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FIRE PROTECTION HISTORY-PART 200: 1903 (TOWN GRADING)

By Richard Schulte

The seventh Annual Meeting of the National Fire Protection Association (NFPA) was held in Chicago in late May 1903. Among the topics discussed at this meeting was a preliminary standard for the "grading" of the public fire protection provided for towns (town grading). The following is a transcript of the Committee report on the town grading standard:

"***REPORT OF COMMITTEE ON STANDARDS FOR GRADING TOWN PUBLIC FIRE PROTECTION.***

F. M. Griswold, Chairman.

F. D. P. Balch,	*Everett U. Crosby,*	*C. C. Fleming,*
C. M. Goddard,	*C. A, Hexamer,*	*Wm. H. Johnson,*
F. J. McFadden,	*R. G. Potter,*	*F. C. White.*

Mr. Griswold. This report was prepared primarily for the members of the Committee of which I am Chairman, and therefore in its opening passages it refers to the Committee work and not to Association work. With that preliminary statement I will proceed to read the report to you.

The following suggestions and conclusions in relation to the formulation of "Standards for Grading Town Public Fire Protection" (in conformity with the request of the National Board of Fire Underwriters) are submitted to you for consideration, suggestion and criticism, in the hope that, through the counsel and advice of members of the committee it may be possible, at an early date, to formulate a preliminary report, embodying the consensus of opinion on this very important matter, for submission to a discussion at a meeting of the members, which, it is hoped, may be called in the near future.

It is to be noted that in seeking the appointment of a committee to consider and decide upon the essentials of the "Standards" called for, the National Board has refrained from dictating, or even suggesting, any line of action or of limitations, thus leaving the committee untrammelled in its efforts to formulate conditions which may at least approximate a solution of the problem presented in the resolution, which prompted the request for its appointment; viz.:

*"Should not a standard be adopted for perfect equipment and water-works service, * * * * which shall be at once intelligible and comprehensive?"*

In seeking a foundation upon which to construct a "standard" conforming to the above suggestions, it is plainly evident that none of the methods now in use for grading towns and their fire protection as a basis for ratings will serve the purpose, as they deal in broad generalities which permit wide latitude in application, and are not, as a rule, "at once intelligible and comprehensive."

It is also evident that the most carefully prepared standard of requirements, even when entering into minute" details, will not properly serve for universal or "automatic" application, and may, at best, only form a basis schedule upon which to erect a practicable standard, which, to prove of value, must be carefully and intelligently applied in each locality, after proper investigation of the conditions which tend to the promotion of disaster by fire.

While it is true that no two cities or towns of approximately equal population can be treated as identical in respect of relative fire hazard, owing to the differences in the class of construction and the congestion of values under varying conditions, it is also true that it is not always practicable to proportion the water and fire service of every city or town in such measure as to be fitted at all times to successfully combat the emergencies of a great conflagration; hence, in the formulation of an "intelligible and comprehensive" standard of water supply and fire service, some theory must be adopted as a base; but in no case should compliance with theoretical conditions be considered as satisfactory until proper practical tests of the system have been made, whereby may be accurately demonstrated the value of the water supply in relation to its reliability, availability, volume and pressure at the point of tests, under conditions similar to those which might prevail in the case of an actual fire.

The data thus secured would properly indicate the possibilities of fire protection in the districts under test, without awaiting disaster for practical demonstration, and at the same time present the conditions upon which to properly found a justifiable base rate.

In order to reach satisfactory conclusions in relation to the efficiency of a water supply under the tests above suggested, it is well to bear in mind that no dependence can be placed upon the record of static (still) pressure as an assurance of volume or of utility, for in many instances such indications of head or pressure are proven illusive and misleading when one or more streams of standard volume are allowed to flow from the system; hence, these tests should in all cases be made with water flowing simultaneously from such number of outlets as may be deemed necessary for the ample protection of the town as a whole, or for any one or more of its separated sections, singly or collectively; each such stream to show a standard of delivery of not less than 250 gallons of water per minute through an inch-and-an-

eight[h] *smooth nozzle at the end of not less than one hundred feet of standard rubber-lined two-and-a-half-inch fire hose, with a flowing pressure, with all outlets open of not less than 75 to 76 pounds to the square inch at the hose inlet.*

A stream of this character, at the pressures indicated, will be propelled to a vertical height of 80 feet and about 70 feet horizontally, thus serving with efficiency for fire purposes in the average town or city up to 30,000 population, where building in excess of 60 feet in height are not of usual frequency.

In this connection it may be well to state that a single standard fire stream consumes water at the rate of about 400,000 gallons per twenty-four hours, and though such use may not be of long duration at any one time, it is essential that the maximum volume be always available, in addition to the maintenance of the necessary quantity for the average domestic and manufacturing daily supply during the time the fire-streams may be in use, as are there occasions, even in the smaller towns and cities, when the volume of water needed for fire extinguishment may, for hours at a time, exceed all other demands upon the supply in the proportion of 80 to 1, and during such times it is not practicable to cut off the domestic supply to supplement that needed for the emergency of fire.

