16 DEPARTMENT OF PUBLIC SAFETY

219 OFFICE OF STATE FIRE MARSHAL

STATE OF MAINE STANDARD FOR THE DESIGN AND INSTALLATION OF LIFE-SAFETY SPRINKLER SYSTEMS

DESIGN AND INSTALLATION OF LIFE-SAFETY SPRINKLER SYSTEMS

CONTENTS

PREFACE

The intent of this design standard is to define an alternative sprinkler system installation which offers an enhanced level of life-safety to occupants evacuating a structure during the first minutes of a detected fire. The system design is not primarily intended to adequately protect the structure itself from fire loss or damage. A complete sprinkler system designed and installed in accordance with the currently adopted edition of NFPA #13 may offer superior protection to the structure and contents.

SECTION 1 GENERAL INFORMATION

1-1 Application

1-1.1 The sprinkler system herein described is an alternative standard subject to permission for its use by the office of State Fire Marshal exclusively. The system may at the discretion of the State Fire Marshal be permitted in buildings up to four stories in height, which must fall into one the following categories: apartment buildings, condominiums, hotels, motels, inns, low-rise office buildings, existing or new places of assembly with an established occupant load of 300 persons or less, class "C" mercantile occupancies. The lack of a water supply of sufficient capacity to support the normally installed NFPA #13 sprinkler system may be a determining factor in obtaining permission to use this alternative standard. Approval may also be required in those municipalities who have adopted sprinkler system requirements.

1-1.2 Application for the installation of a Maine Life Safety designed sprinkler system shall be obtained from the State Fire Marshal's Office prior to preparation of plans and hydraulic calculations.

1-2 Scope

This standard deals with the alternative design and installation of automatic sprinkler systems as permitted by the State Fire Marshal.

1-3 Levels of Protection

1-3.1 Fire sprinkler coverage pursuant to this standard shall be throughout the building except as otherwise modified under section 5-5.1.

1-3.2 This standard assumes that one or more smoke detectors will be installed in accordance with the appropriate standard for the installation, maintenance and use of fire warning equipment.

1-4 Purpose

1-4.1 The purpose of this standard is to provide a sprinkler system that will aid in the detection and control of fires in occupancies where the quantity and/or combustibility of contents is low and fires with relatively low rates of heat release are expected, An operating sprinkler system installed in accordance with this standard is expected to prevent flashover (total involvement) in the room of fire origin, and increase the chances for occupants to escape or to be evacuated.

1-5 Definitions

Approved. Acceptable to the State Fire Marshal.

Automatic Sprinkler. A fire suppression device which operates automatically, when its heat actuated element is heated to or above its thermal rating, allowing water to discharge over a specific area.

Backflow Prevention Device. A device that does not allow liquid to flow back to the supply and thus cause contamination.

Check Valve. A valve that allows flow in one direction only.

Control Valve. A valve employed to control (shut off or turn on) a supply of water to a sprinkler system.

Density. The quantity of water discharged by automatic sprinklers over a specific area expressed as gallons per minute per square foot (GPM/FT^2).

Design Area. An area expressed in sq. ft. having a number of sprinklers, all flowing at or above the minimum required application rate.

Fire Department Connection. A threaded inlet connection located on the exterior of a building, arranged to enable the Fire Department to pressurize and supply the sprinkler system, bypassing the system control valves and supply main.

Labeled. Equipment or materials which has attached a label, symbol or other identifying mark of an organization acceptable to the State Fire Marshal and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed. Equipment or materials included in a list published by an organization acceptable to the State Fire Marshal and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or material and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

Pre-engineered System. A packaged sprinkler system including all components, designed to be installed according to pretested limitations.

Pump. A mechanical device that transfers and/or raises the pressure of a fluid (water).

Residential Sprinkler Head. An automatic sprinkler specifically listed for use in residential occupancies.

Sprinkler System. An integrated system of piping connected to a water supply, with listed sprinklers which automatically initiate water discharge over a fire area. This Design Guide requires sprinkler systems to include a control valve and a device for actuating an alarm upon system operation.

Supply Pressure. Pressure within the water supply system (i.e., city or private water source).

System Pressure. Pressure within the sprinkler system (i.e., above the check valve or other backflow prevention device).

Water Flow Alarm. An electrical sounding device activated by a water flow detector arranged to sound an alarm audible in all occupied areas over background noise levels with all intervening doors closed.

