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FIRE PROTECTION HISTORY-PART 143: 1910 (HIGH PRESSURE MUNICIPAL (FIRE PROTECTION) WATER DISTRIBUTION SYSTEMS)

By Richard Schulte

The interest in the installation of high pressure municipal water distribution systems was peaked by the Great Baltimore Fire in 1904 and the San Francisco Earthquake and Fire in 1906. The following is a transcript of the Report of Committee on High Pressure (Municipal) Fire Service (Water Distribution) Systems presented at the fourteenth Annual Meeting of the National Fire Protection Association:

"*The Chair:*

[TEXT OMITTED]

The next on the program is the report on High Pressure Fire Service Systems, Mr. A. G. Patton, Chairman.

Mr. Patton then read the following:–

REPORT OF COMMITTEE ON HIGH PRESSURE FIRE SERVICE SYSTEMS.

Mr. Chairman and Members of the National Fire Protection Association:

Gentlemen: The period which has elapsed since the appointment of your Committee has been too short to crystallize the sentiments of its various members (living at distant points) as to the course which should be taken in our general work. A mass of information bearing on the installation of high pressure service has been collected; but little time, however, was at our command for digesting and tabulating data. We shall not, therefore, attempt to incorporate such information in this report. While we have no concrete purposes formulated as yet, it has been our aim to secure information relative to the general conditions in connection with the installation of various high pressure plants in the country. We were fortunate in securing the presence of one or two members of the Committee at a meeting held in New York; and by this means and through correspondence we have been able to propound certain questions which we feel are essential in connection with the high pressure work, and which in turn would be valuable to present to you for discussion at this time.

First.– Should the general installation of high pressure service be recommended.

Second.– If installed should connections to interior and exterior standpipes and sprinkler equipments be permitted.

Third.– Should such connections be by permanent or by flexible pipe.

Fourth.– Does steam or electricity or gas-driven engines give best and most economical service.

Fifth.– Does double system of high pressure mains, such as is now being laid in New York, recommend itself for general installation.

Sixth.– Should high pressure services fed by fire boats only, be recommended.

Furthermore, it has been suggested that a classification of high pressure services on the following general lines be laid down:–

Class 1. The system whose installation consists of separate and distinct service mains, independent of any other branch of water service of the city, fed by its own independent source of supply, such as pumps in stations by themselves or by gravity service, and whose object is to furnish water for high pressure streams, for fire service only.

Class 2. System consisting of independent fire service mains upon which hydrants are installed and fed by fire boats.

Class 3. High pressure furnished by gravity into low level congested sections of the city from the high level service of the city through independent mains, to be used for fire fighting purposes only in the low level sections, but used for domestic purposes in the high level sections.

It is not our intention to discuss fully all issues which arise from these various heads; but in order that the matter may be properly introduced, we would note that considerable criticism has been aroused among engineers by the tendency at the present time to advocate the installation of high pressure service in all manner of cities and towns, regardless of the exigencies of the case. It is felt by many that the main water supply of a town should be of sufficient volume and pressure to meet all requirements of local conditions, including fire fighting. In view of this fact, a discussion as to the general value of high pressure service in towns where buildings are not excessive in height and where no special hazards or considerable congested districts are to be found, would be essential, and that high pressure is of value only where these conditions do exist.

The argument has been advanced that the indiscriminate use of high pressure service tends to reduce salvage in that too much water is generally thrown. It is further argued that an agitation for a high pressure system tends to weaken the proper development of the domestic system or service, which by the means of a well-directed plan and the expenditure of much less money than would be necessary to install a high pressure plant, could be brought to a state of efficiency capable of meeting all requirements. Where, however, the physical local conditions are such as to demand a volume and pressure of water for fire purposes, so great as to require the entire rebuilding of the trunk and distribution service, as well as the plumbing in dwellings and factories, or where the conditions of a water supply are such as to necessitate installation and maintenance of an expensive filtration plant, a high pressure service for fire purposes becomes essential. It should be borne in mind in this connection that it is not good practice to load a domestic service with too great a pressure, owing to the increased possibility of bleeding the system through faulty faucets and connections. The higher the pressure the greater the loss through a small leak.

As to the connection of high pressure with the interior and exterior protection, such as sprinklers and standpipe systems, there may be ground for argument on both sides. The possibilities of bleeding the system have been strongly advanced by some, while equally efficient engineers claim that the installation of gate valves and the proper training of the fire department in handling same would eliminate any such possibility. The question of falling walls has been argued against this, or the disruption of the internal system of protection by an explosion in the burning building has been advanced as an argument against such connections.

It is further contended that the sprinkler equipment would in all probability give way under the continued hammering of throwing on and off the high pressure, should open connections be maintained.

