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FIRE PROTECTION HISTORY-PART 217: 1912 (STANDPIPE SYSTEMS)

By Richard Schulte

The sixteenth Annual Meeting of the National Fire Protection Association was held in Chicago in mid-May 1912. Among the subjects discussed was a standard for the design and installation of standpipe systems. The following is a transcript of the discussion held on standpipe systems:

> "***The Chair:*** *The Committee on Standards, Mr. W. C. Robinson, of Chicago, Chairman.*
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> ***Mr. Robinson:*** *I would say that the Committee on Standards have outlined a standpipe and hose system to be presented to this meeting and I will read the paper which has been prepared, and if there are any suggestions to be made, if you will interrupt me as I go along, perhaps we will get a little better discussion in that way.*
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> ***REPORT OF COMMITTEE ON STANDPIPE AND HOSE SYSTEMS.***
>
> *W. C. Robinson (Chicago), Chairman,*
>
> *H. E. Burdette (Atlanta), F. E. Cabot (Boston), A. W. Hadrill (Montreal), H. C. Henley (St. Louis), J . M. Hughes (Newark), H . O. Lacount (Boston), W. E. Mallalieu (New York), R.H. Newbern (Philadelphia), E. A. Northey (Boston), W. G. Sanderson (Chicago), T. B. Sellers (Columbus), F. J. T. Stewart (New York), E. P. Stover, Jr. (New York), J. R. Sullivan (Milwaukee), R. Sweetland (Boston).*
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> *Your Committee on Standards has given consideration to the subject of Standpipe and Hose Systems during the past year, with a view of formulating rules and requirements sufficiently comprehensive to warrant their adoption as a standard for all classes of buildings.*

Next to the automatic sprinkler equipment a well designed, properly equipped and reliably maintained standpipe system constitutes the best means for the extinguishment of fire in buildings. Each of these equipments is capable of furnishing a class of service of which the other is incapable, and in most instances they may be made to serve as components of each other.

Primarily, the standpipe system should afford a ready means for the control of incipient fires by the occupants of buildings during working hours and by watchmen and those present during the night time and holidays. Properly equipped, they are also capable of furnishing the high power streams required during the more advanced stages of fire, and constitute a most valuable auxiliary apparatus for use by fire departments. They should provide, ready-to-hand, all that the fire department would use, at least during some considerable interval after fire starts. Heavy calibre streams can be supplied through their agency at the different elevations inside buildings, for the protection of the exterior of buildings against exposure, and for fighting fire in near-by buildings. In fact, the standpipe system furnishes the only reliable means of obtaining effective fire streams at the upper stories of high buildings, and within the limits of non-automatic apparatus, of applying the water to the seat of the fire in the shortest possible space of time, a feature of the utmost importance.

If properly designed, the standpipe system can be made to form a most valuable part of the so-called high pressure systems now being installed for the protection of the congested districts of our larger cities, particularly where the service pressures are constantly maintained.

It follows that if the best results are to be obtained, all classes of service for which the standpipe and hose system may be utilized must be carefully studied and the system so designed and installed that it will meet all conditions. The standpipe and hose system is a real piece of fire apparatus in the strict meaning of the term and must be well engineered for the purposes for which it is intended.

Unfortunately, the standpipe and hose systems heretofore installed have usually only been intended for one class of service, and are frequently poorly suited for that. They have been employed for many years, and various requirements relative to their installation and use have been adopted by municipal and insurance authorities throughout the country, but far too little attention has apparently been given to their design, arrangement and equipment, and it is anticipated to their proper maintenance. In fact, standpipe and hose equipments have apparently fallen into such disrepute among officials and property owners in some districts that but little attention is paid to them, and, if used at all, they are only installed to fulfill the requirements of some loosely worded ordinance, or as a means of obtaining concessions in insurance rates. Standpipes are often located at remote points in the building, rendered useless by obstructions, provided with almost worthless equipment, and fre-

quently not the slightest attempt is made to instruct those who may be called upon to use the equipment at time of fire, or to maintain the system in serviceable condition. The reason for this condition of affairs is probably another instance of our American characteristic of carelessness. Under such conditions, is it any wonder that fire departments in some of our larger cities either disregard the standpipe systems or make a practice of disconnecting the attached hose and using their own hose and equipment.

The standpipe and hose system has been tried and found wanting by occupants of buildings so often that the general public has also lost confidence in this means of safeguarding property against loss by fire. It is particularly fitting, therefore, that this Association take up this very important subject and not only present to the public a standard so well considered that it will meet all requirements, but so prove the efficiency of this form of fire equipment that it will have a far-reaching influence, and serve as a valuable and reliable means of reducing our greatly disproportionate loss of life and property by fire.

At the outset, the preparation of a standard for standpipes was found to be much more complex and difficult than anticipated. The subject is somewhat complicated by the great difference in municipal requirements, and in the opinions relative to the value of standpipe and hose systems as a means of fire extinguishment, but the existing requirements are usually so general in character that a comprehensive standard can probably be made to include all of their good features.

The committee has confined its efforts to the consideration of inside standpipe and hose systems in which the water pressures can be maintained at all times. Standpipes for installation on the exterior of buildings, and standpipes subject to freezing and in which the water cannot be maintained, will also require careful consideration. As a result of the investigations made, the subject has been divided into the subdivisions indicated by the general headings in this report. An attempt has been made to include under each division all of the more essential features which require special consideration, particularly those relating to installation, use and maintenance. No attempt has thus far been made to formulate definite requirements or specifications, but it is hoped that the various items have been presented in such a way that full discussion will be brought out and a good start secured toward requirements which will meet approval in all sections of the country.

GENERAL INFORMATI0N.

