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FIRE PROTECTION HISTORY-PART 120: 1953 (SPRAY SPRINKLERS)

By Richard Schulte

The fifty-seventh Annual Meeting of the National Fire Protection Association was held at the Palmer House Hotel in Chicago in mid-May 1953. At this meeting, a major advancement in building fire protection was discussed-the installation requirements for a new type of sprinkler known as the "spray sprinkler". (This type of sprinkler is now known as the "standard spray sprinkler".) The following is the text of a presentation on the spray sprinkler titled "*What the New Spray Head Means to the Sprinkler Industry*" given by T. Seddon Duke, National Automatic Sprinkler and Fire Control Association:

> "*As you can see from the program, the subject assigned is "What the New Spray Head Means to the Sprinkler Industry?" I am glad that question-mark is there–it certainly should be.*
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> *In the final analysis, any new device in the fire protection field has a greater effect on those who purchase fire protection and on the insurance fraternity than it has on the manufacturer.*
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> **[TEXT OMITTED]**
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> *It seems in order that we first tell about the spray sprinkler itself–what it is and its record in the very considerable number of fire tests that have been conducted. The spray sprinkler represents a radical change and all of our thinking had to be revised.*
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> *Since 1882, all automatic sprinklers have been designed to discharge approximately sixty percent of the water from each sprinkler directly against the ceiling above the sprinkler. It was felt that direct ceiling wetting was necessary and that excess water directed to the ceiling would fall back into the fire. However, we know that such water falls in the form of small streams or large drops and is relatively inefficient in its capacity to cool the atmosphere.*

We recognize and realize that it is essential to cool the products of combustion above the fire–especially under the ceiling and around other structural elements–so as to reduce the exposure temperature. The extent of break-up of the water distribution is of great importance and the tests have evidenced that, with the new automatic spray sprinkler, the cooling is so effective that combustion at the ceiling will not be supported.

This seems to be a good time to remark that, while better extinguishment is something earnestly desired, the Sprinkler Industry has no illusions as to how much it can better the performance record of 96.1% efficiency of operation of sprinklers in extinguishing and controlling fires. Nothing can be expected of the finest sprinkler system if there is a closed gate valve, partial sprinkler protection or other things well-known to all of us. It is our Industry's earnest endeavor to provide a national inspection service since we realize that only more inspections, better maintenance and a more widespread use of central station automatic sprinkler supervisory service will better the record of losses in sprinklered properties. Any advance in design of sprinklers themselves can only be responsible for a small part of the hoped-for final 4% improvement.

In the fire tests conducted, the new spray sprinkler clearly demonstrated greater efficiency in the control and extinguishment of fires, particularly severe fires under adverse conditions of piling; less damage from the water discharged from the sprinklers and less damage from fire to contents of the occupancy. In many tests it has been shown that fewer spray heads than regular heads will operate in a given fire with equal water pressures, with equal water discharged per head, and up to a 30% increase in spacing.

There has always been a complaint concerning water damage despite the fact that, without the sprinklers, the property could well have been entirely destroyed. It is evident that, with less water being discharged, we can expect reduced water damage in sprinklered building fires, although this will be somewhat offset by the fact that in all one head fires (35% of the total) approximately twice the floor area will be wet by spray sprinklers than would be wet by standard sprinklers.

Fire tests in the Laboratories involving Class A material resulted in the consumption of less material when spray sprinklers were used than was consumed in fires extinguished by standard sprinklers. It is, therefore, evident that, if extinguishment can be accomplished using less water and with lower material loss, a significant improvement in fire protection is presented to industry which, in turn, should have a beneficial effect on the already truly remarkable efficiency and general performance record of automatic sprinkler systems.

A recourse to the fire records on sprinkler experience will show that the difference in efficiency over all the years is insignificant. However, we must bear in mind that the number of sprinkler installations increased tremendously and we believe that both the insurance fraternity and the Automatic Sprinkler Industry would have been satisfied just to have held the record even. The hazards have increased tremendously in recent years with large unbroken areas of combustible construction and combustible occupancy and a great many processes about which we knew little.

Great interest has been expressed in the new spray sprinkler from the standpoint of cost and many seem to feel that because of a stretched spacing, costs should be substantially lowered. For some years, the Automatic Sprinkler Industry, through its Association and Fact-Finding Committee, has endeavored to find ways and means of reducing the cost of automatic sprinkler systems. This is just as vital for those of us who manufacture and install sprinkler systems as it is to the purchaser. Frankly, to date we have not been able to effect savings to a point where we can keep up with the increased costs. It will take a longer experience than the industry has had to date to demonstrate the actual savings involved in the installation of the new spray sprinkler systems. However, it is certainly reasonable to assume that eventually the cost of such systems will be less than the present standard systems.

