

Self Inspection Program

HSB  Global Standards
Professional Loss Control

INSPECTION AND TESTING OF FIRE PROTECTION SYSTEMS

Introduction

Engineered fire protection systems are a vital factor in the reduction of potential large fire losses at all properties. Statistical evidence of suppression by properly designed and maintained fire protection equipment has proven these systems to be effective. Unfortunately, reports of uncontrolled large fire losses stemming from fire protection equipment malfunction continue due to insufficient inspection and testing. Some of the recurring problems we continue to experience from inspection deficiencies include:

- undetected closure of sprinkler system control valves
- inoperative fire pumps
- empty water supply tanks
- malfunctioning special suppression equipment
- inoperative or blocked fire doors
- inoperative detection systems
- inoperative alarms
- inoperative sprinkler control valves

Plant management must take an aggressive approach in establishing a program for periodic inspection, testing, and maintenance of fire protection equipment in an effort to maintain fire systems operational reliability. An intelligent person would not entrust their safety to an airline that failed to conduct adequate safety and equipment inspections. Similarly, management should address their own need for a documented fire protection self-inspection program as part of ongoing efficient plant operations.

Corporate management should establish a policy calling for a self-inspection program at every location. HSB Professional Loss Control has established self-inspection guidelines which should serve as a minimum standard. HSB Professional Loss Control inspection forms can be used for documentation or as a guide for the insured to develop their own. HSB Professional Loss Control representatives will cooperate with plant personnel in establishing a customized program which will meet the needs of both the insured and insurer.

The following "Self-Inspection Quick Reference Table" is intended to provide a quick overview of the recommended test activities and testing frequencies described in these guidelines. The referenced National Fire Protection Association (NFPA) standards should be consulted for complete requirements.

The number of the inspection activity listed in the table corresponds with the activity in the inspection procedure. For example, to find the recommended monthly inspection activity for sprinkler systems, the table refers you to guideline Item No. 7 (sprinklers), Section B (monthly inspections). The inspection guidelines refer you to the appropriate inspection form for documentation.

The "Reference" column of the table refers to the specific NFPA standard(s) for each activity. A list of the NFPA standards is provided for your reference, if further information is desired.

The last two columns of our table are for location use to check-off completed documentation of testing procedures and to denote person(s) responsible for implementation of the testing activity.

TABLE 1: SELF-INSPECTION QUICK REFERENCE TABLE

INSPECTION ITEM NO.	FIRE PROTECTION EQUIPMENT	HSB PROFESSIONAL LOSS CONTROL GUIDELINE SECTION					REFERENCE NFPA CODES	LOCATION INSPECTION-TESTING DOCUMENTATION	
		A WEEKLY	B MONTHLY	C QUARTERLY	D SEMIANNUAL	E ANNUAL		WRITTEN PROCEDURE ESTABLISHED	PERSON RESPONSIBLE FOR IMPLEMENTATION
1	Control Valves; includes water supply, sprinkler system, sectional valves	V	V		S	PO, M	25 Table 12.1		
2	Fire Pumps	AOP, FPC			S	WF	25 Table 8.1		
3	Water Supply Tanks	V			S	WF	25 Table 9.1		
4	Public Water	V				WF	25 Table 12.1		
5	Special Extinguishing Systems	V			S, AOA, M		11/11A/12 12A/16/17 17A/750		
6	Fire Doors	V				AOD	80/221		
7	Sprinkler, Water Spray Systems		V	AT, DT	S	DPV, DLV, DT	25 Table 5.1		
8	Inside Hose, Standpipe Systems		V			M, FHT	25 Table 6.1		
9	Fire Hydrants, Monitor Nozzles			V		PO, FHT, M	25 Table 7.1		
10	Portable Fire Extinguishers		V			M	10 Chapt 6		
11	Automatic Detection Systems, Manual Fire Alarm Systems		V, AT		S		72 Table 10-4.3		
12	Mobile Fire Apparatus		V, M				1901		

