716 HCRA HB 648

COMMITTEE REPORT

(7)

HOUSE

1/31/80

FURTHER: FINANCE

Date: 3 [illegible]

Mr. Speaker:

The Committee on COMMUNITY AND REGIONAL AFFAIRS has had HB 648

"An Act relating to fire prevention."

under consideration and (a majority of the committee) (the committee) reports it back with the following recommendations:

[ ] do pass [ ] do not pass

[ ] do pass with attached amendments(s)

[x] replace with CS for HB 648 [x] same title [ ] new title

and recommends [illegible]

[ ] AND attaches a "Letter of Intent" [ ] New Fiscal Note

[ ] reports it back without recommendation

[ ] referred to the ______ Committee

MEMBERS SIGNING DO PASS

[signature]

[signature]

Charles H. [illegible]

Fred F. Zharoff

MEMBERS HAVING OTHER RECOMMENDATIONS:

[signature]

CHAIRMAN

H 60 (Rev. 12/78)

C&RA

BILL WORK SHEET

HB

BILL NO. 648 re Fire Prevention — Dave Creekman 2504 Commerce Fiscal Note

Received from —

Referred to Finance

Original Sponsor Malone / Duncan

Fiscal Note requested 2/14 Fred Fischer

2/26 Companion Bill SB 370 (C&RA)

(Murray 3394) Colletta contacted, Bradley 3748 contacted

LAA Legal Research Contact

CONTACTS:

State Fire Protection people originated

✓ Malone 3799 (Joan)

How many other municipalities

✓ Duncan 3818 (Dale)

✓ Fred Fischer 4723 C&RA - fiscal note

David Creekman 2504 Commerce & Ec Dev. - call 2/19 re Dept. position

APUC - 276-6222 Ray Kipperman

Evolved ? controversy over rate. Regulatory + political problem municipality took over fire protection (CAU utilities privately owned) municipality paying for.

Approved paying CAU for fire protection.

Sprinklers not covered.

Aimed at municipal utilities, possibly.

Gordon - personally likes sprinklers so -

Water Conservation group

~ criteria - spreading cost

cost user → cost payer

City Anch. study (3 yrs. ago) estab. of rates

modified sprinkler rates

must be some way of levying rate

Demand charge should be levied.

Brian Shute - Anch. Attorney Muni 283-4388 - collected standby of fee - back charges

Robert L. Steinberg - Fire Marshall, Nikiski Fire Dept. Kenai - may testify

Malone - Demand charge - connections line charge. Shouldn't be monthly charge. Demand charge discriminate against sprinkler systems. Monthly demand charge based on size of hook up. Against APUC re regulation

- Zerbity - Section 2

Who is going to pay -
Operating costs
Dry/wet systems
2 Component - demand charge
pipes fitted for main =
Contribution → main -
usage - 1 flush toilet
Certain am't. of sizing
Water Study =

All water utilities not owned by a municipalities

C[illegible] Utilities -

Tariff filing — no scientific way of
12 communities approx.

Demand charge -
Tariff (run around the

Liability exposure
If people burn they sue.

Tariff - $70-$80 -

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

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

Commerce Dave Creekmore - leg. contact
Opposed Sharon Trailer, Director of Business Loans
Difficult to.

COMMITTEE MINUTES

Alaska State Legislature

House of Representatives

Committee on Community & Regional Affairs

Official Business

Pouch V
State Capitol
Juneau, Alaska 99811

BILL NUMBER AND TITLE: HB 648 Relating To Fire Protection

ORIGINAL SPONSOR: Malone/Duncan
OTHER SPONSORS:
RECEIVED FROM:
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 protetion from loos 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 proptecting 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 officiers 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- Magnatude 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 Ghallager, Pres. of Fire Fighters

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

THE LEGISLATURE OF THE STATE OF
ELEVENTH LEGISLATURE

FISCAL NOTE

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

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

EXPENDITURES (Thousands of Dollars)

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

FUNDING (Thousands of Dollars)

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

POSITIONS

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

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

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

Sharon R. Traylor

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

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

33-001 (Rev. 12/79)

FISCAL NOTE DETAIL, HB648 & SB370

Fire Prevention Related Loans

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

10% Inflation for succeeding years.

BILL ANALYSIS

ASSIGNMENT DATE 2-1-80

UNASSIGNED

DEPARTMENT	SPONSOR (PRINCIPAL)	BILL NO.
Public Safety	Colletta and Bradley	SB 370

DEPARTMENT POSITION

Support

DIVISION DIRECTOR	DATE	COMMISSIONER	DATE
Ronald A. Hendrie	2-13-80	William R. Nix	2/14/80

GOVERNOR'S OFFICE USE

☐ POSITION NOTED ☐ POSITION APPROVED ☐ POSITION DISAPPROVED

BY: DATE:

SUMMARY

(1) RELATED BILLS (SIMILAR OR CONFLICTING) (1) Identical to HB 648 introduced 1/31/80

(2) OTHER AGENCIES AFFECTED BY BILL (2) Department of Commerce & Economic Development

(2) a. ORGANIZATIONAL SUPPORT FOR BILL	(2) b. ORGANIZATIONAL OPPOSITION TO BILL
Alaska Fire Chiefs Association Alaska State Firefighters Association	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 state and local levels.

(4) FISCAL IMPACT: ☐ NONE ☐ FISCAL ANALYSIS ATTACHED

(5) AMENDMENTS PROPOSED:

None

(6) COMMENTS:

The provisions in this bill provide the incentive and means and methods for the installatic 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 Alask

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, auxilliary 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

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	Malone, Duncan
Committees:	Community and Regional Affairs	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

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.

...HIKAN RAINBIRD

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

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 para.

Material Prepared By:
Robert R. Shirnberg
Fire Marshal
Nikiski Fire Dept.
Chairman Ad-Hoc Committee
ASFA/~~AFCA~~
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 catagories. 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 peoperty 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, Propietary 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. Oehler
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:

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. (HB 648)

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 rpovide 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

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 establishemnt'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

"City of Petersburg"

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

February 29, 1980

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

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

Dear Ms. Chitwood:

The proposal to exempt fire protection systems 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 systems 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 system is installed. For example, one local business paid for a sprinkler system in four years due to reduced insurance rates. Surely this is incentive enough.

