SCHULTE & ASSOCIATES
Building Code Consultants
3655 East 25th Street
Lawrence, KS 66046
fpeschulte@aol.com
847/312-7617

FIRE PROTECTION HISTORY-PART 211: 1899 (SPRINKLER SYSTEM INSTALLATION RULES)

By Richard Schulte

The third Annual Meeting of the National Fire Protection Association was held in Boston, Massachusetts in mid-June 1899. Among the topics of discussion at this meeting was Report of Committee on Automatic Sprinkler Regulations and Devices. The following is a transcript of the Report and the discussion which followed:

"***REPORT OF COMMITTEE ON AUTOMATIC SPRINKLER REGULATIONS AND DEVICES.***

Mr. Anderson. *Previous to our last meeting the sprinkler committee invited suggestions from members who desired to propose changes or amendments to the standard requirements. Only one response was received and the committee decided to make no changes until this year. During the past year we have received a large number of suggestions. We have considered them very carefully and conscientiously. We present you today the result of the committee's work.*

TOPICS.

SPRINKLER EQUIPMENT REGULATIONS.

A. Preliminary Information.

1. Many buildings require preparation for sprinkler equipment. All needless ceiling sheathing, hollow siding, tops of high shelving, needless partitions or decks should be removed. Necessary "stops" to check draught, necessary new partitions, closets, decks, etc., should be put in place that the equipment may conform to same.

2. Full effective action of sprinklers requires about 24 inches wholly clear space below roofs or ceilings; this loss of storage capacity should be realized in advance of equipment.

3. Sprinkler equipments require accessory woodwork, dry-pipe valve closets, ladders, anti-freezing boxing for tank pipes, etc. This work should be promptly attended if not let with sprinkler contract.

4. Sprinkler installation is a trade in itself. Insurance inspectors cannot successfully act as working superintendents nor correct errors of beginners. It is strongly recommended to entrust sprinkler work to none but fully experienced and responsible parties.

5. Experience teaches that sprinklers are ofttimes necessary where seemingly least needed. Their protection is required not alone where a fire may begin but also wherever any fire might extend, including wet or damp locations.

6. A maximum protection must not be expected where sprinklers are at more or less permanent disadvantage, as in the case of stocks very susceptible to smoke and water damage, buildings having deep piles of hollow goods, excessive draughts, explosion hazards, or large amounts of benzine or similar fluid.

7. Paper or similar light inflammable ceiling sheathing is objectionable and unnecessary. Where floors leak dirt, an acceptable sheathing may be made of lath and plaster, matched boards or joined metal. All channels back of sheathing to be thoroughly closed between timbers or joists. Sheathing to be tightly put together and kept in repair. In mill bays, sheathing to follow contour of timbers without concealed space.

8. Vertical draughts through buildings are detrimental to the proper action of sprinklers and must be "stopped " where practicable.

9. Sprinklers cannot be expected to keep out fire originating in unsprinkled territory. Stringent measures should be used to cut off all unsprinkled portions of buildings or exposures.

B. The Automatic Sprinkler.

These rules (Sec. B) are but a partial outline of requirements. An automatic sprinkler which will meet these requirements and no more will by no means be necessarily acceptable.

1. As a basis for these rules, it is required that each automatic sprinkler have an unobstructed outlet of such size and form that with 5 pounds pressure maintained at the sprinkler, it will discharge approximately 12 gallons per minute.

2. An automatic sprinkler upon original test must not leak under a pressure of 300 pounds hydraulic pressure.

3. Sprinklers upon original test must not burst or leak by suddenly increasing the pressure from 0 to 300 pounds, repeated 500 or more times.

4. An automatic sprinkler when intended for ordinary use must, when immersed in hot fluid, fuse at not less than 155 degrees F, nor more than 165 degrees F. Head not to be under pressure in this test. " Hard heads" in like manner must fuse at not less than 275 degrees or more than 300 degrees F. The fusing point of solder should not change with age.

5. On original test an automatic sprinkler on fusing must open without perceptible halt or hesitation at any point of the opening action, all freed parts must throw clear. This test to be made without subjecting the sprinkler to pressure or depending upon the action of a coil spring.

6. An automatic sprinkler must be designed to open and spray satisfactorily in an upright or pendant position.

7. Rules For Distribution of Water From Sprinklers.

Sprinkler upright or pendant with deflector 4 or 6 inches below smooth ceiling and 10 feet above smooth floor.

Shall, under 5 pounds nozzle pressure, wet ceiling over an area of not less than 3 to 4 feet in diameter.

Shall, when under 5 pounds nozzle pressure, throw approximately 90 per cent of water inside an area 10 feet square on floor.

Shall, when under 50 pounds pressure, throw not less than 75 per cent of water inside the 10 feet square area.

Distribution in both above tests to be approximately uniform over the 10 feet square area.

Water should not be cut up into fine spray.

Rotary deflectors are allowable, but the distribution must be satisfactory with deflector fixed.

The distribution in any direction shall not be obstructed by yoke, levers or other parts of sprinkler.

8. Automatic sprinklers must contain no iron, steel or fibrous material subject to the effect of corrosion.

C. Location and Arrangement of Automatic Sprinklers.

1. Sprinklers to be located in an upright position. (Note.–Where construction or occupancy of a room make it preferable, permission may be given, except on dry pipe systems, to locate sprinklers in a pendant position.)

2. Sprinkler deflectors to be parallel to ceilings, roofs, or the incline of stairs except that the deflectors of sprinklers in the peak of a pitch roof shall be horizontal.

3. Distance of deflectors from ceilings or bottom of joists to be not less than 3 inches nor more than 10 inches.

4. Sprinklers to be placed throughout premises including basements and lofts under stairs and inside elevator wells, belt, cable, pipe, gear and pulley boxes, inside small enclosures such as drying and heating boxes, tenter and dry room enclosures, chutes, conveyor trunks and all cupboards and closets except they have tops entirely open and so located that sprinklers can properly spray therein. Sprinklers not to be omitted in any room because it is damp or wet.

Special instructions must be obtained relative to placing sprinklers inside boxed machines, metal air ducts, ventilators and concealed spaces, and under large shelves, benches, tables, overhead storage racks, platforms and similar water sheds.

5. In vertical shafts having inflammable sides, a sprinkler to be provided for each 200 square feet of the inflammable surface.

Metal lined shafts are construed as inflammable.

Such sprinklers to be installed at each floor when practicable and always when shaft is trapped.

D. Spacing of Automatic Sprinklers.

(Also See F., 4.)

1. The distance from wall or partition must not exceed one half the distance between sprinklers in the same direction.

2. A line of sprinklers should be run on each side of a partition. Cutting holes through a partition to allow sprinklers on one side thereof to distribute water to the other side is not effectual. This rule applies to solid or slatted partitions.

3. Under Mill Ceiling (smooth solid plank and timber construction, 6 to 12 feet bays) one line of sprinklers should be placed in centre of each bay and distance between the sprinklers on each line not to exceed the following:

8 feet in 12 feet bays (measuring centre to centre of timbers.)
9 feet in 11 feet bays (measuring centre to centre of timbers.)
10 feet in 6 to 10 feet bays (measuring centre to centre of timbers.)

