Saving Lives, Saving Money

AUTOMATIC SPRINKLERS

A 10 YEAR STUDY

A detailed history of the effects of the automatic sprinkler code in Scottsdale, Arizona

Produced in cooperation wIth the Home Fire Sprinkler Coalition

Dedication

This report is dedicated to all the visionaries who were not content with the suffering and losses associated with the fire problem in America.

While too numerous to mention, these truly remarkable fire service Professionals understand and realize the positive impact they have made on the future of fire protection in the United States.

Special inspiration for this document was-provided by Chief Frank Hodges, who dedicated his career to working smarter to provide truly effective community protection.

This document could not have been produced and distributed without the assistance of the Home Fire Sprinkler Coalition, City of Scottsdale, and Rural/Metro Fire Department

CITY OF SCOTTSDALE ARIZONA

Rural/Metro Fire Department
A RURAL/METRO COMPANY

Home Fire Sprinkler
COALITION
Improved Fire Protection Through Public Education

"Scottsdale's Sprinkler Ordinance is a model of its kind and it would be impossible to overstate the credit due Rural/Metro and the City of Scottsdale for its implementation. There is no question that it will have a major ameliorative effect on fire incidence in the future."

1989 Independent Fire Panel Report to the Scottsdale City Manager

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Executive Summary

In the early 1980's, a unique opportunity presented itself to the rapidly growing City of Scottsdale, Arizona and the Rural/Metro Fire Department. Technology was changing and serious discussion was beginning to take place within the fire protection community that was related to developing better methods of pro-viding more efficient and effective community fire safety. Many in the fire protection community understand there is not one single method of protection that can provide the answers to all the variables associated with providing effective fire protection. However, some items can make more of a positive impact than others, if one is willing to honestly evaluate the benefits and results that can be obtained.

This report will look specifically at one community's history and efforts to address the fire problem. It will outline the steps used in Scottsdale to research, adopt, implement, and now evaluate the benefits that this community received as a result of embracing and using sprinkler technology to help address the current and future fire problem.

In July of 1985, when Scottsdale passed Ordinance #1709, there were still numerous questions related to the effectiveness and wisdom of using built-in protection to replace some of the traditional resources commonly used by the fire service. It was well established that automatic sprinkler protection could have a positive impact on large risk facilities. Why couldn't this type of equipment be used in the structures that are the most dangerous to our citizens: their homes?

Now, ten years later, the decision to embrace this philosophy has produced numerous documented benefits. Many of the early questions have been answered. The cost and economics associated with built-in protection can be addressed through design freedoms without negatively impacting fire suppression effectiveness. The impact and installation costs have been reduced dramatically, from $1.14 sq. ft to $0.59 sq. ft. The average fire loss per sprinklered incident was only $1,945, compared to a non-sprinklered loss of $17,067. Automatic protection had a direct role in saving eight lives. One or two heads controlled or extinguished the fire 92% of the time, with the majority of the exceptions a result of flammable liquid incidents. Estimated water flows were substantially reduced for this community. The potential structural fire loss has been dramatically reduced for sprinklered incidents. When the city finally reaches its full growth potential, it is estimated that it will be a community with over 300,000 residents and more than 65% of the residential homes and 85% of commercial property protected with automatic sprinkler systems. There are many more examples of the experiences and benefits in the report that follows.

The City of Scottsdale fosters innovation and constantly seeks to challenge traditional ways of thinking when it comes to providing quality, cost effective services to their citizens. This was very evident in the late 1970's and early 1980's, when much of the breakthrough research with residential sprinkler systems was being accomplished. Much of the credit for the success of this program has to go to the past and current political leadership of the City of Scottsdale. These community leaders objectively evaluated the impact, along with the cost and benefits that could be obtained by dramatically changing the approach to providing community fire protection. Without the vision and support of these leaders, the progress which is outlined in this document, would not have been possible. This commitment to technology, change and innovation has resulted in the City of Scottsdale becoming one of the most fire safe communities in the country.

II

Introduction
to the
10 Year Study

In the early 1970's, Chief Lou Witzeman, founder of Rural/Metro Fire Department, embraced a strategy that a smaller, better trained firefighting force could provide a community with quality fire protection. That could be accomplished if the department increased its efforts on preventing fires, embraced and developed new technologies that took advantage of built-in fire protection features, and adopted new, comprehensive, community based fire codes.

A blueprint for this type of protection was enacted in Scottsdale. A major tenet of this strategy included evaluating the true level of the community fire risk and directing the available resources to address the most common types of emergency incidents. As a result, those larger hazard and risk occupancies like hospitals, nursing homes, hotels, and large commercial structures, would be required to provide additional built-in fire protection features. This would help reduce the chances that a major campaign fire could negatively impact the protection and resources that are available to protect the community.

Additional support for this type of strategy was initially provided in the original 1973 publication "America Burning", by the National Commission of Fire Prevention and Control. The report summarized the nation's fire problem and identified six major areas that should be evaluated to better address the issue of fire loss in the United States. They were:

The need to place more emphasis on fire prevention;
The fire service needs better training and education;
Americans must be educated about fire safety, in both design and materials;
The* environment in *which Americans live and work presents unnecessary hazards;
The fire protection features in buildings need to be improved; and
Important areas of research are being neglected.

In 1987, a follow-up workshop and report was developed by the U.S. Fire administration to evaluate the progress that had been made since the original 1973 America Burning Report had been released. The 1987 workshop identified there were still major improvements that needed to be made in the fire service. Areas of special concern included the efforts associated with fire prevention and public education. Like the earlier report, numerous recommendations were made to provide additional guidance for improving the American fire service. Some of these recommendations identified the need to:

Educate the fire service to the need to change its role (proactive vs. reactive);
Increase the visibility of the fire service in public, other than just during emergency incidents;
Change the fire service attitude towards prevention and public education accomplishments;
Identify the need for increases in suppression efforts as a failure;
Develop informational materials to be distributed and posted in public areas; and
Develop publications for teachers on fire safety in the school and home environments.

There is no question that a great deal of progress had been made by the fire service in America since the initial America Burning report in 1973. However, many of the original and follow up recommendations still apply and deserve to be better addressed by those who are charged with providing the emer-

gency service protection for the citizens of their community.

The commitment to prevention was later summed up by the Operation Life Safety division of the International Association of Fire Chiefs. The definitions they helped develop were:

Reactive Fire Protection

Traditional fire service organization; where a problem has occurred before it is addressed with passive building codes and the hope that the fire department resources that have been amassed, will be able to beat the clock and arrive soon enough to have a positive impact on the emergency incident.

Proactive Fire Protection

This philosophy is accomplished by embracing new, proven technology and built-in protection, like automatic sprinkler and early detection systems, combined with an aggressive code enforcement and strong public education programs.

A major section of this report will address an area of concern that traditionally receives little attention; the protection of the residential community. This deserves special review and should rank high on the list of fire service priorities due to a consistent, documented record that residential structures are the greatest risk for Americans. In 1994 alone, the National Fire Protection Association estimates 80% of all fire fatalities occurred in residential structures.

History has shown us that traditionally, these tremendous annual losses are suffered at small isolated incidents across the country. As a result, the residential building industry has been successful in opposing changes to the built-in protection concept for homes. In addition to this organized opposition, there has not been a major push from local or national policy makers, local citizens, or much of the fire service community, to honestly evaluate and substantially change the way that emergency protection is provided to our communities.