Preparation of Buildings:–

Little preparation is necessary for the installation of standpipe and hose systems under ordinary conditions. The fixed part of the system can usually be conveniently located, and, by reason of the flexibility provided by the hose, without seriously affecting the protection furnished.

In buildings elaborately finished on the interior, where concealed piping is desired, special preparation for the installation of the standpipes in walls and partitions is often necessary. Closets or cabinets are sometimes desirable for the hose equipment, to render it less conspicuous and objectionable from the aesthetic point of view. Such closets or cabinets should be so designed as not to interfere with the handling of the hose and should be provided with signs calling attention to the fact that they contain the fire hose. Fire extinguishers and extra equipment in the form of axes, crowbars and lanterns can also be placed in such enclosures. Watchmen's stations and fire alarm boxes may be located to advantage in such closets or cabinets in some cases.

Ventilated metal-clad hose houses on roofs are necessary where roof hydrants are provided and where the hydrant cannot be conveniently placed in existing enclosures on roofs. Special provision must often be made in the walls of buildings at the first story for the accommodation of the connections for the city steamers.

Plans and Specifications:–

Detailed plans showing the location, sizes and connections of the fixed portion of standpipe systems should be provided, particularly where the building or plant is large and where numerous partitions or obstructions must be taken into consideration in the layout. These drawings should be drawn to scale, and should consist of such floor plans and sections as may be necessary to clearly indicate all of the apparatus to be installed and its location, The plans should be accompanied by specifications covering the character of the material, and features relating to the installation in detail.

Experienced Workmen:–

Standpipe systems should be intrusted to none but fully experienced and responsible workmen. Their installation should not be made incidental to other contracts of a similar nature unless full detailed specifications are employed in which the apparatus and materials to be used and the character of the installation work required are made clear.

SIZE OF STANDPIPES AND CONNECTIONS.

The size of the standpipes and connections is governed by the size and number of effective fire streams it is necessary to economically provide at any point or number of points in the building simultaneously. In other words, the size of the piping is dependent on the maximum quantity of water it is necessary to deliver at any point in the building in a given interval of time without introducing excessive losses by friction or placing an undue burden on the pumping apparatus.

After the size and location of the fire streams necessary for the proper protection of the building, both on the inside and on the exterior, and the number of these streams which it will be necessary to operate simultaneously have been ascertained, the size of the standpipes and connections necessary to supply them can be accurately determined, as the amount of water discharged by standard streams and the friction losses in hose and piping at various rates of flow are known and the problem is one in hydraulics.

In well designed buildings where fire cannot readily communicate from story to story, and where exterior streams are unnecessary, one standard 1[-]*1/8-inch stream on each story, from each standpipe equipped for fire department use, will ordinarily be all the heavy hose service requires. In some cases, however, where the conditions are such that streams from two stories may be readily brought to bear, it may be advisable to make the standpipes large enough for two standard streams at each story.*

Where the building is so designed that fire can readily spread from story to story and where roof hydrants and exterior streams are necessary, the size of the standpipes should be increased to supply the number of streams which the conditions indicate will be called for at the same time.

In buildings where the exterior exposures are such that monitor nozzles or roof hydrants are desirable and the simultaneous use of fairly large streams is likely to be necessary at several stories, the standpipes and connections must be large, possibly in excess of eight inches. The number and size of the streams required for effective service of this character, particularly in high buildings where it may be only possible to fight fire from the near-by buildings, are the largest factors influencing the size of the standpipes intended for use by public fire departments and trained private fire departments. The necessity for large standpipes was clearly evidenced during the burning of the Equitable Building in New York last winter. The part played by standpipe and hose equipments at this fire is prominently mentioned and analyzed in some detail in the very comprehensive report issued by the New York Board of Fire Underwriters.

The standpipes used solely to supply the first aid streams operated by the occupants of buildings may be comparatively small, as these streams do not require water in much volume and will ordinarily only be employed in the story where the fire originates. The amount of water required for such streams probably will not be a factor in determining the size of standpipes where they are supplied by the larger standpipes equipped for fire department use.

Connections to the standpipes should have as few changes in direction as the construction of the building and the circumstances will permit, and should be provided with long bend fittings. The connections from tank supplies should be made to the top of the standpipes, and where several standpipes are employed they should be cross connected at top and bottom and each source of water supply properly checked against the others.

The connection from each source of water supply should be independent, direct and as large as the class of service requires, or large enough to deliver its maximum volume of water per minute without undue loss by friction. Particular attention should be given to the size of the connections through which the standpipes are supplied by city fire departments, as it is from this source that water in the greatest volume must often be secured for the longest periods of time.

NUMBER OF STANDPIPES.

The number of standpipes necessary for proper protection is governed by the area and design of the building, the obstructions affecting accessibility, the exterior exposures, the length of hose which can be effectively handled, the facilities for fire extinguishment otherwise provided, and in some measure by the occupancy and the character of the construction of the building.

There should be one or more standpipes in each building and in each section of a building divided by fire walls.

All portions of each story of the building should be within the reach of at least one effective first aid fire stream supplied through hose not exceeding 50 feet in length, and also within the reach of at least one standard 1[-]*1/8 inch stream supplied through hose not exceeding 100 feet in length. Proper allowance should be made for all obstructions interfering with laying the hose or the application of the streams. Partitions, stock, machinery and fixed obstructions incidental to the occupancy constitute the most common obstructions likely to have an influence on the number of standpipes required.*

Long lengths of hose should be avoided as they are difficult to handle, liable to kink and interfere with the effectiveness of the stream and cause the loss of time when it is most valuable. It is important, therefore, that the standpipes supplying the smaller first aid streams be in sufficient number to permit their prompt and effective application. Where the occupancy is specially hazardous, a number of short lengths of the smaller hose at very frequent intervals may sometimes be supplied by lateral pipe connections from one standpipe. Extra hose stations or hose stations necessarily located to one side of the standpipe, may also be supplied by lateral connections to the standpipe.

