

Inspection, Testing and Preventive Maintenance

Fire Protection Systems and Equipment

Risk Solutions

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Introduction

The owners and operators of industrial plants, shopping centers, universities, hospitals, and similar large, complex facilities have a significant investment in fire protection systems and equipment. Fortunately, this hardware is seldom called upon to perform the job for which it was provided. However, when needed, it must perform flawlessly – often to keep a small problem from becoming a disaster.

Many plant engineers, risk managers and others responsible for facility operation do not adequately concern themselves with the inspection, testing and preventive maintenance (*I, T & PM*) of their fire protection systems and equipment. Downsizing has eliminated many of the people who had valuable experience and time available for this critical work, and it may now be performed poorly, if at all, by unqualified personnel.

Insurance inspectors, who some facility operators expect to police this effort, are usually unable to spend the time necessary at every facility to make certain all of the fire protection systems and equipment are in top condition.

The management of any facility is ultimately responsible for being aware of the requirements that apply to their particular systems, structures, occupancies and operations. This paper is provided as a planning tool to assist facility management in developing a comprehensive program of *I, T & PM* for fire protection systems and equipment.

I, T & PM Requirements in the NFPA Standards

Most of the NFPA standards contain recommendations for the type and frequency of *I, T & PM* activities. However, for the systems and equipment at any given facility, this information is probably scattered through a number of different standards, making it difficult to obtain an overview of all the work that needs to be accomplished or to evaluate alternative approaches.

NFPA 25 - 1998: *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems* is now included in the standards library. This very useful document pulls together the detailed *I, T & PM* recommendations in several existing standards, including those for fire pumps, private water supplies, standpipe and hose, and sprinkler systems of various kinds. It does not include



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suppression systems using gaseous and chemical agents, portable fire extinguishers, exit components, detection and alarm systems, in-plant fire apparatus, and other systems and equipment often included in the fire protection mix of a particular facility.

The table in this paper contains an overview of NFPA recommendations for *I, T & PM* on the most frequently encountered fire protection systems and equipment as an aid for planning and scheduling these activities. It includes the recommendations from a total of 23 current NFPA standards.

Note: The table is only a summary and the specific standards referenced should be consulted for critical details that were not included so that the document remained of manageable size. The various recommendations have been arranged, edited and, in some cases, interpreted to provide a useable planning tool. Most of the recommendations are located in the main body of the referenced standards; however a few are in appendices. The tabulation does not include acceptance testing or recommendations in many other NFPA standards related to specific occupancies, specific hazards or fire service equipment. Although reasonable effort was made to ensure the tabulation is accurate and complete for the standards listed, this is not guaranteed.

Type and Frequency of *I, T & PM* Activities

Taking a critical look at the *I, T & PM* needed for a particular facility, and at what intervals, is likely to be a challenging task. The frequency of these activities tends to be more controversial than their nature. Most would agree that a fire pump should be periodically tested to see whether it will start automatically, since this is an expensive and critical piece of equipment to let sit idle year after year and hope it will work if it is ever needed. But whether such a test should be performed every day, week, month, year or millennium is not as easily established.

The recommendations contained in the NFPA standards obviously provide a very important reference point. However, these standards come from the consensus process in which many interests and experiences are represented, including those of property owners, insurers, public officials, emergency responders, suppliers of the systems and equipment, and servicing contractors. Many of the recommendations in the NFPA standards are based on a combination of tradition and anecdotal experience and are pretty much of a "one size fits all" variety without particularly recognizing variations in conditions at different facilities. This is not to say the recommendations contained in the NFPA standards are inappropriate, only that they are not tailored to a specific facility and do not usually have a rigorous statistical or probabilistic basis.

Although the NFPA standards are widely accepted and referenced, local, state or Federal agencies with regulatory authority may have specific requirements that differ from the NFPA recommendations. Particular insurance carriers may also have different criteria, and manufacturer's recommendations or site conditions can influence activities or frequencies.

