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13A

CARE AND MAINTENANCE OF

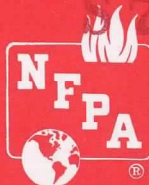
SPRINKLER

SYSTEMS

1971

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CLOSED VALVES HAVE CAUSED 35%
OF ALL SPRINKLER SYSTEM FAILURES.*

*NFPA Automatic Sprinkler
Performance Tables 1970 Edition

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NATIONAL FIRE PROTECTION ASSOCIATION
International

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National Fire Protection Association

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The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection. Anyone interested may become an Associate Member; the annual dues are \$30.00. National and regional societies and associations are eligible to be Organization Members; annual dues are \$225. Full membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association. All NFPA codes, standards, and recommended practices are prepared by NFPA Technical Committees and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This and other NFPA codes, standards, and recommended practices are published in the **National Fire Codes**, a ten-volume compilation of NFPA's official technical material. Following are the titles of the ten-volume set:

- Vol. 1 Flammable Liquids, Ovens, Boiler-Furnaces
- Vol. 2 Gases
- Vol. 3 Combustible Solids, Dusts and Explosives
- Vol. 4 Building Construction and Facilities
- Vol. 5 Electrical
- Vol. 6 Sprinklers, Fire Pumps and Water Tanks
- Vol. 7 Alarm and Special Extinguishing Systems
- Vol. 8 Portable and Manual Fire Control Equipment
- Vol. 9 Occupancy Standards and Process Hazards
- Vol. 10 Transportation

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Recommended Practice for the Care and Maintenance of Sprinkler Systems

NFPA No. 13A — 1971

1971 Edition of No. 13A

This edition of the Recommended Practice for the Care and Maintenance of Sprinkler Systems (NFPA No. 13A) was adopted at the 1971 Annual Meeting of the National Fire Protection Association held May 17-21 in San Francisco, Calif. This 1971 edition revises the Section headed "Summary of Important Factors." Special attention is called to the Appendix.

Origin and History of NFPA No. 13A

Work on this Recommended Practice was initiated by the NFPA Committee on Automatic Sprinklers in 1938 and the first edition was adopted by the Association in 1939. Revisions were made in 1940, 1951, 1953, 1958, 1968, and 1969, with this edition being the latest recommendations of the committee. Reference is made to the NFPA Standard for the Installation of Sprinkler Systems (No. 13), and to the NFPA Standard for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems (No. 13E).

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SCOPE: The design, installation, inspection, and maintenance of automatic and of open sprinkler systems, including the character and adequacy of water supplies, and the selection of sprinkler heads, piping, valves and all materials and accessories; but not including the installation and operation of fire pumps, nor the construction and installation of gravity and pressure tanks and towers, nor the installation, maintenance and use of Central Station, Proprietary, Auxiliary and Local Signaling Systems for Watchmen, Fire Alarm and Supervisory Service, nor the Supervision and Care of Valves Controlling Water Supplies, nor the design of fire department hose connections.

Recommended Practice for the Care and Maintenance of Sprinkler Systems

NFPA No. 13A — 1971

Foreword

An automatic sprinkler system provides for the extinguishment of fire in a building by the prompt and continuous discharge of water directly upon burning material. This is accomplished by means of an arrangement of pipes to which are attached outlet devices known as automatic sprinklers. These sprinklers are so constructed as to open automatically whenever the surrounding temperature reaches a predetermined point.

In general, there are two types of automatic sprinkler equipment, dry pipe systems and wet pipe systems. In locations which are not subject to freezing temperature, wet pipe systems, in which the pipe lines contain water under pressure may be installed, but in buildings or portions thereof which are subject to freezing temperatures, the dry pipe system is ordinarily used. In the latter type of system, water is admitted to the pipes automatically after elevated ceiling temperature has caused the automatic sprinkler to operate.

If not properly maintained, a sprinkler system may become worthless. The following offers to property owners and managers advice and suggestions relative to the care and maintenance of sprinkler equipments upon which the safety of their property may depend.

RESPONSIBILITY OF THE OWNER

The purpose of an automatic sprinkler system is to protect life and property. Serious fires seldom occur in properties completely protected with properly maintained automatic sprinkler systems. The responsibility for properly maintaining the fire protection system belongs to the owner (or the occupant). In order to properly maintain the system, attention must be given not only to the system itself, but also to other features that may affect the proper and satisfactory control of fire by the sprinklers.

Automatic sprinkler systems employing standard devices and installed in accordance with the sprinkler Standard are sturdy and durable, and require a minimum of expenditure for maintenance. However, like other types of equipment, they may suffer deterioration or impairment through neglect or from certain conditions of

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service. Definite provision for regular and competent attention to maintenance is a prime requirement if the system is to serve its purpose effectively.

The provision of automatic sprinkler protection where needed shows good business foresight. The quality of business administration and the intelligence of management are reflected in the provisions made for the maintenance of this protection.

Summary of Important Factors

Experience of more than seventy-five years clearly shows the troubles which may occur and which affect the proper control of fire by automatic sprinklers. The more important factors relating to proper care and maintenance of sprinkler systems are as follows:

Controlling valves should be kept open and water supplies maintained in service.

Automatic sprinklers will open in vain if there is no water or its flow is turned off.

When fire occurs, sprinkler control valves should not be closed until the fire is out or under positive control by other means.

Haste to close sprinkler valves before proper investigation has been made or with the hope of preventing damage by water has resulted in serious fires which may otherwise have been controlled by the sprinkler systems. The amount of water discharged by sprinklers is small compared to that from hose streams which may be needed if fire rekindles.

When, of necessity, sprinkler protection is interrupted, every effort should be made to limit the extent and duration of the interruption.