4. Under joist ceiling, open finished, distance between sprinklers not to exceed 8 feet at right angles with joists or 10 feet parallel with joists. (Exception.– An exception may be made to this rule if the conditions warrant, viz., special permission may be given to instal[l] *but one line of sprinklers in bays 10 to 11*[-]*½ feet wide from centre to centre of the timbers which support the joists. In all cases where such bays are over 11*[-]*½ feet wide, two or more lines of sprinklers must be installed in each bay as required by the rules for spacing. This does not apply where beams are flush with the joists, in which case sprinklers may be spaced as called for in rule D, 4.*

5. Under a pitch roof sloping more steeply than 1 foot in 4, one line of sprinklers to be located in peak of roof, and sprinklers on either side to be spaced according to above requirements. Distance between sprinklers to be measured on a line parallel with roof.

6. Under open finish, joisted construction floors, decks and roofs, the sprinkler shall be "staggered" spaced so that heads will be opposite a point half way between sprinklers on adjacent lines, the end heads on alternate lines to be within 3 feet from sides of room. (Note.–This regulation applies to all sprinklers under open finished joists not excepting the sprinklers within a bay whether on one, two, or more lines; where the joists are flush with timbers; or where the channel ways between joists are "stopped" at intervals. Care must be taken that the end and intermediate sprinklers do not violate the rules for joist work spacing).

7. Special instructions must be received relative to location of sprinklers under floors and roofs of unusual construction which would interfere with distribution of water and for which provision is not hereinbefore made.

E. Pipe Sizes for Automatic Sprinklers.

1. In no case shall the number of sprinklers on a given size pipe exceed the following:

Size of Pipe.	*Maximum No. of Sprinklers Allowed.*
3/4 inch,	*1 sprinkler*
1 "	*2 "*
1[-]1/4 "	*4 "*
1[-]½ "	*8 "*
2 "	*16 "*
2[-]½ "	*28 "*
3 "	*48 "*
3[-]½ "	*78 "*
4 "	*110 "*
5 "	*150 "*
6 "	*200 "*

2. If more than 6 sprinklers be placed on a "branch line" of pipe, the following schedule shall apply:

Size of Pipe.	*Maximum No. of Sprinklers Allowed.*
3/4 inch,	*1 sprinkler*
1 "	*2 "*
1[-]1/4 "	*4 "*
1[-]½ "	*6 "*
2 "	*8 "*
2[-]½ "	*16 "*
3 "	*28 "*

Furthermore, no feeder to any such "branch line " shall be smaller than said "branch line." (Note.–The old-fashioned "Parmelee" or "tree" arrangement of piping, viz., a pipe with short branches to one sprinkler on either side shall be construed as coming under this rule.)

F. Feed Mains and Risers.

1. "Centre central " or "side central" feed to sprinklers is recommended. The former preferred, especially where there are over 6 sprinklers on a branch line. End feed is not approved. (See cuts.)

2. There should be a separate riser in each building and in each section of a building divided by fire walls. The size of each riser to be sufficient to supply all the sprinklers on any one floor, as determined by the standard schedule of pipe sizes. If the conditions warrant, special permission will be granted allowing the sprinklers in a fire section of small area (total number of sprinklers not to exceed 48 per floor) to be fed from the riser in another section.

3. Where there are sprinklers enough in one room to require a six-inch riser, according to schedule, it is preferable to have these sprinklers supplied through 2 or more smaller risers.

4. Where 2 or more floors communicate by openings not provided with approved "stops," acceptable "curtain boards" must be fitted around the openings at each floor or by consent of Board having jurisdiction the automatic sprinklers at each floor may be placed within 1 foot of the openings.

[ILLUSTRATIONS NO. 1, 2, 3, 4, 5, 6 AND 7 OMITTED.]

G. Valves and Fittings.

1. Pipes must be supported in a substantial manner by wrought or cast iron hangers well secured.

2. Long bend fittings are recommended.

3. On wet systems, there shall be a test pipe ½ inch in diameter connected directly with each riser in upper story and arranged to discharge outside building.

4. There shall be a straightway gate valve and a straightway check valve in the pipe connecting each water supply with sprinkler system. Straightway check valves to be placed in horizontal pipe, or in vertical pipe "looking up," never "looking down."

5. All gate valves (except they are fitted with post indicators) in supply pipes to sprinklers, in discharge pipes from tanks, in suction and discharge pipes from pumps to be of outside screw and yoke or approved sign indicator pattern, and to be kept secured open with padlocked or riveted leather straps passing around the riser and spoke of the wheel. Draw-off valves to be secured closed. Cases about post gate valves to be arranged to drain through at least a 3/4 inch outlet having a non-corrosive bushing.

6. Drip pipes to be provided to drain all parts of system. Drip pipes at main risers to be not smaller than 2 inches.

7. Main discharge pipes from gravity and pressure tanks, as well as from water works systems and pumps to connect with sprinkler system at foot of riser. Locate in this lower level the check valve in each connecting pipe, also one gate valve controlling all water supply to sprinklers. Place the gate valve called for in each connecting pipe, close to the supply as at the tank, pump, or in connecting pipe to riser from water works system.

8. Where sprinklers are supplied from yard main, if possible, place an outside post indicator gate valve in connecting pipe at safe distance from building (say 40 feet).

9. When a pump, not located in a non-combustible pump house, discharges into a yard main fed by another supply, a check valve or post gate valve shall be placed in this discharge pipe outside the building underground.

10. Each underground check valve to be located in a pit accessible through manhole. Pit to be tight enough to keep out water from the ground or surface, and to be provided with a deck forming a double air space, to prevent freezing.

11. A standard make, 5 inch dial, spring pressure gauge to be connected with the discharge pipe from each water supply (this includes the connecting pipe from public water works); also with each sprinkler system above the alarm check or dry valve; also at air pump supplying pressure tank, at pressure tank and in each independent pipe from air supply to dry systems (Rule l, 7). Gauges to be located in a suitable place, and where water will not freeze. Each to be controlled by a cock valve having a square head for wrench. A plugged tee or pet cock to be located between each cock and gauge.

H. Alarm Valve System.

1. Every automatic sprinkler system should contain an alarm valve so constructed that a flow of water through same would operate an electric gong, a mechanical gong, or both, as the character of the property and circumstances may require. In cities where there is a thermostat alarm company with a central station, the alarm valve may be connected with such central station. In other places, especially in small towns, the valve may be directly connected with public fire department house or some other suitable place.

The use of both electric and mechanical gongs is strongly recommended. The gong of the latter can be located on the outside of building or any other desirable place on the premises. Valve should be so constructed that the flow of water through but one sprinkler would cause it to operate. It must not be affected by the varying water pressures received from street mains or automatic pumps. It must have a water way equal to or greater than the pipe in which it is installed and must be so designed as to but little diminish the flow of water. Valve to be so located that the passing of water through any of the sources of supply to any of the sprinkler will cause its action. To accomplish this in some equipments, it would be necessary to use two or more alarm valves. Construction of valve to be such that it cannot be prevented from opening in full by water column, corrosion, sticking of parts or sediment. No valve to be installed unless it has the approval of the underwriters having jurisdiction.

2. Wiring of Electric Alarms Connected to Check and Dry Valves.

(Note–The following rules are in accord with those of the N. F. P. A. governing installation of thermo-electric fire alarms.)

Inside Wiring–To follow general rules as given under Section 1 of Thermostat Rules.

Outside Wires–To follow general rules as given under Section 2 of Thermostat Rules. (Note.–In certain country risks, where outside connections are nearby, and wires cannot be crossed by other wires, protectors may be waived.)

Batteries–Must be located in as cool and dry place as possible, enclosed, but readily accessible.