The standpipes equipped for use by public fire departments and those trained in handling the larger fire streams may be fewer in number and provided with longer lengths of hose. The larger streams will usually be brought into play after the fire has gained some headway; employed as a protection against exposing fires, or in fighting fire in adjoining buildings. The greater power of the larger streams and their ability to reach the seat of fire from greater distances have an important influence on the number of larger standpipes required. These standpipes may also be used to supply the smaller first aid streams for the areas in which they are located. Where the area of the building is small, standpipes provided with large and small hose equipment may be all that is necessary for full protection.

In buildings where the first aid fire streams can properly be supplied from a system of automatic sprinklers, the number of standpipes can be confined to those supplying the larger streams for fire department use.

LOCATION OF STANDPIPES.

Questions relating to the design of the building, the accessibility of all portions of the interior, the safety of those on whom dependence must be placed for the operation of the system, and the exterior exposures, are the most important factors influencing the location of the standpipes.

For mercantile and manufacturing buildings, and buildings which are not divided by numerous partitions, standpipes from which the first aid fire streams are supplied are best located next to columns in or near the middle of the building, particularly where the area is large and the building is of considerable width. Where the building is narrow and where the area can be properly covered by standpipes on each side, the side central location may be found most suitable. The standpipes should be so located that the hose stations are unobstructed by stock, machinery or obstructions incidental to the occupancy.

For hotels, office buildings, and buildings which are divided by numerous partitions, the standpipes should be located in the passages and corridors, and so spaced that fire in any room can be quickly reached by at least one first aid fire stream.

The exterior exposures should be taken into consideration in the location of the standpipes from which the larger fire streams are taken, particularly where the buildings are high and not separated by wide streets or open spaces. Under such conditions streams from near-by buildings may be the only available means of fighting fire.

Standpipes are most commonly located near stairways or within enclosures containing the stairs and elevators. Where such shafts are well designed to keep out fire and smoke and provide safe entrance and exit, they form a desirable location for some of the larger standpipes. Where the stairs are not enclosed, and particularly where several are provided, it may, in some instances, be more desirable to locate the standpipes between the stairways.

Stairways are usually few in number, widely separated and frequently unenclosed. Such conditions afford little sense of security against fire and effective service from inside fire streams in the hands of the occupants can, at the most, only be expected during the incipient stages of fire. On this account great care should be taken to locate in convenient and conspicuous places the standpipes from which first aid streams are to be taken.

As the safety of the occupants of buildings, as well as the safety of those on whom dependence must be placed for the operation of the firefighting apparatus, is dependent to the greatest extent on the enclosures of the stairways, elevators and vertical openings through buildings, the erection of new buildings and the continued occupation of existing buildings should be conditional on the proper safeguarding of the vertical hazard.

EQUIPMENT OF HOSE STATIONS.

The character of the equipment at hose stations is governed by the class of service to be supplied, and in some measure on the class of building in which the standpipe and hose system is to be installed.

Hose.–

Generally speaking, all fire hose stored inside buildings should be approved unlined linen hose, on account of its greater durability and reliabilty [reliability] *in such localities. Linen hose also has the advantage of being lower in cost than good hose containing rubber. Its chief disadvantages consist of the relatively high friction losses due to the rough interior, its greater tendency to kink when handled, and the fact that it is not absolutely water tight when water is first turned on. These disadvantages are more than offset by its lightness and the comparative ease with which it can be handled, the fact that it can be stored in small compass, and, most of all, by its very materially greater durability as compared with rubber or rubber-lined fire hose in the heated dry atmosphere usual inside buildings.*

Cotton rubber lined hose may be advisable in some localities, but only where moist atmospheric conditions prevail and at roof hydrants and outside stations forming part of the standpipe system. Rubber hose should only be used in localities where hose fabrics are quickly destroyed by the action of chemicals.

Hose stations provided with equipment to be used by the occupants of the building should each be equipped with 1[-]*1/2-inch hose not exceeding 50 feet in length, and with a conspicuous permanent sign calling attention to the purpose for which this hose is provided. At upper stories and where the initial water pressures are low, the use of two inch in place of 1*[-]*½- inch hose may prove advisable.*

Hose stations intended for use by fire departments or those trained in handling heavy fire streams should each be equipped with a 2[-]*1/2-inch hose not exceeding 100 feet in length. A conspicuous permanent sign should be placed at each station calling attention to the fact that the 2*[-]*1/2-inch hose is only to be used by the fire department or several persons trained in handling it, and that smaller hose is provided for use by occupants of the building. The present general practice of equipping standpipes with 2*[-]*½ inch hose only, is often a menace to life on account of the inability of inexperienced persons to handle it, and in most cases affords no protection during the incipient stages of fire for the same reason.*

In most cases it will probably be found convenient and advisable to provide both sizes of hose at the stations supplied by the larger standpipes.