Contracts for fire insurance state or imply the requirement for the exercise of such precautions by the insured. Most insurance inspection service organizations are ready to advise property owners as to measures that may be taken to maintain protection in emergencies.

Whenever sprinkler protection is turned off for any reason, or is otherwise impaired, prompt notice of any such condition should be given by the owners to the public fire department, responsible parties representing all owners and building occupants, insurers and any other interested persons. Special instruction should be given in regard to exceptional precautions that should be taken during the impairment (such as, but not restricted to the inauguration of special watch service, the prohibition of welding, the ces-

sation of hazardous operations and the placing in readiness of other fire defenses).

Sprinkler protection should be complete in the areas to be protected.

Sprinkler action may be ineffective if fire gains headway in an area where water from sprinklers will not reach. Sprinklers should be extended to protect new areas before they are occupied.

Obstructions by stock or partitions to the distribution of water discharge from sprinklers should be avoided. High piling of stock may negate the value of sprinkler protection.

Arrangements should be made to keep all stock piles, racks and other possible obstructions the proper distance below sprinklers. (The minimum recommended distance below sprinklers is 18 inches, with increased clearance of 36 inches or more over large, closely packed piles of combustible cases, bales, cartons or other closely packed combustible stock.) To extinguish a fire, the water from the sprinklers must reach the burning material.

Sprinkler equipments should be protected against the freezing of water in pipes or devices.

Freezing even in minor areas may stop the flow of water to sprinklers or may render control and alarm devices inoperative. Serious damage may be caused to the equipment, resulting in expensive repairs and interruption of sprinkler protection.

Owners' Organization

A trained engineer is not required to look after a sprinkler system, but it does require a competent, intelligent and reliable employee who has been given the responsibility of regularly inspecting the system and reporting any troubles or defects to his employer. This employee must have a certain amount of instruction and training and a general understanding of the mechanical requirements of operation.

The importance of having some one person responsible for maintenance cannot be overemphasized. A large part of the troubles that have been experienced with sprinkler systems has been due to lack of responsibility rather than lack of knowledge.

There are two basic factors in the responsibility for maintenance. The property owner, company official, or others responsible for the installation of the sprinkler system, and from a business and financial standpoint directly interested in fire protection, maintenance and cost of repairs, should be directly represented by some one person in authority with whom insurance organizations, the sprin-

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kler installing company, or others can cooperate. Also important, is the appointment of an employee to be responsible for the condition of the sprinkler system and other matters affecting control of fire by sprinklers. This employee must be made familiar with all such matters, must make periodic inspections and report regularly to his superior officer. The selection and supervision of this man is of vital importance. Sufficient time should be allotted to such a man to permit him to give the necessary attention to this work.

Weekly inspections of sprinkler equipments are recommended and a written report of the conditions found should be made to the management. This report should be signed and dated by the inspector, and attested by his superior officer who should then see that reported defects are corrected. These reports should be filed for future reference. Some of the insurance inspection organizations have forms available for this purpose.

Where a watchman is employed, he should be a competent and trustworthy man; he should be instructed in the operation of the sprinkler system and what to do in case of fire.

Although the foregoing stresses the importance of having some one person responsible for maintenance, other persons should be trained in this respect and be fully capable of taking over the function at any time when the authorized individual is unavailable.

Where central station supervision of sprinkler alarm and control devices is provided under contract, a specially valuable aid to maintenance is afforded. The outside agency reporting to the owner or manager each incident involving water flow or gate valve closure keeps a constant check on the condition of the equipment and stimulates care on the part of plant employees.

Most fire insurance inspection service organizations as well as the manufacturers and installers of automatic sprinkler equipment are ready to advise and guide owners in the provisions to be made for the maintenance of sprinkler systems. The owners who benefit from the provision of sprinkler protection, however, should recognize that the costs and responsibility for the maintenance of this protection rests with them.

By means of periodic tests the equipment is shown to be in good operating condition or any defects or impairments are revealed. Such tests are made, however, at the owner's responsibility and risk. Intelligent cooperation in their performance is evidence of interest in maintenance.

Sprinkler Contractors Inspection Service

The efficiency and reliability of the protection offered by automatic sprinkler systems is promoted when there is regular and competent inspection service by a qualified automatic sprinkler contractor who is equipped to render emergency service. Inspections by automatic sprinkler contractors should include:

- (a) A minimum of four inspections, at regular intervals, yearly.
- (b) Sealing of valves when seals are broken.
- (c) Tripping of dry-pipe valves periodically as recommended by the authority having jurisdiction.
- (d) The use of an inspection report form with copies furnished the property owner and the authority having jurisdiction after each inspection.

The recommended scope of services to be provided and the recommended report form are shown in the Appendix.

DETAILS OF MAINTENANCE

In order that property owners and those charged with responsibility for proper maintenance of sprinkler systems may have useful information readily available there is presented on the following pages, recommendations and suggestions in regard to each of the principal features and devices commonly found in sprinkler installations.

Control Valves.

Each control valve in the sprinkler system should be secured in its normal or open position by means of a seal.

All control valves of the sprinkler system should be examined at regular intervals, preferably at least once each week.

Control valves should be numbered and each should have a sign indicating the portion of the system that it controls. An inspection should be made at regular intervals, and the condition of each valve recorded on a report blank. A valve inspection report should show that the valves are: (1) open or closed, (2) properly sealed, (3) in good operative condition, turn easily and do not leak, (4) readily accessible, and (5) that wrenches are in place.

If the examination of a valve shows any unsatisfactory condition, proper notice should be given to those in authority and the condition should be corrected as soon as possible. Valve stems should be oiled or greased at least once a year.