Outside Connections–To follow general rules as given under "Outside Connections" of Section 8 of Thermostat Rules, except that where connection is made with any fire department house, no other connection will be required.

Bells– Must be not less than 6 inches in diameter. Where there is only one outside connection, bell shall be of vibrator pattern. Where there are two outside connections, bells to be wired in series, a vibrator being placed in principal one and a single stroke in the other.

Testing–System to be tested daily by closing a circuit through the binding posts of the alarm valve. Test to be recorded by a device which shall make a series of punctures on a dial showing the vibration of the main bell. This device to be of single stroke pattern nominally out of main circuit (that is in the test circuit connecting the binding posts) in series with and vibrated by main bell.

3. Switches for cutting out alarms are prohibited.

I. Dry Pipe System and Fittings.

1. A dry pipe system is not recommended when a wet system can he used.

2. The use of an approved dry valve, is, however, far preferable to entirely shutting off water supply during cold weather; the latter practice is not sanctioned.

3. Dry system to be maintained throughout the year unless changed by consent of the underwriters having jurisdiction.

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4. Especial care must be taken to arrange all sprinkler pipes and fittings that they may be thoroughly drained. Sprinklers must be located in an upright position. (Note.–Large dry pipe systems to be provided with "drum drips " preferably located in warm places, at discretion of the underwriters having jurisdiction.)

5. All water supplies to sprinklers must enter system below dry valve.

6. A large number of sprinklers (500 or more) on a dry system to be supplied through two or more dry valves. System to be divided horizontally.

7. There shall be an independent pipe from air pump to each air system. Locate in each pipe a gate valve, check valve and pressure gauge.

8. Where exposed to cold, dry valve to be in an approved underground pit or enclosed in a closet of sufficient size to give 2[-]½ feet free space on all sides of and above and below dry valve. Make double walled top sides and bottom with 4-inch hollow space. Space may be filled with tan bark, mineral wool, etc., as desired. Heat by steam, lard oil, lantern or gas. Provide a wet pipe sprinkler in closet with shut off valve.

9. It is advised that a steam driven air pump be used instead of a power pump.

10. If it is necessary to have but 50 per cent or less of the total number of sprinklers on an air system, only such sprinklers should be thus piped; the remainder to be on wet system. (Note.–This rule requires small dry pipe systems for show windows, blind attics or other minor portions exposed to freezing.)

J. Water Supplies.

1. Double Supply–Two independent water supplies are absolutely essential for the best equipment. At least one of the supplies to be automatic and one to be capable of furnishing water under heavy pressure. The following are acceptable supplies: Public water works system, duplex steam pump, private reservoir or standpipe, gravity tank, air pressure tank, rotary pump. The choice of water supplies for each equipment to be determined by the underwriters having jurisdiction.

2. No water supply for sprinklers to pass through a meter or pressure regulating valve, except by special consent.

3. Connection from water supply or main pipe system to sprinkler riser to be equal to or larger in size than the riser, and to supply no hydrant or standpipe.

K. Public Water Works System.

(Rules also applicable to private reservoir and standpipe systems.)

1. Should give not less than 25 pounds static pressure at all hours of the day at highest line of sprinklers.

2. Street main should be of ample size, in no case smaller than 6 inches.

3. If possible, avoid a dead end in street main by arranging main to be fed at both ends.

L. Steam Pump.

1. Steam pump to be of approved duplex type (underwriters' pattern preferred) of the capacity named by the underwriters in each instance but never less than 500 gallons rated capacity per minute, so located on the premises as to be free from damage by fire or other causes, and to take water from an approved source having a sufficient quantity of water to supply the pump while delivering its rated capacity for at least 60 minutes. Suction pipe to have a strainer, and, if the lift be more than 5 feet, a foot valve may be recommended. If pump is to be a supply for hose or open sprinklers, as well as automatic sprinkler system, it should never be of less than 750 gallons rated capacity. (Note 1.–In determining the rated capacity of a pump, 70 revolutions shall be allowed for 12-inch stroke, 75 revolutions for 10-inch stroke, 10 per cent shall be deducted for slip). (Note 2.–It is requested that a clean and well floored room with a tight roof be provided for fire pump. No room is acceptable where the conditions prevent or discourage the engineer from keeping pump in good condition.)

2. Where a pump does not take water under head, it should be primed from water tank, used exclusively for that purpose, of not less than 200 gallons capacity or its equivalent. Priming pipe to connect into each of the four water chambers.

3. Pump to be so located in respect to its water supply that at no time shall it have a lift of over 15 feet during 60 minutes discharge at rated capacity. (Note.–When a pump takes water under head, there shall be a gate valve in suction pipe, located at pump).

4. Discharge pipe to contain a spring relief valve and pressure gauge.

5. 2[-]*½ inch hose connections with gate valves to be placed in pump discharge, at pump (one connection for every 250 gallons rated capacity of pump). These are required for the purpose of properly testing pump.*

6. If an automatic regulator is placed in steam connection to pump, it shall be on a by-pass with a shut-off valve on each side of same and a satisfactory steam trap provided.

7. Steam pressure of not less than 50 pounds to be maintained at all times. Provision to be made for sufficient steam power to run pump to full rated capacity; not less than 40 HP for each 250 gallons rated capacity of pump. Means shall be provided for liberally oiling steam chests of pumps independent of sight feed, viz. hand oil pump. 3 gallons special quality oil to be kept at pump for this purpose.

8. Where a steam pump is the primary supply an automatic gauge to record the steam pressure in pump steam chest shall be applied.

9. Fire pump to be operated at least once a week.

10. Any boiler house on which pump depends for steam supply should be of brick or stone, detached or cut off from main buildings by standard fire doors.

11. Steam pipe from boiler or boilers to pump to supply pump only; as far as practicable to be located where not subject to injury in case of fire or other accident, to be fitted with steam trap and drip pipe. Where there is more than one boiler, the arrangement of pipes and valves to be such that each boiler may be "cut out" without interrupting steam supply to pump from the other boilers. Where there are several fire pumps, each should be arranged to be "cut out" without affecting the others. Pump exhaust to be free from liability to back pressure.

12. Valves to be located in boiler house so that all steam supply to other buildings may be cut off from them in time of fire and reserved for pump.

M. Gravity Tank.

1. Elevation of bottom of tank above highest line of sprinklers on system which it supplies and capacity of tank to be specified by the underwriters having jurisdiction. In no case shall a tank of less than 5,000 gallons capacity be accepted. The greater the elevation of a gravity tank the less likelihood of inefficient service. Underwriters having jurisdiction are urged to have such tanks placed at the greatest practicable elevation.

2. Water for filling tank shall be conveyed through fixed iron piping not less than 1[-]*1/4 inch in size. Sprinkler piping not to be used for this purpose.*

3. Tank to be used as a supply to automatic sprinkler system only, except that, at the discretion of the underwriters, tank may be made larger than called for, and so arranged that the excess supply only, may be used for domestic service.

4. Tell-tale–All gravity tanks to be provided with a water level indicating device satisfactory to the underwriters having jurisdiction.

5. End of sprinkler riser should enter bottom of tank and project above bottom 4 inches, to avoid sediment entering pipe system.

6. Provision shall be made to drain each tank independent of the sprinkler system.

7. Provision must be made to prevent water from freezing in tank and pipes communicating with the same. A tank exposed to the weather must have a double cover, provided with trap door. When a steam pipe is used for heating tank, it should be run directly from boilers with controlling valve located in boiler room. A check valve to be located in this pipe at tank to prevent siphoning.

