HB 648 cont.,
1148

48,500 square feet of ordinary construction, and a total area of 70,400 square feet with 31% being of wood frame construction and 69% being of ordinary construction. Under the one-story column in the wood frame construction table (C = 1.5), an area of 70,400 square feet has a corresponding fire flow of 7250 gpm. Similarly, under the one-story column in the ordinary construction table (C = 1.0), an area of 70,400 square feet has a corresponding fire flow of 4750 gpm. In this case, the fire flow will be 31% (7250) + 69% (4750) = 2250 + 5530 gpm or, to the nearest 250 gpm, = 5500 gpm.

d. Given: A 2-story building of ordinary construction of 105,000 square feet (ground area) communicates with a 1-story building of noncombustible construction of 80,000 square feet (ground area). Normally the required fire flow would be determined by proportioning as in "c" above. This would result in a required fire flow of 7460 gpm, or 7500 gpm. However, it is to be noted that the total area of the 2-story building alone results in a fire flow of 8,000 gpm and, of course, the logical answer would be 8,000 gpm. Any time the total area results in the use of an upper limit for fire flow, the possibility of a portion of the fire area justifying the upper limit must be investigated.

e. Given: A normal 1-story building of ordinary construction of 210,000 square feet (ground area). The table gives a required fire flow of 8,000 gpm, however, since this is a normal 1-story building, the maximum fire flow is 6,000 gpm.

f. Given: A normal 1-story building of ordinary construction of 80,000 square feet communicates with a normal 1-story building of noncombustible construction of 85,000 square feet. Normally the required fire flow would be determined by proportioning as in "c" above. This would result in a required fire flow of 6480 gpm, or 6500 gpm. However, since these are normal 1-story buildings the maximum fire flow is 6,000 gpm.

Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June 1972.

APPENDIX

NFPA No. 13-1971, Paragraph 1311. Light Hazard Occupancies:

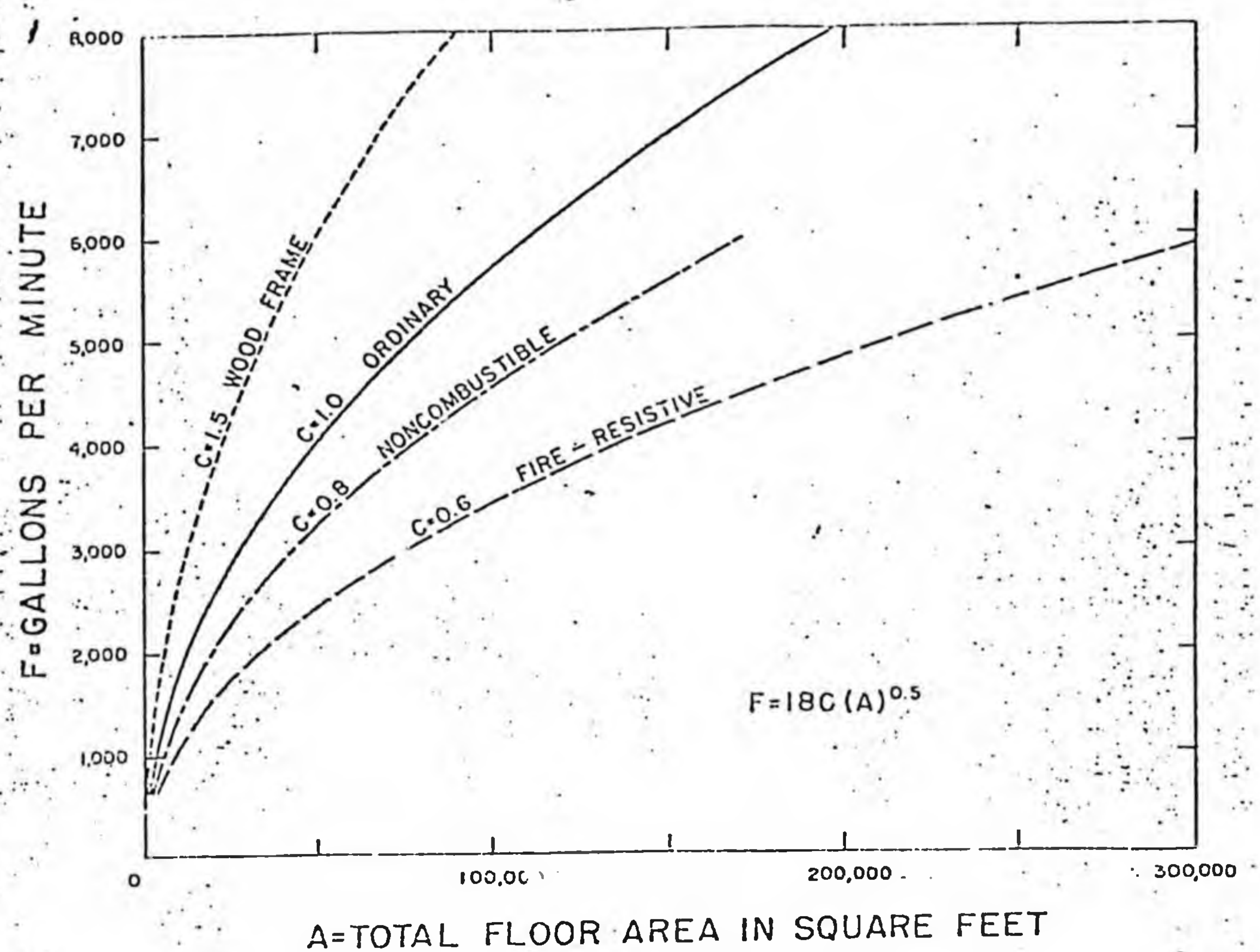
- Apartments
- Asylums
- Churches
- Clubs
- Colleges & Universities
- Dormitories
- Dwellings
- Hospitals
- Hotels
- Institutions
- Libraries, except Large Stack Room Areas
- Museums
- Nursing, Convalescent & Care Homes
- Office Buildings
- Prisons
- Public Buildings
- Rooming Houses
- Schools
- Tenements

NFPA No. 13-1971, Paragraph 1331. Extra Hazard Occupancies:

- Aircraft Hangers
- Chemical Works - Extra hazard
- Cotton Picker and Opening Operations
- Explosives and Pyrotechnics Manufacturing
- High Piled Combustible Storage in excess of 21 feet high
- Linoleum and Oilcloth Manufacturing
- Linseed Oil Mills
- Oil Refineries
- Paint Shops
- Pyroxylin Plastic Manufacturing & Processing
- Shade Cloth Manufacturing
- Solvent Extracting
- Varnish Works

and other occupancies involving processing, mixing, storage and dispensing flamable and/or combustible liquids.

Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June 1972.



Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June 1972.

C=1.5

INSURANCE SERVICES OFFICE

FIRE FLOW VS GROUND AREA

Wood Frame Construction

(ground area in square feet)

$F=18C(A)^{0.5}$

F=gpm; C=1.5

A=area in sq. ft.

gpm	1	2	3	4	5	6 Stories
500	500	300	200	100	100	100
750	1,100	600	400	300	200	200
1000	1,700	900	600	400	300	300
1250	2,600	1,300	900	700	500	400
1500	3,600	1,800	1,200	900	700	600
1750	4,800	2,400	1,600	1,200	1,000	800
2000	6,200	3,100	2,100	1,600	1,200	1,000
2250	7,700	3,900	2,600	1,900	1,500	1,300
2500	9,400	4,700	3,100	2,400	1,900	1,600
2750	11,300	5,700	3,800	2,800	2,300	1,900
3000	13,400	6,700	4,500	3,400	2,700	2,200
3250	15,600	7,800	5,200	3,900	3,100	2,600
3500	18,000	9,000	6,000	4,500	3,600	3,000
3750	20,600	10,300	6,900	5,200	4,100	3,400
4000	23,300	11,700	7,800	5,800	4,700	3,900
4250	26,300	13,200	8,800	6,600	5,300	4,400
4500	[illegible]	14,700	9,800	7,300	5,900	4,900
4750	32,600	16,300	10,900	8,200	6,500	5,400
5000	36,000	18,000	12,000	9,000	7,200	6,000
5250	39,600	19,800	13,200	9,900	7,900	6,600
5500	43,400	21,700	14,500	10,900	8,700	7,200
5750	47,400	23,700	15,800	11,900	9,500	7,900
6000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

WOOD FRAME

C=1.5

INSURANCE SERVICES OFFICE

FIRE FLOW VS GROUND AREA

Wood Frame Construction

(ground area in square feet)

$F=18C(A)^{0.5}$

F=gpm; C=1.5

A=area in sq. ft.

gpm	1	2	3	4	5	6 Stories
6000	51,500	25,800	17,200	12,900	10,300	8,600
6250	55,700	27,900	18,600	13,900	11,100	9,300
6500	60,200	30,100	20,100	15,100	12,000	10,000
6750	64,800	32,400	21,600	16,200	13,000	10,800
7000	69,600	34,800	23,200	17,400	13,900	11,600
7250	74,600	37,300	24,900	18,700	14,900	12,400
7500	79,800	39,900	26,600	20,000	16,000	13,300
7750	85,100	42,600	28,400	21,300	17,000	14,200
8000						

Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June 1972

INSURANCE SERVICES OFFICE

C=1.0

FIRE FLOW VS GROUND AREA
Ordinary Construction
(ground area in square feet)

$F = 18C(A)^{0.5}$
F=gpm; C=1.0
A=area in sq. ft.

gpm	1	2	3	4	5	6 Stories
500						
	1,200	600	400	300	200	200
750						
	2,400	1,200	800	600	500	400
1000						
	3,900	2,000	1,300	1,000	800	700
1250						
	5,800	2,900	1,900	1,500	1,200	1,000
1500						
	8,200	4,100	2,700	2,100	1,600	1,400
1750						
	10,900	5,500	3,600	2,700	2,200	1,800
2000						
	13,900	7,000	4,600	3,500	2,800	2,300
2250						
	17,400	8,700	5,800	4,400	3,500	2,900
2500						
	21,300	10,700	7,100	5,300	4,300	3,600
2750						
	25,500	12,800	8,500	6,400	5,100	4,300
3000						
	30,100	15,100	10,000	7,500	6,000	5,000
3250						
	35,200	17,600	11,700	8,800	7,000	5,900
3500						
	40,600	20,300	13,500	10,200	8,100	6,800
3750						
	46,400	23,200	15,500	11,600	9,300	7,700
4000						
	52,500	26,300	17,500	13,100	10,500	8,800
4250						
	59,100	29,600	19,700	14,800	11,800	9,900
4500						
	66,000	33,000	22,000	16,500	13,200	11,000
4750						
	73,300	36,700	24,400	18,300	14,700	12,200
5000						
	81,100	40,600	27,000	20,300	16,200	13,500
5250						
	89,200	44,600	29,700	22,300	17,800	14,900
5500						
	97,700	48,900	32,600	24,400	19,500	16,300
5750						
	106,500	53,300	35,500	26,600	21,300	17,800
6000						

ORDINARY

INSURANCE SERVICES OFFICE

C=1.0

FIRE FLOW VS GROUND AREA
Ordinary Construction
(ground area in square feet)

$F = 18C(A)^{0.5}$
F=gpm C=1.0
A=area in sq. ft.

gpm	1	2	3	4	5	6 Stor
6000						
	115,800	57,900	38,600	28,900	23,200	19,300
6250						
	125,500	62,800	41,800	31,400	25,100	20,900
6500						
	135,500	67,800	45,200	33,900	27,100	22,600
6750						
	145,800	72,900	48,600	36,500	29,200	24,300
7000						
	156,700	78,400	52,200	39,200	31,300	26,100
7250						
	167,900	84,000	56,000	42,000	33,600	28,000
7500						
	179,400	89,700	59,800	44,900	35,900	29,900
7750						
	191,400	95,700	63,800	47,900	38,300	31,900
8000						

Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June 1972

INSURANCE SERVICES OFFICE

C=0.8

FIRE FLOW VS GROUND AREA
Non-combustible Construction
(ground area in square feet)

$F=18C(A)^{0.5}$
F=gpm; C=0.8
A=area in sq. ft.

NONCOMBUSTIBLE

gpm	1	2	3	4	5	6 Stories
500	1,900	1,000	600	500	400	300
750	3,700	1,900	1,200	900	700	600
1000	6,100	3,100	2,000	1,500	1,200	1,000
1250	9,100	4,600	3,000	2,300	1,800	1,500
1500	12,700	6,400	4,200	3,200	2,500	2,100
1750	17,000	8,500	5,700	4,100	3,400	2,800
2000	21,800	10,900	7,300	5,500	4,400	3,600
2250	27,200	13,600	9,100	6,800	5,400	4,500
2500	33,200	16,600	11,100	8,300	6,600	5,500
2750	39,700	19,900	13,200	9,900	7,900	6,600
3000	47,100	23,600	15,700	11,800	9,400	7,900
3250	54,900	27,500	18,300	13,700	11,000	9,200
3500	63,400	31,700	21,100	15,900	12,700	10,600
3750	72,400	36,200	24,100	18,100	14,500	12,100
4000	82,100	41,200	27,400	20,500	16,400	[illegible]
4250	92,400	46,200	30,800	23,100	18,500	15,400
4500	103,100	51,600	34,400	25,800	20,600	17,200
4750	114,600	57,300	38,200	28,700	22,900	19,100
5000	126,700	63,400	42,200	31,700	25,300	21,100
5250	139,400	69,700	46,500	34,900	27,900	23,200
5500	152,600	76,300	50,900	38,200	30,500	25,400
5750	166,500	83,300	55,500	41,600	33,300	27,800
6000						

INSURANCE SERVICES OFFICE

C=0.8

FIRE-FLOW VS GROUND AREA
Fire Resistive Construction
(ground area in square feet)

$F=18C(A)^{0.5}$
F=gpm; C=0.8
A=area in sq. ft.

FIRE-RESISTIVE

gpm	1	2	3	4	5	6 Stories
500	3,300	1,700	1,100	800	700	600
750	6,600	3,300	2,200	1,700	1,300	1,100
1000	10,900	5,500	3,600	2,700	2,200	1,800
1250	16,200	8,100	5,400	4,100	3,200	2,700
1500	22,700	11,400	7,600	5,700	4,500	3,800
1750	30,200	15,100	10,100	7,600	6,000	5,000
2000	38,700	19,400	12,900	9,700	7,700	6,500
2250	48,300	24,200	16,100	12,100	9,700	8,100
2500	59,000	29,500	19,700	14,800	11,800	9,800
2750	70,900	35,500	23,600	17,700	14,200	11,800
3000	83,700	41,900	27,900	20,900	16,800	13,900
3250	97,700	48,900	32,600	24,400	19,500	16,300
3500	112,700	56,400	37,600	28,200	22,500	18,800
3750	128,700	64,400	42,900	32,200	25,700	21,500
4000	145,900	73,000	48,600	36,500	29,200	24,300
4250	164,200	82,100	54,700	41,100	32,800	27,400
4500	183,400	91,700	61,100	45,900	36,700	30,600
4750	203,700	101,900	67,900	50,900	40,700	34,000
5000	225,200	112,600	75,100	56,300	45,000	37,600
5250	247,700	123,900	82,600	61,900	49,500	41,300
5500	271,200	135,600	90,400	67,800	54,200	45,200
5750	295,900	148,000	98,600	74,000	59,200	49,300
6000						

Source: Insurance Services Office, Guide for Determination of Required Fire Flow, New York, June, 1972

B. Insurance Grading Schedule

The "Grading Schedule for Municipal Fire Protection"[2] is published and copyrighted by the Insurance Services Office.* The schedule provides a yardstick for ISO insurance grading engineers in classifying municipalities with reference to their fire defenses and physical conditions. Gradings obtained under the schedule are used throughout the United States in establishing base rates for fire insurance purposes. A similar schedule is used in Canada by the Insurers' Advisory Organization to evaluate municipal fire defenses in that country.

The Insurance Grading Schedule originally was developed by the National Board of Fire Underwriters and was continued by its successor, the American Insurance Association, prior to the organization of ISO. It has had a profound influence upon the level of municipal fire protection provided in many communities. While ISO never assumes to dictate the level of fire protection services provided by a municipality, reports of surveys made by its Municipal Survey Office generally do contain recommendations for correcting any serious deficiencies found, and over the years have been accepted as guides by many municipal officials in planning improvements in their services. It is generally appreciated that removal of deficiencies can result in a more favorable fire insurance classification which has certain economic rewards as well as a general satisfaction that the community is providing its citizens with an improved level of service, or is holding a favorable classification where already obtained. While from time to time communities may want to employ independent consultants to evaluate their fire departments, water supplies, and building regulations, the fact is that over the past sixty odd years underwriters' surveys have provided a uniform measurement of municipal fire defenses involving many millions of dollars of engineering time and talent at no cost to the local communities which may choose to follow the recommendations. It has been observed, for example, that American communities enjoy the most adequate and reliable water systems in the world. This has been due in large measure to the engineering evaluations and recommendations of underwriter survey teams.

The Municipal Grading Schedule is subject to change with the state of the art and references in this text are to the 1974 edition. With the organization of ISO, application of the Grading Schedule has tended to be more uniform throughout the country. Under NBFU and AIA the larger communities, generally those over 40,000 population, were surveyed directly by teams of engineers from the national organization while smaller communities generally were graded by state or regional rating associations some of which used their own systems of grading municipal fire defenses. Most of the latter now have been consolidated into regional ISO offices insofar as municipal surveys are concerned although state associations have essential functions in filing rates and performing other duties as may be required by law.