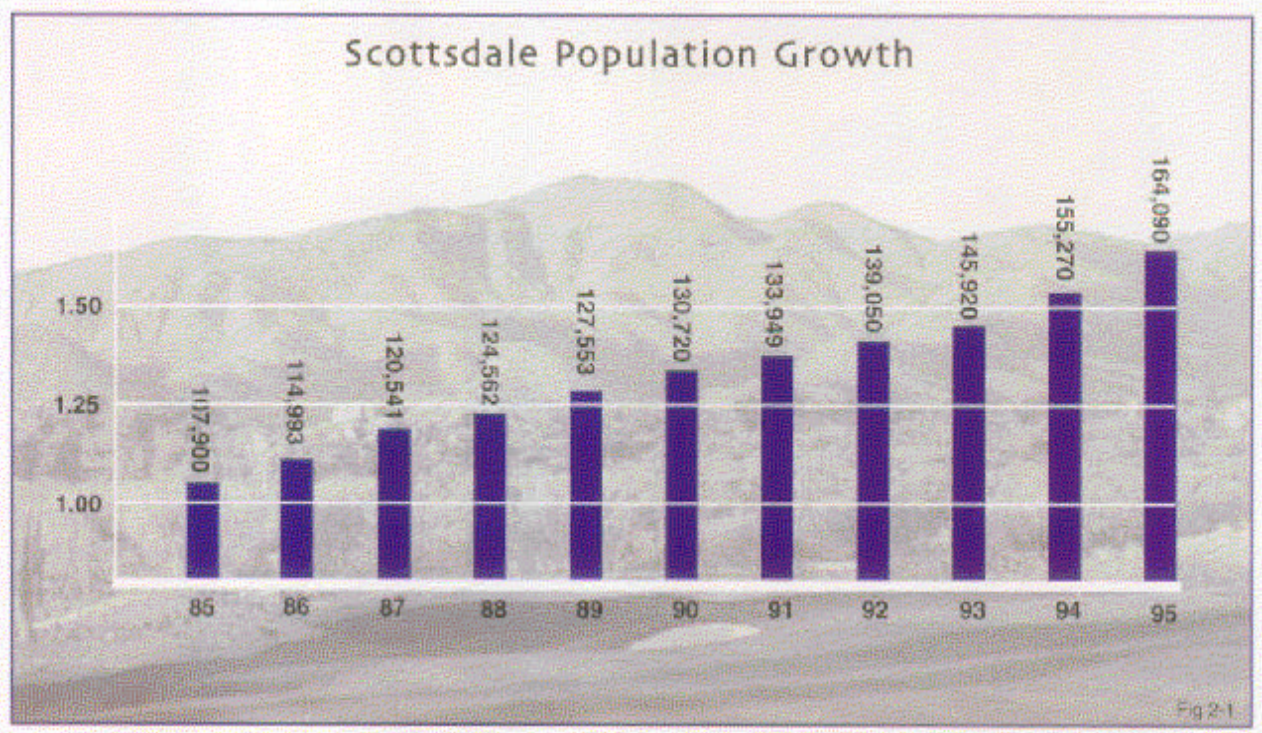
Special thanks and recognition must also be extended to all the pioneers and special people in the sprinkler and fire protection communities, who have contributed countless hours to the development, implementation and documentation of the real progress and benefits associated with this type of proactive protection for the residential community.

III

Background

This report will primarily focus on the City of Scottsdale. It will illustrate the history, development, records, and results for the first 10 years of a comprehensive, community sprinkler ordinance. The ordinance was adopted for the community on June 4, 1985 and it was fully implemented on January 1, 1986.

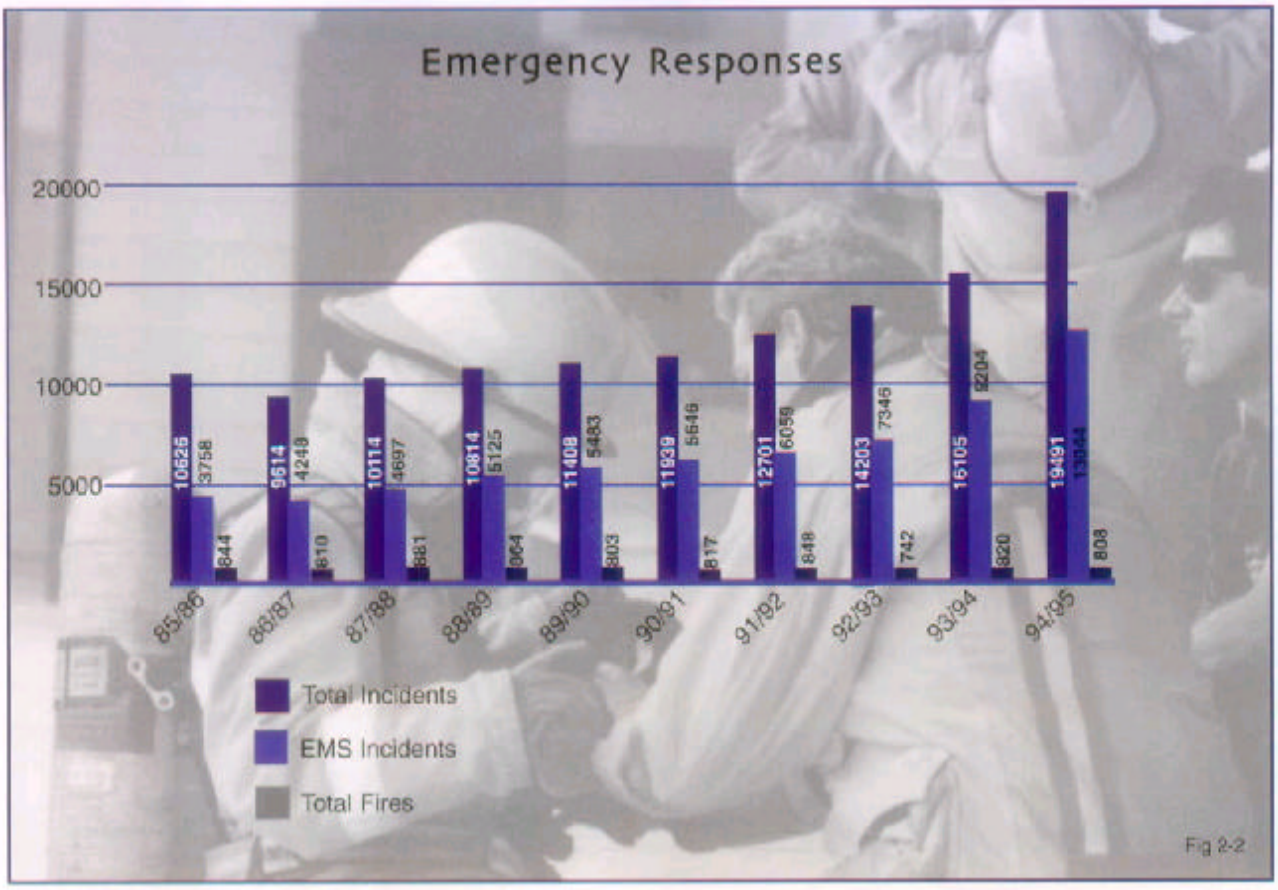
The City of Scottsdale is located in Central Arizona and is a member of the greater Phoenix metropolitan area. The city is a suburban community whose economic development is focused in four areas: the airpark and technology industry, tourism, retail, and health care. It was initially founded in 1888 by Army Chaplin Winfield Scott and his wife. The town was incorporated in 1951 with an area of one square mile and a population of about 2,000. It has since grown to encompass an area of 182.5 miles and supports a rapidly expanding community with a current population of 174,490. The city is 32 miles long and borders Phoenix to the west, Tempe to the south, Cave Creek and Carefree to the north, and Fountain Hills, the Salt River Pima Maricopa Indian Community and the Tonto National Forest to the east.



The City has contracted fire services with Rural/Metro Fire Department since it was first incorporated in 1951. Rural/Metro is one of the largest fire and emergency service providers in the United States with operations in more than 150 communities throughout 18 states. Nationwide responses total more than one million calls for service each year.

The performance based contract with the City of Scottsdale for fire and EMS services, currently provides for fire protection to be provided from nine fire stations, with 11 ACLS engine companies, two ACLS truck companies, six ACLS rescue units, two airport apparatus, and seven support and utility vehi-

cles. The contract allows for 120 full-time personnel (47 per shift). Of these employees, 65 are paramedics and 19 are fire prevention staff. By contract, the fire prevention division activities include all aspects of public education, fire prevention engineering, and plan review. The prevention responsibilities also ensures code compliance inspections for all new construction and existing occupancies.



In 1985, the city annexed an additional 36 square miles near it's northern borders. This increased the size of the city to it's current 182.5 square miles. At the time, there was still approximately 100 square miles in the community that remained primarily undeveloped.

Since 1985, the city has experienced consistent growth. Scottsdale has expanded it's population by 29% since 1990. This is the second fastest growth rate in the greater Phoenix area. The primary growth areas were to the eastern and northern portions of the community. In the beginning of 1985, the city had a population of 107,900 which grew to 166,490 by 1995. This is a 54% increase in 10 years.

IV

Ordinance Development

The City of Scottsdale and Rural/Metro have a long history of recognizing the benefits associated with a proactive, preventive approach to emergency service delivery. The first major step in this arena occurred in September of 1974, when the city enacted its first major fire sprinkler code. City Ordinance #829 adopted the 1973 Uniform Fire Code and amended the document to require automatic sprinkler protection for any structure that was larger that 7500 square feet, or more than three stories in height. At the time the ordinance was passed, it was one of the most advanced in the United States.

The ordinance development was based on two primary beliefs. First, the understanding within the fire protection community that automatic sprinkler systems have been extremely effective in controlling or extinguishing fires. Second, the realization that in spite of the best efforts of a community, large fire incidents often exceed the capability and available resources of the local fire service. These major incidents negatively impact the emergency service levels of a larger geographic area for an extended period of time.

Often it takes a dramatic incident to illustrate this point on both a national and local level. Three of the most easily recognized incidents that relate to the effectiveness and positive impact that automatic sprinklers could provide for large structures occurred in Philadelphia, Las Vegas and Los Angeles.