AOA - Testing of Operation Mechanism
AOD - Automatic Operational Test of Doors
AOP - Automatic Start-up of Pump and Weekly Running
AT - Testing of Local and Remote Alarms
DLV - Deluge Valve Testing

DPV - Dry Pipe Valve Testing
DT - Drain Test
FHT - Fire Hose Testing
FPC - Fire Pump Checklist Form Completed
M - Equipment Maintenance Functions

PO - Physical Operation of Valves-Hydrants
S - Testing of Supervisory Alarms
V - Visual Inspection
WF - Water Flow Testing

SECTION A – WEEKLY INSPECTION PROCEDURES (Form 2340)

1. Control Valves

This includes all sprinkler system control valves, water supply and fire pump control valves, and sectional control valves.

- Each fire protection control valve on the site should be identified using a number or lettering system. Valve identification and the control function of each valve should be properly listed on the report form.
- Each valve should be inspected to verify it is "locked" in the open position and the inspection form should be marked accordingly.
- When a control valve is found unlocked, it should be physically tried by turning it to the fully open position. A 2" drain test should be conducted downstream of the valve to verify it is fully opened. The valve should then be locked. Remember, all valves should be sealed if they are not provided with a lock.
- If a control valve is found shut, the reason should be determined. If no problems are determined, the valve should be opened, a 2" drain test performed, and the valve locked. The reason for the valve being shut should be investigated and HSB Professional Loss Control should be immediately notified using the Impairment Notification procedures.

NOTE: Curb box valve key wrenches should be readily available at the plant site in an accessible location. Electronically supervised control valves may be inspected on a monthly basis.

2. Fire Pumps (Form 2339)

The fire pump checklist should be completed.

- Identify each pump by number and/or location.
- Each pump should be started automatically by a drop in pressure.
- Combustion engine driven fire pumps should be run for at least 30 minutes weekly. Operation of electric motor driven pumps may be limited to 7 minutes; steam driven pumps to 5 minutes.
- The churn pressure (this is the pressure output with no water discharging) should be recorded.
- Check for proper heat and ventilation in the pump room. Check intake screens (if possible) to ensure they are clean. If pump is a horizontal pump taking suction under lift, check priming water, (for internal combustion engines) check oil and fuel levels and batteries. Any deficiencies or unusual conditions should be noted in 'comments'!

3. Water Supply Tanks

- Each tank should be identified by location or number.
- The water level of each tank should be verified by checking the level gauge or by overflowing the tank.

- Tanks should be visually examined for leaks or corrosion problems.

4. Public Water

- Verify that the public water supply is in full service. The primary concern is to make sure all control valves in the city pit are open and sealed and locked. In a situation where there is a weakness in the city water supply reliability due to major pressure fluctuations on a periodic or seasonal basis, a static pressure gauge should be installed on the public water supply side of the pit check valve assembly. Abnormally low pressure readings should be noted on the report form and the condition should be brought to the attention of the City Water or Public Fire Department so that it can be corrected.
- Inspect the fire department connection for accessibility. If caps are missing, make sure there is no debris in the piping up to the check valve and install new caps.

5. Special Extinguishing Systems

- Identify all special extinguishing systems by the system number and hazard protected.
- Special suppression systems include carbon dioxide, dry chemical, Halon 1301, alternate clean air extinguishing agents, foam, foam-water sprinklers, and explosion suppression systems.
- Inspect each system to verify that the system control panel power light is on and the control mode is in the automatic position.
- Verify that system nozzles are not plugged from foreign debris or obstructed in any manner. Make sure that the manual pull station is accessible.
- Indicate the date the system was last serviced and the date the system was last tested.