A valve sealing and tag system may be used in connection with the supervision and maintenance of a sprinkler system. Instructions for the establishment of such a system may be secured from the authority having jurisdiction.

POST INDICATOR VALVES. These should be tried with a wrench at each inspection but should be left about one-quarter turn from the wide open position so that they will not be jammed open. When they are tried with a wrench they should be brought to the wide open position to get the spring of the rod, as sometimes the rod becomes detached from the valve itself and the indicator may read "Open" when the valve is closed. The stems and indicating mechanism of these valves should be oiled at least once each year. Wrenches should be fastened to the valve or kept near by.

UNDERGROUND GATE VALVES EQUIPPED WITH ROADWAY BOXES. The location of each such valve should be clearly indicated by a sign on a near-by wall or by a marker. The road-box for the valve should always be readily accessible and the caps should be kept in place. The wrench should be located near by and properly marked.

OUTSIDE SCREW AND YOKE VALVES. The position of the stem indicates whether the valve is wide open or not. These valves need not be given a one-quarter turn at each weekly inspection. The valve stems should be kept clean and oiled.

VALVES IN PITS. These should receive the same attention as other valves at each inspection. Access to the pits should be easy and care should be taken that the pits are kept free of water and properly protected against freezing. If of the outside screw and yoke (O. S. & Y.) type, the stems should be cleaned and oiled frequently.

Gages.

At the weekly inspection of control valves, the gages showing water and air pressure on the system should be read to make sure that normal pressures are being maintained.

The maintenance of proper pressure is of vital importance. Provision should be made to check the system gages with an inspector's gage once each year to insure reliability of readings.

Flow Tests.

At the time of each periodic inspection regular water flow test should be made from water supply test pipes (main drain valves).

Regular testing of sprinkler systems by water flow may be made in cooperation with the authority having jurisdiction. Test at the main drain valves includes noting of pressure gage readings with unrestricted flow of water with the drain valve wide open, as compared with the reading with the drain valve closed. If the readings vary materially from those previously established or normal readings, the condition should be investigated. These tests are intended to show whether or not the normal water supply is available on the system and to indicate the possible presence of closed valves or other obstructions in the supply pipe.

NOTE: Water flow test of a system having a direct connection to central station or fire department should be made only after proper notice is given to the signal station.

Alterations and Repairs.

If a sprinkler valve is closed, shutting off any part of the system, the owner or the manager of the property should be notified immediately.

Valves should be kept open and the sprinkler system in service to the greatest extent possible during alterations and repairs.

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After any alterations or repairs, a special inspection should be made to make sure that the valves are in the fully open position, properly sealed, and the system otherwise in commission.

When any alterations, additions or repairs are to be made, involving interruption of the sprinkler protection in whole or part, the insurers should be notified and the authority having jurisdiction consulted, in advance of making such changes. The authority having jurisdiction may be able to render valuable advice relative to the maintenance of the protection and recommendations for any new work.

When building extensions, new partitions, decks, platforms or enclosures are erected, the required extension of the sprinkler system to the new areas should be completed promptly.

When repairs or alterations affecting the sprinkler system are in progress, special provisions should be made to keep the sprinkler system in service in all areas not affected. When the sprinkler system is turned off during the day to allow for work in progress, it should be restored at night. When the normal water supply to the system is interrupted, it is frequently possible to provide emergency supplies or connections.

If the sprinkler system is necessarily turned off in any portion overnight, it is a proper precaution to post a specially instructed watchman to guard the portions without sprinkler protection.

Sprinkler valves are sometimes inadvertently left closed after alterations or repairs have been completed. A special inspection should be made to check the condition of the system following any such work, to make sure that all the control valves are in the fully open position and properly sealed.

Changes in Class of Work or Fire Hazard.

Any proposed changes of this nature should be referred to the authority having jurisdiction in order to determine whether changes in the sprinkler protection should be made.

Such changes in the class of work may justify alterations to the sprinkler system as a whole or in part. Special types of protection, changes in location and temperature rating of sprinklers and protection against corrosion, loading and mechanical injury are sometimes necessary.

Changes in heating, lighting, or mechanical equipment may also necessitate changes in the sprinkler system. The installation of unit heaters, heating ducts, or high power lighting units may require a change to sprinklers of higher temperature classification at such locations. Any changes in equipment or occupancy which might

result in temperatures at the sprinklers exceeding 100 degrees, or less than 40 degrees with wet pipe systems, should be given immediate attention in order to guard against premature operation or freezing.

Changes in Exposure from Other Buildings.

Additional protection may be required because of changes in exposure fire conditions.

Any such changes, new buildings, sheds, lumber yards, or any conditions which might affect spread of fire to the property equipped with sprinklers, should be taken up with the authority having jurisdiction.

Automatic Sprinklers.

Sprinklers should be checked regularly to make sure that they are in good condition, clean, free from corrosion or loading, not painted or whitewashed, and not bent or damaged.

All automatic sprinklers should be replaced when they become fifty years old and other sprinklers when they are painted, loaded, corroded or damaged.

Representative solder-type sprinklers with temperature classification of Extra High (325-575°F.) or greater which are exposed on a semi-continuous to continuous maximum allowable ambient temperature condition should be tested at five year intervals for operation by a recognizable testing laboratory.

It is of prime importance to keep sprinklers in good condition. If they are subject to loading with dust or foreign material, the authority having jurisdiction should be consulted.

Where sprinklers are exposed to corrosive atmospheres, special types of sprinklers, which are coated to prevent or retard corrosion, should be used.

Tests of the reliability of operation of sprinklers that may have been affected by corrosion may be arranged with a nationally recognized testing laboratory.