The highrise fire that occurred in Philadelphia on Saturday, February 23, 1991, provides the first example of how fire sprinklers can assist the fire service. The fire progressed to a 12-alarm incident as additional manpower and equipment were needed to assist firefighters that were engaged in hours of fire combat. The fire, which began on the 22nd floor, claimed the lives of three firefighters. The fire raged out of control until it reached the 30th floor. Here, firefighters were able to supply water to a light hazard sprinkler system where ten heads activated and controlled the blaze.

In Las Vegas, Nevada, the MGM Grand Hotel fire occurred on November 21, 1980. This single incident resulted in 85 civilian fatalities and dramatically illustrated the impact that fire gases have on occupants within a large structure. This landmark incident is another example of how quickly a major fire can impact the available resources of the local fire department, and where the installation of automatic sprinkler systems could have made a positive impact on the incident.

On May 4, 1988, the tallest building in Los Angeles experienced a fire that dramatically impacted the available resources of the City Fire Department. Beginning on the 12th floor, it took 64 fire companies over 3 1/2 hours to gain control of the incident. The First Interstate Bank fire was ultimately suppressed by fire crews, but only after killing one civilian, injuring 40, and consuming five floors. The fire loss is estimated at $50 million, and rendered the structure unusable for six months. It was reported that at times, the incident commanders were unsure whether this fire could be controlled and wondered if the entire 62 story building would be lost in flames. Further evaluation also identified that, if the sprinkler retrofitting of the structure had been completed, a single sprinkler head could have controlled the fire during the incipient phase.

The fire service in the United States has responded to the challenge presented from major national events by using the heightened awareness to establish public education initiatives and get local policy

makers to require stricter fire codes and prevention measures. This "legislation by catastrophe" has resulted in some effective local proactive measures being taken after the incident occurred. Still, how many large office, residential structures, and high risk occupancies are not being addressed or protected due to local conditions or politics?

Scottsdale was first introduced to the residential sprinkler concept in 1977, when Chief Ron Coleman of San Clemente, California requested Lou Whitzeman be present when his breakthrough residential ordinance and protection concept was presented to the City Council. Chief Witzeman and several other recognized leaders in the sprinkler protection field were in attendance to provide assistance and support for Chief Coleman. Specifically, their support was related to identifying the advantages and disadvantages of built-in protection. When Witzeman returned, he assigned the task of developing a comprehensive sprinkler ordinance for the City of Scottsdale to the City's Fire Marshal, Bob Edwards.

After making extensive contact with all the parties involved in the early development of the residential sprinkler technology, it was decided that for this concept to be successful, two primary issues still needed to be addressed. The critical issues were: 1) some additional real life scenario testing of the new technology would need to be established; and 2) further development and research of the design freedom concept to help address the economic impact of this built-in protection.

The first issue addressed was additional testing of the new residential sprinkler technology. It was identified that in the late 1970's and early 1980's all of the testing had been conducted in the controlled environments of testing laboratories or in buildings of little value that were scheduled for demolition. A plan was developed to test the various types of residential systems in new single family homes.

Contact and negotiations began with a local builder, Womack Homes, to develop and install residential sprinkler systems in two model homes. The primary objective was to establish the effectiveness and impact that various types of new residential sprinkler technology could provide on fires in structures with real market value. The obstacles to conducting this type of comprehensive, real-life testing were tremendous. One of the most significant challenges was convincing Womack Builders to participate. Final negotiations boiled down to an agreement that Rural/Metro guaranteed the new technology would work or they would purchase the home at full market value should it be destroyed. In addition, Rural/Metro agreed to completely restore the homes, and place the sprinkler systems back in service.

Support from the fire protection community was also critical, because the planning and implementation for testing of this magnitude was a massive undertaking. Some of the major participants included: the City of Scottsdale, Factory Mutual, United States Fire Administration, National Fire Protection Association, Sentry Insurance, Underwriters Laboratories, Central Sprinkler Corporation, Grinnell Sprinkler Corporation, Grantham Fire Protection, Marriott Corporation, Arizona State Department of Emergency Services, Phoenix Fire Department, and, of course, Rural/Metro. Over 250 individuals also participated and supported the three day testing process.

The objectives of the tests were: 1) to combine the results of many years of study and experimentation into one conclusive test and summary of the residential sprinkler concept; 2) to complete actual, real life testing on the current fast response sprinkler technology; 3) to study the actual costs associated with the application of this technology for installation and effectiveness; and 4) to provide a conclusive test that indicated the potential benefits for life safety by placing actual participants in the rooms of origin for two of the initial tests.

The actual Scottsdale tests took place during the week of April 19, 1982. The schedule included five scenarios that would be duplicated in each of the homes, for a total of 10 fires. A total of nine fire tests were conducted in the living rooms, kitchens and bedrooms of the two new homes. One scheduled test was aborted due to a malfunction in the ignition equipment. The actual tests were televised through closed circuit equipment, and provided numerous witnesses with live video of the event. The preliminary fire and loss data was compiled by Factory Mutual and Sentry Insurance.

Estimated Damage Dollar Loss
(Calculation on Basis of Damage With Sprinkler System and Without Sprinkler System)
Rural/Metro Fire Sprinkler Tests, April 19, 20, 21, 1982

Test Number	1	2	3	4	5	6	9	10	Totals
A. Carpets-repair, Clean, replace	800	150	150	150	400	350	1,100	650	3,750
B. Floors uncarpeted as above			200	150	75		50		475
C. Walls, ceilings – Paint, clean, seal	300	350	550	700	425	500	950	800	4.575
D. Drywall repair				500		150	150	300	1,100
E. Deoderization	100	100		150	150	150	150	150	950
F. Electrical repairs			300	150					450
G. Kitchen light panels			100						100
H. Kitchen, cabinets, hoods			1,500	500					2,000
I. Furnishings, drapes, clean repair	300	400	300	400	700	500	150	150	2,900
J. Clothing, cleaning					250	150	150		550
K. Fireplace, cleaning								150	150
L. Unidentified				200					200
Total	1,500	1,000	3,600	2,400	2,150	1,800	3,000	1,750	**17,200**
Midrange damage estimate without sprinklers	3,500	3,500	12,500	6,500	12,500	12,500	32,500	32,500	**116,000**
Low range damage estimate without sprinklers	3,000	3,000	10,000	5,500	10,000	10,000	25,000	25,000	**91,500**
High range damage estimate without sprinklers	4,000	4,000	15,000	7,500	15,000	15,000	40,000	40,000	**140,500**
Indicated savings by fire sprinkler systems	2,000	2,500	8,900	4,100	10,350	10,700	29,500	30,750	98,800

Fig 3-1

Preliminary Fire Data

Test Number	**1**	**2**	**3**	**4**	**5**	**6**	**8**	**9**	**10**
Test Description	Living Rm. W. House Couch Min:Sec	Living Rm. E. House Couch Min:Sec	Kitchen W. House Grease Min:Sec	Kitchen E. House Grease Min:Sec	Bedroom W. House Bed Min:Sec	Bedroom E. House Bed Min:Sec	Kitchen W. House Coffee Pot Min:Sec	Living Rm. W. House Xmas Tree Min:Sec	Living Rm. E House Xmas Tree Min:Sec
Ignition	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
Vapor	0:10	0:16	0:40	1:20	0:30	0:24	2:00	0:07	0:04
Open Flame	0:33	0:31	3:15	4:12	1:10	0:52	3:15	0:07	0:04
Smoke Detector	1:18	2:07	4:34	5:20			6:57		1:07
Sprinkler Activation	2:55	1:17	3:45	4:50	1:56	1:04	6:47	0:15	0:19
Control by Sprinklers	4:15		3:55	5:12	3:07	4:00	7:07		0:45
Sprinkler Shut Down	4:40	4:15	6:50	7:15	4:46	4:25	7:50	2:15	2:04
Ceiling Temperature (F)	161	136	199	455	256	160	169	560	295
Temperature at 5 feet	88	82	82	109	124	91	85	96	78
Temperature at 3 feet	81	80	82	88	82	84	81	81	74
Carbon Monoxide – PPM	162	239	100	0	693	619	164	408	306
No. of heads activated	1	1	1	1	2	1	1	6	2

Fig 3-2

In conclusion, the tests were a major success for the insurance, sprinkler, and fire protection industries. It was estimated that there was a property savings of 85.17% due to the ability of the fire sprinklers to control the incidents. The property loss in the sprinklered fires was estimated at $17,200. The estimated loss without the sprinklers was $116,000, a difference of $98,800. The new technology worked

well with eight of the nine fires being controlled by two or less heads. The only "sprinkler failure" was event #9, which was a Christmas tree fire. In this test the fuel load, heat and ceiling spread of the fire activated six sprinkler heads before the fire was controlled. The life safety benefits were also dramatically illustrated by allowing two persons to be present inside the homes, for the first two burn tests and measuring the impact of the temperature and associated fire gases for all of the incidents.