6. Fire Doors

- Visually inspect all fire doors and shutters to verify they are in good operating condition and there is no blockage (i.e. temporary storage within doorway) which could obstruct the proper closing of the door in a fire emergency.
- The metal cladding on the fire doors and all necessary hardware, including latches and guides should be inspected. Fusible links should be inspected to make sure that they are free of paint or other foreign material, which could delay operation.

Housekeeping:

During the weekly tour, the entire facility should be checked for housekeeping problems and control of common hazards such as careless smoking, oily rags, improperly stored flammable liquids, blocked electrical switch gear, storage of combustibles in electrical rooms, etc. Deficiencies should be noted on the report form and corrected.

Impairments:

Any impairment to fire protection discovered during inspections or testing should be immediately reported to HSB Professional Loss Control using the Impairment Notification Procedure Pamphlet.

SECTION B - MONTHLY INSPECTION PROCEDURES

8. Inside Hose - Standpipes Systems (Form 2342)

Identify each inside hose connection and location. At each inside hose connection, the adjustable spray nozzle should be attached and the hose should be correctly racked and connected to the supply piping. It is important to determine that all hose connections are in full service, immediately accessible, and the hose and nozzles are in good condition.

9. Fire Hydrants - Monitor Nozzles (Form 2342)

Identify each hydrant, hose house, and monitor nozzle at the facility by number and location. Check each monitor nozzle and hydrant to make sure they are accessible, in service, and in good condition. Hydrant caps should be easy to remove. Hose gate valves, if provided, should be checked for quick opening. Hydrant and monitors should be inspected to make sure they are properly drained. The condition of the hose house equipment should also be noted.

10. Portable Fire Extinguishers (Form 2343)

Hand and wheeled portable fire extinguishers should be inspected to make certain they are accessible, properly placed, and maintained. Each extinguisher should be properly charged and a tag should be attached indicating that it has been serviced within the last year. It is advisable to provide a plan showing the location and type of units to make certain each unit is inspected.

11. Automatic Detectors, Manual Fire Alarm Systems

Automatic detection systems should be tested on a monthly basis. One detector in each zone of an automatic fire alarm system should be tested monthly, in accordance with NFPA 72, with the goal of having all detection units tested within a year.

Manual fire alarm units should be scheduled for monthly testing with the intent of having all units properly tested within a year.

Combustible gas detection equipment should be tested and recalibrated monthly following manufacturer's instructions. Units which are located in severe environments may have to be tested and recalibrated more frequently.

12. Mobile Fire Apparatus

Mobile Fire Fighting Apparatus should be inspected and maintained on a monthly basis. A checklist should be developed for this equipment following manufacturer's guidelines.

SECTION C - QUARTERLY INSPECTION PROCEDURES

7. Sprinklers, Water Spray Systems (Form 2341)

Identify all sprinkler systems by number and area protected. Wet pipe sprinkler system alarms should be tested using the inspector's test connection which simulates the operation of a single remote sprinkler head. This connection is located near the end of the system. In a multi-story building, the connection may be located at the top floor level. Dry pipe, deluge, and pre-action sprinkler system alarms can be tested by opening the alarm test bypass valve located at the system riser. This testing should verify both the operation of local alarms and transmittal of remote alarms.

NOTE: Notify the responding Fire Department and the central, remote, or proprietary station alarm service as necessary before conducting tests.

To verify that system control valves are in the fully opened position, the 2" system drain valve should be opened and pressure should be recorded. The drain valves should then be slowly closed to avoid creating water hammer due to a high pressure surge. The static pressure at the riser should then be recorded. Static pressure may vary slightly from the pressure of previous tests due to normal fluctuations in water supply usage.

The difference between the recorded static and flowing pressures represent the pipe friction loss between the water supply and the riser gauge connection with water discharging through the fully open 2" drain valve. When the static pressure does not return to normal or the differential pressure increases materially from previous records, the cause should be determined and corrective action taken immediately. The reasons for this type of situation may be a partially shut control valve or an obstruction in the underground piping.