Sprinklers should be protected against mechanical injury. Where there is danger of injury, approved sprinkler guards should be provided.

Automatic sprinklers and fusible links protecting commercial type cooking equipment and ventilation systems should be replaced annually. Other actuating devices shall be properly cleaned. Release devices should be checked twice a year for proper operation.

Sprinklers of the proper temperature rating should be used, and changes in temperature conditions may require changes in sprinklers. Higher ceiling temperature without corresponding change in temperature rating of sprinklers may result in premature operation.

The standard temperature ratings of automatic sprinklers are:

TEMPERATURE RATINGS, CLASSIFICATIONS AND COLOR CODINGS

<i>Maximum Ceiling Temperature °F</i>	<i>Temperature Rating °F</i>	<i>Temperature Classification</i>	<i>Color Code</i>
100	135 to 170	Ordinary	Uncolored
150	175 to 225	Intermediate	White
225	250 to 300	High	Blue
300	325 to 375	Extra High	Red
375	400 to 475	Very Extra High	Green
475	500 to 575	Ultra High	Orange

Information regarding the highest temperature that may be encountered in any location in a particular installation should be obtained by use of a thermometer that will register the highest temperature encountered, which should be hung for several days in the questionable location with the plant in operation.

Always use the special sprinkler wrench in removing or installing sprinklers. Other types of wrenches may injure the sprinkler.

Extra Sprinklers.

An adequate supply of extra sprinklers should always be on hand.

A supply of extra sprinklers should be kept in a cabinet provided for that purpose, together with sprinkler wrench. The cabinet should be so located that it will not be exposed to moisture, dust, corrosion, or a temperature exceeding 100 degrees. The supply of extra sprinklers should include sprinkler heads of the different temperature ratings that may be required for replacements. The extra sprinklers should be supplied by the installing contractor and replenished when necessary. It is necessary that this supply be maintained in order that replacements may be made in an emergency and the sprinkler protection promptly restored.

Piping.

Piping should be kept in good condition and free from mechanical injury.

Sprinkler piping should not be used for support of ladders, stock or other material.

When the piping is subject to corrosive atmosphere, special protection against corrosion may be needed.

Where the age or service conditions of the sprinkler equipment warrant, an internal examination of the piping should be made in accordance with instructions of the authority having jurisdiction. Where it is necessary to clean or flush a part or all of the piping system, it is well to have this work done by experienced workmen or contractors in accordance with the instructions of the authority having jurisdiction.

Hangers.

Hangers should be kept in good repair. Broken or loose hangers should be replaced or refastened.

Broken or loose hangers may put undue strain on piping and fittings, cause breaks, and interfere with proper drainage.

Dry Pipe Valves.

The air pressure on each dry pipe system should be checked at least once a week and the air replenished when necessary.

Instruction charts are provided for the maintenance of dry pipe valves by the sprinkler installing company and should be posted near the valves.

It is necessary to watch the maintenance of air pressure on dry pipe systems carefully. If pressure is lost rapidly, requiring frequent pumping, the piping system should be gone over and made tight.

It is desirable to maintain dry-pipe systems on dry-pipe service throughout the year in order to reduce the amount of corrosion and accumulation of foreign matter in the pipe system. If water is admitted to a dry pipe system, alarm devices will ordinarily be out of service until dry system is restored.

The priming water should be maintained at the proper level above the dry pipe valve.

In cold weather, the valve enclosure should be properly heated and the heating equipment kept safe and in order.

Slight freezing of priming water in a dry pipe valve may cause it to be inoperative. It is extremely important to make sure that adequate provision is made for the heating of the valve enclosure.

Before and during freezing weather, all low point drains of the dry pipe system should be drained and kept free of water.

Dry system piping should be thoroughly drained before freezing weather and kept free of water during the winter. The freezing of a small amount of water in the piping may cause rupture of the piping or sprinklers and the operation of the valve, which in turn may result in extensive damage not only to the entire system but also building and contents.

Each dry pipe valve should be cleaned and reset once each year during the warm weather.

Operating tests of dry pipe valves, including quick opening devices, if any, should be made from time to time, and this work should be done either by a sprinkler installing company or qualified personnel with the approval of or under the observation of the authority having jurisdiction. At the time of such a test, occasion should be taken to thoroughly clean and properly reset the valve, performing any necessary service with respect to renewal of rubber parts or the adjustment of gages, alarm devices and connecting piping and quick opening devices.

In general, it is recommended that the servicing of dry pipe valves be entrusted only to men experienced in this work or to representatives of the sprinkler installing company.

No grease or other sealing material should be used on seats of dry pipe valves in an effort to stop leaks. Force should not be used in an attempt to make dry pipe valves tight.

Dry pipe valve should carry a tag or card to show the date on which the valve was last tripped and to show the name of the organization making the test. Such tags are usually available from the installing company.

QUICK OPENING DEVICES. The operation of quick opening devices usually can be tested either with or without operating the dry pipe valve itself. The manufacturer's instructions for testing and resetting the device should be carefully followed.

If the device does not operate properly on test, it can if necessary be removed and the sprinkler system kept in operative condition. Repair parts can be ordered from the manufacturer, or the device sent to the manufacturer for repair or adjustment.

Deluge Preaction and Automatic On-off Preaction Systems.

Complete charts are furnished by the installing company, showing the proper method of operating and testing thermostatically controlled systems. Only competent men fully instructed with respect to the details and operation of such systems should be employed in their repair and adjustment. It is highly advisable for

the owner to arrange with the installing company for regular periodic inspection and testing of the equipment.