The Grading Schedule is based upon a deficiency point system with a possible 5,000 points of deficiency representing a community totally unprotected against fire. The 5,000

* Available from Insurance Services Office, 160 Water St., New York, N.Y. 10038.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 9-77 through 9-80 14th edition 1976

Table 9-6B. Relative Class as Determined by Points of Deficiency

Points of Deficiency	Relative Class of Municipality
0– 500	First
501–1,000	Second
1,001–1,500	Third
1,501–2,000	Fourth
2,001–2,500	Fifth
2,501–3,000	Sixth
3,001–3,500	Seventh
3,501–4,000	Eighth
4,001–4,500	Ninth*
More than 4,500	Tenth*

* A ninth class municipality is one (a) receiving 4,001 to 4,500 points of deficiency or (b) receiving less than 4,001 points but having no recognized water supply.

* A tenth class municipality is one (a) receiving more than 4,500 points of deficiency, or (b) without a recognized water supply and having a fire department grading over 1/55 points, or (c) with a water supply and no fire department, or (d) with no fire protection.

points are divided into 10 classes, and every 500 points eliminated places the community in a more favorable class. Table 9-6B shows the relative class as determined by points of deficiency. However, a ninth class municipality may be one receiving 4,001 to 4,500 points of deficiency, or receiving less than 4,001 points but having no recognized water supply. A tenth class municipality may be one receiving over 4,500 points of deficiency, or without a recognized water supply, or with a water supply but no fire department, or without a water supply with a fire department grading over 1,755 points, or no fire protection at all. In many rural areas there are subclasses of Class 9 recognizing the value of properly organized and equipped rural fire departments serving communities without a recognized water supply. Such fire departments are required to have stipulated water tanker capacity as well as pumping engines.

The 5,000 possible deficiency points are divided between 4 main subject areas or features. Water supply and fire department each account for a possible 1,950 points, or 39 percent. Fire service communications account for another 450 points, or 9 percent. Fire safety control, including fire prevention and building regulations, counts for 650 points, or 13 percent. Where there is a divergence of more than 500 points between water supply and the fire department, additional deficiency points may be assessed on the grounds that a good water supply requires an adequate fire department to apply it in fire fighting, and a good fire department without an adequate water supply is less effective. If either of these essentials is lacking, up to 900 additional deficiency points may be charged.

Water Supply

It is important to understand that a principal basis for the Grading Schedule's evaluation of fire protection is the ability to provide needed "fire flow" of water measured in gpm. In years past schedule requirements were based largely upon population protected which, while having some validity, was not entirely equitable because some of the smaller communities may contain properties with serious fire potentials that could require large flows of water, whereas a larger community might not require as much water to control its fires. An example might be a very large unsprinklered shopping complex in a suburban residential community. In both water supply and fire department service, reliability factors get considerable attention in the schedule.

Required fire flow is the rate of flow needed for fire fighting to confine a major fire to the buildings within a block or group. The determination of this flow depends upon construction, occupancy, size of buildings, and exposure hazards. Required flow is determined for each section of a municipality and may vary from a minimum of 500 gpm to a maximum of 12,000 gpm for a single fire. Where consideration must be given to simultaneous fires, an additional 2,000 to 8,000 gpm is required. Actual flow tests are made in each section of the municipality and the results obtained are compared with the flow required in each neighborhood to deal with the hazards found.

For purposes of grading under the standard, a "basic fire flow" is used which is indicative of the quantities of water needed for handling fires in important districts. Among the items considered under water supply are: adequacy of supply works; reliability of source of supply; reliability of pumping capacity and of power supply; the condition, arrangement, operation, and reliability of system components; adequacy and reliability of mains and their installation; arrangement of the distribution system; distribution of hydrants and their size, type, installation, and condition; and various miscellaneous factors.

A minimum recognized water supply for grading purposes must be able to deliver at least 250 gpm for 2 hours, or 500 gpm for 1 hour for fire protection plus consumption of water at the maximum daily rate. Any water supply which cannot meet this requirement is not graded, and the full 1,950 deficiency points are assigned.

Fire Department

Items considered under the fire department include: pumpers, ladder trucks, distribution of companies and types of apparatus, pumper capacity, design and condition of apparatus, number of officers, manning, master and special stream devices, equipment for pumpers and ladder trucks (including elevating platforms), hose and its condition, training, response to alarms, fire operations, special protection such as fireboats, and miscellaneous factors.

A minimum recognized fire department under the schedule must have a permanent organization under applicable state and local laws, and be headed by one person responsible for the operation of the department. There must be sufficient membership to provide a response of at least 4 members to alarms, with training conducted for all active members. There must be at least one piece of suitable fire apparatus with housing and maintenance for the apparatus. Means must be provided for 24-hr receipt of alarms and immediate notification of members. Any fire department that cannot meet these requirements is not graded, and a full 1,950 deficiency points are assigned.

Under the schedule the number of engine and ladder companies must be at least equal to the number required for the basic fire flow. Engine and ladder companies must be located so that travel distances for first due, for first alarm companies, and for the maximum number of companies needed to apply required fire flows meet recommended travel distances. Structural conditions and hazards in the municipality may call for more companies than needed to apply basic fire flow. The probability of simultaneous fires, the number and extent of runs, and the need for placing additional companies in service or for relocating companies during periods of high frequency of alarms are factors considered. Consideration is given to providing protection for all areas during multiple alarms and simultaneous fires.

Where the required fire flow is 4,500 gpm or less, response

Source: National Fire Protection Association; Fire Protection Handbook, pp.9-77 through 9-80 14th edition 1976 distance for the first due engine company must be not over 1½ miles, except that it may be 2 miles in residential districts of 1- and 2-family dwellings not requiring over 2,000 gpm fire flow, and 4 miles where such dwellings have an average separation of 100 ft or more. For flows of from 5,000 to 8,500 gpm inclusive, the first due engine should be within 1 mile, and for flows of 9,000 gpm or more the distance is ¾ mile.

The first due ladder company should be within 2 miles for flows of 4,500 gpm or less, but may be 3 miles for residential districts of 1- and 2-family dwellings and 4 miles where such dwellings have an average separation of 100 ft or more. Where there are less than 5 buildings of a height equal to 3 or more stories, a ladder company may not be required. Where required fire flow is from 5,000 to 8,500 gpm, the first due response distance for ladder trucks is reduced to 1½ miles, and where the required flow is 9,000 gpm or more the first due ladder should be within 1 mile.

Standard first alarm response is 2 engines and 1 ladder company for flows not exceeding 8,500 gpm, except that for flows of less than 2,000 gpm only one engine may be required, and ladder coverage may not be required for flows of 3,500 gpm or less if there are less than 5 buildings of a height requiring such service.

For flows of 9,000 gpm and above, the first alarm response should be 3 engines and 2 ladders. Response distances for the second due engine should be within 4 miles with fire flows of under 2,000 gpm, within 2½ miles for fire flows of from 2,000 to 4,500 gpm, 2 miles for flows from 5,000 to 6,500 gpm, and 1½ miles for flows between 7,000 and 8,500 gpm. Where 3 engines are required, these should be within 1½ miles. Where 2 ladders are required on first alarms, these should be within 2 miles.

Maximum multiple alarm response and response distances also are specified for the various fire flows. In general, one engine company is required for each 1,000 gpm fire flow through 7,000 gpm. At higher flows, additional engine companies are required up to 15 for 12,000 gpm. Maximum multiple alarm response distances for engines vary from 3 miles for 3 engines to 5 miles for 15 engines. In general, the response on each multiple alarm should duplicate the first alarm response.

A second ladder company within 2½ miles is required for multiple alarms with fire flows of 5,000 to 6,500 gpm, a third ladder company should be within 3½ miles for flows of 7,000 to 8,500 gpm, and on up to 7 ladders within 5 miles for 12,000 gpm.

It should be appreciated that these response requirements are a rather conservative minimum standard. Many fire departments will exceed these because pre-fire planning indicates need for additional companies because of life hazard or in order to run hand lines to control fires inside of buildings rather than application of maximum fire flow to merely confine fires as envisioned under the schedule. Levels of manpower on responding companies often influence the number of companies assigned to respond to various alarms. The basic purpose of the Grading Schedule is to confine fires to groups of buildings involved to avoid conflagrations, and it does not demand the same level of service that many communities choose to provide.

Under the schedule there should be at least one reserve pumper for every 8 pumpers or major fraction in service, but not less than one. This is essential to permit proper maintenance. Fully equipped reserve pumpers manned by designated off-shift or volunteer members are considered as increasing the pumpers in service and may equal up to one in-service pumper if manned on first alarms, and ½ an in-service pumper if manned on specified multiple alarms; however, credit cannot exceed ⅓ of the required number of pumpers. Where the requirements for manning reserve pumpers have not been met, equipped reserve pumpers may be credited the same as outside aid.

Pumpers responding on automatic mutual aid within 5 miles of the municipal limits may be credited not to exceed ⅓ of the pumpers required. This credit requires a detailed mutual aid system with scheduled assignments and proper training and communications. Credit allowed may not reduce the point charge by more than 75 percent, except that where there is a central communications center dispatching all companies the reduction may be up to 90 percent. Consideration also is given to outside aid available within 15 miles, and depending upon various factors deficiencies may be reduced by not more than 33 percent for such available response. Similar credits are allowed for response of ladder companies responding on scheduled mutual aid and outside aid, and for reserve ladders manned by off-shift personnel. However, deficiencies charged for an inadequate number of ladder trucks is only half that for pumpers.

Pumping capacity must be not less than the basic fire flow, and additional capacity may be needed. From the response assignments in the schedule it appears that 1,000 gpm pumpers are assumed to be standard, although credit is given for smaller capacity pumps and also for available pumps on other apparatus. Where simultaneous fires are likely, the pumper capacity must not be less than the total flow requirements for the simultaneous fires. Pumper capacity is taken as that demonstrated by test and not merely that specified in purchasing contracts. In the absence of proper test data, the credit for pumper capacity may be reduced.

Fire Department Officers

There must be a chief officer in charge of the department. For more than 2 companies there must also be an assistant or other officer above company rank who is in charge in the absence of the chief. For over 8 companies there must be sufficient battalion or district fire chiefs to provide one on duty for each 8 companies or major fraction thereof. For less than 12 companies the assistant chief may serve as a battalion or district chief. The preceding is a very conservative requirement. Many fire departments provide a district fire chief on duty for each 5 or 6 companies in order to give prompt supervision of fire companies at fires and to cover simultaneous alarms. Most fire departments with 5 or more companies provide a chief officer on each duty shift, although not required under the schedule.

There must be a company officer on duty at all times with each required engine, hose, or ladder company. The company officers are credited in the company strength. Two call or volunteer officers are considered equivalent to one full paid officer, up to ½ the number of paid officers required.

Manning Standards

Standard manning is 6 men on duty for each required engine and ladder company, including the officer and 5 men for hose companies where pumps are not required. Where companies operate special apparatus, additional manning may be needed. Years ago from 5 to 7 men were considered standard manning, depending upon the type of company and the hazards of the district served. Today with the greater mobility of radio-equipped apparatus and the fact that serious hazards are found in all parts of the community and not just in a central district, a uniform manning is considered desirable. The 6-man standard level of com-

Source: National Fire Protection Association; Fire Protection Handbook, pp. 9-77 through 9-80 14th edition 1976

pany manning is a practical requirement based upon the work that must be done by engine and ladder companies. Where fewer men are provided, it is often necessary to obtain additional manpower from other companies.

While the standard calls for a 6-man level of company manning, credit is given for chiefs' aides who participate in fire fighting. Credit also is given for manpower responding on other units, such as rescue squads and fire department ambulance crews, to the extent that these assist in fire fighting, but not to exceed credit of one man per company. Credit is given also for the regular response of off-duty or volunteer fire fighters. In the schedule, 3 off-duty or volunteer members are counted as equal to one paid man on duty, up to ½ of the required on-duty strength. Thus a fire company with 3 men on duty and 9 off-duty or volunteer members assigned to respond can be counted as a full 6-man crew. However, records of such off-duty response must be kept for both day and night alarms to substantiate the actual value of such manning. If proper records are not kept, call or volunteer response may be taken on the basis of 6 men on call equaling one on duty. In many small fire departments, small outside fires may be handled by the paid men on duty on still alarms without call assistance, but full standard response should be made immediately to all alarms for structural fires and other alarms that present a hazard to life and property.

Under the schedule a fully volunteer or call department with no paid men on duty ready to immediately answer alarms but with good call response would be charged 40 points of deficiency, as compared with an identical fire department having standard 6-man fire companies on duty or the equivalent under the schedule. This amounts to only 80 percent of all the possible deficiency points in a municipal grading. This would appear to be a small deficiency as compared with the advantage of immediate response by on-duty fire companies. If the volunteer or call department has paid apparatus operators on duty, the deficiency might be only 20 points out of 5,000 in the grading, all other things being equal.

Manpower responding on automatic mutual aid is credited up to ½ of the required strength, but may not reduce the point charge by more than 75 percent or 90 percent as may be applicable. Credit also is given for outside aid, but may not reduce the point charge remaining after automatic aid and off-shift response credit has been applied by more than 33 percent. Credit also is given for off-shift response based upon past experience when called.

Deficiency charges are determined by comparing the total required manning of the fire companies being graded with the on-duty strength of these companies as determined by the schedule. Any deficiency divided by the number of companies equals the average deficiency per company. An average deficiency per company of one man results in only 10 points, two men 20 points, three men 40 points, four men 80 points, and five men 160 points. Thus, a fire department that maintains 5 men on each required engine and ladder company assisted by rescue squads, ambulance crews, and chiefs' aides may not be considered deficient in manpower under the standard. Likewise, a fire department that has an average on-duty manning of 3 men per required company plus response of off-duty or call men may not be considered deficient if the record of response is satisfactory. Thus, the manpower requirements are flexible and reasonable. Places that should expect poor grading on manpower are those with 2- and 3-man engine companies and 1- or 2-man ladder companies without satisfactory arrangements for prompt response of off-shift members or other men on call and without well-scheduled automatic mutual aid. Such departments obviously are too badly undermanned to effectively apply required fire flow when serious fires occur. On the other hand, a small community requiring 2 engines and a ladder and having 6 paid men on duty supplemented by good off-shift and call response plus automatic mutual aid may have a minimum deficiency charge for manning.

Fire Service Communications

As fire service communications are an essential element in the fire defenses of any community, the Grading Schedule evaluates the following: the communications center; the communications center equipment and current supply; fire alarm boxes; alarm circuits and facilities including current supply at fire stations; material, construction, condition, and protection of circuits; fire department radio; fire department telephone service; conditions adversely affecting use and operations of facilities; fire alarm operators; and the handling of alarms. While alarm boxes are not required in residential districts, a credit of up to 20 points is given for such boxes depending upon coverage.

Determination of deficiencies under the various communications items are based upon the degree of compliance with the intent of applicable provisions of NFPA No. 73, Standard for Public Fire Service Communications. This Standard is discussed in further detail in Chapter 3 of this Section of the HANDBOOK.

Some persons in the fire service have often felt that the Grading Schedule placed undue emphasis on water supply at the expense of the fire department. In earlier editions of the schedule this may, to some extent, have been true. However, in recent editions items under fire department control including fire service communications and control of hazards amount to up to 58.5 percent of the 5,000 possible deficiency points. The one area in which water supply still has an advantage over the fire department service is the requirement that without a recognized water system, no community can have a classification better than Class 9. Hundreds of fire departments serving areas without water systems are organized to exceed the minimum requirements for fire flow from water systems by using fleets of tankers, and by the use of large diameter water supply hose supplied from pumpers at suction sources prepared and maintained by the fire department. With the water supply equipment responding with the attack pumpers, no delay is involved. Many rural fire departments believe that their ability to apply required fire flow should be recognized because it has proven successful in the control of major fires, including fires in communities recognized as having inadequate water supplies.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 9-77 through 9-80 14th edition 1976

PART IV

INSURANCE STATISTICS AND INFORMATION CONCERNING SPRINKLERS AND FIRE PROTECTION

INSURANCE SAVINGS CAUSED BY AUTOMATIC SPRINKLERS

Installation of automatic sprinklers reduce fire insurance premiums by an approximate average of seventy-five percent (75%) when they are installed in a building. The insurance savings will vary from this percentage by:

1. Type of construction;
2. Occupancy hazard class;
3. Quality of construction (combustible to fire resistive); and,
4. Quality of sprinkler equipment installation

In a building of fire-resistant construction, the insurance premium reduction is less since the sprinkler system is merely an addition to a building which already has fire protection qualities.

Source: Insurance Services Office, Anchorage, Alaska. The above information is subject to particular circumstances of each individual risk being evaluated, and is not conclusive or binding for any particular risk or other building.

PART V

S T A T I S T I C S

SPRINKLER WATER CONSUMPTION CHARACTERISTICS

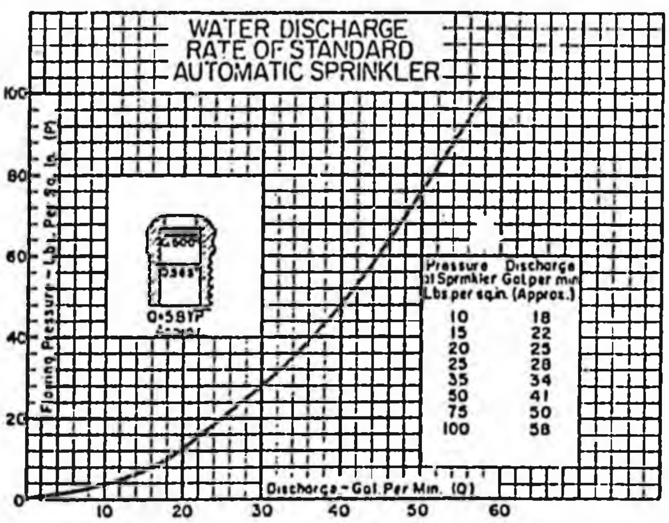


Fig. 14-3G. Water discharge rate of standard automatic sprinkler.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976

It is vital that every automatic sprinkler system have a water supply of adequate pressure, capacity, and reliability. Both the rate of flow and the total volume that may be needed must be considered.