Check each dry pipe system for adequate air pressure. This pressure should normally be 20 psi above the trip pressure of the dry pipe valve, usually in the range of 40-45 psi. If the pressure is high or low, it should be corrected. Check each pre-action system for proper supervisory air pressure. The Quick Opening Device (QOD) on dry pipe systems should be checked to make sure valves are open and sealed and QOD air pressure should be in the range of system air pressure. Each enclosure for a dry pipe, deluge, or preaction valve should be checked for adequate temperature to prevent freezing. Any problems encountered during the inspection should be noted in the remarks column and promptly corrected.

SECTION D – SEMIANNUAL INSPECTION PROCEDURES

1. Control Valves

Electronic tamper supervisory alarms on all control valves should be tested.

2. Fire Pumps

All fire pump supervisory alarms should be tested. This would include:

- a. Controller main switch has been turned to "off" or "manual position".
- b. Loss of electrical power (electric pumps).
- c. Controller trouble alarms:
 1. Failure to start.
 2. Engine over-speed.
 3. Low oil pressure.
 4. High water cooling temperature.
 5. Battery failure.

NOTE: Reference the Controller Manufacturer's Operating Manual for alarm test methods.

3. Water Supply Tanks

Supervisory alarms should be tested. This would include:

- a. Low water level alarms.
- b. Low water temperature.
- c. Low air pressure on pressure tanks.

5. Special Extinguishing Systems

Detection devices, the actuation mechanism, and alarms (including all supervisory alarms) should be tested at least twice a year. Agent discharge is not necessary to perform these test functions. Testing should be performed by **authorized** personnel following the manufacturer's maintenance and testing guidelines. Recorded test results should be maintained for review by an HSB Professional Loss Control engineer. The system should be tagged indicating the last service inspection.

7. Sprinkler, Water Spray Systems

All supervisory alarm functions should be tested. This would include:

- a. High/Low dry pipe valve air pressure.
- b. Supervised deluge valve actuation systems.

11. Automatic Detection, Manual Fire Alarm Systems

Supervisory alarms should be tested by **authorized** personnel, following the manufacturer's testing guidelines. Test functions would include:

- a. Loss of electrical power.
- b. Battery failure.
- c. Open circuit conditions.

SECTION E – ANNUAL INSPECTION PROCEDURES

Items 1, 8, 9:

All fire protection system valves should be physically operated. Fully close each valve, then open full and slowly back off one-quarter turn. Relock the valve and perform a drain test for valves controlling sprinkler risers. Flush all fire hydrants. Lubricate hose threads with graphite and replace the hydrant caps.

Pressure test lined fire hoses. Use the highest pressure available for fire fighting plus 50 psi (do not exceed 250 psi). Bleed air from the hoses before building up pressure.

CAUTION: Hoses, especially unlined, may be susceptible to rupture.

Items 2, 3 4:

Flow testing of all fire protection water supplies should be conducted annually. Ideally, this includes individual performance tests of fire pumps, gravity tanks, private reservoirs, and connections to public water systems. Water flow test activities should be directed and witnessed by an HSB Professional Loss Control engineer. However, this is not essential if the tests are performed by qualified personnel and complete records are maintained and made available for review.

6. Fire Doors

A testing program should be instituted to verify automatic closure of fire doors by physically lifting door weights, disconnecting or cutting fusible links, and/or testing of automatic detection release mechanisms. It is the intent that all major fire doors be tested in this manner each year. This can be accomplished by scheduling a certain number of doors for automatic testing on a weekly or monthly basis.

7. Sprinkler, Water Spray Systems

Annually, each dry pipe valve should be trip tested with the control valve partially open and cleaned and reset. The shutoff valve should be kept open at least far enough to permit full flow of water at good pressure through the main drain when it is fully open.

All dry pipe valves (including QODs) and deluge valves should be trip tested with control valve wide open at a minimum within a 3-year interval. Therefore, it is advisable that one-third of these systems be tested annually, following manufacturer's test procedures.