The automatic valves controlling the flow of water into these systems operate through the effect of fire temperature on heat responsive devices. Ordinarily when it is necessary to repair the actuating system, as distinguished from the piping system itself, the water may be turned into the sprinkler piping, and automatic sprinkler protection thus maintained without alarm service, provided there is no danger of freezing.

Water Flow Alarm Devices.

Water flow alarm devices should be tested at regular intervals.

The small valves or cocks controlling the water supply to alarm devices should be secured in the normal open position.

The frequency and method of testing alarm devices may be established after consultation with the authority having jurisdiction.

It is not advisable to test water motor gongs in cold weather if the piping to the gong is exposed to freezing.

Care should be taken to maintain properly the electric wiring, gongs, and transformer or batteries in the electric alarm equipment.

On wet pipe systems installed without inspector's test drains, such as in certain old systems, such drains should be installed in accordance with Section 3080 of NFPA No. 13.

Central Station Supervisory Service.

The central station should always be notified before operating any valve or otherwise disturbing the sprinkler system.

The central station sprinkler supervisory equipment is so arranged that the operation of a control valve or the flow of water from a sprinkler, drain, or test connection, or other abnormal condition in the system, gives an automatic signal at the central station, and certain signals may be transmitted direct to the fire department as a fire alarm. Special arrangements should always be made with the proper authorities before water flow or other tests are made, which might result in an alarm signal being received at the central station.

The supervisory company service provides frequent periodic inspection of devices and tests. Other tests that may be advisable should be made subject to the approval of the authority having jurisdiction.

Gravity Tanks and Suction Tanks.

Periodic inspections should be made to check the maintenance of water at proper level in the tank.

Constant maintenance of a full supply of water in gravity tanks is necessary not only to insure proper performance of the sprinkler system in the event of a fire but to prevent shrinkage of wooden tanks and unnecessary corrosion of steel tanks.

Heating devices should be kept in order and the maintenance of proper temperature in the tank checked during freezing weather.

The tank roof should be kept tight and in good repair, with the hatches fastened closed, and the frost-proof casing of the tank riser in good repair.

The prevention of freezing in the riser or the formation of ice in the tank itself is extremely important. Freezing in the riser may obstruct the flow of water to the sprinkler system, while the formation of a layer of ice on the water may impede or prevent the flow from the tank. The formation of heavy icicles through leaking of the tank is dangerous as tank collapse may ensue.

The bases of the tower columns should be kept free from dirt and rubbish which would otherwise permit the accumulation of moisture with consequent corrosion. The tops of foundation piers should always be at least 6 inches above the ground level.

Coal or ashes or combustible material of any kind should not be piled near the columns as this may cause failure of the steel work due to fire, heating or corrosion. The tank site should be kept cleared of weeds, brush and grass.

Examination of all paint, including the inside of a steel tank without cathodic protection and the hoops and grillage of a wood tank, should be made at least once in two years. Steel work without cathodic protection should be kept painted to prevent the formation of rust. Frequent repainting, if not protected by cathodic equipment, is necessary when the paint is exposed to conditions causing rapid disintegration.

Before repainting, all loose paint should be removed with scrapers and wire brushes and the surface thoroughly dried. A two-coat job is recommended, first touching up any bare spots with a red lead and oil paint. The red lead paint should be mixed with 100 pounds of red lead paste (94 percent Pb_3O_4) to $2\frac{1}{2}$ gallons of linseed oil (if raw oil is used add $\frac{1}{2}$ pint of dryer to every gallon of paint); or an approved ready mixed red lead paint. Paints have a tendency to soften and lose their imperviousness when submerged in water

for long periods. Red lead paints resist this softening action and dry more quickly if 10 percent by weight of litharge is added. Mix the litharge in a quart of boiled oil and add to small quantities of the paint as needed.

The painters should be instructed not to allow any scraping or other foreign material to fall down the riser. If the opening is covered for protection nothing but a few sheets of paper tied over the end of the settling-basin-stub should be used. The water pressure would then break the paper if it should be forgotten.

If cathodic protection is maintained in a steel tank, the tank shall be cleaned out sufficiently often to prevent sediment and scale entering the discharge pipe.

Necessary periodic emptying of steel tanks for repainting can be minimized by use of a cathodic rust prevention system that counteracts the natural electrolytic action that is the basis for most corrosion. Such a system needs periodic attention to the condition of suspended electrodes. If chemical water additives are used to inhibit corrosion, semi-annual chemical analysis of the water should be made. (See also NFPA No. 22, "Water Tanks for Private Fire Protection", Section 715).

The authority having jurisdiction should always be notified in advance when and for how long the tank is to be out of service.

Pressure Tanks.

Pressure tanks should be inspected regularly, checking the water level, air pressure and, during freezing weather, the heating of the tank enclosure.

The interior of pressure tanks should be inspected carefully at three-year intervals to determine if corrosion is taking place and if repainting or repairing is needed. When necessary, they should be thoroughly scraped and wire brushed and repainted with an approved metal-protective paint.

Safety codes of your state or municipality with respect to the maintenance and testing of pressure tanks, as unfired pressure containers, should be consulted.

Gage cocks of pressure tanks should be kept closed, except when test for water level is being made.

The tank and its supports should be examined and painted as recommended for gravity tanks.

Fire Pumps.

STEAM PUMPS. The pump should be started once each week and operated until water is discharged freely from the relief valve. Regular inspections should be made, checking the maintenance of ample pressure, proper supply of lubricating oil, operative condition of relief valve, and level of water in the priming tank.

The pump room should be kept clean, accessible at all times, and at proper temperature to prevent freezing.

Fire pumps should be operated only in connection with fire protection service and not for plant use.