Unless specific requirements of a regulatory agency or an insurance underwriter exist, facility specific *I, T & PM* criteria can be developed if they can be based on appropriate risk-based / reliability-centered techniques. Be advised,

however, that such may be more easily wished than accomplished given the typical scarcity of useable supporting data. When this approach is taken, the consensus NFPA recommendations can still serve as a starting point or a content check for developing facility-specific guidelines based on more rigorous analysis.

This type of analysis, by the way, should not always be viewed as simply a means of reducing the level of effort. In some cases, additional activities or increased performance frequencies may result from such an exercise.

Who Performs and/or Witnesses the Work

The table included with this paper contains an indication of who might typically best perform the various *I, T & PM* tasks (i.e. facility personnel or an outside contractor). This is something that is not included in the NFPA standards and is provided here simply for planning guidance, to be revised as appropriate for each specific facility or organization.

Fire protection systems have some unique attributes, a lot having to do with code requirements and their unusual "standby" operating status. As a result, otherwise skilled and knowledgeable electricians, mechanics and other trade specialists may not have an appreciation of the peculiarities of fire protection systems, and many have little if any real working experience with them.

Fire protection contractors have been used most often for servicing special hazard protection such as carbon dioxide and foam systems. Current downsizing and outsourcing trends encourage increased use of contractors, not so much for routine inspections, but for the more time consuming testing and preventive maintenance activities such as those required for fire pumps and detection systems.

Who performs a particular task varies considerably from facility to facility, depending to some extent on the capabilities and labor practices of the organization involved. The size of a facility is a major factor influencing the use of outside contractors. Larger operations typically have available a bigger and more diversified internal labor pool.

Even when facility personnel are available to do the work, a contractor may be used for efficiency and quality on jobs that are performed infrequently and involve complicated, seldom used procedures or special tools. Also, it is less likely that necessary work on fire protection systems will be postponed in favor of production-related demands when a contractor is budgeted and brought in for this specific purpose. When contractors are used, it is essential that the specific activities for which they are responsible be evaluated and clearly spelled out in the contract with the facility. In many instances, facility management abdicates real *I, T & PM* content evaluation and a low bid contractor provides an inadequate program.

In some jurisdictions, a fire marshal or other official may have the authority to perform or witness certain inspections and tests on fire protection systems. Regulations requiring this are usually applied to occupancies that have a high public safety exposure, such as schools, hospitals, nursing homes, hotels and theaters. Fire service inspections are most likely to be associated with fire alarm systems, exits and other life safety features.

Insurance carriers may want to be involved in certain inspection and testing activities, particularly those related to water supplies and sprinkler systems. Each insurer has their own criteria and a clear understanding should be reached as to their anticipated participation in and scheduling of these tasks, particularly when a new carrier enters the picture. Sometimes a specific contractual agreement between insured and insurer spells this out, but more often it is simply left to the prerogative of the insurer and may change with workload or other pressures on the availability of their field staff. In any case, facility management must be sure that *I,T & PM* work is performed in a correct and timely manner, regardless of regulatory or insurance involvement.

Recommendations to Upgrade an *I,T & PM* Program

What should be done to improve a program for the *I,T & PM* of facility fire protection systems and equipment? The following steps are recommended:

- Review the recognized NFPA standards to see what they recommend be provided for your facility.
- Develop site-specific criteria using the recommendations in the NFPA standards as a base, modified by any regulatory or insurance requirements and to the extent possible by sound risk/reliability analysis.
- Use facility personnel only for those activities that reasonably fit their experience and availability.
- Use local fire protection contractors to perform work that requires special experience or tools, but be sure that between in-house personnel and contractors, all elements of the program are covered.
- Provide oversight monitoring to ensure this critical work is performed correctly and in a timely manner following the guidelines developed.

Summary

There is no doubt that a well conceived *I,T & PM* program is essential for maintaining the functionality of fire protection systems and equipment. The NFPA standards provide a good benchmark for establishing such a program and the table contained in this paper contains an overview of these recommendations. It may be necessary to consider specific regulatory or insurance requirements as well.

The type and frequencies of this work can be modified for facility-specific conditions, but this should only be done on the basis of a realistic risk/reliability analysis and not merely to achieve temporary cost savings or personnel reductions. The use of outside contractors to perform selected testing and maintenance work is often a means to improve the quality and timeliness of the program.