While there is no fixed and absolutely reliable rule upon which to calculate the number of fire-streams necessary for the proper protection of a town in proportion to its population, there are several theoretical propositions in relation to such apportionment, having the sanction of eminent hydraulic engineers which may be assumed as sufficiently reliable to form a base for the formulation of the standards under consideration. In illustration of these theoretical bases, the following is abridged from a very interesting and instructive article by Mr. J. T. Fanning, C. E., the tabulation showing at once the approximate number of fire-streams needed for concentrated use at one time, and the volume of water necessary for both fire and domestic service per diem in towns of the stated population, in millions of gallons:–

Population	*Streams*	*Fire Flow*	*Dom. Flow*	*Total Flow*
4,000	*7*	*3.9*	*.20*	*4.10*
5,000	*8*	*4.1*	*.25*	*4.35*
6,000	*8*	*4.3*	*.30*	*4.60*
8,000	*9*	*4.65*	*.45*	*5.10*
10,000	*9*	*4.90*	*.60*	*5.50*
15,000	*10*	*5.50*	*1.00*	*6.50*
20,000	*11*	*5.90*	*1.40*	*7.30*
25,000	*12*	*6.25*	*1.90*	*8.15*
30,000	*12*	*6.50*	*2.40*	*8.90*

The quantities noted in the table are based upon a direct pressure (gravity or pump) water supply, and show an average of from 50 gallons per head at 4,000 population to 80 gallons per head at 30,000 population for domestic service alone. The per capita supply for population below 4,000 may safely be held at 50 gallons per day for domestic service, and this constantly available supply must be augmented at the rate of 400,000 gallons per 24 hours for each of the total number of standard fire-streams assumed to be necessary for simultaneous use in case of fire in any section or district of the town. An approximate estimate of the number of fire-streams necessary for the protection of towns of less population than 4,000 may readily be calculated on the lines set forth in the above table, but final conclusions should be based upon the needs of each case separately, considered after inspection.

The prime object to be attained in relation to the water supply of a town is an assurance of its efficiency for fire service, the essentials of such service being the certainty of permanent source or means of supply, ample volume, constant and reliable pressure at all points in the system of distribution, and its ready availability in such quantity as may be demanded in an emergency.

With these essential conditions assured, it would make but little difference by what method the proper pressure might be secured, whether it be due to gravity flow, direct pumping; stand-pipe or fire-engines; but at the same time there is a decided choice of systems of supply in relation to ownership, assurance of constant service and safety from possible accident in operation, which should influence conclusions in grading a town or city in respect to the probable efficiency of its water supply for fire service.

Primarily, the operation and control of a water supply under municipal ownership is to be preferred as compared with one under private ownership, as in the former case the public interests are more likely to be properly served under all conditions, without reference to the profits to be derived from its operation, which latter consideration is the usual incentive controlling the action under private ownership.

Comparing the various systems of water supply in common use, it appears exigible to classify them in the following order of excellence:–

("A.") Gravity flow from a sufficiently elevated reservoir or impounding basin, fed from its water shed or from flowing streams; or from a reservoir formed by a natural lake. Storage capacity to be equal to all demands for service, and source of supply to be reliably constant in flow to replace depletion in use. Supply mains to service distribution system to be in duplicate.

("B.") Gravity flow from a sufficiently elevated reservoir to which the supply is delivered by duplicate sets of hydraulic or steam power pumping engines, drafting from a source of constant supply. The reservoir to be of sufficient capacity to hold in store from six to ten days' reserve supply equal to the average service for all purposes. The combined capacity of the pumping engines should be equal to the delivery of the total average per diem supply of the town within ten hours, and one-half of the pumping capacity should accomplish the same result within twenty hours of continuous operation. Supply mains to service distribution system to be in duplicate.

("C.") Gravity flow from combined and connected high and low-service reservoirs, the water supply from same being secured by any of the methods indicated under "A" or "B"; supply mains to the distribution service to be in duplicate. High and low-pressure service to be properly connected so as to permit high service pressure in low-pressure distribution in case of fire or other emergency.

Mr. Lemmon. In B the number of days' supply is distinctly specified; is any reference to be made to that in C?

The President. You will notice as we go along in the alphabet that the gradation falls from the standard; possibly that was the reason.

Mr. Lemmon. It is ten days in B, and no time is specified in C; first it is unlimited, then it is ten days, and now no time at all.

Mr. Bruen. I would like to inquire of the committee if that is not taken care of by the statement "secured by any of the methods indicated under A or B?" Both of them specify a sufficient supply.

Mr. Griswold. I think that is taken care of by that reference to A and B.

("D.") Direct-pressure service by means of duplicate sets of hydraulic or steam power pumping engines, supplemented by an auxiliary reservoir or stand-pipe, having independent supply mains to the distribution system and also duplicate supply mains from the pumping station to the distribution, provided with proper checks against the reservoir or stand-pipe in order to permit high-pumping service in the distribution.