A. Types of Supplies

Sprinkler systems may be supplied with water from one or a combination of sources, such as street mains, gravity tanks, reservoirs, fire pumps, pressure tanks, rivers, lakes, wells, etc. (see Fig. 14-1F).

In theory, a single water supply would seem to be all that is necessary for satisfactory protection. However, that single supply may at times be temporarily out of service; it may be disabled at the time of a fire or before a fire is completely extinguished; or the pressure or the capacity may be below normal during an emergency. Therefore, a secondary supply may be necessary, depending on the strength and reliability of the primary supply, the value and importance of the property, the area, height and construction of the building, the occupancy, and the outside exposures. Occasionally, three supplies are needed, especially where neither the primary nor a single secondary supply is judged wholly satisfactory or reliable.

Connections to Public Water Works Systems

A connection from a reliable public water works system of adequate capacity and pressure is the preferred single or primary supply for automatic sprinkler systems. In determining its adequacy, consideration has to be given not only to the normal capacity and pressure of the system, but also to the probable minimum pressures and flows available at unfavorable times such as during summer months, during heavy demand on the system, or during impairment caused by flood or by winter conditions.

The size and arrangement of street mains and feeders from public water supplies are also important. Connections from large mains fed two ways or from two mains on a gridiron system may provide an excellent supply. Street mains less than 6 in. in diameter are usually inadequate and unreliable. Feeds from dead-end mains are also undesirable.

Water meters, if required by the water supply authority, should be of types approved for fire service (see Sec. 11, Chap. 2).

Flow and pressure tests under varying conditions of demand are generally necessary to determine the amount of public water available for fire protection. The proper method of making such tests is described in Section 13, Chapter 5.

Cross-connections Between Public and Private Supplies

Where a secondary supply is needed to supplement the public water supply, public and private supplies can be connected so as to feed into a single fire protection system. These systems are commonly referred to as being "cross-connected."

In some localities, cross-connections may be prohibited by health authorities.

Where they are not prohibited, regulations and sound practices must be complied with in order to avoid the possibility of public health being endangered by water of questionable potability entering the public system.

In general, cross-connections are permitted if carefully supervised precautions, such as a special double check valve, or other accepted devices for preventing backflow, are provided. In cases where one sprinkler supply is from public mains, health authorities usually permit, as a secondary source, either well constructed and well maintained covered steel tanks or concrete reservoirs that are filled with public water only.

Gravity Tanks

Gravity tanks of adequate capacity and elevation make a good primary supply and may be acceptable as a single supply. Details of the construction, heating, and maintenance of gravity tanks are given in NFPA No. 22, Standard for Water Tanks for Private Fire Protection, hereinafter in this chapter referred to as the NFPA Water Tank Standard (see also Sec. 11, Chap. 3 of this HANDBOOK). In determining tank size and elevation, consideration should also be given to the number of sprinklers expected to operate, duration of operation, the arrangement of underground supply piping, and the provision of hose standpipes, hydrants, and fire department connections.

Fire Pumps

A fire pump having both a reliable source of power and a reliable suction water supply provides a good secondary supply and in some instances is acceptable as a primary supply. With ample water a fire pump is capable of maintaining a high pressure over a long period of time, and may be a necessary part of some installations requiring greater water pressure than would otherwise be available.

For details of power sources, pump construction, installation, and methods of control and operation, NFPA No. 20, Standard for Centrifugal Fire Pumps, should be consulted (see also Sec. 11, Chap. 3 of this HANDBOOK).

Manually controlled pumps may be used if the primary water supply will last long enough to allow dependable starting of the fire pump, and if there is an automatic waterflow signal to make known the need for fire pump operation.

Automatic control of fire pumps is usually needed where a high water demand may occur immediately, as with a deluge system; or where a competent pump operator is not continuously present. Automatic fire pumps should have their suction under a positive head to avoid the delays and uncertainties of priming.

Under favorable circumstances of moderate property values and hazards, dependable power, and a dependable suction supply under a head, an electrically driven, automatically controlled fire pump supervised from a central station may be accepted as the primary supply for automatic sprinklers.

The automatic control of electrically driven centrifugal pumps must be arranged to prevent frequent repeated starting of the motor, either by initiating continuous running until stopped manually, or by a timing device that will stop the motor automatically only after a predetermined period of operation.

Source: National Fire Protection Association; <u>Fire Protection Handbook</u>, pp. 14-42 through 14-48 14th edition 1976

Pressure Tanks

Pressure tanks have several possible uses in automatic sprinkler protection. An important limitation is the small volume of water which can be stored in such tanks. Whe' a small pressure tank is accepted as the water supply, the system is classed as a Limited Supply System.

In situations where an adequate volume of water can be supplied by a public or private source but where the pressure is not sufficient to serve a sprinkler system directly, the pressure tank gives a good starting pressure for the first sprinklers that operate; the flow from it may be used while the fire pumps start automatically to increase the supply pressure.

In tall buildings where the public water pressure is too low for effective water distribution from the highest sprinklers, pressure tanks may be used to supply such sprinklers during the time required for a public fire department to begin supplying water through fire department connections.

Each proposed use of pressure tanks calls for special consideration and analysis of water capacity, location, and arrangement of the connection to the sprinkler system. Each installation is usually required to have specific approval. Details on the construction, installation, and maintenance of pressure tanks are given in the NFPA Water Tank Standard (see also Sec. 11, Chap. 3 of this HANDBOOK).

Fire Department Connections

Under fire conditions which result in a considerable number of sprinklers operating, public water or tank supplies may not provide water at sufficient pressure for effective discharge and distribution. Also, the pressure in many public water supplies to sprinkler systems may be materially reduced by hose streams from hydrants. In such cases, a connection through which the public fire department can pump water into the sprinkler system provides an important auxiliary supply. Fire department connections are therefore a standard part of sprinkler systems.

Fire department connections should be of approved type, readily accessible, and properly marked. Each connection should be fitted with a check valve, but not with a gate valve. There should be a proper drain, and an approved drip

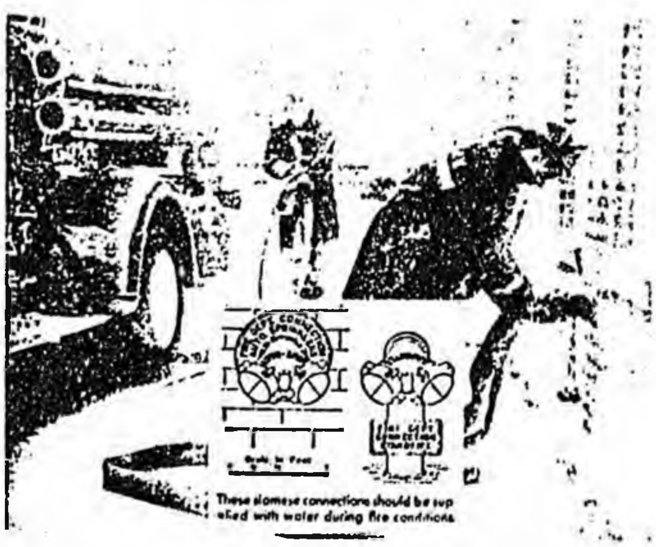


Fig. 14-4A. Fire fighters attaching hose lines to a fire department (siamese) connection supplying a sprinkler system. The inset shows typical siamese connections for sprinkler systems and standpipes. A check valve allows the use of a single hose line.

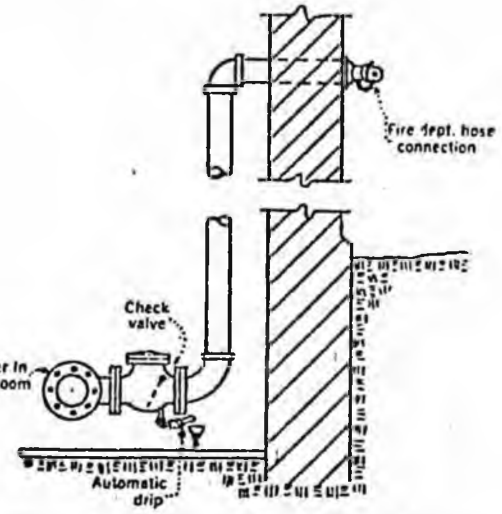


Fig. 14-4B. Typical fire department connection.

device between the check valve and the outside hose coupling. Figures 14-4A and 14-4B show the main features of a fire department connection. Other details of installation and pipe size are given in NFPA No. 13, Standard for the Installation of Sprinkler Systems, hereinafter referred to in this chapter as the NFPA Sprinkler Standard.

Where a sprinkler system has a single riser, the fire department connection should be attached to the system side of the controlling gate valve for a wet system, and between the dry-pipe valve and the gate valve for a dry system. This makes it possible to pump water into the system even if the gate valve is closed.

If there are two or more sprinkler system risers connected to a public main, each system must have its own fire department connection. If more than one riser is connected to a yard system, the fire department connection should feed into the yard system on the supply side of all riser shutoff valves, and there must be a check valve in all other water supply connections into the yard system to prevent backflow and loss of water supplied through the fire department connection. If one riser is shut off, the fire department connection can still supply all other risers.

In an emergency, a fire department can pump water from public hydrants or other sources of water into a sprinkler system through its hose and a yard hydrant or other hose connection using a double female hose coupling, if other supply connections have a check valve or a gate valve that can be closed.

B. Water Supply Requirements

The water supply needed for sprinkler systems raises questions that defy specific answers except with sprinkler systems where it is planned that all sprinklers in the fire area will discharge water. Such systems include deluge and water spray systems utilizing open sprinklers where the design must provide water supply for all the sprinklers in any fire area, systems employing closed automatic sprinklers in hazardous areas where the simultaneous operation of all sprinklers is usually assumed, and multiple open sprinkler systems in a single fire area where one or more systems can be expected to operate. With such sprinkler systems (largely used for special hazard situations) the water supply requirement resolves itself mainly into a matter of hydraulic and mathematical calculations. The answer to the water supply requirement with the majority of sprinkler systems, how-

Source: National Fire Protection Association; <u>Fire Protection Handbook</u>, pp. 14-42 through 14-48 14th edition 1976

ever, is not so definite. If a water source that could supply all the sprinklers is available, there would be no problem, but such a water supply is seldom practical except in the case of small systems. The water supply requirement for any sprinkler system is directly related to the number of sprinklers expected to operate, but this depends on so many variables and uncertain factors that no exact mathematical solution is possible.

The NFPA Sprinkler Tables show that in 93 percent of all fires in sprinklered buildings, twenty or less sprinklers opened. Experience shows that with adequate water supply the percentage of unsatisfactory sprinkler performance is extremely small. Thus, water supply is a significant problem, particularly with large sprinkler systems and with systems protecting greater than ordinary hazards.

The answer to the water supply requirement for any particular sprinkler system lies mainly in experienced engineering judgment, based on consideration of the factors for or against sprinkler control. Where the cooling effect from the water discharged by sprinklers is greater than the heat liberated by the fire, the sprinklers can gain control. When the reverse situation occurs, as from an overtaxed water supply, the sprinklers cannot control the fire and the sprinkler system may fail. Where all conditions are favorable, the control of fire should be accomplished by the operation of only a small number of sprinklers. As conditions vary, however, with different classes of occupancy, areas, and types of buildings, the number of sprinklers expected to operate in order to control a fire may range up to possibly the total number in the area, and the water supply should be provided accordingly. (See Fig. 14-1D for cumulative data for the various numbers of sprinklers operating in fires.)

C. Influence of Various Factors on Water Supply Need

The primary factors affecting the number of sprinklers which might open in a fire, and therefore to be considered in determination of the water supply requirement, include the following:

Hazard of Occupancy, Including Flash Fire Hazard and Potential Rate of Heat Liberation: This is the most important factor, and one involving experienced judgment to evaluate. Where the flash fire hazard is present, it is usually necessary to provide water sufficient for the operation of all the sprinklers in any individual fire area.

Initial Water Pressure: At a pressure of 15 psi, a standard sprinkler will discharge about 22 gpm, or an average of 0.17 gal per sq ft per min on an area of 130 sq ft. At 30 psi, the discharge is 33 gpm; at 50 psi, 41 gpm; and at higher pressures the discharge is correspondingly greater, also with a greater area of coverage. With a greater discharge and greater area of coverage, there is a better chance of fire control with a small number of sprinklers, and less need for large volumes of water to supply a large number of sprinklers.

Obstructions to Distribution of Water from Sprinklers, such as High-piled Stocks, Bale Tiering, Pallets, Racks, and Shelving: With obstruction, there is less likelihood that fire will be controlled in its initial stages, and a greater chance of opening a large number of sprinklers needing large water supplies.

High Ceilings and Draft Conditions: With ceilings of unusual height, there is greater chance that drafts will carry heat away from the sprinklers immediately over a fire, resulting not only in delay in the application of water but also in the opening of sprinklers remote from the place of origin of the fire. More water is usually needed under such conditions. The same situation exists wherever there are drafts, such as in areas open to the weather on the sides, where winds can divert heat from sprinklers over the fire.

Unprotected Vertical Openings: Sprinkler systems in multistory buildings are usually designed on the assumption that fire will be controlled on the floor of origin. Where there are unprotected openings up which heat and fire may spread, it may be expected that more sprinklers will open, particularly in the case of a fire originating near the vertical opening. In case of high combustibility, the interconnected floors may need to be considered as one fire area. This means more water and larger pipe sizes in risers and supply main.

Wet or Dry System: Owing to the delay due to exhausting air from dry-pipe systems, more sprinklers open on dry-pipe systems than on wet systems. This may call for greater water supplies.

Size of Undivided Areas: A large undivided area has a greater number of sprinklers, with a possibility of a greater maximum number of sprinklers operating, and a consequently greater water demand than with a small area.

Configuration and Type of Ceiling Construction: These influence water demand, including such factors as curtain boards, or beams affording curtain board effects to retard fire spread, and the possibility that fire may spread under a combustible ceiling out of reach of sprinklers or burn through.

Extent of Coverage and Exposures: Any fire in an unsprinklered space extending to an area with automatic sprinklers places an abnormal demand on the sprinkler system, and requires increased water supplies for effective functioning of the system.

The preceding factors must be considered individually and collectively, and it is not feasible to derive any general formula or simple method of arriving at water supply requirements.

There are, however, certain general statements on this subject that may be made. One is that any situation may be effectively protected with much less water where the water is applied automatically rather than manually. Another is that it is good practice to provide more water, at higher pressure, than will probably be needed to extinguish any fire. Hose streams may be used to supplement sprinklers, even when not necessary, and an ample supply of water provides a margin of safety.

With a very large fire area of low to moderate hazard it is not reasonable to expect to supply all sprinklers simultaneously. Actually, the pipe sizes are not large enough to do so, except where very high supply pressures can produce a high discharge rate from sprinklers near the source of supply as well as effective discharge from the most remote sprinkler. This situation is aggravated where sprinkler supply is from an end or side of the system. The most effective piping pattern calls for sprinkler risers at the center.

The managers of large properties under sprinkler protection may, by "shopping," secure insurance coverage predicated on water supplies that are "shaded" for economy. Obtaining the desired coverage does not mean that, measured in terms of true fire safety, the property is sufficiently protected. Property owners who realize that any fire may cause indirect losses far beyond any insurance indemnity will consider full protection essential.

D. Water Supply Requirements for Pipe Schedule Sprinkler Systems

Notwithstanding the general problems involved in arriving at water supply requirements, the hazard of occupancy, being the factor of major importance, has made it

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976

possible to establish "Guides to Water Supply Requirements for Sprinkler Systems" using this factor as the primary consideration with latitude allowed for the contributing factors.

The established "Guide" tables contained in the NFPA Sprinkler Standard divide hazards of occupancy, for the purpose of determining water supplies, into several groups with specified minimum water supplies for each group (see Table 14-4A).

Where fire pumps contribute to the water supply, standard sizes of pumps should be used with adequate rate of discharge, as outlined in Section 11, Chapter 4. A suction supply for the pump should preferably be large enough for continuous operation, as outlined in Section 11, Chapter 4.

Where pressure tanks furnish the water supply, the provisions for pressure tanks in Section 11, Chapter 3, should be followed.

Where a combination of different water supplies is provided in the interest of reliability, it is good practice to have the rate of supply from each source at least equal to the minimum requirement for the system.

The "Guide" should be used only with experienced judgment, but it can serve for all cases qualifying in the Light Hazard and Ordinary Hazard, Groups 1 and 2, occupancy classifications which constitute the larger percentage of sprinkler installations. The other occupancy classifications usually involve more complex factors, and therefore require special consideration.

Light Hazard Occupancies

Examples of Light Hazard Occupancies are apartment buildings, dormitories, office buildings, seating areas of restaurants, and hospitals. In these occupancies the potential rate of heat liberation is low, areas are usually subdivided, and a small number of sprinklers should normally control any fire. Under these conditions, 500 gpm should generally be sufficient, with an upward range to 750 gpm where conditions are less favorable.

Ordinary Hazard, Group 1, Occupancies

The Ordinary Hazard, Group 1 classification includes occupancies where the combustibility of contents is generally low, such as in garages, bakeries, laundries, and canneries, but is greater than for the Light Hazard classification. In this group the water supply requirement may be as low as 700 gpm where small areas, noncombustible construction, and very limited hazards are encountered; it can range up to 1,000 gpm as these conditions become more adverse.

