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## **Life Safety Equipment and Systems Inspection, Testing, and Maintenance Guidelines**

University of Maine System

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## Life Safety Equipment and Systems Inspection, Testing, and Maintenance Guidelines

### 1 Introduction

The University of Maine System (UMS) has prepared the following guidance to assist campus maintenance personnel in the performance of necessary inspection, testing, maintenance and documentation of fire safety equipment. These procedures are not intended to limit more extensive inspection, testing, or maintenance requirements, but rather to describe a set of minimum acceptable standards recognized. Note: This document is a supplement to the various codes/standards listed throughout document. You must refer to these codes and standards further when applicable.

Maine State Fire Codes, through the adoption of specific National Fire Protection Association (NFPA) Standards, require buildings to be provided with life safety systems such as: fire alarms, early detection devices, emergency lights, and exit lighting. Certain occupancies such as Dormitories and certain Places of Assembly must also be provided with automatic sprinkler systems.

The requirements of inspecting, testing and maintaining the various life safety systems outlined here are the minimum requirements based on Maine's Fire Codes, instructions from the State Fire Marshall's Office, NFPA standards, and University policies. These are subject to change as new requirements are adopted. Where there are conflicts between UMS guidelines and any local, state, or federal regulation, the more stringent or protective standard shall take precedence.

When reviewing Maine's Fire Codes, the term "Authority Having Jurisdiction (AHJ)" is used. This term is used in NFPA documents in a broad manner since the codes are designed to be used by many different jurisdictions and approval agencies.

In Maine, where NFPA standards have been adopted as State regulation, the Authority Having Jurisdiction (AHJ) is the State Fire Marshal's Office. Local fire departments and town code enforcement entities may also be authorities having jurisdiction through adoption of NFPA standards as Maine regulations and local specific building codes or ordinances adopting NFPA standards

Where employee safety is at issue, Maine Bureau of Labor Standards may be the AHJ. Where insurability of losses is at issue, the University's insurance carrier, and Risk Manager (University of Maine System) may be the Authority Having Jurisdiction under NFPA.

The University of Maine System is "Owner of record" of all University buildings in addition to being an instrumentality and agency of the State or Maine for the purpose for which it was established. As owner, the University of Maine System is also an Authority Having Jurisdiction under the NFPA Codes.

The University of Maine System shall provide guidance and determinations with regard to life safety within University buildings and property. This document is one element in the University of Maine System's effort to provide guidance under its authority.

## 2 General Requirements

Life safety equipment and systems are emergency systems. They are rarely used and their state of readiness is not obvious. Therefore, when these systems are called upon to work, there is an emergency at hand and they must work properly the first time, every time. There is no time during an emergency to perform maintenance or repairs to these systems.

To ensure that they are in proper working order, inspection, testing, and maintenance must be provided and records kept. The following general requirements apply to all University of Maine System Life Safety Systems in addition to specific requirements described below.

- Written records of inspections, testing and maintenance of all life safety equipment and systems must be kept for a period of five years. After five years this information may be discarded.
- Copies of inspection, testing, and maintenance reports shall be kept on file for review upon request.
- **No emergency systems shall be removed from service in any occupied building without:**
  - Notifying the local fire department or authorities having jurisdiction
  - Notifying the University of Maine System Risk Manager
  - Evacuating the building or establishing an approved and documented fire watch while the emergency systems are removed from service. A fire watch should involve special action beyond normal staffing using people specifically trained in fire prevention and notification techniques.

Note: As provided by NFPA 101, when an emergency system is removed from service for maintenance in a non-residential occupancy, evacuation or fire watch is required if fire alarm or sprinkler system is removed from of service for more than 4 hours in a 24 hour period. The local fire department, other authorities having jurisdiction, and UMS Risk Manager shall be notified and the building either evacuated or an approved fire watch be provided for all parties left unprotected by the shutdown.

In residential occupancies (e.g., dormitories, University apartments, or University residences), if any alarm or sprinkler system is out of service, the local fire department, authorities having jurisdiction and the UMS Risk Manager shall be notified. In addition, the building must be evacuated or a fire watch be provided for all parties left unprotected by the shutdown.