After establishing the life safety and property conservation benefits that could be obtained with the residential sprinkler concept, the next task was to develop an ordinance that would best implement this type of protection. A primary goal was to create a new sprinkler ordinance Which would best use this type of new technology without having a major, negative impact on the future development of the community. It soon became apparent that this effort would not be very successful, unless the economic impact issues were aggressively addressed. Initial contacts with communities, which had been successful in developing voluntary standards, like Cobb County, Georgia, provided the groundwork for the development of real life "design freedoms" that would help make the program and the sprinkler ordinance more cost effective.

Development of the local issue began with evaluating the impact that a comprehensive residential and commercial sprinkler ordinance would have on current city departments and statutes. All areas were addressed with the primary changes and impacts determined to be in water resources, development services, and both the building and fire codes. The initial focus was to identify which of the passive development code guidelines could be changed or modified to help reduce the initial cost of required sprinkler protection.

As a result of the staff research and valuable input from the development community, several "design freedoms" were identified. These changes were items which could be inserted into the ordinance, and would help reduce the impact of mandatory sprinkler protection. In development services, a density increase of 4% for single family communities was initiated. A reduction in residential street width from 32 feet to 28 feet was approved. Cul-de-sac lengths were increased from 600 feet to 2,000 feet. For commercial development, the 360 degree access requirement for fire apparatus was eliminated for fully sprinklered structures. In the building code, the requirement for one hour construction was eliminated for single and multi-family dwellings. The standards for rated doors separating single family homes from garages was also eliminated. The most substantial impact was in the water resources department. Fire hydrant spacing was increased from 330 feet to 700 feet for sprinklered commercial and multi-family developments and from 600 feet to 1200 feet in fully sprinklered single family home developments. The required fire flow demand for structures was reduced by 50%, and resulted in a typical one step reduction in water main size. These changes also resulted in the ability to provide smaller water storage tanks. An additional feature included with the water resource issue, was the ability to use reclaimed or "grey water" to provide supplies for the fire protection systems in commercial structures where community potable water systems were inadequate. The Uniform Fire Code had to be amended to require sprinkler protection in all occupancies and revisions were made to the fire flow demands that are located in the appendix.

A closer evaluation related to the impact of the allowable design freedoms has also been completed. Several comments and concerns were registered by members of the fire protection community relating to the increase of hydrant spacings now 700 feet for commercial and 1200 feet for residential. Concern was expressed that the ability of suppression forces to conduct fire combat operations would be negatively impacted by the changes. First, it must be remembered the focus for the community fire pro-

tection was being changed from traditional or reactive activities, to built-in protection and that these spacings apply only to fully sprinklered residential developments and commercial structures. Actual practical drills indicated, that even with the most dramatic spacing (1200 feet for residential) the longest hose lay would be only 600 feet. When this distance was combined with the large diameter hose which is carried on all apparatus and used for supplying engine companies, the impact was minimal as it related to the time needed for performing the supply line operation and the ability to receive adequate water. The reduction in hydrants also had a positive economic affect in two other areas. An evaluation of the fire hydrant distribution plans indicated a reduction by approximately 1/3 in the total number of hydrants required. This resulted in a savings of $2,000 per hydrant and has contributed to reducing the future, ongoing maintenance costs which the city is required to provide.

The justification for narrower streets and longer cul-de-sacs was related to the risk and possibility of multiple alarm fires occurring in sprinklered structures. It was determined, with the vast majority of fires starting in the protected living areas of a residence (67.5% per NFPA statistics) that the required sprinkler protection would result in smaller, lower impact fire incidents. The development community is also actively pursuing various methods to develop in the upper desert and foothills regions of the city with minimal impact to the environment. The longer narrower street design resulted in actual dollar savings to the project. This also gave the development community another tool to accomplish their reduced environmental impact goals, without having any measurable or negative impact on fire suppression forces.

A practical evaluation of the one hour construction and compartmentalization building requirements for residential structures was also completed. Several evaluations of one hour construction, indicate this laboratory rating is obtained under optimum testing conditions and often does not translate to actual material or construction practices and real time fire conditions. In real life experience, the theory of one hour compartmentalization is an optimistic assumption that might be effective if people did not move into the structure. Post fire investigations and reports regularly reveal, the required one hour construction components had easily been voided and provided questionable protection. It was recognized that each structure will still receive a measure of compartmentalization with the use of 1/2 inch non-rated gypsum materials. Actual live testing indicated, when non-rated materials were combined with the proactive protection of working fast response sprinklers, the structure has a better chance of being less impacted by the growth and destruction associated with typical structure fire events.

During the three years it took to identify and develop these economic guidelines, several new projects in the City of Scottsdale were allowed to use the "design freedom" concept to establish and complete their projects. They were the Harbor Point apartment complex, Paseo del Norte nursing facility, and the Boulders residential resort. These test projects identified, that the concept of fully sprinklered facilities could be more cost effective and allowed the fire department more latitude to establish acceptable protective guidelines for projects that presented difficult design challenges.

When the ordinance was ready to be presented to the city council, the primary focus and impact identified not only the life saving factors, but, the economic benefits that could be expected for the approximately 100 square miles of the city still essentially undeveloped. Estimates for the infrastructure costs were based on the current city master plan and showed that substantial savings were possible. The major impact was projected at $7.5 million in infrastructure savings for the water distribution system.

Additionally, it was anticipated that the sprinkler ordinance would result in the reduction in size or elimination of at least three fire stations at a savings of $6 million in initial capital costs and annual savings of over $1 million. The final determination identified that the cost of requiring this type of comprehensive fire protection was minimal compared to the life safety, emergency resource management, and property conservation results that would be achieved.

After years of testing, developing and educating the members of the community, Chief Robert Edwards presented the Scottsdale Sprinkler Ordinance to the City Council on June 4, 1985. Support and testimony for this concept was provided by Kathy Vernot of Central Sprinkler Corporation, Chief Ronald Coleman from California, Chief Dave Hilton from Georgia, as well as several local developers. This single event took approximately four and one half hours for the mayor and council members to hear testimony from all interested parties, on both sides of the issue. The result was the passage of Scottsdale Ordinance #1709 by a vote of 6 to 1.

Local guidelines established that the commercial and multi-family requirements of the sprinkler ordinance would go into effect 30 days after the council meeting. The requirement for the implementation of the single family residential sprinkler portion of the ordinance, would be delayed until January 1, 1986. During the implementation period, another city task force was established to better identify the associated costs and design freedom benefits, specifically associated with the residential protection. A consultant study from Reese-Carr, Inc. was commissioned by the City of Scottsdale and completed in February 1986. This report applied the new ordinance to several existing residential developments and established a local base line for the associated costs of residential sprinkler protection.

V

Installation Comparison and Benefits

Historically, the first and largest issue associated with the requirement for residential sprinkler systems is cost. The 1986 Reese-Carr study was based on 11 different local home designs by three developers. Using these guidelines, an average house was developed. All of the calculations for the study were based on an average 2,000 square foot single family home. The two primary areas this study focused on were the total costs and allowed design freedoms for both on-site and off-site changes. The findings of this 1986 study indicated the total costs would be $1.14 per square foot to install a residential sprinkler system in a new 2,000 square foot Scottsdale home. The design freedoms that were included in the ordinance equaled a per house savings of $158.52 for on-site construction tradeoffs and an additional $1,951.55 for off-site adjustments. When these ordinance design freedoms were included, the total costs of the residential system were estimated to be $157.24 per installation to the builder and approximately $212.27 per home to buyers.

The installation costs of residential sprinklers in Scottsdale have been closely monitored since the ordinance went into effect. The City has experienced a consistent reduction in the installation price of residential systems. Discussions with members of the sprinkler industry helped identify the primary reasons behind this trend. They are: this is a mandatory requirement for the community; established standards are identified for all builders; increased competition for the available business; better availability of quality materials; and an increase in the efficiency of those installing the systems, resulting in better and quicker installations. The following chart illustrates the overall trend and average installation costs in Scottsdale. This does not include the additional design freedom savings that were identified in the Reese Carr Study.

Production Homes	Custom Homes	Date
$1.14 sq. ft	NA	February 1986
.79	.89	June 1989
.63	.79	March 1993
.59	.70	January 1996

Fig 4-1

It must be recognized that Scottsdale's location in the Southwest has a positive impact on the associated costs due to the climate and dramatic growth associated with the area. Additionally, these same advantages might not apply to all areas of the country. However, what is important is the ability of the industry to become more innovative, productive and cost effective when market conditions allow open competition for the installation of these required systems.