In reference to connection by permanent or flexible piping, much might be said on either side of the question; some contending that a flexible connection, the leads being made from the nearest hydrant, would be as efficient as permanent connection, at the same time eliminating to a large degree the possibility of bleeding the system.

On the other hand, the argument is advanced that with a permanent connection, the entire block might be protected simultaneously, while with flexible connection there should be a limit to the number of buildings which might be covered.

While your committee will not undertake to definitely state their unqualified endorsement of permanent connections to interior and exterior protection from a high pressure service, yet in view of the fact that very few cases of bleeding have been reported from such connections, we can tentatively endorse the practice where valves are installed governing each such connection and where valve men specially trained are detailed to answer fire alarm. There would appear to be little or no argument as to the wisdom of installing a double system of piping, such as is now being put in place in New York in the extension of the high pressure service in that city. The possibility of cutting out the service on alternating streets from the main pumping plant appears to present an argument in favor of such a system that is unanswerable.

As to the relative efficiency and economy of the steam, gas or electrically driven pumps, your committee feel that the local conditions enter so strongly into such a discussion that it would be unwise to make any comparison or to fix any set rule. As to use of fire boats exclusively as a source of supply to a high pressure service, it must be admitted that good results have been secured in some cases, and yet in view of even this evidence such service cannot be considered reliable except as auxiliary.

It has not been the purpose of your committee to discuss, at all, high pressure service fed by gravity where it can be secured and utilized economically, it being conceded that such service is superior to mechanically raised pressure. On general principles, it is always deemed wise to secure, where at all possible, a primary source of supply for high pressure service which can be used before calling up the heavy battery of the main service.

As to the details of the high pressure, great vigilance should be exercised on insisting on construction of proper fireproof and protected pumping stations, and the isolation of these stations in sections of the city where they are not exposed.

We believe that greater care should be exercised in the installation of fire-fighting appliances in skyscrapers; and furthermore, that our very best efforts should be bent in the endeavor to secure co-operation on the part of the local fire companies in the use of the apparatus so installed.

Let us first secure the confidence of the fire fighters that the apparatus installed or under their supervision is the equal, if not the superior, of anything in the departments, and then insist that such apparatus shall be utilized. Almost untold wealth has been sacrificed in high buildings through the unwillingness, whether justified or not, of the firemen to use the apparatus supplied. We fear that in too many cases there is a justification for criticism, and it behooves us as fire protection engineers to prove our claim to efficiency by demanding only the best and most usable apparatus.

The Chair: Gentlemen, you have heard the report. What is your pleasure? (On motion, unanimously carried, the report was accepted.)

Mr. Merrill: I would be glad if the record could include, under this topic, a recognition of what has been done by our friends across the border, in the installation of a high pressure service in the city of Winnipeg. That plant is operated with English machinery, gas-driven engines, supplied by gas from gas-producers. The system is called upon to operate under severe conditions, at very low temperatures. It was my privilege to be in Winnipeg, and see a practical operation of this system last winter. If the Committee having this matter in charge would send for data on that service, I think they would find it of value.

Mr. Hexamer: I would like to have some one give the meeting the results of the application of high pressure service, in small towns. During the year, the high pressure service went into service in twelve cases. The maximum time consumed in extinguishing a fire was three and one-half hours. One million one hundred thousand gallons of water were on pumps at that fire. The total amount pumped during the year was a little over six million gallons. The cost of pumping was about six cents a thousand gallons. The cost of making a high pressure pumping station for the city of Philadelphia, with a capacity of about ten thousand gallons, or twenty times the capacity of a five-hundred-gallon engine, was the cost of the maintenance of one single engine company.

The Chair: Are there any further remarks?

Secretary Wentworth: Mr. President, I have discovered that Chief Croker of the New York Fire Department, and Chief Horan of the Chicago Fire Department, have come quietly and modestly into this meeting; and if they would have a word to say on this subject of high pressure fire systems, I know the members would be very glad to hear from them.

The Chair: We would be very glad to hear from Chief Croker.

Fire Chief Croker (New York City): I appreciate the honor of saying a few words to your Association. I can remember a fire we had January 7th of last year.

We had three 4-alarm fires in the same year, within half a mile of each other at the same time. We have two pumping stations, five pumps in the station, with a capacity of 3,000 gallons each. That night we were discharging 35,000 gallons of water per minute upon three different fires. We still had three pumps left in reserve, at the three fires, and they were controlled absolutely by high pressure,–not one engine in service.

Further, we have disbanded seven engine companies and placed additional hose wagons in each house, especially adapted to carry 3,000 feet of 3-inch hose each. We have 30 men, with 2 to 4 horses to a company. At each fire we rode to, we rode with an officer and from 10 to 15 men per company. The result has been that we can very readily handle a fire on the high pressure, which originally called for a third alarm with the old company.