Cordially,

Bruce Aronson
City Manager

BA/plc

COMMUNITY FIRE PROTECTION INCENTIVE PROGRAM

Prepared by ~~Robert R. Shirnberg~~
October 20, 1979
Fire Marshal
Nikiski Fire Department
283-4202
P.O. Box 1167, Kenai 99611

V
F

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 business 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.

VI
F

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

Exsisting 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 exsisting dwelling units where the property owner desires to install a approved sprinkler protection system.

VI
F

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 illiminated 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 propert 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 systen in our communities throughout the state, with the direct long-range effect of reducing or at least being able to maintain th 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 syste: 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 [illegible] 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 benefi 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 world 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.

BASE FIRE INSURANCE RATES

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

Fire Protection Class Rural #8

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

Monthy Payment $831 Annual Payment $9979

Cost Unprotected Property		Cost Protected Property	
Insurance	$18,550	Insurance	$2,300
Tax (mill rate)	$3,500	Tax	$3,500
		Tax Credit	$210
		Loan Payment	$9,979
Total	$22,050	Total	$16,069

Annual saving to property owner $5,981

Saving to property owner on complition of loan payments $15,960

BASE FIRE INSURANCE RATES

Property Discription 20,000 square foot, 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

Monthy Payment	Annual Payment
$514	$6,177

Cost Unprotected Property			Cost Protected Property	
Insurance		$8,800	Insurance	$715
Tax (mill rate)	16	8,000	Tax	$8,000
			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 complition of loan payments $8,501

BASE FIRE INSURANCE RATES

Property Discription 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

Monthy Payment $1,435 **Annual Payment** $17,226

Cost Unprotected Property

Insurance	$28,100
Tax (mill rate)	$5,000
Total	$33,100

Cost Protected Property

Insurance	$5,000
Tax	$5,000
Tax Credit	- $362
Loan Payment	$17,226
Total	$26,864

Annual saving to property owner $6,236

Saving to property owner on complition of loan payments $23,462

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

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 eac

One method of measuring property hazard levels is to determine the amount of water required to control and extinguish a fire in a building c 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 transmissior 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 fi flow requirements according to a community's hazard variables. The guid 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 i general agreement that the public protection equipment requirement incre with the fire flow requirement. Conversely, as the property hazard is reduced, so is the required fire flow and thus, the level of fire depart 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 pro erty insurance premiums and the demand on the community's fire suppressi 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., occupanc 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 requirec 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 f

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 gallon 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 individ
- 38 persons are required to staff a suppression position 24 hours a d
- 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 an 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 Sprink
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 Sprink
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 hypothetic case does not consider the cost factors for installing automatic sprinkler 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.

V
F

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 [illegible],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, 80 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, and [illegible] 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 Concorde 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 confine 95 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 building construction costs running [illegible] $40,000, 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 Bundy, 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.