Hose Racks:–

All hose should be attached to valves at the standpipe and stored on approved racks of substantial construction securely fastened in position. Hose racks of the swinging type are the most reliable under ordinary condition, although special claims are made for other types which are apparently in some measure justified. For 2-1/2-inch hose, which can only be effectively handled by several persons, there does not appear to be any necessity for racks which are automatic or partially automatic in operation. Racks for such hose should be so designed that the hose can be quickly laid by those at the nozzle, without danger of its dropping to the floor in a tangle as it is pulled from the rack. Water should not be turned into 2[-]*½-inch hose until it is laid and the signal is received from those at the nozzle.*

The 1[-]*1/2-inch hose should be stored on racks of the same general type, so designed that the water can be turned on without disturbing the hose or preventing it from being pulled off and laid without further attention to the controlling valve. Racks of this character have the advantage of being easily operated by one person and are sufficiently automatic in their action. If properly designed and constructed, they are reliably operative under pressures somewhat in excess of 125 pounds, and when the water is turned on before or after the hose has been removed from the rack. The valve difficulties almost always accompanying the automatic reel or rack are eliminated in these racks.*

Hose Valves:–

Particular attention should be given to the selection of the hose valves located at the standpipes. A variety of such valves are available but it is probably difficult to obtain in one valve all of the features which may be desirable for the various conditions of service. A hose valve should have a straight, full, unobstructed waterway through it, should open easily and quickly to the full open position, should be absolutely tight against high pressures when closed, should be difficult to accidentally disturb and cause leakage, should be provided with an open drip to take away slight leakage and prevent water from entering the hose, should be compact and neat in design and appearance, substantial in construction, and capable of withstanding without leakage all reasonable stresses to which it is subjected.

It is questionable whether any hose valve now available fulfills all of these requirements to a sufficient degree to warrant its unqualified approval for all classes of service. It is also possible that all of the above qualifications are not essential under some conditions, particularly where the water pressures are comparatively low. Hose valves are expected to prevent leakage into the most perishable part of the equipment and remain in a reliable condition for indefinite periods of time without excessive maintenance costs or trouble in localities where they are liable to be molested. All things considered, the best valve obtainable will probably prove to be the most economical.

Hose valves should be placed below the hose which is attached to them and within easy reach. If they are liable to be molested they should be provided with guards which are sufficiently secure to prevent tampering but which will not prevent access to them in case of fire. The 2[-]*1/2-inch valves, together with the hose couplings, should be provided with hose threads interchangeable with those of the fire department.*

Play Pipes and Nozzles:–

All 2[-]*1/2-inch hose should be provided with approved Underwriters' play pipes having a nozzle with 1*[-]*1/8-inch discharge orifice. As this hose is for the use of those trained in handling heavy streams, each system should be supplied with a number of extra nozzles of larger diameter so that heavier streams can be obtained if desired. The extra nozzles should fit the Underwriters' play pipe, but the size of the larger streams likely to be required will depend on circumstances and should be determined by the fire department officials. One or more special nozzle holders should also be supplied where the heavier streams are to be employed. A standard 1*[-]*1/8-inch nozzle will discharge approximately 250 gallons of water per minute if provided with a constant water pressure of 45 pounds to the square inch. Streams from such nozzles have an effective reach of approximately 70 feet horizontally and 77 feet vertically in still air. On the interior of most buildings the effective reach of such streams is probably materially less than the distance given on account of obstructions and the inability to elevate the stream without striking the ceiling.*

The distances given will be materially reduced by the presence of wind when the streams are used on the exterior of buildings.

One and one-half inch hose should be provided with composition metal play pipes having a discharge orifice not less than 1/2[-]*inch nor more than 3/4*[-]*inch in diameter. The play pipe should be at least eight inches in length, tapered, machined to a smooth finish on the interior, and provided with a heavy outside bead at the discharge tip to prevent injury in service and consequent disturbance of the stream. A short well made play pipe without swivel handles can be safely handled when used with 1[-]1/2-inch hose. The small streams are not accompanied by a heavy reaction, and the hose can be easily held and managed by any able bodied person even at fairly high pressures.*

A 1/2-inch nozzle will discharge approximately 32, 51 and 72 gallons of water per minute at 20, 50 and 100 pounds pressure at the base of the nozzle respectively, but the effective horizontal and vertical reach of such streams has not been determined so far as could be ascertained. A 3/4-inch stream will discharge 73, 116 and 164 gallons per minute respectively at the above pressures, and has an effective reach of 32 feet horizontally and 37 feet vertically in still air at 20 pounds nozzle pressure.

The vast majority of the play pipes now used for the equipment of standpipes are cheap, inferior and poorly suited for the purpose. They are most always highly polished on the exterior and rough and unfinished on the interior. Those used in connection with 2l/2-inch hose are often provided with small discharge tips and furnish streams easily furnished by smaller hose.

Inferior play pipes furnish inferior fire streams and have considerable influence on the attitude of public fire departments toward private standpipe systems.

Pressure Regulators:–

One of the most serious problems in the design of standpipe systems for high buildings is that of reducing the pressures in the lower stories to a point where the hose streams can be safely and efficiently handled. Nozzle pressures in excess of 65 pounds render the larger streams difficult and dangerous to handle, even by trained men, and nozzle pressures in excess of 100 pounds make it practically impossible to use such streams for this service. While it is probably possible to handle the smaller first aid streams at somewhat higher pressures than the larger streams, the pressures should not exceed certain limits if the best results are to be expected from those untrained in handling fire streams.

A number of methods of accomplishing the desired reduction of the pressures in the fire hose have been tried with indifferent success. One method involves the use of several tanks at different elevations in the building, the standpipe being so connected that each tank will supply the hose on a limited number of stories only, and excessive gravity pressures thus avoided. This method necessitates the use of considerable valuable floor space is expensive on account of the duplication of tanks, and loads, and necessitates complicated pipe connections to the water supplies. It fails to accomplish the desired results at lower stories, when the pumps or auxiliary sources of water supply are in use.

The use of special pressure reducing or regulating valves at each hose station has been attempted, but it is understood that the valves thus far tried have not been wholly successful. This method involves the use of numerous mechanical devices, the operation of which is more or less uncertain, complicates the pipe connections and is expensive on account of the cost of the valves.