Wet System. A system employing automatic sprinklers attached to a piping system filled with water and connected to a water supply so that water discharges immediately from sprinklers opened by fire.

SECTION 2 INSTALLATION

2-1 Devices and Materials

2-1.1 Only listed new residential sprinklers shall be employed in the installation of life-safety sprinkler systems. Standard sprinklers or fast-response sprinklers of intermediate or high temperature rating may be installed in areas of high ambient temperature. Sprinklers shall be listed.

2-1.2 Only listed or approved materials and devices shall be used in sprinkler systems.

2-1.3 Pre-engineered systems shall be installed within the limitations which have been established by the testing laboratories where listed.

2-2 Acceptance Tests

2-2.1 The installer shall perform all required acceptance tests,~~,~~ complete the Contractor's Material and Test Certificate(s), and forward the certificates to the State Fire Marshal, prior to asking for approval of the installation.

2-2.l.l When the State Fire Marshal desires to be present during the conducting of acceptance tests, the installer shall give advance notification of the time and date the testing will be performed.

2-2.2 All aboveground piping shall be hydrostatically tested at 200 p.s.i. for two hours, in accordance with the currently adopted edition of N.F.P.A. #13, *Standard for the Installation of Sprinkler Systems*.

SECTION 3 WATER SUPPLY

3-1 General Provisions

3-1.1 Every automatic sprinkler system shall have at least one reliable water supply.

3-2 Water Supply Sources

3-2.1 The following water supply sources are acceptable:

3-2.1.1 A connection to a reliable water supply

3-2.1.2 An elevated tank.

3-2.1.3 A pressure tank installed in accordance with the currently adopted editions of NFPA #13, *Standard for the Installation of Sprinkler Systems*, and NFPA #22, *Standard for Water Tanks for Private Fire Protection*.

3-2.1.4 A stored water source with an automatically operated pump on a dedicated circuit of proper size and capacity, Pumps shall not cycle on and off during minimum flow situations, i.e., one sprinkler flowing.

3-2.2 All stored water sources shall have an automatic filling mechanism set to regulate the available water supply volume from a minimum low water level equal to 110% of the calculated volume to a minimum high water level of 125% of the calculated volume, or, an audible water level alarm set to give a steady signal when the water level falls below 125% of the calculated volume. Tanks shall be covered and protected against freezing. When stored water is used as the sole source of supply, the minimum calculated volume shall equal the water required to flow 3 sprinklers for 10 minutes (see 5-1.3)

3-3 Combined Piping System

3-3.1 A piping system serving both sprinkler and domestic needs shall be acceptable when:

3-3.1.1 A demand flow of 5 gal/min is included for domestic use. The domestic use shall be added to the sprinkler system in determining the size of common piping and the size of the total water supply requirement. In multiple occupancies, 2.5 GPM for each living unit up to a maximum of 50 GPM shall be added to the calculated system demand.

3-3-1.2 All piping in the system conforms to the piping specifications of this standard.

3-3.1.3 Permitted by the local plumbing or health authority.

3-4 Water Utility

3-4.1 Every Life-Safety Sprinkler System supplied by a water utility shall be provided with the following:

3-4.1.1 A State Department of Human Services approved and local utility accepted backflow prevention device arranged to prevent non-potable water from entering the domestic water supply of the distribution system. Connection for fire protection to city mains is often subject to local regulation concerning metering and backflow prevention requirements. The flow characteristics of the meter and/or backflow prevention device must be included in the hydraulic calculation of the system.

3-4.1.2 An approved pressure reducing valve in those locations where water utility pressure exceeds 120 p.s.i.

3-4.1.3 A service line to support a Life-Safety Sprinkler System shall be installed to the utilities specifications.

3-4.1.4 The local water utility shall comply with the local fire department requirements concerning notification of the disruption of water service to properties protected by Life Safety Sprinkler Systems, The local water utility and local fire department will be notified by the State Fire Marshal's Office of any Life Safety Sprinkler System installed within their jurisdictions

SECTION 4 SYSTEM COMPONENTS

4-1 Valves and Drains

4-1.1 Each system shall have a control valve. Control valve shall be an indicating type that is supervised in accordance with the currently adopted edition of NFPA 13, *Standard for the Installation of Sprinkler Systems.*

4-1.2 Each sprinkler system shall have a 1/2" or larger drain and test connection with valve on the system side of the control valve and flow alarm device. The test orifice size shall be equal to the sprinklers installed. Drain shall discharge to the atmosphere or to a suitable interior sanitary drain with air gap, as required by local/state plumbing codes.