8. A permanent substantial ladder extending 3 feet above tank or satisfactory stairway must be maintained to allow access to tank on outside. Also a ladder to be permanently located inside tank. (Note.–The outside ladder at a tank exposed to the weather affords a treacherous foothold at best. For years after it is erected, it must be used by inspectors in all seasons and conditions of wind, temperature and storm. A ladder of much more than ordinary strength and durability is required and must be most securely attached. A heavy iron pipe ladder, having diamond shaped treads, is recommended.)

9. Tank to be built and supported under specifications and supervision of the municipal or building authorities.

N. Pressure Tank.

1. Total capacity of tank or tanks to be not less than 4,500 gallons except by special consent.

2. Tank not to be located below upper story of building. The 2 valves in water gauge are ordinarily to be kept closed, and opened only to ascertain the amount of water in tank; as breaking of or leakage about glass would cause the escape of pressure.

3. Water for supplying tank to be conveyed through fixed iron piping not less than 1[-]*1/4 inch in size. Sprinkler piping not to be used for this purpose. Pipe from air pump to tank to be not smaller than 3/4 inch; to be independent of water supply pipe; to connect with tank above the water level. Both water and air connections to be fitted with check and stop valves located near tank.*

4. Tank to be kept 2/3 full of water, and an air pressure (not less than 75 pounds) maintained, such as will give not less than 15 pounds pressure on highest line of sprinklers when all water has been discharged from tank.

5. Wherever steam is available, a steam driven air compressor shall be used.

6. Tank to be used as a supply to automatic sprinklers and hand hose only. (See Rules S, 1 and 2).

7. Provision shall be made to drain each tank independent of the sprinkler system.

8. It is desirable to have water fed to tank by a pump so that proper water level may be restored at any time without reducing air pressure.

9. Tank to be built and supported under specifications and supervision of the municipal or building authorities.

O. Rotary Pump.

1. To be of approved type, rated capacity never less than 500 gallons per minute; to have gears at both ends. To be located where easy of access and free as possible from damage by fire. If inside main building, to be arranged, together with water wheel, to start from outside of building; to take water from a source having sufficient quantity of water to supply the rated capacity of the pump for 60 minutes.

2. In many cases it will be found necessary to provide an approved friction clutch by which shafting and machinery can be disconnected and full power confined to driving pump.

3. Pump to be so located in respect to its water supply that at no time shall it have a lift of over 10 feet during 60 minutes discharge at rated capacity. To have hose connections, spring relief valve, gate in suction and pressure gauge the same as steam pump. To be started by friction clutch or friction gearing. Care should be taken to provide sufficient power to run pump to full rated capacity.

4. Rust and usage will impair the efficiency of a rotary pump more quickly and to a much greater degree than an underwriter steam pump. In most cases, a rotary pump cannot be as advantageously located and is under less control. Consequently, it is not to be recommended when practicable to install a steam pump.

5. Means should be provided for liberally oiling journals. 1 barrel special quality oil to be kept at pump for this purpose.

P. Steamer Connection.

1. In addition to the above required double supply, it is recommended that a hose inlet pipe to sprinkler system be provided for connection from hose or steamer of public fire department, in all cases where the public water works is not sufficient to exert 25 pounds pressure at highest sprinkler, or is not connected to the sprinklers.

Said pipe to be not less than 3 inches in size and fitted with a straightway check valve but not with a gate valve. To be attached above dry valve or gate valve controlling sprinkler riser where there is but one riser and below said dry or gate valves where the equipment has more than one riser.

Hose connection to suit thread of public department.

Large buildings to have several connections designated by proper signs.

Q. Underground Pipes and Fittings.

HYDRANT MAINS.

1. No 4-inch pipe to be used.

2. For pipes extending to a dead end–

(a) Allow 200 feet 6-inch pipe with one 3-way hydrant.

(b) Allow 500 feet 6-inch pipe with one 2-way hydrant. (This might be extended in special cases.)

© Allow 1,000 feet 8-inch pipe with one 3-way hydrant.

(d) Allow 500 feet 8-inch pipe with one 4-way hydrant or its equivalent in hose streams.

(e) Allow 300 feet 8-inch pipe to first hydrant, where there is a hydrant equivalent of 6 streams.

(f) Whereas the above limitations for 8-inch pipe are low, it is deemed undesirable to have over 4 streams on a dead end and loop system would ordinarily be employed where it is intended to concentrate over 4 streams at one point.

(g) Never allow more than 3 streams on 6-inch branch pipe.

3. For loop systems–

(a) With two 3-way hydrants, say 250 feet apart, allow 250 feet 6-inch pipe from each hydrant towards source (preferably use 8-inch pipe with 3-way hydrant systems).

(b) With two 2-way hydrants, say 250 feet apart, allow 500 feet 6-inch pipe from each hydrant toward source.

© With three 2-way hydrants 250 feet apart allow 250 feet 6-inch pipe from end hydrants toward source.

(d) To feed four 2-way hydrants or their equivalent, use 8-inch main feed pipes and allow 500 feet of 8-inch pipe each way from end hydrant to water supply, rest of pipe 6 inch, if desired.

(e) To feed five 2-way hydrants or their equivalent, use 8-inch main feed and allow 250 feet from end hydrants to water supply.

(f) Where water supplies are such that over 4 streams can be obtained, loop pipes should never be less than 8 inch.

(g) In laying out a loop system where it is intended to concentrate 4 to 6 streams at any one point, an 8-inch loop should be amply sufficient even if it is as much as 1,000 feet from supply to point of concentration.

(h) Under conditions where a large number of streams can be concentrated at one point, it would be sometimes desirable to use 10-inch or 12-inch pipe.

R. Open Sprinklers.

(To be used only on the external surfaces of a building.)

1. Each open sprinkler to have an unobstructed outlet of such size and form that with 5 pounds pressure maintained at the sprinkler it will discharge approximately 6 gallons per minute. Such sprinklers are to he arranged on piping not smaller than that used for automatic sprinklers. (Note–It is to be remembered that in a system of open sprinklers all are operated at one time, and with a system of any size, there is a considerable quantity of water discharged per minute. For that reason, outlet of each open sprinkler is made smaller than that of an automatic sprinkler. A 3/8-inch thin plate or ring orifice will give the discharge desired. The schedule of pipe sizes for "branch lines" does not apply to open sprinklers having 3/8-inch thin plate orifice or its equivalent. Only approved types of open sprinklers, specially designed for the purpose, to be used. Opened automatic sprinklers are not acceptable.)

2. Adequate service is provided in many cases if one line of open sprinklers is run directly under cornice.

3. Where a small wall surface is to be protected, a good arrangement is to place one head opposite and about 6 inches below the top of every window on each floor.

4. Riser for open sprinklers to feed into the line at centre and not to be supplied from any point which would actuate a properly located alarm valve of the automatic sprinkler system whether or not such an alarm valve is provided.

5. Supply to open sprinklers to be town water works, standpipe, pump or steamer connection but never pressure or gravity tank used to supply automatic sprinklers.

6. Valve controlling the supply to be located at a safe distance from the exposure and readily accessible.

7. All pipes and fittings in such a system to be carefully arranged so that water can be entirely drawn from same.

8. Open sprinklers on the peak of a roof require a differently shaped deflector from those used at cornice that all water may be at once deflected upon the roof, equally distributed on either side of peak.

9. Not over 12 open sprinklers to be at one side of feed point on one line of pipe and not to be located over 8 feet apart "on the line."