("E.") Direct-pressure service by means of duplicate sets of hydraulic or steam power pumping engines, without the use of an auxiliary reservoir or stand-pipe. Supply mains from the pumping station to the service distribution to be in duplicate and to be provided with proper relief and other safety device to prevent accident.

("F.") Gravity flow from a sufficiently elevated reservoir to which the supply is delivered by duplicate sets of pumping engines actuated by gas or gasolene engines operating on the explosion principle. In all other respects to conform with the conditions under class "B."

Mr. Fiske. I think that No. F is too low down the list. I see no reason why F is not as good as B, and I say that without any intention of giving the idea that I believe in gasolene engines. But in B you have allowed for a ten hour capacity and with a duplicate system it seems to me that you have a sufficiently good supply either with a gas or gasolene engine so you would not have to operate at all times.

Mr. Griswold. Mr. President, I have found in my experience with gasolene and gas engine pumping machinery, and I think the sellers of them will admit it, that they stop, but the sellers won't tell us why and you can't tell when, and you have got to have an expert to find out, and duplicate parts of the engine there to put it in shape again. Now, the location in the standard in which I put that pumping device was with the idea that an ordinary hydraulic engine or an ordinary steam engine may in the course of time or instantly or accidentally once in a while get out of order; but the gas and gasolene engines get out of order without any apparent cause, and they stay out of order with perversity, and I made the restriction that they should comply with B, so that while they were working we would get water, and then when they didn't work we could have some water any how. I don't believe we are at all safe in assuming that either gas actuated or gasolene actuated engines will give reliable service to us, and I should be sorry if it was changed here; but nevertheless I am willing to stand by whatever the Association thinks best.

("G.") Public fire cisterns having capacity from 40,000 to 60,000 gallons each, filled from flowing water, natural springs or some other reliable source, properly located and in sufficient number to afford the protection demanded.

("H.") Water supply from permanent ponds or flowing streams accessible to engine suctions and contiguous to congested districts of buildings or values wherever located in the town.

Given a water supply fully covering the essentials of adequate volume, pressure and availability at points where needed on demand in relation to the full supply of the total number of standard fire-streams deemed necessary to meet the requirements of each district or locality, and which, in other respects, is in full conformity with any one of the several conditions above delineated, the methods by which the supply is secured and may best be utilized for the purpose under consideration, appear so segregate themselves (from both the hydraulic and fire-engineering viewpoints) into the following order of preference:–

Methods "A" to "C," inclusive, as first class; "D" as second class; "E" as third class; "F" as fourth class; "G" as fifth Class; and "H" as sixth class.

Reviewing the propositions above presented, it appears safe to assume that in the acceptance of a classification for a water supply based upon conclusions similar to those outlined, there will be established a prime factor in the equation for the formulation of an initial "base-rate" in the grading of any town, without particular reference to its population, as it is undoubtedly true that the only safe foundation upon which defence for variation in "base-rating" in various localities must rest, is in the efficiency and reliability of its water supply, as demonstrated after due investigation and tests under conditions similar to those which would be developed in case of an actual fire or fires.

While it is neither the desire nor the province of this Committee to attempt the fixing of rates, it is hoped that it may not be considered a transgression of its prerogatives to suggest that initial base-ratings should be gauged on a gradually rising scale, in relation to the water supply, from the most perfect to the least satisfactory conditions under each of the methods nominated, and be built up from the foundation thus established to a complete "town-base-rate" through penalizing additions to the initial rate for deficiencies, and in elucidation of this suggestion it appears necessary to attempt standardizing such public utilities in order to fix conditions upon which to add charges for deficiencies, somewhat similar to the practice in vogue in the formulation of schedule ratings for mercantile and special hazards, and to this end the following is submitted:–

WATER SUPPLY.– To be of gravity flow, in accordance with Class "A" noted in preceeding classification. To be owned, controlled and operated by the municipal authorities.

And here, if I may interpolate, I will say that it strikes me that one of the absolute essentials for a satisfactory water supply is the ownership of the supply by the municipality. We all know of cases throughout the country where private owners have assumed to say, if you don't do so and so we will shut off your water, and they do shut if off not only from private consumers but from the public, and the consequence is the town goes unprotected.

THE PIPE-SCHEME, served from any of the methods of water supply classified from "A" to "F" inclusive, should include duplicate supply mains from the source of supply to the distribution service, each of such mains being of sufficient capacity to fully supply the service under the full average requirements of domestic and fire-defence consumption combined.

The pipe-scheme of the distribution service should be divided into sections by properly located stop or gate-valves, and be installed on the so-called "grid-iron " system, particularly in the built-up sections and the congested districts of the town, with no main intended for use in the fire-service of a less diameter than six inches in the residential or the minor retail sections, and none less than eight inches in diameter in the business, manufacturing or other congested districts; the submains supplying the borders of the "grid-iron" system to be not less than 10 or 12 inches in diameter.– "Dead-ends" to be avoided, where possible to eliminate them, and where they may not be avoided, there should be provided a "waste-valve" at the extremity of the "dead-end," emptying into a fire cistern of not less than 40,000 gallons capacity; the flushing or "blowing- off" of the dead-end serving to help fill the cistern.