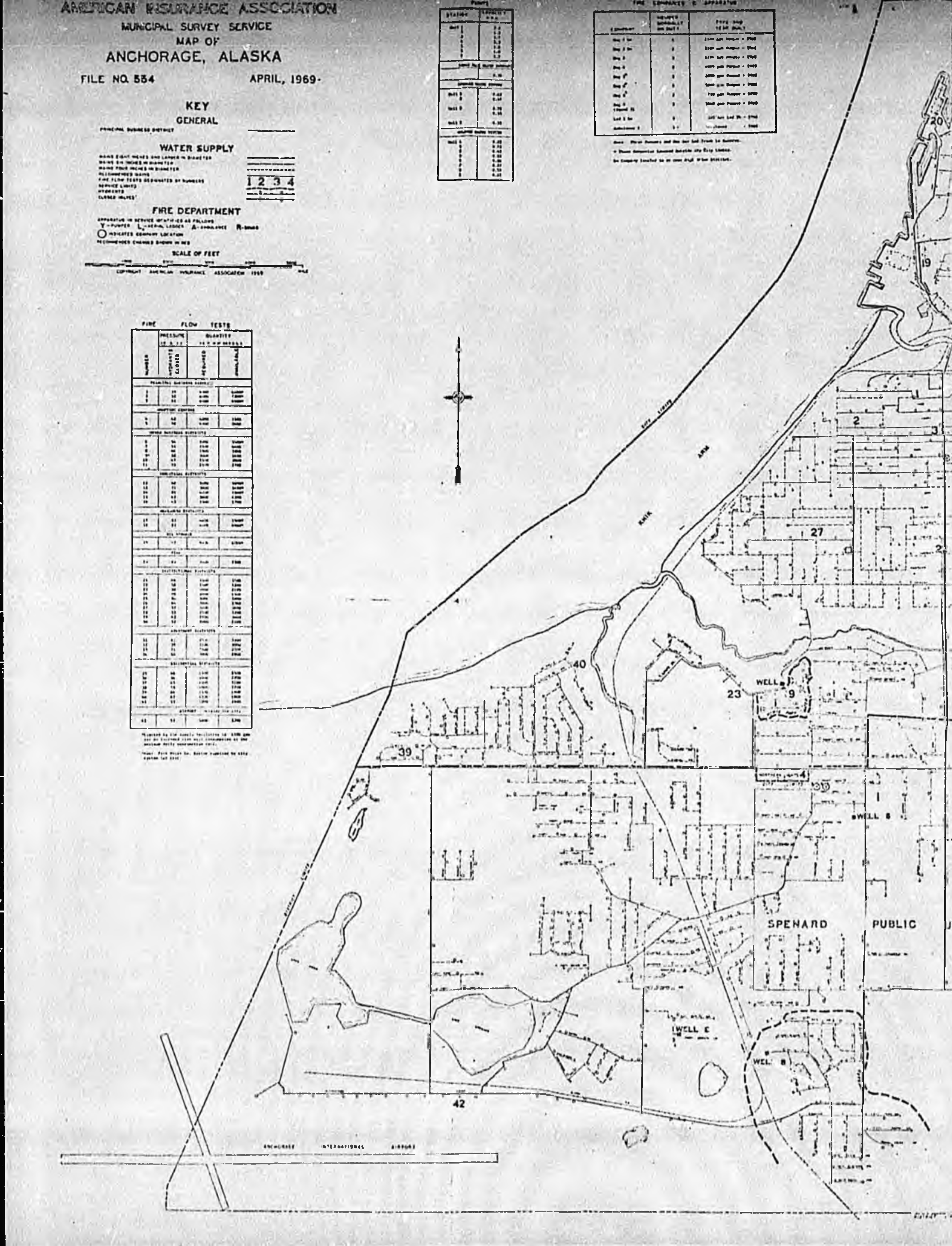
Premium cut sought

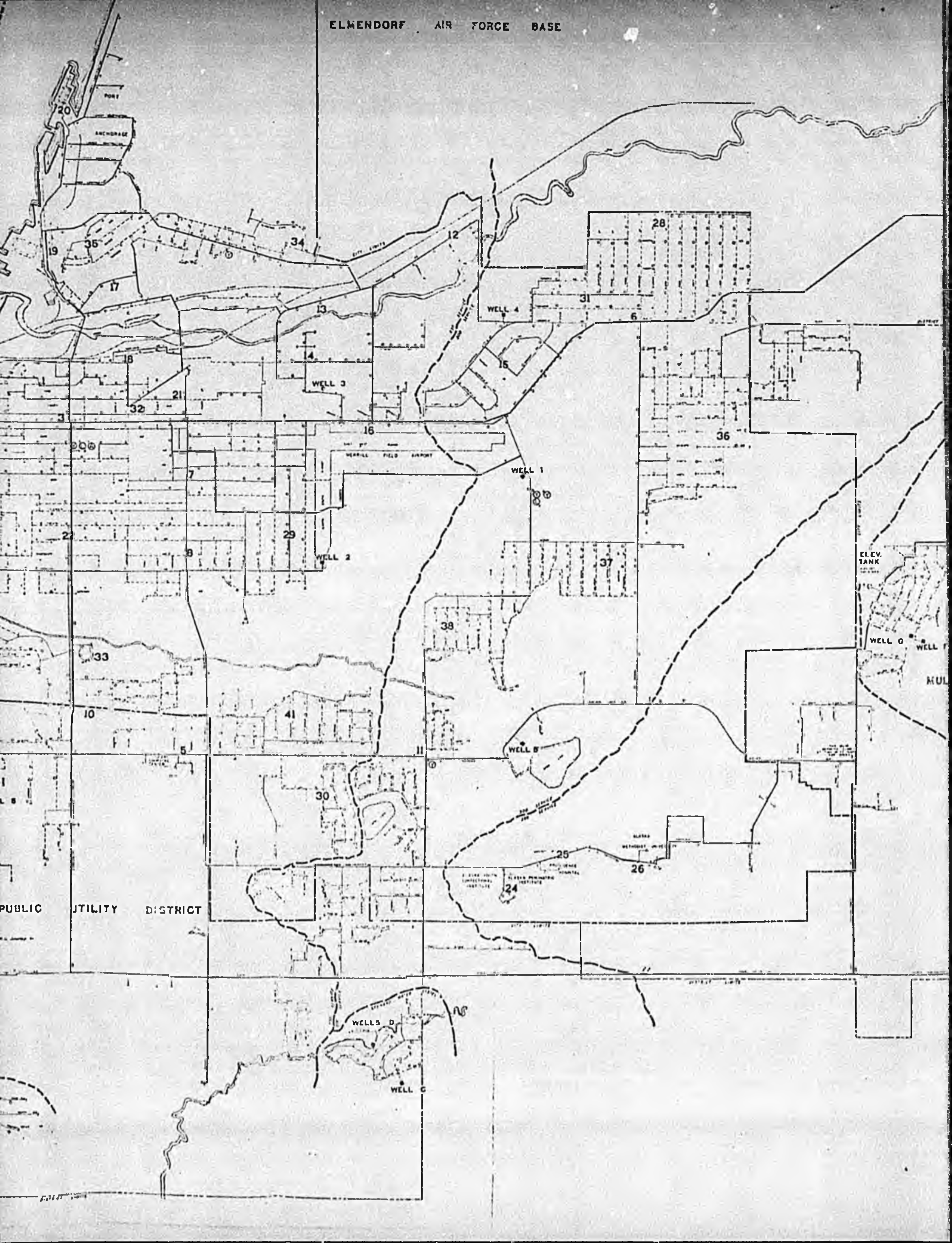
The fire prevention bureau is soliciting input from the insurance industry in an attempt to get a reduction in insurance premiums for occupancies that are protected by all three built-in systems. The results of that study are incomplete at this time.

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.