Each pump should be tested to capacity with hose streams at least once a year during the warm weather.

Accumulation of water, through condensation, in the steam supply line or drainage equipment may be dangerous and should be avoided.

The suction pipes, intakes, foot valves, and screens of fire pumps should be examined frequently to make sure that they are free from any obstruction. Mud, gravel, leaves and other foreign material entering the suction pipe may cause damage to the pump or obstruction of the piping of the sprinkler system. The formation of ice may also impair the operation of the pump.

CENTRIFUGAL PUMPS. The pump room and equipment should be checked regularly, as recommended for steam pumps.

The pump should be operated every week at rated speed with water discharging through some convenient opening. This is desirable to make sure of the condition of the pump, bearings, stuffing boxes, suction pipe and strainers, and the various other details pertaining to the driver and control equipment. If the driver is an internal combustion engine, it should be run for at least thirty minutes to bring it up to normal running temperature, and to make sure it is running smoothly at rated speed. When automatically controlled pumping units are to be tested weekly by manual means at least one start should be accomplished by reducing the water pressure sensing line or with a larger flow from the entire system. The examination should be extended to include the condition and reliability of the electric power supply, and if the pump is engine driven, the storage batteries, lubrication system, and oil and fuel supplies.

Fire Department Connections.

Fire department connections should be inspected regularly.

The caps should be in place, threads in good condition, ball drip or drain in order, and check valve not leaking.

Open Sprinkler Equipment.

Outside or open sprinkler equipment should be tested once each year during warm weather.

These tests should, when practicable, be made in the presence of a representative of the authority having jurisdiction, and, if desired, with representatives of the fire department.

Before making operating tests, care should be exercised to make sure that all windows and doors through which water might enter are tightly closed. Proper precautions should be taken to prevent damage from discharge or accumulation of water to sidewalks, streets, areaways or adjoining buildings.

Determine by test whether the sprinklers and the system piping are in good condition and free of obstruction. Any piping or sprinklers that are found clogged should be at once removed, cleaned and replaced.

Flushing of Underground Water Supply Connections.

Underground piping connecting water supplies to sprinkler systems should be flushed at periodic intervals using sufficient flow of water to remove any obstructions from the piping.

Yard Hydrants.

Hydrants should be inspected monthly to make sure they are not obstructed by storage, weeds, etc., conveniently accessible, visible, and with caps in place. At least twice per year, in Spring and Fall, they should be opened and closed to ensure proper operation and drainage, and should be properly lubricated.

SPRING INSPECTION

Annually, as soon as danger of freezing weather is past in the spring, a special inspection of the sprinkler system should be made to make sure that all is in proper condition for the summer.

At this time, the cold weather valves should be opened.

Dry pipe valves should be opened, thoroughly cleaned, carefully serviced and properly reset by a competent sprinkler mechanic or by the sprinkler installing company.

The electric and water motor water flow alarms should be tested.

13A-20 CARE AND MAINTENANCE OF SPRINKLER SYSTEMS

Any needed repair work or painting on the sprinkler equipment should be given prompt attention.

FALL INSPECTION

Annually, in October or at the approach of freezing weather, a special inspection should be made covering each building, its sprinkler system and its water supplies, to make sure that all conditions are proper for winter service and that all needed precautions are taken to prevent the impairment of the sprinkler protection by freezing.

Control valves should be checked to make sure that they are open and properly sealed. Post indicator valves should be examined to make sure that they are properly oiled and turn easily and that there is no leakage around the stem.

Cold weather valves should be closed and the exposed pipes drained. The drain valves on the exposed piping should be left slightly open.

Dry pipe valves should be checked to make sure that the systems are holding air properly and that the electric and water motor alarms are in order. The drains at low points of the dry piping should be checked to make sure that they are free of water and the sprinkler piping otherwise pitched to drain properly. The heating provisions for the dry valve should be checked. Stoppage in the sprinkler piping may prevent proper draining.

Alarm valves should be tested for operative condition and the valves or cocks controlling the alarm devices should be left in the proper position.

The gravity tank and its protection against freezing should be checked and the heating system should be tested for operative condition.

Fire pump rooms should be checked for proper condition. Attention should be given to the intake and suction reservoir.

Buildings should be inspected to make sure that windows, skylights, doors, ventilators, etc., are in proper repair and that cold air will not enter nor unduly expose sprinkler piping to freezing. Heating equipment should be made ready for winter service. Special care should be given to the heating of any idle or vacant portions. Arrangements should be made for adequate maintenance of heat in extreme weather, at night, and on Sundays and holidays. Blind or unused attics, perimeter areas, stair towers, low spaces under buildings and roof houses are especially subject to freezing.

GUARDS

The guard should be instructed regarding the sprinkler equipment and the location and use of the control valves, drains and the alarm devices.

The guard should be instructed to give the alarm at once and summon aid if he discovers fire or if the sprinkler alarms operate.

The guard should be instructed how to transmit a fire alarm to the fire department or brigade which is his first duty. He should also be told how to notify someone in authority in case of fire or other trouble.

Serious fires and losses have occurred because the guard turned off the water before the fire was extinguished, allowing the fire to spread beyond the control of sprinklers. If sprinkler alarms operate, it is important that the sprinkler valves shall not be closed until it has been definitely ascertained that there is no fire or that the fire is out. It is of vital importance to determine the cause of water flow from the sprinkler system before shutting off the water.

While the guard may give valuable service in extinguishing incipient fires, he should not attempt emergency work of this character without first giving an alarm or summoning aid.

The guard should be instructed to inspect as far as feasible on his first round the sprinkler control valves to make sure that they are open. If any are found closed, he should at once notify someone in authority.