It is well known that excessive pressures in fire hose attached to high pressure water supplies can be avoided by only partly opening the hose valve and limiting the amount of water which enters the hose. In other words, by establishing the ratio between the size of the inlet and outlet which will result in the reduction of the pressure to a point where the stream can be safely and effectively handled. Unfortunately, it is impracticable and unsafe for those who operate standpipe systems to try and obtain the proper reduction in the hose pressures by the manual adjustment of hose valves at time of fire, and some reliable means of automatically accomplishing the desired result must be provided. Your committee is advised that recent experiments in New York have shown that the use of a metal disk placed in the coupling at the inlet side of the hose, and having the proper size of orifice through it, will probably give satisfactory results for the smaller streams.

The experiments have been made with disks having orifices from 9/16 to 1 inch in diameter under standpipe pressures as high as 165 pounds, and with 50 and 100 foot lengths of 1-1/2 inch linen hose provided with a 5/8-inch smooth bore nozzle. It is highly probable that by this or similar means the desired results can be obtained for all sizes of hose streams under all conditions of service.

Drains:-

Each hose valve should be provided with an open pet cock arranged to discharge any leakage past the valve into an open drain pipe. The system of drain pipes should be large enough to carry off the water while the pet cocks are discharging under pressure,–should be rigidly installed and connected to the sewer or other convenient place for the disposal of the water. The discharge of water from the larger drains with which roof hydrants or monitor nozzles are provided should be taken into consideration in determining the size of the main drain pipes.

Roof Hydrants and Monitor Nozzles:–

Roof hydrants should be equipped with 2[-]*½-inch hose and Underwriters' play pipes having 1*[-]*1/8-inch discharge. When the hydrants are located in roof houses where there is no danger from frost, the usual hose valves can be employed. When they extend through the roof and cannot be protected from frost, the water should be controlled by gate valves under the roof, and the hose stored in ventilated metal or metal-clad hose houses. The gate valves should be operated by rods extending through the roof and provided with drains so arranged that they will automatically drain the hydrants when the water is shut off.*

Monitor nozzles will usually be exposed to freezing and the water should be controlled by gate valves located under the roof, similar to those described for roof hydrants which are subject to frost. As these nozzles are usually employed to furnish heavy streams in commanding positions and are intended for use by trained firemen, and as the size of the stream is largely governed by conditions of exposure, fire department officials should be consulted before their installation.

WATER SUPPLIES.

The size of the water supply for standpipe and hose systems is dependent on the size and number of fire streams likely to be brought into action at any one fire, and the probable length of time during which the streams will have to be operated. Both factors are largely influenced by conditions existing at the building or plant to be equipped.

Available sources of water supply may be divided into two classes; those within the building or plant, provided and controlled by the owner; and those outside the property, owned and controlled by municipalities or other outside parties. The inside sources include the gravity tank, the pressure tank and the fire pump. City fire engines and city mains and high pressure systems constitute the outside sources.

Large and important properties should be provided with water supplies of sufficient capacity to supply all of the fire streams necessary for the full protection of the building or plant in which the standpipe system is installed. Where exposures are not severe, such supplies may be large enough to also provide the streams necessary for fighting fire in near-by buildings, but in most instances, the water for the latter purpose will have to be obtained from public fire departments or other outside sources, particularly where large quantities of water will be necessary for considerable periods of time.

For small and relatively unimportant buildings, the system may be only provided with water supplies of sufficient capacity to supply the first aid streams for comparatively short periods, supplemented by connections from outside sources for the larger streams.

For low buildings of small area in outlying districts, single connections from outside sources may furnish ample supply for the fire stream service required.

Water supplies of comparatively limited capacity will suffice for first aid fire service streams. Streams for such service must necessarily be of light calibre as they will be operated by individuals and those more or less unfamiliar with the handling of hose streams. Usually only one or two such streams will be in operation at any one time. Fires will either be promptly extinguished, or the need of outside aid and heavier streams will be manifest during reasonably short intervals after fire starts and before any considerable volume of water has been used. It is possible, however, that conditions may arise where the use of heavier fire streams may be desirable or necessary before the arrival of the fire department, or the services of trained men may be available before outside aid can be secured. Such contingencies should be taken into consideration in determining the size of the water supply for first aid service.

A much larger water supply is required for the larger fire streams necessary for the protection of the interior and exterior of buildings. It may be necessary to use several such streams for hours, and large volumes of water are required where monitor nozzles are employed. For this class of service the water supply should ordinarily be capable of quickly and continuously supplying from 2 to 6 standard 250 gallon streams, and should be supplemented by connections for materially increasing this supply from outside sources.

The primary sources of supply for the first aid streams must be constant and automatic, and are most reliably obtained from gravity or pressure tanks or open connections to outside mains. The latter source and the fire pump are most suitable for the heavier streams which must be quickly available. Connections for stream [steam] *fire engines and connections to high pressure systems, even though normally closed, constitute the only practical auxiliary supplies for the development of the full extinguishing power of the ordinary system. At large fires of long duration, the auxiliary supplies will probably constitute the main source of water supply.*

It is manifest that the water pressures must be such as to afford good effective fire streams at any point in the system under the maximum conditions of service. The height of buildings, the volume of water required and friction losses in piping and hose are the most important fac

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tenance of the water supplies can usually be made almost incidental to the upkeep of other necessary parts of modern building or plant equipment. Systematic periodical inspection of all portions of standpipe systems is essential, and employees to whom this duty is intrusted should be held strictly responsible for their condition.

A trustworthy standpipe and hose system will naturally appeal to those who must spend a large proportion of their time under its protection, particularly so in high buildings and buildings from which escape at time of fire is manifestly difficult. Full appreciation of the value of such systems for the protection of life and property against fire will undoubtedly result in a more systematic drilling of employees in the handling of fire apparatus and the more extensive establishment of trained private fire departments. The members of such organizations will gain confidence in their own ability to extinguish fire, and, if properly organized and instructed, will undoubtedly take pride in their share of the maintenance of the standpipe and hose system.