All underground water mains should be of standard quality cast-iron, tar-coated, and be laid well below the frost-line; provided with proper gate, check, waste, and relief valves to prevent accident entirely disabling the service. (Calculations relative to the theoretical delivery capacity of mains of any diameter will need to be variously modified when such mains have been laid for a long time, on account of the reduction of the interior diameter through the presence of rugosities and tuberculations due to corrosion and obstructions to flow caused by presence of sediment or of aquatic plant growth on the inner shell walls.)

Mr. Stratton. Are those underground joints to be caulked with lead or flanged?

Mr. Griswold. It was our intention to insert there "in conformity with the National Board Rules," and I think an amendment of that kind will be a very proper thing.

The President. The Chairman of the Committee accepts that amendment.

FIRE HYDRANTS should be "staggered" and be located not more than 300 feet apart in the business and manufacturing districts and in other localities holding large values.

Hydrants in the residential and mixed minor retail districts should be located not over 450 to 500 feet apart. Water supply for all hydrants should be secured from the largest available service main through a branch main not less than six inches in diameter. Where steam fire engines take suction from hydrants the suction hose and suction connections should not be less than four inches in diameter. In most instances it is permissible as well as desirable, where the pressure warrants it, to have one two-and-a-half-inch hose connection on the hydrant in addition to that provided for the engine suction.

Standard hydrants should be self-draining and have uniform threads at all outlets, and with frost-proof jackets where climatic conditions demand them.

It is well to emphasize here the fact that it is more economical practice to provide numerous hydrants than to purchase fire hose, as the price of one hundred feet of standard fire hose is about the same as that incident to the complete installation of a good two-way hydrant, including one hundred feet of standard six-inch cast-iron main, trenching, laying and setting up. (Freeman.)

WATER PRESSURE.– The constantly reliable and available pressure at the outlet of any fire hydrant served at any point in the distribution system should be maintained at not less than seventy-five pounds to the square inch flowing pressure at inlet to the hose during full discharge from the total number of outlets or streams nominated for the protection of the district or the districts involved.

FIRE LIMITS should be established to cover as large an area as practicable, be well defined, and laws or ordinances relating to the erection of duly approved structures within such prescribed limits should be rigidly enforced.

BUILDING AND INSPECTION LAWS. –Approved laws or ordinances should be enacted and compliance with their conditions should be enforced in every town credited with fire protection.

Mr. Lemmon. What is meant by "approved laws or ordinances?" Approved by whom?

Mr. Griswold. Well I think, Mr. President, that Mr. Lemmon has perhaps asked a question which I cannot answer. Approved laws are those which carry with them common sense as to conditions. There is no authority that I know of in the insurance business which has approved inspection building laws–no general authority.

Mr. Lemmon. What do you mean by it? That is the point.

The President. I think the word "approved" might be eliminated.

Mr. Griswold. It wouldn't do any harm to eliminate it; I have no objection at all.

Mr. Lemmon. I haven't any objection to the use of the word, only I wanted to know what was meant by it.

POLICE FORCE. When properly organized will serve as an available auxiliary adjunct in relation to the efficiency of a fire department, and the formation of such organized force should be encouraged, and be given proper credit when in effect.

STREET PAVEMENTS.–As serving in a large measure to affect the prompt action and efficiency of the fire department, due consideration should be given to the nature of the material composing the paving of the street roadways, which, in the business, manufacturing and other districts holding large values, should be of a hard and durable nature, and be kept in repair by the municipal authorities.–Streets less than 60 feet in width present difficulties liable to militate against good fire service.

FIRE ALARM SYSTEM. –The value of a fire alarm system is dependent upon contingencies relating to its reliability of action under adverse conditions, and it should, therefore, possess the qualities of approved devices, proper installation, supervision, ease of repair and freedom from accidental or designed interference; hence, the largest credit allowance should apply to a system operated by the electric current, with complete and divided metallic circuits in underground conduits, and with alarm boxes of the keyless pattern. Central station apparatus should preferably be located in a fireproof building, or in one used for department purposes only.

FIRE-PATROL OR SALVAGE-CORPS SERVICE being usually organized, and supported by the insurance companies, the value of such organization in relation to its effect upon basis-rating is entirely extraneous to municipal or fire department control, and is therefore dependent for its efficiency upon the efforts of its creators, to whom it would seem an act of supererogation to make suggestions by which to insure such discipline of force and efficiency of apparatus as to warrant a rate penalty for its absence in the fire defence of any locality.