It is interesting to draw a comparison to an article published in the July 1990 edition of the Operation Life Safety newsletter called "Why Johnny Can't Afford a House." This review of construction and associated costs for homes in California, showed that the installed residential fire protection (which included automatic sprinkler systems) equaled less than one percent of the sales price of a typical California home. In 1996, a residential sprinkler system for a 2,000 square foot Scottsdale home will now cost the builder as little as $1,180. This is less than 1% of the sales price for new Scottsdale homes and typically less than most upgrades in residential structures.

There continues to be a tremendous difference in the recognition of sprinkler system effectiveness between commercial and residential applications. In 1991, the City of Scottsdale, Reliable Sprinkler Corporation and Rural/Metro Fire Department conducted a pilot program to retrofit a small, downtown strip shopping center with an automatic sprinkler system. This retail center was block construction with a flat composition roof and covered 7,790 square feet. According to the Insurance Services Organization (ISO) standards, the complex and individual occupancies experienced a reduction in the insurance costs of approximately 75% as a result of the installation of a sprinkler system.

	Non-Sprinklered Rates	Sprinklered Rates	Difference
Complex	.327 per $100 coverage	.080 per $100 coverage	75.54%
Example	$500,000 coverage times .327 equals $1,635 per year		
	$500,000 coverage times .080 equals $400 per year		$1235
Contents	.545 per $100 coverage	.140 per $100 coverage	74.31%
Example	$500,000 coverage times .545 equals $2,725 per year		
	$500,000 coverage times .140 equals $700 per year		$2,025

Fig 4-2

Recognition for the effectiveness of residential sprinklers by the insurance industry has been slower to materialize and several issues still remain that are related to residential protection. The losses associated with residential properties indicate this issue continues to be a major area of concern for the United States. The NFPA reported that in 1994 nearly 74% of all structure fires occurred in residential properties, 57% of the total structure loss for the year occurred in residential properties (estimated $3.615 billion dollar loss in single family structures), and 80% of fire fatalities occurred in residential buildings (66% of total fire fatalities occurred in single family structures).

A review of the policies associated with several major insurance carriers across the country identified a wide variance in the policies of the industry. Local agents and underwriters still need additional training related to the benefits of residential sprinkler protection and industry policy. Depending on the design of the system and the areas to be protected, the discounts can range from 5% to 45%. The higher discounts are available only when sprinkler protection is combined with features like smoke detection, monitoring of the systems, installation of fire extinguishers, and deadbolt locks. Surveys of the local insurance industry indicate the majority of insurance carriers will offer some type of discount, with the average being approximately 10% for approved residential sprinkler system protection.

It has often been reported by the building industry, some members of the real estate industry, and even individual insurance agents, that insurance costs for residential properties will increase due to the possibility of water damage from sprinkler systems. A survey of local and national insurance providers failed to identify any organizations that currently subscribed to this practice. However, this issue refuses to go away.

When examined closely, the issue of water damage is full of holes. All new homes already have an extensive network of plumbing installed for domestic use. Typically, the required water flows for the domestic system dictate the connection and size of the water meter for the residence and usually will

exceed the hydraulic demands for residential sprinkler protection. The domestic network is not tested for reliability, other than for its ability to handle the static pressure from the community distribution system without developing any leaks. Typical domestic distribution system pressures can range between 60 and 100 pounds per square inch. The most popular sprinkler. construction material, CPVC pipe, has a rated burst test pressure of 650 psi and the typical residential sprinkler head is tested at 500 psi. In Scottsdale, the materials used for residential sprinkler installations receive a pressure test of 150 psi for a 24 hour period. These tests far exceed what is already accepted for the domestic water systems and will positively identify any area of the sprinkler piping network that was installed incorrectly or had material deficits.

An initial in-depth study of the first 40 activations of working structural fires which resulted in sprinkler activation, revealed some interesting information that was related to fire flow comparison and water damage potential. The 40 activations consisted of 28 commercial fires, eight multi-family, four single family, and two incidents where definitive times and flows could not be established. For the purpose of the study, 38 incidents were used and comparisons were drawn between sprinkler head activation and flows versus estimated fire flows from suppression hand lines. The actual flow times for the sprinkler incidents which are recorded on the activation records were used as a baseline. Residential sprinkler flow calculations were set at 18 gallons per minute for a single head and 26 gpm for two heads. These are the original standards established from NFPA 13D and have been improved on over the last several years by the sprinkler industry. Commercial flows were set at an average of 25 gpm for each sprinkler head. Fire flows were based on two 1 3/4 inch handlines, with Task Force nozzles, flowing 200 gpm each or 400 total gpm. The sprinkler water flow consumption for all 38 incidents was a total of 13,573 gallons. This equaled an average flow of 357 gallons per incident, The comparable suppression operations indicated a total of 185,600 gallons of water flowed. This equaled an average of 4,884 gallons of water per incident. For the purpose of this evaluation, it was estimated that the suppression flow times to control the fires for all 38 incidents were the same as the sprinkler control times. This review illustrated that smaller amounts of water, distributed earlier in the incident by built-in protection, had a positive effect on the impact and extent of fire and water damage experienced by the structure.

Another issue that has been identified in Scottsdale, is the process associated with the Insurance Service Organization (ISO), Commercial Risk Services grading schedule. This process is designed to evaluate the relative effectiveness of the local fire protection capabilities. Life safety issues are secondary to property protection in this grading schedule. This evaluation primarily focuses on the local fire suppression features that relate to the abilities, amount, and use of suppression manpower and equipment. This type of expensive and reactive fire protection tends to over estimate the true capability of fire suppression forces, as it relates to structural fire protection in the community.

In 1980, Scottsdale received its current rating as a Class 4 community. Recently this community participated in another rating evaluation. While currently not completed and published, several issues surfaced during this process. The schedules currently used by ISO evaluators were last established in 1980, over 15 years ago. There is a definite lack of ability, and little attempt, to address the new technological advances that have been made in the fire service over the last 15 years. It is often reported that ISO does recognize automatic sprinkler protection in commercial structures. However, the accuracy of the records transferred between the ratings bureau and their field inspection division were surprisingly outdated and

inaccurate as related to the installed automatic fire protection systems in Scottsdale. An example was the ISO supplied printout of the non-protected complexes that were located in this jurisdiction. These facilities need to be properly identified to accurately evaluate the worst case scenario for fire flow requirements and suppression capabilities. When compared to the established pre-emergency plans, nearly all of the ISO identified non-protected complexes were, in fact, protected with automatic sprinkler systems. Even new commercial retail developments, that were constructed in the early 1990's (long after the passage of the Scottsdale sprinkler ordinance), were listed as non-protected structures. As a result, nearly all of the sprinklered complexes evaluated for the new Scottsdale rating were required to supply the fire flows that have been established for non-sprinklered properties.

Several other issues were identified during the recent rating process. These were primarily related to the inability of ISO to recognize new technology and credit the local fire service for sound proactive decisions. The ISO standards place a high premium on station locations and response time criteria. In Scottsdale, the fire units can control traffic in intersections through the use of the 3M Opticom system. Currently, there are over 230 intersections that use this technology to maintain traffic and emergency vehicle response flows. New station locations are identified through the use of a computer response program called Fire Router, that identifies the best locations and expected response times given actual road conditions. As a result of these programs, the citizens of Scottsdale consistently receive an average response time of between 3:30 and 3:45 minutes. A major portion of the City of Scottsdale growth has been related to multi-family and single family residential development. The use of NFPA sprinkler standards 13D and 13R to protect residential properties does not translate to an increased community credit by ISO standards. This occurs because the introduction of these standards indicate the primary goal of these documents is to better address life safety issues. As a result, this community will receive no credit for the built-in protection that has been installed over the past decade. The use of these technologies to help address community wide fire protection was merely interesting to the rating procedure. Primarily, because they were not identified in the community rating schedules that had been established in 1980.

VI

Opposition
to
Sprinkler Systems

It is obvious to most professionals associated with the fire protection industry, that there is not a single approach or device that can provide all the answers to the various conditions and issues which are encountered when providing effective fire protection for a community. The challenges, risks, expectations and local conditions vary widely, based on which part of the country reviewed. It must be recognized that success in addressing the fire problem will come on many fronts and in small victories. Understanding this reality, efforts must still be concentrated on the numerous barriers to positive change and progress. Automatic sprinkler systems are not the savior of the fire service in the United States. However, using the new technology and objectively evaluating and understanding the positive impact these tools can have on a community, it is sometimes difficult to understand the massive amounts of opposition this type of program encounters.

The major opposition to mandatory residential sprinkler ordinances comes from the National Association of Home Builders (NAHB) Publicly, the National Association of Home Builders and their Research Center try to indicate they support the continued development of safety devices and residential sprinkler protection. At several open meetings, representatives of the NAHB research center indicated that if the costs of a residential sprinkler installation were reduced to around $1.00 a sq. ft., there would not be much opposition from their members. Their official positions often conflict. What is usually consistent are their comments that they do not oppose residential sprinkler protection, the cost of the sprinkler systems are too high and would provide a dis-incentive to future home buyers, that it is not necessary in new homes because new homes don't burn, and this protection should be a buyer's choice and not a mandatory requirement. However, when it comes time to actually support progress, the organization members take extraordinary steps to see this type of concept does not gain support or become widely practiced.