The standpipe and hose system must necessarily lack the essential qualification responsible for the success of the automatic sprinkler system, namely, the automatic application of water to the seat of fire regardless of the locality at which the fire may start within the building. It is also lacking as regards its reliability of application to fire under all conditions. At the same time, the standpipe and hose system furnishes the closest possible approximation to the standard of efficiency in fire extinguishment set by the automatic sprinkler. Its use is essential to the proper protection of present day buildings against fire. Its general application to buildings in congested city districts, particularly where the buildings are high, will greatly increase the fire department facilities and very materially decrease the conflagration hazard.

In the foregoing, your committee has attempted to outline the essential requirements for a standpipe and hose system which will prove efficient, reliable and safe, in the hands of all who may be expected to handle it. If designed, installed and maintained as indicated, the system provides the means for the extinguishment of fire during its incipient stages; for the control of fire in its more advanced stages on the interior and exterior of buildings and for the heavier fire stream service of long duration often necessary in fighting fire in near-by buildings, particularly at the higher levels. The system is ready for instant use, and is so equipped that it need only be provided with the men to operate it.

The committee sincerely trusts that this will be a prominent subject in the deliberations of the Association until all of the problems it presents are properly solved and a comprehensive standard is adopted.

Mr. Burdette: *Where there are several standpipes to be connected at the top and bottom, do you mean one section of the building?*

Mr. Robinson: *Yes. That is a very good point, Mr. Burdette. I had in mind not so much a plant composed of a number of buildings as I did a single building. If there are four standpipes, one in each corner of this building, and a tank supply at one corner, it probably would be advisable to put a circulating main at the top and also at the bottom where the pumps and other supplies come in, properly checked against each other. Where you have a number of buildings you can treat them the same as we do in the sprinkler system, with independent control. While I had in mind the larger plants generally, there may be applications mentioned here that have not been thoroughly worked out. You know we have not attempted to draw any definite rules as yet.*

Mr. Stewart presiding as Chairman.

The Chair: *Gentlemen, as the Chairman who submits this report says, it is very desirable at this meeting that the opinions advanced should have the benefit of your criticisms and suggestions before proceeding to the detailed requirement, and I would therefore be pleased to hear any discussion on this subject, particularly from the representatives of fire departments or others who are concerned in the use of standpipe equipment. There is now a feeling that standpipes, especially in the high buildings of the large cities, should form a most important adjunct to the public firefighting equipment. That is a very important phase of the subject, and in years past it was perhaps not given a great deal of consideration and the equipments have in many cases been put in primarily for local use,– that is by the architects. We desire to have a discussion on this subject.*

Mr. Evans: *I would like to ask what is the proper size of pipe or spacing.*

Mr. Robinson: *The question of pipe sizes is one very similar to that of sprinkler pipes. The thought or hope of the Chairman is that any standpipe standard the Association adopts will include the complete protection of buildings by both classes of streams, those in the hands of the occupants of the buildings and those of the fire department. If that is done, the length of hose permitted would determine in a measure the number of standpipes. The number of streams for each standpipe has been mentioned in the report, and the amount of water required for each stream being known, you can figure from the top down and arrive at the pipe sizes in the usual manner. No attempt has as yet been made to figure out a schedule of pipe sizes. I should imagine for some buildings in New York it would be very easy to conceive of a standpipe that would have to be eight inches and even more, depending on circumstances. I recall a case in this city where we were obliged to rise 100 feet at the corner of a grain elevator with an eight-inch pipe to get the best results with a large stream designed to take care of fire in a lumber yard.*

Mr. Clark: *I would like to inquire if these recommendations for standpipes apply to buildings that are sprinkled, a separate standpipe with a small hose?*

Mr. Robinson: *Yes. It is stated in the report, however, that in buildings where first aid fire streams can be properly supplied from a system of automatic sprinklers, the number of standpipes can be confined to those supplying the larger streams for fire department use. The smaller streams are provided for in our sprinkler rules. It is really placing a portable sprinkler within easy reach. I had opportunity to talk with Mr. Newbern this noon at lunch, and he believes there are certain classes of risks where he would prefer a system of this sort, properly arranged and ready for instant use, to the automatic sprinkler system.*

Mr. Griswold: *In relation to the question of supporting the hose,–whether it should be a hose rack or hose reel. Mr. Robinson says that he prefers, or his committee prefers, an automatic reel, but he doesn't state so. When the hose is unreeled, the water may come in while the unreeling is in process. Now I have found in my experience with the rack, as you detach the hose, and the pin drops, it gives you a free rein, and that is an advantage over those ordinary hose reels in which the pressure begins as soon as you start the hose. With a rack you have a better condition for avoiding kinks and ties and the freedom that comes in handling the hose, more than you have in the handling of the reel. I don't know whether Mr. Robinson or his committee have brought out that opinion or not.*

Mr. Robinson: *We expressed an opinion for the rack. While we didn't state the exact type, it is pretty well defined. One and a half inch hose should be stored on racks of the same general type as those recommended for 2*[-]*1/2-inch hose, so designed that the water can be turned on without disturbing the hose or preventing it from being used. That doesn't mean an ordinary reel. It means a rack that you can turn the water on and then take the hose to the fire. The water is there about the same time you are, because it doesn't let the water into the main part of the hose until you have pulled off all but about two folds.*

Mr. Griswold: *I had in mind this: You take a hose of 50 feet or more, and you will not exceed a height of more than perhaps 20 or 22 inches, but if you open the valves to let off the hose,–what is going to be the result, after you have opened your valve, if you have fifty pounds pressure behind you?*