FIRE DEPARTMENT ORGANIZATION.– As the character of the fire department organization and the nature of its proper equipment are entirely dependent upon the method or system of its water supply, it is evident that no satisfactory conclusions can be based on theory alone, and that each case must be decided according to its necessities, as developed through careful, practical investigation on the ground; but under somewhat broad generalities, it appears warrantable to classify the various systems of such organizations into several well-marked divisions in relation to their promise of reliable efficiency, under any method or system of water supply, in about the following order of preference:

FIRST CLASS.–Chief, subordinate officers and full complement of men to each company full paid and permanently housed in company quarters; apparatus to be fully manned and be drawn by horses owned by the department, trained for the service and used for no other than fire department purposes.

SECOND CLASS.–Chief, subordinate officers and larger half of the men of each company full paid and permanently housed in company quarters; balance of the complement being "call-men" paid for service performed; other conditions as to organization being identical with those nominated for the first class.

Mr. Lemmon. "Larger half," is that just exactly the right way to put that? "Larger proportion of the men" would be better, would it not, or "a majority?"

Mr. Tanner. Does the "street pavements," "fire-alarm system" and "fire-patrol or salvage corps service" apply to all the seven divisions of your classification of cities or not?

Mr. Griswold. Yes, everywhere they have them they get credit for them.

Mr. Tanner. You have specified in your first and second-class cities, and why I am asking that question is that with us in first and second-class cities we require paved streets and an electric alarm system, while in others we do not; and I just wanted to know whether those three stipulations to which I have referred apply to all your classification or not. In your first class you say chief, officers, full paid companies and horses, but do you not stipulate whether the streets shall be paved, whether you shall have a salvage corps, or whether you shall have an alarm system.

Mr. Griswold. I would like to reply by saying this: that thus far and in what will follow in the way of a schedule or inspection blank from which a rate can be fixed, our idea is to nominate a standard first-class city, which must have its paved streets and its fire alarm and its salvage corps and all those conditions, and then we go down in the grade. When those things are not present we make a charge for their absence, on the same principle that you apply when you go into a building. When it has an open elevator or stairway you make an extra charge, while if they have conformed to the standard requirements for protection you give them the benefit of it. The idea is to provide, at the request of the National Board, a comprehensive method by which ratings of town fire defence and water supply may be reached, and the attempt has been made to secure that by nominating what would be absolutely a first class, thoroughly satisfactory condition, and dropping from that by such gradations as we find in general practice, and making–let me interpolate here that I was going to say making a charge; but this Committee is not empowered to make either a basis rate or a charge for the deficiencies, and therefore we don't do it, but we try to lay out something from which those who are charged with the duty of rating may make the rates all the way through from the basis here given.

Sec. Crosby. The same question had occurred to me that occurred to Mr. Tanner, I think, but I was then laboring under the misapprehension that this was a grading of cities, and I have found out it was not. These specifications are not a grading for first, second and third-class cities at all, but simply an arbitrary grading for public fire departments.

Mr. Tanner. The reason I asked the question was that they put street pavements, fire alarm systems and salvage corps in one condition, and then in rating a first-class city they only refer to the fire department service per se; and therefore it occurred to me that if you were going to have a standard for a city it would be much better and clearer, as you already have the other items in your standard, to have your gradations come down, leaving out the salvage corps, the fire alarm and the paved streets in your lower classifications, and keeping them in your higher classifications.

The President. The Committee may make a note of that, and it may be well to consider it before final action.

Mr. Henley. I should like to ask the Chairman of the Committee how many men will be required for a company, that is, for a first-class fire department. It says "chief, subordinate officers and full complement of men to each company;" how many men to a company?

Mr. Griswold. That, Mr. President, if you will permit me to say, is a disputed subject throughout the United States. We find here in Chicago it is a question of dispute– they claim they haven't men enough to a company; in New York they have twelve, in some other places they have six, and in other places eight. That is one of the conditions which will rest entirely, or should rest, in my judgment, entirely with the rating body. When they go to a town and make an inspection of its water supply, its fire department and its fire apparatus, if they are intelligent men, as most insurance men are as matter of course, they will say: With this area you have got to protect and with the apparatus you have here, you need so many men, and if you haven't got them you have a deficient supply of men. We cannot nominate, I do not believe that this Committee is in a position to nominate, how many men shall constitute the full complement of a company. Those things are like the water supply and like the number of hydrants you want; they depend altogether on the locality itself. There are some places where a small number of men will do very efficient work, and other places where it would take a much larger number of men. I do not think it is in our province and I do not think we could safely assume to nominate how many men would constitute the complement of a company. It seems to me it belongs entirely to the rating body, the body of supervision.

THIRD CLASS.– Engineers, stokers, drivers and tiller-men to be full paid and permanently housed in company quarters, the balance of the complement being volunteers. Other conditions as to organizations being identical with second class.

FOURTH CLASS.–Engineers and drivers only full paid and permanently housed at company quarters, balance of the complement being volunteers. Horses belonging to the department but used for other purposes during the day time when not on duty in fire service.

FIFTH CLASS.– Fully organized and officered volunteer service, under municipal control and with apparatus drawn by hired horses.