S. Miscellaneous Rules.

1. Circulation of water in sprinkler pipes is very objectionable owing to greatly increased corrosion, deposit of sediment and condensation drip from pipes; sprinkler pipes must not be used in any way for domestic service.

2. Hand hose to be used for fire purposes only, may be attached to sprinkler pipes within a room under the following restrictions. Hose not to be larger than 1[-]*1/4 inch. Nozzle not to be larger than ½ inch. Hose not to be connected to any sprinkler pipe smaller than 2*[-]*½ inches, never to be attached to a dry pipe system.*

T. Cautions and Prohibitions.

1. Where pipes are painted or bronzed for appearance, the moving parts of sprinkler heads must not be so coated.

2. Sprinkler heads must be free to form an unbroken spray blanket for at least 2 feet under the ceiling from sprinkler to sprinkler and to sides of room. Any stock piles, racks, or other obstructions interfering with the foregoing are not permissible.

3. Where a building settles and deprives a dry pipe system of its drainage, the ends of lines must not be raised to violate Rule C, 3. The drainage should be restored by shortening the vertical piping.

4. Use of water or circulation of water above base of sprinkler riser is prohibited. See Rules S, I; M, 2; N, 3.

5. Notice that it is the deflector of a sprinkler which must be at least 3 inches (and not over 10 inches) from ceiling or bottom of joists. 5 to 6 inches is the best distance with average pressure and present types of sprinklers (See Rule C, 3).

6. Sprinkler piping must not be used for the support of stock, clothing, etc.

7. It is not permitted to change, plug up or remove the fittings pertaining to dry pipe valves, pressure tanks, pumps, gauges, etc. If such fittings leak or become deranged, they are to be put in order.

8. There should be maintained on the premises a supply, never less than 6, of extra sprinklers to promptly replace any fused by fire or in any way injured.

A. Preliminary Information–

Mr. Anderson. *There was some doubt in the minds of the committee whether it was desirable to put this " Preliminary Information " into the report. Some of us thought it would be better to restrict it to the requirements; others thought these preliminary suggestions would be important, and be a great help in some locations.*

Mr. Stratton. *I cannot see any objection to the general suggestions contained in this "Preliminary Information," or to its publication. It brings together a number of ideas that are pretty well known to all who are engaged in our work, and I think it is unobjectionable, with the exception of the tenth paragraph. I am hardly ready to be committed to the statement that there is any particular deterioration in sprinkler equipment, or that such equipment is bound to depreciate in any particular degree in any particular time. I think that would create alarm among the people who put them in; a feeling that they will be called upon to replace them as a complete outfit, involving a heavy expense. I am afraid it would stop the progress of the work of getting them introduced. If there is any especial deterioration of this equipment I would like to hear on what points they have information, but I think that one clause should be eliminated.*

Mr. Robinson. *I would like to say that while I think the deterioration in the apparatus itself might not be such as to cause alarm, such an article or paragraph as this No. 10 might have that effect. The deteriorating influences vary in different classes of buildings. The use of sprinklers is increasing very largely in our mercantile risks, city risks, miscellaneous manufacturing risks, and I should not want to discourage or hinder their increasing use. I think a good deal of the deterioration is not due to the general letting down of the equipment, but to the influences. I think a sprinkler system, unless interfered with, or obstructed, or affected by influences independent of the system itself, would probably last a good many years without any deterioration.*

Mr. Hexamer. *We have not considered the question of corrosion. I think the deterioration is due more to corrosion than any other point.*

Mr. Robinson. *I would like to ask in regard to this 24-inch wholly clear space below roofs or ceilings. I think in a number of cases we could, perhaps, afford to waive that, with certain classes of stock. I would like to bring that matter up.*

Mr. Anderson. *That matter was considered by the committee, and full and effective action was thought advisable. We find in New York very great trouble in keeping the goods down. While in a cellar we may waive it, we think it is desirable to put it before the public in this way. It is not positive. It leaves it for local boards to accept a smaller distance if they think it desirable.*

The President. *It is not a rule but a recommendation that for full and effective service there should be so much clear space.*

Section " B. The Automatic Sprinkler," being read–

Mr. Lemmon. *How are we going to prevent the fusing point of solder from increasing? It does increase. I have seen a 165 degree sprinkler run up to 400 degrees and not open,–due to the action of well water. Is there any way to avoid that and require solder that will not increase?*

Mr. Hexamer. *How, under the present sprinkler construction, can well water affect the fusibility of the solder?*

Mr. Lemmon. *I referred to a case where the suction for the fire pump was an 8-inch driven well. After this was discovered, the connection was removed from the well, and now we have the city water. New heads were put on.*

Mr. Stratton. *If the rest of the committee and the members will consent, it would seem to me desirable to eliminate that entire portion from the report, and await the result of further investigation as to the deterioration of solder and the other features.*

Mr. Hexamer. *You propose to eliminate the entire section?*

Mr. Stratton. *Down to No. 6. We have not yet considered the rules for distribution.*

Mr. Hexamer. *I cannot see any reason why that should be done. I have noted two points which I would like to offer as substitutes. In B 1, I want to amend by inserting after the words, " 12 gallons per minute" " not less than one-half inch openings to be permitted"; and in B 4, where it reads, " the fusing point of solder must not change," to read "should not change."*

The Secretary. *I trust you will not decide to eliminate this section up to and including No. 6. It is scarcely necessary to wait for further investigation of the solder now generally used for releasing automatic sprinklers to feel safe in adopting these rules. This question of the impairment of solder may be considered as covered by the first sentence: " An automatic sprinkler which will meet these requirements and no more will by no means be necessarily acceptable." The solder which is generally used is made after a standard formula which is many years old, and, if properly compounded and exposed to ordinary conditions is entirely satisfactory, so far as my experience goes. Of course, if it is put to a more severe test, as in sulphite pulp mills, for instance, which will eat the whole sprinkler up, the solder will go with it. Solder compounded according to the standard formula will not change more than is shown in these limitations of from 155 to 165 degrees. Heads installed for a dozen or fifteen years and removed in large numbers have shown that very clearly. They have operated at, or very close to, the point at which they were expected to operate. I think that those heads that have been spoken of, that did not operate with 400 or 500 degrees of heat, were not properly compounded. There may have been a change, but the real trouble was in the way the solder was originally made. I don't think any such difficulty has been found with properly compounded solder.*

Mr. Stratton. *My objection is to making partial requirements. My objection is to going into the subject at all until we can make complete specifications. Take a sprinkler, for instance, that will stand a hydraulic pressure for thirty-six hours. That would be no proof that on the thirty-seventh hour it would not go to pieces. The limitation is too short to produce the effect of the disintegration of the solder. We have attempted to outline a standard, but have not approached the subject in this section. It seems to me we ought to let it go until we are ready to make a more comprehensive standard based on more experience than we have had.*

The Secretary. *There are quite a number of us that have to do with the testing of new sprinklers. Men come in from all parts of the country, with all kinds of crazy sprinklers. Of course, we have to treat them kindly, and go over the same old story with each, and explain what the matter is with the devices they bring. A general set of rules like this will be of enormous help to us, because they will enable us to say to a man, " Here are the first requirements you want to meet."*