Mr. Robinson: *The rack I refer to will stand about one hundred and fifty pounds when new. So far as I know, there is only one rack that is designed to do that.*

Mr. Griswold: *I haven't seen any.*

Mr. Robinson: *The ordinary pin rack will not do it. Probably you have a good illustration of a pin wheel, because laps of hose would be thrown up in every direction by the pressure. To get such hose off, a man would have to be a very active fireman.*

Mr. Griswold: *That is what I thought.*

Mr. Affeld: *I understand that there is a system where they could use a pipe for fire purposes and also a smaller one of hydrant size to be used by individuals. That was supposed to be put in this building (The Insurance Exchange), or should have been put in this building, and it had pressure in it by which they could pump the water direct from the main. Those conditions were supposed to be necessary for a building of this kind. As it is now, I don't know whether Mr. Robinson knows what protection we have on this floor or any of the floors, but as I understand, they are connected with no pump whatever, and are dependent upon city pumping up when we need it.*

Mr. Robinson: *I would say from what I know, although I haven't any very extensive knowledge of the system in this building, that protection is badly needed.*

Mr. Boone: *There are two points I would like to get information on. The first is the cross connection of systems at the top and bottom. Is it the committee's idea that all standpipe systems of two or more vertical pipes should be cross-connected at the top and bottom, as, say, in a building twenty stories high or thirty stories high?*

Mr. Robinson: *I think I would be willing to accept such a method as standard, yes. The tank for the ordinary building having only one source of water supply must necessarily be limited. If the standpipes are cross-connected you will get the water to the hose in the shortest way. If they are properly checked and you have a more extensive water supply from your pump, or the fire department connections, they would go directly into a similar cross-connection at the bottom. Now, I know that departs from the ideas we have given in our sprinkler requirements, but I don't think conditions are quite the same, although it is rather hard to distinguish between them. What was the objection, Mr. Boone?*

Mr. Boone: *My thought was in relation to the introduction of widely separated valves. In the event of a break in the standpipe system there is a likelihood of delay in shutting off the water and consequent water damage. You would have two valves instead of one.*

Mr. Robinson: *There would be no objection in making the connections as we do with sprinklers, if desired.*

Mr. Boone: *The other point is regarding long bend fittings. Is it the committee's recommendation that they be employed on the hose connections?*

Mr. Robinson: *No, sir. You will notice that the word "connections" is used in a broad sense. There will be no real necessity of long bend fittings at the hose outlets.*

The Chair: *Are there any other comments? The Chair understands the committee is working under the conviction that the present fire-fighting facilities of many fire departments in the country are not sufficient to properly cope with a fire in a high building that starts above the sixth floor, and in going ahead with these detailed specifications they have in mind a standpipe equipment that will be used by fire departments and which will materially add to their ability to more promptly cope with the fire in the upper stories of high buildings. It is felt that no fire department, however fine a high pressure system they may have, can do work of any great value above at least the sixth story with streams directed from the street.*

Mr. Hardy: *I was going to ask Mr. Robinson if the committee had before it any of the specifications which are used in the different cities. I presume they did.*

Mr. Robinson: *Yes, sir, we did.*

Mr. Hardy: *In New York City?*

Mr. Robinson: *Yes, but as we desired to get these fundamentals laid down we did not go into those as extensively as we might have, perhaps. I had the New York code and I had several others. In San Francisco they have a very elaborate system.*

Mr. Hardy: *In New York of course the specifications are exceedingly meager, and for some years they have attempted for several purposes in rate making to have the approval of the fire department. As a matter of fact, the fire department was never able to keep up the inspection. We had no bureau to do that work, but it is now expected that they can take care of that work.*

I am also assuming Mr. Chairman, that if any member has any suggestion to make, they can be made to the committee.

Mr. Robinson: *Yes sir, the committee will be very glad to have all the communications they can get from members or others on this subject.*

Mr. Henley: *Mr. Chairman, the first aid fire stream with the standpipe located next to the columns in or near the middle of the building. It seems to me that if they are so located a person wouldn't have a chance to escape. If possible, the standpipes should be located near the stairway. Furthermore, the heaviest standpipe that is spoken of I think should be used for the protection of the building from exposure to fire from adjoining buildings.*

It might be of advantage at times to put those standpipes in the interior of the building, but it would be impossible for the firemen to use them from the outside.

Mr. Robinson: *I would say in reply to Mr. Henley, that the most economical way to cover the area is to place the standpipe in such a position that you can reach the area to the full length of the hose on all sides of the standpipe. Now if you place it against the wall, you cut off half of the area that can be covered in the other way. This standpipe I might say, is for the use of those who can reach it at the time the fire starts. It is probably true in a great many cases they will not do so, but it is there for them.*

The number of standpipes should be governed, of course, by the area. I have a case in mind where fifteen years ago I laid out six standpipes with fifty feet of hose in one area. I used at that time a well made valve having a babbit seat. It was especially made. I think those valves are in good condition to-day and tight. I have been told so. Now carrying this idea through means that you will have to place some standpipes away from the stairway. It means that you must engineer this thing all the way through, the locations of the standpipes and everything, to cover the area, and in addition a certain number of streams or standpipes will have to be so arranged that the fire department will be provided with the service that they need. It is a fixed part, or intended to be so, as far as *the building equipment is concerned– a fixed part of the fire department apparatus, and I would like to ask Chief McDonald, who I notice is here, and whom I happen to know, whether in his opinion a standpipe so equipped, and equipped with his knowledge of every detail of the apparatus furnished, whether he believes that would meet with the favor of the firemen or not. In other words, Chief, if you found the system ready for your men, and you were assured of that fact by our own personal knowledge, would it be a pretty good arrangement for the fire department? How does the fireman feel generally regarding these equipments?*