SIXTH CLASS.–Same as fifth class, but with apparatus drawn by manual power.

SEVENTH CLASS.–Volunteer service without regular organization, not under municipal control and with manually drawn apparatus.

EQUIPMENT.–Referring now to the apparatus and appliances serving to render the work of a fire department of value, it is evident that the proper utilization of a water supply for the purpose of fire extinguishment under any method or system of service depends primarily upon the presence and use of fire-hose; hence, whatever the method by which the water under pressure is to be served to the hose, there should always be such sufficient quantity of it kept in condition for instant service as to readily concentrate, at one time and at any one point of emergency, the full number of fire-streams nominated as essential for the protection of the locality or district involved.

Estimating on the basis of general practices well as upon the theory already presented, each fire-stream of the number required for full protection should have a complement of about 400 feet of standard 2[-]*1/2-inch rubber-lined hose always available for service, and in addition to this quantity the department should maintain a reserve supply equal to not less than 50 per cent of that in service, with proper means and apparatus for the safe and rapid transportation of both supplies to the scene of operation as an essential factor in any equipment. The class of device most highly recommended for use in carrying hose appears to be the wagon, and where this class of vehicle also carries a chemical tank and its appurtenances, its value for fire service is greatly enhanced and its presence in an equipment is to be commended.*

In any case where a town is credited with having fire protection, one or more hook and ladder apparatus should be provided as an essential part of the equipment, the number of such devices in the equipment being dependent upon the area of the territory under the protection of the department.

One or more serviceable steam fire engines should form a portion of the equipment for emergency use in all towns served by gravity flow or direct pressure water systems, the number of such devices necessary or desirable depending upon the size and character of the town and the nature of its water supply.

Mr. Lemmon. I should like to ask who is going to determine these matters in regard to the different towns.

Mr. Griswold. The different rating organizations having authority.

Mr. Lemmon. For each separate town?

Mr. Griswold. Yes.

Mr. Lemmon. Will that put them all on a par?

Mr. Griswold. I should like to interpolate here in relation to Mr. Lemmon's remarks that the whole idea underlying a standard as this is involved in the question of an absolute personal knowledge of the condition of each town's water supply and fire protection. That cannot be obtained from a map, but only from personal, careful, conscientious inspection, testing the fire department, putting on the streams necessary to put out a fire in certain places, and if they show they can do it you let them have the benefit of it; and the number of men there should be in a company, or the number of men in the [de]*partment, and all those things are questions for the intelligent men who make the inspection to determine.*

Mr. Lemmon. I simply made the suggestion I did in order to bring out the point that a uniform schedule could not be adopted by that means for rating or for arriving at the basis rate. A schedule cannot be made which will be uniform, for taking in any town and rating it.

The President. It will have to be met by the rating organization having jurisdiction, Mr. Lemmon; I don't see any other way out of it.

As in a measure making plain the above attempts at standardization, and forming at the same time an inspection blank upon which rate deficiency charges may be predicated, the following suggestions are submitted for consideration:

Name of Town. *County.* *State.*

Population.

System or method of water supply.

A.			*F. (4)*
B. (1)	*D. (2)*	*E. (3)*	*G. (5)*
C.			*H. (6)*

Ownership and control of water supply.

Location, construction, occupancy and exposure of Pumping Station.

Size and number of supply mains to distribution service.

Size of service mains in the distribution system.

Size of sub-mains to distribution system, if grid-ironed.

Location of "dead-ends" in congested or business districts.

Character, age and condition of underground service.

Number of localities or districts where congestion of values or of buildings call for concentration of fire streams.

Number of standard fire streams available for simultaneous use in each such locality or district.

Average pressure at hydrant or other inlet to hose under test, with total number of streams within the selected district under a full head of pressure, and flowing at the same time.

Average pressure at nozzle under same conditions.

Length, size and character of hose and nozzle used in tests.

Size of branch pipe from service main to hydrants.

Size of hydrant barrel; size and number of outlets to same.

Are they self-draining, frost-proof and of uniform thread at all outlets.

Distance between hydrants in congested districts; in residential and small or mixed retail districts.

Width of streets and class of roadway paving in business sections and congested districts.

Fire limits established and law enforced.

Building and inspection laws established and enforced.

Organized police force.

Number and class of steam fire engines[.]

Number and class of hand fire engines.

Number and class of chemical fire engines.

Number and class of hook and ladder trucks.

Number and class of combination chemical and hose wagons.

Number and character of hose wagons, carts or reels.

Size and character of hose in use.

Number of feet of standard hose in service.

Number of feet of serviceable hose in reserve[.]

Class and condition of fire alarm in service.

Organized fire patrol or salvage corps.

Fire department full paid and manned.

Part paid-part call men.

Part paid-part volunteers.

Volunteers under organization, and municipal control.

Volunteers not under organization, or municipal control.

Apparatus drawn by horse or manual power.

Horses owned and used for fire purposes only; leased or used for other purposes.