During cold weather, the guard on his first round should make sure that windows or other outside openings are closed and that proper temperature is being maintained to prevent freezing of the sprinkler system.

PUBLIC FIRE DEPARTMENT

It is advisable to notify the fire department of the installation of automatic sprinkler equipment so that they may become familiar with the system. The fire department should know the extent of the protection and the location and arrangement of the control valves and the connections for fire department use. At the time of a fire, inadequate knowledge of the sprinkler equipment on the part of the fire department may lead to faulty operations.

RESTORING SYSTEMS TO SERVICE AFTER DISUSE

Occasionally, automatic sprinkler systems in idle or vacant properties are shut off and drained during the winter months or for longer periods. When the equipments in such properties are restored to service, it is recommended that such work be performed by a responsible and experienced sprinkler contractor. In such cases, the following procedures are recommended:

1. All lines of sprinkler piping should be traced from the extremities of the system to the main connections with a careful check for blank gaskets in flanges, closed valves, corroded or damaged sprinklers or piping, insecure or missing hangers and insufficient support. Proper repairs or adjustments should be made and needed extensions or alterations of the equipment should be completed.

2. Air may be used to test the system for leaks before turning on the water. Water should be admitted slowly to the system, with proper precautions against damage by escape of water from previously undiscovered defects. When the system has been filled under normal service pressure, drain valve tests should be made to detect any closed valve that possibly could have been overlooked. All available test pipes then should be flushed, and where such pipes are not provided in accordance with the present standards, the proper equipment should be installed.

3. Where the sprinkler system has been long out of service, damaged by freezing or subject to extensive repairs or alterations, the entire system should be hydrostatically tested in accordance with the NFPA Standard for the Installation of Sprinkler Systems (No. 13). Special care should be taken to detect any sprinklers showing minor or dropping leaks and to make replacements where necessary.

4. Dry pipe valves, quick opening devices, alarm valves and all alarm connections should be examined, put in proper condition and tested. Fire pumps, pressure and gravity tanks, reservoirs and other water supply equipment should receive proper attention before being placed in service. Each supply should be tested separately.

5. An investigation for obstruction or stoppage in the sprinkler system piping should be made as outlined in the American Insurance Association pamphlet "Internal Cleaning of Sprinkler Piping."*

6. Finally, all controlling valves should be operated from closed to fully open position and should be left sealed in the open position by the inspection organization or sprinkler contractor.

*Obtainable from the American Insurance Association, Engineering and Safety Department, 85 John Street, New York, N. Y. 10038.

APPENDIX. SCOPE OF INSPECTION SERVICES

The contractor should inspect, test and service the fixed fire protection equipment in a workmanlike manner in accordance with the recommendations of this publication and American Insurance Association publication, Recommended Method for Reporting Dry Pipe Valve Tests (No. 13-C). The service should be performed quarterly and meet the requirements of the insurance authority having jurisdiction. To guide in completing an inspection of the apparatus as installed, the standard Report of Inspection contained in this appendix should be followed in conjunction with the manufacturer's instructions for testing and servicing the equipment.

Wet Systems — Alarm Valves

Test alarms by opening the inspector's test connection and/or the by-pass test connection, in conjunction with making a water flow test when facilities and conditions permit.

Check cold weather valves and exposed piping to assure their proper conditions for winter and summer operation.

Test the solution in anti-freeze system for satisfactory condition, as required in the Standard for the Installation of Sprinkler Systems (NFPA No. 13).

Dry Systems — Dry Valves, Accelerators, Exhausters

Test the alarms, both water flow and air if provided, and perform a water flow test through the drain connection when facilities and conditions permit.

Check air pressure, priming water level, latching arrangements, automatic drip connections when provided, and the general condition of the dry pipe valves, accelerators or exhausters, and their environment, including dry pipe valve room or enclosures.

Trip test dry pipe valves, together with accelerators and exhausters if provided, in accordance with standard testing and reporting procedures required by the authority having jurisdiction.

After testing, restore the system and the dry pipe valve to operation according to the manufacturer's instructions.

Open condensation drains on drum drip connections and drain low points during fall and winter inspections.

Special Systems — Water Deluge, Foam, CO₂, Dry Powder

Test alarms when facilities and conditions permit according to the procedures suggested by the manufacturer(s) and/or as requested by the authority having jurisdiction.

Replacement Parts and Field Service Adjustments

Provide and replace, when necessary, renewable rubber gaskets, rubber clapper facings, and renewable valve discs for control valves. Perform field service adjustments for all control and alarm devices.

Reports

A copy of the report of inspection should be sent to the subscriber and a copy should be sent direct to the authority having jurisdiction.

REPORT OF INSPECTION

Inspection Report
No.

Inspection Contract
No.

Conferred With
.....

Bureau File
No.

REPORT TO BUILDING OR LOCATION

STREET INSPECTOR

CITY & STATE DATE

1. GENERAL

	Yes	N.A.†	No*
--	-----	-------	-----

- | | | | |
|---|---|---------|---|
| a. Is the building occupied? | ● | ● ● ● ● | ● |
| b. Is occupancy same as previous inspection? | ● | ● ● ● ● | ● |
| c. Are all systems in service? | ● | ● ● ● ● | ● |
| d. Are all fire protection systems same as last inspection? | ● | ● ● ● ● | ● |
| e. Is building completely sprinklered? | ● | ● ● ● ● | ● |
| f. Are all new additions and building changes properly protected? | ● | ● ● ● ● | ● |
| g. Is all stock or storage properly below sprinkler piping? | ● | ● ● ● ● | ● |
| h. Was property free of fires since last inspection? (Explain any fire on separate sheet) | ● | ● ● ● ● | ● |
| i. In areas protected by wet system, does the building appear to be properly heated in all areas, including blind attics, perimeter areas and are all exterior openings protected against entrance of cold air? | ● | ● ● ● ● | ● |