Ordinary Hazard, Group 2, Occupancies

Ordinary Hazard, Group 2 classification includes occupancies such as clothing factories, mercantiles, pharmaceutical manufacturing, and shoe factories. With this group the features of combustibility of contents, ceiling heights, and obstruction are generally unfavorable, separately or jointly, and as indicated the water supply requirements may range as high as 1,500 gpm. It will be noted, however, that an 850 gpm minimum is retained for this group and this, of course, would be applicable only under very favorable conditions.

Water supply requirements for the three classes mentioned, as in all cases, call for a careful consideration of all factors concerned, but the figures given in Table 14-4A are of value in placing lower and upper limits for the classes concerned. While it is never advisable to provide less than the lower limit indicated, the upper limit will usually be sufficient for all situations within the group classification.

Ordinary Hazard, Group 3, Occupancies

Ordinary Hazard, Group 3, consists of occupancies where standard sprinkler spacing and pipe schedules are considered satisfactory, but where more than ordinary water supplies are advisable. This group includes certain woodworkers and other occupancies such as flour and feed mills, paper mills, piers and wharves, and tire storage.

Table 14-4A. Guide to Water Supply Requirements for Pipe Schedule Sprinkler Systems

Occupancy Classification	Residual Pressure Required (See Note 1)	Acceptable Flow at Base of Riser (See Note 2)	Duration in Minutes (See Note 4)
Light Hazard	15 psi	500-750 gpm (See Note 3)	30–60
Ordinary Hazard (Group 1)	15 psi or higher	700–1000 gpm	60–90
Ordinary Hazard (Group 2)	15 psi or higher	850-1500 gpm	60–90
Ordinary Hazard (Group 3)	Pressure and flow requirements for sprinklers and hose streams to be determined by authority having jurisdiction.		60–120
Warehouses	Pressure and flow requirements for sprinklers and hose streams to be determined by authority having jurisdiction. Also see Chapter 7 of NFPA 13, NFPA 231, and NFPA 231 C.		
High-Rise Buildings	Pressure and flow requirements for sprinklers and hose streams to be determined by authority having jurisdiction. Also see Chapter 6 of NFPA 13.		
Extra Hazard	Pressure and flow requirements for sprinklers and hose streams to be determined by authority having jurisdiction.		

NOTES:

1. The pressure required at the base of the sprinkler riser(s) is defined as the residual pressure required at the elevation of the highest sprinkler plus the pressure required to reach this elevation.
2. The lower figure is the minimum flow including hose streams ordinarily acceptable for pipe schedule sprinkler systems. The higher flow should normally suffice for all cases under each group.
3. The requirement may be reduced to 750 gpm if building area is limited by size or compartmentation or if building (including roof) is noncombustible construction.
4. The lower duration figure is ordinarily acceptable where remote station water-flow alarm service or equivalent is provided. The higher duration figure should normally suffice for all cases under each group.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976

Extra Hazard Occupancies

Extra Hazard occupancies consist of properties where flash fires opening all the sprinklers in a fire area are probable, and call for close sprinkler spacing and larger pipe sizes. Such occupancies include explosives manufacturing, extra hazard chemical works, pyroxylin plastic manufacturing, cotton picking and opening operations, and other occupancies with a flash fire hazard.

It is not possible to lay down any general rules for these last two groups, and their water supply needs can be evaluated only on an individual basis by engineers with broad background experience. For this reason, the NFPA Sprinkler Standard refers to determination by the authority having jurisdiction as the only possible answer to the problem. It is in such occupancies that hydraulic calculations are most often needed to determine water supplies.

In any treatment of hazards by general groups of occupancy, it must be noted that individual properties differ markedly, and that buildings of the same nominal occupancy classification may show widely different individual hazards which should be considered in any determination of water supply.

E. Water Supply Requirements for Hose Stream Protection

The values given in Table 14-4A include hose stream requirements. In considering water requirements for hose streams, it should be realized that if sprinklers perform effectively little hose stream assistance is required. Although this is generally the case, a realistic viewpoint must be taken of possible contingencies and the amount of water that might be needed for hose stream protection under adverse conditions.

In evaluating hose stream requirements, possibilities should be considered such as the amount of water necessary for final extinguishment or clean-up operations, or in the event that sprinklers are retarding fire spread but are not fully effective in gaining control and extinguishment.

F. Water Supply Requirements for Hydraulically Designed Sprinkler Systems

A fire protection engineer planning new water supplies or evaluating existing supplies for sprinkler systems must have some information regarding the hydraulic behavior of sprinkler piping systems.

Hydraulic Calculations

A hydraulically designed sprinkler system is one in which pipe sizes are selected on a pressure loss basis to provide a prescribed density (gallons per minute per square foot) distributed with a reasonable degree of uniformity over a specified area. This permits the selection of pipe sizes in accordance with the characteristics of the water supply available. The stipulated design density and area of application will vary with occupancy hazard.

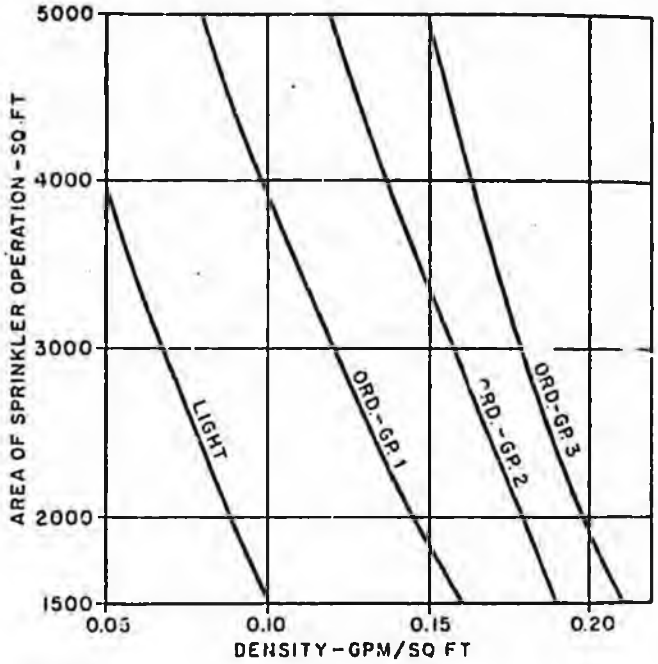
Table 14-4B is used to determine density, area of sprinkler operation, and water supply requirements for hydraulically designed sprinkler systems. Systems must be calculated to satisfy a single point on the appropriate design curve, and interior piping must be based on this design point. It is not necessary to meet all points on the selected curve. Total water supply available to the system at the base of the riser at the residual pressure required by the design must be not less than shown in Table 14-4B; this total water supply need not be calculated through the overhead piping.

Table 14-4B. Density, Area of Sprinkler Operation, and Water Supply Requirements for Hydraulically Designed Sprinkler Systems

Minimum Water Supplies

Hazard Classification	Sprinklers GPM	Combined Inside & Outside Hose—GPM	Duration in Minutes
Light	150	100	30
Ord.—Gp. 1	400	250	*60–90
Ord.—Gp. 2	600	250	*60–90
Ord.—Gp. 3	750	500	*60–120

NOTES: The lower duration figure is ordinarily acceptable where remote station water-flow alarm service or equivalent is provided.



NOTES:

For dry systems increase area of sprinkler operation by 30 percent.

For combustible construction with wet or dry systems the minimum area of application is 3,000 sq ft

For hazard classifications other than those indicated see appropriate NFPA Standards for design criteria.

Calculations shall be based upon the area of sprinkler operation selected from Table 14-4B, or upon the area of the largest room being considered, whichever is smaller. Such rooms must be enclosed by construction having a fire resistance rating at least equal to the water supply duration indicated in Table 14-4B, and wall openings must be protected in an approved manner. For areas of sprinkler operation less than 1,500 sq ft, the density for 1,500 sq ft is used.

The same hazard occupancy classifications apply to hydraulically designed sprinkler systems as apply to pipe schedule sprinkler systems as mentioned in Part D of this Chapter. The recommended water supply figures are, however, somewhat lower due to the greater efficiency of a calculated system.

The water allowances for inside hose and for outside hydrants may be combined and added to the system requirement at the system connection to the underground main. The total water requirement must be calculated through the underground main to the point of supply.

With deluge systems and water spray systems having open orifices, calculations are essential. (See NFPA No. 15, Standard for Water Spray Fixed Systems.) Automatic sprinkler systems protecting high piled storage situations require a specific water density for fire control. (See NFPA No. 231, Standard for Indoor Storage, and NFPA No. 231C, Standard for Rack Storage of Materials.) Hydrau-

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976

lically calculated systems can, however, be used for all types of occupancies.

Methods of making flow calculations for sprinkler systems are given in the following: (1) the NFPA Sprinkler Standard, (2) NFPA No. 15, Standard for Water Spray Systems for Fire Protection, (3) *"Automatic" Sprinkler Hydraulic Data* published by "Automatic" Sprinkler Corp. of America,[1] (4) Factory Mutual Corporation's *Handbook of Industrial Loss Prevention*,[2] and (5) an address "Water Flow Characteristics of Sprinkler Systems" reported in the Proceedings of the 58th Annual Meeting of the NFPA.[3]

The design area for the system is the hydraulically most remote area, and usually includes sprinklers on both sides of the cross main. Each sprinkler in the design area must discharge at a flow rate at least equal to the stipulated minimum water application rate (density). Begin calculations at the sprinkler hydraulically farthest from the supply connection. With common system configurations this will be the end sprinkler on the end branch line. The minimum operating pressure for any sprinkler must not be less than 7 psi.

The Most Remote Sprinkler

Assuming a minimum pressure of 10 psi at the most remote sprinkler and a discharge coefficient of 0.75 for a standard ½-in. orifice sprinkler (the coefficient varies—0.78 is used elsewhere in this HANDBOOK), we will have a discharge of 17.7 gpm calculated from the formula $Q = 29.8\ cd^2\sqrt{P}$ (see Sec. 11, Chap. 6), used in calculating flows through orifices and short tubes. The value for 29.83 cd^2 in this instance is 5.6, a figure commonly used as the sprinkler discharge constant K in the simplified formula $Q = K\sqrt{P}$. Velocity pressure is not a factor at the more remote sprinkler, but it is considered at all the other sprinklers in the example that follows. Some organizations ignore velocity pressure in their calculations. The error introduced is on the safe side. NFPA No. 15, Standard for Water Spray Fixed Systems, recommends considering velocity only when it is more than 5 percent of the total pressure.

Assuming sprinklers 10 ft apart on branch lines, with the end section of pipe 1 in. nominal diameter, the friction loss at 17.7 gpm flow, with a Hazen and Williams formula coefficient of 120 (value for black steel pipe) will be 1.0 psi (see Fig. 11-6L in Sec. 11, Chap. 6 and change friction loss values in that graph, which are based on $C = 100$, to values based on $C = 120$ by multiplying by 0.714).

Second Sprinkler from the End

The total pressure at the second sprinkler will be 10.0 + 1.0 = 11.0 psi. Of this, velocity pressure based on a flow of 17.7 gpm will be 0.3 psi (see Fig. 11-6A, Sec. 11, Chap. 6). The normal pressure (pressure acting perpendicular to the pipe wall) acting on the second sprinkler is the total pressure of 11.0 psi less the velocity pressure of 0.3 or 10.7 psi. On all sprinklers except the end sprinkler, only normal pressure is considered as acting on the sprinklers.

The discharge from the second sprinkler, at a pressure of 10.7 psi, will be 18.3 gpm.

The pipe between the second and third sprinkler, also 1 in. diameter, 10 ft long, and with a flow of 17.7 + 18.3 = 36.0 gpm, will have a friction loss of 3.8 psi, and a velocity pressure of 1.2 psi. Total pressure at the third sprinkle equals 10.7 + 3.8 + 1.2 or 15.7 psi.

Other Sprinklers on a Branch Line

Up to this point, velocity pressure has been based on flow downstream from the sprinkler being considered; this has been confirmed by tests.[3] It has also been shown by those tests that beyond the second sprinkler velocity pressure should be figured from the flow on the upstream side of the sprinkler being considered. This is done by trial and error, assuming a flow from the sprinkler, calculating the velocity pressure from the total flow, determining a normal pressure, and calculating a flow from the normal pressure. If the calculated flow is not reasonably close to the assumed flow, assume a different flow and repeat the procedure until the two are close.

Assume a flow from the third sprinkler of 19.0 gpm, and also assume that the pipe between the third and fourth sprinkler is 1¼ in. Total flow is 36.0 + 19.0 = 55.0 gpm. Velocity pressure is 0.9 psi and normal pressure at the third sprinkler is therefore 15.7 − 0.9 or 14.8 psi. Corrected flow then becomes 21.6 gpm, which is not close enough to the 19 gpm assumed. Try an assumed flow of 21.4 gpm. Velocity pressure at 57.4 gpm is 1.0; normal pressure is 14.7 psi and the new corrected flow is 21.5 gpm. Total flow at the third head then becomes 36.0 + 21.5 = 57.5 gpm. The calculating procedure for the other sprinklers on the branch line is the same as for the third sprinkler.

At this point it will be seen that we have exceeded the 15 psi minimum riser pressure, unless, as is quite probable, the pressure with 57.5 gpm flow is substantially higher than that with 500 gpm flow. Whether or not the pressure with 57.5 gpm flow is higher than 15 psi depends on the characteristics of the water supply. However, in any case it appears that with not many more sprinklers open the pressure at the most remote sprinkler will be less than the 10 psi selected in this example.

Branch Lines, Cross Mains, Risers, and Fittings

Cross Main Pressure at the Branch Line Connection: This is the normal pressure at the nearest open sprinkler increased by the friction loss and the velocity pressure in the intervening pipe. If the branch line is fed through a tee and nipple, additional friction loss allowances must be made except that the friction loss in nipples less than 6 in. long is customarily neglected.

Two Branches in One Line of Sprinklers: These may have the same or different numbers of sprinklers. The pressure at the entrance to the two branches will always be the same. The computations starting at the end sprinklers will be duplicated for the number of open sprinklers.

After the discharge from any number of sprinklers on a branch line has been computed and the pressure to produce the flow has been determined, the entire branch line can be considered to have the discharge characteristics of a single orifice and the discharge constant K in the formula $Q = K\sqrt{P}$ can be determined, P being the net pressure where flows are taken from tees in the cross main.

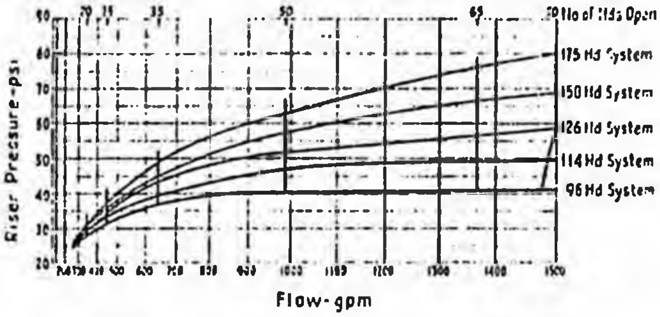
Branches on Opposite Sides of a Cross Main: These branches may have different numbers of sprinklers open, in which case the cross main pressure must be the higher of the two computed values. This increases the discharge from the branch giving the lower computed pressure, and the actual discharge must be calculated for the higher pressure using the equation:

$$\frac{Q_1}{Q_2} = \sqrt{\frac{P_1}{P_2}}$$

in which P_2 is taken as the higher pressure, Q_2 the corresponding increased discharge to be determined, and P_1 and Q_1 the pressure and corresponding discharge from the branch requiring only the lower pressure.

After the appropriate increased discharge has been deter-

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976



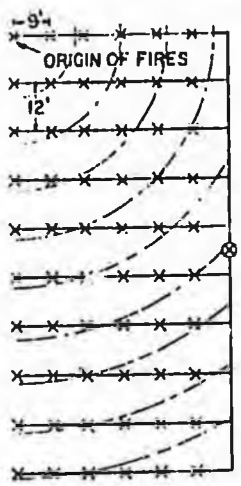


Fig. 14-4C. A flow curve for a side-central feed to sprinklers on a system having six sprinklers on each branch line is shown on the above graph. Below is the pattern of sprinklers opening on a side-central feed system. (Factory Mutual System)

mined, the two rates of flow can be combined and *K* for the combined branches calculated.

When sprinklers on the second branch line are assumed to have opened, starting at the cross main sprinkler, the opened sprinkler most remote from the cross main is considered as the end head in the branch line computation, the next opened is the second, etc., regardless of nonoperating sprinklers on the outer end of the branch.

Cross Main Pressures: Cross main pressures are calculated by the same procedure as used for sprinklers on a single branch line, except that it is not necessary to use the trial and error procedure for the third and additional branch lines since the effect of change in velocity pressure with flows passing through tees in the cross main is usually negligible. The net head producing the flow in successive branch lines is taken as the normal pressure at the end branch line increased by the friction loss in the pipe between the branches.

Riser Pressure: Riser pressure is taken as the normal pressure at the nearest flowing branch increased by the total friction loss between this branch and the riser and by the velocity pressure in the cross main at the riser connection.

Friction Loss in Fittings: This is generally included in calculations only when the fitting involves a change in direction of flow. An exception to this is the fitting immediately preceding the sprinkler.

Friction loss in control, gate and check valves, strainers, meters, and similar devices is always included.

The friction loss in piping between the source of supply and the opened sprinklers must obviously be included in all calculations.

Where there are differences in elevation, these must be allowed for on the basis that each foot of height represents 0.434 psi. In multistory buildings, this may be a substantial factor.

Feed mains, cross mains, and branch lines within the same system may be looped or gridded to divide the total water flowing to the design area.