Various terms are used throughout this document. A few key terms require definition:

**Inspection** is a visual examination of the fire detection and alarm system to verify that it appears to be in good operating condition and free of physical damage. The visual inspection is generally done from floor level by walking through protected premises.

**Maintenance** is routine repair or upkeep service, including periodic inspection and testing required to keep systems in operative conditions at all times and provides for the replacement of systems or components when they become unpredictable or inoperable for any reason.

**Qualified individual or firm** is used frequently in discussing the requirements of maintaining life safety equipment and systems. Good judgment must be used in complying with this requirement. As an example a custodian may make monthly checks of emergency lights and fire extinguishers, but certainly would **not** be qualified to inspect and maintain a highly technical fire alarm system or sprinkler system. Furthermore, any maintenance over and above visual inspection would require a specialist trained and familiar with the equipment.

Staff performing these life safety equipment and system inspections must be trained, have experience and or certified to perform the tasks. There are several requirements for determining qualifications of personnel performing this work. The first and foremost is employee competency as determined by the shop supervisor for the staff in the performance of his/her tasks. In the absence of code requirements specifying training and or experience staff can obtain factory or equivalent training to perform operational task.

### 3 Life Safety Equipment & Systems

#### Emergency Lighting

**Monthly:** A Functional Test for a minimum of thirty (30) seconds shall be conducted on every emergency lighting system (e.g., lighted emergency exit signs, emergency lights).

**Annually:** A Functional Test for a minimum of one and one-half hour duration shall be conducted on every emergency lighting system. Equipment shall be fully operational for the duration of the test. Alternate strategies for testing must be approved by local Authority Having Jurisdiction or the State Fire Marshal's office

Where emergency lighting is provided by a prime motor operated electric generator, a delay of not more than 10 seconds is permitted from the time the normal building lighting systems go out until the emergency lights come on.

Written records must include the building, location of units within the building, date of monthly or yearly test, result of the test, and name of person conducting the test. Records must be retained for five years.

#### Portable Fire Extinguishers

The following definitions taken from NFPA 10, Portable Fire Extinguishers:

**Inspection** -Inspection is a regular "quick check" that an extinguisher is available and will operate. Inspection knowledge and training is necessary to perform a monthly quick check or inspection in order to follow the inspection procedure listed below.

**Maintenance** -Maintenance is a "thorough examination" of the extinguisher. The examination provides maximum assurance that an extinguisher will operate effectively and safely. Maintenance includes a thorough examination for physical damage or condition to prevent its operation and any repair or replacement. The examination will normally reveal if hydrostatic testing or internal maintenance is required.

Note: Follow NFPA 10 regarding certification and training.

The following is a summary of the inspection and maintenance requirements for portable fire extinguishers.

### **Monthly Inspection**

Monthly inspections of extinguishers shall include a check of at least the following items:

1. Located in designated place
2. No obstruction to access or visibility
3. Operating instructions on nameplate legible and facing outward
4. Seals and tamper indicators not broken or missing
5. Fullness determined by weighing or "hefting"
6. Examination for obvious physical damage, leakage or clogged nozzle
7. Pressure gauge reading or indicator in the operable range or position
8. Proper signage and labeling in place

If inspection reveals deficiency in any of the above conditions, immediate corrective action shall be taken. Corrective action may include the initiation of maintenance procedures for rechargeable extinguishers.

If a non-rechargeable extinguisher and has deficiencies described in items 3, 5, 6, or 7 above, it shall be removed from service and replaced.

### **Inspection Recordkeeping**

Records shall be kept that provides a permanent record that can be reviewed upon request. The records must include name of inspector, date inspection performed, and corrective actions taken.

### **Annual Maintenance**

Extinguishers shall be subjected to maintenance at intervals no greater than 12 months and hydrostatically tested at the intervals as indicated in the current life safety codes. Note: If maintenance is a contracted service, the contractor must provide a copy of inspection records.

Maintenance shall include a thorough examination of the three basic elements of an extinguisher: mechanical parts, extinguishing agent, and expelling means.

Each extinguisher shall have a tag or label securely attached that indicates the date the inspection was performed and the initials of the person performing the inspection. The same tag shall indicate if recharging was also performed.