During the developmental stage of the Scottsdale sprinkler ordinance, extensive input and comments were solicited from the development community and local home builders. This is the primary reason the previously identified list of design freedoms was so extensive. During this developmental stage, representatives from the local Home Builders Association stated they still did not like the mandatory requirement, but they would not oppose ordinances similar or less restrictive than Scottsdale's proposal. Their story has changed.

On June 4, 1985, representatives of the National Association of Home Builders testified to the Scottsdale City Council that by passing this comprehensive type of sprinkler ordinance, they would be making the cost of new homes increase to the point that future residents would not be able to qualify for a home loan. In addition, the council was also advised that new development of residential homes would stop in this city and dramatically impact the ability of the city to continue its positive growth cycle. As illustrated earlier in this report, this has not happened.

A closer review of the home buying habits associated with the general public indicate that very few basic homes are sold to people who barely qualify. All contracts examined indicated that upgrades to the lot, landscaping, carpeting, kitchens, tile, window coverings, fireplaces and patio coverings were common. When reviewing the costs of these upgrades, nearly all were more expensive than the additional cost of a typical residential sprinkler installation, Over the past 10 years, no purchase contracts were submitted to the fire department for review that indicated an individual homebuyer was excluded from the new home

market because of residential sprinklers.

The National Association of Home Builders National Convention, which was held in Las Vegas, Nevada in January of 1994, was a good review of their policies. It was widely reported that the sprinkler industry was allowed to install an automatic sprinkler system in a conference display home. However, what was not reported was the installing company was not allowed to provide informational packets promoting the benefits associated with this type of proactive protection.

A handout placed in the conference participant's information packet, identified the strategies that could be used to oppose sprinkler requirements in single family homes. This informational handout specifically listed the strategies that have been successfully used on a local level to defeat sprinkler protection. In general, the handout advised the local area home builders to develop an area impact study and identify the additional costs for installation, estimate how many customers would be excluded from the home market due to this increase, evaluate the local fire fatalities and show more fires and risk in older homes, and since these systems are reported to be so effective, determine if the local fire chief had installed residential sprinklers in his own home. Additionally, they advised their members to use the NAHB Fire Safety Packet and write a local informational paper stating why sprinklers should not be required, attempt to go public by getting their paper distributed to the local press and radio talk shows who can provide coverage for their negative position, develop a coalition and recruit local groups to help write opinions to support their opposition, And finally, to lobby the local policy makers with an outside expert and coalition members on the issue of this unnecessary protection, but, make sure to stress that as a builder you are neutral.

Nowhere in the document are any instructions, suggestions, or standards related to meeting with the local fire authorities, community planners or members of the fire protection industry on how to objectively evaluate the possible positive impact this type of protection could have for the community or methods to develop support for any aspect of this type of protection.

An example of the inconsistencies in the position of the National Home Builders Association and their Research Center occurred in early 1993. The International City Managers Association (ICMA), US Fire Administration and National Association of Home Builders Research staff had developed a research project. This program would use eight to ten jurisdictions and study the feasibility of reducing housing costs by identifying redundant fire protection in developments that are built with residential sprinklers. A rapidly growing suburb of Phoenix contacted ICMA's project director to indicate their willingness to participate in this research program. One of the requirements was that a local builder and the local chapter of the National Association of Home Builders had to participate and support the project. After the initial contacts had been made, and the community's willingness to participate became known, the regional director for NAHB initiated a process to advise the city policy makers and the ICMA project director, that the area builders were not going to provide any local participation or support for this project. This jurisdiction was removed from consideration for this project. Given there were numerous local builders in Central Arizona who were familiar with residential sprinklers and the design freedom concept, this geographic area and rapidly developing community could have proven to be a valuable asset to the research.

Another example of the extent to which local home builder associations will go occurred in late 1995. The California Building Industry Association began distributing a tape called "Make the Right Choice." This is a slick, professionally produced program which attempts to illustrate the point that residential sprinklers are not in the public's best interest. The tape was widely distributed and shown to local policy makers in an attempt to get existing residential sprinkler ordinances repealed and defeat the passage of any new legislation. Unfortunately, the tape uses numerous untrue statements along with minor-

ity opinions and presents this misinformation as factual. As a result, several local California sprinkler ordinances soon came under attack. The National Fire Sprinkler Association quickly responded with a point-by-point publication that researched the Building Industry Association's "facts" and responded accordingly. Given the timing of the tape, several of the claims on this production were compared to the actual 10 year history of the Scottsdale Sprinkler Ordinance. The following is a brief review of some of their issues and how they relate to Scottsdale's experience.

Sprinkler requirements are based on fear not facts:

It is incredible to make the statement that the fire service primarily uses fear to pass sprinkler ordinances and that the threat of fire in the United States should not be a high priority issue. Any community can evaluate the NFPA annual statistics and compare them to the fire experience in their own community. As was illustrated earlier in the report, residential and single family fire protection is a major area of concern that receives too little attention. The fire service should not have to resort to "Legislation by Catastrophe" to get beneficial ordinances and guidelines enacted. Part of the problem still must be identified as the unrealistic expectations and the true abilities of the local fire service to provide the community with traditional/reactive protection.

The benefits versus economic impact must be evaluated, including the infrastructure costs:

Numerous design freedoms were identified earlier in this report that can be developed and implemented which will positively impact current and future community infrastructure costs. Estimated future infrastructure cost savings for the City of Scottsdale were estimated at $7.5 million. Fires will continue to occur and impact all communities whether the structures are protected or not. It has been estimated that 80 to 90 percent of the small business occupancies in a community that experience a working fire never recover. The records indicate that 92% of all Scottsdale fire activations were controlled with two or fewer sprinkler heads. Fire departments will not be eliminated; however, the destructive fire impact to a community can be positively addressed while the long term economic impact to the community as it relates to requests for additional resources can be controlled.

The costs of installing residential sprinklers do not justify the benefit because fires and fatalities occur in older homes:

Every decision related to the fire service is a cost versus benefit decision. These factors relate to the number and location of stations, amount of manpower, equipment, and resources available to the community and the realization that the fire service will never be able to prevent or abolish all emergency incidents or fires. When does a new home become an old home and begin contributing to the communities risk? The continued construction of unprotected residential properties will only add to the future risk, fire potential, and infrastructure requirements for the community. A fire does not know if a structure is new or old and the great majority of fires are caused by the actions of people and not mechanical or equipment failures. This type of protection can be addressed economically with the design freedom concept. The cost to install sprinklers in Scottsdale has dropped dramatically since the ordinance was adopted, from $1.14 per square foot to $.60 per square foot. This is primarily due to the required nature along with

improved materials and installation procedures.

Sprinklers cannot address fast flaming liquid fires or save people who are in the room of origin:

Over the past 10 years, automatic sprinkler systems have been effective in controlling numerous fires in the City of Scottsdale that involved grease, liquid flammable thinners, natural gas, and several arson fires that used gasoline as an accelerant. Five people were in the room of origin or in the direct vicinity of these incidents and would have been fire fatalities, if not for the installation of automatic sprinkler systems. Quick response residential sprinklers have proven very effective with flammable liquid fires, even in structures that were under construction. In addition, residential sprinklers are specifically designed to protect people located in the room of origin.

The installation of smoke detectors and current building code requirements adequately address the fire protection needs*:*

Without the protection provided in the Scottsdale Sprinkler Ordinance, the fire fatality rate for the city would have experienced a minimum increase of 80% (from 10 to 18 over the past 10 years). Of the 10 fire fatalities, seven had smoke detectors, four were working properly, investigators were unable to determine if the other three had worked, and three fire fatalities had no smoke detectors. The mere presence of smoke detection did not assist two children, one teenager, one elderly and three middle aged adults. Smoke detectors are an important and valuable tool to assist the fire service; however, the experience over the past 10 years in Scottsdale illustrates that even with a working smoke detector, the occupant must have the skills, knowledge and ability to escape the structure on their own. Smoke detection cannot address the growth, impact or control of the fire incident, because it is only a local, primary notification process. The building code requirements are reactive at best. Additionally, most building codes still do not establish any minimum requirements for fire flows.

Homeowners should have a choice about all that goes into the house and sprinklers will drive people out of the home market*:*

Homeowners have very little to say about the majority of zoning, code and building requirements that apply to the construction of homes. It is very common for local stipulations to establish non-safety issues related to color of paints, roof type and color, additions to the structure, amounts and types of windows and even the direction and location of the building on the lot. Why should an issue that can positively impact citizen and community safety be pulled from the discussion? The previous discussion related to home buying practices apply and home builders still have been unable to identify anyone that was unable to purchase a local home due to the additional cost of a sprinkler system. The Scottsdale real estate market has not experienced any reduction in activity and knowledgeable local relators advise homes protected with automatic sprinklers are easier to sell.