*Recalling the essence of the sentiment which prompted the request for the appointment of the Committee, which, inferentially at least, served to outline the scope of its work, it appears exigent to reiterate with some force the statement that no proper approximation of a solution of what shall constitute "a perfect equipment of waterworks service * * * * which shall be ot* [at] *once intelligible and comprehensive" can be had unless its foundation is based upon the knowledge gained through actual and practical tests of the water supply and the operation of such utilities as are provided to render it properly effective in case of emergency; the satisfactory elucidation of these conditions depending upon a proper and painstaking investigation of each of the details above enumerated as they may relate to the protection of any*

town or any of the selected districts in such town, singly or cumulatively, the prime motive being to assuredly know that the water supply is to be had in volume and in pressure to make it effective, and that those conditions are properly supplemented by such appliances and utilities as will render a promise of the best service in case of an emergency of fire.

In reaching conclusions as to the practical value of the results secured through the tests of volume and pressure above suggested, it is realized that where such tests are undertaken, the results are given more quickly and not with such absolute accuracy as might in all cases be desired for a scientific demonstration of the absolute conditions, but it is apparent that the determination of practical conditions of reliable service cannot be considered in such minute detail as might under other circumstances be deemed essentially necessary.

It does not appear to be within the province of this Committee to suggest an "initial-base-rate" nor to nominate the percentages of accretion to such rate as will produce the proper and justifiable "town-base-rate," these matters being entirely in the hands of the rating authorities having jurisdiction within the various districts.

The proper aggregation or arrangement of the standards as proposed to be used as a key to the ratings, is a matter of clerical detail which may be decided upon at the conference of the Committee soon to be held.

Mr. Lemmon. Mr. President, it seems to me that the matter covered by this report is one of very great importance. To my mind it practically eliminates or takes the place of the only standard that has been heretofore known or used for arriving at the basis rate or the initial rate for a city. The Universal Mercantile Schedule heretofore has prescribed what is supposed to be a standard city, and 25 cents as the basis rate. I do not wish to talk rate at all, but it seems to me this takes the place of that entirely and will supersede or alter that.

The President. This is a standard for grading town public fire protection. It is distinctly specified that the rating of cities is left out.

Mr. Lemmon. For the purpose of making an initial rate?

The President. For towns, and the size of such towns is limited to a certain population.

Mr. Lemmon. Does this not go any further than towns of that population?

The President. I think not; the intention is for the rating of towns. The demand for this action came from the Middle Department Association's application to the National Board to request the National Fire Protection Association to prepare standards for the grading of town public fire protection.

A Member. Limited to cities of 30,000 and less?

The President. Yes.

Mr. Lemmon. That is what I wanted to understand. Then it does not throw out the other at all?

The President. No; it does not supplant the Universal Schedule, it supplements it.

Mr. Palm. If a suggestion is now in order, I would say that it has occurred to me whether the question of over-head wires, such as trolley wires and telephone and telegraph wires might not be dealt with in a report of this kind. It seems to me that, taking into consideration the condition of the streets, the width and the paving, the question of over-head obstructions should also form a part of the report.

The President. The Committee, I think, did not consider that point at all.

Sec. Crosby. In discussing with Chairman Griswold and his Committee his report on this subject, I could not help but think many times of the difficulties generally met in the practical application to specific towns of any grading schedule. It seems to me the results are often most unsatisfactory, that the tendency is to give undue prominence to the fire department, and too little to the number of effective hose streams required.

In applying these schedules, it is frequently found that one of the factors may be 1st-class, another 4th-class, etc., and compromise gradings must result as the product of the man applying the schedule. Furthermore, these schedules do not seem to take into account the size or necessities of the town to be protected.

It has occurred to me that the standards which have been presented by this committee could be made use of somewhat in the following manner, which I will but roughly outline:

OBJECT.

To devise a system which shall when applied to the public protection of any town bring out a grading in simple terms, preferably, a per cent.

A NECESSARY/ FUNDAMENTAL PRINCIPLE.

To accept the specifications as of this Committee for what is considered fully satisfactory protection, but the quantity and quality of this Protection will naturally vary according to the nature of that which is to be protected. Hence, in each case in grading a specific town, we must estimate the demands of that particular town, and then the shortcomings of the Protection as found in said town. There are towns of 5,000 population where there is a congestion of values, hazards, and inflammable buildings, requiring a comparatively large amount of Protection in order to allow fair promise of Control, while there are cities of 25,000 population with no menace from congested or manufacturing districts; perhaps suburban residential communities, which would not require so great a quantity of Protection. Therefore, it is not feasible to specify the Protection altogether along the lines of population.

THE TOWN TO BE PROTECTED.