Sprinkler System Water-flow Curves

To avoid repetition of laborious computation of water flows and pressures when such information is needed in cases involving standard sprinkler, spray, or open head systems, it is possible to prepare diagrams or "water-flow curves" from which riser pressures and corresponding total sprinkler flows may be determined for different numbers of opened sprinklers. One such series of curves, as developed by the Factory Mutual Engineering Corporation, and the piping arrangement and assumed pattern of opened sprinklers is shown in Figure 14-4C.

SI Units

The following conversion factors are given as a convenience in converting to SI units the English units used in this chapter.

1 ft^2 = 0.0929 m^2
1 in. = 25.400 mm
1 ft = 0.305 m
1 psi = 6.895 kPa
1 gpm = 3.785 litre/min

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NFPA 15, Standard for Water Spray Fixed Systems.
NFPA 20, Standard for Centrifugal Fire Pumps.
NFPA 22, Standard for Water Tanks for Private Protection.
NFPA 231, Standard for Indoor General Storage.
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Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-42 through 14-48 14th edition 1976

PART VI

S T A T I S T I C S

METERS ARE AVAILABLE WHICH CAN MEASURE WATER
CONSUMED FOR FIRE PROTECTION AND CITIES WHICH HAVE
UTILIZED METERS FOR DETERMINING PRIVATE FIRE PROTECTION CHARGES

H. Meters for Fire Connections

Fire flow meters are devices capable of measuring small and large flows with a minimum loss of head for heavy

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-21 through 11-25 14th edition 1976

demands. They are offered in two types: (1) detector check valve-type meters that detect only small rates of flow and (2) so-called full registration meters that measure the entire flow throughout the line in which they are installed. Meters of types other than the fire flow type have been found to be unsatisfactory for fire protection water supplies.

Detector Checks

These devices consist of a check valve with a weighted clapper in the main passage and a disc meter in a bypass around the check. In operation the smaller flows pass through the disc meter in the bypass and are accurately registered. Disc meters may be furnished up to 3 in. in size to serve specific needs. For heavy flows the check valve opens and a free unmetered waterway is provided. Beyond the point where the weighted check valve lifts, the bypass meter registers only a small part of the flow. In many situations the detector checks should give the water works the assurance desired as to the proper use of water.

Figure 11-2BB shows a representative detector check valve.

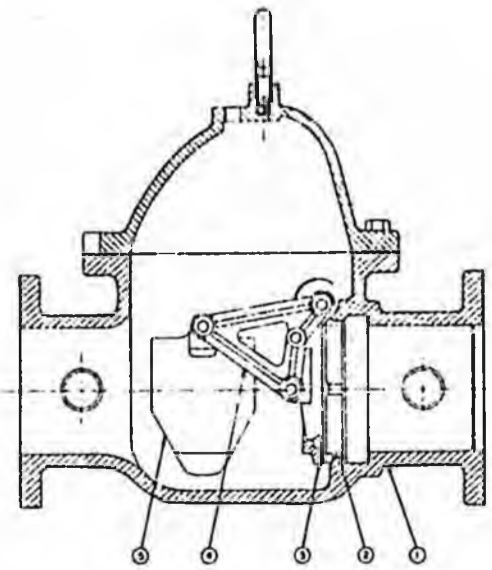

Fig. 11-2BB. A detector check valve. Photo shows view from top of weighted check valve and meter in bypass. Section view shows clapper in closed position. (The Viking Corporation)

Full Registration Meters

These devices are of three general types, each produced by a different manufacturer, and they have been designed for small friction loss with large flows and for a main passageway practically unobstructed when open. The three types are: (1) proportional type meters, (2) meters of the displacement type in a bypass and (3) turbine-type meters.

Proportional Type, Hersey Detector Meter, Model FM: This meter is a special meter of the compound type in which a "proportional meter" and an automatic valve in the main line of the meter are combined with a disc or compound meter in a bypass (see Fig. 11-2CC).

In the Model FM, the smaller flows pass through and are measured by the bypass meter. When the demand for water reaches a rate of flow which causes a difference in pressure

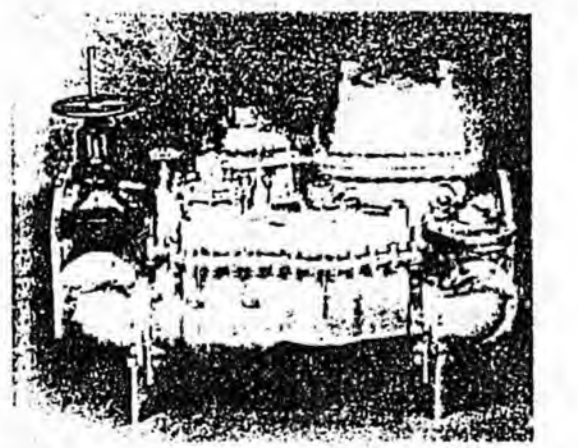

Fig. 11-2CC. A detector meter of the proportional type. (Hersey-Sparling Meter Company)

of 4 psi in the bypass, the automatic check valve opens and provides a practically free waterway through the main line. When water begins to flow through the line in which the automatic valve has opened, it is slightly retarded by a restricting orifice placed a little upstream from the automatic valve, and a part of the water is diverted through a metering unit. This diverted flow is a fixed percentage of the total flow through the restricting orifice. The metering unit is calibrated to record the total quantity through the line, the sum of the readings of the bypass meter and the main line metering unit gives the total flow.

Displacement Type, Neptune Trident Protectus Meter: This meter has all of the working parts in one casing. A disc meter is installed in a bypass on one side and a current meter on the other side of the main waterway. Small flows pass through the disc meter and are recorded when the check valve is closed. With larger flows the main check valve opens and gives a free waterway. The opening of the check valve stops the flow through the disc meter and opens the bypass to the current meter so that the flow through the open waterway is measured proportionately. The sum of the readings gives the total flow (see Fig. 11-2DD).

Turbo Type, Rockwell W-2000 Turbo Meter: This meter is based on the turbine principle of measurement. The meter is composed of two principal assemblies, the main case and the measuring chamber. The main case contains the flow straightening vane assembly. The measuring chamber includes rotor, adjusting vane, pulse amplifier chart and terminal strip for attaching the connecting cable. The function

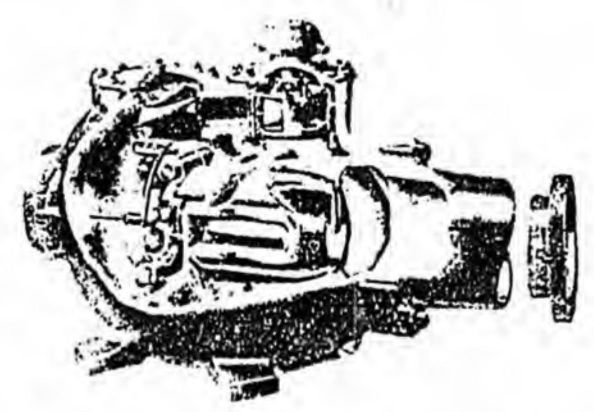

Fig. 11-2DD. A fire flow meter of the displacement type. (Neptune Meter Company)

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-21 through 11-25 14th edition 1976

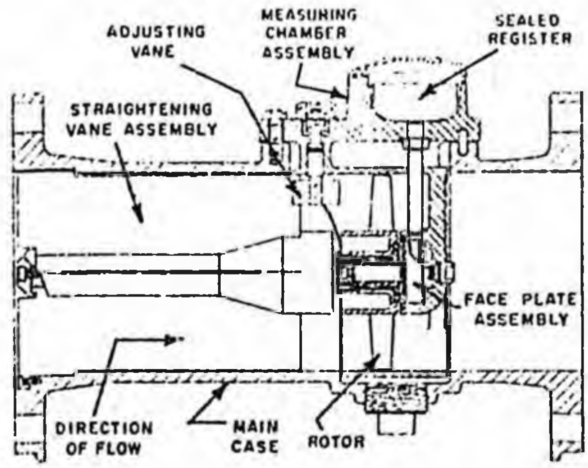

Fig. 11-2EE. A fire flow meter of the turbo type. (Rockwell Mfg. Co.)

of a printed circuit card is to electronically count revolutions and transmit intelligence to a register. The meter should be installed with a 6-in. Rockwell strainer placed immediately upstream of the meter. If the strainer is not used, a minimum of 15 diameters of straight pipe must be immediately upstream of the meter to assure valid registration (see Fig. 11-2EE).

Friction Loss in Fire Flow Meters and Detector Check Valves

The standard specifications for cold water meters adopted by both the American Water Works Association and the New England Water Works Association limit the friction loss for fire flow meters to 4 psi at rated flow capacities. Table 11-2H gives friction loss values for the three currently available types of fire flow meters.

Friction loss values for meters of the disc, current and compound type that are used commonly in waterworks systems for general purposes are relatively high and not suited for fire protection purposes. AWWA limits their friction loss values to 20 psi.

Detector Check Valves: The friction loss in detector check valves listed and approved by recognized testing laboratories is less than 3 psi for the following flows:

Size (in.)	Flow (gpm)
4	750
6	1,500
8	3,000
10	4,500
12	6,500

The pressure required to open the clapper is less than 20 psi.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-21 through 11-25 14th edition 1976

Table 11-2H. Friction Loss in Fire Flow Meters

Compiled from data supplied by manufacturers

Meter Name and Type	Size of Meter Inches	Loss of Pressure Caused by Meter Pounds per Square Inch — Gallons per Minute Flowing: 250	500	750	1000	1250	1500	2000	2500
...oportional Type (...ersey-FM)	4	2.2	1.9	4.0					
	6	3.8	2.7	1.4	1.8	2.2	2.9	3.9	
	8	3.0	3.7	1.9	1.0	0.8	0.8	1.3	2.2
	10	1.6	3.6	4.0	3.7	2.6	1.4	0.8	1.1
...fferential Type (...ndent Protectus)	4	2.2	2.0	3.9					
	6	2.9	1.9	1.8	1.8	1.8	1.8	2.2	3.3
	8	3.2	1.8	1.5	1.5	1.5	1.6	1.8	2.2
	10	3.0	2.3	1.8	1.3	1.2	1.1	1.1	1.2
...bo Type (...ockwell W-2000 Turbo)	6	0.2	0.3	0.6	0.85	1.2	1.6	3.5	

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-21 through 11-25 14th edition 1976

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PART VII

PLANNING

FIRE PROTECTION CAN BEST BE ACHIEVED THROUGH FORESIGHT AND COOPERATION OF ALL CITY DEPARTMENTS INCLUDING THE FIRE DEPARTMENT AND WATER DEPARTMENT

C. Planning

The following information has been extracted in whole and in part from "America Burning," the report of the National Commission on Fire Prevention and Control[1], and is considered appropriate for inclusion in this portion of the HANDBOOK.

Planning

Fire protection has been largely a local responsibility, and for good reasons it is destined to remain so. Each community has a set of conditions unique to itself, and a system of fire protection that works well for one community cannot be assumed to work equally well for other communities. To be adequate, the fire protection system must respond to local conditions, especially to changing conditions. Planning

Source: National Fire Protection Association; Fire Protection Handbook, pp. 9-80 through 9-82 14th edition 1976

is the key: Without local-level planning, the system of fire protection is apt to be ill-suited to local needs and lag behind the changing needs of the community.

Excellent fire protection (for example, in the form of automatic extinguishing systems) lies within technical grasp, and certainly lies within the resources of most communities to provide. Even with considerable public support, this protection would require many years to accomplish. In the meantime, in every fire jurisdiction (whether a municipality, county, or region) standards aiming at a significant increase in fire protection must be set. Among the concepts to be defined:

Adequate Level of Fire Protection: The question of "adequacy" addressed itself not only to day-to-day normal needs, but to major contingencies that can be anticipated and to future needs as well. What is needed is a definition of "optimal" protection—in contrast to "minimal" protection, which fails to meet contingencies and future needs, and "maximal" protection, which is more than the community can afford.

Reasonable Community Costs: Fire, both as threat and reality, has its costs: property losses, deaths, injuries, hospital bills, lost tax revenues, plus the costs of maintaining fire departments, paying fire insurance premiums, and providing built-in fire protection. Each community must decide on an appropriate level of investment in fire protection. Some costs beyond the public's willingness to bear should be transferred to the private sector (as when buildings over a certain size or height or with a certain occupancy are required to have automatic extinguishing systems).

Acceptable Risk: A certain level of losses from fire must be accepted as tolerable simply because of limited resources of the community. Conditions that endanger the safety of citizens and fire fighters beyond the acceptable risk must be identified as targets for reduction.

Consideration of these matters helps to determine what functions and emphasis should be assigned to the fire department, other municipal departments, and the private sector, both now and in the future. It helps to define new policies, laws, or regulations that may be needed. Most important, consideration of these matters makes clear that fire safety is a responsibility shared by the public and private sectors. Because the fire department cannot prevent all fire losses, formal obligations fall on owners of certain kinds of buildings to have built-in fire protection. For the same reason, private citizens have an obligation to exercise prudence with regard to fire in their daily lives. But prudence also requires education in fire safety, and the obligation to provide that education appropriately falls in the public sector, chiefly the fire department. The public sector (again, chiefly the fire department) also has an obligation to see that requirements for built-in protection in the private sector are being met.

A fire department, then, has more than one responsibility. Nor are the responsibilities just mentioned exhaustive. At least 8 important functions for fire departments can be identified:

Fire Suppression: Fire fighters need proper training and adequate equipment for saving lives and putting out fires quickly, and also for their own safety.

Life Safety-paramedical Services: Capabilities needed during fires and other emergencies include first aid, resuscitation, and possibly paramedical services. (By "paramedical services" we mean emergency treatment beyond ordinary first aid, performed by fire service personnel under supervision (through radio communication, for example) of a physician.)

Fire Prevention: This includes approving building plans and actual construction, inspecting buildings, their contents, and their fire protection equipment, public education, and investigating the causes of fires to serve as a guide to future priorities in fire prevention.

Fire Safety Education: Fire departments have an obligation to bring fire safety education not only into schools and private homes, but also into occupancies with greater than average fire potential or hazard to people, such as restaurants, hotels, hospitals, and nursing homes.

Deteriorated Building Hazards: In coordination with other municipal departments, fire departments can work to abate serious hazards to health and safety caused by deteriorated structures or abandoned buildings.

Regional Coordination: Major emergencies can exceed the capabilities of a single fire department, and neighboring fire jurisdictions should have detailed plans for coping with such emergencies. But effectiveness can also be improved through sharing of day-to-day operations—as, for example, an area-wide communication and dispatching network.

Data Development: Knowledge of how well a fire department is doing, and of how practices should change to improve performance, depends on adequate record-keeping.

Community Relations: Fire departments are representative of the local community that supports them. The impression they make on citizens affects how citizens view their government. Volunteer departments dependent on private donations must, of course, also be concerned with their community relations. Moreover, since fire stations are strategically located throughout the community, they can serve as referral or dispensing agencies for a wide range of municipal services.

As communities set out to improve their fire protection, it is not the fire department alone they must consider. The police have a role in reporting fires and in handling traffic and crowds during fires. The cooperation of the building department is needed to enforce the fire safety provisions of building codes. The work of the water department in maintaining the water system is vital to fire suppression. In the realm of fire safety education, the public schools, the department of recreation, and the public library can augment the work of the fire department. Future development and planning will influence the location of new fire stations and how they will be equipped.

These are just the obvious examples of interdependence. So seemingly trivial a matter as the manner in which house numbers are assigned and posted can affect the ability of fire departments to respond quickly and effectively to emergencies.

Master Planning

Fire protection is only one of many community services. Not only must it compete for dollars with other municipal needs, such as the education system and the police department, but, in planning for future growth, the fire protection system must take into account the changes going on elsewhere in the community. For example, if a slum area is to be torn down and replaced with high-rise apartment buildings, that will change the fire protection needs of the area. Changes in zoning maps will also change the fire protection needs in different parts of the community.

To cope with future growth, local administrators are turning increasingly to the concept of *master planning* of municipal functions. Such plans include an examination of existing programs, projection of future needs of the community, and a determination of methods to fill those needs. They seek the most cost-effective allocations of resources to help assure that the needs will be met.

Source: National Fire Protection Association; Fire Protection HandLook, pp. 9-80 through 9-82 14th edition 1976

A major section of a community general plan of land use should be a *Master Plan for Fire Protection*, written chiefly by fire department managers. This plan should, first of all, be consistent with and reinforce the goals of the city's overall general plan. For example, it should plan its deployment of manpower and equipment according to the kind of growth, and the specific areas of growth, that the community foresees. It should set goals and priorities for the fire department. Not only is it important to set objectives in terms of lives and property to be saved, but also to decide allocations among fire prevention inspection, fire safety education, and fire suppression as the best way to accomplish the objectives.

Having established goals, the plan should seek to establish "management by objectives" within the fire department. This operates on the principle that management is most effective when each person is aware of how his tasks fit into the overall goals and has committed himself to getting specific jobs done in a specified time.

Because fire departments exist in a real world where a variety of purposes must be served with a limited amount of money, it is important that every dollar be invested for maximum payoff. The fire protection master plan should not only seek to provide the maximum cost-benefit ratio for fire protection expenditures, but should also establish a framework for measuring the effectiveness of these expenditures.

Lastly, the plan should clarify the fire protection responsibility for other groups in the community, both governmental and private.

Devising a Fire Protection Plan

The following can serve as guidelines to fire department administrators for developing and presenting a master plan for fire protection:

Phase I

1. Identify the fire protection problems of the jurisdiction.

2. Identify the best combination of public resources and built-in protection required to manage the fire problem, within acceptable limits:
   - (a) Specify current capabilities and future needs of public resources;
   - (b) Specify current capabilities and future re[illegible]irements for built-in protection.