In addition to the required tag or label, a permanent file record should be kept for each extinguisher. This file should include the following information:

1. The maintenance date and the name of person or agency performing the maintenance.
2. The date when last recharged and the name of the person or agency performing the recharge.
3. The hydrostatic retest date and name of person or agency performing the list.
4. Description of dents remaining after passing a hydrostatic test.

Records must be retained in accord with the General Requirements.

### **Automatic Sprinkler Systems**

An automatic sprinkler system provides protection of life and property, if properly maintained. The university is responsible to have any existing sprinkler system maintained and operable. To assure adequate inspection and maintenance, it may necessary to enter into a contract with a firm qualified in the design, installation, and maintenance of sprinkler systems or provide qualified campus personnel. Inspection and maintenance may be split between campus personnel and a contracted firm.

See Appendix A to determine inspection program requirements.

Note: Any relocation, expansion or discontinuation of existing sprinkler systems must be done by an approved designer and installer of sprinkler systems. Note: NFPA A13 allows licensed individuals to install/replace up to six sprinkler heads

Shutting off a sprinkler system is illegal in the State of Maine except for short term maintenance/repairs. No existing life safety feature shall be removed or reduced where such a feature is required in new construction. If a sprinkler system is required for new construction of a particular occupancy, then removal or allow it to fail to disrepair is not allowed.

In order to shut down a sprinkler system permanently:

Determine whether or not the fire sprinkler system is required for new construction. If the fire sprinkler system is required for that occupancy use in new construction, then the system must not be removed.

If the fire sprinkler system is not required for new construction, all of the following need to occur:

- Permission to remove a system must come from all of these: Insurance Carrier, University, the Local Authority Having Jurisdiction (town code enforcement or local Fire Department, and the State Fire Marshall's Office. Permission will not be granted if local or state-adopted codes require the fire sprinkler system. State approval can be applied for through a plan review process.

## Sprinkler System Inspection

### Weekly

Gauges on dry, preaction, and deluge systems shall be inspected to ensure that normal pressures are being maintained.

### Monthly

Gauges on wet systems shall be inspected to ensure good condition and that normal pressures are being maintained.

### Quarterly

Alarm devices shall be inspected to verify that they are free of physical damage.

### Annually

From floor level, sprinkler systems must be inspected. Inspection shall include sprinklers, pipes, fittings, hangers, and braces.

Sprinklers must be inspected to ensure no signs of leaks, corrosion, foreign materials, paint, or signs of physical damage are noted. In addition, sprinklers should be inspected to ensure proper orientation. There shall be no storage or obstructions within 18 inches of the sprinkler deflector.

Any sprinkler head found leaking, corroded, damaged, or in the improper orientation shall be replaced.

Pipes and fitting should be free of mechanical damage, leakage, corrosion, and misalignment. They should not be subjected to external loads by materials either resting or hung on the pipes and hangers.

Hangers and braces shall not be damaged or loose. Those that are shall be replaced or refastened.

Concealed sprinklers, piping, hangers, or braces do not require annual inspection.

A campus' spare sprinkler supply shall also be inspected for the proper number and types of spare sprinklers and a proper wrench for each type of sprinkler. Prior to the onset of freezing weather, buildings with wet pipe systems **shall** be inspected to verify windows, skylights, doors, ventilators, other openings and closures, blind spaces, unused attics, stair towers, penthouses, and low spaces under buildings do not expose water filled piping to freezing and verify adequate heat (at least 40°F) is available.

## **Testing Sprinklers**

Sprinkler testing described below must occur at a recognized testing laboratory acceptable to the Maine State Fire Marshal's Office. A representative sample must be a minimum of 4 sprinkler heads or 1 percent of the number of sprinkler heads per individual sprinkler sample, whichever is greater. Failure of one of the representative sprinklers in the sample requires all sprinklers represented by the sample to be replaced.

Sprinkler heads which have been in service for 50 years (e.g., pre-1965) shall be replaced or samples tested for function. Testing should repeat every 10 years.

Sprinklers manufactured using fast-response elements that have been in service for 20 years shall be tested for function (e.g., pre-1995). Testing should repeat every 10 years.