Let us divide our towns–which hereafter we will call the Subject–into five grades, namely, Municipalities, Cities, Towns, Villages, and Hamlets, and consider that we need not concern ourselves with the two extremes, because the Municipalities are few and require special provision, and the Hamlets are without any serious Protection and do not deserve consideration from a fire protection engineering view point. While, as above pointed out, we cannot be guided strictly by population, let us accept it as a rough guide to the above division, a Village being of, we will say, 5,000 or less centralized population a Town of from 5,000 to 20,000 centralized population, and a City of from 20,000 up. When our inspector– using these standards and applying our grading–visits a certain subject, he determines within which one of these classes it falls. He would then determine as to whether it was (as regards need of Protection) of average, above average, or sub-average as a Village, Town or City. If it was above average, it would be because it was favorably regarded in a number or all of the following particulars: Notably good construction, width and pavement of streets, freedom from conflagration conditions due to open spaces or barriers, such as fire-proof or sprinklered risks and blank walls, freedom from conflagration breeders menacing all or large portions of the Town, freedom from notably congested districts, from inaccessible water fronts, or from dangerous winds. The sub-average V. T. or C. (Village, Town or City) would be notably dangerous in some or all of the features above mentioned. Therefore, having analized our Subject, we have found it to be a V. T. or C. average, sub-average, or super-average.

SUB-DIVISION OF THE TOWN TO BE PROTECTED.

The Subject might have the following districts, one or more of each: Mercantile, warehouse, manufacturing, water-front, lumber or dwelling. Inspector would note how many of such districts existed.

PROTECTION REQUIRED FOR THE SEVERAL DISTRICTS OF TOWN.

The next step of the inspector is to determine number of standard hose streams which he would consider requisite in each of the above mentioned districts in order to grade said district as having full credit Protection. This would have to be arbitrarily determined, but, with a great many such Subjects continually passing before a corps of inspectors, a fairly uniform opinion could be brought about. In the first place, we would have to determine upon a standard hose stream, both as regards amount of water flowing per minute, and minimum pressure at which it should flow. My thought is that we could have two standards–a 200-gallon stream being ample for dwelling house districts, while a 250-gallon stream would be required for heavier work. A minimum water flowing pressure of 40 lbs. might be adequate for the former district, while 75 lbs. water flowing pressure might be required for the other districts. If the water system was capable of giving us both quantity and pressure required, that would be sufficient. If, however, steamers were necessary, we would consider the streams available from the combined water supply and steamer service. It is quite time that we should measure our town public Protection in satisfactory hose stream units and find out from actual tests how many units of this Protection actually exist.

WATER -FLOWING TESTS.

Inspector would then in each one of these districts make water flowing tests to determine whether the existing Protection would meet these requirements, and if not, the amount it fell short. These actual tests should be required in order to get full credit, and, such being the case, co-operation of the town might be expected.

MAINTENANCE.

The inspector would need to ascertain how conditions during the year varied from those at time of his test. Departure from continuous service, day and night, summer and winter, year by year, should be ascertained and discounted. He would also take up the question of pipe scheme and note conditions likely to cause interruption of service. Next, he would make inspection covering hydrants, hose, apparatus, men and fire alarm system, and make accounting of any condition not sufficiently ample to make use of all the water supply available.

FINAL RESULTS.

A grading worked out along these lines would start out in a specified district with a percentage representing the shortcomings of the hose stream facilities as shown by actual test, and this percentage would be still further reduced by the various factors much in the order given, leaving a final result which would be the grading of the district.

I wish to place these thoughts before you. They are not matured, but I have a strong feeling that the practical grading of Town Protection should be taken up somewhat along these lines. In reality, a Town is nothing more than one great big risk. In devising Protection for a large mill, we study the Subject to be protected, and our mantle of Protection is cut and fitted according to the size and demands of the particular hazard. We then make careful tests after the installation is completed. If all this time and attention is practical for a single property, it is surely entirely feasible where the large values and the many built up blocks of a town are concerned, and I would particularly point out the urgent need of these water flowing tests at every opportunity available, especially before granting any credits for increased public Protection.

The President. Gentlemen, you have heard the report of the Committee, what is your pleasure?

Mr. Cabot. I move that it be referred to the incoming Executive Committee with power.

The President. And I take it you mean together with Mr. Crosby's paper.

Mr. Cabot. Yes.

Adopted.

The President. Mr. Wilmerding has been called by a telegram to New York, and I have named Mr. Hess to take his place on the Nominating Committee.

Noon recess."

The series of "Great Fires" which visited a number of major cities in North America in the last three decades of the 19th Century caused havoc in the fire insurance industry and needed to be addressed. One solution to the problem proposed was the concept of "grading" a town's public fire protection and using this "grading" as a basis for the insurance premium charged.

As noted above, the National Board of Fire Underwriters (NBFU) assigned the task of developing a "town grading" system to the National Fire Protection Association. While the proposed system outlined above is only an initial proposal for a "town grading" system, the above transcript reflects the "state-of-the-art" in public fire protection in towns across the United States in the early years of the 20th Century, *i.e.* horse-drawn fire engines with steam-powered pumps and unpaved roadways.

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Source: "*Proceedings of the Seventh Annual* [NFPA] *Meeting*", Chicago, Illinois, 1903.