4-1.3 A pressure gage shall be installed on the system side of the check valve or backflow prevention device, in an accessible and visible-location.

4-2 Pipe and fittings

4-2.1 Pipe used in sprinkler systems shall be as permitted by the currently adopted edition of NFPA #13.

4-2.2 CPVC fire sprinkler pipe listed for exposed systems may be installed with the following restrictions:

4-2.2.1 Listed residential sprinklers shall be used in conjunction with exposed CPVC pipe and fittings.

4-2.2.2 Exposed CPVC piping shall only be installed under flat ceiling construction.

4-2.2.3 Deflectors of sprinklers in systems with exposed CPVC pipe and fittings shall be located in accordance with Section 5-1.5 or special listing limitations, but never more than eight inches below the ceiling.

4-2.3 Fittings used in sprinkler system shall be as permitted by the currently adopted edition of NFPA #13.

4-2.4 Joints for the connection of copper pipe may be soldered when used for wet pipe systems. Solder used shall conform to local plumbing codes.

4-2.5 Fittings for CPVC or Polybutylene piping shall be compatible with, and capable of withstanding the same working pressure as the piping being joined.

4-3 Piping Support

4-3.1 Piping shall be supported in accordance with the currently adopted NFPA standards.

4-3.2 Piping laid on open joists or rafters shall be secured to prevent lateral movement.

4-4 Sprinklers

4-4.1 Only residential/commercial quick response sprinkler heads tested and listed by a recognized testing agency shall be used.

4-4.2 The sprinklers shall have fusing temperatures not less than 35 degrees F above maximum expected ambient temperature.

4-4.3 Fused, damaged or painted sprinklers shall be replaced with sprinklers having the same performance characteristics as original equipment.

4-5 Alarms

4-5.1 Local water flow alarms shall be installed on all sprinkler systems.

4-6 Spare Sprinklers

4-6.1 At least 3 spare sprinklers of each type, temperature rating and orifice size used in the system shall be kept on the premises.

4-7 Fire Department Connection

4-7.1 Each sprinkler system shall include a fire department connection of the size and type of connection specified by the local fire department. The minimum size of connection shall not be less than 2 ½ inches.

4-8 Electrical Wiring

4-8.1 All electrical wiring for pump motors, magnetic contactors, switches, circuit breakers, alarms, etc. shall be in compliance with the currently adopted edition of NEC 70 *National Electrical Code*. Pump motor bases shall be at least 6" above the floor. Starting loads and operating loads of pump motors must be considered in determining sizing of electrical feeds, breakers and starting devices.

4-9 Electrical Supervision/Pump, Motor

4-9.1 The pump power circuit shall be monitored.

4-9.2 Methods of monitoring the pump power circuit condition shall be one of the following:

4-9.2.1 Installation of a power alarm relay connected to the pump power circuit and to a separately controlled power circuit, in such a manner as to activate an audio/visual alarm in the event of interruption of the pump power circuit, which will be promptly noticed.

4-9.2.2 Interconnection of a frequently used light or appliance with the pump power circuit, so that interruption of the pump power circuit will be promptly noticed.

4-9.3 The pump power failure alarm shall be wired so that an alarm indicator must remain "ON" until the pump power is restored. A silencing switch which deactivates an audible alarm, but simultaneously activates a visual indicating light until the pump power is restored, is allowed.

SECTION 5 SYSTEM DESIGN

5-1 Design Criteria

5-1.1 **Design Discharge**. The system shall provide a discharge of not less than 13 gal/min per sprinkler to three operating sprinklers in the design area.

5-1.2 **Number of Design Sprinklers**. The number of design sprinklers shall be 3. If a compartment contains more than 3 sprinklers, only 3 must be calculated and those sprinklers must be adjacent to one another.

5-1.2.1 The design area shall be that compartment or section of the building which is most hydraulically remote from the water supply.

5-1.2.2 The definition of compartment for use in determining the number and location of design sprinklers, is a space which is completely enclosed by walls and a ceiling. The compartment enclosure may have openings to an adjoining space if the openings have a minimum lintel depth of 8" below the ceiling.

5-1.3 **Water Demand**. The water demand for the system shall be determined through hydraulic calculation of the 3 most hydraulically demanding adjacent sprinklers, in accordance with section 5-1.2.

5-1.4 **Sprinkler Coverage**. Residential sprinklers shall be spaced so that the maximum area protected by a single sprinkler does not exceed 144 sq. ft.