Ultimately, the facility management is responsible for establishing and monitoring the *I,T & PM* program to be certain that it ensures the functionality of fire protection systems and equipment. This important responsibility should not be neglected.

Inspection, Testing and Preventive Maintenance

Frequency, Type Activity and Who Performs		
FREQUENCY: Dy = Daily Wk = Weekly Mo = Monthly	Qt = Quarterly Se = Semiannually An = Annually	TYPE ACTIVITY: I = Inspection T = Testing PM = Preventive Maintenance
2 - 50yr = Number of Years		PERFORMED BY: F = Facility Personnel C = Contractor F/C = Facility or Contractor
VLC = Varies with Local Conditions		

Equipment / Task	Freq	Type	By
Water-Based Systems: NFPA 25-1998			
Control Valves			
- Position (sealed only)	Wk	I	F
- Position (locked or electrically supervised)	Mo	I	F
- Tamper Switches			
- Tamper Switches	Se	T	F
- Full Operation	An	T	F
- Lubrication	An	PM	F
Fire Hydrants			
- Condition	An	I	F
- Flow, Operability and Drainage	An	T	F
- Lubrication	An	PM	F
Fire Department Connections			
- Condition and Accessibility	Qt	I	F
Monitor Nozzles			
- Condition and Accessibility	Se	I	F
- Flow and Operability	An	T	F
- Lubrication	An	PM	F
Mainline Strainers			
- Internal Component Servicing	An	PM	F/C
Check Valves			
- Internal Component Servicing	5yr	PM	F/C
Backflow Prevention Assemblies			
- Isolation Valves (unsupervised)	Wk	I	F
- Isolation Valves (electrically supervised)	Mo	I	F
- Flow (forward / backward / design)	An	T	C
- Internal Component Servicing	VLC	PM	C

Equipment / Task	Freq	Type	By
Pressure Relief Valves			
- Condition	Qt	I	F
- Partial Flow	An	T	F/C
- Full Flow	5yr	T	F/C
Piping Systems - See NFPA 24 also.			
- Leaks / Corrosion / Damage / Restraints (exposed outdoor)	An	I	F
- Fire Flow and Friction Loss Analysis	5yr	T	C
Yard Fire Hose			
- Hose House and Equipment	Qt	I	F
- Hose House	An	PM	F
- Hose (hydrostatic) - See NFPA 1962 also.	5/3yr	T	C
Standpipe and Hose Systems - See NFPA 14 also.			
- Pressure Regulating Devices, Piping and Hose Connections	Qt	I	F
- Water Flow and Supervisory Alarm Devices	Qt	T	F
- Nozzles, Hose Storage Devices and Cabinets	An	I	F
- Pressure Regulating Devices (partial flow)	An	T	F/C
- Main Drain			
- Hose (unrack / unreel)	An	PM	F
- Hose Connections and Valves (lubricate)			
- Hose (hydrostatic) - See NFPA 1962 also.	5/3yr	T	C
- Water Supply and Piping System (flow)	5yr	T	C
- Pressure Regulating Devices (full flow)			
- Dry Piping Systems (hydrostatic)			
Fire Pumps - See NFPA 20 also.			
- Pumps, Motors, Engines, Controllers, Batteries, Fuel Systems, Switches, Gauges, Lubricants, Coolant, Piping, Isolation Valves, Relief Valves and Pump House	Wk	I	F
- Pump (automatic start and run)	Wk	T	F
- Diesel Fuel System (operation)			
- Battery Charging System)	Mo	I	F
- Motor Isolation Switch and Main Circuit Breaker (exercise)	Mo	T	F
- Batteries (specific gravity)			
- Batteries (clean)	Mo	PM	F
- Batteries (terminals)	Qt	I	F
- Electrical Wiring			
- Fuel Strainer, Water Supply Strainer and Crankcase Breather	Qt	PM	F
- Engine Exhaust Insulation	Se	I	F
- Motor (manual start)	Se	T	F
- Engine Anti-freeze (condition)			
- Safeties and Alarms			