I often wonder why large cities, including New York, did not take up high pressure years ago. I think I am safe in saying that the days of the steam fire engine are passing rapidly. I am sure that any city that wants to make an improvement in fire equipment should install high pressure throughout the city, for the better protection of the city.

I thank you, gentlemen, for the opportunity to make this statement.

The Chair: We are also favored with the presence of Chief Horan of the Chicago Fire Department. We would be glad to hear from him.

Fire Chief Horan (Chicago): Mr. Chairman and Gentlemen, The only thing that I can say to you is to relate an experience I had with a nearby suburb which contemplated being annexed to Chicago. I was called before the committee of one of the highly intellectual suburbs, seeking to ascertain what the fire marshal would do if this town was annexed. I said the only thing we would do would be to make a lot of promises; and that is all that we are doing in Chicago–"making promises." (Laughter.)

We have facilities here for a high pressure system. We do not have to go 160 miles for our water the same as they do in New York,–they have plenty of water there, but we have a supply here both in the river and in the lake.

Of the contemplated bond issue of $16,000,000, not a dollar that I know of will be spent for a high pressure system. Nine hundred thousand dollars has been promised to the fire department here, but will be used for extensions to the fire service, and nothing for a high pressure system. The only contemplated plan is a plan in South Chicago, whereby a connection can be made from 103d Street and the Calumet River to Commercial Avenue, a stretch of about one and three-fourths miles, and that only for the fireboats to pump into.

It is a mighty easy matter to have somebody come from New York and tell you about 7 or 10 or 27 million. We haven't got 27 cents to spend for anything! (Laughter.)

The Chair: We have also had with us during our meetings, we are very glad to say, as the accredited representative of the International Association of Fire Engineers, one of our active members, Chief Horton, of Baltimore, and we would be glad to hear a word from him.

Fire Chief Horton (Baltimore): Mr. President, I am not in position, to-day, to give you any results from high pressure system in Baltimore. We are installing such a system now, and in the next year or ten months we claim we will have one of the best in the country.

Through the kindness of our sister cities who have such a system, we have been enabled to take from those cities the best that they have, which has enabled us to form a plan for what we consider the best in the country.

We are pretty well through with laying our mains, but we have been rather unfortunate in the erection of our pumping stations. Our city has recently passed through the baptism of fire. We were improving properties, and our city fathers took it into their heads that commercial interests were the paramount issue, and they forced the fire department, as they do in most cities, to the background. We calculated to get a pumping station on one of our new piers, but as I say, we were forced back by the commercial interests, into a ground which we have since found almost impractical for the building, and hence the delay in erecting our pumping station.

I have had the pleasure of witnessing the operation of the New York and Philadelphia high pressure systems. I have seen some actual work at fires in Philadelphia, and the entire system is highly commendable, and like my brother chiefs of Philadelphia, Chicago, New York and other cities that have such a plan, I heartily endorse the system of high pressure.

We propose to have means at all times of combating fires, so weather conditions will not interfere, which is seriously the case with horse-drawn instruments that we have now. I am thankful to you gentlemen for giving me an opportunity of saying a few words to this convention. I consider it an honor. I thank you. (Applause.)"

The impetus for the construction of high pressure municipal water distribution systems was, of course, the conflagrations which destroyed wide swaths of major cities in the United States and Canada in the late 1800's and the first decade of the 1900's. While in theory, the construction and use of high pressure water distribution systems to assist in the prevention of conflagrations makes sense, there are two inter-related problems inherent with the concept of high pressure water distribution systems, the first being maintenance costs and the second being reliability of the system.

Since underground water distribution piping systems are buried, the need for maintenance and repairs is not readily obvious and any repair work is both inconvenient and costly. Given that the reliability of high pressure systems is imperative during a major fire, the reliability of such systems is of the utmost importance. The fact that necessary repairs and maintenance to the piping system are not obvious and are both costly and inconvenient to perform, means that the reliability of any water distribution system will likely decrease as the system ages, particularly with the piping technology in use a century ago.

The prediction that the use of high pressure water distribution systems would replace fire apparatus equipped with high pressure pumps missed the mark. The replacement of coal-fired steam-driven fire engines pulled by a team of horses with gasoline-fueled fire apparatus made fire department responses both quicker and pumping capacity more reliable and proved to be more efficient than the aging high pressure systems. Eventually gasoline-fueled fire apparatus eclipsed the high pressure water distribution systems and, like the steam fire engine pulled by horses, high pressure water distribution systems became a relic of the past throughout the country, with the exception of the high pressure system provided to protect San Francisco.

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