There are some problems involved that probably would not be thought of by someone else outside of the industry. One problem in particular concerns the use of pipe. At the present time, pipe ordinarily is produced at the mills in 20 ft. random lengths. This, of course, is ideal for the present standard sprinkler spacing but would be extremely wasteful for the stretched spacing of the spray sprinklers. The Industry hopes to solve this problem by arranging with the pipe mills to supply pipe in increased lengths more suitable for, spray sprinkler spacing, and by modifying its own facilities for the storing and handling of these extra long bars of pipe.

The cost of anything is important and we, in the Industry, realize fully the necessity for minimizing the cost of automatic sprinkler systems if we are to sell them in increasing numbers. A more widespread use of automatic sprinkler systems is a vital contribution to the economy of our country in preventing loss of life and destruction of property by fire and limiting the spread of conflagrations, possibly from bombings.

In the preparation of the rules presented for your approval today, our Industry was able to make a contribution, through its Fact-Finding Committee, and on behalf of the Industry may I express appreciation for the splendid cooperation of all of the insurance interests and particularly to the members of the Committee on Automatic Sprinklers of the National Fire Protection Association.

With the knowledge that we have gained as an Industry, through the tests of the new spray sprinklers, the distribution and atomization of water, research, design and test on the part of all the individual members of the Industry will continue on, and, at this point, I would like to emphasize that the Automatic Sprinkler Industry is fully aware of its obligations to its insurance friends and its customers.

Fire tests and the approval reports of the new spray sprinklers indicate at least a 25 percent increase in efficiency of fire extinguishment and control.

The new rules as drawn up take advantage of this 25 percent in only one way–stretched spacing. The effect on costs might have been more pronounced if the problem had been approached first from the standpoint of due credit for higher pressures, involving the use of smaller orifices and pipe sizes, or, in the other direction, by the acceptance of water supplies ample in quantity but low in pressure. The increased efficiency could be taken advantage of in three ways: (1) Stretched spacing–with everything else the same, including water supply requirements; (2) Standard spacing-with orifices smaller than ½ inch and correspondingly reduced pipe sizes all the way back to the supply where pressures available were good to excellent; (3) Standard systems with ample water but at pressures deemed to low to be acceptable.

Item No. 2, in this instance, would probably save money faster than No. 1. No. 3 would eliminate the need for costly pumps or other additional water supplies. Once more, all of these things bear heavily on that all-important item of cost and to lower cost more radical changes are in order if there is to be a more widespread use of automatic sprinkler systems.

Some of us who have had long experience in the Automatic Sprinkler Industry question strongly whether the very rigid requirements insisted upon are already [always] *necessary. We feel that there should be a greater distinction than now exists between classes of occupancy in order that more properties may be protected, thereby reducing the loss of life and property.*

In view of the record showing the number of sprinklers opening necessary to extinguish or control a fire, water supplies and pipe sizes are totally unrealistic. The record is impressive: 35 percent of the fires required only one sprinkler. In 72 percent of the fires fewer than five sprinklers were actuated. In only 8 percent of 50,000 fires recorded in fifty years did more than 25 sprinklers operate. A careful study of the hazards of occupancies to be protected should have more of a bearing on the details of design of automatic sprinkler systems, the decisions as to adequacy of water supplies, both pressure and volume, etc., than it does under the present standards. Once more I say that it is unrealistic to have the same sprinkler system in a building where the pressure is thirty pounds, for instance, as in the same occupancy and the same type building where the pressure is a hundred.

[TEXT OMITTED]

In conclusion, let me emphasize that despite how much or how little we sell as an Industry, our first consideration is the positive extinguishment of fire. (Applause.)

The development of the spray sprinkler was definitely a major advance in providing fire protection for buildings. However, what is perhaps of even more importance in Mr. Duke's presentation is the discussion of different occupancy classifications and the use of smaller supply piping when the water supply provides higher pressure. Essentially, this is a reference to the use of hydraulic calculations to determine the size of the water supply piping.

The use of hydraulic calculations to determine water supply piping sizes accomplished what the switch to the use of spray sprinkler couldn't-significant reductions in the cost of sprinkler system installations.

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Source: "*Proceedings of the Fifty-seventh Annual* [NFPA] *Meeting*", Chicago, Illinois, 1953.