Equipment / Task	Freq	Type	By
- Electrical Components (clean)	Se	PM	F
- Pump (flow performance)	An	T	C
- Circulation Relief Valve (closing)			
- Low Suction Pressure Control Devices			
- Automatic Transfer Switch			
- Gauges, Alarm Sensors and Indicators			
- Motor (voltage and current)			
- Pump Room (environmental controls)			
- Engine Exhaust (back pressure)			
- Pumps, Motors, Engines, Mechanical Transmissions, Controllers and Other System Components (lubrication)	An	PM	C
- Fuel Tank (water/sediment, vents/overflow, piping system)			
- Engine Coolant (replace)			
- Pressure Relief Valve (adjust)			
- Combustion Air System (clean)			
- Heat Exchanger (clean)			
- Electrical Components (lubricate, trip circuit breakers, tighten connections)			
- Circuit Breakers and Fuses	2yr	PM	C
Water Tanks - See NFPA 22 also.			
- Heating System and Water Temperature (unsupervised - during cold weather)	Dy	I	F
- Heating System and Water Temperature (electrically supervised - during cold weather)	Wk	I	F
- Water Level (unsupervised)	Mo	I	F
- Air Pressure (unsupervised - pressure tanks)			
- Water Temperature Alarms/Controls (during cold weather)	Mo	T	F
- Water Level (electrically supervised)	Qt	I	F
- Air Pressure (electrically supervised - pressure tanks)			
- Tank, Structure and Surroundings (condition)			
- Water Level Alarms	Se	T	F
- Tank Contents (sediment flushing)	Se	PM	F
- Tank Shell Exterior and Expansion Joints	An	I	F
- Wood Tank Hoops and Grillage			
- Heating System, Corrosion Protection and Vent Screens	An	PM	F/C
- Drain Valve (cycling)			
- Tank Interior (pressure tanks / tanks without corrosion protection)	3yr	I	F/C
- Tank Interior (tanks with corrosion protection)	5yr	I	F/C
- Level Indicators, Pressure Gauges and Check Valves			
- Tank Exterior (shell painting)	VLC	PM	C

Equipment / Task	Freq	Type	By
Sprinkler Systems - See NFPA 13 also.			
- Heated Valve Enclosures (without temperature alarm - during cold weather)	Dy	I	F
- Heated Valve Enclosures (with temperature alarm - during cold weather)	Wk	I	F
- Gauges (dry pipe / preaction / deluge)			
- Dry Pipe, Preaction, Deluge and Alarm Check Valves	Mo	I	F
- Gauges (wet pipe / electrically supervised air pressure)			
- Gauges (detection system air pressure)	Mo	T	F
- Pressure Regulating Devices	Qt	I	F
- Hydraulic Nameplate			
- Alarm Devices			
- Water Flow and Supervisory Alarms	Qt	T	F/C
- Sprinkler Heads, Piping, Hangers and Seismic Braces	An	I	F/C
- Building Freeze Protection			
- Heated Valve Enclosures (low temperature alarms)			
- Spare Sprinkler Head Supply and Wrenches			
- Main Drain	An	T	F/C
- Pressure Regulating Devices (partial flow)			
- Sprinkler Heads (in commercial cooking equipment)	An	PM	C
- Hose Connections (flow and alarm)	3yr	T	F/C
- Alarm Valves (interior components)	5yr	T	F/C
- Strainers, Filters and Orifices			
- Gauges (calibrate or replace)			
- Pressure Regulating Devices (full flow)			
- Extra-high Temperature Sprinkler Heads			
- Sprinkler Heads - Over 75 Years Old			
- Sprinkler Heads - O-ring, Dry Systems	10yr	T	F/C
- Sprinkler Heads - Fast-Response Type	20yr	T	F/C
- Sprinkler Heads - All Types	50/10yr	T	F/C
- Sprinkler Heads - Installed Before 1920 (replace)	-	PM	C
- Plastic Overspray Protection Bags (replace)	VLC	PM	F
- Air Compressors and Dryers	VLC	PM	F/C
Special Sprinkler Systems (In addition to Sprinkler System items above as applicable.)			
Anti-freeze Systems			
- Solution Freezing Point (before cold weather)	An	T	F/C
Dry Pipe Systems			
- Priming Water Level	Qt	T	F/C
- Air Pressure Alarms			
- Quick Opening Devices			
- Automatic Air Pressure Maintenance Devices	An	T	F/C