3. Develop alternative methods that will result in trade-offs between benefits and risks.

4. Establish a system of goals, programs, and cost estimates to implement the plan:
   - (a) The process of developing department goals and programs should include maximum possible participation of fire department personnel, of all ranks;
   - (b) The system should provide goals and objectives for all divisions, supportive of the overall goals of the department;
   - (c) Management development programs should strive to develop increased acceptance of authority and responsibility by all fire officers, as they strive to accomplish established objectives and programs.

Phase II

1. Develop, with the other government agencies, a definition of their roles in the fire protection process.

2. Present the proposed municipal fire protection system to the city administration for review.

3. Present the proposed system for adoption as the fire protection element of the jurisdiction's general plan. The standard process for development of a general plan provides the fire department administrator an opportunity to inform the community leaders of the fire protection goals and system, and to obtain their support.

Phase III

In considering the fire protection element the governing body of the jurisdiction will have to pay special attention to:

1. Short- and long-range goals,
2. Long-range staffing and capital improvement plans,
3. The code revisions required to provide fire loss management.

Phase IV

The fire loss management system must be reviewed and updated as budget allocations, capital improvement plans, and code revisions occur. Continuing review of results should concentrate on these areas:

1. Did fires remain within estimated limits?
2. Should limits be changed?
3. Did losses prove to be acceptable?
4. Could resources be decreased or should they be increased?

SI Units

The following conversion factors are given as a convenience in converting to SI units the English units used in this chapter.

1 gal (U.S.) = 3.785 litres
1 gpm = 3.785 litres/min

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Source: National Fire Protection Association; Fire Protection Handbook, pp. 9-80 through 9-82 14th edition 1976

MAR 10 1980

Alaska Fire Chiefs' Association

March 4, 1980

The Honorable John C. Sackett
Pouch V
Juneau, Alaska 99811

Dear Senator Sackett:

This letter is in support of House Bill 648 and Senate Bill 370 which are strongly supported by the Alaska Fire Chiefs' Association and the Alaska State Firefighters Association.

This bill will make low interest loans available to property owners to finance the installation of private fire protection systems, it will provide tax credits to property owners with private fire protection systems, and it will eliminate water standby utility charges on property owners' utility bills. It is an impressive program which will save cities and property owners money, without increasing mandatory regulation or other red tape.

Upon reading the enclosed position paper authored by the above Associations, I am sure you will agree with the Firefighters and Fire Chiefs that this bill is something long over due and it should be strongly supported.

When the program is explained every organization to whom the program has been presented has enthusiastically supported the program. The Fire Chiefs' Association is in receipt of letters from the Cordova Chamber of Commerce, the City of Ketchikan, the Water Conservation Association, all of which enthusiastically support the legislation. It is understood that more enthusiastic support is on the way and building. Please support House Bill 648 and its companion Senate Bill 370 this session. Thank you.

Very truly yours,

ALASKA FIRE CHIEFS' ASSOCIATION

James Evans, President

P.S. The sponsors of the House and Senate bills, as well as Committee Chairmen, have been provided with a Digest of factual material which conclusively and emphatically documents the effectiveness of private fire protection in controlling fires, and, therefore, local government costs. Copies of that material can be obtained from their respective Legislative offices.

	Senate Bill 370	House Bill 648
Sponsors:	Colletta, Bradley	Malone, Duncan
Committees:	Community and Regional Affairs	Community and Regional Affairs

SB 370

Alaska Fire Chiefs' Association

March 4, 1980 MAR 11 1980

The Honorable Mike Colletta
Pouch V
Juneau, Alaska 99811

Dear Senator Colletta:

Thank you for your sponsorship of Senate Bill 370. Enclosed is a position paper authored by the Alaska Fire Chiefs' Association and the Alaska State Firefighters Association providing additional data in support of the bill. Also enclosed is a Digest of the factual material which conclusively and emphatically document the effectiveness of private fire protection in controlling fires, and. therefore, local government costs.

Copies of the position paper have been sent to all Senators and Representatives. Copies of the Digest are provided to you and Senator Bradley as sponsors of Senate Bill 370, and to Representatives Duncan and Malone as sponsors of House Bill 648, as well as to Chairmen of the Senate and House Community and Regional Affairs Committees and the Speaker of the House and President of the Senate.

If either of the above Associations can be of assistance to you in promoting passage of this bill, please do not hesitate to request such assistance.

Very truly yours,

ALASKA FIRE CHIEFS' ASSOCIATION

James Evans, President

REDUCE ESCALATING INFLATION OF LOCAL GOVERNMENT COSTS

SAVE LIVES AND PROPERTY

ENCOURAGE SUSTAINED RESPONSIBLE BUSINESS AND ECONOMIC ACTIVITY IN ALASKAN COMMUNITIES

***

SUPPORT COMMUNITY FIRE PROTECTION INCENTIVE PROGRAM

A Legislative Incentive Program
Which Will Save Your Taxes,
Provide Low Interest
Capitalization Loans and
Reduce Fire Department and
Your Water Utility Costs
and, at the same time,
Increase Fire Safety

Prepared For
Alaska Fire Chiefs Association
and
Alaska State Firefighters' Association
by
Brian R. Shute
Attorney At Law

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I. THE PROBLEM: ALASKA'S EXPANDING AND DEVELOPING COMMUNITIES WITH UNDERDEVELOPED PUBLIC SERVICES ARE PARTICULARLY VULNERABLE TO CATASTROPHIC FIRE LOSSES.

A high fire death rate is peculiarly an American problem. No other industrialized nation comes close to the American fire death rate. Fire deaths and injuries per million population in the United States are nearly three times that of Sweden which has the next highest death and injury rate by fire.

In 1974 nearly 3 million fires caused nearly $4 billion worth of fire losses. The dollar value of the damage and destruction by fire does not even begin to approximate the actual losses because serious fires create indirect business and community losses such as:

(a) Loss of customers

(b) Loss of profits

(c) Cost of retaining key personnel during shutdown

(d) Loss of taxes on destroyed property.

Finally, there are indirect losses of a personal nature. These may be even more difficult to estimate, yet their importance should not be neglected. In addition to financial losses incurred through temporary unemployment and expenses incurred in finding and moving to new housing, there is the destruction of irreplacable personal belongings. With its vast expanses and small communities with underdeveloped public services, Alaska has a particularly dismal experience with fire losses. Tragic reminders of this are the New England Fish Company and Alaska Steamship dock fire in Cordova, the fires in Sitka which destroyed the priceless Russian cathedral, and the Sitka Cold Storage Company and dock facility. Perhaps most tragic are the cannery fires in small communities (most recently in Craig, Alaska, in 1980). Most often the canneries have not been rebuilt, and in some cases, the communities, which relied on the canneries as their sole means of economic support have ceased to exist. Canneries have plenty of water by virtue of the business they are in, and private fire protection would have eliminated the monetary losses, and in some cases, assured the continued existence of the community itself.

Water is an indispensable commodity when it comes to fighting fire. Fires cause billions of gallons of water to be consumed putting them out. Providing adequate water supplies constitutes a major community expense. Residents of the Anchorage and Matanuska-Susitna boroughs are certainly aware of the Susitna hydroelectric project, as part of the ongoing efforts to assure that area with adequate and safe water supplies. The residents of Juneau learned of the exigencies of having adequate water supplies in January of 1980, when climatic conditions temporarily depleted their water supply.

The State of Alaska will undergo rapid growth in population as development of its resources progresses. The oil industry is expanding, other industrial plants associated with the oil industry are planned and coming on line. The fishing industry is expanding into new products and plants. This is bringing increasing population and business to many of our communities. The growth is impacting the fire protection and water supplies of these growing areas. Communities are being faced with providing additional fire protection services, and with the costs of providing these services. See, Shirnberg, Robert R., Community Fire Protection Incentive Program, October 20, 1979.

Consequently, given the compelling social goal of avoiding catastrophic fire losses, together with the absolute necessity to provide water for basic human existence, a community must develop policies wich maximize its ability to provide both fire protection and adequate water supplies.

II. THE SOLUTION: MAXIMUM UTILIZATION OF PRIVATE FIRE PROTECTION SYSTEMS MINIMIZES FIRE LOSSES AND MINIMIZES COSTS OF OPERATING FIRE DEPARTMENTS AND WATER UTILITIES.

Private fire protection systems (the backbone of which are automatic sprinkler systems) are the most effective means of controlling fires in buildings. Not only do private fire protection systems put out fires, they do not require nearly as much water to extinguish fires as would be required for the Fire Department to put out the same fire. Nor do sprinkler systems require as much or as expensive equipment to fight a given fire as a Fire Department. Where private fire protection systems are deployed the expense and cost of the Fire Department are much less, and the chance for injury to firemen as a result of fire is almost negligible in sprinklered buildings. Sprinkler systems are the most technologically advanced fire fighting weapon, and their use should be maximized to reduce and hold down costs of the Fire Department.

We must accept the fact that public fire departments can contral a fire only in its early development stages. For the most part, fire departments can only combat fire by directly overwhelming it with massive amounts of expensive equipment, manpower and water. When the fire is small, the fire department is still on the way. Even with the best response time, it is fact that many small fires are out of control by the time the fire departments arive.

By contrast, the private fire protection system has no response time. It is on scene before the fire starts, and usually has put out the fire before the fire department even arrives.

III. LEGISLATION CREATING INCENTIVES FOR THE INSTALLATION OF PRIVATE FIRE PROTECTION SYSTEMS WILL ENCOURAGE A STATEWIDE SHIFT TOWARD MAXIMIZING UTILIZATION OF MORE EFFICIENT, LESS COSTLY FIREFIGHTING TECHNOLOGY, THEREBY HOLDING DOWN OR REDUCING COSTS OF WATER UTILITIES AND FIRE DEPARTMENTS.

Private fire protection is an alternative. Its technology is ready to be implemented, and, through legislative incentive, it will reduce the increasing burden of fire protection costs. Within a few short years of implementing legislative incentives, private fire protection systems will become increasingly prevalent in communities statewide. As Alaskan communities expand and grow, the legislative incentives will alleviate the necessity to expand the manpower, equipment, and water supplies for the fire department as in the past. Fire departments won't need to open as many new stations, buy as much firefighting equipment, or hire as many firefighters to meet the fire protection needs of the state's expanding communities. Costs of water supplies will be reduced as existing supplies go farther as a result of the water conservative propensities of private fire protection systems are realized. By moving now to take advantage of proven fire protection technology huge savings in property loss, jobs, insurance costs, building costs, life, and indeed even entire communities (in cases of unprotected cannery fires) will result and those savings will continue to accrue and continue to accelerate as the incentives prompt more and more property to be protected. (For a hypothetical case study of savings a community can realize as a result of widespread sprinkler installation see, Hackey, Associate Professor, Univ. Maryland, _Built In Fire Protection and Fire Department Manning_ (Appendix A).

IV THE SAVINGS IN LIFE, PROPERTY, CONSERVATION OF WATER, AND REDUCED COST OF LOCAL GOVERNMENT SERVICES FROM WIDESPREAD INSTALLATION OF PRIVATE FIRE PROTECTION SYSTEMS.

Statistics showing the effectiveness of automatic sprinkler systems are phenomenal. Only in rare instances do automatic sprinkler systems fail to control fires in sprinklered buildings. The failures are seldom due to the sprinklers, but rather, the lack of water, often because the system has been turned off, either unintentionally, intentionally, or by vandals. A complete record of fires in sprinklered buildings would show that their efficiency probably approaches 100%. National Fire Protection Association, Fire Protection Handbook, pp. 14-1 through 14-48, 14th edition, 1976. Given the billions of dollars in fire losses, the potential for savings resulting from widespread installation of sprinklers cannot be ignored. Of all the fires controlled by sprinklers, more than 90% of them are controlled by three or less sprinkler heads. Fire Protection Handbook, supra.

The effectiveness of automatic sprinklers stems from their presence at the scene of a potential fire before it srarts. They can apply water immediately where it is needed because there are not problems of access to the seat of the fire, or interference with visibility for fire fighting due to smoke. Fire Protection Handbook, supra. Sprinklers extinguish fires much earlier than a fire department could ever respond to an alarm. Automatic sprinklers are particularly effective for life safety because they give warning of the existence of fire, and at the same time apply water to the burning area.

> The only fatalities in fully sprinklered properties reported to the National Fire Protection Association were caused by explosions or flash fires; by ignition of the bedding or clothing of a person who was too young, too old, too intoxicated, or too handicapped in some other way to protect himself properly. . . .
>
> In those isolated instances of fatalities to sleeping, handicapped, or intoxicated persons, ignition of clothing or bedding caused fatal burns or asphyxiation either because the small fire did not generate sufficient heat to fuse the sprinkler, or because the victim had suffered fatal injuries before the sprinkler operated. In these later instances, however, the sprinklers protected the lives of persons in adjoining areas. _Fire Protection Handbook_, _supra_.

See, _also_, Horne, B.G., Fire Chief, _Controlling the Cost of Fire Protection in the City of San Buenaventura_.

Water necessary to put out a fire in its beginning stages is nowhere near the water required for the fire department to put it out after it once gets blazing. Performance characteristics of sprinklers indicate that standard automatic sprinklers discharge anywhere from 18 to 58 gallons of water per minute, depending on the pressure at the sprinkler head. <u>Fire Protection Handbook</u>, <u>supra</u>, at pp. 14-42 through 14-48. By comparison, a heavy-attack two and one-half inch mobile fire department hose line in operation can consume as much as 250 gallons of water per minute. If the fire is not put out in its infant stages (as occurs over 90% of the time when automatic sprinklers are deployed), it may take a number of heavy-attack lines hours to control the fire - if the water supply holds out that long.

Sprinklers do not cause excessive water damage. Damage by sprinklers is negligible compared to that caused by fighting the same fire with a hose stream. Most fires are controlled by a small number of sprinklers, while many hose streams are required to combat a fire which is out of control. Sprinklers, in most cases, control the fire immediately. The water damage which does occur is negligible compared to the damage which would have resulted if the building should have been completely or substantially consumed by a fire fought by conventional means. See, Horne, B. G., Fire Chief, <u>Controlling the Cost of Fire Protection in the City of San Buenaventura</u>.

V. THE SIZE OF A COMMUNITY'S WATER SYSTEM CAN BE REDUCED BY WIDESPREAD INSTALLATION OF PRIVATE FIRE PROTECTION SYSTEMS IN THE COMMUNITY.

A major part of the cost of the developing community's water supply is the additional reservoir of water which must be on hand for major fires, and the high pressure distribution lines from the reservoir to assure the fire department will have enough water pressure to project many hose streams onto a raging major fire. Nowhere near the same quantity of water or water pressure would be required for automatic sprinklers to do the same job.

The traditional method for estimating the water supply required to serve a community's fire protection needs is by computing fire flow requirements. The criteria to estimate fire flow requirements are found in the Guide for Determination of Required Fire Flow, Insurance Service Organization, 1972. The fire flow formula reflects significant water conservation propensities of private fire protection. Depending on the flammability of a given building, the fire flow required is reduced by 25% to 75% when a sprinkler system is present in a building. Fire Protection Handbook, supra, at pp. 11-2 through 11-6.

The fire flow formula developed by ISO can be utilized to determine the community-wide fire flow requirements. This procedure is more fully described in ISO's Municipal Grading Schedule, copies of which are available in many community Fire Department and Fire Department Protection offices.

Although the methodology in the <u>Municipal Grading Schedule</u> does not enable a precise computation of the reduction in community fire flow requirements caused by widespread sprinkler installation, it is significant. Anchorage, Alaska, is a specific case in point, where ISO engineers indicate installation of sprinklers in the Central Business District, alone, made Anchorage a more fireworthy community, and caused a reduction in fire flow requirements.

VI. PRIVATE FIRE PROTECTION REDUCES THE COST OF OTHER PUBLIC SERVICES.

In addition to the water conserving properties of automatic sprinkler systems, and the significant savings in life and property, there are other public benefits from widespread installation of private fire protection systems. Among these are:

1. Both the economic and physical burden of the Fire Department are decreased since private fire protection generally puts out the fire before the fire department even arrives. This also decreases the hazards of fighting fire.

2. The cost of manpower and time fighting the fire is reduced and therefore the money necessary to operate the Fire Department can be reduced, stablized, and diverted to other essential Fire Department or community expenditures.

3. Private fire protection decreases fire insurance costs not only for the person installing it, but also for an entire community where the installations are widespread. Many rural communities have little or no fire protection. These communities may not be able to afford the expensive firefighting equipment more urbanized communities have. Commercial construction moneys are also difficult to obtain because insurance rates are too high. By installing private fire protection, great reductions in insurance premiums can be achieved, which will enable property owners to get reasonable insurance premiums needed to obtain financing for construction.

4. Construction without sprinklers imposes higher insurance costs and imposes on the architect more stringent rules governing compartmentalization, fire proofing, exit distance spacing, travel distance, and exterior design requirements. It costs more to construct without sprinklers. 242 News Bulletin, Automatic Sprinkler Fire Control Association, Inc., pp. 1316 (1973). Providing incentives to construct with sprinklers will lower construction costs and then insurance costs, enabling construction to go forward that otherwise would have been too costly. The resulting stablization and expansion of a community's economic base, not to mention expanded tax base, is obvious.

5. Private fire protection increases municipal tax revenues by encouraging property development.

6. Private fire protection increases a communit's total fire protection security, preventing conflagrations and exposure fires.

7. Private fire protection results in lessening the cost of capital improvements to the community's water supply since widespread installation of private fire protection decreases the required fire flow necessary for adequate municipal fire protection.

8. Private fire protection saves billions of gallons of water, which is in chronic short supply in many communities.

9. Encouragement of private fire protection is consistent with the State policy of encouraging installation of fire protection devices (smoke alarms).

10. Since private fire protection can reduce the cost of the Fire Department and the water utility, Municipal tax

dollars and State revenue sharing
monies can be expended for other
essential services, making more efficient
use of government dollars.

These benefits are substantial and should be encouraged by the incentive legislative programs hereinafter described.

VII. TAX CREDITS, LOW INTEREST LOANS FOR PRIVATE FIRE PROTECTION, INSTALLATION, AND ELIMINATION OF WATER STANDBY CHARGES WILL PROVIDE THE LEGISLATIVE INCENTIVE TO MOVE TOWARD UTILIZATION OF THE BEST AND MOST ECONOMICAL FIRE SAFETY TECHNOLOGY - PRIVATE FIRE PROTECTION.

A. Why Legislative Incentives?

The decision to install or not to install private fire protection hinges on two variables. First, the Uniform Building Code requires building materials with a higher fire rating for higher fire rating for higher risk occupancies. If construction is without sprinkler systems the construction costs may be too high, and the increased cost could prevent the decision to construct from even being made. Second, the reduction in insurance rates for buildings with sprinklers will be greater for some kinds of buildings than for others. The size of the reduction is largely determinative of how long it will take the property owner to amortize the cost of the sprinkler system. If the insurance reduction is too small, it will take too long to amortize the cost of installing the system, and the decision to install it may not be made, with the resultant loss in fire safety. Legislative incentives in the form of low interest loans which can be obtained to finance sprinkler installation, additional tax credits to buildings that have sprinklers, and legislative elimination of water standby charges will make the decision to install private protection economical and, thus, voluntary. A significant trend would develop wherein water guzzling fire companies would be replaced by water efficient sprinkler systems, reducing both losses caused by fire and costs to local government.

B. Low Interest Loans Will Cause Financing to be Available so that Sprinklers can be Installed in Both New and Pre-existing Construction.

Funds for low interest loans to finance installation of private fire protection systems should be available in amounts that will allow for a rapid implementation and installation of private fire protection systems by those who qualify for the loans. Many small businesses in our state do not have access to financing at reasonable rates. The current level of interest rates simply does not make it economical for the property owner to consider the installation of private fire protection. Loan qualifications should be established on the basis of need similar to that required for small business loans. But, in addition, loans should also be made available to property owners who are required to install private fire protection by the community building codes, with some consideration given to those property owners desiring to install a system in a pre-existing structure. Making funds available to owners of pre-existing structures will accelerate the move towards utilizing private fire protection technology instead of the more costly and riskier Fire Department.

C. Tax Credits for Installation of Private Fire Protection Will Encourage, not Penalize the Owner who Adopts Better Fire Safety Technology, and Will Not Cause Cities to Lose Tax Revenue.

Installation of private fire protection systems causes property valuations to increase. Up to now the increase has been included in the property's assessed and the community's mill rate has been applied accordingly, thus raising the owner owner's taxes. This penalizes the property owner for installing fire protection systems. A property owner who does not install such a system is the one to penalize, because he increases the potential for disastrous fires in the community, and causes escalating costs for the Fire Department and Water System. Enacting State legislation will remove from tax rolls the penalizing assessment against private fire protection systems. This approach does away with counterproductive taxing practices, and maximizes the cost savings of better fire safety technology.

Local governments will not lose tax revenue as a result of the tax credit for fire protection systems. First, as the incentives induce increasing numbers of fire protection systems to be installed, fire departments will save literally millions of dollars because their requirements for manpower, equipment, and additional fire stations will be drastically reduced, to maintain a given level of fire safety. Attached as Appendix II is an actual case study of great savings which resulted in fire department costs in the City of Fresno, California. By inducing widespread installation or of private fire protection systems, the City of Fresno's fire department saved literally millions of dollars, according to the study. Reilly and Viniello, Sprinklers Cut Fresno's Fire Losses and Budget, Fire Journal, November 1979 (See Appendix II). Appendix I empirically documents the huge savings which will result to the Fire Department from a program of this sort.

Second, the assessed value of a sprinkler system, when compared to the value of the rest of a building, is minimal. Without the sprinkler system a fire will destroy the building, and the corresponding loss from municipal tax rolls of the entire valuation of the building will be many-fold greater than the minimum value of the sprinkler system. The City's tax base will grow more rapidly if it is not being consumed by destructive fires, which will not occur when a City's property tax base is protected by sprinklers. It is a certainty that the loss of tax-assessable property will be many times greater in a community that does not have widespread sprinkler installation.

Third, the major component of a City's water supply cost is the necessity to have water available to combat fire. Widespread installation of private fire protection systems will drastically reduce the fire flow demand, with a correspondent cost reduction to the water utility. In sum, then, the savings to the fire department and the water utility, together with the increased tax base that will result from the increased fire safety, induced by exemption of fire protection systems from the tax base, all culminate to provide increased, rather than decreased, revenue to municipalities. The tax credit incentive in Senate Bill 370 and House Bill 648 will insure this result.

D. Elimination Of Water Standby Charges

One of the most invidious disincentives to the installation of private fire protection systems has been the water standby charge levied by water utilities. The charge is levied when a private fire protection system is connected to the water system, regardless of whether it consumes water or not. The theory of the charge is that the connection of the system creates demand that the Utility must meet. Nothing can be further from the truth, however. By connection to the water supplies, the required fire flow, and, therefore, demand, is reduced. Sprinklers simply do not demand anywhere near as much water to fight fires as do Fire Departments. See, p. 6, supra; see, also, Fire Protection Handbook, supra, at 14-42 through 14-48. The cumulative effect if widespread spinkler installation is reservoir requirements which are stablized or reduced when compared to the requirements without the sprinklers.

Water demand charges eat up or completely eliminate any insurance savings to the property owner which would otherwise go towards amortizing the cost of installing the system. The demand charge makes it uneconomical to install the sprinklers. The water demand charge eliminates the only source of cost saving to be realized by installation of the sprinkler system. The demand charge should be exposed for what it is--a disincentive to installation of private fire protection that is counter productive to the goal of having adequate water supplies, and to the goal of making our communities safe from destructive fires. In the interests of conserving scarce water resources and maximizing the public fire protection dollar, then, legislation banning imposition of water demand charges on private fire protection systems should be enacted.

VIII. CONCLUSION

For the foregoing reasons support of this legislative program is urgently solicited. Senators, Representatives, local governments, and the public are urged to support these legislative incentives. The Alaska State Firefighter's Association and the Alaska State Fire Chiefs Association believe it's time to stop utilizing expensive, dangerous, and outmoded fire safety technology to protect our communities. These legislative incentives promote utilization of the best firefighting technology, while at the same time saving money. It will save the public and local government money, and conserve scarce water resources, thereby saving in water supply construction.

Fire management review
A QUARTERLY NEWSLETTER FOR LOCAL GOVERNMENT OFFICIALS WINTER 1979

Reducing Manning Costs For Fire Suppression

"Manning policy for fire suppression personnel is a very controversial issue. At a time when taxpayers are demanding budget stringency, fire department manning practices require further examination and evaluation. To date, no significant research has been done on the fundamental question of how many fire fighters are optimally required for fire suppression duty. As a priority issue, the U.S. Fire Administration is planning to initiate a manning study this year. In this issue of Fire Management Review, Dr. Harry Hickey makes some important observations on how built-in fire protection can affect ISO water flow requirements and therefore, fire suppression manning levels."

Gordon Vickery, Administrator, U.S. Fire Administration

Built-In Fire Protection And Fire Department Manning

by
Harry E. Hickey
Associate Professor
University of Maryland

The number of companies required and the manning levels for each company are directly related to the number of hazards in a community. Any community has a range of hazards. Therefore, the geographical location and the nature of those hazards are prime factors in determining the location of engine and ladder companies.

Property Hazard Level Reduction

Generally, property hazard levels should be used to determine the number and type of fire companies required and the manning levels for each.

One method of measuring property hazard levels is to determine the amount of water required to control and extinguish a fire in a building or group of buildings. Required fire flow will vary according to a building's ground floor area, height, construction, occupancy, internal fire protection and alarm systems (automatic sprinklers and alarm transmission to an emergency response service), and exposure conditions.

The Guide for the Determination of Required Fire Flow, which is published by the Insurance Services Office (ISO), can help to determine fire flow requirements for specific hazards (there is some question on the validity of the final computations). It is also helpful in assessing fire flow requirements according to a community's hazard variables. The guide states that by using these computations, fire flow requirements "may be reduced by up to 50 percent for complete

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automatic sprinkler protection. Where buildings are either fire resistive or non-combustible construction, the reduction may be up to 75 percent." Thus, established fire flow values can be cut drastically by requiring the installation of automatic sprinkler protection.

Regardless of the method used to compute required fire flow, there is general agreement that the public protection equipment requirement increases with the fire flow requirement. Conversely, as the property hazard is reduced, so is the required fire flow and thus, the level of fire department response.

A community policy to control and reduce property hazard levels by requiring automatic sprinklers can have a significant impact on holding the line with fire department manning requirements. In addition to improved life safety and property protection, automatic sprinklers may reduce property insurance premiums and the demand on the community's fire suppression delivery system. This may open new service delivery options, such as improvement of emergency medical services with existing personnel.

Hypothetical Case Study

The community of Newtown, which covers approximately 12.75 square miles, has 5 primary hazards characterized by: ordinary construction; four stories; ground floor areas from 43,000 to 50,000 sq. ft.; occupancies at the moderate hazard level and normal exposure conditions. It is assumed that these buildings are the worst fire hazards in the community, and that the level of fire protection required for them will be equal or better for the rest of the community.

FIRE MANAGEMENT REVIEW
VOLUME ONE, NUMBER THREE

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FIRE MANAGEMENT REVIEW is published to share recent research with emphasis on utilization to build management skills of local government administrators and fire service managers, and to create a climate for change. Points of view or opinions stated in this publication do not necessarily represent the official position of the National Science Foundation or ICMA.

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Project Secretary — [illegible]

Without automatic sprinkler protection the ISO guide sets a required fire flow of 8,000 gallons per minute for each fire. However, using the water supply section of the ISO Grading Schedule, the basic fire flow for Newtown is 7,500 gallons per minute. The guide makes a clear distinction between required fire flow and basic fire flow.

If each of the primary hazards were retrofitted with a hydraulic automatic sprinkler system, the peak required fire flow for each fire demand zone would be reduced from 8,000 gallons per minute to 4,000 gallons per minute. This would reduce the basic fire flow for Newtown to 3,500 gallons per minute.

The reduction in fire flow requirements has a dramatic effect on manning levels. Fire suppression manning requirements were calculated on the following assumptions:

- a 48 hour work week;
- average vacation and sick leave of 4 hours per week for each individual;
- 3.8 persons are required to staff a suppression position 24 hours a day, and
- engine and ladder companies each require one officer on duty at all times.

The ISO **Grading Schedule** was used to determine the number of engine and ladder companies required, based upon the response distance and the established required fire flows, and the manning requirements for each company.

Company and manning requirements were calculated with and without automatic sprinklers.

	Without Automatic Sprinklers	With Automatic Sprinklers
Stations	5	3
Engines	7	4
Ladders	3	1
Officers	42	15
Fire fighters	209	76

Annual personnel costs (including fringe benefits) were estimated on the basis of $24,000 for each officer and $18,000 for each fire fighter.

	Without Automatic Sprinklers	With Automatic Sprinklers
Officers	$1,008,000	$ 360,000
Fire fighters	3,762,000	1,368,000
TOTAL	4,770,000	1,728,000

Please turn to page

Sprinklers Cut Fresno's Fire Losses and Budget *(continued from page 59)*

deficiency point rating had been implemented as a solution to the fire defense strategy.

Real losses (measured in replacement cost of buildings destroyed) were reduced by 22 percent. While most cities in the United States are operating with fewer fire stations, fewer pumpers and ladders, fewer fire fighters, and less equipment than they had 20 years ago (and many are protecting more land area), Fresno chose to do so out of an intelligent master concept. Its results: a more efficient municipal government, more fire protection for its citizens at less cost, lower insurance rates, and a smaller, more efficient, higher paid, and well-trained fire department, plus a planning and inspection department with the proven capability to develop and execute a "cost-effective" master plan for municipal fire defense. △

Light-Wall and Special Light-Weight Pipe in Automatic Sprinkler Systems *(continued from page 61)*

Table 1.

Pipe Trade Size	*Internal Diameter (Inches)* Schedule 40	Schedule 10[4]	*% of Reduction in Friction Loss*
1"	1.049	1.097	20%
1¼"	1.380	1.442	19%
1½"	1.610	1.682	19%
2"	2.068	2.157	19%
2½"	2.469	2.635	27%
3"	3.068	3.260	26%
4"	4.026	4.260	24%
5"	5.047	5.295	21%
6"	6.065	6.357[2]	20%
8"	8.071[1]	8.249[3]	10%

[1] Schedule 30.
[2] 0.134" wall thickness — light-wall pipe
[3] 0.188 wall thickness — light-wall pipe
[4] ASTM A-135 light-wall steel pipe.

An illustration of the effect of specifying light-wall pipe as a substitute for standard-weight pipe in an automatic sprinkler system follows. A warehouse with high-piled storage of a type requiring 0.38 gpm per square foot over 2,000 square feet of floor area uses 17/32-inch orifice automatic sprinklers. The pressures required for this automatic sprinkler system are illustrated in Table 2 for both standard-weight and light-wall pipe.

Fire pump power demand in this example can be reduced by as much as 13 percent, depending on pump efficiency. Table 2 illustrates that this water supply will be required to deliver 16.7 psi less pressure at 760 gpm.

Smooth Interior Pipe Walls

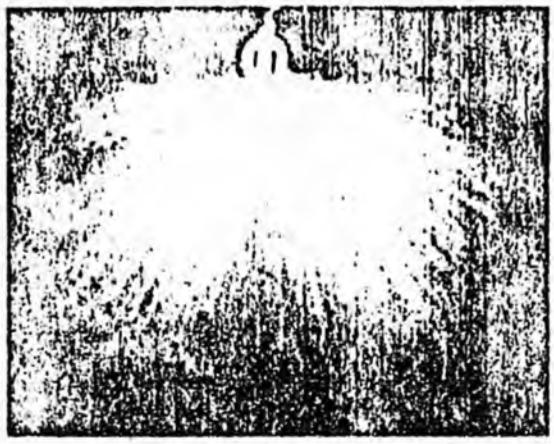
Friction loss is a function of interior wall roughness. Light-wall pipe, manufactured in accordance with ASTM A-135 specifications, is made by the electric-resistance weld process. The steel used to form this pipe is rolled, either cold or hot, and has a smooth surface. The pipe is generally formed cold, and thus has little opportunity for scale formation and roughening of the surfaces. Standard-weight pipe is often formed hot, and may include scale and other imperfections on its surfaces. Ten percent improvement in surface finish can result in a 16 percent reduction in friction loss.

Table 2

Pressure Required	*Standard-Weight*	*Light-Weight [illegible] or 40*
To obtain sprinkler discharge	22.6	22.6
Friction Loss		
Branch Line	32.0	26.1
Mains	45.0	34.2
Underground	15.0	15.0
Elevation	10.8	10.8
TOTAL	125.4	108.7

SUMMARY

1. Sprinkler system designers have an added option of using Schedule 10 light-wall pipe.
2. Substitution of Schedule 10 light-wall pipe for Schedule 40 pipe will significantly reduce the total pressure and power demand on the water supply.
3. Reduction in pressure requirements can save installed and operating costs as follows:
- Less horsepower required to deliver water;
- Smaller pumps or the ability to supply sprinkler systems from existing water supplies.
- Smaller pipe sizes — lower pipe cost — less weight — less labor and freight costs. △



Sprinklers Cut Fresno's Fire Losses and Budget

EDWARD J. REILLY and JOHN A. VINIELLO

IN THE 1960s, the city of Fresno, California began the process of basing its municipal firesafety program on the installation of automatic sprinklers. As a result, the city decreased its fire losses, decreased the percentage of the municipal budget allocated to its fire department, and improved its insurance rating.

Many of the details of the Fresno program were explained in a March 1975 FIRE JOURNAL article entitled "How the City of Fresno Achieved Better Fire Protection." A major element of the program was the enactment by the Fresno City Council in 1961 of the Dangerous Building Ordinance, which focused on the central business district and gave city officials the power to remedy the hazards resulting from unsafe buildings or structures. City officials were empowered to condemn those buildings or order their repair, renovation, or restoration so that they would meet the requirements of the *Fresno Building Code*.

Under the provisions of the Dangerous Building Ordinance, buildings owners could choose among several alternatives to bring their buildings up to the requirements of the *Building Code*. Most owners found that the most economical way to comply with the *Code* was to install automatic sprinklers.

The city coupled the Dangerous Building Ordinance with a funding plan that city officials arranged with the local agency that administered the federal urban renewal program in Fresno. Federal funds were provided to the city by the US Department of Housing and Urban Development for the acquisition of property and the demolition of buildings not worth saving. The city's agreement with the urban renewal agency specified that any new construction in the city's urban renewal area would be sprinklered in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. Finally, the urban renewal agency agreed to help interested owners find loans for building renovation. The agency did not, however, provide funds to owners or guarantee loans made to owners.

As a result of these two actions by the city — enactment of the Dangerous Building Ordinance and the agreement with the federal urban renewal agency — sprinkler protection became almost universal in the 18-block central business district and a separate 22-block area once considered a slum. More than 95 percent of all the buildings in both areas ultimately were protected by automatic sprinklers.

Representatives of the National Automatic Sprinkler and Fire Control Association (NAS), which was involved in the initial discussions that resulted in the Fresno program, revisited the city in 1977 to study the results produced by the program. What follows is a recounting of the effects that the organization found the program had made on the fire department and fire losses.