Dry sprinklers that have been in service for 10 years (e.g., pre-2005) shall be tested or replaced. If maintained and serviced, they **shall** be retested every 10 years.

Note: The owner can approve alternative strategies that meet intent and include in maintenance procedures replacement every “X” years in lieu of sampling and testing, when approval is obtained by the AHJ in writing.

## **Gauges**

Gauges shall be replaced every 5 years or tested every 5 years by comparison with a calibrate gauge. Those not accurate within 3 percent shall be replaced.

## **Alarm Devices**

Water flow alarm devices shall be tested quarterly.

Vane type water flow devices shall be tested every six months.

## **Maintenance**

In general a supply of spare sprinklers, never fewer than six, shall be maintained on the premises so that any sprinklers that have operated or been damaged in any way can be promptly replaced. Refer to the life safety codes for further guidance.

## **Fixed Fire Suppression Systems**

Fixed fire suppression systems include, but are not limited to carbon dioxide, Halogen and dry chemical systems. These are frequently found in commercial kitchen range hoods, computer rooms, specialized research laboratory hoods, or area housing valuable collections of art or rare books. Therefore, there may be specific maintenance requirements outlined in the equipment manual that must be accomplished in addition to those listed below.



Fixed system shall be checked semi-annually by a qualified person. As a minimum, the inspection shall include the following:

- Manual and automation actuators are unobstructed
- Maintenance tag or certificate is in place
- Hoses or pipes examined for damage
- Pressure gauges, if provided, are in operable range or tanks weighed

When fixed temperature sensing elements of the fusible metal are used, they shall be replaced at least annually.

Records of maintenance and inspections must be retained in accord with General Requirements.

### **Fire Detection and Alarm Systems**

Inspection, testing, and maintenance of fire detection and alarm systems shall satisfy the requirements of NFPA 72, conform with equipment manufacturer's recommendations, and shall verify correct operation of the fire alarm system.

#### **Visual inspections**

Visual inspections are made to ensure that there are no changes that may affect equipment performance.

#### **Weekly** (For unmonitored systems for alarm, supervisory, or trouble signals)

Check fuses, interfaced equipment, lamps and LEDs, and primary (Main) power supply. Note: The owner can approve alternative strategies that meet intent of the maintenance procedures, when approval is obtained by the AHJ in writing.

#### **Monthly**

- Check fire alarm equipment to ensure not damaged or inoperative
- Check fire alarm system power supply for normal operation
- Illuminate lamps and LED on fire alarm annunciator panels
- Check manual stations for obstruction
- Check detectors for damage or obstruction

#### **Annually**

- Fuses, Interfaced Equipment, Lamps, LEDs and main power supply for control equipment monitored for alarm, supervisory and trouble signals.
- Fiber-Optic Cable Connections

## Testing

### Monthly

- Load voltage test on dry cell (primary type) batteries serving fire alarm systems

### Semi Annually

- Check voltage of each rechargeable battery cell. Lead-Acid Batteries: Discharge test (30 minutes), load voltage test and specific gravity measurement.
- Sealed Lead-Acid Batteries and Nickel-Cadmium Batteries: Load voltage test.
- Remove fuses check ratings reinstall

### Annually

- Test supervisory device circuits
- Remove fuses check ratings reinstall
- Verify primary power supply
- Test secondary power supply
- Test lamps and LEDs
- Activate alarm notification appliances
- Test all control unit functions
- Test each alarm initiating and signaling circuit for trouble
- Calibrate and test smoke detectors
- Test each manual station
- Measure battery voltage under full load with battery charger disconnected
- Check operation of battery charger
- Discharge batteries for 30 minutes (i.e., let battery carry load)
- Measure open circuit voltage
- Clean and inspect battery connections
- Test 20% of restorable fixed temperature, spot type heat detectors (Test different 20% each year so all detectors are tested in 5 years)

All fire alarm systems shall be tested and maintained by qualified persons. A maintenance agreement with contractor may be used in lieu of developing a staff specialist.