Equipment / Task	Freq	Type	By
- Dry Pipe Valve (trip and service)	An	PM	C
- Low Point Drains (before cold weather)			
- Dry Pipe Valve (trip and system flow)	3yr	PM	C
Preaction Systems			
- Priming Water Level (supervised system)	Qt	T	F/C
- Low Air Pressure Alarms			
- System Operation and Full Flow	An	T	C
- Manual Releases			
- Preaction Valve Service	An	PM	C
- Low Point Drains (before cold weather)			
- Preaction Valve Internal Inspection (when valve can be reset without removing faceplate)	5yr	I	C
Deluge Systems			
- Low Air Pressure Alarms	Qt	T	F/C
- System Operation and Full Flow	An	T	C
- Manual Releases	An	PM	C
- Area Drainage			
- Deluge Valve Servicing			
- Low Point Drains (before cold weather)			
- Operation and Full Flow (in situations where testing requires shutdown of operations)	3yr	T	C
- Deluge Valve Internal Inspection (when valve can be reset without removing faceplate)	5yr	I	C
Water Spray Systems - See NFPA 15 also.			
- Nozzle Condition	Mo	I	F
- Area Drainage	Qt	I	F
- Piping, Fittings, Supports and Hangers			
- System Operation and Full Flow	An	T	C
- Nozzle Discharge Patterns			
- Manual Releases			
- Deluge Valve Service	An	PM	C
- Strainers (mainline and nozzle)			
- Deluge Valve Service (when valve can be reset without removing faceplate)	5yr	I	F/C
- Strainers (mainline and nozzle), Filters, - Orifices and Diaphragm Chambers			
Foam-Water Systems - See NFPA 16 also.			
- Foam Concentrate Proportioning System	Mo	I	F
- Spray Nozzle (location / position)			
- Foam Concentrate Pump	Mo	PM	F
- Overhead Piping, Fittings, Supports and Hangers	Qt	I	F
- Area Drainage			
- Foam Concentrate Strainer	Qt	PM	F

Equipment / Task	Freq	Type	By
- System Operation and Flow	An	T	C
- Manual Actuation			
- Backflow Preventer			
- Sprinkler Heads (location / position)			
- Foam Concentrate Sample			
- Foam Concentrate System (strainers, pumps, vents)	5yr	PM	C
- Foam Concentrate Tank (drain / flush)	10yr	PM	C
Foam Systems: See NFPA 11 and NFPA 11A also.			
- Complete System Service (including foam concentrate quality and proportioning)	An	PM	C
- Pipe (underground)	5yr	I	F
Commercial Cooking Systems - See NFPA 96 also.			
- Fire Protection System	Se	I	F
- Sprinklers / Nozzles / Fusible Links (replace)	An	I	F/C
Wetting Agent Systems - See NFPA 18 also.			
- Pre-mixed Solutions	Mo	T	F
Water Mist Systems: NFPA 750-1996			
- Water Tank, Air Receiver, Air Compressor (unsupervised)	Wk	I	F
- Pump Operation	Wk	T	F
- Water Tank, Air Receiver, Air Compressor (supervised)	Mo	I	F
- Air Pressure Cylinders (unsupervised)			
- Operating Components, Valves (unsupervised)			
- Air Compressor	Mo	T	F
- Air Pressure Cylinders (supervised)	Qt	I	F
- Operating Components, Valves (supervised)			
- Control Equipment (unsupervised)	Qt	T	C
- Main Drain			
- Batteries	Se	T	C
- Pressure Relief Valves			
- Control Equipment, Fiber Optic Cable Connections	An	I	C
- Strainers, Filters, Piping System			
- Pump Flow	An	T	C
- System Flow			
- Water Analysis			
- Control Equipment (supervised), Control Unit, Water Level Switch, Release Mechanism, Detectors, Remote Alarm, Section Valve and Pressure Cylinders			
- Water Tank (drain & refill)	An	PM	C
- System Flush			
- Pressure Cylinders	5/12yr	T	C