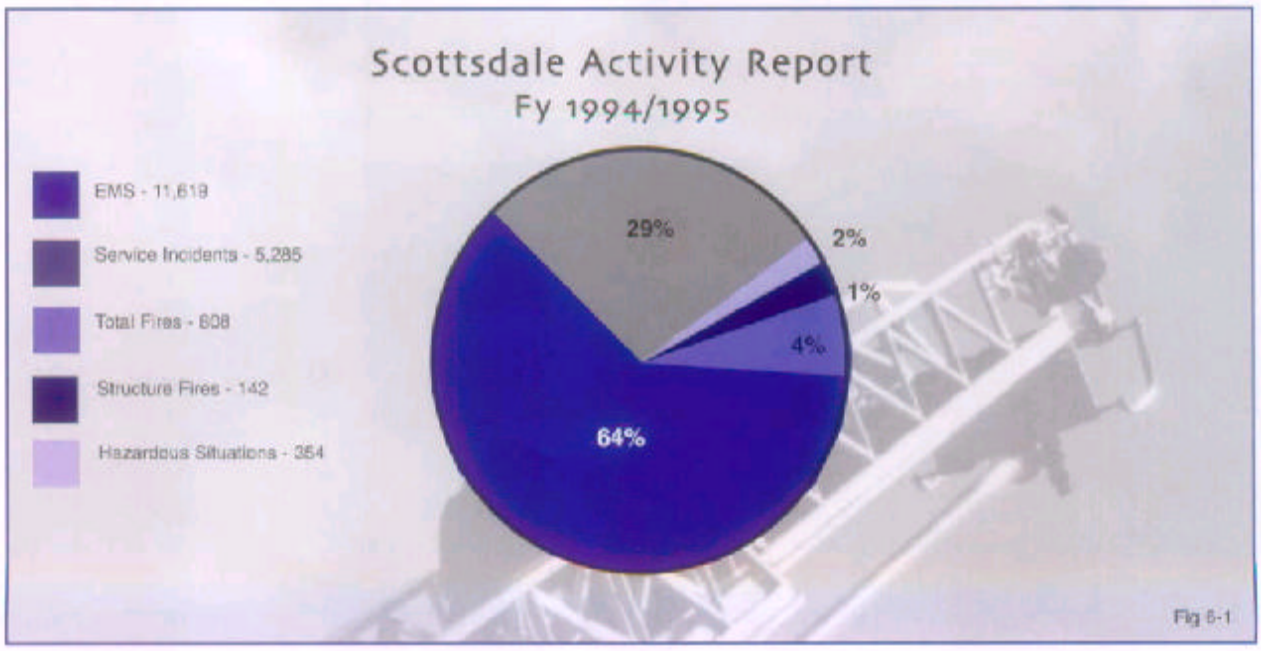
There is difficulty in maintaining and inspecting residential sprinkler systems:

Systems are pressure tested and much more reliable than domestic water systems. The only

mechanical parts of a residential sprinkler system are the heat activated sprinkler, flow switch, 150 psi pressure relief and drain valves. The systems are very reliable and minimal maintenance is required once placed into service. The individual homeowner, insurance agent, or fire personnel can easily check the system for readiness.

The opposition for the residential protection also comes from some individual members of the fire protection community, An example is the video "Making the Right Choice" which uses a Texas Fire Chief to support the building industry's position against residential sprinklers. Most of the internal fire service opposition to sprinkler protection is related to addressing change, protecting the status quo, and the belief that by adopting comprehensive sprinkler ordinances the local fire departments will no longer be needed. This is simply not true. However, what is true, is throughout the country the fire service is being asked to re-evaluate the service that is provided to its customers and to do more with less. It is also recognized that in some areas fewer responses, diminished resources and budget issues have become a tremendous concern. In some cases, the conflicts appear to be between the internal departmental desires to grow and obtain resources versus what the community actually needs or can afford.

Operation Life Safety published an article several years back called "What's My Line?." This article correctly asked "What is the mission of a fire department?" Does a fire department best serve its community by suppressing fires quickly and efficiently -- or by keeping the fire from occurring and having a major impact on the community through effective prevention efforts? Clearly it is more economical and effective for the community to use the available technology and reduce the impact of fire, than to continue to increase the efforts to provide traditional reactive protection. There is no question that once a fire does occur, it is a major emergency and critical event. However, can the fire service afford to concentrate the available resources on activities that continually make up a smaller percentage of the requests for emergency service?



VII

Evaluation of the Ordinance

A closer review of the impact of the passage of Ordinance #1709 on June 4, 1985 by the City of Scottsdale shows this event was one of the most significant, positive actions that has been taken by the leadership of this rapidly changing community. Without the encouragement, integrity and support from these community leaders, this type of progressive action could not have been accomplished.

In late 1989, several independent fire service consultants evaluated the entire fire protection and emergency medical system for the Scottsdale City Council. It is interesting to review the comments that were made about the Scottsdale Sprinkler Ordinance at that time.

1989 Fire Panel Report for the Scottsdale City Manager
Panel Chairman: Chief Ray Picard, Huntington Beach, CA

"North Scottsdale is protected by some of the most unique and effective fire prevention measures in the nation. Scottsdale is like in first place, right at the top nationally, when it comes to built-in prevention systems, such as required by the City's sprinkler ordinance."

1990 University City Science Center Consultant Report

".... Rural Metro has a model prevention and inspections program .... The cornerstone of the fire prevention program is the installation of fire sprinkler systems in all new commercial and residential units. This has controlled and will continue to control the amount of fire risk in the community. Their sprinkler program, coupled with an active inspections program provides the citizens of Scottsdale with a higher degree of safety than is available in most communities."

The following information is a review of the overall positive impact the implementation of this type of sprinkler ordinance has had on the fire history in the City of Scottsdale.

January 1, 1985 through January 1, 1996

Total Working Structure Fires in Sprinklered Buildings		109
Occupancy Types for Incidents	Commercial	65
	Multi-Family	26
	Single Family	18
Total Value of Incident Properties		$620,765,000
Total Fire Loss at 109 Incidents		$211,950
Definite Lives Saved		8
Average Loss per Sprinklered Incident		$1,945
Average Loss per Non Sprinklered Incident		$17,067
Sprinkler Head Activation Rates	1-2 Heads (100)	92%
	3 or more (9)	8%
Estimated Sprinkler Water per Incident		299 gls
Estimated Suppression Water Comparison		5,996 gls
Estimated Sprinkler Flow per Residential Incident		209 gls
Estimated Suppression Water per Residential Incident		3,290 gls

Fig 7-1

When evaluating the impact this protection has had on residential structures, it is interesting to note how close the estimates from the 1982 sprinkler tests are to the actual 10 year history. Both single family and mufti-family records are included due to the compatibility of the technology, protection levels and installation requirements. Commercial activation information is not included in this review, with the exception of lives saved.

	Sentry Tests	Single Family	Multi Family	10 year Total
# Fires	8	18	26	44
Avg Loss (spr)	$2,150	$1,689	$1,398	$1,544
Avg Loss (non)	$14,500	$9,571*	NA	$11,624*
Total Loss (spr)	$17,200	$30,400	$36,350	$66,750
Total Potential	$560,000	$5,393,000	$20,066,000	$25,459,000
Max Loss	$32,500	$15,000	$12,000	NA
type of fire	Xmas Tree	Arson	Heater	
Hds Activated	6	13	2	
Definite Lives Saved	NA	1	3	8 (including commercial)

Fig 7-2

City Coverage of Protected Residential Penetration

Unit Type	Single Family Residential	Multi-Family Residential
Non-Sprinklered	37,652	14,888
Sprinklered Dwellings	19,649	13,938
Total Units	57,301	28,826
% Homes Protected	35%	49% (39% City total)

Fig 7-3

Over the duration of this 10 year study, the City of Scottsdale experienced 598 fire incidents in residential structures. Of these fire incidents, 7.35% or 44 events resulted in sprinkler activation. The review of the 44 residential type activations indicate, 41 were controlled or contained with one or two sprinkler heads activating. Two of the three that needed additional heads were flammable liquid arson fires. The largest multiple head activation resulted from a flammable liquid pour which activated 13 sprinklers. A closer evaluation of the fire cause for the 44 residential activations is included in the following chart.