Mr. Robinson. *I think, instead of meeting Mr. Crosby's idea, it would have just the opposite effect. I believe it would in the West, certainly in some of the parts Mr. Hardy has travelled over. The rules as we put them out in Cook County are very liable to be asked for, and distributed among engineers and superintendents at the factories. I think suggestions for the construction of the sprinklers would be liable to result in an attempt on the part of a large number of engineers to try to make a sprinkler to substitute in equipment already installed. I think these rules are entirely out of place under rules for installation. If the association wish to put out a set of rules more elaborate, let them do it under a separate cover, and as a separate part of the subject of automatic sprinklers. I think that Mr. Crosby's idea would create, in certain parts of the country, the very difficulty that he wishes to avoid.*

Mr. Crosby. *Why, if issued under a separate cover, would it not be just as much of a stimulus to those engineers?*

Mr. Robinson. *Because they would go to the Associations and not to the engineers.*

Mr. Wensley. *I think this Association should put itself on record with specifications as to the method of testing sprinklers. I don't like to see this left out altogether. It might be taken as an argument that it was the consensus of opinion of the Association that we were not competent at the present time to provide the proper specifications. I think it would be a better plan, if these are not complete, or not altogether satisfactory, to leave them out now, and refer this portion of the report back to the Committee with a request that they draw up specifications covering this feature, and that they be subsequently added to the report. I move, therefore, an amendment to the motion to strike out, that this section be referred back to the Committee with the request that they draw up specifications to be submitted later.*

The motion to refer was lost.

Mr. Stratton. *I should like to ask whether these are supposed to be suggestions for testing sprinklers or for contrasting sprinklers?*

Mr. Blauvelt. *I think the language is very plain and that anyone who reads it can understand that the committee has brought these suggestions forward as partial requirements. We have to use sprinklers, and they have to perform certain functions. When they come up for consideration, it is best for the members to have a general idea of the function which the sprinklers have to perform. If we make elaborate specifications we shall be making suggestions which will result in a multiplication of sprinklers, and I, for one, desire to avoid that. I think what we have said is not far from right. Perhaps the 300 pounds pressure ought to be applied for more than 36 hours. I do not agree with Mr. Robinson in all the points which he has made. We have sprinklers which come up and are passed, and after that the fellows who make*

them let down on them. I would like to have some general requirements of this kind that can be referred to when we find they are making a bad sprinkler. If we can have some general views expressed by this body, when a foolish inventor comes in you can suppress him. He is going to continue to come, any way. He exists in large numbers, and there is no way of disposing of him. It seems to me the choice of evils is to say enough to let the inventor have some idea of what he is coming up against, enough to give him the requirements, but not to tell him how to build them.

The Secretary. *If at this meeting these very general specifications are passed, we will not be taking any new step or radical action. Yesterday, we went into the question of the fire door and the day before into the question of chemical extinguishers. We treated them very much as it is now proposed to treat this matter of automatic sprinklers. It seems to me the automatic sprinkler is as worthy of consideration as either of the others.*

Mr. Goddard. *I don't know as we shall be able to find out what the committee mean. One member of the committee has asked what the committee was trying to do. We naturally suppose, when a report is brought in, that the committee are bringing in the best work of, at least, the majority of the committee, and that the committee, as a whole, would naturally support the general plan, if not all its details. If there are any objections to any special points in these items I think it well for the Association to consider them and amend them, but it does not seem to me the committee have laid down in this Section B anything that could not properly be called axioms in sprinkler construction. Perhaps we have not gone far enough in saying the sprinklers ought to stand for thirty-six hours. If that is not enough, increase it. I do not suppose you would hand out this pamphlet,–or that Mr. Stratton would,–if you were to go into a factory, and say, "Here are the requirements. If you keep them, or when you comply with them, we will insure you." He is going to say, "I will take the risk." Now, this is sent out as an approval of certain fundamental necessities in sprinkler equipment, and that is what, I understand, has been done by the committee. Take this matter of sprinkler heads, for instance, a man comes in and hands you a sprinkler head made of wood. You can hand him this and say, "It will not go," and you can knock out more inventors than you will create, by these fundamental principles. I don't see what objection there can be to adopting fundamental principles, on which we are practically all agreed, simply because we are leaving a little field open to an inventor to get a patent on.*

Mr. Hexamer. *I renew my motion that not less than a half-inch opening be allowed.*

The Secretary. *Of course, we all understand that a half-inch, thin-plate opening, under five pounds pressure, will discharge 12 gallons per minute. The rule was purposely worded in this manner in our original rules of three or four years ago, because of the use of the smooth nozzle, ring nozzle and the thin plate orifice, which would need to have different sized outlets to obtain the same result, and it is the result we are after. We are figuring on so much consumption of water per minute. This rule, as worded, practically accomplished what we want, but if we limit the opening to a half-inch we do away with other means of getting the same result.*

The motion to strike out from Section B. Articles 1 to 6, was voted down.

Mr. Robinson. *I would like to suggest an amendment to paragraph 2, in such a way as to make the rule a little more general, and still be able to accomplish the same result. I have not the exact words in mind, but would it not be well to determine a satisfactory pressure that a sprinkler should stand for all time and put that as a limit instead of stating thirty-six hours. I don't think that means much; I don't think that thirty-six days would mean much more. We want a sprinkler that will stand the required pressure for thirty-six months, or thirty-six years. Of course, I mean for an indefinite time.*

The Secretary. *I should be glad to second a motion to that effect.*

Mr. Stratton. *I don't think any stated time is going to tell whether a sprinkler will hold or not. It is physically impossible to decide that solder will not deteriorate.*

G, No. 10, being read–

Mr. Stratton. *I question the desirability of building these pits for check valves. It involves a great deal of expense. In some cases they come in driveways, where it cannot be done. I think we ought not to insist upon that as an absolute requirement. I move to amend "G," 10 to read "should be located."*

Mr. Bauvelt. *I should like to ask Mr. Stratton whether he considers there are any check-valves which you can afford to leave inaccessible. I find that check valves are very tricky no matter whether you have city water or the supply is from a tank. I find the check valve which is supposed to close to prevent the tank from emptying back into the city main in case the city service gives out, or to prevent the system from leaking,-- I find that these check valves are quite unreliable. They get dirt under them, and one sort of foreign matter or another, and when the emergency comes, when your city water supply is off, you find yourself in trouble. You want to keep careful watch of your source of supply, because just when you need it the check is apt to fail you, and you want to be able to get at it, and see that it is in good condition at all times. How large the pit should be built is a matter for consideration, but I should like to ask Mr. Stratton whether be* [he] *thinks these check-valves should be left to be dug up, when they are inoperative, especially in winter when the ground is frozen?*

Mr. Stratton. *I have said that I do not think the check-valve is a device that can be relied upon for holding tight, and saving the loss of tank water. The prime reason for their introduction is to hold the volume of water when you start the pump. I don't think you expect to have them tight. Of course, it is desirable to have them in pits, but whether it should be imposed in every case is what I question.*

The Secretary. *This regulation has been in force in New England for three years, and has been required in all the equipments, and found to be desirable. Very often, however, there is no check-valve that needs to be placed underground; again, there is. In some cases, three or four may be placed in one pit. The best iron manhole cover, brick pit, built by day labor, will not cost over $30, and that is not onerous to impose upon the protection of a plant that involves many thousand dollars.*

Mr. Stratton. *If it is so desirable, would it not also be desirable to make some reference to the pit being so constructed as to guard against its filling up with surface water, or from freezing in extreme weather; that is, should have inside, a double airspace, so it would be impossible to freeze?*

The Secretary. *That is all very good, and that is what the inspectors are doing. It might be desirable to add that opinion, but we do not want to throw this out of the rules and make it only recommendatory, when at least half of the installations would fall back to the old way.*