Trip tests of each dry pipe valve (including QODs) should be done in the spring. In addition to the trip test, the dry pipe valve should be thoroughly cleaned and parts renewed as required.

Trip tests and DPV maintenance should be documented (see Form 6193). This record should be posted at each valve.

10. Portable Fire Extinguishers

Annual servicing should be conducted by authorized personnel. A tag should be attached to each unit indicating the date of the annual maintenance service and date of the next required hydrostatic test.

COLD WEATHER PRECAUTIONS

1. Before and during freezing weather in cold climates, all low points and "drum drip" chambers on all dry pipe automatic sprinkler systems should be properly drained as frequently as required to remove all moisture.
2. Once each shift during freezing weather, the temperature of fire protection water storage tanks should be checked to make sure heaters are working. Also, temperatures should be checked in areas where wet pipe sprinklers may be subject to freezing.
3. Immediately following snow storms, make sure that all hydrants, fire protection control valves, and hose houses are accessible. Clear any obstructed passageways as necessary.
4. Annually, the freezing point of solutions in antifreeze systems should be checked by measuring the specific gravity with a hydrometer. Solutions should be adjusted as needed.
5. Enclosures for dry pipe valve, deluge, or preaction mechanisms should be adequately heated to prevent freezing.

REPORT FORMS

HSB Professional Loss Control will provide insured facilities with weekly and monthly fire protection equipment inspection report forms. The item numbers on these forms again follow the inspection item numbering on the Quick Reference Table. Due to the varied nature of fire equipment installations, the HSB Professional Loss Control forms were designed to be general, with the purpose of providing a format which could be custom tailored and refined to fit specific facility inspection needs. Reproducible samples of all our report forms are included in the following pages.

Sample forms are provided of the following:

- Fire Protection Equipment Weekly Self-Inspection Report-2340
- Fire Pump Weekly Inspection Checklist-2339
- Fire Protection Equipment Quarterly Self-Inspection Report - Sprinkler Systems-2341
- Fire Protection Equipment Monthly Self-Inspection Report-2342
- Fire Protection Equipment Monthly Self-Inspection - Fire Extinguishers 2343
- Dry Pipe Valve Test Log-6193

RECORDS

Management should review completed forms for thoroughness and consistency. Deficiencies may exist that require management action to solve or expedite. To minimize any potential detrimental impact, deficiencies should be promptly resolved. Documenting action taken helps manage the resolution of the problem.

Completed forms and guard round records (where applicable) should be available for review by the next visiting HSB Professional Loss Control representative.

NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS FOR FIRE PROTECTION EQUIPMENT

NFPA	10	• Portable Fire Extinguishers
	11	• Low, Medium- and High-Expansion Foam
	11A	• Medium- and High-Expansion Foam Systems
	12	• Carbon Dioxide Extinguishing Systems
	12A	• Halon 1301 Fire Extinguishing Systems
	13	• Installation of Sprinkler Systems
	14	• Standpipe, Private Hydrant and Hose Systems
	15	• Water Spray Fixed Systems
	16	• Deluge Foam - Water Sprinkler and Foam - Water Spray Systems
	17	• Dry Chemical Extinguishing Systems
	17A	• Wet Chemical Extinguishing Systems
	18	• Wetting Agents
	20	• Installation of Stationary Pumps
	22	• Water Tanks for Private Fire Protection
	24	• Installation of Private Fire Service Mains
	25	• Water-Based Fire Protection Systems
	72	• Automatic Fire Detectors National Fire Alarm Code
	80	• Fire Doors and Windows
	221	• Standard for Fire Walls and Fire Barrier Walls
	600	• Industrial Fire Brigades
	750	• Water Mist Fire Protection Systems
	1901	• Fire Apparatus Preventive Maintenance
	1962	• Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles