

HB

648

CARA

BILL WORK SHEET

HB

BILL NO. 648 re Fire Prevention

Received from _____
Referred to Finance

Original Sponsor Malone/Dunon
Fiscal Note requested 2/14 Fred Fischer

David Creekman ²⁵⁰⁴ Comm. Fiscal Note

2/26

Companion Bill SB 370 (CIRA)
(Murray) Paletta Bradley 3748
CONTACTS: 374 contacted contacted

LAA Legal Research Contact _____

State Fire Protection people
originated

✓ Malone 3799 (Joan)

✓ Dunon 3818 (Dale)

How many other municipalities

✓ Fred Fischer 4723 C+RA - fiscal note

David Creekman 2504 Comm. & Co. Sec. - call 2/19 re Dept. position

A.P.U.C. - 276-6222 Ray Wisperman

Involved in controversy over rate. Regulatory + political problem. Municipality took over fire protection (CA utilities privately owned) municipality paying for.

Approved paying CAU for fire protection. Sprinklers not covered.

Arrived at municipal utilities, possibly.

Gordon - personally likes sprinklers so. Rate conservation groups

a criteria - spreading costs

cost user - cost payer

City - Arch. study (3 yrs. ago) - estab. A rate

modified sprinkler rate

must be some way of levying rate

Demand charge should be levied!

Brian Shute - Arch. Attorney, March 21 - scheduled standing A fee - back charges

Robert P. Shernberg - Fire Marshall, Nat. Fire Dept.

Remain - may testify

Demand charge - connection's line charge, shouldn't be monthly charge. Demand charges clear against sprinkler systems. Monthly demand charge based on size of hook up. Ask A.P.U.C. re regulation

Malone

Ferbitz - Section 2

Who is going to pay -
Operating costs

Dry wet systems

2 components - demand charge

pipes fitted for main =

contribution - main -

usage - 1 flush toilet

certain amt. of sizing

Water Study -

All water utilities not owned by a
municipalities

CAU utilities -

Tariff filing - no scientific way of
12 communities approval.

Demand charge -
Tariff from around the

Liability exposure
if people burn they
pay.

Tariff \$70-80 -

Sett. 1 - Fire protection equipment off tax roles
Definition of "equipment." There was "community" tried
to include swimming pool -

B

Sett 3 - definition fire protection -
approved by Insurance Rating Service

Commerce Done Cushman - leg. contact
Opposed Sharon Traylor, Director of Business Loans
Difficult to.



Alaska State Legislature

House of Representatives

Committee on

Pouch V
State Capitol
Juneau, Alaska 99811

Official Business

Community & Regional Affairs

BILL NUMBER AND TITLE: HB 648 Relating To Fire Protection

ORIGINAL SPONSOR: Malone/Duncan
RECEIVED FROM: _____

OTHER SPONSORS: _____
FURTHER REFERRALS: Finance

HEARING DATE: 2/20/80

MEMBERS PRESENT:	Bill Parker	X	Pat Carney	X
	Margaret Branson	X	Charlie Parr	X
	Pat O'Connell	X	Fred Zharoff	X
			Ray Metcalfe	X

Robert Shirenberg, Kenai

25 years in fire service. Discusses history of protection and the poor record of fire protection from loss of life and property damage. Mentions effects of public and private fire systems/This bill would give businessmen an incentive to install fire systems. Efforts are directed at containing fire and confining it to one individual piece of property. In the major fires experienced in the state, the amount of loss has been substantial. The proposed incentives in the bill will allow businessmen to have a cost effective method of protecting their businesses. Insurance costs would be reduced. In rural area this would be especially important. As growth continues in the state, the situation will become worse. Passage of this bill would assist in general public fire protection. The costs associated with protecting a non-protected building are astronomical. These costs are greatly reduced with sprinkler systems. If such systems are removed from the tax rolls, there is a great incentive.

Sharon Trailer - Div. of Loans

Fire protection loans are available now. The preferred treatment indicated in the bill for fire protection loans would be a problem and would require a reallocation of resources within the dept. There would need to be additional staff.

Parr - Doesn't see that this would be a problem. Field officers should be able to rubber stamp fire protection loan applications to indicate what they are for.

Marie Pignalberi, Deputy Commissioner of C&RA

Dept. is opposed to the bill. It is further eroding the "full and true value" definition as used by the assessor. It erodes the property tax base and places an unfair burden on others. If committee wants to go this route, it should place this as an exemption under AS29. If the state mandates such exemptions, there should be consideration of reimbursement to the communities.

COMMITTEE ACTION: No Action

TAPE # 2 SIDE 1&2 Footage 00-820 (Side 1) 238-461 (Side 2)

Parr - p. 1 lines 16-17 Parr questions if these are retroactive.

McCarter - Says that the value of an existing or new structure would be covered.

Chitwood, Ak. Municipal League

Since the bill mandates an exemption there should be reimbursement to the municipalities. Corresponding benefit to the community is recognized by the League.

Parr - Permissive language re "full and true value" might be considered. Leave it up to the communities to decide.

Chitwood - Local government might be penalized in school foundation formula as the figure is used in that formula.

Gordon Zerbitz, Ak. Public Utilities Commission

Discusses reason for standby rate and the problems with eliminating totally the charge associated with such standby supply for sprinkler systems.

Parr - Doesn't see any justification for standby rates.

Zerbitz - Magnitude of rates are of concern.

O'Connell - Would Commission be open to reducing rates?

Zerbitz - Requirements are placed re "delivery" on demand--that is the basis for the rates.

Jeff Hill, A., State Firefighters

Supports bill. Passed resolution of support #799.

Gary Croize, Dept. of Public Safety

Supports bill. It provides incentives necessary. (Questions what is included in definition of fire protection systems in bill? Definition is unclear.

Lee Challager, Pres. of Fire Fighters

Anchorage fire fighters have been opposed to standby rate. Give full support to the bill.

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)

GENERAL FUND		77.2	81.0	89.2	98.1	107.9
FEDERAL FUNDS						
OTHER (Specify Fund Source)						

POSITIONS

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 & Econ. Dev.
PHONE 455-2510

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

FISCAL NOTE DETAIL, HB648 & SB370

Fire Prevention Related Loans

		<u>12 Months</u>
100.	1 Loan Examiner I/II (flex) @2,289/mo.	\$27.5
	1 Clerk Typist III @1,277/mo.	15.3
		<u>\$42.8</u>
	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	<u>\$55.2</u>
200.	Trips to inspect collateral and close loans:	
	10 Trips @430	\$4.3
	20 Days per diem @60	<u>1.2</u>
		5.5
300.	Telephone, postage, printing	\$10.0
	Additional office space @200/mo.	<u>2.4</u>
		12.4
400.	Office supplies	<u>.5</u>
	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	<u>.8</u>
		3.6
	Total	\$77.2

10% Inflation for succeeding years.

BILL ANALYSIS

ASSIGNMENT DATE 2-1-80

UNASSIGNED _____

DEPARTMENT Public Safety	SPONSOR (PRINCIPAL) Colletta and Bradley	BILL NO. SB 370
DEPARTMENT POSITION Support		
DIVISION DIRECTOR Ronald A. Hendrie	DATE 2-13-80	COMMISSIONER William R. Nix
		DATE 2/14/80
GOVERNOR'S OFFICE USE		
<input type="checkbox"/> POSITION NOTED <input type="checkbox"/> POSITION APPROVED <input type="checkbox"/> POSITION DISAPPROVED		
BY: _____ DATE: _____		
SUMMARY		
(1) IDENTICAL TO HB 648 INTRODUCED 1/31/80 (1) RELATED BILLS (SIMILAR OR CONFLICTING) (2) Department of Commerce & Economic Development (2) OTHER AGENCIES AFFECTED BY BILL		
(2) a. ORGANIZATIONAL SUPPORT FOR BILL Alaska Fire Chiefs Association Alaska State Firefighters Association		(2) b. ORGANIZATIONAL OPPOSITION TO BILL Unknown
(3) PROGRAM EFFECTS OF BILL		
The incentive aspects of the bill (voluntary or regulated installation of private fire protection systems) will favorably affect fire prevention and protection programs and efforts at the <u>state and local levels</u> .		
(4) FISCAL IMPACT: <input type="checkbox"/> NONE <input type="checkbox"/> FISCAL ANALYSIS ATTACHED		
(5) AMENDMENTS PROPOSED:		
None		

(6) COMMENTS:
 The provisions in this bill provide the incentive and means and methods for the installation of private fire protection systems in private property which will in turn enhance and support the public fire protection systems and capabilities of communities throughout Alaska. Many communities are being faced with providing additional fire protection services and with the costs associated with providing those services. A community fire protection incentive program can provide an alternative to the increasing costs of fire protection. A long term affect of such a program would be in the area of security of a communities assets, e.g. private fire protection systems protect the economics of the community by providing security for the businesses that provide the tax base and employment of those within the community. Both the direct and indirect socioeconomic impacts, from fire, would be reduced.

BRIAN R. SHUTE
ATTORNEY AT LAW
1026 WEST 4TH AVENUE, SUITE 208
ANCHORAGE, ALASKA 99501
(907) 274-6644

February 29, 1980

The Honorable Bill Parker
Pouch V
Juneau, Alaska 99811

Dear Mr. Parker:

Re: Definitions of Fire Protection Systems in
House Bill 648

At the House Community and Regional Affairs Committee hearings on the above bill, a question concerning definition of fire protection systems was raised. The State Fire Chiefs Association explained their understanding of the bill was that it would cover those fire protection and fire alarm systems as defined in the National Fire Codes. What follows is a suggested definition of fire protection systems.

Fire protection systems are those systems as defined in the National Fire Codes, current edition, published by the National Fire Protection Association.

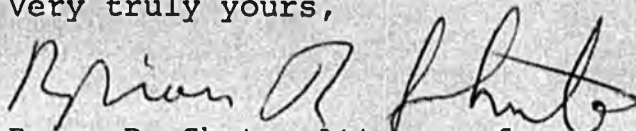
The systems include, but are not limited to, the following: Foam extinguishing systems, high expansion foam systems, carbon dioxide systems, Halon 1301 systems, Halon 1211 systems, dry chemical systems, water operation fixed systems, foam/water sprinkler and supply systems, standpipe and hose systems, hydraulic sprinkler systems, and associated pumps and tanks as required for the foregoing systems.

Fire alarm systems include, but are not limited to: supplemental station signalling systems, local protective signalling systems, auxiliary signalling systems, remote station signalling systems, proprietary signalling systems, automatic fire protection systems.

The growing public support for this bill is indicative of its benefit. The Alaska Fire Chiefs Association and the Alaska State Fire Fighters Association emphatically urge its enactment.

If you have any questions please do not hesitate to call.

Very truly yours,



Brian R. Shute, Attorney for
Alaska Fire Chiefs Association and
Alaska State Fire Fighters Association

March 11, 1980

Mr. James Evans, President
Alaska Fire Chiefs' Association
211 W. 7th Avenue
Anchorage, Alaska 99504

Dear Mr. Evans:

As a member of the House Community and Regional
Affairs Committee, I listened to the testimony on
HB 648, about which you wrote on March 4. I voted
"Do Pass" in the Committee and will support the
bill.

Sincerely,

Charles H. Parr

CHP:vc

Alaska Fire Chiefs' Association

March 4, 1980

The Honorable Charles H. Parr
Pouch V
Juneau, Alaska 99811



Dear Representative Parr:

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.

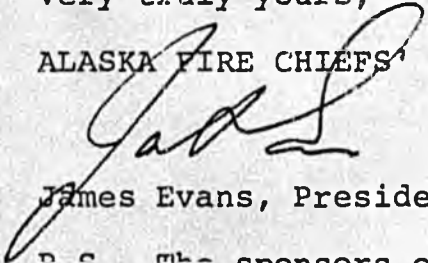
This bill will make low interest loans available to property owners to finance the installation of private fire protection systems, it will provide tax credits to property owners with private fire protection systems, and it will eliminate water standby utility charges on property owners' utility bills. 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
Committees: Community and
Regional Affairs

Malone, Duncan
Community and
Regional Affairs



Greater Ketchikan Chamber of Commerce

2415 Hemlock - 110 — Ketchikan, Alaska 99901

Telephone (907) 225-3184

Community and Regional Affairs Committee
House of Representatives
Alaska State Legislature
Pouch V
Juneau, AK 99811

February 14, 1980

Dear Sirs:

The Board of Directors of the Greater Ketchikan Chamber of Commerce would like to go on record as fully supporting House Bill 648 and Senate Bill 370, regarding "An Act relating to fire prevention".

Best regards,

Sally Smith
President
Greater Ketchikan Chamber of Commerce

cc: Community and Regional Affairs Committee
Senate
Alaska State Legislature

Representative Terry Gardiner
Representative Oral Freeman
Senator Robert H. Ziegler, Sr.





Greater Ketchikan Chamber of Commerce

2415 Hemlock - 110 - Ketchikan, Alaska 99901

Telephone (907) 225-3184

RESOLUTION

(An Act Relating to Fire Prevention)

WHEREAS: The Greater Ketchikan Chamber of Commerce Board of Directors has evaluated House Bill #648 and Senate Bill #370 and;

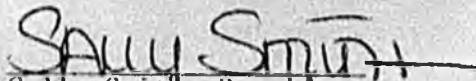
WHEREAS: The Greater Ketchikan Chamber of Commerce Board of Directors has determined that Fire Protection systems should not be included in the assessment value of a building and;

WHEREAS: The Greater Ketchikan Chamber of Commerce Board of Directors has determined that a Utility Company should not be entitled to levy charges for water to hydraulic sprinkler fire prevention systems per unit and

WHEREAS: The Greater Ketchikan Chamber of Commerce Board of Directors has determined that the directives indicated in these bills are in the best interest of preventative operations relating to fire protection;

BE IT THEREFORE RESOLVED: The Greater Ketchikan Chamber of Commerce Board of Directors recommends immediate passage of House Bill #648 and Senate Bill #370 as they read in identical form.

Approved and adopted this 13th day of February, 1980, by the Greater Ketchikan Chamber of Commerce Board of Directors.


Sally Smith, President
Greater Ketchikan Chamber of Commerce



KETCHIKAN RAINBIRD

RECOMMENDATIONS
FROM THE
ALASKA FIRE CHIEF'S ASSOCIATION
ALASKA STATE FIREFIGHTER ASSOCIATION

FOR
ADOPTION OF THE
COMMUNITY FIRE PROTECTION INCENTIVE PROGRAM

*Get bill drafted
change loan part.*

Material Prepared By:
Robert R. Shirnberg
Fire Marshal
Nikiski Fire Dept.
Chairman Ad-Hoc Committee
ASFA/AFGA
December-2-1979

The Alaska State Firefighters Association and the Alaska Fire Chief's Association, at their respective annual meetings in October of 1979 in Petersburg, Alaska, were presented a program entitled, "Community Fire Protection Incentive Program".

Both the Alaska State Firefighters Association and the Alaska Fire Chief's Association submitted to their respective memberships a resolution calling for support in the preparation of program material to enact the Community Fire Protection Incentive Program during the 1980 session of the Alaska State Legislature. Both bodies passed unanimously this resolution.

A joint AD-HOC committee was formed, comprised of members of the ASFA and the AFCA to prepare the necessary material and to carry out the legislative program presentation.

The State of Alaska has the honor of being Number #1 in many categories. We are by far the largest state in the Union. Our fisheries and resources from the sea are Number #1 in value. Our resources on oil and gas production are approaching Number #1. Our mineral potential is the greatest of all states.

Our state also has the dubious honor of being Number #1 by some margin in the loss of life per capita by fire and the property dollar loss per capita. It appears that the growth of our state is assured with projections of ship building facilities, processing and support facilities for a bottom fishing industry, oil and gas production with related petrochemical industrial plants, mineral development, etc. With the population and constructions that will come with this growth and with our present methods of providing fire protection, we will retain the dubious honor of being Number #1 in per capita loss of life and property damage as a result of fire.

We in the fire service recognize that a new approach in providing for both public and private fire protection needs must be developed. We recognize that the Community Fire Protection Incentive Program does offer the method to redirect fire protection systems and combine the best features of both public and private fire protection in a manner that will improve and better the community against the ravages of fire. It provides a method whereby the costs for public fire protection can be controlled as the community expands and grows.

The Community Fire Protection Incentive Program provides a method whereby the private property owner and businessman will have the incentive and support necessary to provide for the installation of private fire protection systems in their property. This incentive is created through a three-part program as follows:

~~Permanent Revolving Loan Fund~~

*Include in
Small Business Loans Program*

~~This loan fund will provide loans to private property owners and businessmen at an interest rate and such terms that will create an incentive to install private fire protection systems such as hydraulic sprinkler systems.~~

~~The terms of the loan will be such that the direct insurance saving received for the installation of the sprinkler system will be calculated in the repayment schedule. It is the intent that the property owner will realize a real dollar return on the installation of the sprinkler system. An example would be~~

~~that if the net insurance saving was \$6,000 annually, the loan terms would require a \$4,000 annual payment, resulting in a net return to the property owner of \$2,000 annually until the loan has been paid off, at which time the property owner would receive the entire \$6,000 benefit.~~

Tax Incentive

Remove from the property tax rolls the assessed value of the private fire protection system. There is no question of the roll that the private fire protection has in supporting the public fire protection system. It is taken into consideration in the I.S.O. rating schedule, it has a decided effect on reducing the overall insurance rating of a community's fire defenses. It protects the community's tax base. It protects the jobs and the economy of the community.

With our present policy of taxing private fire protection systems, we discourage the property owners from installing such voluntary systems.

Again, the private property owner and business man will be encouraged to install private fire protection systems if we remove the tax burden that is placed on such systems.

Water Standby Surcharge for Sprinkler Connections

Some water utilities have placed an excessive standby water rate to property owners that have installed hydraulic sprinkler systems in their property. In many cases these special rates have eliminated or exceeded any dollar saving the property owner may have enjoyed because he has installed a sprinkler system.

In some cases the owners of property equipped with sprinkler systems have shut the sprinkler system down and discontinued its use and accepted the higher insurance rate because there was a dollar saving between the water standby rate and the increased insurance premiums.

As can be seen, the excessive water rate charge is a direct attack on the incentive to install private fire protection systems.

Therefore, it is necessary that special water rates for properties equipped with sprinkler systems be reduced to a very nominal fee or eliminated altogether.

This program intent is to provide for the property owners and businesses the incentive and assistance to install fire protection systems. The program is to be made available to property owners in all areas of the state of Alaska, from the larger municipalities to the smaller communities and very rural areas. To those communities with full-time paid fire departments; to those with volunteer fire departments, and also those areas without any fire protection at all. The program makes assistance available to areas that are isolated, such as remote cannery locations, and a method to provide for fire protection of such facilities.

With such a program in effect and within a few short years, we will see a decided reduction in our property fire loss and loss of life from fire. We will realize a direct saving in the cost of our public fire protection systems. We will be able to better meet the fire protection needs of our expanding and growing communities, and be able to control the costs of this expansion.

Fewer jobs will be lost through catastrophic fires, the economy better protected, the tax base of the community better assured, and those public programs that are supported by the tax base better protected.

DEFINITIONS OF FIRE PROTECTION SYSTEMS

Fire protection and fire alarm systems are those systems as defined in the National Fire Codes, current edition, published by the National Fire Protection Association.

These systems include, but are not limited to the following: Foam Extinguishing systems, High Expansion Foam systems, Carbon Dioxide systems, Halon 1301 systems, Halon 1211 systems, Dry Chemical systems, Water Spray Fixed systems, Foam/Water Sprinkler and Spray systems, Standpipe and Hose systems, Hydraulic Sprinkler systems, and associated pumps & tanks as required for the foregoing systems.

Fire Alarm systems include, but are not limited to: Central Station signaling systems, Local Protective signaling systems, Auxiliary systems, Remote Station signaling systems, Proprietary signaling systems, Automatic Fire Detection systems.

Correspondence
Received

Stran

The other way to build
AUTHORIZED BUILDER

Kenai Steel Buildings, Inc.

P. O. Box 340 - Kenai, Alaska 99611 - (907) 283-7810

February 28, 1980

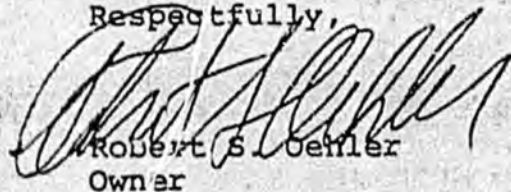
Representative Hugh Malone
Alaska State Legislature
Pouch V
Juneau, Alaska 99811

Dear Representative Malone:

This is a letter of support for House Bill No. 648.
I am very pleased that you and Representative Duncan
have taken the initiative to introduce this measure.

This legislation will certainly support the businessman
and encourage him to install fire protection systems in
his property; which will lead to improved fire protection
for our communities, along with reduced costs for fire
protection services.

Respectfully,



Robert S. Gensler
Owner

RSO/lc



South Central
Fire Prevention
Council

"Lands, Homes, and Lives"

February 19, 1980

Representative Bill Parker
Chairman
House Community and Regional Affairs Committee

Dear Representative Parker:

(HB 648)
We strongly support and recommend that the Community and Regional Affairs Committee act favorably and recommend DO PASS to Senate Bill No. 370, an Act relating to fire prevention.

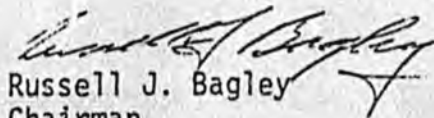
We feel the provisions of this act that will allow businessmen and property owners to receive loans at terms and interest as proposed, will encourage the installation of fire protection systems. An additional incentive will be created for the property owner by removing the fire protection systems from the real property tax roles.

This bill addresses and removes the inequity in water utility rates charged to property owners who have installed hydraulic fire protection systems.

All three of the provisions of this bill will create the much needed incentive that will allow property owners to make the needed installation of fire protection systems a reality. This will, in years to come, reduce the costs and demands of the public fire departments, and will assist greatly in bringing our escalating loss of life and property under control; reducing this loss and bringing together the public and private fire protections to provide the most cost effective method of providing for the fire protection needs of our communities.

Your support on this legislation will be greatly appreciated by those of us who work daily in the areas of fire prevention and suppression.

Respectfully Yours,


Russell J. Bagley
Chairman

RJB:dgs

Representing All Agencies Concerned With Fire Prevention And Education
In South Central Alaska

Cordova Chamber of Commerce

BOX 99

"The Friendly City"

CORDOVA, ALASKA 99574



MT. ECCLES

January 30, 1980

Mr. Robert Shirnberg
Post Office Box 1167
Kenai, Alaska 99611

Dear Mr. Shirnberg,

This is to inform you that on January 29, 1980, the Cordova Chamber of Commerce took action supporting proposed legislation for the installation of Private Fire Protection Systems.

The following are specific concepts supported by this Chamber:

1. Low interest or no interest loans with a minimum of paperwork to be made available to businesses for the purpose of installing Private Fire Protection and Suppression Systems.
2. That loan payments be held to the amount saved on the establishment's fire insurance premium.
3. That legislation be passed urging local municipalities to not increase the assessed evaluation of the property because of the installation of such system, whether it be named as an improvement or any other such designation.
4. That sufficient publicity be given to business people in all communities.

The Chamber of Commerce feels that incentives for the installation of Private Fire Protection and Suppression Systems will reduce the loss of lives, property, and lost man-hours due to destruction of business property.

Sincerely,

Robert L. Varnam

cc: Alaska Fire Chief's Association, Alaska State Fire Fighter's Association, Cordova City Council

Home of the Iceworm

"City of Petersburg"

*P. O. Box 329
Petersburg, Alaska 99833
(907) 772-4511*

February 29, 1980

Ginnv Chitwood, Executive Director
Alaska Municipal League
204 North Franklin Street
Juneau, Alaska
99801.

Re: Exempting Fire Protection Svstems from Municipal Property Tax
Assessment (HB-648)

Dear Ms. Chitwood:

The proposal to exempt fire protection svstems from local property tax assessment is absurd. Although the goal is admirable, it would tend to disrupt the fairness of the property tax. All property should be on the tax rolls so that the tax rate is at a minimum and all property owners will be paying on the same basis. By exempting certain property, the tax rate will increase and the tax burden will be on fewer taxpayers.

Also, if fire protection svstems are worthy of a tax exemption, why not other exemptions for other worthy improvements (eg. better locks thus reducing burglaries, fireproofing walls, etc.).

Finally, it was reported that no financial encouragement is needed at this time due to the significant reduction of insurance rates when a fire protection svstem is installed. For example, one local business paid for a sprinkler svstem in four years due to reduced insurance rates. Surely this is incentive enough.

Cordially,



Bruce Aronson
City Manager

BA/dlc

COMMUNITY FIRE PROTECTION INCENTIVE PROGRAM

Prepared by Robert R. Shirnberg

October 20, 1979

Fire Marshal

Tikiiki Fire Department

283-4202

P.O. Box 1167, Kenai 99611

V
P

COMMUNITY FIRE PROTECTION INCENTIVE PROGRAM

This program is designed to provide the means and methods for the installation of private fire protection systems in private property and to enhance and support the public fire protection systems of the communities throughout the state of Alaska. This is to be accomplished through the combination of three approaches:

1. Establish a loan fund to provide loans to private property owners for the installation of fire protection systems.
2. A tax incentive for property owners by removing from the property tax rolls the assessed value of the private fire protection system.
3. Control the water standby rate charge, charged by water utilities for large diameter service to sprinkler systems. Such rate charges should be set at a level that will not discourage the installation of sprinkler systems.

What are the possible long term benefits from the Community Fire Protection Incentive Program?

It is apparent that if such a program is carried out to the ultimate, that most of our commercial and business properties could be protected by sprinkler systems. If this was the case, it will have a decided effect on the fire flow requirements of each community by reducing the flow requirements. This will affect the apparatus and equipment required, location and response distances of the companies, the number and location of fire stations, as well as the manning requirements of the fire departments.

There is no question that the State of Alaska is undergoing rather rapid growth in population. 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 additional population and businesses into many of our communities. This growth is impacting the fire protection systems of many of our cities and rural areas. Communities are being faced with providing additional fire protection services and with the costs of providing these services.

The community fire protection incentive program can provide an alternative to the increasing costs of fire protection. The fire service may well be able to hold the line in respect to increasing costs associated with the growth of the community, and may well be able to reduce the costs in relation to the mill rate required for fire protection.

I have enclosed a copy of an article by Harry E. Hickey, an associate professor with the University of Maryland, entitled "Built-In Fire Protection and Fire Department Manning." This was published in the Fire Management Review, a publication of the City Management Association. This is an area of interest to city managers, and will probably be discussed with the fire departments. The article is idealistic, but does indicate what effect providing sprinkler systems can have on the fire protection system of a community.

I suspect that the greatest long term effects of the Community Fire Protection Incentive Program will be in the area of security of the community's assets. I look at these assets as the commercial property, the businesses within these properties, and the jobs created by these businesses. The community's assets are all the properties within their community, and the income for the community's programs are derived in the form of taxes on this property. With the property protected by sprinkler systems, the community's tax base and programs are protected from fire.

Such a system protects the economics of the community by providing security for the businesses that provide employment of those within the community. The immediate effect of fire on a business is often dramatic, in that amount of dollar loss attributed to the building and contents. The long-term effect of this fire is often overlooked in that the business and jobs lost, the former employees who often must leave the community to work elsewhere, and the effect of the lost payrolls. Few businesses recover from large fires; most often the fire destroys not only the building and contents, but along with that, the jobs and revenue from the business itself. This has the direct effect of removing the property from the tax rolls. We lose the tax generated by the former employees of the business. In many cases, the long-term effect is far more costly on the community than the dramatic immediate loss of the fire itself. In the long-term, this is probably the most important consideration for the establishment of a Private Fire Protection Systems Funding Program.

There have been a number of canneries in smaller communities that have been destroyed by fire. Most often they have not rebuilt, and in some cases the communities where this has happened have ceased to be. There have been a number of fires in commercial property in our larger communities that have destroyed a million dollar tax base, along with large numbers of jobs. These have long-term effects on the community.

The Community Fire Protection Incentive Program can reduce by a very large degree the economic effects of this type of fire.

FIRE PROTECTION REVOLVING LOAN FUND

The revolving loan fund should be funded at a level that will allow for rapid implementation and installation of private fire protection systems.

This fund will make loans to property owners that desire or are required by the uniform building code to install private fire protection systems. Interest rates and loan terms of such loans should be established at a level that encourages the property owner to install such systems.

Requests for loans shall be considered on a priority basis, with those properties that are required to retro-fit fire protection systems in existing properties having the highest priority.

Loan priorities shall be established by the State Fire Marshal's Office. The fire protection system to be installed shall meet the standards as required by the State Fire Marshal's Office.

Cities and municipalities that have code enforcement and standards administered by building department and fire prevention services shall establish the priority schedule for loans and shall review and approve fire protection systems that meet the required standards. Loan requests meeting their approval shall be forwarded to the State Fire Marshal's Office for review and approval.

The revolving loan fund shall be administered by the Department of Commerce, and loan requests that have been approved by the State Fire Marshal's Office shall be granted.

LOAN PRIORITY

PRIORITY#1

Property that will be required under the Uniform Building Code (1976) or (1979) as adopted by the State of Alaska to be retro-fitted with sprinkler systems.

PRIORITY#2

Existing property that is not required by the Uniform Building Code to be retro-fitted with sprinkler systems, but where the property owner desires to install a sprinkler fire protection system.

PRIORITY#3

New construction that is not required by the Uniform Building Code to install sprinkler systems, but where the property owner desires to install a sprinkler fire protection system.

PRIORITY#4

New or existing dwelling units where the property owner desires to install a approved sprinkler protection system.

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TAX INCENTIVE PROGRAM

What are we talking about when we speak of a tax incentive program for fire protection? In looking back over the years, and in particular to the fire protection systems that are provided by private property owners, business and industry, we find that through Fire Codes, Uniform Building Codes and ordinances we have insisted that these same property owners provide private fire protection systems.

In effect, what we are telling the property owner is that we in the fire service cannot provide or meet the fire protection requirements for their particular property, that we insist that they install a system that will provide for fire detection and extinguishment, and supplemented by our fire department, we can then possibly handle the fire problem in his building or property.

When the property owner provides for this private fire protection, we often overlook the fact that he is not only providing protection for his property, but in effect is providing a part of the overall fire protection system of the community. His system does provide for fire protection to nearby properties in that the chances of the fire extending beyond his property is practically eliminated through his built-in fire protection system.

With the installation of a sprinkler system or other fire protection system within the property, the value of the property increases. Up to now the increased value of the fire protection system has been added or included in the tax assessment bill on the property.

I strongly feel that to require a property owner to provide for private fire protection systems on his property and then increase his tax bill because he has installed such a system is again self-defeating. We must be able to encourage the property owner to install such systems. We well know that such a system adds directly to the over-all fire protection system of the community.

To encourage the installation of private fire protection system in our communities throughout the state, with the direct long-range effect of reducing or at least being able to maintain the current level of public fire protection we should consider the following:

Inact legislation at the State level that will remove from the tax rolls the assessment against private fire protection systems. The net effect to the property owner will be that his property tax rate will be reduced by the value of the private fire protection system.

Presently, the property owner that provides fire protection systems for his property receives the following benefits:

1. Protection for his building
2. Protection for the contents
3. Protection for the occupants
4. Protection for his business
5. A reduction in the insurance premiums

The public receives the following benefits when a private property provides fire protection systems:

1. The public that enters or resides within the building is protected.
2. The nearby property owners are protected from fire extending from the property in question.
3. The community's tax base is protected in the property
4. The community has assurance that this business will not be destroyed by fire.
5. The jobs provided within this property are secure from fire.
6. There is a lesser demand or requirement on the community public fire department because this property has a built in fire protection system.
7. The overall fire insurance rating will be enhanced by those properties protected by fire protection systems.

It is apparent that those property owners that install private fire protection systems not only receive certain benefits directly, but in respect to the community as a whole, that through their private efforts, provide a larger degree of benefit to the community in general.

Up until the present time, the property owner that provided private fire protection systems has received no direct benefits or credit from the community or local government for his effort. The community has in general not recognized what the private fire protection systems mean to a community.

It is apparent that if all private property owners could or would provide private fire protection systems, it will have a dramatic long-term effect on the total community fire protection system. It will certainly affect the costs of providing community fire protection in the future.

WATER SURCHARGE RATE

The standby water surcharge rate that is applied in some communities to those property owners that have or have been required to install full sprinkler protection for their property is in effect self defeating in respect to the fire protection system of the community.

It appears that the only consideration for this type of charge is to provide additional revenue for the utility.

This type of rate charge will result in property owners taking a second look at installations of sprinkler systems. Unless the property owner has a direct benefit that is cost effective he will not be interested in providing fire protection systems for his property.

The benefits that the property owners should receive in the event he provides a sprinkler system for his property would be a reduction in his insurance rate, that will pay back the cost of the sprinkler system within a reasonable time. Another benefit is the protection of his property and business from fire.

An additional water surcharge for sprinkler connection is contrary to the fire protection needs of the community. The community should rather assist and encourage the property owner to install such systems.

We in the fire service, and those that are in communities that have placed a surcharge for sprinkler systems, have often been silenced and are unable to protest this self-defeating development of our fire protection systems. Where the administration is dead set against such charges and they are unable to speak out, such organizations as the State Fire Fighters Association can take a stand and pursue legislation at the State level prohibiting such charges.

If we can encourage the state legislators either by law, or administrative action by the Public Utilities Commission, to eliminate or reduce to a reasonable charge, the service provided for sprinkler systems we will have accomplished much in providing a direction and guidance in meeting the needs for fire protection in our communities.

The following examples compare cost figures
for an Incentive Program versus today's cost.

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BASE FIRE INSURANCE RATES

Property Description 29,560 sq. ft. concrete block, retail shop complex.

Fire Protection Class Rural#5

Value of Building \$702,000

Insurance Carried \$700,000

Protected Rate .40 per 100

Unprotected Rate 2.65 per 100

Estimated cost of Sprinkler System \$42,000

Assesed value of Sprinkler System \$42,000

Property Tax Rate 5 mills

Fire Protection Loan 42,000 Interest 7% No. of Years 5:

Monthly Payment \$831 Annual Payment \$9979

<u>Cost Unprotected Property</u>		<u>Cost Protected Property</u>	
<u>Insurance</u>	\$18,550	<u>Insurance</u>	\$2,300
<u>Tax (mill rate)</u>	\$3,500	<u>Tax</u>	\$3,500
		<u>Tax Credit</u>	\$210
		<u>Loan Payment</u>	\$9,979
<hr/>		<hr/>	
<u>Total</u>	\$22,050	<u>Total</u>	\$16,059
<u>Annual saving to property owner</u>	\$5,931		
<u>Saving to property owner on completion of loan payments</u>	\$15,960		

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BASE FIRE INSURANCE RATES

Property Description 20,000 square feet, wood frame, mercantile

Fire Protection Class Class #6

Value of Building \$500,000

Insurance Carried \$500,000

Protected Rate .143 per 100

Unprotected Rate 1.76 per 100

Estimated cost of Sprinkler System 25,000

Assesed value of Sprinkler System 26,000 .

Property Tax Rate 16 mills

Fire Protection Loan 26,000 Interest 7% No. of Years 5

Monthly Payment Annual Payment

\$514 - \$6,177

Cost Unprotected Property

Cost Protected Property

Insurance \$8,800

Insurance \$,15

Tax (mill rate) 16 8,000

Tax \$3,000

Tax Credit -\$416

Loan Payment \$6,177

Total \$16,800

Total \$14,476

Annual saving to property owner \$2,324

Saving to property owner on completion of loan payments \$3,501

Property Description 26,000 square foot, shop office and bus storage garage, wood frame construction

Fire Protection Class Unprotected Class 10

Value of Building 1,000,000

Insurance Carried 1,000,000

Protected Rate .40/.50 per \$100

Unprotected Rate 2.81 per hundred

Estimated cost of Sprinkler System \$72,500

Assesed value of Sprinkler System \$72,500

Property Tax Rate 5 mills

Fire Protection Loan 72,500 Interest 7% No. of Years 5

Monthly Payment \$1,435 Annual Payment \$17,226

<u>Cost Unprotected Property</u>		<u>Cost Protected Property</u>	
<u>Insurance</u>	\$28,100	<u>Insurance</u>	\$5,000
<u>Tax (mill rate)</u>	\$5,000	<u>Tax</u>	\$5,000
		<u>Tax Credit</u>	- \$362
		<u>Loan Payment</u>	\$17,226
<hr/>		<hr/>	
<u>Total</u>	\$33,100	<u>Total</u>	\$26,864
<u>Annual saving to property owner</u>	\$6,236		
<u>Saving to property owner on completion of loan payments</u>	\$23,452		

. There are two insert articles on the effect :
of sprinkler system installations on public :
fire protection systems. :

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 these hazards are prime factors in determining the location of engine and ladder companies.

Built-In Fire Protection And Fire Department Manning

By
Harry E. Hickey
Associate Professor
University of Maryland



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 a 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 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% for complete automatic sprinkler protection. Where buildings are either fire resistive or non-combustible construction, the reduction may be up to 75%". 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 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., occupancy 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.

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
- 38 persons are required to staff a suppression position 24 hours a day
- 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
Firefighters	209	76

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

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

The reduction in personnel costs alone is \$3,042,000. This hypothetical case does not consider the cost factors for installing automatic sprinklers, community water system design, deactivation of two fire stations, or the potential savings on community insurance premiums.

It has been established that the property hazard level is the primary factor affecting manning levels for fire companies. When the hazard is reduced, so is the manning requirement. This is only one method of assessing the difference between protection from specific hazards with a complement of fire suppression personnel and increased private protection to lower the demand for public protection.

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BY R. J. COLEMAN
Director of Fire Protection

and

G. L. CARMICHAEL
Fire Marshal
San Clemente, Calif., Fire Dept.

Faced with a tremendous increase in the residential fire problem as its population doubles in the next 10 years, San Clemente, Calif., has passed an ordinance requiring sprinkler systems to be installed in new residential construction. The ordinance also applies to the remodeling of more than 50 percent of a building.

There has been a great deal of talk over the years about residential fires, which account for the largest number of structural fires and take the most lives, but San Clemente has done something about the residential fire problem. The sprinkler ordinance is also aimed at restraining the cost of public fire protection while maximizing fire department services and putting technology to work for us.

What prompted the passage of the residential sprinkler ordinance was a unique growth situation in the city and preparatory work by the staff of the San Clemente Fire Department.

Land to be developed

San Clemente covers 15 square miles with a population of 25,000. Two thirds of the city, about 10 square miles, is vacant land. The three corporations which own this land are prepared to fully develop it within the next 10 years. The population of San Clemente is due to double by 1990.

The fire department staff several years ago realized that it faced this potential and instituted a fire department master plan project. One of the elements of the master plan was to examine alternative methods of providing fire protection during this period of unprecedented growth. Initially, the department received most of its information and training on the master plan project from attending the National Fire Academy fire protection master planning course.

Historically, 70 percent of the fire loss in San Clemente has occurred in single and multiple residential buildings. The five-year fire record also showed that the largest percentage of fires started in kitchens and living rooms. The result of this statistical data was the formulation of a master plan goal to "reduce the loss of life and property in dwelling fires

by building fire protection into new construction."

Three systems studied

Research during the master plan project developed a great deal of information on studies of residential sprinkler systems, smoke detectors and early warning systems. These systems were immediately identified as possible means of mitigating the fire problem.

The first of these systems that was integrated into the city's codes was that of smoke detectors. A comprehensive smoke detector ordinance, patterned after the San Carlos one, was adopted in 1976. This ordinance requires the installation of smoke detectors in all new homes and in existing homes when they are sold or by 1981, whichever comes first.

Members of the fire department took some of their basic information on residential sprinkler tests from United States Department of Commerce studies. With the aid of several local automatic sprinkler companies, the department conducted a series of controlled burns, experimenting with a wide range of heads and installation specifications suggested by the Department of Commerce studies. These tests were run in cooperation with local building contractors and developers. Interested parties were allowed to witness the tests and make suggestions on how to incorporate sprinkler systems into their construction projects.

Four sprinkler goals

The residential sprinkler ordinance was developed with four major goals:

1. That it be low cost.
2. That it be aesthetically acceptable to homeowners.
3. That it be aimed at reducing liability in providing fire services.
4. That it speed the response of extinguishing agents in a dwelling fire.

One thing became apparent right away. The state of the art in residential sprinkler protection was not perfect. But, to draw an analogy, the fire department staff felt "that if the Wright Brothers had waited for the Concord to be invented, they probably never would have built the first aircraft." The decision was made to take what information we had and move forward with the development of a comprehensive sprinkler ordinance for dwellings.

The San Clemente Fire Department operates with an attack pumper that is backed up by reserve fire fighters. Based on this operational situation, it was our intent to provide residential

sprinkler systems with three objectives in mind. The first objective was to contain 75 percent of all dwelling occupancy fires to the room of origin. The second was to utilize the sprinkler system to prevent flash-over from extending a fire into rooms adjacent to the room of origin. The third objective was to provide fire suppression capability for the first 15 minutes of an alarm.

Fire department support

These three objectives recognized that these systems must be supported by fire suppression forces if they were to be 100 percent effective. These three objectives also recognized that the residential sprinkler system was primarily a tool to mitigate against fire spread during the reflex time period.

The department already had a partial track record on these systems. Due to the other problems in the community, such as limited access, underground garages, etc., the department had already required several apartment houses and condominiums to be sprinklered to NFPA Pamphlet 13-D requirements. Prior to passage of the ordinance, the fire prevention bureau had required these systems in approximately six of these occupancies. Three had been completed prior to the final drafting of the ordinance.

Consideration of this alternative was given a tremendous boost with the passage of proposition 13. This tax-limiting initiative highlighted the general problem of eroding revenue to support fire departments.

One of the most important elements in the study was that of cost. With home construction costs spiraling rapidly, one of the objectives of the study was to develop a system that would be economically feasible during construction. With single family dwelling construction costs running at \$41,000, the installation of a truly domestic residential system was a relatively insignificant amount. The staff estimated the cost to be only \$700 to \$900 during the construction of a home of about 2100 square feet.

Early warning system

The third system that has yet to be required by ordinance is the early warning alarm system to tie together the other systems. The fire department communications officer, Captain Bill Bondy, has authored an ordinance and designed specifications for an alarm system that will allow the fire department to monitor both smoke detectors and residential sprinkler systems with

There are many other elements of the residential sprinkler system too lengthy to discuss in this article. Two of the major construction requirements, however, will be tightly controlled by the fire department.

First, the system must be installed according to proper design. Through a series of inspections and testing, the fire department will examine every installation and compare it against the standards and engineering drawings.

Secondly, the quality of construction will be controlled through a series of permits authorized under the ordinance, which in summary states, "No one shall install a residential sprinkler system in San Clemente without a fire department permit." These permits can be obtained through the office of the fire chief. It will be his obligation, prior to issuance of a permit, to be satisfied that the applicant has adequate training and knowledge in sprinkler system plumbing practices.

One-year sprinkler installer permits are issued for a \$10 fee that covers the administration costs of the fire department.

Premium cut sought

The fire prevention bureau is soliciting input from the insurance industry in an attempt to get a reduction in insurance premiums for occupancies that are protected by all three built-in systems. The results of that study are incomplete at this time.

In summary, the enactment of these amendments to the Uniform Fire Code should allow our city to maximize our fire suppression forces without facing spiraling costs or reduced revenue. It will not prevent our department from growing in terms of additional staff and equipment. As a matter of fact, the master plan also calls for two new fire stations.

It is still too soon to determine if the standards and the ordinances produce a statistically significant level of reduction in the fire problem. The fire department staff is continuing to build a partnership of the fire service, the sprinkler industry, the insurance industry, the building industry and the local citizenry to upgrade the ordinances if that becomes necessary.

Hopefully, when the development of the three vacant land areas is completed, we will have an environment that is considerably safer from a fire loss point of view than the average community. We really don't know that for sure. To compare to our early analogy about the Wright Brothers, we have now built in a system that is flying, but we are really not sure how it's going to land. Only time will tell! □ □

KEY

GENERAL

WATER SUPPLY

INDICATES LOCATION OF
WATER SUPPLY
CONNECTIONS TO
EXISTING WATER
LINES AND
INDICATES
LOCATION OF
NEW WATER
LINES TO BE
CONSTRUCTED

1 2 3 4

INDICATES

FIRE DEPARTMENT

INDICATES LOCATION OF
FIRE DEPARTMENT
STATIONS AND
INDICATES
LOCATION OF
NEW FIRE
LINES TO BE
CONSTRUCTED

SCALE OF FEET

AMERICAN ENGINEERING ASSOCIATION 1969

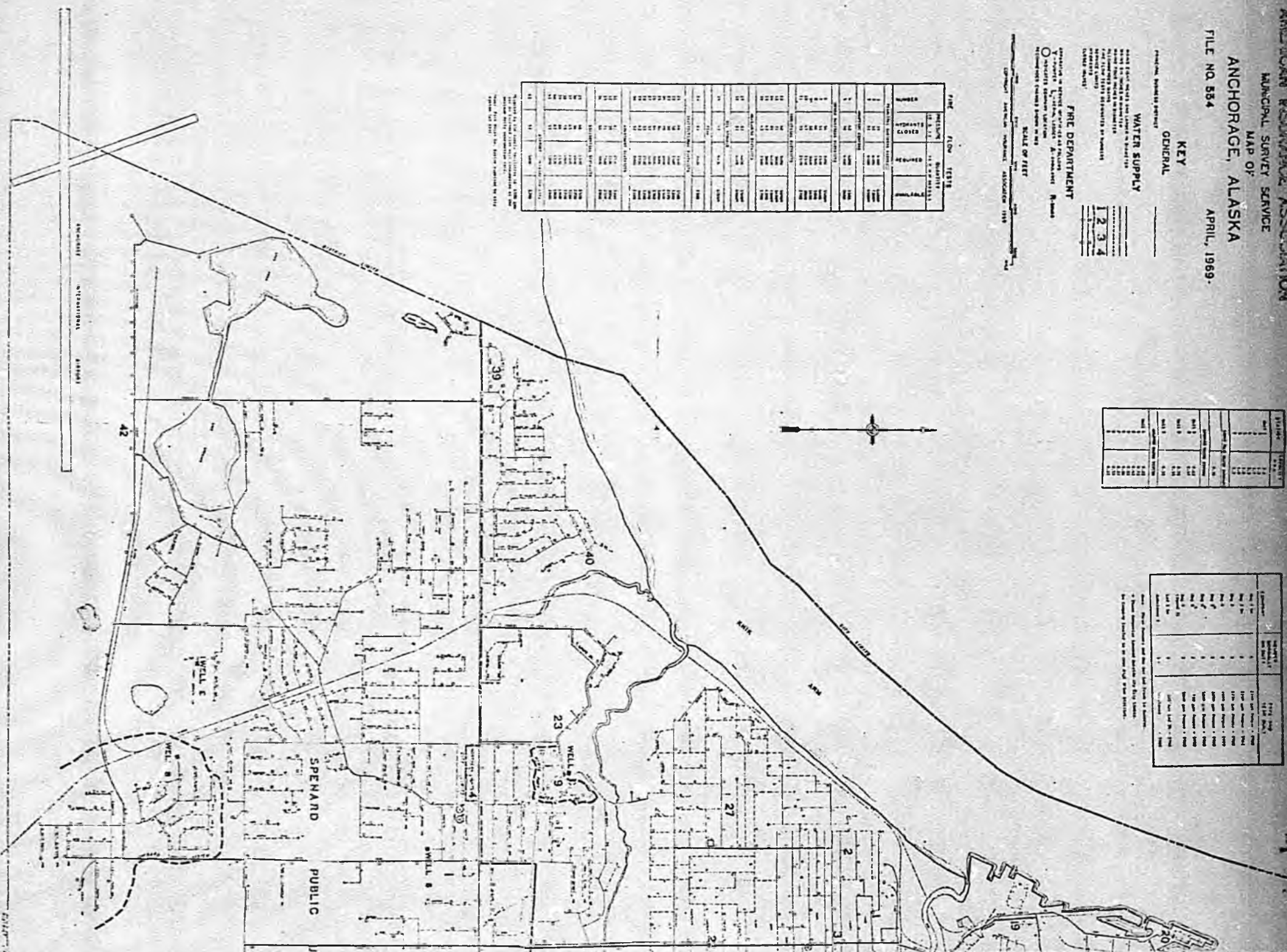
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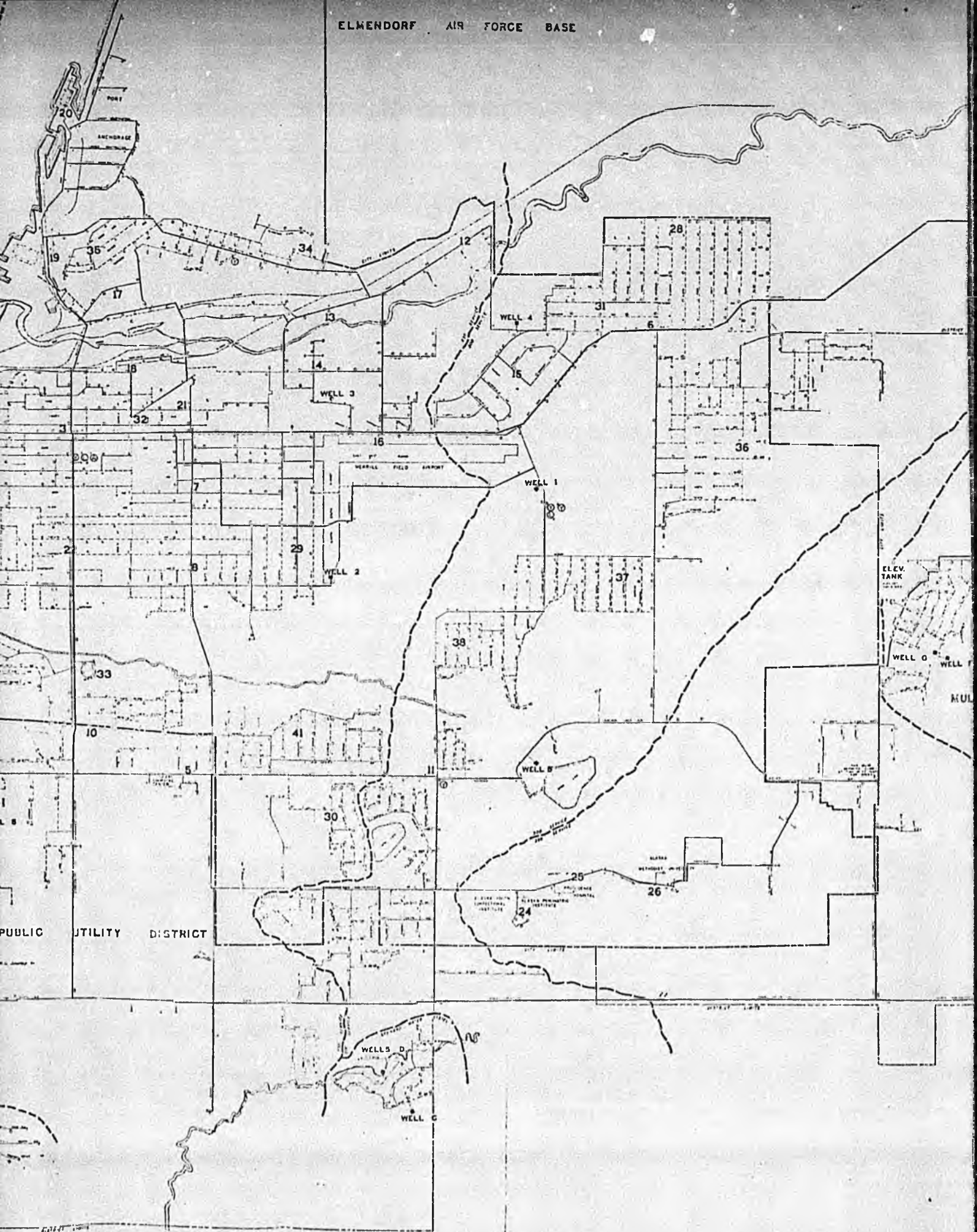
1. This map shows the location of the water supply lines and fire lines to be constructed in the area shown.

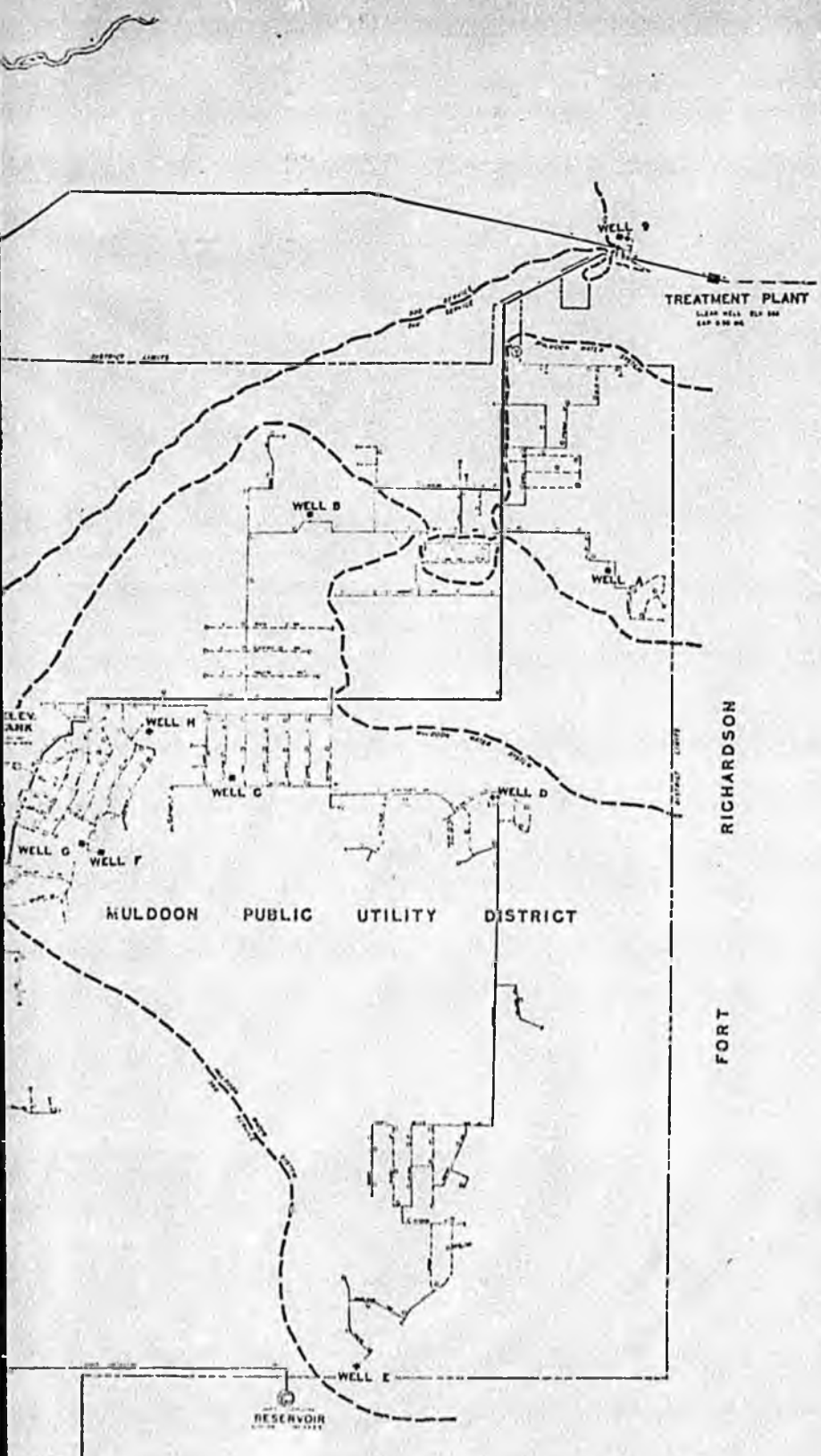
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2	200	40,000	200	40,000
3	300	90,000	300	90,000
4	400	160,000	400	160,000
5	500	250,000	500	250,000
6	600	360,000	600	360,000
7	700	490,000	700	490,000
8	800	640,000	800	640,000
9	900	810,000	900	810,000
10	1,000	1,000,000	1,000	1,000,000

INDICATES LOCATION OF
NEW WATER
LINES TO BE
CONSTRUCTED

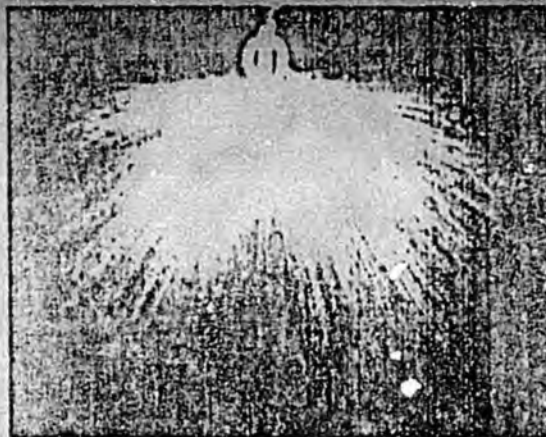


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Sprinklers Cut Fresno's Fire Losses and Budget

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. Vinello is that organization's Vice-President of Field Operations.

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 Service 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)

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

Real losses (measured in replacement cost of building, 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. Δ

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

Table 1.

Internal Diameter (Inches)

Pipe Trade Size	Schedule 40	Schedule 10 ¹	% of Reduction in Friction Loss
1"	1.049	1.097	20%
1½"	1.380	1.442	19%
1½"	1.610	1.682	19%
2"	2.069	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 ³	8.249 ⁴	10%

¹ Schedule 30.

² 0.134" wall thickness — light-wall pipe.

³ 0.158 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 0.35 gpm per square foot over 2,000 square feet of floor area uses 1½-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, as 10
To obtain sprinkler discharge		22.6
Friction Loss		
Branch Line	32.0	26.1
Main	15.0	31.2
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. Δ

Fire Protection Water Standby Charges: Not in the Public Interest

by BRIAN R. SHUTE

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 1978 over 3 million fires caused over \$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 irreplaceable personal belongings.

Water is an indispensable commodity when it comes to fighting fire. Fires cause billions of gallons of water to be consumed putting them out. Consequently, given the compelling social goal of avoiding the catastrophic fire losses, together with the absolute necessity of water for basic human existence, a municipality should develop policies which maximize its ability to provide both fire protection and adequate water supplies.

According to the National Fire Protection Association, private fire protection systems (of which automatic sprinkler systems are the backbone) 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 on the average as is required by the Fire Department. The expenses of the Fire Department incurred fighting sprinklered fires are much less, and the chance for injury to firemen as a result of fire is almost negligible in sprinklered buildings.

Brian R. Shute is an Anchorage, Alaska attorney. He represents the Water Conservation Association of Anchorage.

In Anchorage, Alaska, in 1977, the Public Utilities Commission approved a new tariff for the Anchorage Water Utility. As a result, the utility required owners of private fire protection systems to make a monthly payment for merely having an automatic sprinkler system connected to the utility water supply. The owner was required to pay even when he did not use any water at all.

It came to the attention of the Water Conservation Association that the monthly charges in some cases were so high that they were in excess of insurance savings realized through installation of the system. Consequently, some owners were deciding to turn off their fire protection system because it had become uneconomical to maintain. The Water Association was also aware of some new construction for which plans for installation of private fire protection systems had been cancelled because the stiff water standby charge was too high in relation to the savings which could be realized by having the systems installed.

The Water Conservation Association took the position that the standby charge which owners of private fire protection systems were being required to pay was not in the interest of conservative water usage, was not in the interest of increasing the fire worthiness of the general Anchorage municipal area, and did not further cooperative planning to solve the interrelated problems of providing adequate fire protection and water supplies to the City.

The Water Conservation Association prepared a memorandum to more fully explore whether the standby charge fire protection owners were being required to pay was in the public interest. A detailed fact digest was compiled. As a result of its study, the Water Conservation Association concluded that the standby charges were not in the public interest and, consequently, should either be eliminated or alternative methods found to restore the economic incentives for installing private fire protection systems so the water conserving and fire loss reducing characteristics can be promoted.

As a result of its efforts, the Water Conservation Association has apparently succeeded in getting the Municipality of Anchorage to agree to a potential of a reduction in standby charge of as much as 75 percent or more. However, the Association would like to see the charge eliminated completely for the following reasons:

PRIVATE FIRE PROTECTION SYSTEMS BOTH CONSERVE AVAILABLE WATER SUPPLIES AND GREATLY REDUCE LOSSES CAUSED BY FIRES.

1. Private fire protection systems conserve water supplies.

Statistics showing the effectiveness of automatic sprinkler protection 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 intentionally or by vandals. A complete record of fires in sprinklered buildings would show that their efficiency probably approaches 100%. Of all the fires controlled by sprinklers more than 90% of them are controlled by three or less sprinkler heads.

The effectiveness of automatic sprinklers stems from their presence at the potential scene of a fire before the fire starts. They can apply water immediately where it is needed because there are no problems of access to the seat of the fire or interference with visibility for fire fighting due to smoke. Sprinklers can extinguish fires much earlier than a Fire Department could ever respond to an alarm. The amount of water necessary to put out a fire in its beginning stages is nowhere near the amount required for the Fire Department to put it out after it gets going.

Performance characteristics of sprinklers indicate that standard automatic sprinklers discharge anywhere from 15 to 55 gallons of water per minute, depending on the pressure at the sprinkler head. In comparison, a heavy-attack two and one-half inch mobile hose line in operation can consume more than two hundred gallons 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.

2. The total required fire flow for a municipality is reduced with the widespread installation of private fire protection systems.

The traditional method for estimating the water supply required to serve a municipality's fire protection needs is by computing fire flow requirements. The latest developments in estimating fire flow requirements are found in the *Guide for Determination of Required Fire Flow* published by the Insurance Services Office (ISO) in 1972. The fire flow formula reflects significant water conservation propensities of private fire protection. Depending upon the flammability of a given building, the fire flow required is reduced by twenty-five to fifty percent when a sprinkler system is present in a building.

The guide for determining required fire flow just referred to is a determination made for specific buildings. The ISO utilizes this formula for determining fire flow requirements for Anchorage as a City. The procedure for making a city-wide fire flow determination is more fully described in the *ISO Municipal Grading Schedule*.

The last analysis of Anchorage fire flow requirements was performed and summarized by ISO in a 1969 report.

ISO is presently in Anchorage reevaluating the fire flow requirements. The 1972 fire flow guide has been revised since the last fire flow study was done for Anchorage in 1969. ISO engineers indicated that the reduction in fire flow requirements for a building can be even greater than 50%, to as much as 75%, given the right kind of building construction.

It was the opinion of the ISO engineers that although the ISO methodology did not enable a precise computation of the reduction in Anchorage fire flow requirements caused by the private sprinkler protection, it was significant. ISO indicated that the sprinkler installation in the central business district alone made Anchorage's central business district a much better fire risk.

Finally, ISO engineers indicated that with all of the factors of the Municipal grading schedule taken into account, they were hopeful that the required fire flows for Anchorage would be less than the 1969 studies indicated. However, the investigation work for the study has not been completed, and consequently the fire flow requirement is still to be determined.

In 1969, ISO engineers completed a report on Anchorage. It is significant that one of the improvements recommended by ISO was installation of automatic sprinkler equipment in all basements exceeding 2,500 square feet.

Examination of the respective quantities of water needed by the Fire Department versus sprinkler systems to extinguish fires, the 25% to 75% discount for fire flow required for a given building, and a study of the Municipal Grading Schedule all indicate that the amounts of water demanded to maximize Anchorage's fire protection efforts are reduced by widespread installation of private fire protection systems. The conservation aspects of private fire protection are significant and should be encouraged.

PRIVATE FIRE PROTECTION REDUCES THE COST OF OTHER PUBLIC SERVICES.

In addition to the water conservation aspects 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 fire is reduced and therefore the money necessary to operate the Fire Department itself is also lessened.

3. Private fire protection decreases fire insurance cost for the entire city.

4. Private fire protection increases municipal tax revenues by encouraging property improvement.

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

6. Private fire protection results in lessening the cost of capital improvements to the water utility since widespread installation of private fire protection decreases

The required fire flow necessary for adequate municipal fire protection.

7. Private fire protection saves billions of gallons of water which is in chronic short supply in most cities.

8. The encouragement of private fire protection systems is consistent with the State policy of encouraging fire protection devices (smoke alarms). Since private fire protection reduces the cost of the fire department for fighting fires in sprinklered buildings, State revenue sharing money can be used for other fire department purposes, making more efficient use of the State money.

9. The omission of automatic sprinklers imposes upon 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.

BECAUSE WIDESPREAD INSTALLATION OF PRIVATE FIRE PROTECTION CONSERVES SCARCE WATER RESOURCES AS WELL AS SIGNIFICANTLY DECREASING LOSS OF LIFE AND PROPERTY FROM FIRE, THE MUNICIPALITY SHOULD ENCOURAGE WIDESPREAD INSTALLATION OF THE SYSTEMS BY PROVIDING NEW INCENTIVES FOR OWNERS TO INSTALL PRIVATE FIRE PROTECTION, AND BY CONTINUING EXISTING INCENTIVES.

The primary incentive for voluntary installation of private fire protection systems is the reduced insurance rates to the owner which enable him to amortize the cost of installation over a period of a few years.

Because of the safety factors accompanying installation of automatic sprinklers and the reduced fire flow characteristics, an owner installing private fire protection can reduce his insurance premiums when the installation has been approved by ISO. This incentive for voluntary installation of private fire protection had been largely eradicated by the implementation of a flat monthly charge by the Anchorage Water Utility of anywhere between \$7.10 to \$254.10 per month, depending upon the size of pipe delivering water to the building. The most prevalent sizes of pipe are four, six and eight inch pipe for which charges were \$28.45 per month, \$63.55 per month and \$112.85 per month, respectively. These rates nearly eat up, and in some cases entirely eliminate, the savings on insurance an owner achieves by installing private fire protection. Even when the rates do not entirely eat up the insurance savings, they eat up so much of the insurance savings that it takes too long to amortize the cost of installation, and it is uneconomical to install private fire protection.

But when fire protection needs and water supply requirements are examined in the total picture, it appears that the widespread installation of private fire protection will alleviate rather than create additional fire protection demands upon the water supply; the water saving capacities of automatic sprinklers will reduce the total quantity of water required to fight any given number of fires. To levy a standby charge, whether water is used or not, which eliminates the insurance cost advantage is to create a disincentive and discourage voluntary installation of private fire protection systems. Obviously, this will result in a corresponding reduction

in water conservation and increase in total potential demand for water for fire protection.

Largely through the work and application of ISO's Municipal grading schedule, the Municipality of Anchorage receives a fire risk rating which determines fire insurance rates for the City. As has already been discussed, widespread installation of private fire protection systems contribute significantly to reducing fire flow requirements for Anchorage, and, therefore, play a part in reducing fire insurance premiums to property owners in the city generally. It is those owners who do not have private protection systems who raise insurance rates, not owners who have installed such systems. To penalize owners for installing private fire protection systems by requiring them to pay this standby charge is to penalize the wrong people. It is the person who fails to install the sprinkler system who contributes to increased insurance rates, who requires immeasurably greater quantities of water to be consumed in putting out fires, and who creates a public hazard, since a fire in a non-sprinklered building is much more likely to rage out of control and burn property of others nearby.

As owners and citizens of the Anchorage municipal area, private fire protection owners have a vested interest in the continuing viability of both the fire protection effort and the adequacy of the water supply. The members of the Water Conservation Association feel that since widespread installation of private fire protection systems not only makes Anchorage a safer place to live, but also reduces Fire Department costs and conserves precious water resources, that the incentive for voluntary installation of sprinklers should be restored. There are a number of options which can be looked at to achieve this purpose.

METHODS TO OPTIMIZE THE FIRE PROTECTION EFFORT AND PROVIDE ADEQUATE WATER SERVICE.

The Anchorage Area Borough Assembly is empowered by the Municipal Charter to prescribe rules and procedures for the operation and management of municipal utilities. Municipal Charter, Article XVI (C) (1975). The Water Conservation Association offers the following alternatives to the water standby charge as being more productive solutions to the total municipal problem of providing adequate fire protection and sufficient water supply.

1. Grant a tax credit to owners who install private fire protection systems. This will indirectly make those who do not voluntarily install private fire protection systems pay for their counter productive and wasteful practice of depending upon the resources of the Fire Department to fight fires. This will also restore the incentive for owners to voluntarily install private fire protection systems, which is lost when insurance savings are eaten up by the standby charge.

2. Simply stop the standby charge for private fire protection. The Water Utility will not have the benefit of the alternative source of revenue from the ad valorem property tax, but this lack of revenue will be more than made up by the savings which result from the public benefits created by the incentive to install private fire protection systems.

Cordova Chamber of Commerce

BOX 99

"The Friendly City"

CORDOVA, ALASKA 99574



MT. ECCLES

January 30, 1980

Mr. Robert Shirnberg
Post Office Box 1167
Kenai, Alaska 99611

Dear Mr. Shirnberg,

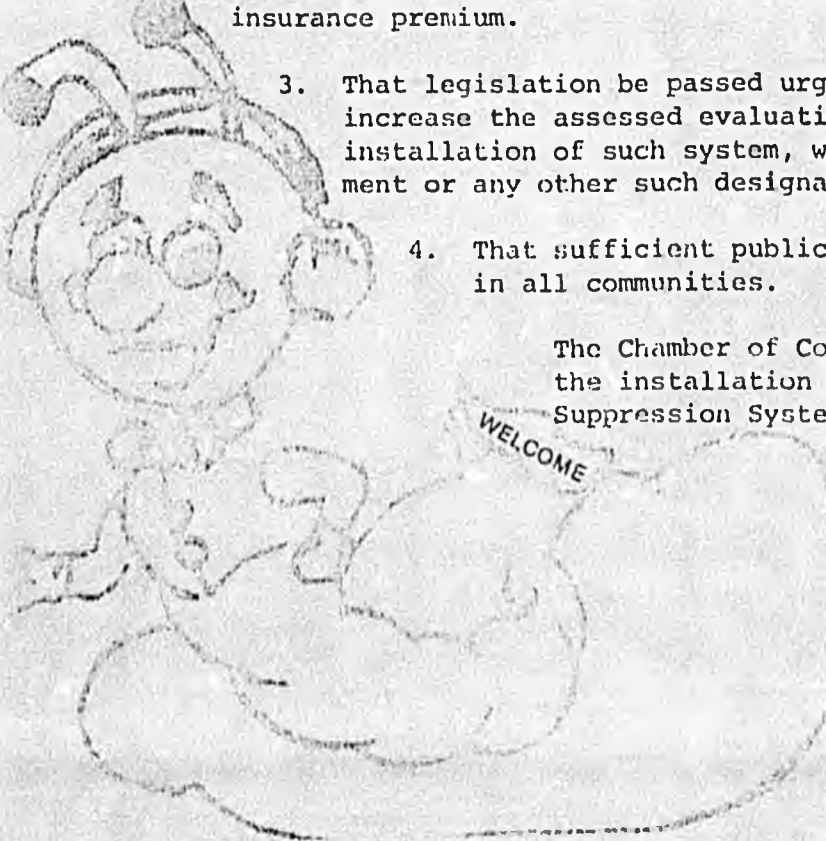
This is to inform you that on January 29, 1980, the Cordova Chamber of Commerce took action supporting proposed legislation for the installation of Private Fire Protection Systems.

The following are specific concepts supported by this Chamber:

1. Low interest or no interest loans with a minimum of paperwork to be made available to businesses for the purpose of installing Private Fire Protection and Suppression Systems.
2. That loan payments be held to the amount saved on the establishment's fire insurance premium.
3. That legislation be passed urging local municipalities to not increase the assessed evaluation of the property because of the installation of such system, whether it be named as an improvement or any other such designation.
4. That sufficient publicity be given to business people in all communities.

The Chamber of Commerce feels that incentives for the installation of Private Fire Protection and Suppression Systems will reduce the loss of lives, property, and lost man-hours due to destruction of business property.

Sincerely,



Robert L. Varnam

Robert L. Varnam

cc: Alaska Fire Chief's Association, Alaska State Fire Fighter's Association, Cordova City Council

Alaska Fire Chiefs' Association

March 4, 1980

The Honorable Bill Parker
Pouch V
Juneau, Alaska 99811



Dear Representative Parker:

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 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. A copy of that Digest is enclosed for the use of your Committee.

F A C T D I G E S T

HOW PRIVATE FIRE PROTECTION CONSERVES PUBLIC RESOURCES
BY REDUCING WATER NECESSARY FOR FIGHTING FIRES, BY REDUCING THE LOSS
OF LIFE AND PROPERTY FROM FIRE, AND BY REDUCING COST OF FIGHTING FIRES

Compiled by Brian R. Shute, Attorney
For the Water Conservation Association

Anchorage, Alaska

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PART I

S T A T I S T I C S

LOSS OF LIFE AND DAMAGE TO PROPERTY FROM FIRE

FIRE CASUALTIES

Throughout the world fire takes a heavy toll of human life. The progress that has been made in controlling this tragic waste has been due primarily to the intelligent application of the principles of fire prevention and protection discussed in other sections of this HANDBOOK.

In this chapter, the present and past record of destruction of life by fires and explosions in the United States is reported, and the factors affecting life safety from fire are discussed. In the other chapters of this Section, property damage is similarly treated, fire investigating and reporting are discussed, and large loss fires and conflagrations are analyzed.

A. Deaths and Injuries by Fire

According to estimates by the NFPA Fire Analysis Department, the annual fire death toll in the United States has averaged about 12,000 per year over the last 20 years. The number increased in absolute terms until 1970. Since then, it has shown a slight decline. (In 1974 the estimate was 11,600, a decline of 100 from the previous year.) In general, the risk of death from fire to a given individual has been declining fairly steadily, as can be seen from the death rate per million population (see Fig. 1-2A).

A high fire death rate seems to be peculiarly an American problem. No other industrialized nation comes close to the American fire death rate (see Fig. 1-2B).

Fire Injuries

Personal injury by fire, always painful and often disfiguring, involves about ten times the number of deaths in the United States. According to estimates by the NFPA at least 123,000 fire-related injuries occurred in the United States in 1974. Every fire injury is a potential fatality,

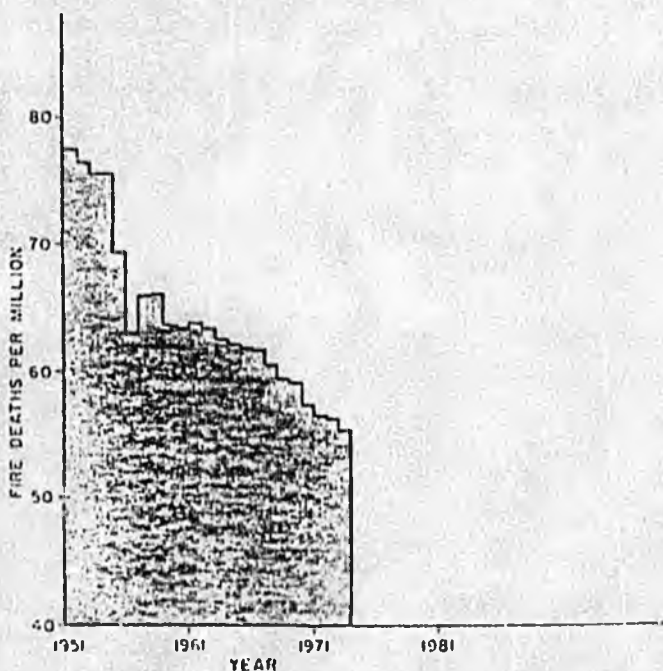


Fig. 1-2A. Trends in fire deaths in the United States.

although improvement in medical techniques has substantially improved the chances of recovery from serious fire injuries.

Nonfatal fire casualties are principally due to burns and to the inhalation of carbon monoxide and other gaseous products of combustion, though many casualties involve various other types of injury.

Trend of Fire Casualties

The principal reason that gradual improvements in life safety have not resulted in a more significant downward trend in the actual number of fire casualties in the rapid growth of population in recent years. From 1964 to 1974 the number of people in the United States increased about 10 percent. During the same period, the annual death rate from fire decreased 2½ percent.

The annual total of fire deaths is continuing, however, at a high level in spite of improvements in building construction, more widespread installation of automatic protection, more effective fire prevention campaigns, and more efficient fire department operation. While these factors have all had their effect in improving life safety from fire, there have been other offsetting factors, particularly the progressive increase in the smoking habit and the general increase in the use of flammable liquids.

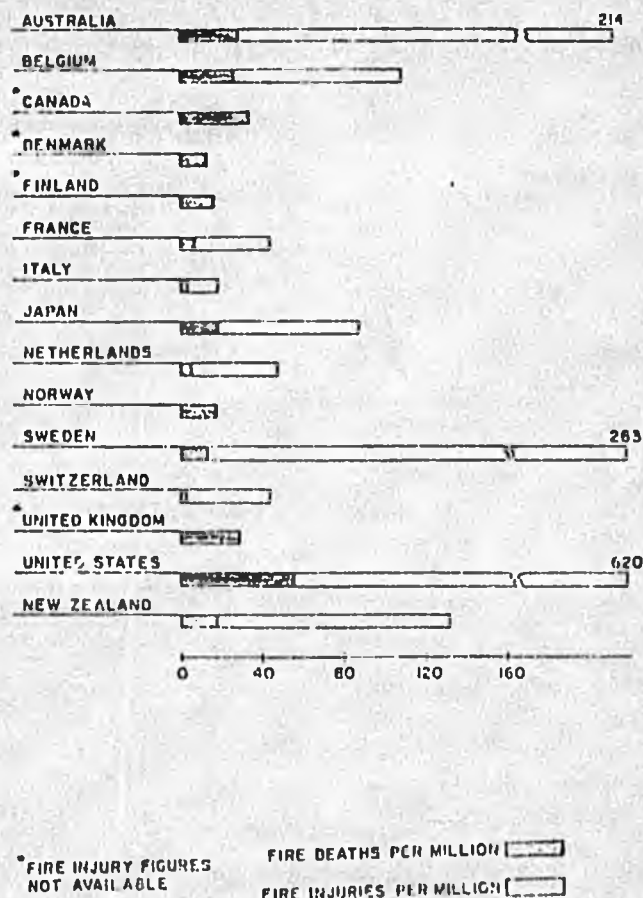


Fig. 1-2B. International fire deaths and injuries per million of population.

Source: National Fire Protection Association; Fire Protection Handbook, p. 1-5 14th edition 1976

When a going industry is struck by fire, and key processes or equipment sustain damage, serious business interruption can occur. Such business interruption can have one or more of the following effects:

1. Losses to the Fire-damaged Business

- (a) Loss of customers
- (b) Loss of return on capital investment
- (c) Loss of profits on finished goods
- (d) Loss of confidence of stockholders
- (e) Loss of credit standing
- (f) Loss of good will of customers, employees, and the community
- (g) Loss of trained personnel who transfer to other jobs
- (h) Cost of retaining key personnel during shutdown
- (i) Loss of productive services of key personnel retained during enforced shutdown
- (j) Seizure of fire insurance payments by uneasy creditors
- (k) Excessive replacement costs due to overtime, inability to buy at time most advantageous to buyer, etc.
- (l) Cost of demolition
- (m) Cost of replacing depreciated buildings and equipment with new facilities
- (n) Continuance of fixed charges during shutdown.
- (o) Cost of hiring temporary quarters
- (p) Loss of patterns, valuable records, and other items that cannot be replaced or can be replaced only at great cost
- (q) Loss of earning power of patents, trade marks, etc.
- (r) Loss of value of past advertising
- (s) Inability to defend against unjust claims due to loss of records
- (t) Loss of rent from tenants

2. Losses to the Community

- (a) Loss of circulation of employee payroll
- (b) Increased burden on welfare funds
- (c) Loss of business by suppliers of raw materials and services to fire-damaged plant
- (d) Loss of a labor market
- (e) Loss of taxes on destroyed property

In some special cases, a single fire can seriously hamper production in an entire industry. The 1954 fire in an automatic transmission plant, in Livonia, Mich., halted production for several months. Its transmissions were used in six makes of automobile. Their unavailability led to sharply depressed sales for five major U.S. automobile makers. Indirect losses were never accurately estimated.

Another example is a fire in a telephone exchange in downtown New York City in 1975 that disrupted service to 170,000 phones. The impact of such an outage on a major commercial center, such as the Wall Street financial district, is hard to assess, but it must have been substantial.

These two cases indicate the magnitude that indirect losses can assume.

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 irreplaceable personal belongings.

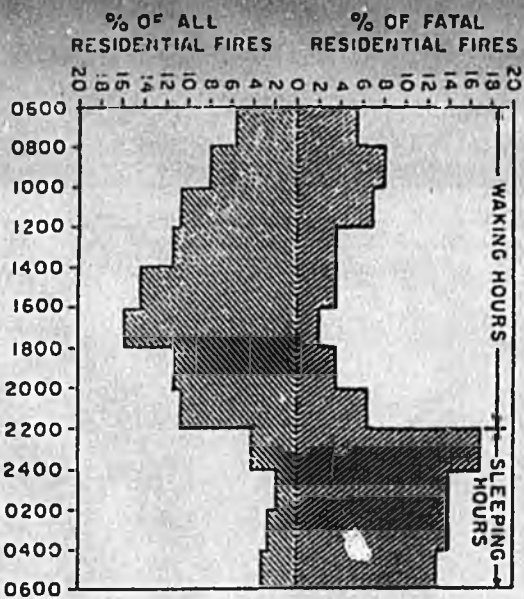


Fig. 1-2E. Time distribution of fatal residential fires.

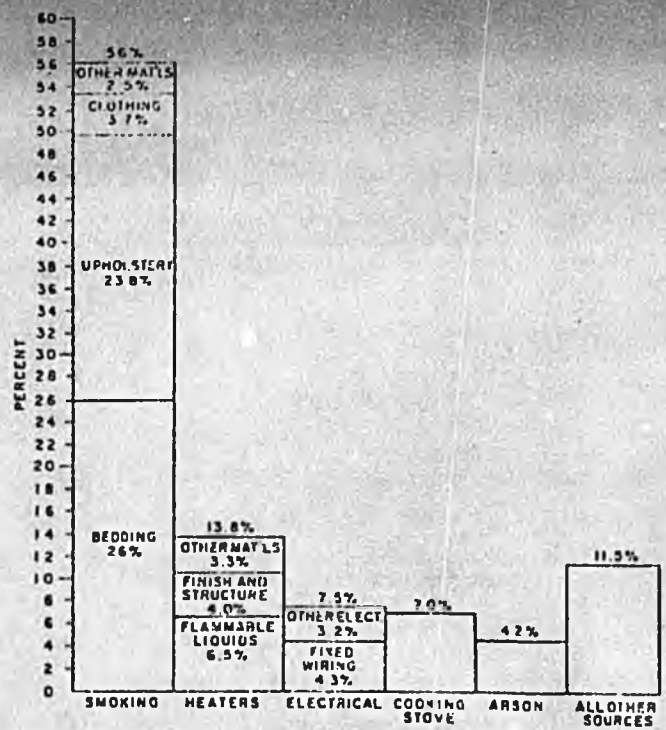


Fig. 1-2G. Causes of fatal residential fires.

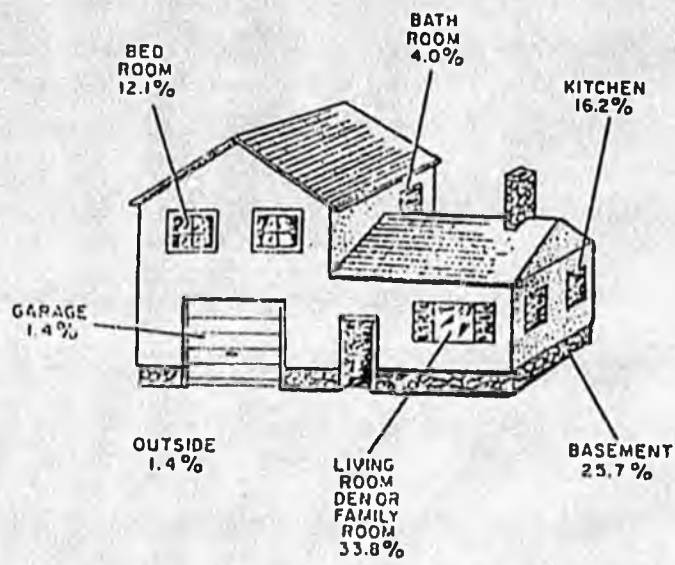


Fig. 1-2F. Locations where fatal fires start in one- and two-family dwellings (5.4 percent of the locations where fatal residential fires started were unknown.)

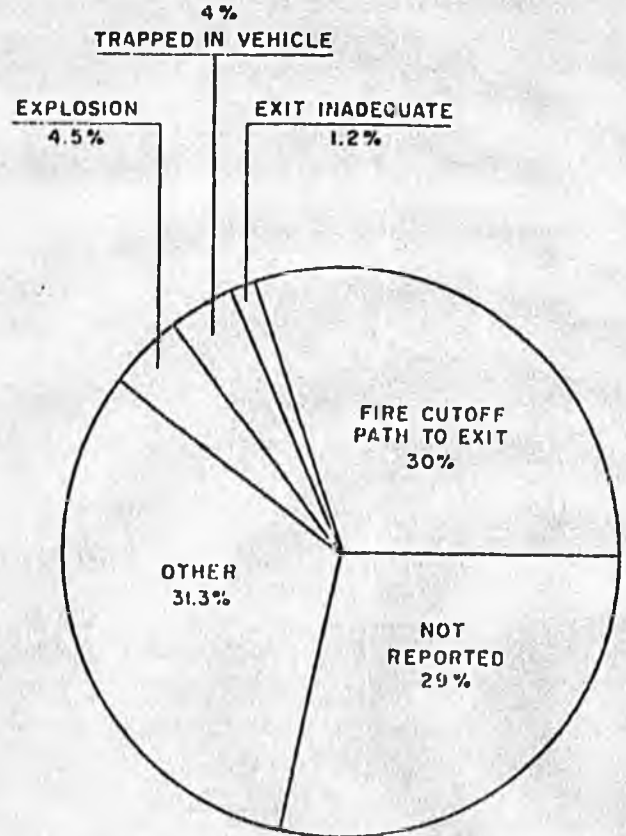


Fig. 1-2H. The reasons why fire victims do not escape.

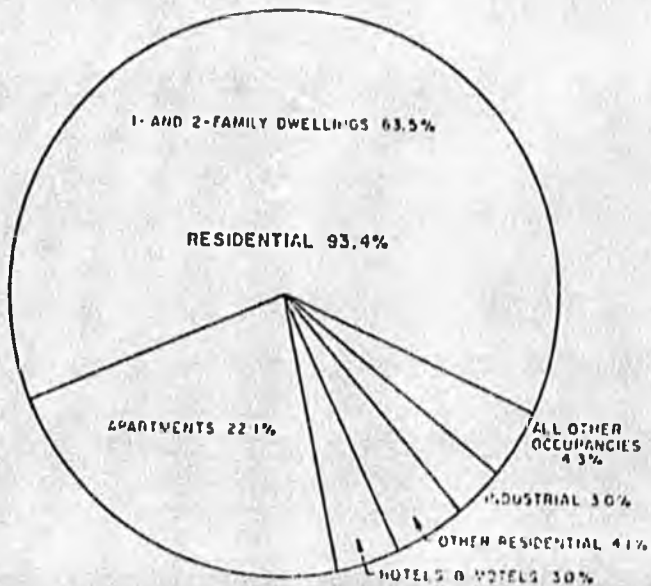


Fig. 1-2D. Occupancies where fire deaths in buildings occur.

Source: National Fire Protection Association; Fire Protection Handbook, p. 1-5 14th edition 1976

PROPERTY LOSS BY FIRE

Table 1-3A. Number of Fires by Occupancy 1970-1974

	1970	1971	1972	1973	1974
Public Assembly Occupancies					
Amusement Centers, Ballrooms	2,300	2,400	2,400	2,300	3,100
Auditoriums, Exhibition Halls	700	700	700	600	800
Bowling Establishments	800	800	900	800	1,100
Churches	3,300	3,400	4,300	3,900	5,400
Clubs, Private	2,900	3,000	3,400	3,000	4,100
Restaurants, Taverns	17,800	18,200	21,700	19,500	26,800
Theaters, Studios	1,000	1,000	1,200	1,100	1,500
Transportation Terminals	600	600	600	500	600
Other Public Assembly Occupancies	1,600	1,600	2,600	2,400	3,600
Total:	31,000	31,700	37,900	34,100	47,000
Educational Occupancies					
Schools, thru 12th grade	13,000	15,700	17,200	18,900	27,800
Other Schools	4,000	4,800	5,200	5,200	7,700
Total:	17,000	20,500	22,400	24,100	35,500
Institutional Occupancies					
Rest & Nursing Homes	3,700	4,800	6,100	6,400	9,300
Hospitals	7,800	10,100	10,500	10,700	15,600
Mental Institutions	500	700	800	800	1,200
Other Institutions	2,000	2,600	3,800	3,700	5,400
Total:	14,000	18,200	21,200	21,600	31,500
Residential Occupancies					
Dwellings, 1-2 Family	547,000	536,000	562,500	587,200	661,400
Apartments	87,700	103,000	109,000	138,000	151,500
Hotels, Motels	13,400	15,200	16,400	21,700	30,200
Mobile Homes	22,600	25,000	27,400	25,100	29,700
Other Residential Occupancies	19,400	19,800	20,300	23,800	28,200
Mercantile & Office Occupancies	74,500	71,000	76,900	70,100	86,800
Appliance, Furniture Stores	4,000	3,800	4,100	4,100	4,700
Clothing Stores	4,400	4,200	4,500	4,500	5,100
Department, Variety Stores	5,200	5,000	4,600	4,500	5,700
Drugstores	3,000	2,900	2,900	2,900	3,300
Grocery Stores, Supermarkets	6,500	6,200	6,900	6,900	7,800
Motor Vehicle Sales, Repair	9,700	9,200	9,700	9,600	11,900
Offices, Banks	14,200	13,500	16,100	15,900	8,100
Service Stations	5,500	5,200	5,400	5,300	6,000
Other Mercantile Occupancies	22,000	21,000	22,700	22,400	24,200
Total:	690,100	699,000	735,600	795,800	901,000
Basic Industry, Defense Occupancies					
Electric Power Plants	3,900	2,900	3,100	3,000	3,100
Laboratories, Data Processing Ctrs.	900	600	800	800	800
Mines, Mineral Products Plants	2,000	1,500	1,600	1,600	1,700
Other Basic Industry Occupancies	1,800	1,300	1,500	1,500	1,600
Total:	8,600	6,300	7,000	6,900	7,200
Manufacturing Occupancies					
Beverage, Tobacco, Essential Oils	1,200	900	900	900	1,300
Drug, Chemical, Paint, Petroleum PL	4,200	3,100	3,800	3,600	4,900
Food Product Plants	6,100	3,700	3,700	3,600	5,700
Laundry, Dry Cleaning Plants	4,400	3,200	3,400	3,300	3,100
Metal, Metal Product Plants	4,700	3,500	4,100	4,000	5,700
Paper, Paper Product Plants	2,400	1,800	3,000	3,100	4,800
Plastic, Plastic Product Plants	1,300	1,000	1,900	1,900	3,700
Printing Plants	1,900	1,400	1,600	1,600	1,400
Textile, Textile Product Plants	3,800	2,800	3,500	3,500	3,900
Wood, Wood Product Plants	3,700	2,700	3,100	3,100	3,700
Other Manufacturing Occupancies	14,900	10,900	12,000	11,800	14,800
Total:	47,600	35,000	41,000	40,400	53,000
Storage Occupancies					
Barns, Stables	19,800	20,600	19,300	14,800	17,900
Bulk Plants, Tank Farms	1,400	1,500	1,500	1,100	1,400
Garages, Residential Parking	20,900	28,000	26,000	20,000	24,800
Grain Elevators	3,000	3,100	2,400	1,800	2,200
Lumber, Building Materials Storage	1,400	1,500	1,300	1,000	1,400
Sheds, Farm Outbuildings	15,000	15,600	14,000	10,800	12,700
Other Storage Buildings	10,600	11,000	10,400	7,800	8,100
Total:	78,100	81,400	74,900	51,300	68,500
Other Buildings	31,100	33,800	33,000	30,200	39,500
Total Building Fires:	992,000	996,600	1,050,200	1,035,900	1,270,000
Nonbuilding Occupancies					
Standing Crops	27,000	22,000	22,000	21,000	27,000
Forests	121,700	111,500	125,000	119,000	127,000
Grass, Brush, Rubbish	908,000	1,076,300	989,900	891,200	920,000
Motor Vehicles	479,700	501,000	550,300	574,000	640,000
Ships, Boats, RR	21,000	20,000	20,000	2,750	2,700
Aircraft, Aerospace Vehicles	150	200	200	250	300
Total Fires:	2,549,550	2,728,200	2,757,600	2,654,100	2,932,000

Source: National Fire Protection Association; Fire Protection Handbook, p. 1-5 14th edition 1976

Table 1-3B. Estimated Fire Losses by Occupancy

	1970	1971	1972	1973	1974
Public Assembly Occupancies					
Amusement Centers, Ballrooms	2,500,000	10,100,000	10,600,000	10,700,000	12,300,000
Auditorium, Exhibition Halls	5,500,000	5,500,000	5,600,000	5,600,000	7,500,000
Bowling Establishments	7,400,000	8,100,000	3,300,000	9,500,000	10,400,000
Churches	18,500,000	23,300,000	28,100,000	28,400,000	34,200,000
Clubs, Privates	13,500,000	12,800,000	14,200,000	14,500,000	19,400,000
Restaurants, Taverns	46,000,000	50,900,000	54,300,000	54,900,000	65,300,000
Theaters, Studios	7,600,000	11,700,000	13,400,000	13,500,000	13,400,000
Transportation Terminals	2,500,000	2,800,000	2,600,000	2,600,000	3,500,000
Other Public Assembly Occupancies	8,900,000	13,700,000	15,100,000	15,300,000	15,400,000
Total:	\$119,400,000	\$138,900,000	\$153,200,000	\$155,000,000	\$181,400,000
Educational Occupancies					
Schools, thru 12th grade	64,800,000	72,500,000	76,100,000	81,900,000	106,200,000
Other Schools	13,000,000	14,500,000	14,800,000	17,100,000	18,600,000
Total:	77,800,000	87,000,000	90,900,000	99,000,000	124,800,000
Institutional Occupancies					
Rest & Nursing Homes	2,700,000	3,500,000	3,900,000	3,600,000	5,900,000
Hospitals	8,500,000	11,100,000	12,200,000	12,400,000	20,400,000
Mental Institutions	1,000,000	1,300,000	1,500,000	1,500,000	2,500,000
Other Institutions	5,000,000	6,500,000	7,200,000	6,400,000	10,600,000
Total:	17,200,000	22,400,000	24,800,000	23,900,000	39,400,000
Residential Occupancies					
Dwellings, 1-2 Family	603,500,000	608,600,000	638,500,000	700,700,000	808,100,000
Apartments	132,800,000	151,400,000	151,600,000	265,300,000	299,100,000
Hotels, Motels	33,800,000	37,900,000	43,600,000	42,200,000	68,300,000
Mobile Homes	33,000,000	36,500,000	42,000,000	57,800,000	77,200,000
Other Residential Occupancies	38,600,000	39,700,000	42,700,000	37,400,000	50,100,000
Total:	841,700,000	874,100,000	918,400,000	1,163,400,000	1,302,800,000
Mercantile and Office Occupancies					
Appliance, Furniture Stores	26,000,000	24,800,000	28,100,000	27,500,000	32,600,000
Clothing Stores	20,400,000	19,400,000	21,800,000	20,900,000	24,900,000
Department, Variety Stores	37,400,000	35,600,000	41,900,000	40,700,000	53,300,000
Drugstores	11,800,000	11,200,000	11,800,000	11,400,000	12,900,000
Grocery Stores, Supermarkets	33,200,000	31,600,000	36,900,000	35,900,000	40,900,000
Motor Vehicle Sales, Repair	33,300,000	31,700,000	35,100,000	34,100,000	43,800,000
Offices, Banks	43,000,000	41,200,000	48,700,000	47,300,000	55,800,000
Service Stations	11,500,000	10,900,000	11,600,000	11,100,000	14,200,000
Other Mercantile Occupancies	132,000,000	125,800,000	141,800,000	137,800,000	154,200,000
Total:	348,600,000	332,200,000	377,700,000	356,700,000	432,600,000
Basic Industry, Defense Occupancies					
Electric Power Plants	9,500,000	8,600,000	24,700,000	22,900,000	26,900,000
Laboratories, Data Processing Ctrs.	2,500,000	2,000,000	2,800,000	2,600,000	12,900,000
Mines, Mineral Products Plants	44,100,000	39,700,000	44,500,000	41,000,000	40,400,000
Other Basic Industry Occupancies	8,700,000	7,900,000	9,600,000	9,400,000	8,200,000
Total:	64,800,000	58,200,000	81,600,000	76,300,000	88,400,000
Manufacturing Occupancies					
Beverage, Tobacco, Essential Oils	6,600,000	6,400,000	6,700,000	5,100,000	6,800,000
Drug, Chemical, Paint, Petroleum PL	76,000,000	73,700,000	94,900,000	89,000,000	172,000,000
Food Product Plants	41,400,000	40,200,000	42,200,000	39,600,000	58,600,000
Laundry, Dry Cleaning Plants	9,200,000	8,900,000	9,900,000	9,200,000	7,100,000
Metal, Metal Product Plants	46,500,000	45,100,000	54,400,000	51,700,000	82,700,000
Paper, Paper Product Plants	8,400,000	8,100,000	11,800,000	11,000,000	17,000,000
Plastic, Plastic Product Plants	11,500,000	11,200,000	16,500,000	16,700,000	27,600,000
Printing Plants	5,400,000	5,300,000	6,400,000	6,100,000	14,100,000
Textiles, Textile Product Plants	16,500,000	16,100,000	18,100,000	15,700,000	32,200,000
Wood, Wood Product Plants	39,800,000	38,600,000	46,500,000	43,600,000	48,600,000
Other Manufacturing Occupancies	81,400,000	99,900,000	82,000,000	76,700,000	118,200,000
Total:	342,700,000	332,500,000	389,000,000	364,400,000	584,900,000
Storage Occupancies					
Barns, Stables	61,600,000	85,000,000	81,000,000	74,400,000	96,600,000
Bulk Plants, Tank Farms	7,900,000	8,300,000	10,300,000	9,300,000	58,700,000
Garages, Residential Parking	29,800,000	31,000,000	30,500,000	27,900,000	36,100,000
Grain Elevators	47,800,000	49,800,000	42,800,000	39,300,000	51,300,000
Lumber, Building Materials Storage	20,400,000	21,300,000	20,700,000	18,900,000	29,900,000
Sheds, Farm Outbuildings	30,200,000	31,500,000	30,100,000	27,600,000	36,600,000
Other Storage Buildings	126,400,000	131,800,000	111,800,000	102,600,000	125,100,000
Total:	344,100,000	358,700,000	327,200,000	300,000,000	434,300,000
Other Buildings	52,900,000	62,200,000	53,500,000	48,500,000	71,400,000
Total Building Fires:	2,209,200,000	2,266,000,000	2,416,300,000	2,537,200,000	3,280,000,000
Nonbuilding Occupancies					
Standing Crops	27,200,000	26,000,000	29,000,000	32,000,000	36,200,000
Forests	131,100,000	119,000,000	128,000,000	126,000,000	169,700,000
Grass, Brush, Rubbish					
Motor Vehicles	88,900,000	112,660,000	127,300,000	135,300,000	135,000,000
Ships, Boats, RR	29,000,000	27,600,000	29,200,000	30,300,000	37,900,000
Railroad Rollingstock					
Aircraft, Aerospace Vehicles	145,000,000	192,000,000	198,000,000	150,000,000	181,000,000
Total Fire Losses:	\$2,630,400,000	\$2,743,260,000	\$2,927,800,000	\$3,020,800,000	\$3,819,100,000

Source: National Fire Protection Association; Fire Protection Handbook, p. 1-5 14th edition 1976

PROPERTY LOSS BY FIRE

Table 1-3C. Occupancies Where Large-loss Fires Occurred, 1974

Occupancy	No. Large-loss Fires	Loss	No. Large-loss Fires	Loss
Public Assembly			73	\$41,649,577
Bowling Establishments	8	\$4,345,000		
Churches	15	6,014,875		
Clubs	7	2,460,000		
Restaurants, Night Clubs and Taverns	31	16,656,786		
Other Public Assembly Places	12	12,172,916		
Educational			42	29,831,212
Nonresidential Schools	40	28,571,212		
Other Educational	2	1,260,000		
Institutional			2	1,350,000
Residential			43	19,242,599
Apartments	16	9,483,607		
Hotels and Motels	13	5,423,325		
Other Residential	14	4,335,667		
Mercantile			118	85,830,629
Food Sales	15	8,731,378		
Textile Product Sales	6	2,837,000		
Household Goods Sales	17	8,808,000		
General Item Sales	20	14,123,750		
Offices	18	17,704,727		
Other Commercial	42	32,525,774		
Basic Industry			24	31,244,500
Utilities	10	6,375,000		
Other Basic Industry	14	24,869,500		
Manufacturing			119	132,668,862
Food Processing	15	17,915,470		
Wood and Wood Paper Products	24	35,320,001		
Chemical, Plastic and Petroleum Products	15	33,754,000		
Metal and Metal Products	29	18,986,457		
Other Industrial and Manufacturing	36	26,692,934		
Storage			138	139,909,279
Agricultural Products	15	19,201,660		
Textile Products	11	18,377,617		
Wood and Wood Paper Products	29	13,239,691		
Chemical, Plastic and Petroleum Products	20	13,992,000		
Metal and Metal Products	16	10,350,500		
General Items	21	24,846,480		
Other Storage	26	39,901,331		
Other Occupancies			35	74,207,057
Special Structures	1	\$7,500,000		
Unoccupied Properties*	20	9,003,417		
Ships and Other Water Vessels	2	2,180,000		
Rail Vehicles	3	31,250,000		
Road Vehicles	4	6,203,640		
Aircraft	5	24,820,000		
Unclassified Property	21	9,975,696	21	9,975,696
Total			616	\$565,909,411

* Includes buildings under construction, renovation and demolition.

Table 1-3D. Large-loss Fires by Size of Loss

Year	No. Fires \$250,000 and Over	No. Fires \$750,000 and Over	No. Fires \$3,000,000 and Over	No. Fires \$10,000,000 and Over
1974	615	177	31	8
1973	501	157	22	4
1972	574	158	12	0
1971	499	132	10	1
1970	504	149	21	4

NOTE: See 1974 Large-loss Fires in the United States, *Fire Journal*, pp 13-18, Sep. 1975.
 Source: National Fire Protection Association; Fire Protection Handbook,
 p. 1-5 14th edition 1976

PART II

S T A T I S T I C S

HOW SPRINKLERS OPERATE AND THEIR
EFFECTIVENESS AT REDUCING LOSSES CAUSED BY FIRE

FUNDAMENTALS OF SPRINKLER PROTECTION

Automatic fixed extinguishing systems are the most effective means of controlling fires in buildings. In order to understand the capabilities of these systems, a thorough understanding of their use is essential. This Section deals with one such extinguishing system; sprinklers.

A. Development of Sprinkler Protection

The rapid growth of business and industry and the resultant increase in fire hazards and property values brought about the need for more adequate protection against fire. The difficulty of reaching a fire with hose streams has often been demonstrated, and such simple fire protection as water pails, standpipes, and hose equipment has proved inadequate unless the fire was discovered in its early stages. Although

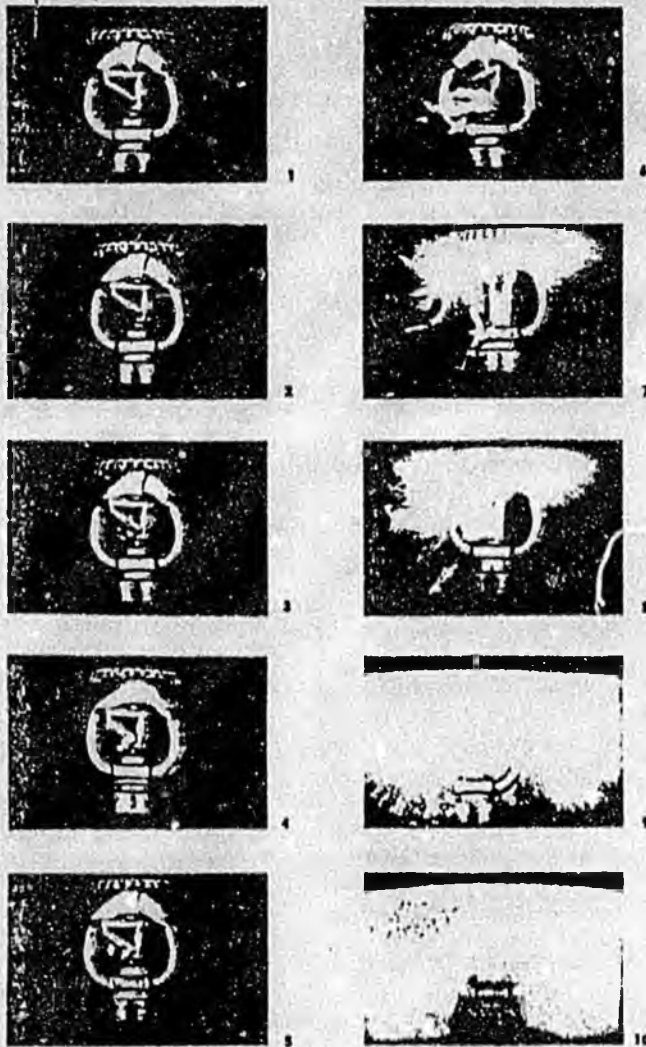


Fig. 14-1A. Operation of a typical fusible link automatic sprinkler is shown in this sequence of photos. As heat melts the solder, separation of members of the soldered link (the sloping side of the triangle in photos 1 to 5) is followed by complete separation of the link and lever arrangement (photo 6) which releases the cap over the sprinkler orifice allowing water to escape and strike the deflector (photos 7 to 10).

fire control has been made easier by improved building construction, comparatively little headway was made in reducing fire loss involving delayed detection until the advent of the automatic sprinkler.

The Automatic Sprinkler

Automatic sprinklers are devices for automatically distributing water upon a fire in sufficient quantity either to extinguish it entirely or to prevent its spread in the event that the initial fire is out of range, or is of a type that cannot be extinguished by water discharged from sprinklers. The water is fed to the sprinklers through a system of piping, ordinarily suspended from the ceiling, with the sprinklers placed at intervals along the pipes. The orifice of the fusible link automatic sprinkler is normally closed by a disk or cap held in place by a temperature-sensitive releasing element. Figure 14-1A shows in stop-action photo sequence the operation of a typical fusible link, upright automatic sprinkler.

Perforated Pipe and Open Sprinkler Systems

The forerunners of the automatic sprinkler were the perforated pipe and the open sprinkler. These were installed in a number of mill properties from 1850 to 1880 (see Fig. 14-1B). The systems were not automatic, the discharge openings in the pipes often clogged with rust and foreign materials, and water distribution was poor.

Open sprinklers, an improvement over perforated pipes, consisted of metal bulbs with numerous perforations attached to piping and intended to give improved water distribution. This system was only slightly better than the perforated pipe.

Early Automatic Sprinklers

The idea of automatic sprinkler protection, whereby heat from a fire opens one or more sprinklers and allows the

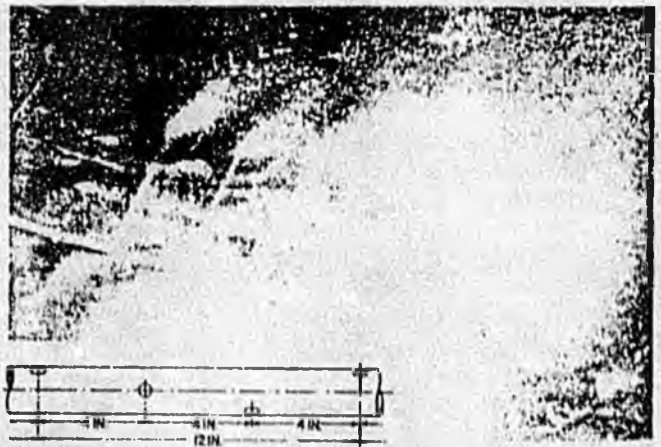


Fig. 14-1B. Early Perforated Pipe Sprinkler System: Water is shown discharging from a length of pipe representing what was the type of sprinkler protection in use from 1850 to about 1880. The inset shows the locations of perforations and the distances between them on a typical length of perforated pipe as was installed by the Providence Steam and Gas Pipe Co. (Grinnell Corp.)

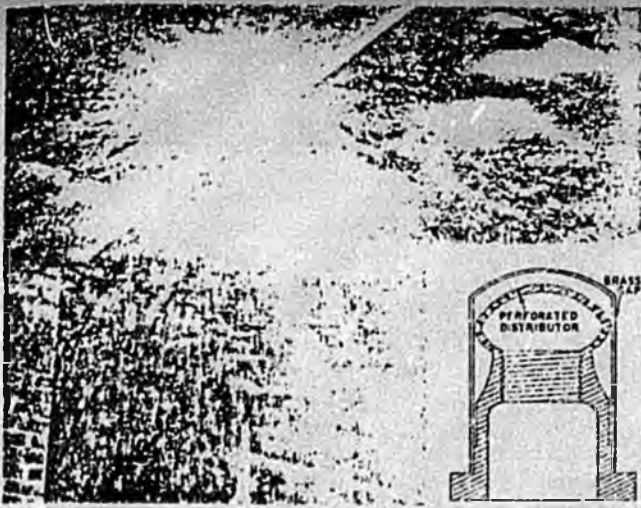


Fig. 14-1C. An Early Automatic Sprinkler: Water is shown discharging from a Parmelee No. 3 upright sprinkler which was first used in 1875. It consisted of a brass cap soldered over a perforated distributor and was designed to screw onto a nipple. The inset shows a cross-sectional view of the sprinkler.

water to flow, dates back to about 1860. Its practical application in the United States, however, began about 1878 when the Parmelee sprinkler was first installed. This sprinkler, while very crude when compared with modern devices, gave generally good results and proved conclusively that automatic sprinkler protection was both practical and valuable. (See Fig. 14-1C.)

B. Value of Automatic Sprinkler Protection

Automatic sprinkler protection helped develop modern industrial, commercial, and mercantile practices. Large areas, high buildings, hazardous occupancies, large values, or many people in one fire area, all tend to develop conditions which cannot be tolerated without automatic fixed fire protection. Part C of this chapter contains material on the performance of automatic sprinkler systems.

Safety to Life

Automatic sprinklers, properly installed and maintained, provide effective safeguards against loss of life by fire. Their value is psychological as well as physical: they give a sense of security to the occupants of buildings, and minimize the possibility of panic.

NFPA records of loss of life by fire show that in completely sprinklered buildings fire fatalities have been minimal.* They are limited to situations where sprinklers cannot

* The only fatalities in fully sprinklered properties reported to the NFPA 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; by closure of water supply valves to the sprinkler system; or by hazards too severe for effective sprinkler performance in the protected property. Explosions in sprinklered properties have caused fatal injuries to occupants or have so damaged sprinkler piping as to render the systems virtually useless, with resultant loss of life. Severe flash fires have under unusual conditions traveled in advance of sprinkler operation, trapping victims before they had time to reach safety.

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 a sprinkler, or because the victims had suffered fatal injuries before the sprinkler operated. In these latter instances, however, the sprinklers protected the lives of persons in adjoining areas.

be expected to be effective, such as in cases where the water is shut off, or where suffocation occurs before a fire is large enough to cause sprinklers to operate. Loss of life can also be caused by explosions where sprinklers have no opportunity to be effective.

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. With sprinklers there are seldom problems of access to the seat of the fire, or of interference with visibility for fire fighting due to smoke. While the downward force of the water discharged from sprinklers may lower the smoke level in a room where a fire is burning, the sprinklers also serve to cool the smoke and make it possible for persons to remain in the area much longer than they would if the room were without sprinklers.

Objections sometimes advanced against automatic sprinkler installation in the interest of life safety are generally based on misconceptions of the basic characteristics of sprinkler protection. The opinion is sometimes expressed that sprinkler discharge might drench people and cause panic or illness. This objection ignores the fact that without sprinklers the same people in the fire area would perhaps be burned to death. There is no case in the NFPA records of over 100,000 fires in sprinklered buildings where water from automatic sprinklers has in any way contributed to panic or caused any other hazard to occupants.

Another common misconception is that *all* sprinklers discharge water at the time of fire. This is not the case, as most fires are controlled by only a few sprinklers in the immediate vicinity of the fire.

Other objections to automatic sprinkler protection are based upon cost, and occasionally upon appearance. These objections are unsound where conditions are such that sprinklers are needed for life safety. Sprinklers are generally no more expensive than some decorative floor coverings, and aesthetic designs are available in sprinklers.

Contrary to popular opinion, automatic sprinklers are practicable for dwellings and other small properties. In country areas where water supplies are limited, a pressure tank can be provided with sufficient capacity to control the fire during evacuation.

NFPA 101, Life Safety Code, recognizes sprinklers in numerous ways, particularly to offset deficiencies in existing buildings. For example, longer travel distances to exits and interior finish of a higher combustibility are permitted with sprinklers.

Recent developments in the sprinkler industry have resulted in systems and discharge devices that will cycle on and off. When a fire occurs, this system reacts to the increase in temperature and discharges water. When the temperature decreases to a predetermined level because the fire has been controlled or extinguished, the system automatically stops the flow of water. Should the fire flare up again, the system will repeat this cycle. This cycling continues until the fire is either out or the system is shut off.

Protection of Property

Figures available on the fire loss in manufacturing and mercantile properties where sprinklers are installed show a much better loss/value ratio than those properties not so equipped. Insurance may largely compensate for property loss, but a severe fire loss goes much further.

Prevention of Business Interruption

In addition to the saving in direct fire losses due to sprinkler protection, there is a saving represented by the

freedom from business interruption. There also is an undetermined but possibly even greater reduction in conflagration and exposure losses, which reasonably may be attributed to automatic sprinkler protection. The destruction of property and its adverse association and sometimes permanent effect upon business may be, and often is, a great hardship, not only to the owner, tenants, and employees, but also to the community as a whole. Safeguarding a business from serious interruption by fire is often a determining factor in a decision to install sprinkler protection.

In many situations, sprinkler protection is required by law for specific parts of the building only. Where partial systems are required, complete systems should be installed. Partial systems are not cost effective. Should the fire start remote to the system, it will have no effect on the growing fire. Should the fire burn into the protected area, it will generally have developed sufficient intensity to overpower the sprinklers, thereby wasting water needed by the fire service to fight the fire.

Minimizing of Water Damage

Standard sprinkler systems have devices which automatically give an alarm in case of sprinkler operation; thus, they not only apply water at the point most needed, but also give an audible signal. This permits immediate check of fire conditions and minimizes water damage.

A properly installed sprinkler system will generate less water damage than the application of hose streams by the fire service. Sprinklers are not hampered in their operation by smoke or heat as is the fire service. Sprinklers can apply water efficiently and promptly to the seat of the fire. For this reason, they are one of the greatest life-saving tools of the fire service.

Fear of water damage is sometimes offered as an objection to the installation of automatic sprinkler protection. This comes in part from the thoughtless emphasis placed upon water damage in news reports of fires. Statements that a fire was of insignificant size, but that water damage was severe have been frequent. The probability of very severe destruction by fire in the absence of automatic sprinkler protection is seldom mentioned in these news accounts.

Accidental discharge of water from an automatic sprinkler system or other parts of a fire service water system due to defects in sprinklers, water control devices, piping, or associated equipment, is very rare. Precautions to prevent unnecessary discharge of water as a result of mechanical injury, freezing or overheating, or corrosion are covered in Chapter 6 of this Section.

Economics of Sprinkler Protection

In addition to the protection against destruction of property values and interruption to business, the saving in insurance costs often makes the expenditure for automatic sprinkler protection a sound business investment.

Many buildings do not have automatic sprinkler protection because the per dollar cost of the protection has appeared unjustifiably high to the building owners in relation to the value of the building.

Savings in insurance premiums alone could in numerous cases be adequate to finance, over a few years time, the installation of automatic sprinkler protection. Of equal importance are the many building code "trade-offs" that are allowed when sprinklers are installed. These "trade-offs" permit an increase in undivided area and often less fire resistance for the building construction, and therefore less erection cost. No value can be placed on the life safety aspects of total sprinkler protection or the security occupants feel when such systems are installed.

C. Record of Automatic Sprinkler Performance

Periodically the NFPA prepares summaries of sprinkler performance from the fire data reported to its Fire Analysis Department. The information is published in the *NFPA Fire Journal* as the Automatic Sprinkler Performance Tables, and is also available in pamphlet form.¹

Effectiveness of Automatic Sprinklers

Only in rare instances do automatic sprinkler systems fail to control fires. The failures are very seldom due to the sprinklers themselves, but rather to the lack of water. Even with older types of sprinklers which are no longer approved, the failure of the sprinkler itself has been very infrequent. Failure of the modern types under normal conditions is practically unknown. Some 117,770 fires in sprinklered buildings have been reported to the NFPA since 1897. Of these, 95 percent of the sprinklers showed satisfactory performance.

Because numerous fires extinguished by one or two sprinklers (with only a slight loss) are not reported to NFPA, the NFPA records do not represent the total number of fires in sprinklered properties. If it were possible to include a complete record, the efficiency of sprinkler performance would probably approach 100 percent.

It should be noted that recorded data reflect only the efficiency of operation, and are but indirectly related to the amount of fire losses. For example, where sprinklers do not operate because the water is shut off, unsatisfactory performance is recorded even though the fire may have been promptly discovered and extinguished by other means. Figure 14-1D shows graphically cumulative data from 1970 to 1974 on the number of sprinklers operating.

In recent years, the apparent percentage of satisfactory sprinkler operations has declined. From 1970 to 1974 it was 81 percent. This may be the result of the NFPA's "tagging" system which concentrates on those fires causing larger losses. Other studies (N.Y. Board of Fire Underwriters, Factory Mutual, etc.) that are based on approximately 100 percent reporting show considerably higher rates. The same is true of Australian records where all sprinkler actuations are reported.

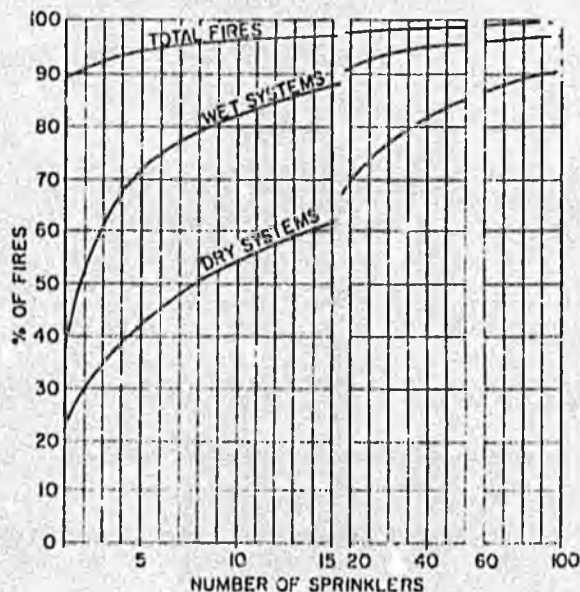


Fig. 14-1D. Number of sprinklers operating, cumulative data, 1970-74.

Effectiveness of Sprinklers by Occupancy Groups

Table 14-1A shows characteristic differences in sprinkler effectiveness for 22 major occupancy groups. As would be expected, some situations present a more difficult extinguishing problem than do others. This record of effectiveness is useful in evaluating the need for specially designed systems or auxiliary fire fighting facilities.

Unsatisfactory Sprinkler Performance by Occupancy Groups

Table 14-1A also lists by occupancy the reasons for unsatisfactory sprinkler performance for the same 22 occupancy groups. Closed sprinkler control valves are the most frequent cause, being responsible for 36 percent of the unsatisfactory performance reported. A study of the fires not controlled by sprinklers is of great importance, as it shows how to guard against such occurrences. It will be noted from Table 14-1A and from Figure 14-1E that in most cases there is a definite explanation for unsatisfactory performance. A more detailed analysis of unsatisfactory sprinkler performance will be found in the 1970 edition of the NFPA Automatic Sprinkler Performance Tables.¹

D. Standard Sprinkler Installations

The terms "sprinkler protection," "sprinkler installations," and "sprinkler systems" usually signify a combination of water discharge devices (sprinklers); one or more sources of water under pressure; water-flow controlling devices (valves); distribution piping to supply the water to the discharge devices; and auxiliary equipment, such as alarms and supervisory devices. Outdoor hydrants, indoor hose standpipes, and hand hose connections are also frequently a part of the system that provides protection. Figure 14-1F is an illustration of a typical sprinkler installation with all common water supplies, outdoor hydrants, and underground piping.

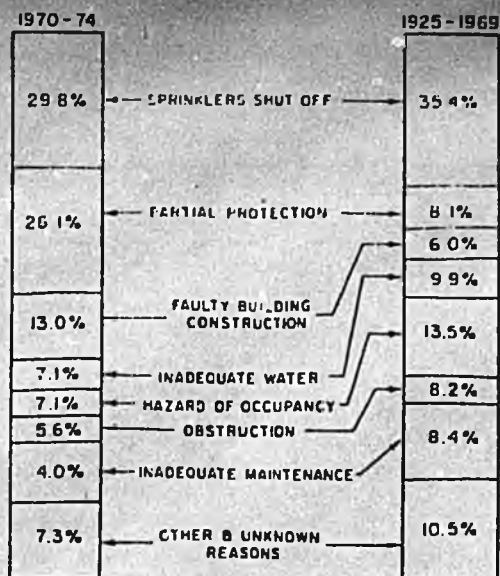


Fig. 14-1E. Reasons for unsatisfactory sprinkler performance.

When considering water supply problems, the performance of sprinklers, dry-pipe or wet systems, or special arrangements of sprinkler protection, the designation "sprinkler system" applies to the sprinklers controlled by a single water supply valve. Under this definition large buildings require several sprinkler systems, and a single water system may supply a number of sprinkler systems.

The fundamentals of sprinkler protection evolve around the principle of the automatic discharge of water, in sufficient density, to control or extinguish a fire in its incipiency. In planning for a system that fulfills this objective, many factors must be considered. They can, however, be broadly grouped into four categories: the sprinkler system itself, features of building construction, hazards of occupancy, and water supplies.

Table 14-1A. Sprinkler Performance Summary and Classification of Unsatisfactory Performance*

Occupancies	Performance Summary				Classification of Unsatisfactory Performance												
	Total No. of Fires	Total Unsatisfactory	Total Satisfactory	Total Satisfactory Per Cent	Water Shut Off	Partial Protection	Inadequate Water Supplies	System Frozen	Slow Operation	Defective Dry-Pipe Valve	Faulty Building Construction	Obstruction to Distribution	Hazard of Occupancy	Exposure Fire	Inadequate Maintenance	Antiquated System	Miscellaneous and Unknown
Residential	1,073	48	1,025	95.5	13	9	5	1	—	11	3	1	—	2	2	1	—
Assembly	1,551	52	1,499	96.6	23	10	3	—	1	9	1	—	1	4	—	—	—
Educational	241	20	221	91.7	4	8	1	—	—	5	—	—	—	1	—	—	—
Institutional	305	12	293	96.1	3	3	2	—	—	1	—	—	1	—	—	—	—
Office	494	13	481	97.4	4	2	1	—	—	2	—	—	1	—	1	—	—
Mercantile	6,237	178	6,061	97.2	83	11	4	4	4	5	35	11	12	1	4	1	1
Industrial																	
Beverages, essential oils	543	64	479	88.2	17	4	8	—	—	1	2	1	18	3	3	5	1
Chemicals	4,147	198	3,949	95.2	33	11	19	—	3	3	1	13	95	2	12	1	6
Fiber products	539	26	514	95.3	6	—	4	1	—	2	—	5	4	—	2	1	—
Food products	2,484	133	2,351	94.6	43	11	8	1	2	1	7	9	29	4	12	1	5
Glass products	519	23	496	95.6	8	—	3	1	—	—	2	1	5	—	3	—	—
Leather, leather products	2,864	114	2,750	96.0	43	8	7	3	2	4	9	7	9	4	9	0	3
Metal, metal products	9,807	305	9,502	96.9	91	36	22	3	6	0	15	35	43	0	29	7	0
Mineral products	394	19	375	95.2	10	4	2	—	—	—	1	—	—	—	1	1	—
Paper, paper products	7,147	234	6,913	96.7	75	16	34	3	2	2	16	32	21	2	23	4	4
Rubber, rubber products	1,489	61	1,428	95.9	21	4	3	—	1	1	1	10	14	1	5	—	—
Textiles—Manufacturing	16,119	291	15,828	98.2	109	15	32	3	5	3	11	27	18	1	50	9	8
Textiles—processing	6,577	127	6,450	98.1	52	6	11	—	5	1	8	13	15	2	7	1	6
Wood products	5,353	492	4,861	91.6	137	57	84	9	16	14	27	19	77	8	24	12	8
Miscellaneous industries	9,013	265	8,748	97.1	146	15	14	8	3	—	12	11	18	3	27	8	—
Total (Industrial)	66,845	2,351	64,494	96.5	711	187	252	37	45	38	112	183	256	36	207	50	46
Storage Occupancies	4,100	375	3,725	91.0	172	24	43	5	6	9	10	57	38	11	40	3	7
Other Occupancies	419	87	332	79.2	67	—	—	2	—	—	2	1	5	3	3	1	3
Total (All Occupancies)	81,425	3,134	78,291	96.2	1,110	254	311	44	56	53	167	256	424	52	262	65	60

* From the 1970 edition of the NFPA Automatic Sprinkler Performance Tables.

Bibliography

References Cited

- ¹"Automatic Sprinkler Performance Tables," 1970 Ed., *Fire Journal*, Vol. 64, No. 4, July, 1970, pp. 35-39.
- ²Thompson, N. J., *Fire Behavior and Sprinklers*, National Fire Protection Association, Boston, 1964, pp. 104-110.
- ³Welb, W. A., "Automatic Sprinklers in Exhibition Halls," *Fire Technology*, Vol. 4, No. 2, May 1968, pp. 115-125.
- ⁴Thompson, N. J., "Hazard of High Piled Combustible Stock," *NFPA Quarterly*, Vol. 43, No. 1, July 1949, pp. 38-46.
- ⁵"Wrought Steel and Wrought Iron Pipe," USAS B-36.10-1959, United States of America Standards Institute, New York.

AUTOMATIC SPRINKLER PERFORMANCE TABLES
 NATIONAL AUTOMATIC SPRINKLER AND FIRE CONTROL ASSOCIATION, INC.

SUMMARY — LIFE SAFETY OCCUPANCIES

Occupancy	No. of Fires	No. of Fires Extinguished	No. of Fires Held In Check	Satisfactory Systems Performance	FIRES CONTROLLED BY			Unsatisfactory Sprinkler Performance	
					1 Sprinkler	2 or Less Sprinklers	3 or Less Sprinklers		
Mercantiles	82	49	32	81	49	64	73	8	1
Hotels, Motels Multiple Residences	31	25	5	30	22	28	29	1	1
Bowling Lanes	24	22	2	24	21	22	23	1	
Nursing Homes	21	18	3	21	16	20	20	1	
Hospitals	17	13	4	17	11	15	15	2	
Restaurants	9	7	2	9	3	7	7	2	
Assembly and Office Buildings	6	3	3	6	4	4	5	1	
Schools and Colleges	35	29	5	34	24	31	32	3	1
Cumulative Totals in Numbers	225	166	56	222	150	191	204	19	3
Cumulative Totals in Per Cent		74.1%	25.0%	99.1%	66.5%	85.4%	90.6%	8.6%	.9%

1957-1967

An analysis of 225 fires in "completely" sprinklered "life safety" occupancies (light or ordinary hazard).

99.1% of these fires were extinguished or controlled by sprinklers.

The three instances of unsatisfactory performance resulted from "closed" valves.

Simple automatic valve supervision by central station, proprietary or remote station systems would send an automatic trouble signal alerting building employees and/or the fire department that water is "shut-off".

9-II

Source: 241 National Automatic Sprinkler and Fire Control Association, Inc.; News Bulletin, P. 18, May-August, 1971

AUTOMATIC SPRINKLER PERFORMANCE IN AUSTRALIA AND NEW ZEALAND

1886-1968

by

Harry W. Marryatt, Chairman, Australian Fire Protection Association

540 pages

Published by

AUSTRALIAN FIRE PROTECTION ASSOCIATION

51-53 William Street, Melbourne, Victoria Australia 3000

April, 1971

We don't very often publish book reviews. But this case is different. We would be remiss in our responsibilities to you — our readers — if we didn't tell you about Harry W. Marryatt's text, a comprehensive and scholarly study of automatic sprinkler performance in Australia and New Zealand, covering a period of 82 years.

Harry Marryatt is the founder of the Australian Fire Protection Association, has been its chairman since it was established in May, 1960. He is a graduate of the University of Melbourne, a charter member of the Society of Fire Protection Engineers (USA) and a Fellow of the Australian Institute of Management. He has been a professional fire protection engineer for more than forty years; has designed, manufactured, installed and serviced automatic sprinkler systems and virtually all fixed fire protection systems in Australia for more than four decades.

The book, inspired by Percy Bugbee, Chief Administrator of the National Fire Protection Association International (retired), is the most incisive, penetrating, detailed and comprehensive text published to date on the historic behavior of automatic sprinkler systems.

The book is more than a statistical analysis of sprinkler performance. It is a fire protection engineer's delight, examining the basic principles of loss control, delving into the basic physical laws governing the capabilities of water to absorb heat when droplets are broken up into a fine spray.

For those of you who relish the physics and chemistry of fire, its calculitic formulae, this book will keep you and your slide rule busy.

For those of you who want a reference text with well documented case histories of fires in virtually every conceivable

AUTOMATIC SPRINKLER PERFORMANCE TABLES

TABLE 3 — CONDENSED *

Number of Sprinklers Operating	Number of Fires		Percentage Extinguished or Controlled	
	Total	Cumulative	Total	Cumulative
1	3809	3809	66.56%	66.56%
2	901	4710	15.56	82.12
3	337	5047	5.89	88.01
4	184	5231	3.22	91.23
5	91	5322	1.58	92.81
6	71	5393	1.24	94.05
7	50	5443	0.87	94.92
8	45	5488	0.78	95.70
9	25	5513	0.44	96.14
10	31	5544	0.54	96.68
10 or more	176	5720	3.08%	99.76%

<u>TOTAL</u>	<u>NUMBER</u>	<u>PERCENT</u>
Fires Extinguished or Controlled	5720	99.76%
Unsatisfactory Performance	14	00.24%
TOTAL	5734	100.00%

*Source — Automatic Sprinkler Performance In Australia, 1886-1969
9 p 84) by — H. W. Marryatt, Australian Fire Protection Association
(April, 1971)*

type of occupancy, this is an indispensable reference source.

If you delight in "the laws of large numbers", statistics, this text is the ultimate source of information about sprinklers, originating from Australia and New Zealand, where statistical research into sprinkler behavior stands out as an example for the world to emulate.

Marryatt has evaluated 5,734 fires, virtually every instance of sprinkler operation of which a known record exists in the nation's down under. His conclusion: 5,720 extinguishments out of a possible

5,734. 99.76% of all recorded fires: successfully extinguished by sprinklers.

Marryatt has wrung every conceivable drop of information out of the statistics he has developed: operating temperatures of sprinklers, types of sprinkler (link and lever, bulb, pendant, upright, etc.), response time of the "fire brigade" (department), time of day at which fires occurred, month of year, construction type (fire resistive — non-fire resistive), floors of buildings in which fires occurred, the height above the floor of sprinklers in operation. He makes extensive

AUSTRALIA - NEW ZEALAND WHY UNSATISFACTORY PERFORMANCE?

	No. of Fires	Percent of Unsatisfactory Performance
• Severe external exposure	4	28.6%
• Partial sprinkler protection	4	28.6%
• Explosions Systems destroyed by blast	3	21.5%
• Fire loading too high for water supply	1	07.1%
• Inadequate water supplies	1	07.1%
• Roof surface destroyed	1	07.1%
TOTAL	14	100.0%

Source: 242 National Automatic Sprinkler and Fire Control Association, Inc.;
News Bulletin, p. 25-28, January-March, 1973

commentaries on water supplies, flowing pressures, gallonage consumed, and a detailed analysis with illustrative case histories on the behavior of fires in nearly one hundred types of occupancies.

His analysis of incendiary fires, even cases where as many as seven fires were set by an arsonist, have given sprinklers a 100% record in controlling 120 out of a possible 120 fires set by arsonists.

Marryatt's five years of research into 5,734 fires discovered only 14 cases where sprinklers failed to extinguish or control fires. That's only 0.24% compared to a record of 99.76% of the total fires successfully managed by sprinklers.

In 82 years, 14 unsuccessful operations is a little short of unbelievable.

The most amazing fact to emerge from the book was the small number of sprinklers needed to control fires. 66.56% of all fires were controlled by one sprinkler.

82.12% by two or less sprinklers. 91.23% by four or less sprinklers. Only 176 fires opened more than ten sprinklers out of a possible 5,734. That's 3.08%.

If you really want to know the story on sprinklers, this book is a must.

You can order it directly from the National Fire Protection Association.

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Attention: Doris Sheldon

Enclose a check or money order made payable to NFPA (\$15.50).

PART III

S T A T I S T I C S

HOW MUCH WATER SHOULD A CITY
HAVE AVAILABLE FOR FIGHTING FIRES

1. ISO Guide for Determination
of Required Fire Flow
2. Municipal Grading Schedule
Description

WATER SUPPLY REQUIREMENTS FOR FIRE PROTECTION

This chapter gives information on the quantities of water needed for fire protection purposes. The components of a water system are discussed in other chapters in this section. No distinction is made for ownership of a system, whether public or private, as quantities of water needed for fire protection are not based on ownership of the system but rather on experience and engineering analysis of fire protection requirements for the property to be protected. Supply requirements for automatic sprinklers or other fixed systems using water are discussed in appropriate chapters of Sections 14 and 15.

A. The Two Uses of Water Systems

Water systems designed today for municipal use have dual functions; they supply potable water for domestic consumption, and they supply water for fire protection. Domestic consumption means more than just water for human consumption. It includes water used for sanitation, industrial processes, lawn sprinkling, air conditioning and similar water-consuming purposes. Sometimes industrial sites will provide separate systems for supplying process water and water for fire protection. Any dual-purpose system must be able to supply enough water for fire protection while at the same time meet the maximum anticipated consumption for other purposes.

B. Rates of Consumption

There are three rates of consumption that are considered in designing water systems. They establish a base to which required fire flows can be added in designing a system or determining its adequacy. The rates are:

1. Average daily consumption—the average of the total amount of water used each day during a 1-year period.

2. Maximum daily consumption—the maximum total amount of water used during any 24-hour period in a 3-year period. (Unusual situations which may have caused an excessive use of water, such as refilling a reservoir after cleaning should not be considered in determining the maximum daily consumption.)

3. Peak hourly consumption—the maximum amount of water that can be expected to be used in any given hour of a day.

The maximum daily consumption is normally about 1.5 times the average daily consumption. The peak hourly rate will vary from two to four times a normal hourly rate. The effect these varying consumption rates will have on the ability of the system to deliver required fire flows will vary with the system design. But both maximum daily consumption and peak hourly consumption should be considered to ensure that water supplies and pressures do not reach dangerously low levels during these periods, and that adequate water will be available in the event of a fire.

C. Water for Fire Fighting

Historically, water systems for cities and towns were developed with needs other than fire protection in mind. However, it was found that in a large city which had to

have a lot of water for drinking, sanitation, and other purposes, there was usually sufficient water to provide a useful supply for fire fighting purposes. On the other hand, waterworks designed on the basis of ordinary water needs of a small city would be able to deliver only a fraction of the water which might be needed for fire fighting.

All this led to inquiries into the cost in a given city for a waterworks that could provide water for fire fighting purposes as well as for other uses. A number of distinguished engineers associated with individual waterworks examined the problem and their findings were discussed in technical papers presented at engineering society meetings. Papers by J. Herbert Shedd (1889),¹ J. T. Fanning (1892),² and Emil Kuichling (1897)³ should be consulted for details of the discussions in which standards now followed in American and Canadian waterworks practice developed (Table 11-1A).

Table 11-1A. Estimates of Fire Flow

Populations Thousands	Number of Fire Streams Required Simultaneously				
	Shedd 1889	Fanning 1892	Freeman 1892	Kuichling 1897	NBFU 1910
1			2-3	3	4
4		7		6	8
5	5		4-8	6	9
10	7	10	6-12	9	12
20	10		8-15	12	17
40	14		12-18	18	24
50		14		20	26
60	17		15-22	22	28
100	22	18	20-30	28	36
150		25		34	44
180	30			38	48
200			30-50	40	48

Sources (these authorities define streams slightly differently as described in accompanying text, but the streams were of the order of 200 gpm to 300 gpm):

Shedd, J. Herbert, discussion on a paper by Sherman, William B., *Ratio of Pumping Capacity to Maximum Consumption*.¹

Fanning, J. T., *Distribution Mains and the Fire Service*.²

Kuichling, E., *The Financial Management of Water Works*.³

Freeman, John R., *The Arrangement of Hydrants and Water Pipes for the Protection of a City Against Fire*.⁴

Figures furnished by National Board of Fire Underwriters, and presented in a paper by Metcalf, Leonard, et al.⁵

The Number of Hose Streams

The starting point for considering the cost of water for fire protection was an estimate of the number of hose streams that a fire department might need for fire fighting. This was usually estimated on the basis of the central portion of the city where the largest buildings were located and where there was the greatest building congestion. The number of streams was found to be related, in a very rough way, to the population. Shedd's proposal, the first, was on the basis of hose streams discharging 200 gpm. He suggested that a community of 5,000 population, as a rule, would need about five such streams and that the needs of

other cities could be graduated up to thirty streams in a city of 180,000. Fanning proposed streams requiring about 54 psi pressure as the basis. His figures were of the same general order as Shedd's, beginning at seven streams for a community of 4,000 and going up to twenty-five streams for a city of 150,000.

Kuichling suggested a formula where the number of streams required would be the square root of the population in thousands multiplied by a factor of 2.8. There were arithmetical differences as to how these estimates worked out for individual cities, but they were of the same general order (Table 11-1A). Most important, they did provide a basis from which the waterworks designers could make some estimates of the cost factors which fire demands imposed on various details of the system.

During this period of consideration of waterworks design features to provide fire protection, the most important paper on the subject, *The Arrangement of Hydrants and Water Pipes for the Protection of a City Against Fire*, was presented (1892) by John R. Freeman.⁴ He had done the fundamental work on flow of water through hose and nozzles, so he was able to pin down the definition of a standard fire stream to one with a discharge of 250 gpm at 40 to 50 psi pressure. He said that the relationships suggested by Shedd and Fanning between population and the number of streams required were of the right order, but he did not think the needs of individual cities could be quite so definitely pinned down. He suggested two to three streams as a minimum at 1,000 population graduated up to thirty to fifty at 200,000 (Table 11-1A). Most significantly, he warned: "Ten streams, or as large a proportion thereof as the financial consideration will permit, may be recommended for a compact group of large, valuable buildings, irrespective of a small population."

Engineering: Distributing Network, Hydrant Spacing, Storage

Freeman noted a fundamental difference in purpose between a system designed for supplying ordinary water needs and one for water for fire protection. Fire draft required concentration of the water, whereas domestic draft was a matter of distribution.

Freeman sought to secure recognition of the fact that if a water system was to supply fire protection needs, the distribution system should be designed to concentrate the needed amounts of water. Small pipes were sufficient for distribution, but larger ones were needed for concentration of supply to fire streams. He suggested 6-in. diameter pipe as the minimum for residential districts, and he noted that 8-in. pipe was adequate only where it formed part of a network of distributing pipes whose intersections were not far apart.

Another important point Freeman made was that hydrants should be placed where they could concentrate streams at specific blocks or groups of buildings to be protected rather than on an arbitrary basis of a certain number of feet apart on the street mains. His work on hose streams had shown how long hose lines reduced the water that can be delivered promptly on a fire. He therefore suggested a working rule for hydrant spacing of 250 ft between hydrants in compact mercantile and manufacturing districts, and 400 to 500 ft in residential districts. These working rules can still be used as guides for good design. (Hydrant spacing is discussed in greater detail in Chapter 2 of this Section.)

Freeman further insisted that fire supply should be in addition to maximum domestic consumption and laid the foundation for eventual recognition of this principle. He also indicated how much water should be stored in standpipes or elevated reservoirs in the application of the principle. He expressed the judgment that flow for all of the hose streams required should be supplied from a reliable source, such as an elevated storage reservoir, for a period of not less than 6 hrs during a period when the system was also furnishing maximum demands for domestic and other uses. His judgment also was that to supply the combined fire and domestic needs in a system provided with reliable pump capacity, a 1-hr supply in a standpipe or elevated reservoir would be acceptable.

The Insurance Grading Schedule

As early as 1889, the NBFU (National Board of Fire Underwriters) began to make fire protection surveys of municipalities. This work was intensified in 1904 after a conflagration in Baltimore. Today the larger cities country-wide and the smaller communities in all but seven states are surveyed by the ISO (Insurance Services Office), successor to the NBFU. The survey includes an evaluation of a municipality's water system in all its details, and a map is usually prepared of the system itself. Actual hydraulic tests are made to determine the fire flow available in various parts of the community.

From the examination of the water supply, as well as other factors affecting fire defenses, the community is provided with recommendations expressing an engineering judgment on what the community should consider in its decisions on its public fire protection program. Engineers use as a yardstick the latest edition of ISO's *Grading Schedule for Municipal Fire Protection*,⁵ that considers a municipality as a whole, and no longer places more emphasis on protection for downtown districts than on other important districts as did earlier editions of the grading schedule. (For a more complete discussion of the insurance grading schedule see Section 9, Chapter 6, III-18-III-21).

D. Fire Protection Requirements in Water Systems

The capacity of a water system is determined by the total amount of water it must furnish. This is the sum of: (1) water required for domestic or industrial uses, and (2) water required for fire service. In small towns, the requirements for fire protection exceed other requirements.

In North American cities, a public water system is expected to furnish water for a great variety of purposes. In individual cities, there may be a heavy industrial demand, but demands for air conditioning and lawn sprinkling are examples of regular uses which can also affect the required capacity of the system. The adequacy of a public water system for fire protection cannot be taken for granted. These other demands on the system must be determined to estimate their effects on the capacity of the system for fire protection.

A joint report (1951) of committees of the American Society of Civil Engineers, the American Water Works Association and others,⁷ suggested that the maximum general service demand on a waterworks system be taken as the peak hourly demand during a test year. This, they noted, was the only figure which can fairly be compared with the maximum fire flow requirement.

Evaluating System Capacity

ISO engineers evaluate the ability of a water system to meet the maximum daily consumption rate plus the needed fire flow. In most large cities, the peak hourly rate exceeds the maximum daily consumption rate plus fire flow, and therefore, is the controlling factor in system design. However, in the smaller communities the reverse is true with the maximum daily consumption rate plus fire flow being the controlling factors. For many years water consumption has been increasing in most municipalities resulting in increased peak hourly rates. One result of this trend has been an increase in the number of municipalities in which the peak hourly rate controls design.

Pressure Characteristics of Systems

The pressure for which systems are normally designed reflect several practical considerations. They attempt to provide pressures that are adequate for water supplies both for domestic consumption and for fire protection. If either type of service demands special ranges of pressure, they too can be provided. Pipe and related fittings and methods of using them will allow almost any desired range.

San Francisco, for example, has a separate system, designated the "high pressure system," under the control of the fire department. All of the pipe is extra-heavy cast iron, tar-coated and lined, and tested on installation and repair to 450 psi. Two steam-operated pump stations can pump water from San Francisco Bay into the system, and 20,000 gpm at 250 psi can be delivered to most of the principal mercantile district. San Francisco provided this system primarily because an earthquake might put the regular public water system out of service. A number of other cities have provided similar "high pressure" systems.

Modern motorized fire department pumping apparatus make heavy streams and high pressures available from ordinary water systems where adequate volume is provided. Cities that formerly had separate systems of fire mains, operating at so-called high pressures, now generally have these operating at what would be normal public water pressures. They retain the advantages of an extra system of water mains.

Public water systems reflect a compromise on the question of pressures. Pressures in the range of 65 to 75 psi are best in most systems. This range is adequate for ordinary consumption in buildings up to about ten stories. It will provide sufficient water for automatic sprinkler systems in buildings of four to five stories. Where pressures of this order are provided, there is a reasonable margin to make it relatively easy to compensate for local fluctuations in draft at various times.

It is generally recommended that a minimum residual pressure of 20 psi be maintained at hydrants when delivering the required fire flow. Pumpers can be operated where hydrant pressures are less, but with difficulty. Where hydrants are well distributed and of the proper size and type (so that friction losses in the hydrant and suction line may not be excessive), it may be possible to set 10 psi as the minimum pressure. Sufficient suction pressure should be maintained to prevent developing a negative pressure in the street mains, which might result in the collapse of the mains or other water system components, or back-siphonage of polluted water from some interconnected source. The use of residual pressures of less than 20 psi is not permitted by most state health departments.

Pressures in a public water system may be considered excessive as they approach 150 psi. As pressures increase,

they tend to cause leaks in domestic plumbing, and special attention is required to restrain the mains in the ground. Pipe and fittings used in the ordinary public water system are designed for maximum working pressures of 150 psi. This does not mean that it is good practice to run pressures up that high. Pressure-reducing valves can be used in some sections of a system where the topography would produce excessive pressures, and individual water services to buildings may require pressure reducing valves to keep the pressure on domestic piping at safe levels.

Systems for Higher Elevations

When water must be supplied to an area of a community on high ground, the usual practice is to provide a separate water distribution system for the elevated section so that a normal range of pressures is provided. In such cases, the elevated area should be provided with its own water storage facility, and pumps may be provided to boost the water from the rest of the system. Likewise, the upper stories of a high building should be provided with water systems in the building itself. These systems will have the same requirements as for an area on a hill. A very tall building would have to be divided into a number of pressure zones. Zones of more than twelve stories tend to get outside the normal pressure ranges. In any case, each pressure zone must have storage of water in amounts needed for the sprinkler service or hose streams to be provided, and a system of pumps so that each zone is supplied from the zone below. Care should be taken to ensure that the pumps will be able to operate even during times of power failures.

E. Calculating Fire Flows

For many years the NBFU formula (see Table 11-1A) was commonly used as a guide in determining the fire flow required in the downtown business districts of municipalities. The formula

$$G = 1020 \sqrt{P} (1 - 0.01 \sqrt{P})$$

gave the fire flow, G , in gallons per minute as a function of the population, P , in thousands.

In making fire protection surveys, the fire flow requirements in the sections of the municipalities outside the downtown business district were estimated by the engineers of the NBFU and insurance bureaus.

As cities became more decentralized, the formula based on population became less reliable as a guide for the fire flow needed in the downtown district. In addition, it became more apparent that a guide to engineering judgment was needed for the other sections of the cities. In 1948, a paper by A. C. Hutson,⁶ assistant chief engineer of the NBFU, provided some specific suggestions for estimating fire flow requirements in these sections.

The latest developments in estimating fire flow requirements are found in the *Guide for Determination of Required Fire Flow*⁶ published by ISO in 1972. It provides guidance for estimating fire flow requirements in all parts of a municipality. The basic formula in the guide is:

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

where F is the required fire flow in gallons per minute, C is the coefficient related to the type of construction, and A is the total floor area of the building considered.

The values for C are: 1.5 for wood frame construction, 1.0 for ordinary construction, 0.8 for noncombustible con-

struction, and 0.6 for fire resistive construction. Interpolation is used if the type of construction does not fall into one of the four categories.

To the result obtained by application of the formula, a credit or surcharge is applied for occupancy, a credit for complete automatic sprinkler protection when provided, and a surcharge for exposures.

The maximum fire flow required is 12,000 gpm for any one location. The practical reason for this top figure is that manual fire fighting methods using men with hose streams and heavy stream appliances are not likely to develop a larger supply considering the general arrangement of buildings and the availability of hydrants. However, the possibility of a second simultaneous fire in the largest cities is considered, for which an allowance of 2,000 to 8,000 gpm additional may be made. This sets a practical maximum fire flow demand of 20,000 gpm for any city.

For groupings of one-family and small two-family dwellings not exceeding two stories in height, the short method of determining required fire flow given in Table 11-1B may

Table 11-1B. Fire Flows for Groups of Dwellings

Exposure Distances Feet	Suggested Required Fire Flow* Gallons per minute
Over 100	500
31 to 100	750-1,000
11 to 30	1,000-1,500
10 or less	1,500-2,000†

* Where wood shingles could contribute to spreading fires, add 500 gpm.

† If the buildings are continuous use a minimum of 2,500 gpm.

be used. The required fire flow should be available with consumption at the maximum daily rate (see Part B of this chapter). The number of hours during which the required fire flow should be available varies from 2 to 10 hours as indicated in Table 11-1C.

Table 11-1C. Duration of Required Fire Flow (U.S. Gallons)

Required Fire Flow			Required Fire Flow		
Gallons per minute	Million gallons per day	Duration hours	Gallons per minute	Million gallons per day	Duration hours
1,000	1.44	2	4,500	6.48	4
1,250	1.80	2	5,000	7.20	5
1,500	2.16	2	5,500	7.92	5
1,750	2.52	2	6,000	8.64	6
2,000	2.88	2	7,000	10.08	7
2,250	3.24	2	8,000	11.52	8
2,500	3.60	2	9,000	12.96	9
3,000	4.32	3	10,000	14.40	10
3,500	5.04	3	11,000	15.84	10
4,000	5.76	4	12,000	17.28	10

There are fires where quantities of water in excess of the required fire flow are used. Water supplies of 50,000 gpm or greater have been used in fire suppression, but to design systems capable of delivering flows of that magnitude in the average community for a possible unusual situation is not good economic practice.

F. Adequacy and Reliability of Supply

The adequacy of any given water system can be determined by engineering estimates. The source, including storage facilities in the distribution system, must be sufficient to furnish all the water that combined fire and domestic needs may call for at any one time. Arrangement of the supply works and details of the pumping facilities may limit the adequacy of the supply or affect its reliability. The various components of a water system are discussed in other chapters of this Section.

In a "pumping" system, a common arrangement is to have one set of pumps that takes suction from wells or from a river, lake, or other body of water. If the water does not have to be filtered, the pumps may discharge directly into the distribution system. Where filtration is necessary, the pumps take suction from the primary source and discharge the water into settling reservoirs and filter beds. After processing, the water flows to clear water reservoir from which a second set of pumps takes suction and discharges the water directly into the water main system. Unfortunately, failure of any part of the equipment may put the supply works out of commission. This is usually taken care of by duplication of units and by arrangement of the plant so as to facilitate repairs.

In considering the reliability of the supply works, features taken into account include: minimum yield, frequency and duration of droughts, condition of intakes, earthquakes, floods, forest fires, ice formations, silting up or shifting of river channels, and absence of watchmen where needed or the possibility of physical injury to them. Reliability is also affected by reservoirs out of service for cleaning and interdependence of parts of waterworks. The condition, arrangement, and reliability of individual units of plant equipment, such as pumps, engines, generators, electric motors, fuel supply, electric transmission facilities and similar items are also factors. Pumping stations of combustible construction are subject to destruction by fire unless equipped with automatic sprinklers.

Duplication of pumping units and storage facilities, and arrangement of mains and distributors so that water may be supplied to them from more than one direction, are measures that can assure continuous operation. The importance of duplicate facilities is shown by the frequency of their use.

G. Future Requirements for Determining Fire Flow

The amount of water needed to control and extinguish a fire in a given property cannot be established currently in precise terms. Differences in fire fighting tactics and variations in conditions which may exist at the time of a fire, as compared with the conditions existing when fire flow requirements were established, are variables that cannot be adequately measured at the present time. Better fire experience data basis should make it possible to tailor fire flows more specifically to conditions that might be expected at the time of a fire. Better analysis may indicate a need to increase fire flow beyond what is presently required, or it may result in a water system design based upon a balance between the risk involved and the economics of maintaining the water system.

The Role of Codes and Ordinances

Fire prevention codes can effectively limit hazards and ignition sources within buildings which in turn will not only help to limit the number of fires, but the size of fires through

the control of combustibles in a fire area. A good building code further reduces the chance for a serious fire by requiring construction materials and building assemblies which will contain a developing fire to a given area. These two factors alone will reduce considerably the amount of water needed for fire fighting. Zoning ordinances that establish distances between properties can be effective in controlling exposure situations.

The Role of Fire Detection and Extinguishing Systems

The increased use of automatic extinguishing systems, whether they use water or some other agent, will affect the quantities of water required. However, until more widespread use is made of early warning systems and automatic extinguishing systems, it will not be possible to equate the effect of these systems to required fire flow. Consideration is now given in the *ISO Guide for Determination of Required Fire Flow* for the presence of automatic sprinklers.

Water supply requirements are just one factor in a complex system that in total determines what the potential for a fire is, how extensive the fire will be, and the measures needed to suppress it. Research will someday equate all these factors and permit establishing fire flows on the basis of sound, thoroughly researched, and documented principles.

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	=	.305 m
1 psi	=	6894.757 Pa
1 gpm	=	3.785 litres/m ³

Bibliography

References Cited

- ¹Shedd, J. Herbert, discussion on a paper by Sherman, William B., "Ratio of Pumping Capacity to Maximum Consumption," *Journal of New England Water Works Association*, Vol. 3, 1889, p. 113.
- ²Fanning, J. T., "Distribution Mains and the Fire Service," *Proceedings of the American Water Works Association*, Vol. 12, 1892, p. 61.

³Kuichling, E., "The Financial Management of Water Works," *Transactions of the American Society of Civil Engineers*, Vol. 38, 1897, p. 16.

⁴Freeman, John R., "The Arrangement of Hydrants and Water Pipes for the Protection of a City Against Fire," *Journal of the New England Water Works Association*, Vol. 7, 1892, p. 49.

⁵Metcalf, L., Huichling, E., and Hawley, W. C., "Some Fundamental Considerations in the Determination of a Reasonable Return for Public Fire Hydrant Service," *Proceedings of the American Water Works Association*, Vol. 31, 1911, p. 55.

⁶*Grading Schedule for Municipal Fire Protection*, Insurance Services Office, New York, 1974.

⁷"Fundamental Considerations in Rates and Rate Structures for Water and Sewage Works," a joint report of Committees of the American Society of Civil Engineers and the Section of Municipal Law of the American Bar Association and of Representatives of the American Water Works Association, National Association of Railroad and Utilities Commissioners, Municipal Finance Officers Association, Federation of Sewage Works Association, American Public Works Association, and Investment Bankers Association of America (reprinted from *Ohio State Law Journal*, Spring, 1951), ASCE Bulletin No. 2, American Society of Civil Engineers, New York, 1951. See also parts of the report presented in "Water Works Revenue for Fire Protection," *NFPA Quarterly*, Vol. 45, No. 1, July 1952, p. 93.

⁸Hutson, A. C., "Water Works Requirements for Fire Protection," *Journal of the American Water Works Association*, Vol. 40, No. 2, Sept. 1948, p. 936. Also reprinted in *Special Interest Bulletin No. 266*, National Board of Fire Underwriters (now American Insurance Association), New York, May 4, 1948.

⁹*Guide for Determination of Required Fire Flow*, Insurance Services Office, New York, June, 1972.

Additional Readings

Babbitt, Harold E., and Doland, James J., *Water Supply Engineering*, 6th ed., McGraw-Hill, New York, 1962.

Blake, Nelson M., *Water for the Cities*, Syracuse University Press, Syracuse, 1956.

Carl, Kenneth J., Young, Robert A., and Anderson, Gordon C., "Guide for Determining Fire Flow Requirements," *American Water Works Association Journal*, Vol. 65, 1973, pp. 335-344.

Carl, Kenneth J., and Anderson, Gordon C., "The 1973 Grading Schedule for Municipal Fire Protection," *American Water Works Association Journal*.

Fair, G. M., Meyer, J. C., and Okum, D. A., *Water and Wastewater Engineering, Water Supply and Wastewater Removal*, Vol. 1, John Wiley & Sons, New York, 1966.

Hudiburg, Everett, and McCoy, Carl E., ed., *Water Supplies for Fire Protection*, 2nd ed., Fire Protection Publications, Oklahoma State University, Stillwater, 1971.

Engineering and Design—Water Supply for Fire Protection, Office of the Chief of Engineers, Department of the Army, Washington, D.C., 1958.

HOW THE ISO ESTIMATES FIRE-FLOW REQUIREMENTS

Insurance Services Office

Guide for Determination Of Required Fire Flow

1. An estimate of the fire flow required for a given fire area may be determined by the formula:

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

where

F = the required fire flow in gpm

C = coefficient related to the type of construction

C = 1.5 for wood frame construction

= 1.0 for ordinary construction

= 0.8 for noncombustible construction

= 0.6 for fire-resistive construction

Note: For types of construction that do not fall within the categories given, use a coefficient reflecting the differences. Such coefficients shall not be greater than 1.5 nor less than 0.6 and may be determined by interpolation.

A = the total floor area (including all stories, but excluding basements) in the building being considered. For fire-resistive buildings consider the 6 largest successive floor areas if the vertical openings are unprotected; if the vertical openings are properly protected, consider only the 3 largest successive floor areas.

The fire flow as determined by the above shall not exceed 8,000 gpm for wood frame construction

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

8,000 gpm for ordinary construction
6,000 gpm for noncombustible construction
6,000 gpm for fire-resistive construction
except that for a normal 1-story building of any type of
construction the fire flow shall not exceed 6,000 gpm.

The fire flow shall not be less than 500 gpm.

For 1-family and small 2-family dwellings not exceeding 2 stories
in height see note 10.

2. The value obtained in No. 1 above may be reduced by up
to 25% credit for occupancies having a light fire loading or may
be increased by up to a 25% surcharge for occupancies have a high
fire loading. As a guide for determining low or high fire loadings,
lists of light hazard and extra hazard occupancies as given in
National Fire Protection Association Standard No. 13 are included
in the Appendix.

The fire flow shall not be less than 500 gpm.

3. The value obtained in No. 2 above may be reduced by up
to 25% credit for complete automatic sprinkler protection. For
building of fire-resistive or noncombustible construction having
a light fire loading the reduction may be up to 50%. The percentage
reduction that can be made for an automatic sprinkler system will
depend upon the extent to which the automatic sprinkler system is

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

judged to reduce the probability of fires spreading within and beyond the fire area. Normally this reduction will not exceed 25 percent.

4. To the value obtained in No. 2 above a surcharge should be added for structures exposed within 150 feet by the fire area under consideration. The degree of this charge shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed buildings(s), the length of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

The charge for any one side generally should not exceed the following limits for the separations shown:

<u>Separation</u>	<u>Charge</u>
0-10 feet	25%
11-30	20
31-60	15
61-100	10
101-150	5

The total percentage surcharge shall be the sum of the charges for all sides, but shall not exceed 75%.

5. The value obtained in No. 2 above is reduced by the

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

credit (if any) determined in No. 3 above and increased by the surcharge (if any) determined in No. 4 above.

The fire flow shall not exceed 12,000 gpm nor be less than 500 gpm.

- Note 1: The guide is not expected to necessarily provide an adequate value for lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants but may indicate a minimum value for these hazards.
- Note 2: Judgment must be used for business, industrial, and other occupancies not specifically mentioned.
- Note 3: Consideration should be given to the configuration of the building(s) being considered and to the fire department accessibility.
- Note 4: Wood Frame structures separated by less than 10 feet shall be considered as one fire area.
- Note 5: Party Walls: Normally an unpierced party (common) wall may warrant up to a 10% exposure charge.
- Note 6: High one-story buildings: When a building is stated as 1 - 2, or more stories, the number of stories to be used in the formula depends upon the use being made of the building. For example consider a 1 - 3-story building. If the building is being used for high-piled stock, or for rack storage, an occupancy surcharge may be warranted. However, if the building is being used for steel fabrication and the extra height is provided only to facilitate movement of objects by a crane, the building would probably be considered as a 1-story building and an occupancy credit may be warranted.
- Note 7: If a building is exposed within 150 feet, normally some surcharge for exposure will be made.
- Note 8: Where wood shingle roofs could contribute to spreading fires, add 500 gpm.
- Note 9: Any noncombustible building is considered to warrant an 0.8 coefficient.

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

Note 10: Dwellings: For groupings of 1-family and small 2-family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

<u>Exposure distances</u>	<u>Suggested required fire flow</u>
Over 100'	500 gpm
31-100'	750-1000
11-30'	1000-1500
10' or less	1500-2000*

*If the buildings are continuous, use a minimum of 2500 gpm.

Also consider Note 8.

Outline of Procedure

- A. Determine the type of construction.
- B. Determine the ground floor area.
- C. Determine the height in stories.
- D. Using tables in Appendix, determine required fire flow to the nearest 250 gpm.
- E. Determine the credit or surcharge for occupancy and apply to the value obtained in D above. Do not round off the answer.
- F. Determine the credit, if any, for automatic sprinkler protection. Do not round off the value.
- G. Determine the total surcharge for exposures. Do not round off the value.
- H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G.

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

Round off the final answer to the nearest 250 gpm if less than 2500 gpm and to the nearest 500 gpm if greater than 2500 gpm.

Use of Tables (Steps A, B, C, D)

The tables use the GROUND AREA of the building and the height of the building in stories. Using the table corresponding to the type of construction, look under the number of stories and locate the ground area of the building(s) being considered between two ground areas given in the table. The corresponding fire flow is found in the left column.

EXAMPLES:

- a. Given: A 3-story building of ordinary construction of 7300 square feet (ground area). Using the table C = 1.0, in the 3-story column, 7300 square feet falls between 7100 and 8500 square feet and the corresponding fire flow is 2750 gpm.
- b. Given: A 3-story building of ordinary construction of 7300 square feet (ground area) communicating to a 5-story building of ordinary construction of 9700 square feet (ground area) for a total ground area of 17,000 square feet. Determine the total floor area which equals $3 (7300) + 5 (9700) = 70,400$ square feet. Using the table C = 1.0, under the one story column for 70,400 square feet the corresponding fire flow is 4750 gpm.
- c. Given: A 3-story wood frame building of 7300 square feet (ground area) communicating with a 5-story building of ordinary construction of 9700 square feet (ground area) for a total ground area of 17,000 square feet.

Determine the total floor area for each type of construction and for the fire area which is $3 (7300) = 21,900$ square feet of wood frame construction, $5 (9700) =$

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

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.

A I P E N D I X

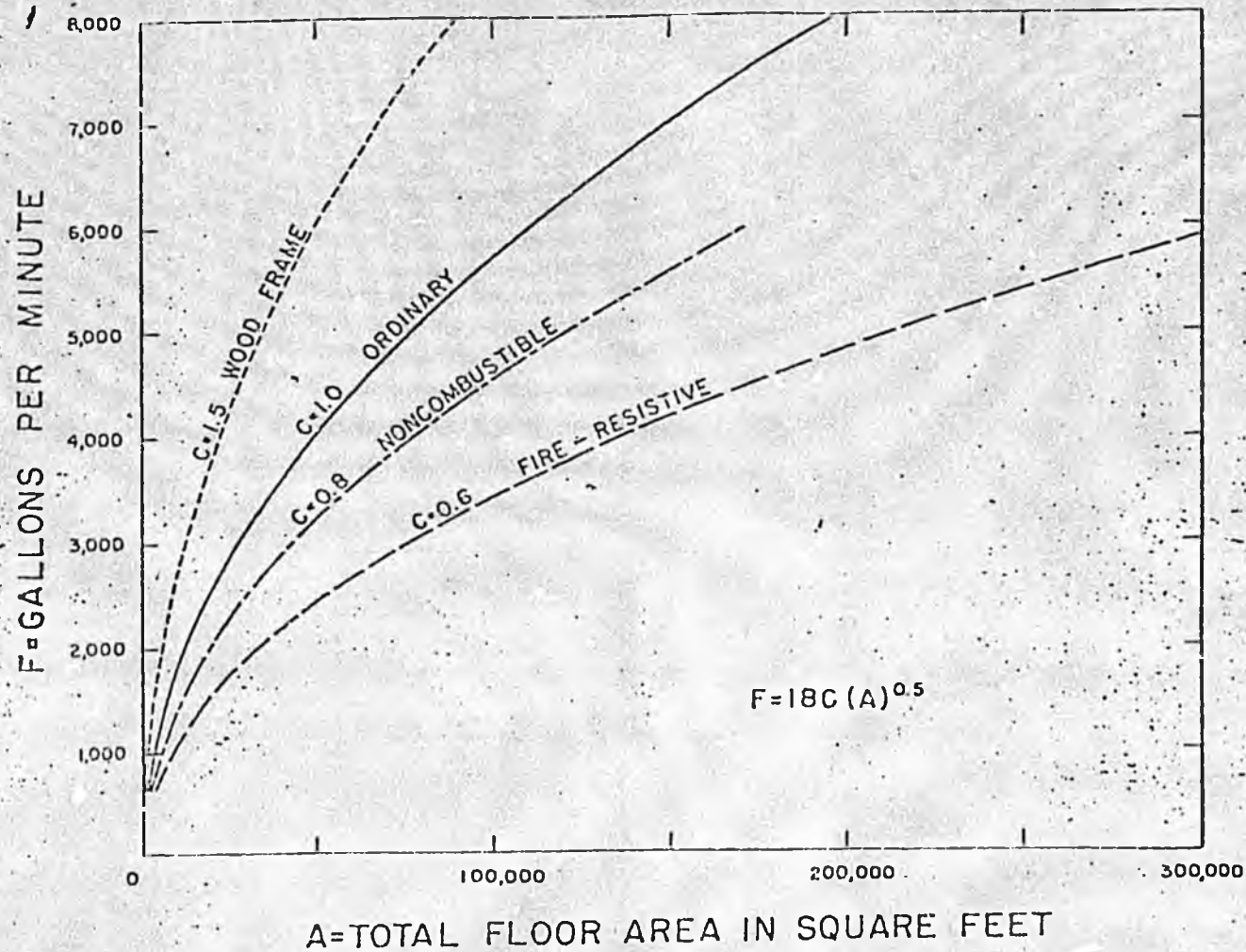
NFPA No. 13-1971, Paragraph 1311. Light Hazard Occupancies:

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

INSURANCE SERVICES OFFICE

C=1.5

FIRE FLOW VS GROUND AREA

$F=100(A)^{0.5}$

Wood Frame Construction

F=ppm; C=1.5

(ground area in square feet)

A=area in sq. ft.

SI-III

ppm	1	2	3	4	5	6	Stories
500							
750	500	300	200	100	100	100	
1000	1,100	600	400	300	200	200	
1250	1,700	900	600	400	300	300	
1500	2,600	1,300	900	700	500	400	
1750	3,600	1,800	1,200	900	700	600	
2000	4,800	2,400	1,600	1,200	1,000	800	
2250	6,200	3,100	2,100	1,600	1,200	1,000	
2500	7,700	3,900	2,600	1,900	1,500	1,300	
2750	9,400	4,700	3,100	2,400	1,900	1,600	
3000	11,300	5,700	3,800	2,800	2,300	1,900	
3250	13,400	6,700	4,500	3,400	2,700	2,200	
3500	15,600	7,800	5,200	3,900	3,100	2,600	
3750	18,000	9,000	6,000	4,500	3,600	3,000	
4000	20,600	10,300	6,900	5,200	4,100	3,400	
4250	23,300	11,700	7,800	5,800	4,700	3,900	
4500	26,300	13,200	8,800	6,600	5,300	4,400	
4750	29,200	14,700	9,800	7,300	5,900	4,900	
5000	32,000	16,300	10,900	8,200	6,500	5,400	
5250	34,800	18,000	12,000	9,000	7,200	6,000	
5500	37,600	19,800	13,200	9,900	7,900	6,600	
5750	43,400	21,700	14,500	10,900	8,700	7,200	
6000	47,400	23,700	15,800	11,900	9,500	7,900	

WOOD FRAME

INSURANCE SERVICES OFFICE

C=1.5

FIRE FLOW VS GROUND AREA

$F=100(A)^{0.5}$

Wood Frame Construction
(ground area in square feet)

F=ppm; C=1.5

A=area in sq. ft.

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

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

9T-III-16

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

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.

LT-17

FEET	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	8,300	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	13,700	
4250	92,400	46,200	30,800	23,100	18,300	15,400	
4500	103,100	51,600	34,400	25,800	20,600	17,200	
4750	114,600	57,300	38,200	28,700	22,700	19,100	
5000	126,700	63,400	42,200	31,700	25,000	21,100	
5250	139,400	69,700	46,500	34,900	27,600	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							

NONCOMBUSTIBLE

INSURANCE SERVICES OFFICE

C=0.8

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

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

FEET	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	15,100	12,100	9,700	8,100	
2500	59,000	29,500	17,700	14,800	11,800	9,800	
2750	70,900	35,500	21,600	17,700	14,200	11,800	
3000	83,700	41,900	27,900	20,700	16,800	13,900	
3250	97,700	48,900	37,600	24,400	19,500	16,300	
3500	112,700	56,400	47,500	28,200	22,500	18,800	
3750	129,700	64,400	57,900	32,200	25,700	21,500	
4000	148,900	77,900	68,600	36,500	29,200	24,300	
4250	164,200	87,100	79,700	41,100	32,800	27,400	
4500	183,400	97,700	91,100	45,700	36,700	30,600	
4750	201,700	101,900	97,900	50,900	40,700	34,000	
5000	225,200	112,600	107,100	56,300	45,000	37,600	
5250	247,700	123,900	117,600	61,900	49,500	41,300	
5500	271,200	135,600	129,400	67,800	54,200	45,200	
5750	295,900	148,000	141,600	74,000	59,200	49,300	
6000							

FIRE-RESISTIVE

B. Insurance Grading Schedule

The "Grading Schedule for Municipal Fire Protection"²² 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.

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

distance for the first due engine company must be not over $1\frac{1}{2}$ 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 $\frac{3}{4}$ 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 $1\frac{1}{2}$ 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 $2\frac{1}{2}$ miles for fire flows of from 2,000 to 4,500 gpm, 2 miles for flows from 5,000 to 6,500 gpm, and $1\frac{1}{2}$ miles for flows between 7,000 and 8,500 gpm. Where 3 engines are required, these should be within $1\frac{1}{2}$ 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 $2\frac{1}{2}$ miles is required for multiple alarms with fire flows of 5,000 to 6,500 gpm, a third ladder company should be within $3\frac{1}{2}$ 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 $\frac{1}{2}$ an

in-service pumper if manned on specified multiple alarms; however, credit cannot exceed $\frac{1}{2}$ 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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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-

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 $\frac{1}{2}$ 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 $\frac{1}{2}$ 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. 71, 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.

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

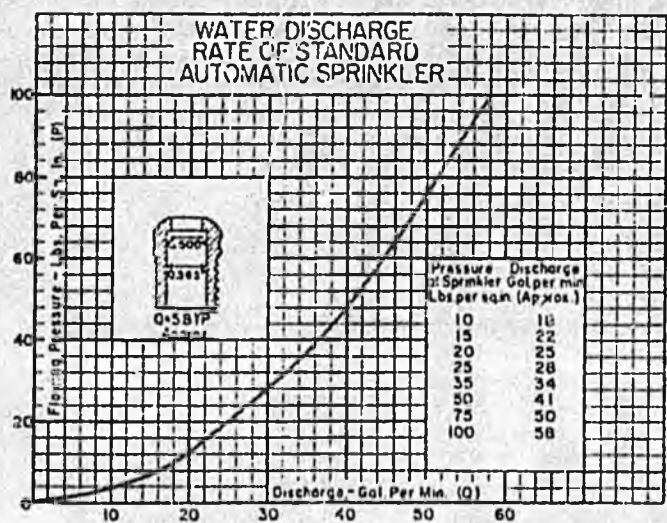


Fig. 14-3G. Water discharge rate of standard automatic sprinkler.

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

WATER SUPPLIES FOR SPRINKLER SYSTEMS

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 feed 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 possi-

bility 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 water-flow 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 hazard, 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.

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. Where 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

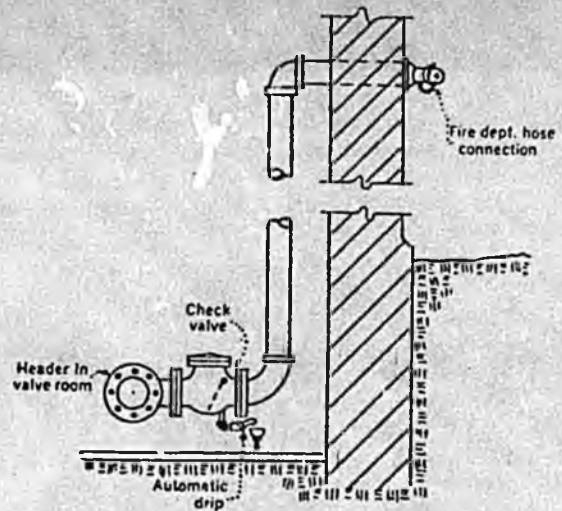


Fig. 14-4B. Typical fire department connection.

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-

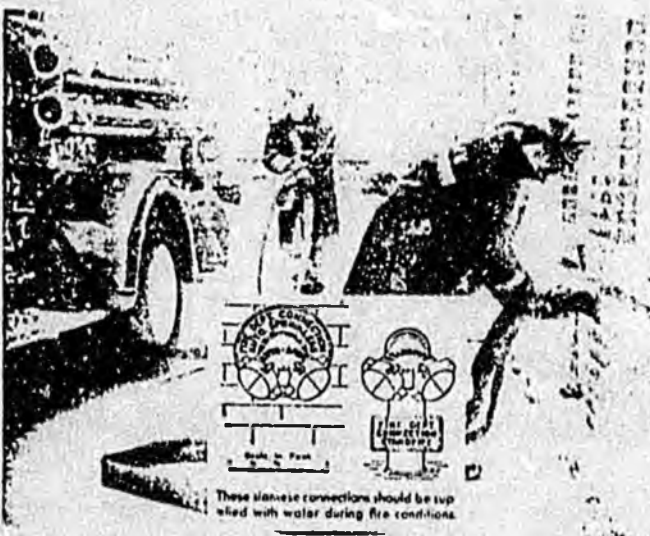


Fig. 14-4A. Fire fighters attaching hose lines to a fire department (siamese) connection supplying a sprinkler system. The inset shows typical siamese connections for sprinkler systems and standpipes. A check valve allows the use of a single hose line.

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 un-sprinklered 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

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 to provide 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 8 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.

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

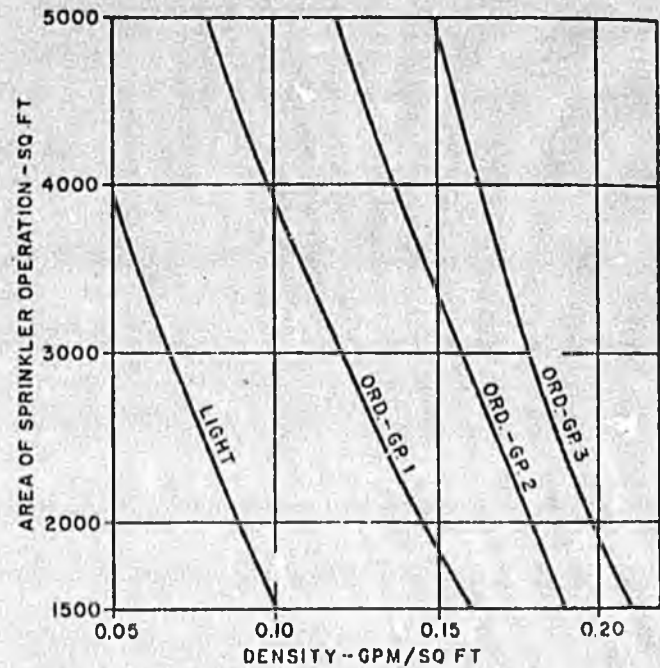
A hydraulically designed sprinkler system is one in which pipe sizes are selected on a pressure loss basis to provide a prescribed density (gallons per minute per square foot) distributed with a reasonable degree of uniformity over a specified area. This permits the selection of pipe sizes in accordance 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

Hazard Classification	Minimum Water Supplies		Duration in Minutes
	Sprinklers GPM	Combined Inside & Outside Hose—GPM	
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.) Hydraulically designed systems are also used for protection of high piled storage situations.

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 1-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 sprinkler 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 1½ 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-

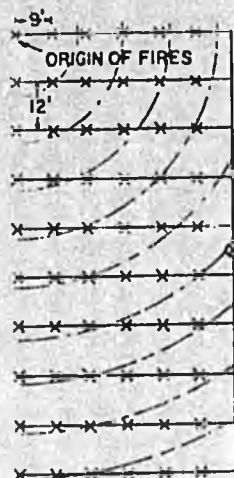
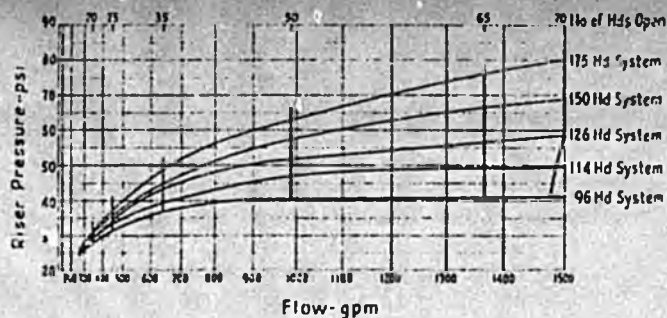


Fig. 14-4C. A flow curve for a side-central feed to sprinklers on a system having six sprinklers on each branch line is shown on the above graph. Below is the pattern of sprinklers opening on a side-central feed system. (Factory Mutual System)

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 flow 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 ft² = 0.0929 m²
- 1 in. = 25.400 mm
- 1 ft = 0.305 m
- 1 psi = 6.895 kPa
- 1 gpm = 3.785 litre/min

Bibliography

References Cited

- ¹ Wood, C. M., Automatic Sprinkler Hydraulic Data, 1961 ed. "Automatic" Sprinkler Corporation of America, Cleveland, Ohio. (reprinted 1964).
- ² Factory Mutual Engineering Corporation, "Hydraulics of Sprinkler Systems," *Handbook of Industrial Loss Prevention*, 2nd ed., McGraw-Hill, New York, pp. 23-1-23-13.
- ³ Nickerson, Malcolm H., "Water Flow Characteristics of Sprinkler Systems," *Proceedings of The Fifty-Eighth Annual Meeting, National Fire Protection Association*, May 17-21, 1954, Washington, D.C., pp. 140-152.

NFPA Codes, Standards, and Recommended Practices (see the latest *NFPA Publications and Visual Aids Catalog* for availability of current editions of the following documents)

- NFPA 13, Standard for the Installation of Sprinkler Systems.
- 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.
- NFPA 231C, Standard for Rack Storage of Materials.

Additional Readings

- Gumberg, Alan, and Cote, A. E., "The Computer Approach to Fire Protection Problems," *Fire Technology*, published by the National Fire Protection Association, Vol. 3, No. 3, Aug. 1967, pp. 202-212.
- Merry, J. T., and Schillhauser, "Hydraulic Sprinkler Systems Design—A Computer Approach," *Fire Technology*, published by the National Fire Protection Association, Vol. 2, No. 2, May 1966, pp. 95-107.
- Patton, R. M., "Engineered Sprinkler Protection," *Fire Journal*, National Fire Protection Association, Vol. 60, No. 1, Jan. 1966, pp. 5-8, 18.
- Wood, C. M., *Study Guide for Automatic Sprinkler Hydraulic Data*, "Automatic" Sprinkler Corp. of America, Cleveland, Ohio, 1964, 64 pp.

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

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 unmeasured 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.

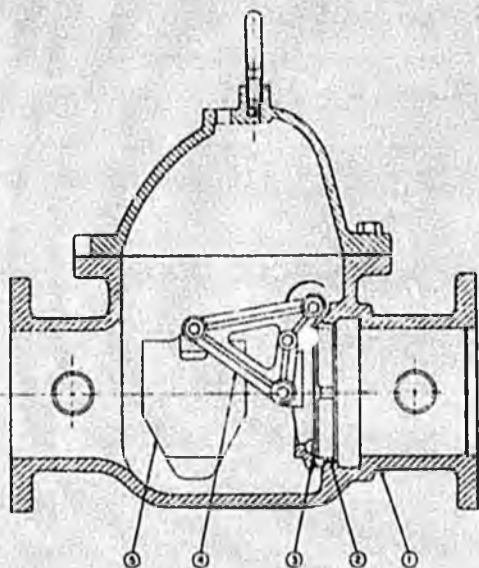


Fig. 11-2BB. A detector check valve. Photo shows view from top of weighted check valve and meter in bypass. Section view shows clapper in closed position. (The Viking Corporation)

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

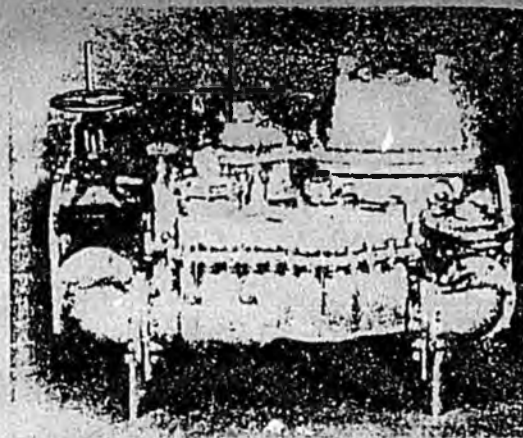


Fig. 11-2CC. A detector meter of the proportional type. (Hersey-Sparling Meter Company)

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

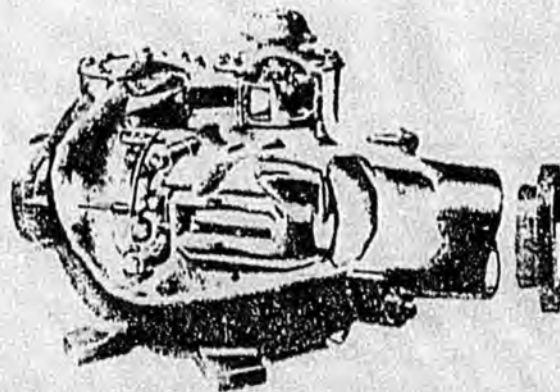


Fig. 11-2DD. A fire flow meter of the displacement type. (Neptune Meter Company)

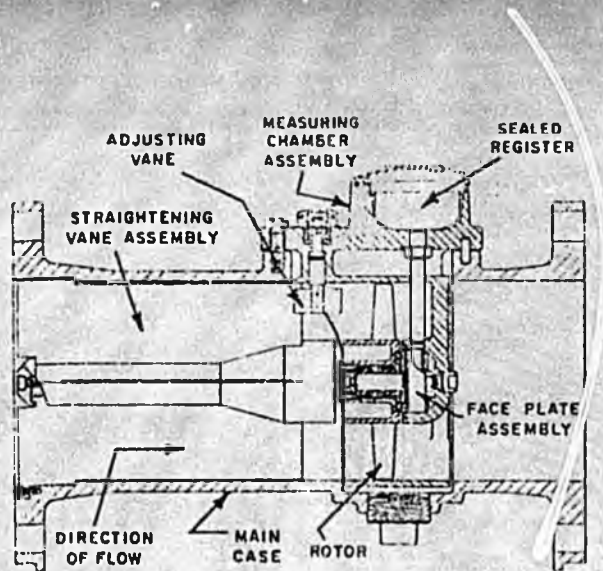


Fig. 11-2EE. A fire flow meter of the turbo type. (Rockwell Mfg. Co.)

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 wited 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.

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
Proportional Type (Torsey-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
Differential Type (Inventor 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
Turbo Type (Rockwell W-2000 Turbo)	6	0.2	0.3	0.6	0.85	1.2	1.6	3.5	

Bibliography

NFPA Codes, Standards and Recommended Practices (see the latest *NFPA Publications and Visual Aids Catalog* for availability of current editions of the following documents)

- NFPA No. 24, Standard for Outside Protection.
- NFPA No. 26, Standard for the Supervision and Care of Valves Controlling Water Supplies for Fire Protection.
- NFPA No. 291, Recommendations for Uniform Marking of Fire Hydrants.
- NFPA No. 292M, Water Charges for Private Fire Protection.

Other Codes and Standards

AWWA Handbooks, and Standards, American Water Works Association, 2 Park Avenue, New York, NY 10016 (see also USASI A21 listings).

AWWA C201, Standard for Fabricated Electrically Welded Steel Pipe, 1966.

AWWA C202, Standard for Mill-type Steel Water Pipe, 1964.

AWWA C203, Standard for Coal-Tar Enamel Protection Coatings for Steel Water Pipe, 1966.

AWWA C205, Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 1971.

AWWA C300, Standard for Reinforced-Concrete Water Pipe—Steel Cylinder Type, Not Prestressed, 1964.

AWWA C301, Standard for Reinforced-Concrete Water Pipe—Steel Cylinder Type, Prestressed, 1964.

AWWA C302, Standard for Reinforced-Concrete Water Pipe—Noncylinder Type, Not Prestressed, 1964.

AWWA 303, Standard for Reinforced-Concrete Water Pipe—Steel Cylinder Type, Prestensioned, 1970.

AWWA C400, Standard for Asbestos-Cement Water Pipe, 1972.

AWWA C401-64, Standard Practice for the Selection of Asbestos-Cement Water Pipe, 1964.

AWWA C500, Standard for Gate Valves for Ordinary Water Works Service, 1971.

AWWA C502, Standard for Fire Hydrants for Ordinary Water Works Service, 1964.

AWWA C503, Standard for Wet-Barrel Fire Hydrants for Ordinary Water Works Service, 1970.

AWWA 506, Standard for Backflow Prevention Devices—Reduced Pressure Principle and Double Check Valve Types, 1969.

AWWA C600, Standard for Installation of Cast Iron Water Mains, 1964.

AWWA C603, Standard for Installation of Asbestos-Cement Water Pipe, 1965.

AWWA C703, Standard for Cold Water Meters—Fire Service Type, 1970.

Canadian Government Specification, Canadian Government Specification Board, National Research Council, Ottawa, Ontario.

No. 34-GP-1a, Specification for Pipe; Asbestos-Cement, Pressure, 7 March 1957.

ULC Standards, Underwriters' Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario.

No. C-246, Hydrants, January 1958.

No. C-262 (a), Inside Screw Valves for Underground Work, March 1950.

No. C-312, Swing Check Valves for Fire Protection Service, Nov., 1964.

No. C-789, Indicator Posts, June 1966.

No. C-888, Steel Pipe for Underground Water Service, May 1950.

UL Standards, Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, Ill. 60611.

No. 107, Asbestos-Cement Pipe and Couplings, April 1973.

No. 246, Hydrants for Fire Protection Service, May 1973.

No. 262, Gate Valves for Fire Protection Service, May 1973.

No. 312, Swing Check Valves for Fire Protection Service, 1964.

No. 385, Play Pipes for Water Supply Testing, May 1973.

No. 789, Indicator Posts for Fire Protection Service, May 1971.

No. 888, Steel Pipe for Underground Water Service, Oct. 1972.

No. 194, Performance of Gasketed Joints for Cast Iron Pressure Pipe and Fittings, May 1973.

No. 753, Alarm Accessories for Automatic Water Supply Control Valves for Fire Protection Service, July 1971.

American National Standards Institute, Sectional Committee A21. This committee is sponsored jointly by American Gas Association, American Society for Testing and Materials, American Water Works Association, and New England Water Works Association.) The following Manuals and Standards are published by American Water Works Association, 2 Park Avenue, New York NY 10016:

AWWA C101-67, ANSI A21.1—1967, Standard for Thickness Design of Cast Iron Pipe.

AWWA C150-71, ANSI A21.50—1971, Standard for the Thickness Design of Ductile-Iron Pipe.

AWWA C104-71, ANSI A21.4—1971, Standard for Cement-Mortar Lining for Cast Iron Pipe and Fittings for Water.

AWWA C106-70, ANSI A21.6-1970, Standard for Cast Iron Pipe Centrifugally Cast in Metal Molds, for Water and Other Liquids.

AWWA C108—1970, ANSI A21.8—1970, Standard for Cast Iron Pipe, Centrifugally Cast in Sand-Lined Molds, for Water and Other Liquids.

AWWA C110-71, ANSI A21.10-71, Standard for Cast-Iron Fittings, 2 in. through 48 in., for Water and Other Liquids.

AWWA C111-72, ANSI A21.11-72, Standard for Rubber Gasket Joints for Cast-Iron Pressure Pipe and Fittings.

AWWA C151-70, ANSI A21.51-71, Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids. American National Standards Institute Sectional Committee B16 (This committee is sponsored jointly by the Mechanical Contractors Association of America, Manufacturers Standardization Society of the Valve and Fittings Industry and the American Society of Mechanical Engineers). The following Standards are published by the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

ANSI B16.1-1967, Cast-iron Pipe Flanges and Flanged Fittings, 25, 125, 250 and 800 lb.

ANSI B16.5-1973, Steel Pipe Flanges and Flanged Fittings, 150, 300, 400, 600, 900, 1500 and 2500 lb., Including Reference to Valves.

U.S. Federal Supply Service, General Services Administration, the following Federal Specifications published by U.S. Superintendent of Documents, Washington, DC 20402.

No. SS-P-351C, Pipe, Asbestos-Cement, August 12, 1968.

No. SS-P-381, A(z), Pipe; Pressure, Reinforced Concrete, Prestensioned Reinforcement (Steel Cylinder Type), May 3, 1972.

No. SS-P-385A(1), Pipe, Steel (Cement-Mortar Lining and Reinforced Cement-Mortar Coating), February 27, 1968.

No. WW-P-406D, Pipe, Steel (Seamless and Welded) (For Ordinary Use), February 2, 1973.

No. WW-P-421C, Pipe, Cast-Iron, Pressure (For Water and Other Liquids), Sept. 11, 1967.

No. WW-P-521F, Pipe Fittings, Flanged Fittings, and Flanges, Ferrous and Steel (Screwed and Butt-Welded), 150 Pound, November 22, 1968.

U.S. Interdepartmental Screw-Thread Committee, Screw-Thread Standards for Federal Services, U.S. Superintendent of Documents, Washington, DC 02402, National Bureau of Standards Handbook H28, Part I, Unified and Unified Miniature Screw Threads, 1970.

Part II, Pipe Threads, including Dryseal Pipe Threads; Gas Cylinder Valve Outlet and Inlet Threads; Hose Couplings, including Fire-Hose Coupling Threads; and Hose Connections for Welding and Cutting Equipment, 1966.

U.S. Interdepartmental Screw-Thread Committee, Screw-Thread Standards for Federal Services, U.S. Superintendent of Documents, Washington, DC 02402, National Bureau of Standards Handbook H28, Part I, Unified and Unified Miniature Screw Threads, 1970.

Part II, Pipe Threads, including Dryseal Pipe Threads; Gas Cylinder Valve Outlet and Inlet Threads; Hose Couplings, including Fire-Hose Coupling Threads; and Hose Connections for Welding and Cutting Equipment, 1966.

U.S. Interdepartmental Screw-Thread Committee, Screw-Thread Standards for Federal Services, U.S. Superintendent of Documents, Washington, DC 02402, National Bureau of Standards Handbook H28, Part I, Unified and Unified Miniature Screw Threads, 1970.

Part II, Pipe Threads, including Dryseal Pipe Threads; Gas Cylinder Valve Outlet and Inlet Threads; Hose Couplings, including Fire-Hose Coupling Threads; and Hose Connections for Welding and Cutting Equipment, 1966.

U.S. Interdepartmental Screw-Thread Committee, Screw-Thread Standards for Federal Services, U.S. Superintendent of Documents, Washington, DC 02402, National Bureau of Standards Handbook H28, Part I, Unified and Unified Miniature Screw Threads, 1970.

Part II, Pipe Threads, including Dryseal Pipe Threads; Gas Cylinder Valve Outlet and Inlet Threads; Hose Couplings, including Fire-Hose Coupling Threads; and Hose Connections for Welding and Cutting Equipment, 1966.

Additional Readings

AWWA Committee on Financial Aspects of Fire Prevention and Protection, A Business-like Approach to Fire Protection Changes, New York, AWWA, 1971.

Angele, G. J., "Backflow Prevention and Cross-Connection Control," *American Water Works Association Journal*, Vol. 62, No. 6, June 1970.

Babbitt, Harold E., Cleasby, John L., and Doland, James, J., *Water Supply Engineering*, 6th ed., McGraw-Hill, New York, 1962.

Blake, Nelson M., *Water for the Cities*, N.Y., Syracuse University Press, Syracuse, 1956.

Engineering and Design—Water: Distribution Systems, Washington, D.C., Office of the Chief of Engineers, Department of the Army, January 31, 1963.

Factory Mutual Engineering Corporation, *Handbook of Industrial Loss Prevention*, Chapter 18, "Public Water Systems" 2nd ed., McGraw-Hill, New York, 1967.

Ibid., Chapter 15, "Underground Fire Service Mains."

FM Loss Prevention Data Sheets, Cross Connections, DS 3-3, 1971; Underground Fire Service Mains, DS 3-33, 1970; Water Demand for Private Fire Protection, DS 3-26, 1974; Factory Mutual System, Norwood, Mass.

Fair, G. M., Geyer, J. C., and Okum, D. A., *Water and Wastewater Engineering*, Vol. I, Water Supply and Wastewater Removal, John Wiley & Sons, New York, 1966.

Handbook of Cast Iron Pipe, Cast Iron Pipe Research Association, Chicago, 1952.

King, Reno C., ed., *Piping Handbook*, 5th ed., McGraw-Hill, New York, 1967.

"Meter Manual," AWWA M6, 1962, American Water Works Association, New York.

Peckworth, Howard F., *Concrete Pipe Handbook*, American Concrete Pipe Association, Chicago, March 1965.

Sweitzer, Robert J., *Basic Water Works Manual*, American Concrete Pressure Pipe Association, Chicago, 1958

PART VII

P L A N N I N G

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 Control¹, 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

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.

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 requirements 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.

$$\begin{aligned} 1 \text{ gal (U.S.)} &= 3.785 \text{ litres} \\ 1 \text{ gpm} &= 3.785 \text{ litres/min} \end{aligned}$$

Bibliography

References Cited

¹ National Commission of Fire Prevention and Control, *America Burning: The Report of the National Commission on Fire Prevention and Control*, Government Printing Office, Washington, D.C., 1973.

² *Grading Schedule for Municipal Fire Protection*, Insurance Services Office, New York, 1974.

NFPA Codes, Standards, and Recommended Practices (see the latest *NFPA Publications and Visual Aids Catalog* for availability of current editions of the following documents)

- NFPA No. 4, Organization for Fire Services.
- NFPA No. 4A, Recommendations for Organization of a Fire Department.
- NFPA No. 73, Standard for Installation, Maintenance and Use of Public Fire Service Communications.
- NFPA No. 197, A Training Standard on Initial Fire Attack.

PART VIII

ANCHORAGE WATER UTILITY TARIFF
ON FILE WITH THE
ALASKA PUBLIC UTILITIES COMMISSION

MAI 25 1977

State of Alaska
Public Utilities Commission

I. FEES AND SPECIAL CHARGES - NONRECURRING

<u>Rule</u>	<u>Service</u>	<u>Fee or Charge</u>
10.8	Water turn-on or turn-off (per visit)	
	During business hours	\$ 12.00
	During non-business hours	50.00 (I)
5.6	Return visit necessitated by restricted access	10.00
6.2(c)	Hydrant wrench deposit	10.00
6.2(d)	Meter deposit (hydrant meters)	100.00
7.2	Fees for water connections (extending a maximum of 50 feet). This charge includes permit and inspection fees.	
	3/4"	189.60
	1"	207.56
	1-1/2"	310.29
	2"	392.04
	Larger than 2"	Cost of Construction
	3" - 4" Connection	800.00 Deposit
	6" - 8" Connection	1,000.00 Deposit
	10" Connection	Deposit determined by AWU Manager

Pursuant to Order No. 4, U-75-66

FEB 28 1977

Tariff Advice No. 8-122

Effective:

Anchorage Water Utility

Issued by

By: Dale R. Merrell
DALE R. MERRELL, P.E.

Utility Manager

Title:

I. FEES AND SPECIAL CHARGES - NONRECURRING (CONTINUED)

<u>Rule</u>	<u>Service</u>	<u>Fee or Charge</u>	
7.2	Charge per foot for construction of service lines exceeding 50 feet		
	3/4"	\$ 2.70	
	1"	3.30	
	1-1/2"	4.85	
	2"	6.70	
	Larger than 2"	Cost of Construction	
7.3	Water extension permit		
	Permit administration fee	5.00	
	Inspection	10.00	
8.10	Reconnection or restoral charge	25.00	(I)
8.19	Unauthorized turn-on/turn-off	60.00	(I)
9.7	Meter test		
	3/4" through 2" meters	25.00	
	Meters larger than 2"	50.00	
10.2	Water service for test purposes	20.00	
10.9	Duplicate locate service	25.00	(I)
	Non-business hours	50.00	(I)
10.10	Private fire hydrant maintenance fee	110.00	(I)

Pursuant to Order No. 4, U-76-66

Tariff Advice No. 8-122

Effective:

FEB 28 1977

Anchorage Water Utility

Issued by

By:


 DALE R. MERRELL, P.E.

Title:

Utility Manager

MUNICIPALITY OF ANCHORAGE WATER UTILITY RATES

II. SERVICE CHARGES

The rates and charges shown are the monthly service charges for water service only. Assessments, contributions in aid of construction or charges for specific services beyond the scope of normal water services (e.g., special construction of a long service line; repair of damage which was the responsibility of the customer) are in addition to the following rates.

Schedule A - Residential

One to five units;
per unit per month \$ 9.50 (I)

Schedule B - Metered commercial and industrial

This schedule applies to commercial, industrial, and multiple unit residential accounts which are metered. Metering requirements are contained in Rule 9 of this tariff.

Metered rate per 1,000 gallons \$ 1.20 (I)

Schedule C - Unmetered commercial and industrial

This schedule applies to all unmetered commercial and industrial accounts, including multiple unit residential accounts which have six or more units. The rates are for one month's service and vary by service size.

<u>Service Size</u>	<u>Monthly Rate</u>	
3/4"	\$ 14.65	(I)
1"	25.90	(I)
1 1/2"	57.70	(I)
2"	102.80	(I)
3"	232.40	(I)
4"	412.95	(I)

Pursuant to Order No. 4, U-76-66

FEB 28 1977

Tariff Advice No. 8-122 (L)

Effective: _____

Issued by _____ Anchorage-Water Utility

Utility Manager

II. SERVICE CHARGES (CONTINUED)

Schedule C - Unmetered commercial and industrial (continued)

<u>Service Size</u>	<u>Monthly Rate</u>
6"	\$ 927.85 (I)
8"	1,649.20 (I)
10"	2,576.20 (I)

Twelve inches or larger service shall be a contracted service. Additionally, any service of six inches or larger which is for mixed accounts (i.e., more than one customer class) may be contractual service at the discretion of the management of the Anchorage Water Utility subject to approval of the APUC.

Schedule D - Special customers

(1) Temporary construction service charge for unmetered service using the service line that will serve the building under construction. The charge shall be a flat monthly charge for service according to the following schedule:

<u>Service Size</u>	<u>Monthly Rate</u>
3/4"	\$ 16.10 (I)
1"	21.50 (I)
1½"	32.20 (I)
2"	42.95 (I)
3"	64.40 (I)
4"	85.85 (I)
6"	128.80 (I)
8"	171.75 (I)
10"	214.65 (I)

Pursuant to Order No. 4, U-76-66
Tariff Advice No. 8-122(L)

FEB 28 1977

Effective:

Issued by: Anchorage Water Utility

By: Dale R. Merrell
Dale R. Merrell, P.E.

Title: Utility Manager

MAR 23 1977
 State of Alaska
 Public Utilities Commission

II. SERVICE CHARGES (CONTINUED)

Schedule D - Special customers (continued)

(2) Temporary construction or other use requiring a connection to a fire hydrant. The AWU reserves the right to require the customer to use a meter when an appropriate meter is available. Service shall be restricted to 2-1/2 inches diameter to 4-1/2 inches diameter. A meter deposit of \$100 will be required when the service is connected. The deposit shall be refunded when the undamaged meter is returned to the Water Utility. The monthly charges are:

<u>Service Size</u>	<u>Demand Charge</u>	<u>Commodity Charge</u>
2½"	\$250.80 per month	\$.42 per 1,000 gallons (I)
3"	300.95 per month	.42 per 1,000 gallons (I)
4"	401.25 per month	.42 per 1,000 gallons (I)
4½"	451.40 per month	.42 per 1,000 gallons (I)

(3) When an appropriate meter is not available for a temporary connection to a fire hydrant, the following monthly charges shall be effective:

<u>Service Size</u>	<u>Monthly Charge</u>
2½"	\$ 271.70 (I)
3"	321.85 (I)
4"	422.15 (I)
4½"	472.30 (I)

Schedule E - Private fire protection

This schedule shall apply to private fire services. The charges are in addition to the charge for basic water service unless the service connection is used exclusively for fire protection. The charges vary by service size.

Pursuant to Order No. 4, U-76-66

FEB 28 1977

Tariff Advice No. 8-122 (L)

Effective: _____

Issued by: Anchorage Water Utility

By: *[Signature]*

Utility Manager

Title: _____

MAR 23 1977

Alaska Public Utilities Commission

I. SERVICE CHARGES (CONTINUED)

Schedule E - Private fire protection (continued)

<u>Service Size</u>	<u>Monthly Rate</u>	
2"	\$ 7.10	(N)
3"	15.90	(N)
4"	28.45	(N)
6"	63.55	(N)
8"	112.85	(N)
10"	176.40	(N)
12"	254.10	(N)

Schedule F - Bulk water sales

All bulk water sales will be handled by special contracts.

Pursuant to Order No. 4, U-76-66

Tariff Advice No. 8-122(L)

FEB 28 1977

Effective: _____

Issued by: Anchorage Water Utility

By: *[Signature]*

Title: Utility Manager

APPENDIX A

ISO REPORT ON ANCHORAGE

RECEIVED

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CITY MANAGER'S
OFFICE

554

ANCHORAGE,
ALASKA

Please consider this report, including the map,
as *confidential information* and exercise due care
if it becomes available only to those persons
who are entitled to this information.

April, 1969

File No. 554

REPORT

ON

ANCHORAGE, ALASKA

AMERICAN INSURANCE ASSOCIATION

Successor to National Board of Fire Underwriters

MUNICIPAL SURVEY SERVICE

85 John Street, New York, N. Y. 10038

120 South LaSalle Street, Chicago, Ill. 60603

405 California Street, San Francisco, Calif. 94104

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ANCHORAGE, ALASKA

FILE NO. 554

GENERAL

The 1960 U.S. Census showed a population of 44,320 and the present estimated population is 56,000. Area of the city is 15.1 square miles of which 4.3 square miles are included in tidelands, military reservations, and railroad right-of-way. The remaining 10.8 square miles are approximately 50% built upon. Elevations in the city range from sea level to 250 feet, with the average elevation of the principal business district 100 feet. The city is a terminus for the main supply routes serving Alaska as well as a tourist stopping point during most of the summer.

Long cold winters are common with an average snowfall of 12 inches. Prolonged low temperatures below -10 degrees are infrequent. A moderate to severe earthquake hazard exists within the city and surrounding areas. Alaska falls within the circum-Pacific belt of earthquakes which also includes coastal California and Japan. The earthquake of March 27, 1964, was centered about 75 miles from the city and reached a Richter magnitude of 8.4. Major landslides occurred in the city's downtown and residential areas, causing major damage to buildings and the water distribution system.

WATER SUPPLY

General.—The system is municipally owned and supplies nearly all of the city built-on areas and additional area to the east and south. Supervision is by an appointed director. There is no civil service but long tenure is prevalent.

Records are mainly complete, but individual valve records are not maintained.

Alarms of all fires during winter and of second alarm fires at other times are telephoned to the water treatment plant; response is made to all such fires.

Supply Works.—See map. A diversion dam on Ship Creek, elevation 530, $5\frac{1}{4}$ miles east of the city, provides 53% of the system supply capacity by gravity and is the source of water supply for Fort Richardson and Elmendorf Air Base; supply line capacity is 10.5 mgd. Seven pumped wells, total capacity 11.6 mgd, deliver the remaining supply to the distribution system. Flow in Ship Creek is a minimum during the early winter, but water has never been below the spillway. The March, 1964, earthquake disrupted casings of 2 wells, and earth slides above the diversion dam muddied gravity supply, seriously reducing the capacity of the treatment plant which can process in excess of the supply line capacity.

A small section, with 7 hydrants, in the southern part of the city is served by the Romig Water Company which has an emergency connection from an 8-inch city main for fire supply.

Distribution Storage.—See map. System storage is limited to the 0.5-mg treatment plant clear well, elevation 366.

Consumption.—The average daily consumption for the 12 months ending July 31, 1968, was 11.01 mgd with a maximum of 16.56 mg on July 24, 1968.

Pressures.—The average pressure during fire flow tests was 57 psi, with a maximum of 87 psi and minimum of 38 psi.

Distribution System.—See map. From the Control House, 1400 feet west of the treatment plant, a 24-inch wood-stave pipe line extends well into the distribution system furnishing the main supply to the more important northern section of the system. The southern portion of the system is supplied by a 36-, 30-inch reinforced concrete steel-cylinder-type pipe the capacity of which is greatly restricted by a 16-inch branch supplying 2 lines of 10- and 8-inch pipe. New mains are of cement-lined cast iron with older

ANCHORAGE, ALASKA

pipe of tar-coated cast iron. Of the total pipe in the system, 28% is asbestos-cement pipe, and 9% is wood-stave pipe in 6-, 8-, and 10-inch sizes. Of the 154.85 miles of 4-inch and larger mains, only 0.32 mile is 4-inch and 59.97 miles are 6-inch. Dead ends of 6-inch mains total 4.21 miles.

The average valve spacing is 4340 feet on supply mains, 910 feet on arterial mains, 440 feet in the principal business district, and 810 feet in representative residential districts. There is no regular valve inspection program.

There are 869 public and 16 private hydrants. Of the public hydrants, 31 have 4-inch connections to mains, and 148 lack a large pumper outlet; others are of satisfactory size and type with a pumper and 2 or 3 hose outlets, and all have valved connections.

The average hydrant spacing is 125,500 square feet in the principal business district, 173,000 square feet in other high-value districts, and 214,400 square feet in representative residential districts; hydrants are inspected 2 or more times a year and after every use during freezing weather.

Fire Flow Tests.—See map with table. Tests were witnessed on August 8 and 14, 1968, under normal conditions. The consumption rate during the tests in the principal business district was about 15.8 mgd, and daily consumption was 13.05 and 12.70 mg, respectively. The principal business district tests were repeated the second day, after regulator valves and important line valves were checked, and were made at a time when consumption did not materially exceed the maximum daily rate. Test 9, on the Romig Water System, was made with the city emergency connection open. Tests 24, 25, and 26 were repeated on October 2 after a regulator by-pass valve, found open, was closed and a 16-inch valve, found closed, was opened.

Proposed Improvements.—See map. The 36-, 30-inch southern section supply main was being extended to a 5-mg reservoir under construction for completion in 1969. A gridiron of 12- and 16-inch mains, being installed in the northern section of the port and industrial area, was nearly complete at the time of the survey.

FIRE DEPARTMENT

In addition to the city, the department provides fire protection for the Spenard and Muldoon Public Utility Districts outside the city with an estimated population of 30,000 and an area of 24 square miles. One ladder and 5 engine companies, and an ambulance are in service in 4 fire stations in the city; the 2 engine companies in one station in the Spenard District and the one engine company in the Muldoon

District are under the jurisdiction of the city fire chief according to written contracts, although the fire stations and the fire apparatus are owned by the districts.

There are 93 full-paid members (including 20 assigned to the 3 companies outside the city) as follows:

Fire Force:		
Officers:	Chief and	
	Senior Captains	5
	Company	28
	Fire fighters and Engineers:	52
Non-fire force:		10

Members work an average of 64 hours per week. The number normally on duty is 18 with the engine and ladder companies within the city and 7 with the 3 companies outside the city. Some of the off-shift members are called on second alarm fires, and all of the off-shift on fifth alarm fires. Some outside aid is readily available.

All apparatus and vehicles in service and reserve are equipped with radio transmitter-receivers on a frequency shared with 3 small fire departments.

Pumper capacity is adequate. Repairs to apparatus are made by a full-time department mechanic; the shop area is at the rear of the apparatus floor at Engine 3 quarters. The preventive maintenance program includes annual tests of pumps, but no 200-psi pressure tests have been conducted in many cases. Service tests, at draft, of 5 pumpers were witnessed during the survey; 2 did not deliver rated capacities at required pressures.

Hose drying facilities are provided at each fire station, and hose tests are conducted annually; 15% is over 10 years old.

Rules and regulations, adopted in 1968, have been distributed to each fire station.

Training is under the part-time supervision of a lieutenant who is assisted by other officers. An 80-foot drill tower with basement, attached to Engine 1 quarters, is of reinforced concrete construction and is equipped with a standpipe system. Grounds are paved but somewhat congested; a pumper test pit is provided, but no hydrants are available. There is no regular schedule for drills at the tower, but most companies average about one 3-hour drill per month on each shift; few of the drills are combined company drills. Each company conducts 2 hours of training daily at quarters; about 25% are drills. New members normally receive some training before appointment; after appointment, the company officer is responsible for the new man's training. Some officer schools have been conducted, and

monthly staff officer meetings are held. Most members have received some instruction in the hazards of radioactive materials; some have had advanced training.

There has been no regularly scheduled building inspection program by companies for pre-fire planning purposes. A few of the more important occupancies are inspected once or twice a year, but most notes and sketches are incomplete or lacking. A more complete inspection program has been recently started but is progressing slowly.

Within the city response to all box alarms and telephone alarms for fires in buildings is 2 engine companies, one ladder company, and a chief officer, except that no ladder company is dispatched to some outlying high value districts and many residential districts; outside the city 2 engine companies and a chief officer normally are dispatched to box alarms and telephone alarms for fires in buildings. During the fiscal year 1967-1968 there were 3757 alarms of which 238 were for building fires and 2444 were ambulance calls; 1430 of the alarms were outside the city of which 916 were ambulance calls.

Fire methods include the extensive use of 1½-inch hose lines, spray nozzles, and breathing equipment. Back-up lines are laid if fire is evident or upon orders. Pumpers connect to hydrants on most fires, but occasionally direct hydrant streams are used in areas with higher pressures. The first company to arrive connects to sprinkler or standpipe systems if fire is evident or upon orders. Ladder, ventilation, and salvage work is performed by the ladder company or engine companies but is hindered by lack of adequate manpower.

FIRE ALARM

The telegraph-type fire alarm system is maintained by a technician from the municipal electronics laboratory.

Alarm headquarters is in a room on the first floor of the public safety building, a 2-story building of fire-resistive construction; the room contains some combustible materials and is not properly cut off from other operations in the building. Headquarters equipment, installed in 1962, with emergency ground return facilities, is of automatic type and is mainly complete. Current is supplied by individual circuit rectifiers with a common battery. Each fire station has a punch register and tapper, a radio receiver, and voice alarm facilities.

There are 117 boxes in service, all of which are accessible; 12 are located outside the city limits in contract districts. Fifteen boxes are provided with

indicating lights; the condition of paint on boxes and on bands on poles is generally good. Of the 47 miles of box and alarm circuits, 4 miles are in underground cable, 35 miles in messenger supported aerial cable, and the remainder is of aerial wire construction. Four box and one alarm circuits are in service; moderate to considerable ground readings were noted on 2 of the circuits.

Five telephone trunk lines extend to a switchboard in alarm headquarters; 4, arranged for progressive operation, are reserved for emergency calls for the city and contract districts, and one additional is for emergency calls from a small nearby fire department; 4 trunks for business calls extend to instruments with switching facilities at the department secretary's desk and in alarm headquarters. Voice amplification circuits extend to 5 fire stations and are used in lieu of fire telephone extension lines.

One operator is on duty at all times. Telephone alarms for fires in buildings are confirmed over the alarm system. Tests and records are fairly good.

FIRE PREVENTION

Hazardous Materials.—The city has adopted the 1965 edition of the Fire Prevention Code of the American Insurance Association along with a few additional ordinances. An amendment has eliminated the requirement for most permits. The gas code contains generally good requirements for gas piping and gas appliances.

Fire prevention activities are under the direction of the chief of the fire department and include the outlying districts adjacent to the city. The fire prevention bureau consists of a fire marshal, a deputy fire marshal, 2 inspectors, and 1 clerk. All are appointed by the chief of the fire department.

The bureau makes inspections of most occupancies every 1 to 2 years. Many businesses are required to have approval from the bureau before their annual business license is issued. Some inspections are made of small businesses by fire department companies. Most conditions found during the survey were fair or fairly good.

Electricity.—A city ordinance adopts the 1965 edition of the National Electrical Code along with some other requirements. Electrical regulations are enforced by the city electrical inspector. Fairly good procedures are in effect for inspections during construction, and each job site is visited at least 3 times. Because the city-owned power and light company also supplies surrounding districts outside the city limits, the inspector spends much of his time on inspections outside the city. There is no

ANCHORAGE, ALASKA

reinspection program. Most new work was fairly good, and existing installations were found to be in fair condition.

BUILDING DEPARTMENT

The city has adopted the 1964 Uniform Building Code, with the appendix and some amendments. The 1964 Uniform Housing Code, which provides minimum requirements for new and existing places of habitation as well as some provisions for fire protection, has also been adopted. Fire Zone 1 covers all of the principal business district, some adjoining blocks, and most other commercial districts throughout the city. Fire Zone 2 includes some of the areas bounding the high-value districts which should be in Fire Zone 1; some of the principal business district is adjacent to a variable zone that allows some types of wood frame construction. Restrictions within Fire Zone 1 are satisfactory; restrictions within Fire Zone 2 are inadequate. Wood shingle or shake roofs are permitted outside of Fire Zones 1 and 2.

The department is under supervision of the building official, assisted by 1 plan check engineer, 1 zone enforcement officer, 2 building inspectors, 1 mechanical inspector, and 1 clerk. All personnel are selected by examination and appointed by the building official. Procedures are fairly good. Plans are checked by the plan checker; review of fire safety features is coordinated with the fire prevention bureau. Records are consolidated although somewhat incomplete. Major plans except for most residential occupancies are kept indefinitely; most plans are fairly well stored and filed.

STRUCTURAL CONDITIONS

Principal Business District.—See map. The district includes 16 blocks or part blocks and covers 38.9 acres. Streets cover 35% of the district and are between 60 and 80 feet in width. Of the total block area, 55% is built upon, with individual blocks ranging from 15% to 84%. Buildings average 1 and 2 stories although 5 buildings are over 8 stories. The tallest building is a 14-story building that joins several older wood frame structures to form a large hotel complex. Wood frame construction covers 21%, fire-resistive construction covers 41%, and automatic sprinklers protect 17% of the built-on area. Exposures to the district are mild from all directions.

Shopping Centers.—The one large shopping center in the city limits, Northern Lights Shopping Center, occupies approximately 9 acres at the south city limits along Northern Lights Boulevard between Spenard Road and Minnesota Drive. Con-

struction is of ordinary type, and the entire area is mutually exposed along a front enclosed mall. Automatic sprinkler protection is provided throughout.

Other Business Districts.—Along the principal streets of the city, namely, 5th Avenue, Gambell Street, Fireweed Lane, and Spenard Road, are smaller commercial districts. Construction in these districts is mostly ordinary or wood frame. Heights vary from 1 to 3 stories. The closely built sections of these districts are confined to narrow strips along both sides of the street.

Industrial Districts.—Practically all of the industrial occupancies are located near or along the railroad right-of-way and the waterfront. This district consists of several large bulk oil storage plants, a large number of warehouse facilities, a few light manufacturing plants, and a variety of small businesses. Most of the buildings are widely separated and have relatively low heights. Some of the larger buildings have automatic sprinkler protection.

Waterfront District.—A portion of the city-owned pier is being reconstructed. Upon completion, the waterfront will have facilities for loading and unloading of cargo, a separate dock for transfer of fuel and oils to the various bulk plants, and several smaller piers to handle fishing boats. The new piers are all of concrete pile and deck construction while the remaining older wharves are mostly timber and wood frame.

Institutional Districts.—Along Providence Drive in the southeast portion of the city, an institutional district is developing. It presently contains the Alaska Youth Correctional Institute, the Alaska Psychiatric Institute, the Providence Hospital, and Alaska Methodist University. All of the buildings are well separated and of new construction. The hospital is a 5-story structure and also the tallest building in the district. Areas are mainly large, and the basement portions of some buildings are sprinklered.

Residential.—Residential districts consist mainly of detached, 1- and 2-story wood frame dwellings with a few apartment house districts and government housing projects. Composition roofs predominate in most sections. Current urban renewal projects are aimed at eliminating the substandard houses along the Seward Highway between 17th and 19th Avenues.

Earthquakes.—The city has felt many earthquakes prior to the severe shock of 1964; for example, the moderate shock of October 3, 1954, caused minor damage to the tall buildings in Anchorage (the same buildings were severely damaged or collapsed in the 1964 shock).

Further details on the 1964 earthquake and nature of the earthquake hazard in Anchorage may be obtained from the following publications:

"The Alaska Earthquake", published by the American Insurance Association and the Pacific Fire Rating Bureau, 465 California Street, San Francisco, California

"The Prince William Sound, Alaska, Earthquake of 1964 and Aftershocks", Volume II part A, available from Superintendent of Documents, Washington, D. C.

RECOMMENDED IMPROVEMENT PROGRAM

The following program has been prepared to assist the City of Anchorage in providing better protection to life and property from fire and may be used as a guide for future planning. In general, recommendations under each heading are listed in the order of their importance. The areas in which the City of Anchorage provides fire protection services under contract have not been analyzed as to their specific fire protection needs, and recommendations for these areas are not included in this program.

WATER SUPPLY

1. That additional hydrants be provided so that:
 - a. In the principal business district there will be one hydrant at each street intersection.
 - b. In other high-value districts there will be one or 2 hydrants at each street intersection, depending upon the character of the district, with intermediate hydrants so that they are not over 300 feet apart.
 - c. In residential districts there will be one hydrant at each street intersection with intermediate hydrants so that they are not over 500 feet apart.
2. That the 5-mg reservoir be completed as soon as possible.
3. That the distribution system be strengthened by the installation of mains shown in red on the map, that 6-inch dead ends be eliminated wherever possible, and that the following be adopted as the minimum size of mains used for hydrant supply for all future construction:
 - a. In high value districts, 8- and 12-inch; the former to be used where it completes a close gridiron and the latter for longer lines, not closely interconnected.
 - b. In residential districts, 8-inch; 6-inch to be used only where it completes a close gridiron and in no case for runs of over 600 feet between interconnections.
4. That the 24-inch wood-stave supply line be replaced by pipe conforming to an appropriate American Water Works Association standard.
5. That comprehensive indexed records and maps suitable for use in the field be compiled for all system valves; that valves be inspected annually and large and important valves more frequently; that valves be maintained in good condition; and that

inspections, operations, and conditions be recorded.

6. That hydrants be maintained in good operating condition at all times.

7. That all alarms of fire be received and recorded over the fire alarm system at the water treatment plant.

FIRE DEPARTMENT

1. That at least 4 members be on duty at all times with each engine and ladder company.

NOTE: Seven members on duty at all times with each high-value engine and ladder company, 6 with other ladder companies, and 5 with other engine companies is considered standard manning.

2. That a ladder company, equipped with an aerial ladder truck, be established in Engine 3 quarters.

3. That a full-time training officer be appointed; that more suitable training facilities, including a structure in which fires may be built, be provided in an area where the use of smoke and water will not be restricted; and that the training program be expanded to include supervised combined company drills at the training grounds, regularly scheduled schools for all officers, and additional training for pump operators.

4. That company members make more frequent inspections of buildings in their respective districts for pre-fire planning purposes; inspection data to be recorded on suitable forms, augmented by appropriate notes and sketches, and used as subjects for discussion in the training program.

5. That the apparatus replacement program be continued, and that the repair facilities be ex-

ANCHORAGE, ALASKA

panded, including additional tools and equipment, and that a more complete preventive maintenance program be adopted.

6. That a ladder company be included in the response to all box alarms and all telephone alarms for fires in buildings.

7. That the rules and regulations be expanded, to include complete fire ground rules, and be distributed to each member.

8. That all fire stations be of noncombustible construction (preferably fire-resistive), of good design, and suitably located, and that proper refueling facilities be provided at each fire station.

9. That if the city continues to provide protection outside the city, an additional ladder company be established.

FIRE ALARM

1. That 2 qualified operators be on duty at all times in alarm headquarters.

2. That additional boxes be installed so that one will be visible from and be within 500 feet of every building in high-value districts and be within 800 feet of buildings elsewhere; and that the conspicuousness of boxes be improved by installing indicating lights over all boxes in high-value districts.

3. That the reliability of the system be improved by:

- a. Providing additional box circuits so that none will serve an excessive area.
- b. Repairing circuits to remove high ground readings.
- c. Providing emergency power facilities at each fire station and for local circuits at alarm headquarters.
- d. Installing circuits underground or in messenger supported aerial cable, wherever possible.
- e. Providing automatic recording devices for radio and voice amplification facilities.

Report based on survey made during July, and August, 1968, by engineers R. I. Eby, M. J. Myrick, and R. E. Boudon, in cooperation with Karl Steinbrugge and other personnel of the Pacific Fire Rating Bureau. Acknowledgment is made of the assistance rendered by the mayor, city manager, and other officials.

EVERETT W. FOWLER, *Manager and
Chief Engineer*

KENNETH J. CARL, *Director of Municipal Surveys
and Assistant Chief Engineer*

FIRE PREVENTION

1. That additional qualified personnel be appointed to the fire prevention bureau so that adequate control can be maintained over hazardous materials, processes, and occupancies including regular and systematic inspections of all commercial and industrial buildings at suitable intervals, and that adequate records be kept of such inspections.

2. That a complete inspection of old wiring be made and defects corrected, and that all wiring be subsequently reinspected at suitable intervals.

BUILDING DEPARTMENT

1. That the building code be amended to include those structural features necessary to restrict the spread of fire. It is recommended that the National Building Code of the American Insurance Association be used as a guide in framing these amendments.

2. That only roof coverings of class C or better be permitted within the city limits.

3. That Fire Zone 1 be revised to include all closely built business and commercial areas. It is suggested that the Recommended Method for Laying Out Fire Limits by the American Insurance Association (National Board of Fire Underwriters) be used as a guide in determining these revisions.

STRUCTURAL CONDITIONS

1. That owners of existing defectively constructed buildings which involve serious life hazard or are so located as to form conflagration breeders be required to protect floor, fire wall, and exposed window openings.

2. That approved automatic sprinkler equipment be required in all basements exceeding 2500 square feet in area used for storage or for mercantile purposes and in all buildings which by reason of their size, construction, or occupancy involve serious life hazard or might act as conflagration breeders.

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 irreplaceable 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 which 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 control 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 arrive.

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 starts. 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. Fire Protection Handbook, supra, 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, Controlling the Cost of Fire Protection in the City of San Buenaventura.

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 Municipal Grading Schedule 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, stabilized, 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 fire-fighting 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 stabilization 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 community'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

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the City of Fresno, California. By inducing widespread installation on 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 ID). 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

MAY 16 1979

FOR'S OFFICE
OF FIRE PREVENTION
STORAGE, ALA



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 Vickory, 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 these 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

Please turn to next page

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International
City
Management
Association



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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Project Director: Gerald Brubaker
 Administration Assistant: Susan Brown
 Project Secretary: Joan M. Eason

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

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. Δ

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

Table 1.
Internal Diameter (Inches)

Pipe Trade Size	Schedule 40	Schedule 10 ¹	% of Reduction in Friction Loss
1"	1.049	1.007	20%
1½"	1.380	1.442	19%
1½"	1.616	1.682	19%
2"	2.069	2.157	19%
2½"	2.469	2.635	27%
3"	3.058	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 ³	8.249 ⁴	10%

¹ Schedule 30.

² 0.134" wall thickness — light-wall pipe.

³ 0.158" 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 1½-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-

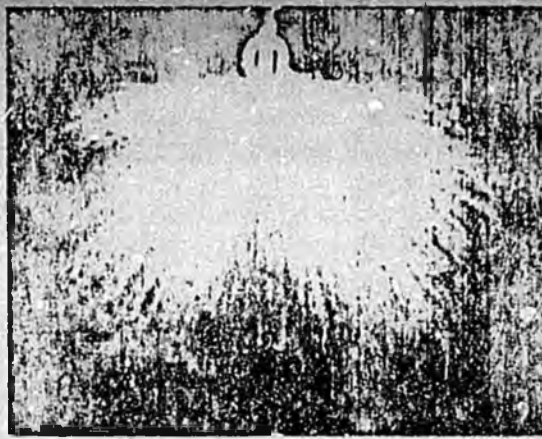
resistance weld process. The steel used to form this pipe is rolled, either cold or hot, and has a smooth surface. The pipe is generally formed cold, and thus has little opportunity for scale formation and roughening of the surfaces. Standard-weight pipe is often formed hot, and may include scale and 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 ¹ or 20"
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	10.5	10.5
TOTAL	125.1	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. Δ



Sprinklers Cut Fresno's Fire Losses and Budget

EDWARD J. REILLY and JOHN A. VINIBELLO

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 U.S. 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 the 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. Vinibello is that organization's Vice-President of Field Operations.

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 1955.

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 1977, it would have come to about 11 percent in 1955 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 \$171. 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)

A M E N D M E N T

By the Community and
Regional Affairs Committee

Offered in the SENATE

TO: SENATE BILL NO. 370

Page 1, lines 8 - 17, delete all material and insert the following in its place:

"* Section 1. AS 29.53.020(a) is amended by adding a new paragraph to read:

(7) real property to the extent and subject to the conditions provided in (j) of this section.

*Sec. 2. AS 29.53.020 is amended by adding a new subsection to read:

(j) Two percent of the assessed value of a structure is exempt from taxation if the structure contains fire protection systems in operating condition incorporated as a fixture or part of the structure. The exemption granted by this subsection is limited to

(1) an amount equal to two percent of the value of the structure based on the assessment for 1981, if fire protection systems are a fixture of the real property on January 1, 1981; or

(2) an amount equal to two percent of the value of structure as of January 1 following the installation of the fire protection systems as fixtures of the structure after January 1, 1981."

Renumber following sections accordingly.

For purposes of this Act, definition of approved types of fire protection systems and fire alarm systems shall be made available through the State Fire Marshall's Office. On or before the end of October 1980 the State Fire Marshall's Office shall submit a list of approved types of systems to the State Assessor's Office, Department of Community and Regional Affairs and Division of Business Loans, Department of Commerce and Economic Development. This information will also be available to the public.

Cordova Chamber of Commerce

BOX 99

"The Friendly City"

CORDOVA, ALASKA 99574



MT. ECCLES

January 30, 1980

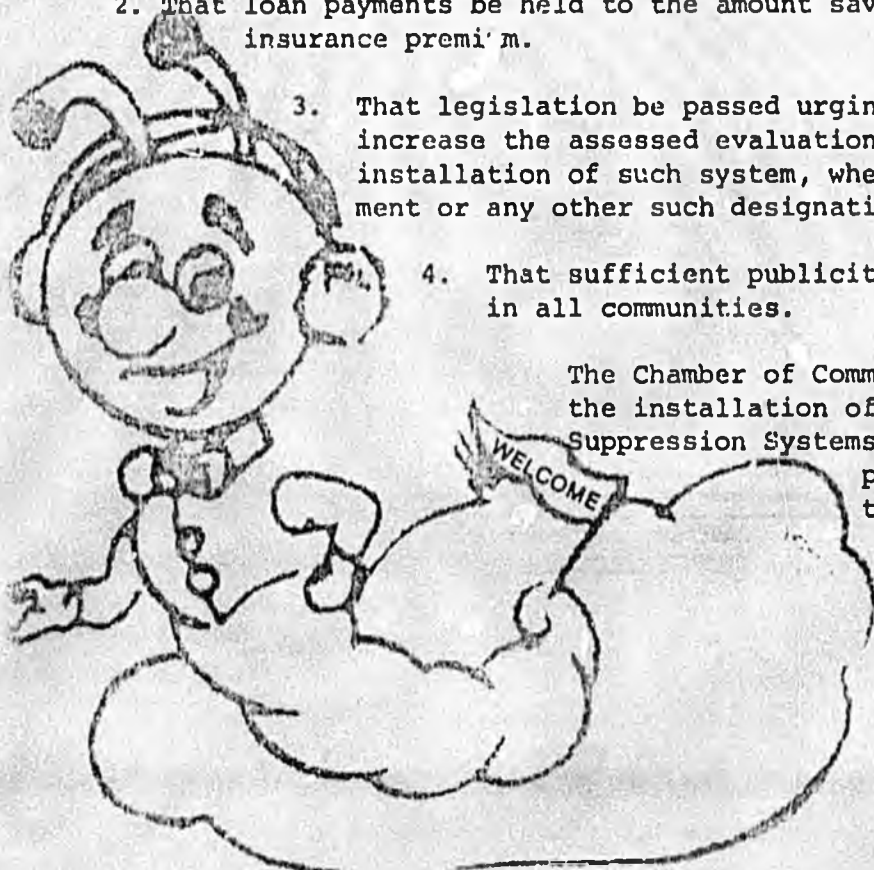
Mr. Robert Shirnberg
Post Office Box 1167
Kenai, Alaska 99611

Dear Mr. Shirnberg,

This is to inform you that on January 29, 1980, the Cordova Chamber of Commerce took action supporting proposed legislation for the installation of Private Fire Protection Systems.

The following are specific concepts supported by this Chamber:

1. Low interest or no interest loans with a minimum of paperwork to be made available to businesses for the purpose of installing Private Fire Protection and Suppression Systems.
2. That loan payments be held to the amount saved on the establishment's fire insurance premium.
3. That legislation be passed urging local municipalities to not increase the assessed evaluation of the property because of the installation of such system, whether it be named as an improvement or any other such designation.
4. That sufficient publicity be given to business people in all communities.



The Chamber of Commerce feels that incentives for the installation of Private Fire Protection and Suppression Systems will reduce the loss of lives, property, and lost man-hours due to destruction of business property.

Sincerely,

Robert L. Varnam

Robert L. Varnam

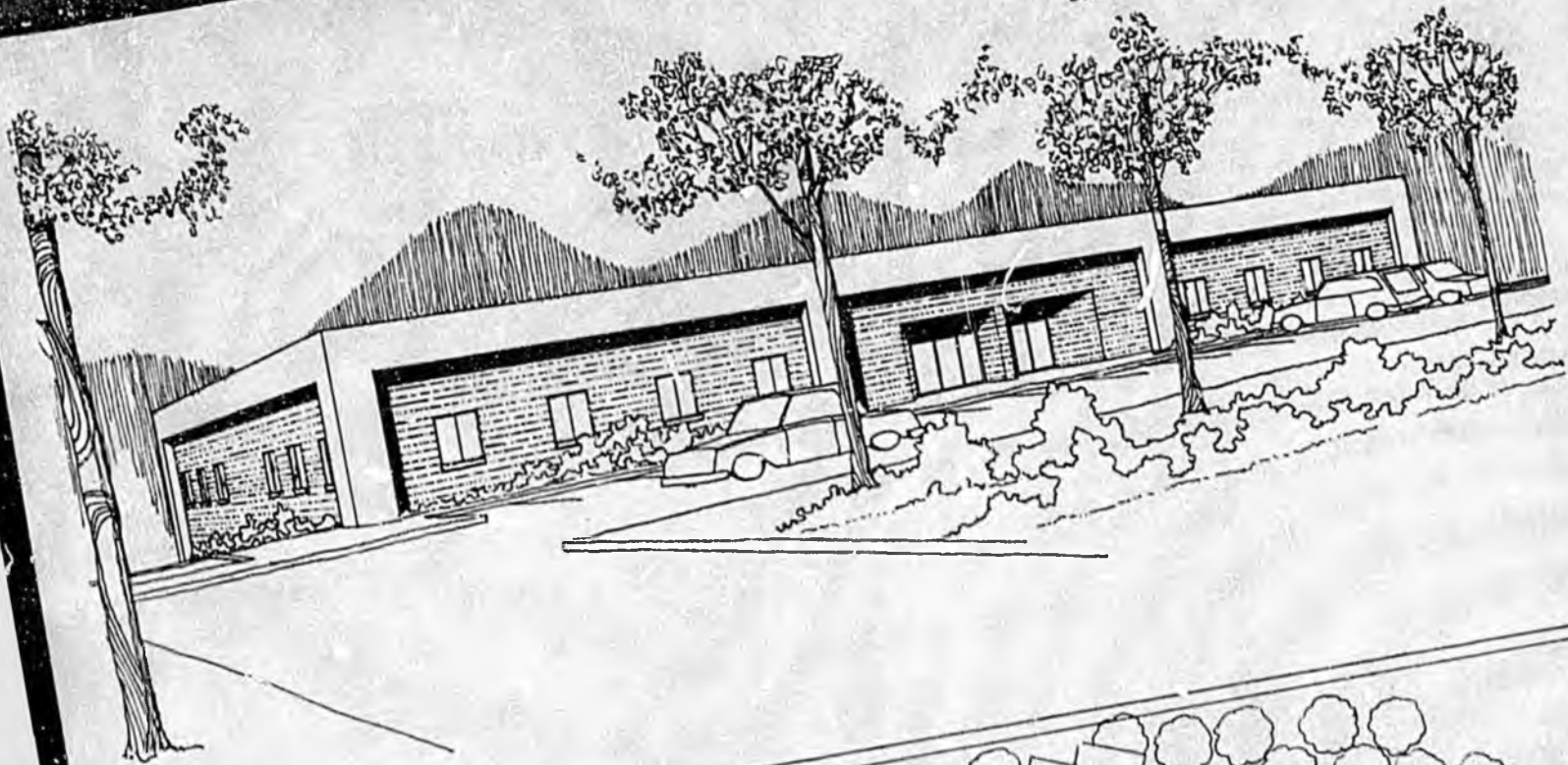
cc: Alaska Fire Chief's Association, Alaska State Fire Fighter's Association, Cordova City Council

SPRINKLING OF NEWS

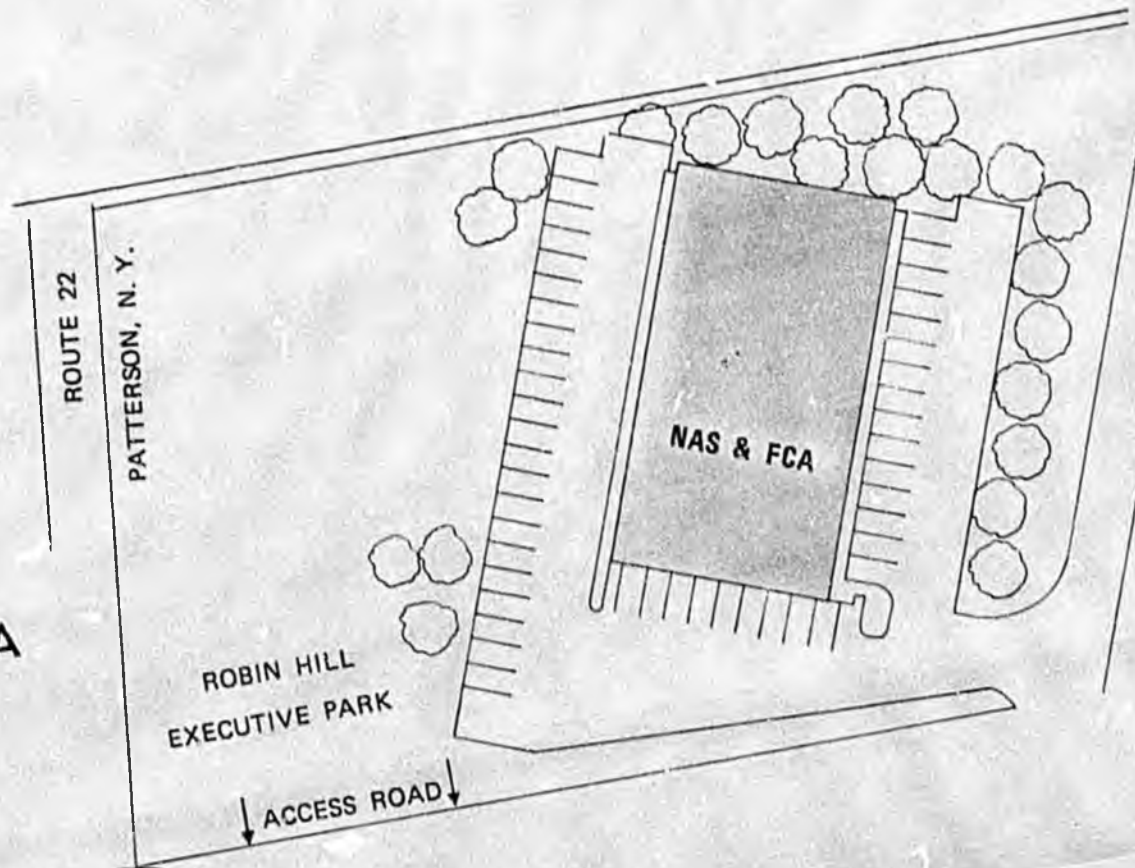
NATIONAL AUTOMATIC SPRINKLER AND FIRE CONTROL ASSOCIATION, INC.

WINTER 1979-1980

Number 33



Future Home
of
NAS & FCA



Fire Protection Water Standby Charges: Not in the Public Interest

by BRIAN R. SHUTE

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 1978 over 3 million fires caused over \$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 irreplaceable personal belongings.

Water is an indispensable commodity when it comes to fighting fire. Fires cause billions of gallons of water to be consumed putting them out. Consequently, given the compelling social goal of avoiding the catastrophic fire losses, together with the absolute necessity of water for basic human existence, a municipality should develop policies which maximize its ability to provide both fire protection and adequate water supplies.

According to the National Fire Protection Association, private fire protection systems (of which automatic sprinkler systems are the backbone) 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 on the average as is required by the Fire Department. The expenses of the Fire Department incurred fighting sprinklered fires are much less, and the chance for injury to firemen as a result of fire is almost negligible in sprinklered buildings.

Brian R. Shute is an Anchorage, Alaska attorney. He represents the Water Conservation Association of Anchorage.

In Anchorage, Alaska, in 1977, the Public Utilities Commission approved a new tariff for the Anchorage Water Utility. As a result, the utility required owners of private fire protection systems to make a monthly payment for merely having an automatic sprinkler system connected to the utility water supply. The owner was required to pay even when he did not use any water at all.

It came to the attention of the Water Conservation Association that the monthly charges in some cases were so high that they were in excess of insurance savings realized through installation of the system. Consequently, some owners were deciding to turn off their fire protection system because it had become uneconomical to maintain. The Water Association was also aware of some new construction for which plans for installation of private fire protection systems had been cancelled because the stiff water standby charge was too high in relation to the savings which could be realized by having the systems installed.

The Water Conservation Association took the position that the standby charge which owners of private fire protection systems were being required to pay was not in the interest of conservative water usage, was not in the interest of increasing the fire worthiness of the general Anchorage municipal area, and did not further cooperative planning to solve the interrelated problems of providing adequate fire protection and water supply to the City.

The Water Conservation Association prepared a memorandum to more fully explore whether the standby charge fire protection owners were being required to pay was in the public interest. A detailed fact digest was compiled. As a result of its study, the Water Conservation Association concluded that the standby charges were not in the public interest and, consequently, should either be eliminated or alternative methods found to restore the economic incentives for installing private fire protection systems so the water conserving and fire loss reducing characteristics can be promoted.

As a result of its efforts, the Water Conservation Association has apparently succeeded in getting the Municipality of Anchorage to agree to a potential of a reduction in standby charge of as much as 75 percent or more. However, the Association would like to see the charge eliminated completely for the following reasons:

PRIVATE FIRE PROTECTION SYSTEMS BOTH CONSERVE AVAILABLE WATER SUPPLIES AND GREATLY REDUCE LOSSES CAUSED BY FIRES.

1. Private fire protection systems conserve water supplies.

Statistics showing the effectiveness of automatic sprinkler protection 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 intentionally or by vandals. A complete record of fires in sprinklered buildings would show that their efficiency probably approaches 100%. Of all the fires controlled by sprinklers more than 90% of them are controlled by three or less sprinkler heads.

The effectiveness of automatic sprinklers stems from their presence at the potential scene of a fire before the fire starts. They can apply water immediately where it is needed because there are no problems of access to the seat of the fire or interference with visibility for fire fighting due to smoke. Sprinklers can extinguish fires much earlier than a Fire Department could ever respond to an alarm. The amount of water necessary to put out a fire in its beginning stages is nowhere near the amount required for the Fire Department to put it out after it gets going.

Performance characteristics of sprinklers indicate that standard automatic sprinklers discharge anywhere from 15 to 55 gallons of water per minute, depending on the pressure at the sprinkler head. In comparison, a heavy-attack two and one-half inch mobile hose line in operation can consume more than two hundred gallons 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.

2. The total required fire flow for a municipality is reduced with the widespread installation of private fire protection systems.

The traditional method for estimating the water supply required to serve a municipality's fire protection needs is by computing fire flow requirements. The latest developments in estimating fire flow requirements are found in the Guide for Determination of Required Fire Flow published by the Insurance Services Office (ISO) in 1972. The fire flow formula reflects significant water conservation propensities of private fire protection. Depending upon the flamability of a given building, the fire flow required is reduced by twenty-five to fifty percent when a sprinkler system is present in a building.

The guide for determining required fire flow just referred to is a determination made for specific buildings. The ISO utilizes this formula for determining fire flow requirements for Anchorage as a City. The procedure for making a city-wide fire flow determination more fully described in the ISO Municipal Grading Schedule.

The last analysis of Anchorage fire flow requirements was performed and summarized by ISO in a 1969 report.

ISO is presently in Anchorage reevaluating the fire flow requirements. The 1972 fire flow guide has been revised since the last fire flow study was done for Anchorage in 1969. ISO engineers indicated that the reduction in fire flow requirements for a building can be even greater than 50%, to as much as 75%, given the right kind of building construction.

It was the opinion of the ISO engineers that although the ISO methodology did not enable a precise computation of the reduction in Anchorage fire flow requirements caused by the private sprinkler protection, it was significant. ISO indicated that the sprinkler installation in the central business district alone made Anchorage's central business district a much better fire risk.

Finally, ISO engineers indicated that with all of the factors of the Municipal grading schedule taken into account, they were hopeful that the required fire flows for Anchorage would be less than the 1969 studies indicated. However, the investigation work for the study has not been completed, and consequently the fire flow requirement is still to be determined.

In 1969, ISO engineers completed a report on Anchorage. It is significant that one of the improvements recommended by ISO was installation of automatic sprinkler equipment in all basements exceeding 2,500 square feet.

Examination of the respective quantities of water needed by the Fire Department versus sprinkler systems to extinguish fires, the 25% to 75% discount for fire flow required for a given building, and a study of the Municipal Grading Schedule all indicate that the amounts of water demanded to maximize Anchorage's fire protection efforts are reduced by widespread installation of private fire protection systems. The conservation aspects of private fire protection are significant and should be encouraged.

PRIVATE FIRE PROTECTION REDUCES THE COST OF OTHER PUBLIC SERVICES.

In addition to the water conservation aspects 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 fire is reduced and therefore the money necessary to operate the Fire Department itself is also lessened.

3. Private fire protection decreases fire insurance cost for the entire city.

4. Private fire protection increases municipal tax revenues by encouraging property improvement.

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

6. Private fire protection results in lessening the cost of capital improvements to the water utility since widespread installation of private fire protection decreases

the required fire flow necessary for adequate municipal fire protection.

7. Private fire protection saves billions of gallons of water which is in chronic short supply in most cities.

8. The encouragement of private fire protection systems is consistent with the State policy of encouraging fire protection devices (smoke alarms). Since private fire protection reduces the cost of the fire department for fighting fires in sprinklered buildings, State revenue sharing money can be used for other fire department purposes, making more efficient use of the State money.

9. The omission of automatic sprinklers imposes upon 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.

BECAUSE WIDESPREAD INSTALLATION OF PRIVATE FIRE PROTECTION CONSERVES SCARCE WATER RESOURCES AS WELL AS SIGNIFICANTLY DECREASING LOSS OF LIFE AND PROPERTY FROM FIRE, THE MUNICIPALITY SHOULD ENCOURAGE WIDESPREAD INSTALLATION OF THE SYSTEMS BY PROVIDING NEW INCENTIVES FOR OWNERS TO INSTALL PRIVATE FIRE PROTECTION, AND BY CONTINUING EXISTING INCENTIVES.

The primary incentive for voluntary installation of private fire protection systems is the reduced insurance rates to the owner which enable him to amortize the cost of installation over a period of a few years.

Because of the safety factors accompanying installation of automatic sprinklers and the reduced fire flow characteristics, an owner installing private fire protection can reduce his insurance premiums when the installation has been approved by ISO. This incentive for voluntary installation of private fire protection had been largely eradicated by the implementation of a flat monthly charge by the Anchorage Water Utility of anywhere between \$7.10 to \$254.10 per month, depending upon the size of pipe delivering water to the building. The most prevalent sizes of pipe are four, six and eight inch pipe for which charges were \$28.45 per month, \$63.55 per month and \$112.85 per month, respectively. These rates nearly eat up, and in some cases entirely eliminate, the savings on insurance an owner achieves by installing private fire protection. Even when the rates do not entirely eat up the insurance savings, they eat up so much of the insurance savings that it takes too long to amortize the cost of installation, and it is uneconomical to install private fire protection.

But when fire protection needs and water supply requirements are examined in the total picture, it appears that the widespread installation of private fire protection will alleviate rather than create additional fire protection demands upon the water supply; the water saving capacities of automatic sprinklers will reduce the total quantity of water required to fight any given number of fires. To levy a standby charge, whether water is used or not, which eliminates the insurance cost advantage is to create a disincentive and discourage voluntary installation of private fire protection systems. Obviously, this will result in a corresponding reduction

in water conservation and increase in total potential demand for water for fire protection.

Largely through the work and application of ISO's Municipal grading schedule, the Municipality of Anchorage receives a fire risk rating which determines fire insurance rates for the City. As has already been discussed, widespread installation of private fire protection systems contribute significantly to reducing fire flow requirements for Anchorage, and, therefore, play a part in reducing fire insurance premiums to property owners in the city generally. It is those owners who do not have private protection systems who raise insurance rates, not owners who have installed such systems. To penalize owners for installing private fire protection systems by requiring them to pay this standby charge is to penalize the wrong people. It is the person who fails to install the sprinkler system who contributes to increased insurance rates, who requires immeasurably greater quantities of water to be consumed in putting out fires, and who creates a public hazard, since a fire in a non-sprinklered building is much more likely to rage out of control and burn property of others nearby.

As owners and citizens of the Anchorage municipal area, private fire protection owners have a vested interest in the continuing viability of both the fire protection effort and the adequacy of the water supply. The members of the Water Conservation Association feel that since widespread installation of private fire protection systems not only makes Anchorage a safer place to live, but also reduces Fire Department costs and conserves precious water resources, that the incentive for voluntary installation of sprinklers should be restored. There are a number of options which can be looked at to achieve this purpose.

METHODS TO OPTIMIZE THE FIRE PROTECTION EFFORT AND PROVIDE ADEQUATE WATER SERVICE.

The Anchorage Area Borough Assembly is empowered by the Municipal Charter to prescribe rules and procedures for the operation and management of municipal utilities. Municipal Charter, Article XVI (C) (1975). The Water Conservation Association offers the following alternatives to the water standby charge as being more productive solutions to the total municipal problem of providing adequate fire protection and sufficient water supply.

1. Grant a tax credit to owners who install private fire protection systems. This will indirectly make those who do not voluntarily install private fire protection systems pay for their counter productive and wasteful practice of depending upon the resources of the Fire Department to fight fires. This will also restore the incentive for owners to voluntarily install private fire protection systems, which is lost when insurance savings are eaten up by the standby charge.

2. Simply stop the standby charge for private fire protection. The Water Utility will not have the benefit of the alternative source of revenue from the ad valorem property tax, but this lack of revenue will be more than made up by the savings which result from the public benefits created by the incentive to install private fire protection systems.

TAX INCENTIVE PROGRAM

What are we talking about when we speak of a tax incentive program for fire protection? In looking back over the years, and in particular to the fire protection systems that are provided by private property owners, business and industry, we find that through Fire Codes, Uniform Building Codes and ordinances we have insisted that these same property owners provide private fire protection systems.

In effect, what we are telling the property owner is that we in the fire service cannot provide or meet the fire protection requirements for their particular property, that we insist that they install a system that will provide for fire detection and extinguishment, and supplemented by our fire department, we can then possibly handle the fire problem in his building or property.

When the property owner provides for this private fire protection, we often overlook the fact that he is not only providing protection for his property, but in effect is providing a part of the overall fire protection system of the community. His system does provide for fire protection to nearby properties in that the chances of the fire extending beyond his property is practically eliminated through his built-in fire protection system.

With the installation of a sprinkler system or other fire protection system within the property, the value of the property increases. Up to now the increased value of the fire protection system has been added or included in the tax assessment bill on the property.

I strongly feel that to require a property owner to provide for private fire protection systems on his property and then increase his tax bill because he has installed such a system is again self-defeating. We must be able to encourage the property owner to install such systems. We well know that such a system adds directly to the over-all fire protection system of the community.

To encourage the installation of private fire protection systems in our communities throughout the state, with the direct long-range effect of reducing or at least being able to maintain the current level of public fire protection we should consider the following:

Inact legislation at the State level that will remove from the tax rolls the assessment against private fire protection systems. The net effect to the property owner will be that his property tax rate will be reduced by the value of the private fire protection system.

Presently, the property owner that provides private fire protection systems for his property receives the following benefits:

1. Protection for his building
2. Protection for the contents
3. Protection for the occupants
4. Protection for his business
5. A reduction in the insurance premiums

The public receives the following benefits when a private property provides fire protection systems:

1. The public that enters or resides within the building is protected.
2. The nearby property owners are protected from fire extending from the property in question.
3. The community's tax base is protected in the property
4. The community has assurance that this business will not be destroyed by fire
5. The jobs provided within this property are secure from fire.
6. There is a lesser demand or requirement on the community's public fire department because this property has a built-in fire protection system.
7. The overall fire insurance rating will be enhanced by those properties protected by fire protection systems.

It is apparent that those property owners that install private fire protection systems not only receive certain benefits directly, but in respect to the community as a whole, that through their private efforts, provide a larger degree of benefits to the community in general.

Up until the present time, the property owner that provided private fire protection systems has received no direct benefits or credit from the community or local government for his efforts. The community has in general not recognized what the private fire protection systems mean to a community.

It is apparent that if all private property owners could or would provide private fire protection systems, it will have a dramatic long-term effect on the total community fire protection system. It will certainly affect the costs of providing community fire protection in the future.

Private Fire Protection

Series A

Public Purpose

Stand-By Charges

Meter Requirements

and

Houston Shows 'Em How!

By Edward J. Reilly *Director of Information*
National Automatic Sprinkler and Fire Control Association, Inc.
277 PARK AVENUE NEW YORK N.Y.

Part One

Water shortage. It is one of the major domestic problems now facing this nation. Its dimensions are long term and nationwide.

What impact does this fact have on your municipality's capacity for fire defense?

Somewhere in the United States a fire breaks out every 12 seconds. Over \$1.5 billion in property and contents are ravaged by flames annually.

On an average of once a day a "large loss" fire makes headlines. (A "large loss" fire is one that exceeds \$250,000.00.)

All this adds up to one conclusion:

Billions of gallons of water are needed daily to safeguard lives and property from fire.

A few years ago a "large loss" fire was sustained in downtown Saratoga Springs, New York. Population: 16,000. At the time of the fire the public water supply for this city was about five million gallons per day. The fire which occurred in the business district placed a demand of six million gallons of water a day to prevent conflagration.

Result: Demand exceeded supply. It was necessary to by-pass the filter beds to meet the total demand for ten million gallons of water needed to fight this fire. For several days, residents had to boil all water used to drink and cook as a health precaution.

THE JOURNAL OF AMERICAN INSURANCE, a monthly publication of the American Mutual Insurance Alliance, spotlighted the problem of inadequate public water in a feature story titled "OUR THIRSTY CITIES" in its December 1962 issue. It is a story of a serious national problem of which all too few Americans are aware. Carefully documenting its sources, the JOURNAL pointed out that in 1961 inadequate water supplies were largely responsible for 52 out of the 358 "large loss" fires that occurred in the United States and Canada. Water shortage "is at least partly responsible for the fact that the nation's annual fire loss has risen from \$5.50 per person in 1951 to \$8.60 per person in 1960. Even more shocking:

- One out of five water utilities was (according to a 1955 survey made by the U.S. Public Health Service) deficient in basic water supply.
 - Two out of five were deficient in transmission capacity.
 - One out of three lacked adequate pumping facilities to meet fire fighting needs.
 - Two out of five needed additional treatment plants to avoid having to pull untreated water into the system in fire emergencies.
-

- Ground storage facilities were inadequate in 29 per cent of the cities; elevated storage was insufficient in 13 per cent.
- Distribution system improvements, such as eliminating dead-end mains, were needed in 57 per cent of the systems to assure adequate pressure and supply to all locations.

Poor water supplies seriously jeopardize the growth of our cities. From a municipal viewpoint, inadequate water prevents industries from locating in a city. Fire insurance rates are too high when water needed for important industrial progress is not available. For example: Springfield, Ohio had not attracted a new industry for 50 years. By improving its water supply facilities, its fire insurance rates dropped by 10 per cent and 11 new industrial plants moved in to provide needed employment.

The fact that water supply facilities must be improved is obvious. Many communities, using federal and state matching grants have already taken steps to alleviate this problem.

But meanwhile it seems essential that water used for fire protection purposes be conserved.

MORE MILES PER GALLON WITH WATER — FOR FIRE FIGHTING PURPOSES

Ironically many American communities are actually working against themselves. All available information indicates that a pernicious tax, known as the "stand-by charge" is gaining wider acceptance in American cities. The Stand-by Charge is a tax or charge, based on the size of a city water connection, the number of sprinklers, a flat rate, floor area, or a combination of any of these for the purpose of raising revenue to provide adequate water for private fire protection systems.

WHAT IS THE PRACTICE IN NORTH AMERICAN MUNICIPALITIES?

The Factory Mutual Engineering Division is part of the National Association of Mutual Fire Insurance Underwriters. Its decennial publication, PRIVATE FIRE SERVICE CONNECTIONS -- SURVEY OF STAND-BY CHARGES AND METER REQUIREMENTS -- 1955-1960, summarizes a survey based on 1,250 public and private water companies serving approximately 3,100 communities in the United States and Canada. Here are the results of that survey:

	UNITED STATES		CANADA
	(1) Municipal (1000)	Private (145)	(2) Municipal (105)
(3) METERS			
Required	28%	38%	18%
Not Required	72	62	82
Total	100%	100%	100%
(4) STAND-BY CHARGES			
Yes	51%	88%	39%
No	49	12	61
	100%	100%	100%
BASIS OF CHARGE			
Connection size	21%	27%	8%
Hydrants	3	3	5
Sprinklers	1	1	5
(5) Combination	21	57	17
Flat Rate	4	—	1
Floor Area	1/2	—	2
Other Basis	1/2	—	1
Total	51%	88%	39%

Let's examine the pros and cons of stand-by charges:

PRO *To provide adequate public water to supply private fire protection facilities, it is necessary to raise additional revenue by taxing owners of buildings protected by private fire protection facilities. Therefore, the cost of such expanded or improved facilities should be borne by owners of buildings protected by private fire protection systems.*

CON Fire Protection is a total municipal problem. The Fire Department and Fire Prevention Bureau (Fire Marshal), the Police Department, the Water Department and the fire insurance underwriters each have a part to play in the total fire security efforts of a community.

No single department operates in a vacuum. They must be viewed as an integral unit mutually concerned with the overall fire protection-prevention effort of a municipality.

However, the major burden of municipal fire defense falls upon the shoulders of the Fire Department.

BUT...

1. Shorter work weeks result in the fact that fewer firemen are able to respond to a given alarm than at any previous time. This condition promises to worsen.
2. The ratio of firemen to population has dwindled steadily since World War II.
3. Firemen are charged with the responsibility of protecting higher valued properties, more buildings, more volatile and flammable contents each year. Because of the plight of the public fire services, the need for private fire protection is increasing. The backbone of private fire protection is the *automatic sprinkler system*.

Fire officials' associations have unanimously endorsed basement sprinkler ordinances and associations of fire chiefs have been extremely effective in obtaining automatic sprinkler ordinances in Fire Prevention Codes across the nation.

Most rank and file fire fighters know that no firemen has ever been killed in line of duty in a building protected by an approved automatic sprinkler system.

Building officials, too, acting through their large building code congresses, have recognized the important roll of automatic sprinklers, and have adopted provisions into building codes to strengthen automatic sprinkler requirements *for new construction*.

PRIVATE FIRE PROTECTION SERVES A PUBLIC PURPOSE

An owner who elects to install an automatic sprinkler system is serving a *public purpose*:

1. He precludes the possibility of exposure fires and conflagrations.
2. He secures greater personal safety to firemen and offers the best possible safety to life to his employees and to the general public.
3. He safeguards continuity of business in his own plant.
4. He is generally a major taxpayer in a community. By installing automatic sprinklers, he insures a steady flow of taxes needed to support the various municipal departments which work together to protect his property and the property and lives of his neighbors.

In cities that have meter and stand-by requirements, he pays for water used to extinguish a fire in his property three times:

First: He pays for private water measured through his meter.

Second: He pays an annual stand-by charge whether he has a fire or not.

Third: He pays for public water should it be needed.

If his neighbor, the owner of an unsprinklered building, has a fire, both he and his neighbor pay for that water.

Water used to fight fires in unsprinklered buildings vs. sprinklered buildings is often consumed in the ratio of *ten thousand* to *one* gallons per minute. The consumption of two, three or four million gallons of water is not uncommon in the suppression of fires in unprotected properties.

CHARGES AGAINST PRIVATE FIRE PROTECTION — REDUCE MUNICIPAL REVENUES

The installation of automatic sprinklers is clearly a property improvement. To the extent that buildings are improved, a direct taxable value is added to the total value of property effected and increased revenue to a municipality results.

Therefore, when private fire protection is discouraged, public revenue diminishes in direct proportion.

COST — PRIVATE VERSUS PUBLIC WATER

It is argued by some water departments that owners of private fire protection systems should pay above and beyond public water rates to expand and improve water facilities.

In view of the fact that private fire protection serves a public purpose by reducing the cost of public fire protection and because it spares the community tens of millions of gallons of water, he should be given water at the lower rate charged to the municipality for municipal fire protection.

It is further argued by some water department officials that the addition of a sprinklered plant to a community required adds expenditure to provide public water mains to the property.

Industry and population follow public water supplies. No water main laid to one sprinklered property in a municipality will remain unshared for long. Other industries, housing developments, shopping centers will invariably move near public water mains; thus, dividing the cost of public water among many users.

5

FIRE INSURANCE REDUCTIONS

PRO *Owners of sprinklered properties enjoy reduced fire insurance premiums which reduce the owner's operational cost and amortize the cost of private fire protection in a few years. Therefore, because of reduced overhead, owners of sprinklered properties are better able to carry the financial burden of providing adequate water supplies.*

CON This is a *non sequiter*.

To impose a tax or charge against an owner of property protected by a private fire protection system because he has made a good business judgment, is discriminatory.

By installing sprinklers, he has diminished the demand placed upon the public fire services, the water supply system, police and traffic control.

Private fire protection must be viewed as a public aid. It should not be penalized.

OTHER UTILITIES HAVE STAND-BY CHARGES

PRO *Some public water officials justify stand-by charges because electric power and gas utilities have them.*

CON This comparison is misleading. Everyone uses electric power. Virtually every taxpayer uses gas or electricity for heating and cooking. Therefore, everyone pays his fair share and there is no inequity in raising revenue when all citizens enjoy equal benefits. In the case of stand-by charges against owners of sprinklered properties, we are discussing a tiny minority of the general population. Not more than a few hundred taxpayers out of a half million are required to pay these charges. Therefore, the stand-by charge against private fire protection is discriminatory.

METER REQUIREMENTS

Some cities require the use of full flow fire meters.

These meters are intended to measure the flow of water when a fire occurs.

Other communities require so-called detector check meters which are designed to detect leakage, waste or theft of water.

The requirement for full flow fire meters can be compared to a requirement for a speedometer on your automobile which costs nearly as much as the automobile itself.

Obviously full flow fire meter requirements discourage private fire protection installations. Fire and building officials who envision automatic sprinklers as an integral part of their city's fire fighting capabilities are hard put to justify fire protection and building codes which make sprinklers mandatory when they are confronted with mandatory requirements for full flow fire meters.

The cost of purchasing and installing such a meter could conceivably be equal to the cost of sprinklering a 4,000 square foot basement.

WHAT'S BEHIND THESE METER REQUIREMENTS?

Some public officials believe that water used to fight fires with private fire protection facilities should be measured and that owners should be charged. The reason is that the owner has benefited from reduced fire insurance premiums and can well afford to pay for the metering devices.

Nevertheless, public water used to extinguish a fire in an unsprinklered building is not metered and public fire protection water in the order of millions of gallons is frequently necessary to effect good fire control. But the water bill for this purpose is shared by everyone, including owners of sprinklered and unsprinklered buildings. Therefore, the requirement for full flow fire meters is *discriminatory* and ultimately results in reduced fire fighting capacity within a community when sprinklers are discouraged or eliminated.

From a fire fighting standpoint such meters result in needless "friction loss" which reduces water pressure and volume needed to fight fires.

"Friction loss" is the result of an impediment (within the metering device itself) which reduced the velocity and volume of water needed to fight fires.

One of the components found in sprinkler systems is a water flow alarm device. In effect it detects the flow of water and prevents waste and leakage within a system. It is a kind of built-in metering device.

Many sprinkler systems are connected to central station supervisory services which transmit an alarm indicating flow of water. The requirement for a meter in such cases is a duplication of cost without concomitant benefit.

SUMMARY:

It has been said that "the power to tax is the power to destroy". Any economic sanction levied against private fire protection is, in effect, a tax which results in a diminishment of the total fire security effort of a community and increases the burden of public fire protection in direct proportion.

Conversely to strengthen private fire protection by encouraging its expansion:

1. Decreases both the economic and physical burden of the Fire Department and concomitantly decreases the hazards of fighting fire.
2. Decreases total fire insurance costs because anyone's fire is everyone's loss.
3. Increases tax revenues by encouraging property improvement.
4. Encourages cost conscious industries to move into new communities.
5. Increases a community's total fire protection security, preventing conflagrations and exposure fires.
6. Saves billions of gallons of water which is in chronic short supply in most cities.

Part Two

Houston Shows 'Em How!

THE DEMISE OF A "STAND-BY CHARGE"

A scrappy little band of Houston businessmen known as the ASSOCIATION FOR ENCOURAGING FIRE PROTECTION has succeeded in showing us all how to deal with that pernicious phenomenon known as the "Stand-By Charge".

On February 21, 1961, the Houston City Council enacted an ordinance that prevailed in part for a *monthly charge* of \$1.00 per inch on all city water connections to automatic sprinkler systems. For example, the owner of a sprinklered building, served by an eight (8") inch city connection to his sprinkler system was required to pay \$8.00 per month or \$96.00 per year.

Then it all began. Mr. Russell Cummings, owner and manager of the leading storage and moving business in Houston asked, Why? Seriously. When the city mailed him a bill for a "stand-by charge", he was puzzled. "What am I getting for my money?" he asked. A chain of phone calls and correspondence led him up and down a labyrinth of municipal offices and he came up with an assortment of answers that didn't make sense to him. He knew he was being asked to pay for something, and he couldn't find out what he was getting for his money.

He began to think about some of the answers he had gotten back when he inquired of various public officials.

He had been told that it was necessary to tax his sprinkler system, a privately owned fire protection system, to raise revenue to expand or maintain public water supplies. But he also knew that the amount of water that could be used by a sprinkler system in case of a fire could only reduce the amount of water needed. If his neighbor who had an unsprinklered building had a fire, millions of gallons of water might be needed, and it would be paid for out of public taxes. But the immeasurably small amount of water that his sprinkler system could conceivably use had to be paid for by means of a "stand-by charge".

He also learned that there were probably in the order of 1,000 or more sprinkler systems in Houston and their very existence greatly reduced the burden of public fire protection. Without these sprinkler systems, far more Fire Department personnel and fire fighting equipment would be needed to cope with the hazards which would exist.

He had invested in a sprinkler system. He reasoned that by doing so he was safeguarding the future of his own business, protecting the lives of his employees and could amortize the cost of the sprinkler system in fire insurance rate reductions. It annoyed him to learn that his good business judgment was being penalized and it could take him

or other owners of sprinklered buildings as much as 200 years to amortize the cost of the system after paying his monthly and annual charge on his water connection.

Further, he had increased the value of his property by installing sprinklers, was paying a tax on the increased evaluation of his building and was now being double taxed for a property improvement which actually worked against the whole fire protection effort of the City of Houston.

THE ASSOCIATION TO ENCOURAGE FIRE PROTECTION

Russell Cummings was a realist. He had some experience in politics. He was a businessman, and he knew that alone he could do nothing.

He wrote a letter to Mayor Louie Welsh, to each City Councilman and to other public officials in the City. A telephone campaign followed and he invited representatives of the Insurance Agents Association (The Insurance Exchange of Houston), the Retail Grocers Association, the Chamber of Commerce Fire Prevention Committee, and the Junior Chamber of Commerce Safety Committee. He invited leading fire protection contractors in Houston and a meeting was called. Attendance was unanimous and an organization known as the Association to Encourage Fire Protection was formed. Russell Cummings was elected President.

An organization was formed, with letterhead, telephone number, officers and some of the leading businessmen of Houston as members.

It turned out that Mayor Louie Welsh; Councilmen A. I. "Curley" Miller, Frank Mann, Lee McLemore, Bill Elliott, Homer Ford, Bob Webb, Johnny Goyan and Frank Mancuso were also interested in fair play and, once the case for "encouraging good fire protection" was layed before them, they were in unanimous agreement: the "stand-by charge" was repealed, as any Texan would say, "pronto".

Less than 20 months after the law had been enacted, it was repealed.

AS WE SEE IT . . . The Houston story could be repeated anywhere. And it should be. Most city officials are fair minded men. But the business of financing a modern municipal government with its myriad of departments and bureaus is a complex business. A single voice, speaking alone at City Hall, would go unheeded. Not because public officials are calloused or indifferent or unresponsive to the wishes of the electorate, but because, by the nature of politics, public officials must tune their ears to organizations; not to individuals.

A lot of work went into the repeal of this Houston "stand-by charge". It took leadership and hard work. But an injustice had been imposed, and that small band of willful men made their voices heard.

To Mayor Louie Welsh, the members of his City Council and other Houston officials, and to the Association to Encourage Fire Protection — *Well Done!*

February 20, 1980

Senator Brad Bradley
Pouch V
State Capital
Juneau, Alaska 99811

Dear Senator Bradley:

I have been informed by the Fire Chief's Association that you are in support of a bill similar to House Bill No. 648 which would exclude the value of fire protection systems from the tax assessments of the full and true value of a building. I believe you will find the following information of interest and useful to you.

On February 15, 1980 I went by the Fairbanks North Star Borough Assessors office and pulled the file on my residence at 3292 Jefferson Drive in Fairbanks, (Executive Park Subdivision, Block 2 Lot 24), and was very surprised to learn that my appraisal had recently increased from \$76,725 to \$93,325, and increase of \$16,600. Inquiring as to the reason for the increase I found out that they had reassessed me \$2.25/foot for my 2,393 square foot house (a total of \$5,384.00) for the simple residential sprinkler system that I installed last summer. Yet the materials for the complete system, which conforms to NFPA Pamphlet 19D, cost me in the neighborhood of only \$600 and the labor amounted to less than thirty (30) hours (about \$1,200.00). This is barely more than 1/3 what I have been assessed.

In comparison it is interesting to note that the recently completed finishing work on the basement of this same house caused a reassessment of \$4,858.00 an amount less than the 1" pipe residential sprinkler system that I had installed.

Hopefully you might be able to use this information as an example to assist you in your effort to get a bill similar to House Bill #648 passed this year. Such a bill will certainly encourage Alaska residents to install residential sprinkler systems within their homes and help reduce the Alaska life and property loss due to fire, without it, it is obvious from my experience that there is certainly strong financial disincentive.

Senator Brad Bradley
Page 2

It is of interest to also note, that the Insurance Companies serving Alaska will not give the home owner a reduction in his fire insurance cost for installing a residential sprinkler system but it is possible for a business to get up to a 75% reduction in his fire insurance cost if he installs a commercial sprinkler system.

Sincerely,



Warren B. Cummings
3292 Jefferson Drive
Fairbanks, Alaska 99701

WBC:jcs

P.S. After I made an inquiry with the Borough Assessor he has indicated he may reconsider, however this initial assessment is causing me considerable consternation.

xc: Tom Monk, A.F.C.T.A.
Andre' Schalk, A.F.C.A.
Senator Don Bennett
Senator Betty Fahrenkamp
Senator Glenn Hackney
Representative Robert Bettisworth
Representative Fred Brown
✓ Representative Charlie Parr
Representative Richard Randolph
Representative Bryon Rogers
Representative Sally Smith
Representative Malone
Representative Duncan

Alaska State Legislature

SENATOR MIKE COLLETTA



SENATE FLOOR LEADER

Senate

MEMORANDUM

FEBRUARY 27, 1980

TO: REPRESENTATIVE BILL PARKER, CHAIRMAN
HOUSE COMMUNITY & REGIONAL AFFAIRS

FROM: SENATOR MIKE COLLETTA *R*

RE: SB 370/HB 648 Fire Prevention

The attached letter from James A. Van Altvorst, City Manager of Ketchikan is forwarded for your review.

Your attention to this matter is appreciated.

SD
full price
FEB 26 1980



CITY OF KETCHIKAN

334 FRONT STREET

P. O. BOX 7300

TELEPHONE 907 225-3111

February 22, 1980

Senator Mike Colletta
Pouch V
Juneau, Alaska 99811

Dear Senator Colletta:

On behalf of the City of Ketchikan, I wish to add support to passage of Senate Bill 370, an act relating to fire prevention.

Approved automatic fire protection systems are obviously and definitely advantageous to the building in which they are installed. However, the benefits of those systems go far beyond the individual structures. They also benefit the entire community.

Essentially, installation of such systems decreases a community's "fire flow requirement" which is the community's ability to deliver water to control fires. A decrease in the "fire flow requirement", in effect, reduces the need for fire fighting equipment, facilities to house that equipment and staff to operate and maintain that equipment and facilities without reducing the level of fire protection in the community. Therefore, the entire community can benefit because of a reduction in the cost necessary to provide a given level of fire protection.

Because the entire community can benefit from the installation of approved fire protection systems in individual building, building owners should be given an incentive to install such systems rather than suffer additional fees or taxes because they installed those systems. Therefore, the City of Ketchikan supports Senate Bill 370.

If you have questions about the City's position on this issue, please contact me.

Sincerely,


James A. Van Altvorst
City Manager

JAVA:gw