No. 11 being read–

Mr. Stratton. *Last Winter we had a number of these gauges frozen. I think it should be designated that they should be located in places where they cannot freeze.*

Mr. Blauvelt. *Referring back to G 9, which was passed quite rapidly ("When a pump, not located in a non-combustible pump house, discharges into a yard main fed by another supply, a check valve or post gate valve shall be placed in this discharge pipe outside the building underground.") If I am not mistaken this was introduced at the suggestion of Mr. Stratton, and I would like to inquire, as a matter of information, whether a thoroughly sprinkled pump-room would be considered under this as a non-combustible pump-house? There are are a good many plants which do not have the pump located in a non-combustible pump-house. They have the pump located in the steam plant near the factory. This steam plant would be very thoroughly equipped with sprinklers. The amount of combustible material in the engine room would be very small, and be absolutely under the control of the sprinklers ; and I think it is usually considered that pumps can be so located and be very safe. There are many plants where there is no room for a detached pump-house, and I would like to know whether, in the case of a pump located in a thoroughly sprinkled room,–all things being favorable,–the pump would be considered safe. These pumps often have a discharge check right close to the pump, next to the gate valve, and I wish to know if Paragraph 9 objects to that, and would require the check to be put under ground.*

Mr. Stratton. *Unless the pump is in a detached pump-house, where the pipe cannot be wrecked by an explosion or the wreck of the building, it should be out of doors and under ground. It is not to guard against the fire hazard alone, but the wreck of the building as well. It should be where it cannot be affected by the bursting of the boiler, or falling walls, or anything of that kind. It ought to be absolutely safe.*

Section I, 4, being read.

Mr. Stratton. *I have not seen a description of this drum-drip, and if we are going to introduce this musical attachment, I should like to have it described.*

Mr. Blauvelt. *I will state that symphonies do not go with these drum-drips. Drum-drips are used largely in the Northwest, on grain elevators, saw-mills, and the like. It is simply an enlargement of the drain pipe. The drain pipes of the system are run into the drum. They are applied to buildings where we have very large systems which are exposed to cold weather where there is not any too much attention given to the building. Take this to represent a grain elevator. (Illustrating by drawing on blackboard.) The system would be in the upper part of the building, of course, over these bins. The drain pipe will come down in this way, being enlarged when it comes into the drum. The drum is made out of very much larger pipe than the drain--say 4 inch, or 6 inch pipe, four or five feet long. It is found that the condensation of the air in the air-pump, and certain residual water in the system in case it has not been fully drained in the fall, makes it necessary to have a reservoir at the end of the drain, to collect that water, at some point where it will not be exposed to frost, or where, if it freezes, there will be no harm. They simply put a pocket at the end of*

the drain, allowing any water that would naturally come down the system to collect at that point. They usually put a cock above and below the drum. The one below is used to bleed out the drum, just as you would any drain. If it happened to be neglected, and the drum is located where it freezes, and a man goes there and finds it is frozen,– if the drum does not happen to burst,– he will shut off the upper cock, take off the drum and thaw it out.

Mr. Stratton. *This paragraph contains a very important element in connection with the protection of buildings under the dry-pipe system. Our own experience developed that the pumping of hot air from a drying room induced so much condensation in the pipes that the condensation accumulated in the sprinklers, and froze and burst them. Taken in connection with the statement that the pipes should all be arranged to drain themselves, and be put in warm places where they cannot freeze,– this is a very important and desirable suggestion; but I think we should go further and say that the system shall be drained to this point, and that this drum, or any other receptacle which may be used, should be installed in a warm place where it cannot freeze.*

Mr. Robinson. *I would like to state that is very often–I think almost always–the practice of the sprinkler companies to install these drum-drips on the bin floor in elevators. In places similar to the figure which Mr. Blauvelt has drawn, where you can come down to a warm place, I have seen the advantage of a drum-drip. If you come down into a warm room you may provide a receptacle large enough to contain the water that will come down, but if it is to be in a cold place and freeze, I cannot see any advantage in the drum-drip.*

Mr. Blauvelt. *This drum-drip, if it is full of water, so the ice cannot crush in the pipe, will, of course, burst; but they do not necessarily burst because they freeze. The men about the elevators told me the drum-drips are much better than nothing. They will collect a certain amount of water, and the water will freeze in the lower part of the drum. I presume, in very many cases, the ice is crushed by the resistance of the pipe. Being inside the drum it is crushed without bursting the drum. When they freeze, they unscrew the drum and take the ice out, so while there is no question that the drum should be put into a warm place, there is also no question that it is better to have a drum, wherever it is put, than to have none at all.*

The Secretary. *I move to amend by adding, after the words, " drum-drips," " located in a warm place."*

Mr. Robinson. *You cannot do that in a grain elevator.*

Mr. Blauvelt. *There are sawmills, also, where there is no heat of any kind.*

The Secretary. *If there are no warm places how do you protect a dry valve?*

Mr. Blauvelt. *You might do it by heating it with a lantern, or something of that kind, but they have not yet introduced a closet for the drum-drip.*

The Secretary. *Would not the same closet do for both?*

Mr. Robinson. *Not in a grain elevator. They divide the system by mains and cross-mains, where it is impossible to get proper drainage. It is a customary thing to place these at remote places. It has been found necessary by the elevator men and the sprinkler men.*

The Secretary. *Suppose we make it "drum-drips, preferably located in warm places."*

Agreed to.

No. 6 being under consideration–

Mr. Anderson. *We received from Mr. Worthington, and held for consideration, the following notes in reference to this portion of the report.*

E. U. Crosby, Esq., Secretary, 93 Water Street, Boston:

> *Dear Sir– Referring to the request that any suggestions concerning the Rules for Installation of Sprinklers be submitted to the Committee, I have to suggest as follows:*
>
> *Rule 98 (referring to Dry Pipe System Sprinklers)– "System to be divided horizontally." In certain buildings, notably grain elevators, it appears to me that this would be a serious error. The conditions in grain elevators are these: The building is long and narrow, involving long runs of pipe on each floor in a horizontally divided dry-pipe system (which all elevator systems must be).*
>
> *In all of the experience I have had with this class of risk, the greatest trouble with this system lies in the constantly changing level of the different portions of an elevator, the loading and unloading the bins causing the floors and ceilings to move in a serpentine manner, thus straining the long runs of pipe and having a tendency to open small leaks of air at the joint.*
>
> *The extreme length of the building as compared with the width also interferes with the proper pitch of the pipes for drainage.*

Conceding the manifest advantage of horizontally divided dry pipe system in the ordinary building, I have to submit that the disadvantages in a grain elevator or any other long and narrow building subject to constant changes of level at points throughout its length composes greater disadvantages than can be compensated for by any advantage in the general system of horizontal division.

I have to suggest a modification of this rule so that horizontal division will not be asked for under conditions that are detrimental to permanence and safety. This has a special reference to grain elevators but it is possible that other warehouses over one story in height may be found where similar conditions will prevail.