Equipment / Task	Freq	Type	By
- Automatic Nozzles	20yr	T	C
- Strainers, Filters	VLC	PM	C
Detection for Water-Based Systems (See section of this table on Detection and Alarm Systems.)			
Gaseous and Chemical Extinguishing Systems			
Carbon Dioxide Systems: NFPA 12 - 1998			
- Tank Liquid Level (low pressure systems)	Wk	I	F
- General Condition	Mo	I	F
- Gas Cylinders (weighing - high pressure systems)	Se	T	F/C
- Full Operation and Engineering Review	An	PM	C
- Hose (hydrostatic)	5yr	T	C
- High Pressure Cylinder (hydrostatic)	5/12yr	T	C
Halon Systems: NFPA 12A - 1997			
- Enclosure Integrity	Se	I	F/C
- Full Operation	Se	T	C
- Gas Cylinders (weight or pressure)			
- Hose (condition)	An	I	C
- Gas Cylinders and Hose (hydrostatic)	5yr	T	C
Dry Chemical Systems: NFPA 17 - 1998			
- General Condition	Mo	I	F
- Complete System Service	Se	PM	C
- Detection Devices (replace fusible metal / clean other types)	An	PM	C
- Agent Containers and Hose (hydrostatic)	12yr	T	C
Wet Chemical Systems: NFPA 17A - 1998			
- General Condition	Mo	I	F
- Complete System Service	Se	PM	C
- Detection Devices (replace fusible metal / clean other types)	An	PM	C
- Containers and Hose (hydrostatic)	12yr	T	C
Clean Agent Systems: NFPA 2001 - 1996			
- Agent Containers (quantity / pressure)	Se	I	F
- Enclosure Integrity	An	I	F
- Hose (condition)			
- Complete System Service	An	PM	C
- Agent Containers and Hose (hydrostatic)	5yr	T	C
Detection for Gaseous and Chemical Extinguishing Systems (See section of this table on Detection and Alarm Systems.)			
Portable Fire Extinguishers: NFPA 10 - 1998			
- Condition, Pressure and Accessibility	Mo	I	F
- Full Service	An	PM	C
- Disassemble (stored pressure loaded stream type)			
- Replace Agent (pump-type water and antifreeze / cartridge-type wetting agent)			

Equipment / Task	Freq	Type	By
- Replace Agent (liquid charge AFFF and FFFP)	3yr	PM	C
- Replace Agent (solid charge AFFF)	5yr	PM	C
- Replace Agent (stored pressure-types)	6yr	PM	C
- Shell and Hose (hydrostatic - varies with extinguisher type)	5/12yr	T	C
Detection and Alarm Systems: NFPA 72 - 1999			
- Control Equipment (unmonitored)	Wk	I	F
- Batteries (lead-acid)	Mo	I	F
- Batteries (primary dry cell)	Mo	T	F
- Initiating Devices (radiant energy fire detectors, supervisory signal and water flow)	Qt	I	F/C
- Control Equipment (unsupervised)	Qt	T	F/C
- Initiating Devices (supervisory signal)			
- Off-premises Transmission Equipment			
- Initiating Devices (air sampling, duct detectors, electromechanical releases, extinguishing/suppression system switches, fire alarm boxes, heat detectors and smoke detectors)	Se	I	F
- Control Panel Trouble Signals			
- Remote Annunciators, Transient Suppressors and Interface			
- Equipment			
- Supervised Alarm Notification Appliances			
- Emergency Voice/Alarm Communications Equipment			
- Guard Tour Equipment			
- Batteries (nickel cadmium and sealed lead-acid)			
- Initiating Devices (radiant energy fire detectors and water flow)	Se	T	F
- Batteries (lead-acid, nickel cadmium)			
- Control Equipment (monitored)	An	I	F
- Fiber Optic Cable Connections			
- Initiating Devices (duct detectors, electromechanical releases, extinguishing/suppression system switches, fire-gas detectors, heat detectors, fire alarm boxes and smoke detectors)	An	T	C
- Control Equipment (supervised)			
- Fiber Optic Cable Power			
- Control Unit Trouble Signals			
- Emergency Voice/Alarm Communication Equipment			
- Guard Tour Equipment			
- Remote Annunciators, Interface Equipment and Alarm Notification Appliances			
- Special Hazards Equipment			
- Initiating Devices (fixed temperature spot type heat detectors)	15yr	T	C
Explosion Prevention Systems: NFPA 69 - 1997			
- System Service	VLC	PM	C