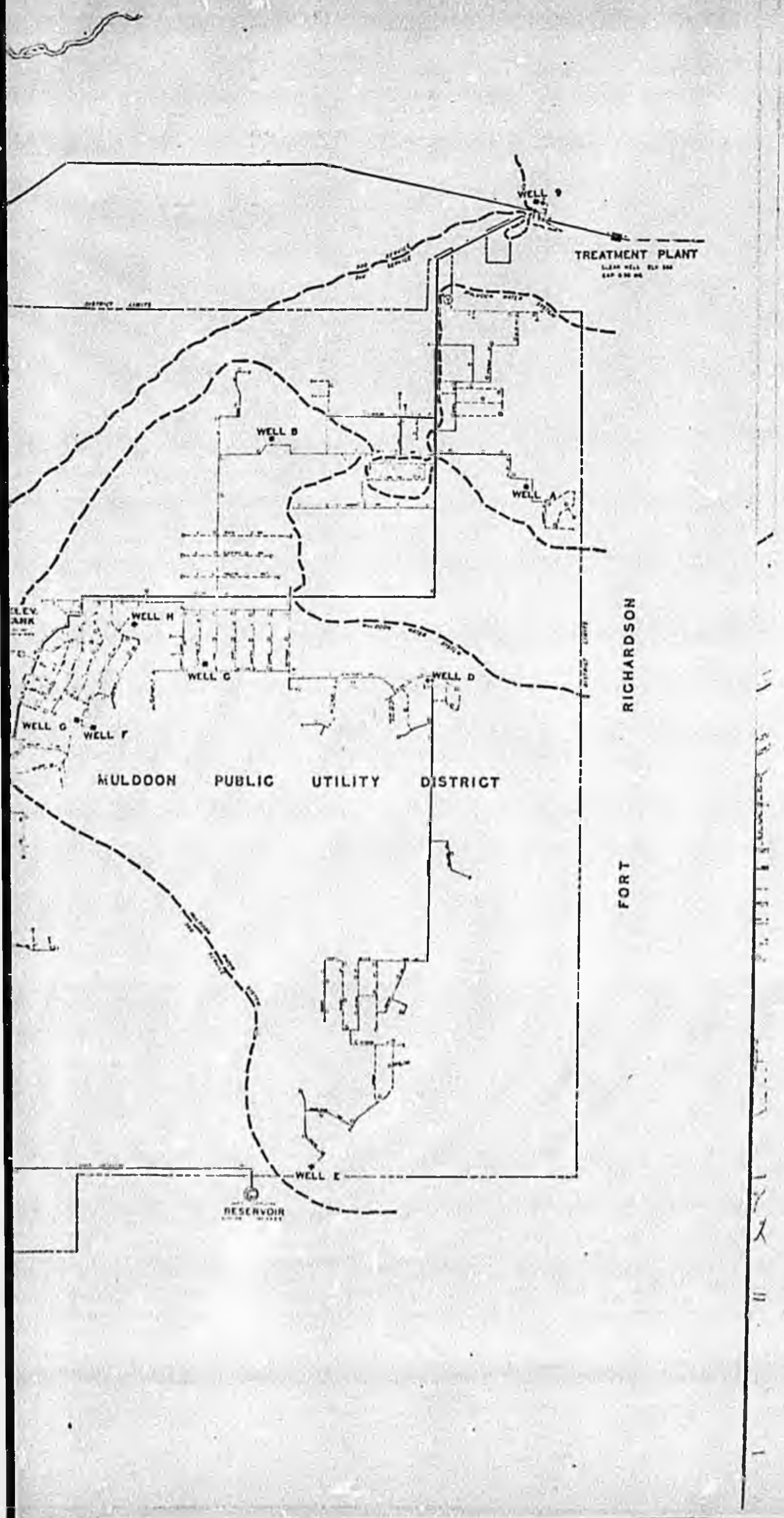
It is still too soon to determine if the standards and the ordinances produce a statistically significant level of reduction in the fire problem. The fire department staff is continuing to build a partnership of the fire service, the sprinkler industry, the insurance industry, the building industry and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

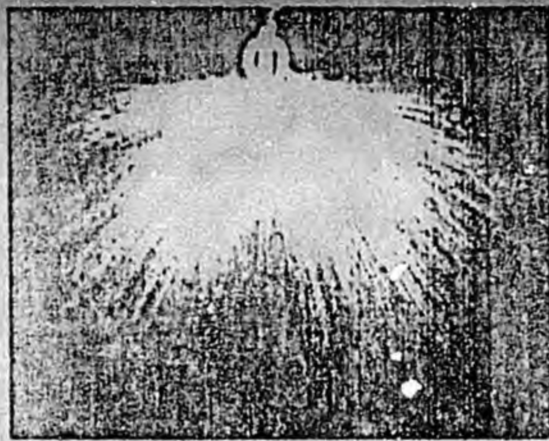
Hopefully, when the development of the three vacant land areas is completed, we will have an environment that is considerably safer from a fire loss point of view than the average community. We really don't know that for sure. To compare to our early analogy about the Wright Brothers, we have now built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


AMERICAN INSURANCE ASSOCIATION
MUNICIPAL SURVEY SERVICE
MAP OF
ANCHORAGE, ALASKA
FILE NO. 584
APRIL, 1969.
KEY
GENERAL
WATER SUPPLY
1 2 3 4
FIRE DEPARTMENT
SCALE OF FEET
FIRE FLOW TESTS
PRESSURE
QUANTITY
NUMBER
HYDRANTS CLOSED
REQUIRED
AVAILABLE
KNIK ARM
40
39
42
27
2
3
19
20
23
WELL
9
4
WELL 8
SPENARD
PUBLIC
WELL E
WEL 8
ANCHORAGE INTERNATIONAL AIRPORT



ELMENDORF AIR FORCE BASE
20
19
35
17
34
12
28
31
6
WELL 4
13
14
15
WELL 3
18
21
32
3
16
WELL 1
36
7
22
29
WELL 2
8
37
ELEV. TANK
38
WELL G
33
10
41
5
11
30
25
26
24
PUBLIC UTILITY DISTRICT
WELLS D
WELL C


WELL 9
TREATMENT PLANT
WELL B
WELL A
WELL H
WELL C
WELL D
WELL G
WELL F
MULDOON PUBLIC UTILITY DISTRICT
FORT RICHARDSON
WELL E
RESERVOIR



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 gua... ee 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 ..ood at 115,000. By 1977, 69,500 people had been added to its population, a

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

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

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

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

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

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

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

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

Fire Losses

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

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

Conclusions

The Fresno program is a comprehensive fire defense master plan.

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

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

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

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

(Continued on page 91)

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

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

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

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

Table 1.

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

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

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

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

Smooth Interior Pipe Walls

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

Table 2

Pressure Required	*Standard Weight*	*Light-Weight Schedule 10*
To obtain sprinkler discharge	22.6	22.6
Friction Loss		
Branch Line	32.0	26.1
Mains	45.0	34.2
Underground	15.0	15.0
Elevation	10.8	10.8
TOTAL:	125.4	108.7

SUMMARY

1. Sprinkler system designers have an added option of using Schedule 10 light-wall pipe.

2. Substitution of Schedule 10 light-wall pipe for Schedule 40 pipe will significantly reduce the total pressure and power demand on the water supply.

3. Reduction in pressure requirements can save installed and operating costs as follows:

- Less horsepower required to deliver water;
- Smaller pumps or the ability to supply sprinkler systems from existing water supplies;
- Smaller pipe sizes — lower pipe cost — less weight — less labor and freight costs. △

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 irreplacable 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 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 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 municpal area, private fire protection owners have a vested interst 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

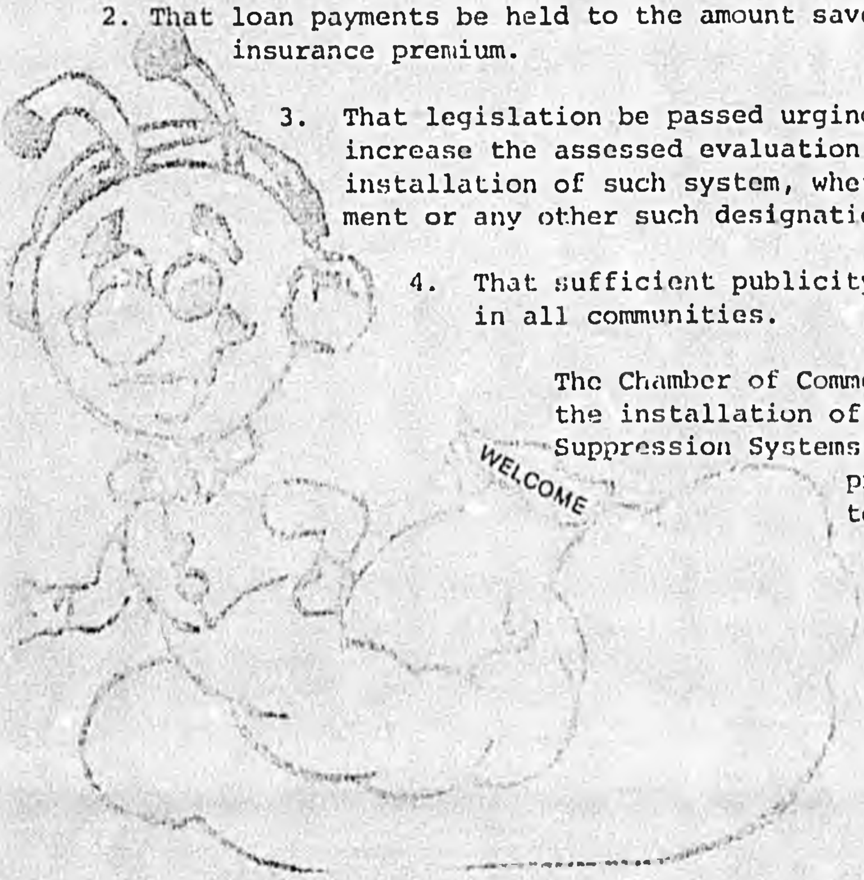
Dear Mr. Shirnberg,

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 establishemnt'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

TABLE OF CONTENTS

TABLE OF CONTENTS

PART I

S T A T I S T I C S

LOSS OF LIFE AND DAMAGE TO PROPERTY FROM FIRE

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, 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.

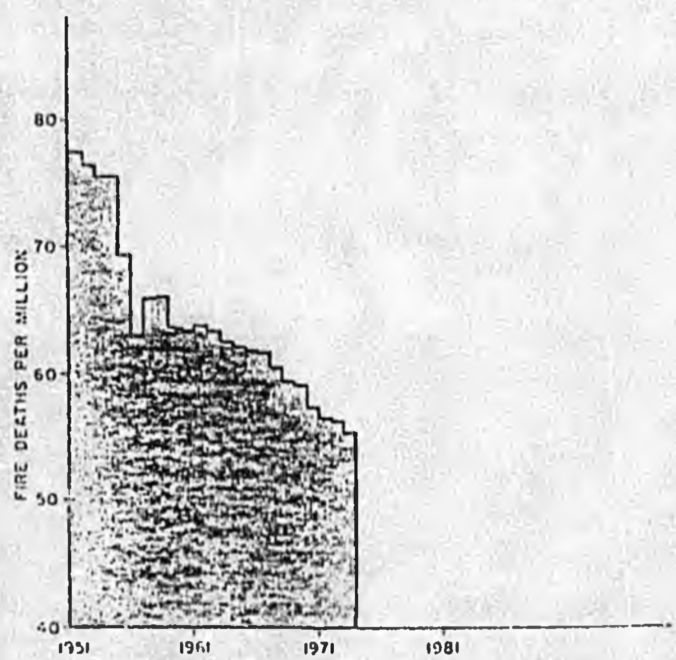


Fig. 1-2A. Trends in fire deaths in the United States.

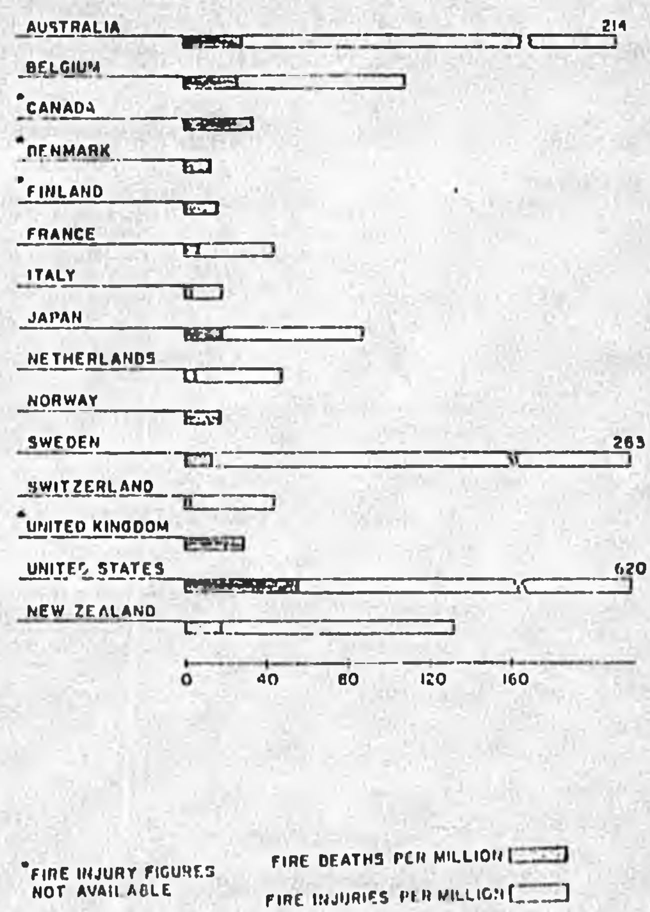


Fig. 1-2B. International fire deaths and injuries per million of population.

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.
   - (j) 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.

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

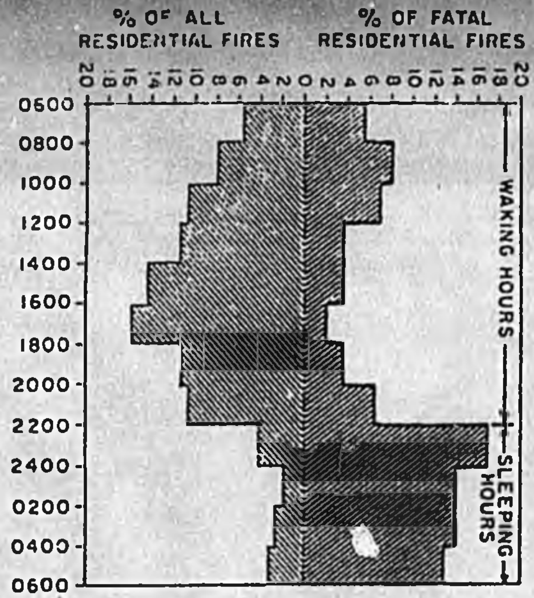


Fig. 1-2E. Time distribution of fatal residential fires.

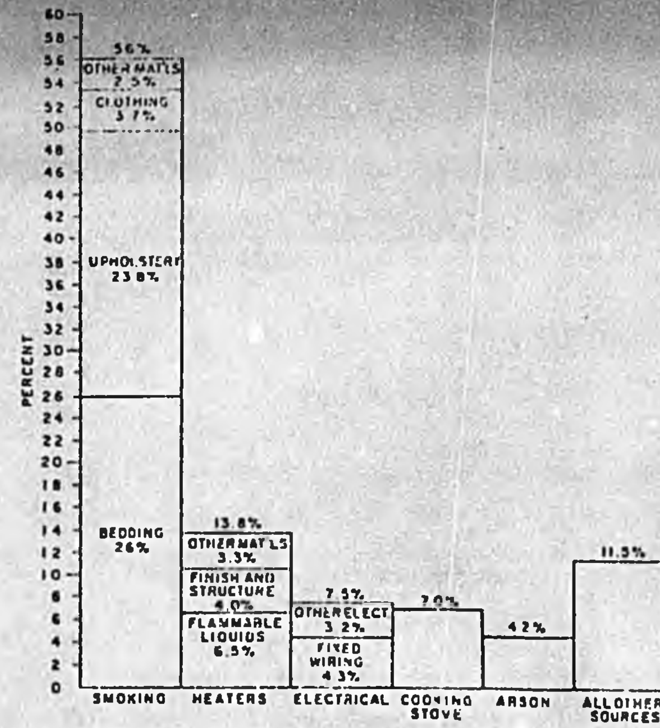


Fig. 1-2G. Causes of fatal residential fires.

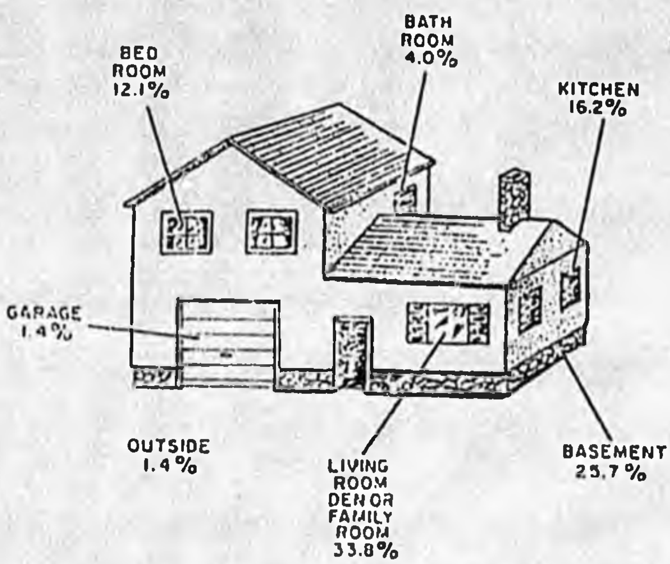


Fig. 1-2F. Locations where fatal fires start in one- and two-family dwellings (5.4 percent of the locations where fatal residential fires started were unknown.)

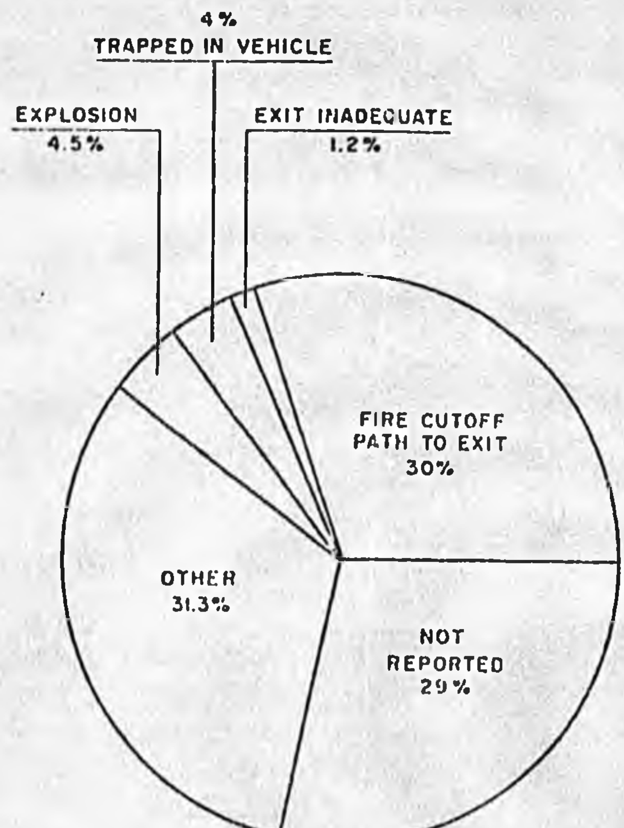


Fig. 1-2H. The reasons why fire victims do not escape.

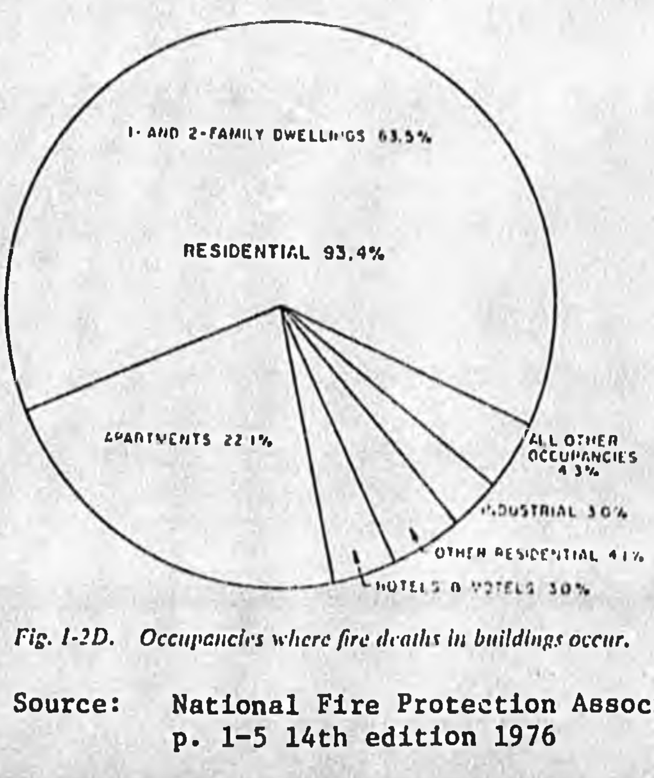


Fig. 1-2D. Occupancies where fire deaths in buildings occur.

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

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	76,100	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	6,100
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	26,900	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	7,600	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	22,000
Forests	121,700	111,500	125,000	119,000	127,000
Grass, Brush, Rubbish	908,000	1,076,300	969,900	891,200	920,000
Motor Vehicles	479,700	501,600	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	2,694,100	2,932,000

Source: National Fire Protection Association; <u>Fire Protection Handbook</u>, 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	9,500,000	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	9,300,000	9,500,000	10,400,000
Churches	18,500,000	23,300,000	28,100,000	28,400,000	34,200,000
Clubs, Private	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
Textile, 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	98,900,000	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	3,260,000,000
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

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	33,625,774		
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			615	$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

STATISTICS

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 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.

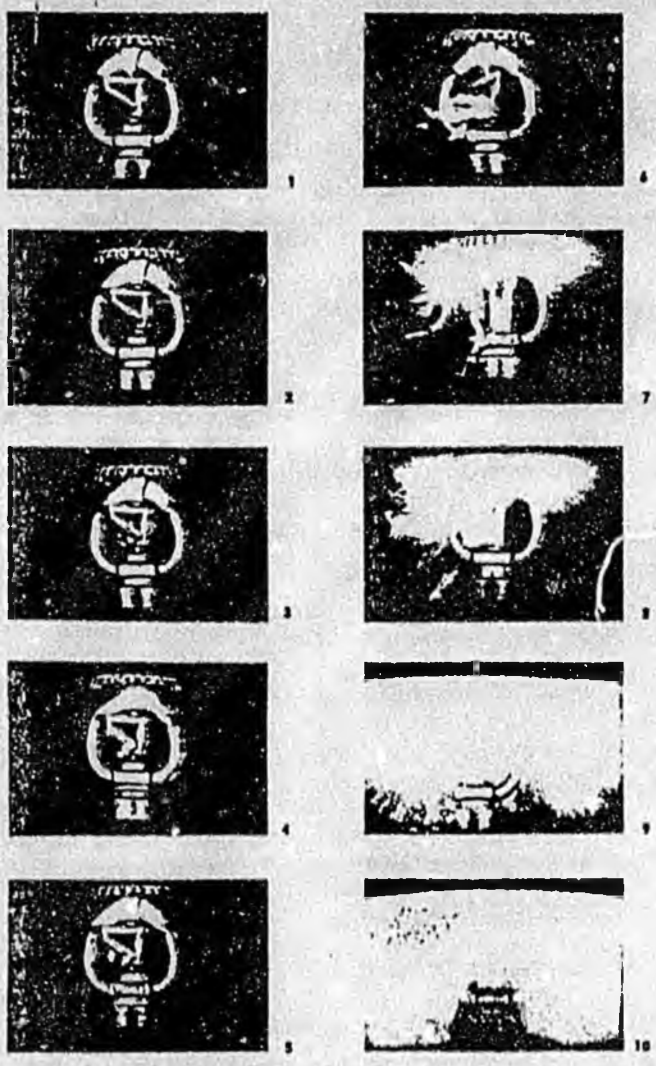


Fig. 14-1A. Operation of a typical fusible link automatic sprinkler is shown in this sequence of photos. As heat melts the solder, separation of members of the soldered link (the sloping side of the triangle in photos 1 to 5) is followed by complete separation of the link and lever arrangement (photo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

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 of, 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

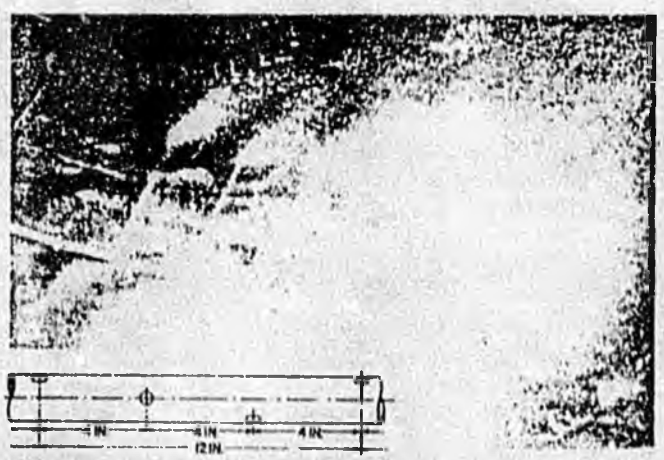


Fig. 14-1B. Early Perforated Pipe Sprinkler System: Water is shown discharging from a length of pipe representing what was the type of sprinkler protection in use from 1850 to about 1880. The inset shows the locations of perforations and the distances between them on a typical length of perforated pipe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

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-1 through 14-48 14th edition 1976

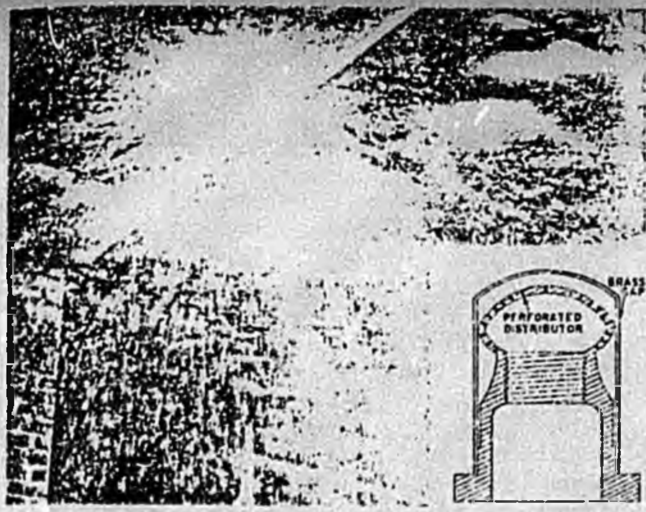


Fig. 14-1C. An Early Automatic Sprinkler: Water is shown discharging from a Parmalee No. 3 upright sprinkler which was first used in 1875. It consisted of a brass cap soldered over a perforated distributor and was designed to screw onto a nipple. The inset shows a cross-sectional view of the sprinkler.

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 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

* 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 victim had suffered fatal injuries before the sprinkler operated. In these latter instances, however, the sprinklers protected the lives of persons in adjoining areas.

Source: National Fire Protection Association; F Protection Handbook, pp. 14-1 through 14-48 14th edition 1976 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 data-gathering 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.

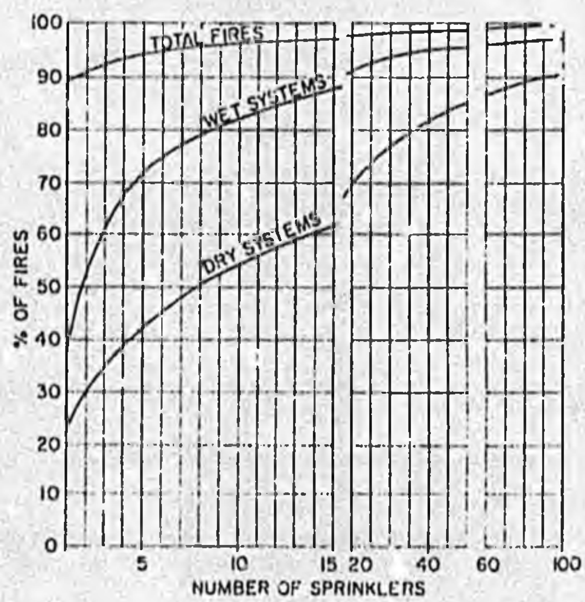


Fig. 14-1D. Number of sprinklers operating, cumulative data, 1970–74.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-1 through 14-48 14th edition 1976

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 auxilliary 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]

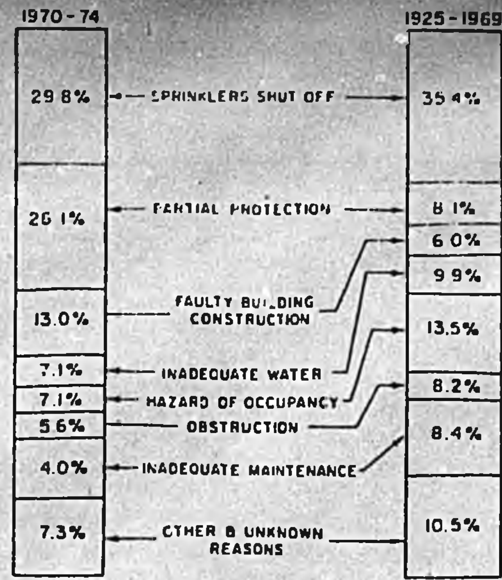


Fig. 14-1E. Reasons for unsatisfactory sprinkler performance.

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.

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: Total No. of Fires	Total Unsatisfactory	Total Satisfactory	Total Satisfactory Per Cent	Classification of Unsatisfactory Performance: 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	1,561	52	1,499	96.6	23	10	3	—	1	—	9	1	—	1	4	—	—
Educational	241	20	221	91.7	4	8	1	—	—	—	5	—	—	—	1	1	—
Institutional	305	12	293	96.1	3	3	2	—	—	—	1	—	1	—	—	—	2
Office	494	13	481	97.4	4	2	1	—	—	1	2	—	1	—	1	1	—
Mercantile	6,237	176	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	25	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	6	3
Metal, metal products	9,807	305	9,502	96.9	91	36	22	3	6	6	15	35	43	6	29	7	6
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	6,527	127	6,400	98.1	52	6	11	—	5	1	8	13	15	2	7	1	6
Wood products	5,353	492	4,861	90.6	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)	66,945	2,351	64,594	96.5	[illegible]	187	252	37	45	38	112	183	356	36	207	56	46
Storage Occupancies	4,160	375	3,785	91.0	122	24	43	6	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	[illegible]	311	44	56	53	167	256	424	52	262	65	60

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

Source: National Fire Protection Association; Fire Protection Handbook, pp. 14-1 through 14-48 14th edition 1976

Bibliography

References Cited

[1] "Automatic Sprinkler Performance Tables," 1970 Ed., *Fire Journal*, Vol. 64, No. 4, July, 1970, pp. 35-39.

[2] Thompson, N. J., *Fire Behavior and Sprinklers*, National Fire Protection Association, Boston, 1964, pp. 104-110.

[3] Welb, W. A., "Automatic Sprinklers in Exhibition Halls," *Fire Technology*, Vol. 4, No. 2, May 1968, pp. 115-125.

[4] Thompson, 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.

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

AUTOMATIC SPRINKLER PERFORMANCE TABLES

NATIONAL AUTOMATIC SPRINKLER AND FIRE CONTROL ASSOCIATON, INC.

SUMMARY — LIFE SAFETY OCCUPANCIES

					FIRES CONTROLLED BY				
Occupancy	No. of Fires	No. of Fires Extinguished	No. of Fires Held In Check	Satisfactory Systems Performance	1 Sprinkler	2 or Less Sprinklers	3 or Less Sprinklers	More Than 3 Sprinklers	Unsatisfactory Sprinkler Performance
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".

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

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

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%

TOTAL	NUMBER	PERCENT
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)

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

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.

60 Batterymarch Street
Boston, Massachusetts 02110
Attention: Doris Sheldon

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

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

PART III

STATISTICS

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

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

	Number of Fire Streams Required Simultaneously				
Populations Thousands	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

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-2 through 11-6 14th edition 1976

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 countrywide 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*,[6] 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.

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-2 through 11-6 14th edition 1976

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,[8] 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*[9] 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-

Source: National Fire Protection Association; Fire Protection Handbook, pp. 11-2 through 11-6 14th edition 1976