Mr. McDonald: *Mr. Chairman, the firemen generally take very kindly to standpipes, interior standpipes, and since you have called upon me, I might go into a few remarks I made when Mr. Robinson read his paper. He has well said that the standpipe equipment is the next best thing in comparison to the automatic sprinkler system. In some senses it is better, for this reason. It not only affords protection within the building itself, but still more, it affords protection outside of the building; and that is its greatest use in the event of a great conflagration,–the greatest benefit that the inside standpipe can be put to. For instance, you take in this building and some other large buildings, a traveling fire, conflagration, where there is no other means of checking the fire or to check its progress except to use the taller buildings as a bulwark against a traveling fire. In that sense I see the greatest efficiency from a standpipe.*

Those papers that are read here, of course, are in a suggestive way; that is, they are suggestions for ordinances. It is always expected that conditions alter cases. It is like every other paper that is read here, it is drawn along ideal lines. It is not always so easy to get ordinances through city councils, as perhaps you might imagine. While I have no objections to its practicability–I won't raise any objections to the practicability of the suggestions in the paper of a fifty-foot line of hose–still, the better the standpipes may be, the more opposition you are liable to encounter. The money interest of the man who is putting up the building might appeal just as strongly to the members of the city council as the fire department's arguments on the necessity of the system. Sometimes they say, we are paying your salaries, as they do, and all we ask of you is it do the best you can.

In the central district here I am afraid, –I am speaking for Chicago now,–I am very much afraid that we might encounter some opposition to start with if we used a two and one-half inch linen hose, or a one and a half inch hose. We might be asked the question, How much longer will it take you to ascend with fifty or one hundred feet of the regulation trustworthy hose that you are depending on outside? From our experience we are a little slow in placing great confidence in the two and a half inch linen hose,– not because of any doubt that it will not stand the pressure. We have known of a great many instances, not isolated, where the play pipes have been stolen, where they have gone to work and taken a knife and cut the pipe off; so for that reason, excepting in large industrial plants outside of the central part of the city, in those places where an efficient local fire brigade is maintained, such as we find in the Stock Yards and International Harvester Co., and places of that kind, the larger hose of both kinds should be commonly used, especially because the general public has not access to it and those people who would be liable to destroy it will not be able to take the brasses off for junk.

Another point with regard to such a hose,–if it was a bad fire and the fire department were badly pressed, the two and one-half inch outlet for fire outside of the building–I take it for granted that the inch and a half in the building are necessary in the building–would be what the department requires. The resistance offered by the larger sized linen hose would be an objection to the department. The department, I am sure, would prefer to use their own hose under most circumstances.

The matter of automatic reels; I would say cut that out all together!

I don't favor reels of any kind. If they object to approved racks, why let them build a box on the wall and let them lay the hose in alternately. That is infinitely better than reels in my estimation. As far as trouble with kinks, it doesn't take any longer to take kinks out of the hose.

There was some question raised about the shut-off valves in case of a burst. I am not theorizing on this either. We have had our shut-off valves taken out of quite a few of the standpipes in this city. The shutoff valves, which are supposed to be left open, we found closed, and when we went to use the hose we found there was no water in the standpipe and after the fire we found the closed shut-off valve.

***Mr. Bell:** In regard to the location of the standpipes I would like to say that a man is going to look for self-preservation before he uses the first aid to put out the fire in the factory and unless provision is had near a point that will afford protection for the man himself, he is apt to pass it by, in my opinion. I think the standpipe, as far as possible, should be placed near the stairs. If the area is so large as to make a long hose necessary, then I would say a second standpipe would be necessary, but in all cases I think we should consider the people who are going to handle the hose and play the water on the fire; we should make all provisions possible for sweeping the fire from a central point, but unless you get a man to stand by that central point all the conditions you may provide will not avail. I think one standpipe at least should be placed somewhere near an exit.*

***Mr. Robinson:** The report so states. It is, of course, impossible to place all the facilities for putting out a fire at or near a stairway, but I quite agree with the gentlemen that we should have such facilities there. It is true also that employees of buildings would probably pass by, in a great many instances, a standpipe equipment at some point remote from the stairway. If, however, you provide ample facilities, and show and prove their efficiency by making your employees familiar with them, you will find those who will run by the standpipes in your plant becoming less and less. They will have confidence. In our own fraternity of insurance men, I have had men belittle the thought that a one and a half inch hose was worth anything. I have invited one or two of these gentlemen to be present while I pulled off and used such a stream, and they were utterly astounded at what you can accomplish with a 5/8 inch or a 3/4 inch stream, which you can change from one hand to the other if you desire. Now,* *if every employee had the knowledge that he ought to have of the facilities that you provide for him; if they familiarize themselves with the standpipe system, their tendency to ignore it will become less, and it will become less in proportion as you make these gentlemen who are in your employ familiar with it.*

The Chair: *Gentlemen, if there is no further discussion, a motion will be in order to accept this report of the committee as one of progress.*

Mr. Evans: *I so move, Mr. Chairman.*

The motion was adopted.

The Chair: *The next report is that on Automatic Sprinklers, Mr. E. P. Boone, Chairman.*"

The discussion above is of particular interest because the discussion explores the theoretical basis for developing the standard for standpipe system installations.

It is interesting to note the reference to unenclosed stairs. Apparently, high buildings were still be constructed with unenclosed stairs in 1912.

Of particular note is the discussion on the flow from nozzles at various pressures. This discussion was the basis for requiring a residual pressure of 65 psi at the standpipe outlets in the standpipe system installation standard which followed. These pressures were for solid streams, and not for fog nozzles utilized by fire departments decades later.

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Source: "*Proceedings of the Sixteenth Annual* [NFPA] *Meeting*", Chicago, Illinois, 1912.