depth until the operability of the degraded or inoperable fire protection feature can be restored or the nonconformance can be corrected. For

typical fire protection system deficiencies (e.g., inoperable fire detection and suppression systems) the plant administrative procedures should specify the appropriate compensatory measures. Fire watches are the most common form of compensatory measure for typical fire protection system deficiencies. Fire watches are personnel trained to inspect for the control of ignition sources, fire hazards, and combustible materials; to look for signs of incipient fires; to provide prompt notification of fire hazards and fires; and, in some cases, to take actions to begin fire suppression activities. The primary purpose of the fire watch is to look for fire hazards and other conditions that could lead to a fire. Therefore, the fire watch strengthens the first echelon of fire protection defense in depth (fire prevention) by compensating for the weakness introduced by the inoperable, degraded, or nonconforming condition. Fire watches may also detect fires, call out the fire brigade, give exact information regarding the nature and location of the fire to the fire brigade, and initiate fire suppression activities for incipient stage fires. These actions all strengthen the second echelon of fire protection defense in depth (fire detection and suppression). (Whether or not a fire watch engages in incipient stage fire fighting activities is based on the individuals' training and procedures.)

1. For identified impaired fire protection features, assure that compensatory actions (usually a posted fire watch) are established and continue until such time that the component is restored.

2. Ensure that the duties of posted compensatory action fire watchers are adequate and fire watch rounds are completed within specified procedural time frames.

03.02 Annual Inspection of the Fire Brigade Drill.[2] If the drill is not scheduled to take place during the inspection, the inspection requirement may be accomplished by interviewing Fire Brigade members to determine the actions they would take in the event of a fire response. Different fire scenarios should be provided to determine the extent of Fire Brigade training.

03.03 Identification and Resolution of Problems. No specific guidance provided.

88055-04 INSPECTION RESOURCES

Approximately 28 hours of actual inspection time will be required to perform this procedure. The normal frequency of inspection is annual.

88055-05 REFERENCES

National Fire Protection Association (NFPA) Codes.

[2]This inspection will be performed by resident inspectors at sites with resident inspectors, otherwise by regional inspectors.

NFPA 10, "Portable Fire Extinguishers"

NFPA 11, "Low Expansion Foam and Combined Agent Systems"

NFPA 11A, "Medium- and High-Expansion Foam Systems"

NFPA 12, "Carbon Dioxide Extinguishing Systems"

NFPA 12A, "Halon 1301 Fire Extinguishing Systems"

NFPA 12B, "Halon 1211 Fire Extinguishing Systems"

NFPA 13, "Sprinkler Systems"

NFPA 14, "Standpipe and Hose Systems"

NFPA 15, "Water Spray Fixed Systems for Fire Protection"

NFPA 16, "Deluge Foam-Water Sprinkler and Foam-Water Spray Systems"

NFPA 20, "Centrifugal Fire Pumps"

NFPA 24, "Private Fire Service Mains and Their Appurtenances"

NFPA 30, "Flammable and Combustible Liquids Code"

NFPA 31, "Oil Burning Equipment"

NFPA 37, "Stationary Combustion Engines and Gas Turbines"

NFPA 45, "Laboratories Using Chemicals"

NFPA 50, "Bulk Oxygen Systems at Consumer Sites"

NFPA 50B, "Liquified Hydrogen Systems at Consumer Sites"

NFPA 51B, "Fire Prevention in Use of Cutting and Welding Processes"

NFPA 54, "ANSI Z223.1-1984, National Fuel Gas Code"

NFPA 69, "Explosion Prevention Systems"

NFPA 70, "National Electrical Code"

NFPA 70B, "Electrical Equipment Maintenance"

NFPA 70E, "Electrical Safety Requirements for Employee Workplaces"

NFPA 72D, "Proprietary Protective Signaling Systems"

NFPA 72E, "Automatic Fire Detectors"

NFPA 75, "Electronic Computer/Data Processing Equipment"

NFPA 77, "Static Electricity"

NFPA 78, "Lightning Protection Code"

NFPA 79, "Industrial Machinery"

NFPA 80, "Fire Doors and Windows"

NFPA 80A, "Protection of Buildings from Exterior Fire Exposures"

NFPA 85D, "Fuel Oil-Fired Multiple Burner Boiler-Furnaces"

NFPA 86C, "Industrial Furnaces Using a Special Processing Atmosphere"

NFPA 90A, "Air Conditioning and Ventilating Systems"

NFPA 90B, "Warm Air Heating and Air Conditioning Systems"

NFPA 101, "Life Safety Code"

NFPA 204M, "Smoke and Heat Venting"

NFPA 220, "Types of Building Construction"

NFPA 251, "Fire Tests of Building Construction and Materials"

NFPA 321, "Basic Classification of Flammable and Combustible Liquids"

NFPA 482, "Production, Processing, Handling and Storage of Zirconium"

NFPA 600, "Private Fire Brigades"

NFPA 801, "Facilities Handling Radioactive Materials"

NFPA 803, "Light Water-Cooled Nuclear Reactors"

05.02 U.S. Nuclear Regulatory Commission Documents.

NUREG 0762, "Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities," Rev. 1, November 1987

NUREG 0800, Standard Review Plan 9.5.1, "Guidelines for Fire Protection for Nuclear Power Plants," Rev. 2, July 1981

Draft Regulatory Guide No. DG 3006, "Standard Format and Content for Fire Protection Sections of License Applications for Fuel Cycle Facilities," September 1990

Federal Register, "Guidance on Management Controls/Quality Assurance, Requirements for Operation, Chemical Safety, and Fire Protection for Fuel Cycle Facilities," Vol. 54, No. 53, March 1989

American National Standards Institute, N665-1985, "Facilities for Fabricating Fuel for Light Water Reactors (LWR) - Fire Protection"

American National Standards Institute/American Society of Heating, Refrigeration, and Air Conditioning Engineers, ANSI/ASHRAE 15, "Safety Code for Mechanical Refrigeration"

American Society for Testing and Materials, ASTM E-84, "Surface Burning Characteristics of Building Materials," 1976

American Society for Testing and Materials, ASTM E-119, "Fire Test of Building Construction and Materials," 1976

Factory Mutual System Approval Guide, "Equipment, Materials, Services for Conservation of Property"

National Fire Protection Association, Fire Protection Handbook

Underwriters Laboratories Standard UL 555, "Standard for Fire Dampers and Ceiling Dampers"

Underwriters Laboratories Standard UL 586, (ANSI B 132.1), "High-Efficiency Air Filtration Units"

Underwriters Laboratories, Building Materials Directory

END

ATTACHMENT 1

Revision History for IP 88055

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	09/05/06 CN 06-020	This document has been revised to: (1) emphasize the risk-informed, performance-based approach to inspection, (2) impose changes to the core inspection program based on operating experience, and (3) remove completed or obsolete MCs and incorporate other fuel cycle MCs into a central location.	None	N/A	ML061790337
N/A	08/19/08 CN 08-024	This document has been revised to add more guidance into the Compensatory Measures and Annual Inspection of the Fire Brigade Drill sections.	None	N/A	ML080880471