Semi-annual inspections and testing are required for all alarm systems. Testing must include the following:

1. Test of pull stations
2. Test of strobe lights and horns
3. Sprinkler water-flow alarm test
4. Remote enunciators verified for proper response
5. Secondary power supply checked under full load for five minutes

6. Automatic detectors: Non-restorable heat detectors tested mechanically and electrically for function. Restorable fixed or rate of rise tested with hair dryer or other heat source. Smoke detectors tested and cleaned.

Records of all inspections, tests and maintenance shall be retained in accord with General Requirements. Refer to Appendix A for a table of visual inspection frequencies and a table of testing frequencies.

### **Exit Signs**

All exit signs must be illuminated by a reliable light source. Externally and internally illuminated signs shall be visible in both the normal and emergency lighting mode.

Internally illuminated exit signs are normally AC/DC with DC power provided by the emergency lighting system. Externally illuminated exit signs rely on light from the emergency lighting system and must be illuminated by not less than five foot candles.

Exit signs should be inspected simultaneously with emergency lighting and may be recorded on the same form.

Records of inspection must be retained in accord with General Requirements.

### **Fire Doors**

Visual Inspection (at least annually)

- Check for door damage or vision panel damage
- Check to ensure door is firmly mounted in frame
- Check closer to ensure proper operation and is able to completely close door with sufficient force to make it latch
- Check for proper latch alignment and ability to maintain door closed
- Check hinges to ensure securely attached to both door and frame
- Ensure coordinators are securely attached and properly operate (Check by completely opening both doors and releasing them)
- Check for unapproved modifications to doors

Maintenance (perform periodically or as needed depending on door use or location)

- Lubricate guides and bearings
- Operate doors on automatic hold devices quarterly to assure proper operation. Adjust closing devices as necessary to ensure door completely closes

## **4 Additional References**

(Contact the University of Maine Safety and Environmental Management Department at 581-4055 for more information)

- National Fire Protection Association (NFPA) 10, Standard for Portable Fire Extinguishers.
  - Table 7.3.3.1 Maintenance Involving Internal Examination
  - Table I.1(a) Mechanical Parts Maintenance Checklists
  - Table I.1(b) Agent and Expelling Means Maintenance Checklist
- National Fire Protection Association (NFPA) 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
  - Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance
  - Table 13.1.1.2 Summary of Valves, Valve components, and Trim Inspection, Testing, and Maintenance

Wayne Maines, Executive Director of Safety

Signature \_\_\_\_\_

Date \_\_\_\_\_

MF Chip Gavin, Chief General Services Officer

Signature \_\_\_\_\_

Date \_\_\_\_\_

## Appendix A Life Safety Equipment and Systems Program Compliance Guide

| Life Safety System                                     | Compliance Task                                   | Frequency         |
|--|---|-------------------|
| <b>Fire Detection, Alarm and Communication Systems</b> |   |                   |
| 1. Smoke detectors in residence halls                  | 1a Visual Inspection                              | 1a. Monthly       |
|  | 1b. Test  | 1b. Quarterly     |
|  | 1c. Clean   | 1c. Annually      |
| 2. Smoke detectors in E&G buildings                    | 1. Visual inspection,                             | 1. Monthly        |
|  | 2. Testing, cleaning                              | 2. Annually       |
| <b>Fixed Fire Extinguishing Systems</b>                |   |                   |
| 1. Fixed Fire Extinguisher Systems                     | 1b. Visual and Test                               | 1. Biannually     |
| <b>Fire Extinguishers (portable)</b>                   |   |                   |
| 1. Portable fire extinguishers                         | 1a. Manual/Visual Inspection                      | 1a. Every 30 days |
|  | 1b. Internal Examination                          | 1b. 6 years       |
|  | 1c. Maintenance                                   | 1c. Annually      |
|  | 1d. Hydrostatic testing                           | 1d. 12 years      |
|  | 1e. NonRecharge removed from service              | 1e. 12 years      |
| <b>Emergency Lights (illumination and exit)</b>        |   |                   |
| 1. Emergency lights                                    | 1a. Function test (30 seconds)                    | 1a. Monthly       |
|  | 1b. Function test (“Death Test” 90 minute)        | 1b. Annually      |
| 2. Exit lights   | 2a. Visual inspection                             | 2a. Monthly       |
|  | 2b. Function test (30 seconds)                    | 2b. Monthly       |
|  | 2c. Function test (“Death Test” 90 minute)        | 2c. Annually      |
| <b>Fume Hoods</b>                                      |   |                   |
| 1. Fume Hood Motors                                    | 1a. Visual and physical inspection                | 1a. Annually      |
| <b>Power Generators</b>                                |   |                   |
| 1. Non-Life Safety                                     | 1a. Visual inspection                             | 1a. Monthly       |
|  | 1b. Exercised under load (less portables)         | 1b. Monthly       |
| 2. Life Safety   | 2a. Visual inspection (diesel)                    | 2a. Monthly       |
|  | 2b. Visual inspection (non-diesel)                | 2b. Weekly        |
|  | 2c. Exercised under load (all)                    | 2c. Monthly       |
| <b>Automatic Sprinklers</b>                            |   |                   |
| Wet and Dry Sprinkler Systems                          | 1a. Inspection – dry, preaction ,or deluge gauges | 1a. Weekly        |
|  | 1b. Inspection Sealed Control Valve               | 1b. Weekly        |
|  | 1c. Inspection Locked/Supervised Control Valve    | 1c. Monthly       |
|  |   |                   |