Equipment / Task	Freq	Type	By
Emergency and Standby Power Systems: NFPA 110 - 1999			
- Batteries and Other Components	Wk	I	F
- Generators (cold start and 30 minute run)	Mo	T	F
- Other Components (exercise under load)			
- Transfer Switches (operate)			
- Transfer Switches	VLC	I	F
- Circuit Breakers (exercise - frequency varies with type service)	Se/An	T	F
Stored Electrical Energy Emergency and Standby Power Systems: NFPA 111 - 1996			
- General Condition and Readings	Mo	I	F
- Batteries and Charging System			
- ECE Components			
- Connected Load (exercise - 5 minute minimum)	Qt	T	F
- Battery Charger (charge current)			
- Batteries (electrolyte)			
- Battery Terminals (clean)	Qt	PM	F
- Battery Cable Connections	Se	I	F
- ECE Terminals			
- Transfer Switch (operate)	Se	T	F
- Transfer Switch Contacts	An	I	F/C
- Full Load / Full Duration	An	T	F/C
- Circuit Breakers / Fuses	2yr	PM	F/C
Lightning Protection Systems: NFPA 780 - 1997			
- System (visual)	Se/An	I	F
- System (in-depth)	3/5yr	T	C
- System Components	VLC	PM	C
Exit Safety Components: NFPA 101 - 1997			
- Exits (obstructions in certain occupancies)	Dy	I	F
- Exit Signs	Mo	I	F
- Fire Drills (varies with occupancy)	Mo/Qt / Se	T	F
- Emergency Lighting and Exit Signs (30 second functional)	Mo	T	F
- Smoke Proof Enclosures (operational)	Se	T	F/C
- Battery Emergency Lighting and Exit Signs (1 1/2 hour functional)	An	T	F/C
Air Conditioning and Ventilating Systems: NFPA 90A - 1999			
- Plenums (apparatus casing and air handling unit)	Mo	I	F
- Plenums (ceiling cavity, raised floor and duct distribution)	Qt	I	F
- Fans and Motors, Ducts, Outside Air Intakes			
- Filters (automatic - electrical controls)	Se	I	F/C

Equipment / Task	Freq	Type	By
- Smoke Detection for Automatic Shutdown	An	T	F/C
- Fan Controls			
- Dampers - Fire, Smoke and Ceiling (operational)	2	T	F/C
- Dampers - Fire, Smoke and Ceiling (full service)	4	PM	F/C
- Plenums, Ducts and Filters (cleaning)	VLC	PM	F/C
Smoke Control Systems: NFPA 92A - 1996			
- Dedicated Systems (full operating sequence)	Se	T	C
- Non-dedicated Systems (full operating sequence)	An	T	C
Smoke Management Systems: NFPA 92B - 1995			
- Full Operational	Se	T	C
Smoke and Heat Vents: NFPA 204 - 1998			
- Mechanically Opened Vents	An	T	F
- Gravity Vents	VLC	I	F
Exhaust Systems: NFPA 91 - 1999			
- All Components	Mo	I	F
- Cleaning	VLC	PM	F/C
Fire Doors and Windows: NFPA 80 - 1999			
- Fire Doors, Shutters and Windows (condition)	VLC	I	F
- Fire Doors (operating mechanism)	VLC	PM	F/C
- Fire Doors - Sliding / Rolling (operation)	An	T	F/C
Fire Brigade Equipment: NFPA 600 - 1996			
- Equipment (general condition)	Wk	I	F
- Pumpers - <i>See NFPA 1911 also.</i>	An	T	F/C
- Aerial Devices - <i>See NFPA 1914 also.</i>	An/5yr	T	F/C
- Self-contained Breathing Apparatus - <i>See NFPA 1404 also.</i>	An	PM	F/C