5-l.4.1 Maximum distance between sprinklers shall not exceed 12 ft. on or between pipe lines and the maximum distance to a wall or partition shall not exceed 6 ft. The minimum distance between sprinklers within a compartment shall be 8 ft.

5-1.4.2 The minimum operating pressure of any sprinkler shall be in accordance with the listing information of the sprinkler and provide the minimum flow rates specified in 5-1.1. Application rates, design areas, areas of coverage, and minimum design pressures other than those specified may be used with special sprinklers which have been listed for such specific installation conditions.

5-1.5 **Position of Sprinkler**. Sprinklers shall be positioned so that deflectors are within 4 in. of a ceiling.

Exception: Special residential sprinklers shall be installed in accordance with listing limitations.

5-1.5.1 Sprinklers shall be positioned so that the discharge is not obstructed by beams, light fixtures or other obstructions. When tests are performed which show that sprinklers are positioned so that the discharge is not obstructed, sprinklers may be installed in accordance with the test results.

5-2 System Types

5-2.1 **Wet-Pipe Systems**. A sprinkler system which is filled with water at all times and protected against freezing.

5-2.2 Dry Systems and pre-action systems shall be prohibited in Maine Life Safety fire sprinkler systems.

5-3 Pipe Sizing

5-3.1 Piping shall be sized hydraulically in accordance with the methods described in the currently adopted edition of NFPA #13.

5-3.2 The minimum pipe size shall be 3/4" on all systems using copper, CPVC and shall be 1" for steel.

5-4 Piping Configurations

5-4.1 Piping configurations may be looped, gridded, straight run or combinations thereof.

5-5 Location of Sprinklers

5-5.1 **Sprinklers shall be installed in all areas.**

Exception No. 1: Sprinklers may be omitted from all closets where the least dimension does not exceed 3 ft. and the area does not exceed 24 sq. ft. and the walls and ceilings are surfaced with non-combustible materials.

Exception No. 2: Sprinklers may be omitted from open attached porches.

Exception No. 3: Sprinklers may be omitted from carports, garages and similar structures. If such spaces are considered hazardous areas in accordance with the currently adopted edition of NFPA 101 *Life Safety Code,* fire resistive separation having a recognized rating of at least one-hour must be provided to separate the space from the remainder of the building.

Exception No. 4: Sprinklers may be omitted from attics and accessible crawl spaces which are not used or intended for living purposes or storage.

Exception No. 5: Sprinklers may be omitted from entrance foyers where a second remotely located means of egress is provided.

5-6 Drawings and Calculations

5-6.1 Scaled and dimensioned drawings showing building and system layout, pipe sizing, ceiling heights and similar construction features shall be signed and submitted along with hydraulic calculations and manufacturers data on sprinklers and plastic piping products to the State Fire Marshal for review and approval prior to installation. Pump performance data and manufacturers' data shall be included in submittal.

5-6.2 Drawings and calculations shall be signed by a person holding at least a Level III certification with the National layout of sprinkler systems, or equivalent competency as evidenced by a nationally recognized organization. Certification or registration numbers of the science shall be included with each submittal. Submittals shall bear the wording:

“Reviewed and Submitted By:” Date of Review; “N.I.C.E.T. Certification Number:” “Other Certification Type and Applicable Registration”

5-6.3 Proof of certification or registration shall be submitted to, and kept on file at, the State Fire Marshal's Office. Expiration dates shall be clearly indicated on

submitted documents. Drawings and calculations signed by a person whose submitted qualification has expired will be rejected without review.

SECTION 6 MAINTENANCE

6-1 The responsibility for properly maintaining a sprinkler system is the obligation of the property owner. Inspection, testing, and maintenance of Maine Life Safety fire sprinkler systems shall be in accordance with the currently adopted edition of NFPA 25.

SECTION 7 REFERENCED PUBLICATIONS

7-1 The following documents or portions thereof are referenced within this document and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of issuance of this document.

7-1.1 **NFPA Publications**. The following publications are available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

NFPA 13 - 2016- *Standard for the Installation of Sprinkler Systems*

NFPA 25 - 2014 - *Standards for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*

NFPA 20 - 2013 - *Standard for the Installation of Stationary Fire Pumps for Fire Protection*

NFPA 22 - 2013 - *Standard for Water Tanks for Private Fire Protection*

NFPA 101 - 2015- *Life Safety Code*