Mr. Worthington. *I had in mind, in writing this letter, a condition we have found to exist in a Massachusetts elevator. This elevator is fed by two long 6-inch mains running to two risers. The length of the elevator is 340 feet. It has settled on the average 20-in. through the entire length, but the settling has been unequal and has varied from time to time. When certain bins are loaded in the centre it will depress and recover. I should say a low estimate of the number of times the valves have been tripped and the water admitted in five years will exceed 100, the leaks being almost wholly due to the strain on the joints on account of this settling and raising of the building. In order to meet this successfully, it was piped from the outside main, and mains were carried in at right angles to the length of the building– which, I believe, is the practice now in the Northwest. The custom has been to make the pitch of the pipes very light, and the scale from the corrosion has been forced into the holes and plugged them, so that, in some cases they are entirely closed. If the pitch had been better they would not have closed. If the division was the other way the elevator could have been drained more readily. There are about 3,400 sprinkler heads, and the heads vary greatly on the different floors. If you should make an intervening system of risers and divide it horizontally, you would not relieve the question of the pitch of the pipes. Of course, it is possible to sub-divide horizontally, but the water does not reach the sprinkler so quick nor is the drainage as effective as if the system is divided vertically. If the rule is arbitrary, I think it leaves too little to the discretion in making the most simple and effective system. I believe what is sought is to get the water to the sprinkler as quickly as possible, with the least friction, and the least amount of air.*

Mr. Robinson. *I do not agree with the gentleman as to the advisability of eliminating the division he mentions–that is, the horizontal division. I think the troubles he mentions in this particular elevator are almost entirely due to the way the mains are laid out. I cannot see why it is not just as possible to divide a system in a grain elevator horizontally as vertically. At the same time I will acknowledge we have a very difficult problem and have to compromise by getting about half of one and half of the other; but as a rule the upper floors of a grain elevator can be divided horizontally, and carried on a separate system which can be carried as direct to the water sup-*

plies as if it was divided vertically. I believe there is an advantage in the horizontal division, and I do not see why it is does not give just as prompt action of the sprinklers. I believe we are weaker on our rules as applied to flour mills and grain elevators than in any other classes of risks we try to apply the rules to. I should like to hear a general discussion of this matter, but I move that the question of applying the present rules be referred to a committee to report next year on this subject of grain elevators, flour mills and risks of that character.

Mr. Stratton. *As I understand it, the change to horizontal was for the very purpose of getting the water the most directly to the fire with the minimum amount of air. We considered the possibility, in a system divided vertically, of the fire getting between the ends of the two systems, letting the water into both. I don't believe it will be possible to devise any system that will chase this elevator up and down through all its variations. At the same time, I don't see why a horizontal division is not as applicable to it as a vertical division.*

L, 8, being read–

Mr. Robinson. *Does this mean that the gauge shall be located on the pump side or steam side?*

Mr. Stratton. *I don't see any place to put it but on the water pipe.*

A Member. *On the water side it would not record the steam pressure much.*

Mr. Robinson. *Most of us are reasonably sure that we have water pressure from the gravity tank or city water; but we are not certain whether we have steam pressure on those risks that are shut down at six o'clock, and the point was whether the regulator should be on the pump end or on the steam end.*

Mr. Goddard. *I would like to say that the object of this article seems to me to be to keep a record of the steam pressure, and whether the engineer keeps his steam up in his boiler. It is a record gauge for the steam pressure; therefore, it has got to be on the steam end.*

The Secretary. *That is correct, and that is the reason it was specified to be on the steam end.*

Mr. Stratton. *The object, it seems to be, is to have a constant record of the water available for fire purposes. The objection to an automatic regulator on a pump is, the consumption of steam. They can have it recorded at 50 pounds, by shutting off the steam from pump but letting it register on this gauge, but you would not have any more water available. It is necessary to record and keep a record of the pressure for fire service for water, and if you put it on the steam end you are not going to accomplish it.*

The Secretary. *If you put it on the steam pipe above the steam throttle valve you will get the reading on that pipe. If you put it on the steam chest of the pump it will show whether the steam is on the pump all the time. If you put it on the discharge end of the pump, inside of the check valve, it will show the water pressure on the sprinkler system. On the steam chest appears to me to be the most desirable single location.*

Mr. Robinson. *It is a pretty good check on everything if you put it there.*

Mr. Blauvelt. *I make that motion; to insert the words, "in pump steam-chest," after the word, "pressure."*

Agreed to.

A Member. *Does the committee recommend that a steam pump draft from salt water?*

The Secretary. *Pumps are considered by the committee in this report chiefly as a supply to automatic sprinklers; and, as such, I believe it to be the sense of the committee that no pump that is supplying sprinklers should draft from salt water.*

R being considered–

Mr. Cabot. *I would like to ask if this section is to apply only to the external surface of the building; why the committee considered it would not be desirable to apply them under open sheds used for storage-say, in wood workers, or where lumber is stored.*

The Secretary. *If a shed of that kind was to be provided with real protection, it would be better to use automatic heads on the dry system.*

Mr. Cabot. *It would be much more effectual, yet there must be times when an exposed building could be reasonably taken care of by an outside system.*

Mr. Worthington. *I should like to ask the committee if they gave any consideration to the practice of increasing the size of orifices at the end heads, where over four heads are installed.*

The Secretary. *These matters were considered in brief by the committee. I think we all recognized the fact that many severe exposure conditions exist at certain risks where the demand made upon the open sprinklers would be too great; and it was realized that for such, a system such as is outlined here would prove very inefficient. In such cases, we should need to have larger orifices. These general conditions seemed to fit the average outside sprinkler equipment, put in by the makers without receiving special directions.*

Mr. Blauvelt. *There have been some cases where such apparatus has not proved efficient.*

The Secretary. *The only two total destructions of sprinkled risks from exposure, in one class of business in New England in the last ten years, were risks equipped with open sprinklers. Those are the only noteworthy fire experiences with open sprinklers which we have had; but many times we have made tests with the systems and found them largely inadequate. At one of the times the water blew away from the windows. At another time, the wind blew down the street and cut the water into very fine spray, leaving the windward end of the building entirely unprotected. Some of the exposure conditions which exist will have to be met by a system which has a larger scope than the one outlined here.*

Mr. Robinson. *Were the outlets under the roof only in those two buildings?*

The Secretary. *They simply had cornice sprinklers on three-story buildings.*

A Member. *We have an eleven-story building in Philadelphia where every second row of windows has a sprinkler over it.*

Mr. Robinson. *In regard to the distance apart at which these sprinklers should be placed. I should like to ask an expression of opinion as to the distance in particularly bad exposures where the surface to be protected is quite considerable. I should like to know what the experience has been. We have very few open sprinklers, but I have an idea there will be a good many used later; and I should like to know what the limit is–whether two, four, or five feet.*

The Secretary. *I think the last clause is drawn to apply more to frame buildings than to brick buildings. In brick buildings we have been content with placing a sprinkler opposite each window; although in many such cases, the " protection " has simply consisted of a vertical row up under the cornice. It is my opinion there should be an open sprinkler opposite each window in a brick building.*

Mr. Robinson. *I had more reference to wooden buildings covered with corrugated iron.*

The Secretary. *I think about eight feet.*

Mr. Anderson. *It depends upon the available water supply as to how near we can put them together. We have found it hard work to get a water supply for any length of time, but I believe eight feet is about right.*

Mr. Robinson. *You are in favor of putting as many as your water supply will allow?*

Mr. Anderson. *Yes, sir.*

It is obvious that much has changed in the installation of sprinkler protection between 1899 and the present, but more interestingly perhaps, is how much is the same.

The pipe schedule utilized in 1899 differs substantially from that of the pipe schedule outlined in later editions of the sprinkler installation standard, as does the specifications for the sprinklers utilized in an installation and the maximum spacing of sprinklers.

Perhaps of most importance is the fact that the sprinkler installation rules in 1899 recommended that two automatic water supplies be provided for a sprinkler system installation.

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