| Life Safety System          | Compliance Task  | Frequency                                |
|-----------------------------|--|--|
|                             | 1d. Inspection – water flow alarm devices                  | 1d. Quarterly                            |
|                             | 1e. Inspection – exterior alarm valves                     | 1e. Monthly                              |
|                             | 1f. Inspection – interior alarm valves, strainers, filters | 1f. 5 years                              |
|                             | 1g. Inspection – wet pipe gauges                           | 1g. Monthly                              |
|                             | 1h. Inspection – hangers, pipes, fittings, sprinklers .    | 1h. Annually                             |
|                             | 1i. Inspection –obstruction, internal piping               | 1i. 5 years                              |
|                             | 1j. Test – water flow alarms (device dependent)            | 1j. Quarterly or semiannually            |
|                             | 1k. Test- antifreeze solution                              | 1k. Annually                             |
|                             | 1l. Test – gauges  | 1l. 5 years                              |
|                             | 1m. Test – Sprinklers extra high temp solder type          | 1m. 5 years                              |
|                             | 1n. Test – Sprinklers (fast response)                      | 1n. At 20 years, and every 10 thereafter |
|                             | 1o. Test – Sprinklers                                      | 1o. At 50 years, and every 10 thereafter |
|                             | 1p. Test – Sprinklers                                      | 1p. At 75 years, and every 5 thereafter  |
|                             | 1q. Test – Sprinklers (dry)                                | 1q. At 10 years, and every 10 thereafter |
|                             | 1r. Maint. – valves  | 1r. Annually                             |
|                             | 1s. Maint. – low point drains                              | 1s. Annually                             |
|                             | 1t. Maint. – cooking equip. sprinklers and nozzles         | 1t. Annually                             |
|                             | 1u.. Test – trip (wet) and full flow (dry)                 | 1u.. Annually                            |
| <b>Fire Pumps</b>           |  |  |
| Fire Pumps                  | 1a. Visual   | 1a. Weekly                               |
|                             | 1b. Test pump  | 1b. Monthly                              |
|                             | 1c. Flow and signals                                       | 1c. Annually                             |
| <b>Standpipes</b>           |  |  |
| Standpipes                  | 1a. Visual   | 1a. Annually                             |
|                             | 1b. Flow Test  | 1b. 5 years                              |
| <b>Fire Hydrants</b>        |  |  |
| Fire Hydrants               | 1a. Visual, function test, and maintenance                 | 1a. Annually                             |
|                             | 1b. Flow test  | 1b. 5 years                              |
| Fire Department Connections | 1a. Visual inspection                                      | 1.a Quarterly                            |
| <b>Backflow Preventers</b>  |  |  |
| Backflow Preventers         | 1a. Visual –   | 1a. Monthly                              |
|                             | 1b. Visual – reduced pressure detectors                    | 1b. Monthly                              |
|                             | 1c. Differential pressure test                             | 1c. Annually                             |