2. CONTROL VALVES (See Section 16)

- | | | | |
|---|---|---------|---|
| a. Are all sprinkler system main control valves open? | ● | ● ● ● ● | ● |
| b. Are all other valves in proper position? | ● | ● ● ● ● | ● |
| c. Are all control valves in good condition and sealed or supervised? | ● | ● ● ● ● | ● |

3. WATER SUPPLIES (See Section 17)

- | | | | |
|---|---|---------|---|
| a. Was a water flow test made and results satisfactory? | ● | ● ● ● ● | ● |
|---|---|---------|---|

4. TANKS, PUMPS, FIRE DEPT. CONNECTIONS

Yes	N.A.†	No*
-----	-------	-----

- a. Are fire pumps, gravity tanks, reservoirs and pressure tanks in good condition and properly maintained?
- b. Are fire dept. connections in satisfactory condition, couplings free, caps in place and check valves tight?

5. WET SYSTEMS (See Section 13)

- a. Are cold weather valves open or closed as necessary?
- b. Have anti-freeze systems been tested and left in satisfactory condition?
- c. Are alarm valves, water flow indicators and retards in satisfactory condition?

6. DRY SYSTEMS (See Section 14)

- a. Is dry valve in service and in good condition?
- b. Is air pressure and priming water level normal?
- c. Is air compressor in good condition?
- d. Were low points drained during fall and winter inspections?
- e. Are Quick Opening Devices in service?
- f. Has piping been checked for stoppage within past 10 years?
- g. Has piping been checked for proper pitch within past 5 years?
- h. Have dry valves been trip tested satisfactorily as required?
- i. Are dry valves adequately protected from freezing?
- j. Valve house and heater condition satisfactory?

7. SPECIAL SYSTEMS (See Section 18)

- a. Were valves tested as required?
- b. Were all heat responsive systems tested and results satisfactory?
- c. Were supervisory features tested and results satisfactory?

8. ALARMS

- a. Water motor and gong test satisfactory?
- b. Electric alarm test satisfactory?
- c. Supervisory alarm service test satisfactory?

9. **SPRINKLERS — PIPING**

	Yes	N.A. †	No*
a. Are all sprinklers in good condition, not obstructed, and free of corrosion or loading?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
b. Are all sprinklers less than 50 years old?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
c. Are extra sprinklers readily available?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
d. Is condition of piping, drain valves, check valves, hangers, pressure gauges, open sprinklers, strainers satisfactory?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
e. Are all sprinklers of proper temperature rating?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
f. Are portable fire extinguishers in good condition?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
g. Is hand hose on sprinkler systems satisfactory?	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●

*Explain "No" answers in Item #19 †Not Applicable

10. Date Dry System Piping last checked for stoppage.

11. Date Dry System Piping last checked for proper pitch.

12. Date Dry Pipe Valve last trip tested.

13. Wet Systems: No? Make and Model?

14. Dry Systems: No? Make and Model?

15. Special System: No? Type

Make and Model? Condition?

			Open Secured Closed Signs								
			Yes No		Yes No		Yes No		Yes No		
16. CONTROL VALVES	No?	Type?									Condition
City Connection Control Valve											
Tank Control Valves											
Pump Control Valves											
Sectional Control Valves											
System Control Valves											

17.

WATER FLOW TEST

Water Pressure?.....CITY.....PSI TANK.....PSI FIRE PUMP.....PSI
 Water Flow Test?.....(If none made, Why?).....

Test Pipe Located	Size Test Pipe	Pressure Before	Flow Pressure	Pressure After	Test Pipe Located	Size Test Pipe	Pressure Before	Flow Pressure	Pressure After
.....

18. Heat Responsive Devices: Type?

Type of test?

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Valve No.....A.....B.....C.....D.....E.....F.....

Auxiliary equipment: No?..... Type?..... Location?..... Test Results?.....

19. Explanation of any "No" answers.

20. Recent changes in building occupancy or fire protection equipment.

21. Adjustments or corrections made.

22. Desirable Improvements.

DUPLICATE TO:

STREET CITY & STATE

*Explain "No" answers in Item #19

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43 Pyroxylin Warehouses '67	.40	85B Gas Multi-Burner Boiler '71	1.75	702 Wearing Apparel '68	.75
46 Timber, Outdoor Storage '61	.50	85D Oil Multi-Burner Boiler '71	1.75	703 Fire Retardants Bldg. Matl. '40	
46A Wood Chips, Storage '65	.40	85E Coal Multi-Burner Boiler '71	1.75	704M Identification of Materials '75	
46B Outdoor Storage of Logs '71	1.00	86A Ovens and Furnaces '71	2.50		
47 Lumber Storage Yards '61	.50	86B Industrial Furnaces '71	2.00	801 Radioactive Matl. Facil. '70	.75
48 Magnesium '67	.60	87 Piers and Wharves '71	1.25	802 Nuclear Reactors '60	.75
48I Titanium '61	.60	88 Garages '68	.75		
482M Zirconium '61	.50	89M Heat Equip. Clearances '71	1.00	901 Fire Reporting System '71	3.50
49 Hazardous Chem. Data '71	2.75			901AM Field Incident Manual '71	1.50
490 Ammonium Nitrate '70	.75	90A Air Conditioning Syst. '71	1.00	910 Library Collections '70	.75
		90B Residence Warm Air Htg. '71	1.00	911 Museum Collections '69	.75