Fire Department Results

In 1955, Fresno's population stood at 115,000. By 1977, 69,500 people had been added to its population, a

Mr. Reilly is President of the National Automatic Sprinkler and Fire Control Association, Inc. Mr. Viniello is that organization's Vice-President of Field Operations.

APPENDIX II

65 percent increase. In 1955, Fresno covered only 21 square miles. By 1977, through a process of annexation, its area had jumped to 58 square miles. During the same period, the number of Fresno's engine companies increased from 9 to 11, a 22 percent increase. Total paid fire-fighting personnel increased from 218 men in 1955 to 276 men in 1977, a 26 percent increase. The number of fire fighters on duty around the clock remained unchanged: 68 men on duty during any 24-hour period in 1955, and 68 men on duty around the clock in 1977.

The burden per fire fighter had increased enormously between 1955 and 1977. In 1955, there were 3.2 fire fighters per square mile of area to protect. By 1977, the number of fire fighters per square mile was reduced to 1.2 men per square mile. Therefore, each fire fighter was required to protect more than 2½ times the number of square miles of area in 1977 than he was required to protect in 1956.

The number of fire fighters on duty during any 24-hour period decreased from 6.04 men per 10,000 in 1955 to 3.64 men per 10,000 in 1977. So the fire department was protecting almost twice as many people and property in 1977 as it had predicted in 1955, and had to cover over 2½ times the geographical area with only 20 percent more equipment, and virtually no increase in manpower.

In 1955, Fresno's fire department received so few deficiency points that it was rated as a Class 1 department. If the fire department were to maintain its Class 1 rating, 14 new fire stations would have to have been added between 1955 and 1976. Assuming a cost of $1 million per station, including land and construction costs, this $14 million acquisition would have cost the taxpayers about $2.2 million per year, assuming a 6 percent municipal bond issue floated over a 20-year period.

Fourteen pumpers would have to have been added to maintain a zero deficiency point rating. At $65,000 per truck, this additional cost would add about $145,600 per year to the fire department budget with the same 6 percent municipal bond float for the same 20-year period.

It is difficult to calculate with precision the impact of additional manpower required to maintain a zero increment in deficiency points resulting from a manpower shortfall. However, in 1955, the Fresno Fire Department was up to full complement: six men per company, on duty 24 hours a day. By 1976, only four men could roll on a call during any hour of the day or night.

If the three-platoon system (three men working 56-hour shifts around the clock) had been in existence in 1955, 84 new fire fighters would have been required to meet full manpower needs of the department. To say it another way, Fresno's 1977 department of 276 men would have to have been increased to 360 men if the department were to maintain its Class 1 rating. This would have added about $1.26 million per year to Fresno's fire department budget. This would have increased the 1977 fire department budget from about $9 million per year to about $12.6 million. About a 40 percent increase. If the fire department budget came to 13 percent of the total in 1955, it would have come to about 11 percent in 1977 if manpower, fire stations, and equipment were to be maintained at zero deficiency point levels.

Fire Losses

Between 1956 and 1966 per capita fire losses averaged $4.71. In the decade immediately following, per capita fire losses averaged $8.11. However, construction cost more than doubles every decade. NAS wanted to measure the cost of replacing buildings destroyed by fire, so it adjusted per capita fire losses to the Building Construction figures published by *Engineering News Record*. Adjusting per capita fire losses to the Building Code Index, "real losses" dropped 22.4 percent in that decade.

Of even greater significance is the fact that nonresidential losses averaged 62.1 percent at the beginning of the 20-year period. By 1976, nonresidential losses had plunged to 43.5 percent of the total, and it was these buildings that became the object of the intensive automatic sprinkler master plan.

Conclusions

The Fresno program is a comprehensive fire defense master plan.

In the decade that followed its implementation, the city's fire losses (adjusted for inflation) were cut by 22 percent.

The fact that 95 percent of two urban renewal areas covering 40 square blocks were protected throughout by automatic sprinklers under a combination of ordinances made it possible for the fire department to take full advantage of the 50 percent reductions permitted under the "fire flow" standards of the Insurance Services Office (ISO) grading schedule and the additional 25 percent credit given by ISO for superior construction. This resulted in the imposition of almost *zero* deficiency points against the water department.

Intelligent planning based upon a thorough understanding of the ISO grading schedule enabled the building and fire departments to take the steps needed to upgrade the city from an ISO Class 3 to Class 2 city.

The implementation of the plan resulted in economies in fire department operations of up to 40 percent of the total operating budget for that department. The 1977 fire department budget of $9 million would probably range up to about $12.6 million if the 84 added fire fighters, 14 pumpers, and 14 fire stations required to maintain a zero

(Continued on page 91)

THE LEGISLATURE OF THE STATE OF ALASKA
ELEVENTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. S. B. 370 and H. B. 648
Title An Act Relating to Fire Prevention
Requested by Legislative Finance Date 2-6-80

II. FISCAL DETAIL
Agency Affected Department of Community & Regional Affairs
Program Category Affected Development
Budget Request Unit(s) Affected Local Government Assistance

EXPENDITURES (Thousands of Dollars)

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84
100 PERSONAL SERVICES						
200 TRAVEL						
300 CONTRACTUAL						
400 COMMODITIES						
500 EQUIPMENT						
600 LAND & STRUCTURES						
700 GRANTS, CLAIMS, ETC.						
TOTAL	0	0	0	0	0	0

FUNDING (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER (Specify)						

POSITIONS

FULL TIME						
PART TIME						
TEMPORARY						

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III)

No fiscal impact to this agency. There may be fiscal impact to Department of Commerce and Economic Development.

IV. DATE 2/5/80 PREPARED BY LaDonna Brown *LaDonna Brown*
AGENCY Local Government Assistance Division
PHONE 465-4739

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named)

33-001 (Rev. 10/78)

CATEGORY: DEVELOPMENT | **AGENCY:** COMMUNITY AND REGIONAL AFFAIRS

PROGRAM: COMMUNITY DEVELOPMENT | **BRU (s):** LOCAL GOVERNMENT ASSISTANCE

The Local Government Assistance BRU assists communities in attaining or sustaining viable units of local government according to established criteria. Particular emphasis is given to communities having local governments that are organized under state law with population less than 2,000. Components include Training and Development, State Assessor, Local Boundary Commission (Administration), Revenue Sharing (Administration) and Coastal Energy Impact Program.

The Training and Development Component provides local government officials with an opportunity to learn or improve skills needed to administer local government. Offices in Juneau, Anchorage, Nome and Bethel provide individual technical assistance for specific needs. Included in this program is the administration of Rural Development Assistance grants which, in FY 80, was in the Community and Rural Development BRU.

The State Assessor assists local government with procedures for determining local property taxes based on full and true value. This component also administers property relief programs, and researches economic data relating to property tax assessments and municipal financing.

The Local Boundary Commission component reviews and makes recommendations on requests for changes to or establishment of municipal boundaries. The intent is to ensure that the proposed changes will facilitate improvements in municipal services. This program also administers a grant program which makes grants of up to $25,000 for newly incorporated municipalities or those assuming special new powers such as police and fire protection.

The Community Legal Assistance Component provides grants to local governments for the purpose of bolstering their legal capabilities by enabling them to purchase appropriate resources to resolve legal issues. These grants may not exceed $20,000.

The Revenue Sharing Administration Component provides the personnel and expertise required to determine eligibility of municipalities to receive revenue sharing grants as well as determine their program allocation.

The Coastal Energy Impact Program is designed to assist those coastal communities, through federal grants from the U.S. Department of Commerce, who expect to be impacted by off-shore energy projects. Two positions will be federally funded in FY 81 to monitor existing grants and bond guarantees and to make future determinations on awarding bond guarantees from CEIP funds obligated to the Alaska Municipal Bond Bank.

COMPONENT DESCRIPTION	79 AUTH	79 FINAL	79 ACT	80 AUTH	80 SUPL	80 RP	GOVERNOR
TRAINING, DEVELOP, & RDA	473.4	515.3	471.6	488.9			740.9
STATE ASSESSOR	247.7	258.9	210.1	235.9			283.8
LOCAL BOUND. COMM-ADMIN	87.2	91.2	84.9	86.0			91.7
REVENUE SHARING ADMINISTRATION	85.4	89.9	77.8	72.5			73.7
COAST ENERGY IMPACT PROGRAM	364.7	886.4	585.2	376.9			585.2
ADMINISTRATION	592.9	625.2	578.5	598.5			
** TOTAL	1851.3	2466.9	2008.1	1858.7			1775.3
** CHANGE VERSUS 80 AUTH							-4.4%
OBJECT DESCRIPTION							
PERS. SERV.	1144.1	1184.9	1105.6	1179.8			952.9
TRAVEL	210.4	214.4	170.5	180.9			120.3
CONTRACTUAL	191.6	216.2	138.8	182.3			157.3
COMMODITIES	17.7	16.2	10.9	14.9			12.5
EQUIPMENT	6.5	8.5	8.4	2.1			29.1
LANDS/BLDGS	3.0	3.0	2.9	4.0			3.2
GRANTS, CLMS	278.0	823.7	521.0	294.7			500.0
FUNDING SOURCE							
FED. RECEIPT	648.7	1226.4	856.9	660.9			585.2
G. F. MATCH	71.0	77.3	67.9	71.0			
GENERAL FUND	1131.6	1163.2	1083.3	1126.8			1190.1
** GENERAL FUND CHANGE VS. 80 AUTH							-0.6%
POSITIONS							
FULL-TIME	34.0	34.0	34.0	34.0			25.0
PART-TIME	7.0	7.0	7.0	7.0			9.6
STAFF MONTHS	450.0	450.0	450.0	450.0			357.6

THE LEGISLATURE OF THE STATE OF ALASKA
ELEVENTH LEGISLATURE

FISCAL NOTE

I. REQUEST
Bill/Resolution No. HB 648 & SB 370
Title An Act Relating to Fire Prevention.
Requested by ____________ Date ______

II. FISCAL DETAIL
Agency Affected Dept. of Commerce & Economic Development
Program Category Affected Development
BRU, Program, or Subprogram(s) Affected Division of Business Loans
(Note: If more than one budget component is affected, separate line-item amounts and funding for each component in the analysis section.)

EXPENDITURES (Thousands of Dollars)

		FY 80	FY 81	FY 82	FY 83	FY 84	FY 85
100	PERSONAL SERVICES		55.2	60.7	66.8	73.4	80.7
200	TRAVEL		5.5	6.1	6.7	7.4	8.1
300	CONTRACTUAL		12.4	13.6	15.0	16.5	18.2
400	COMMODITIES		.5	.6	.7	.8	.9
500	EQUIPMENT		3.6	-	-	-	-
600	LAND & STRUCTURES						
700	GRANTS, CLAIMS, ETC.						
	TOTAL		77.2	81.0	89.2	98.1	107.9

FUNDING (Thousands of Dollars)

	FY 80	FY 81	FY 82	FY 83	FY 84	FY 85
GENERAL FUND		77.2	81.0	89.2	98.1	107.9
FEDERAL FUNDS						
OTHER (Specify Fund Source)						

POSITIONS

	FY 80	FY 81	FY 82	FY 83	FY 84	FY 85
FULL TIME		2.0	2.0	2.0	2.0	2.0
PART TIME						
TEMPORARY						

III. ANALYSIS (See Fiscal Note Preparation Instructions, Section III).

Additional staff needed to give preferential treatment to fire prevention related loans.
See attached fiscal note detail.

Sharon R Traylor

IV. DATE February 19, 1980 PREPARED BY Sharon R. Traylor, Director
AGENCY Div. of Business Loans/ Dept. of Commerce & Eco Dev
PHONE 465-2510

Original: Legislative Finance
cc: Budget and Management
Prime Sponsor (First Legislator Named)

33-001 (Rev. 12/79)

FISCAL NOTE DETAIL, HB648 & SB370

Fire Prevention Related Loans

			12 Months
100.	1 Loan Examiner I/II (flex) @2,289/mo.		$27.5
	1 Clerk Typist III @1,277/mo.		15.3
			$42.8
	Standard Benefits (Wages x.1529)		6.5
	Supplemental Benefits (Wages x.0665)		2.8
	Health Insurance (Man months X $127)		3.1
	Total Personal Services		$55.2
200.	Trips to inspect collateral and close loans:		
	10 Trips @430	$4.3	
	20 Days per diem @60	1.2	5.5
300.	Telephone, postage, printing	$10.0	
	Additional office space @200/mo.	2.4	12.4
400.	Office supplies		.5
	12 Months Operating Costs		$73.6
500.	2 Desks @278	$ .6	
	1 Credenza	.3	
	1 Typist's extension	.4	
	1 Executive chair	.2	
	1 Secretarial chair	.1	
	2 Side chairs @125	.3	
	2 File cabinets @202	.4	
	2 Calculators @225	.5	
	1 Typewriter	.8	3.6
	Total		$77.2

10% Inflation for succeeding years.

Original sponsors: Malone and Duncan

Offered: 3/7/80
Referred: Finance

IN THE HOUSE

BY THE COMMUNITY AND REGIONAL AFFAIRS COMMITTEE

CS FOR HOUSE BILL NO. 648

IN THE LEGISLATURE OF THE STATE OF ALASKA

ELEVENTH LEGISLATURE - SECOND SESSION

A BILL

For an Act entitled: "An Act relating to fire prevention."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. AS 29.53.060(a) is amended to read:

(a) The assessor shall assess property at its full and true value as of January 1 of the assessment year, except as provided in this section and AS 29.53.030, 29.53.035, and 29.53.160. The full and true value is the estimated price which the property would bring in an open market and under the then prevailing market conditions in a sale between a willing seller and a willing buyer both conversant with the property and with prevailing general price levels. The assessor may not include the value of a fire protection system in the assessment of the full and true value of a building.

* Sec. 2. AS 29.53.060 is amended by adding a new subsection to read:

(d) In this section, "fire protection system" means a fire protection system as defined in the National Fire Codes published by the National Fire Protection Association.

* Sec. 3. AS 42.05.381 is amended by adding a new subsection to read:

(d) A utility may not charge a fee or surcharge for standby water for fire protection systems which use hydraulic sprinklers.

* Sec. 4. AS 42.05.701 is amended by adding a new paragraph to read:

(9) "fire protection systems" means fire protection systems as defined in the National Fire Codes published by the National Fire Protection Association.

* Sec. 5. AS 45.95.020(a) is amended to read:

(a) The commissioner shall, under regulations and policies adopted by him, make small business loans to acquire, finance or refinance or equip businesses, including farming equipment, fire protection equipment, mining and fishing, not exceeding $500,000. The loans shall be secured by acceptable collateral and may not exceed 75 percent of the appraised value of the collateral offered as security. The rate of interest may not exceed nine and one-half percent a year on the unpaid balance. The commissioner shall give preference in the granting of loans under this section to applications for loans the purpose of which is to purchase and install fire protection equipment.

* Sec. 6. AS 45.95.020 is amended by adding a new subsection to read:

(e) The commissioner may not disqualify an applicant for, or prejudice an applicant's privilege to receive, a loan to purchase and install fire protection equipment because of a loan already made to the applicant under this chapter.

* Sec. 7. AS 45.95.080 is amended by adding a new paragraph to read:

(2) "fire protection equipment" means fire protection or fire alarm systems as defined in the National Fire Codes published by the National Fire Protection Association.

* Sec. 8. AS 44.33.170 is amended by adding new subsections to read:

(b) Tourist attraction development matching money may also be obtained for the purpose of purchasing and installing fire protection equipment for a building used or to be used for the purposes described in (a) of this section.

(c) In (b) of this section, "fire protection equipment" means fire protection or fire alarm systems as defined in the National Fire Codes published by the National Fire Protection Association.

Introduced: 1/31/80
Referred: Community & Regional Affairs and Finance

IN THE HOUSE BY MALONE AND DUNCAN

HOUSE BILL NO. 648

IN THE LEGISLATURE OF THE STATE OF ALASKA

ELEVENTH LEGISLATURE - SECOND SESSION

A BILL

For an Act entitled: "An Act relating to fire prevention."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. AS 29.53.060(a) is amended to read:

(a) The assessor shall assess property at its full and true value as of January 1 of the assessment year, except as provided in this section and AS 29.53.030, 29.53.035, and 29.53.160. The full and true value is the estimated price which the property would bring in an open market and under the then prevailing market conditions in a sale between a willing seller and a willing buyer both conversant with the property and with prevailing general price levels. The assessor may not include the value of a fire protection system in the assessment of the full and true value of a building.

* Sec. 2. AS 42.05.381 is amended by adding a new subsection to read:

(d) A utility may not charge a fee or surcharge to provide standby water for fire protection systems which use hydraulic sprinklers.

* Sec. 3. AS 45.95.020(a) is amended to read:

(a) The commissioner shall, under regulations and policies adopted by him, make small business loans to acquire, finance or refinance or equip businesses, including farming equipment, fire protection equipment, mining and fishing, not exceeding $500,000. The loans shall be secured by acceptable collateral and may not exceed 75 percent of the appraised value of the collateral offered as security. The rate of interest may not exceed nine and one-half percent a year on the unpaid balance. The commissioner shall give preference in the granting of loans under this section to applications for loans the purpose of which is to purchase and install fire protection equipment.

* Sec. 4. AS 45.95.020 is amended by adding a new subsection to read:

(e) The commissioner may not disqualify an applicant for, or prejudice the applicant's privilege to receive, a loan to purchase and install fire protection equipment on the basis of a prior or present loan t· the applicant under AS 45.95.

* Sec. 5. AS 44.33.170 is amended by adding a new subsection to read:

(b) Tourist attraction development matching money may also be obtained for the purpose of purchasing and installing fire protection equipment for a building used or to be used for the purposes described in (a) of this section.