Causes of Fires in Sprinklered Residential Structures

Cooking	27.4%	12 Total
Smoking / Matches	18.1	8
Electrical	18.1	8
Arson / Suspicious	11.4	5
Trash	11.4	5
Gas Leak	6.8	3
Construction	6.8	3

Fig 7-4

Over the duration of this 10 year study, the City of Scottsdale experienced 574 fire incidents in commercial structures. Of these fire incidents, 11.32% or 65 events resulted in sprinkler activations. The percentage and numbers of fire incidents in sprinklered commercial occupancies is higher due to the requirements to protect most larger structures since 1974. A review of the 65 commercial activations indicate 59 were controlled or contained with one or two sprinkler heads. The multiple activations consisted of three vehicle fires, one arson fire and one flammable liquid spill, The largest multiple activation incident consisted of a fire and ambulance explosion in the covered loading dock of a resort. Five sprinkler heads activated and helped control the fire. A closer evaluation of the fire cause for the 65 commercial activations is included in the following chart.

Types of Occupancy Classes for Commercial Fire Incidents

Business	35.4%	23 Total
Resorts	21.5	14
Assembly	18.5	12
Storage	10.8	7
Mfg/Hazardous	9.2	6
Institutional	3.1	2
Educational	1.5	1

Fig 7-5

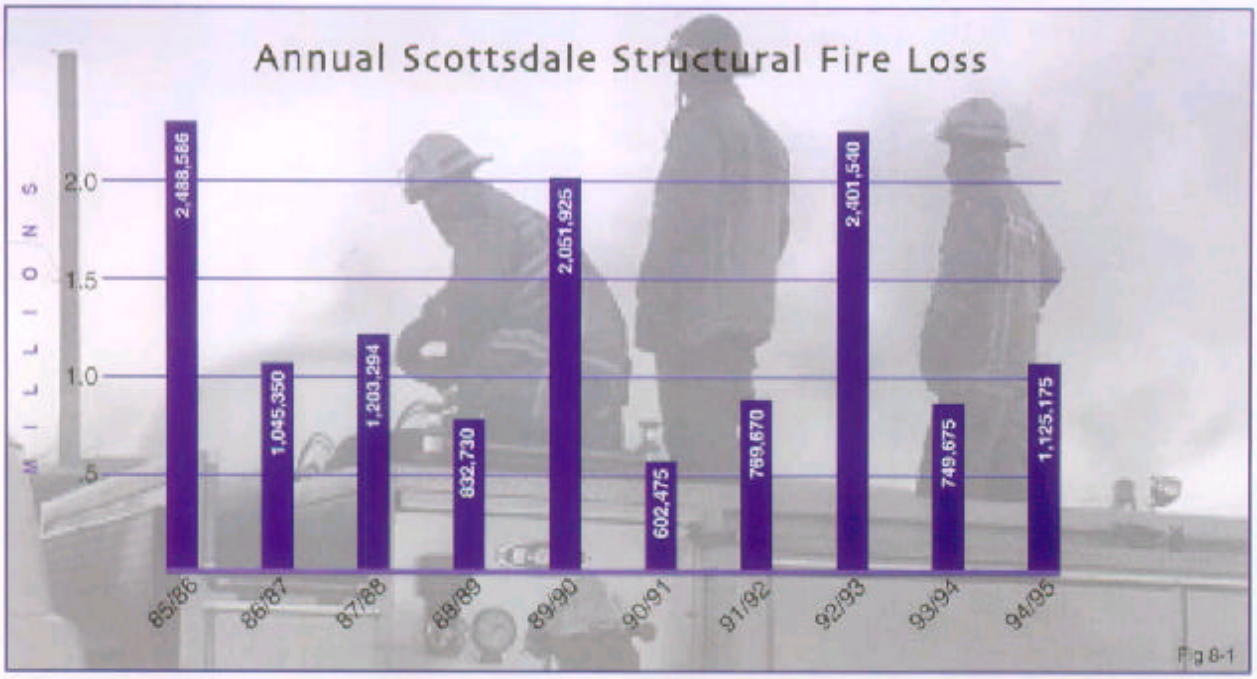
Causes of Fires in Sprinklered Commercial Structures

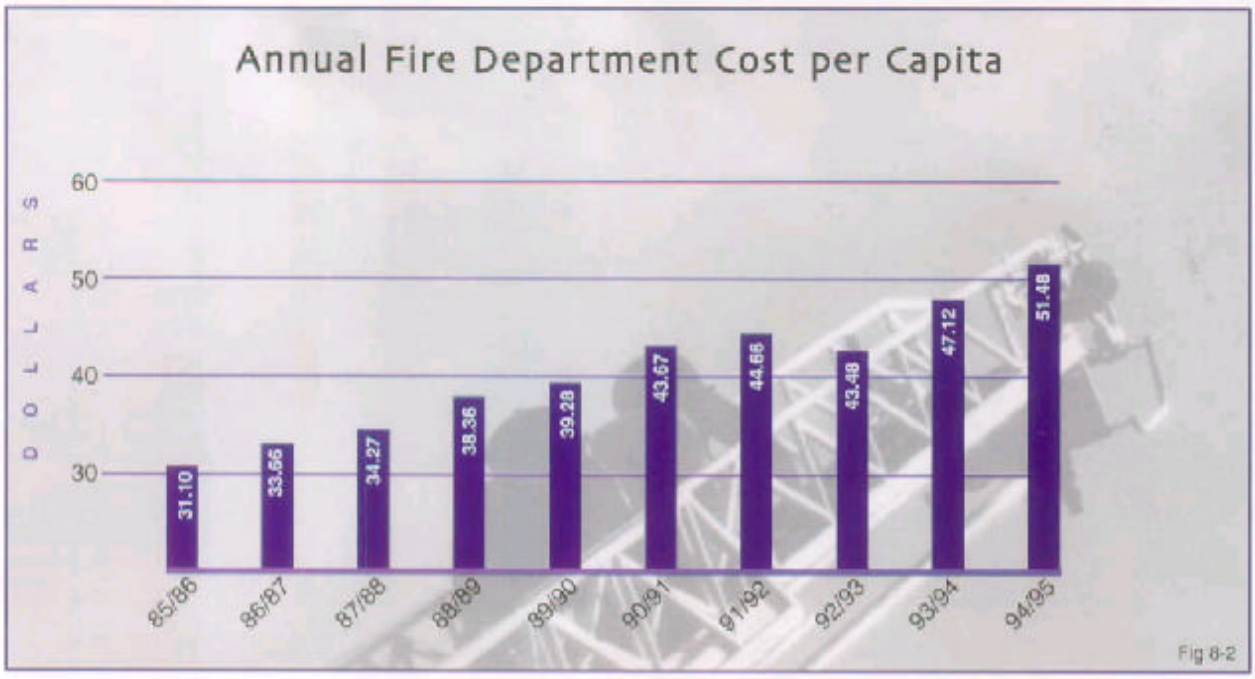
Arson	26.2%	17 Total
Trash / Spontaneous	21.5	14
Cooking / Grease	15.4	10
Electrical	10.8	7
Smoking	10.8	7
Vehicle	9.3	6
Flammable Liquid / Gas	4.5	3
Construction	1.5	1

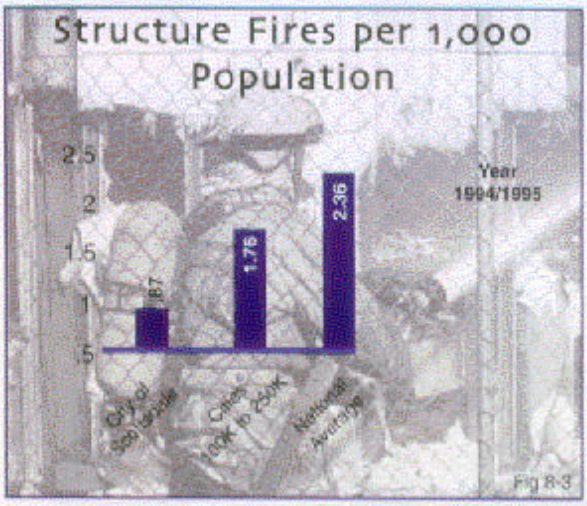
Fig 7-6

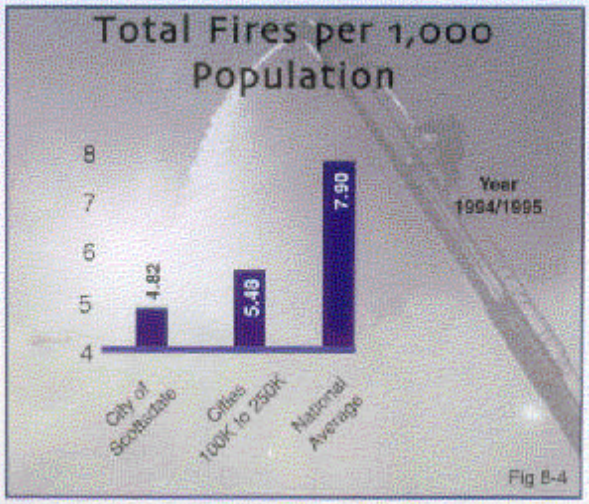
VIII

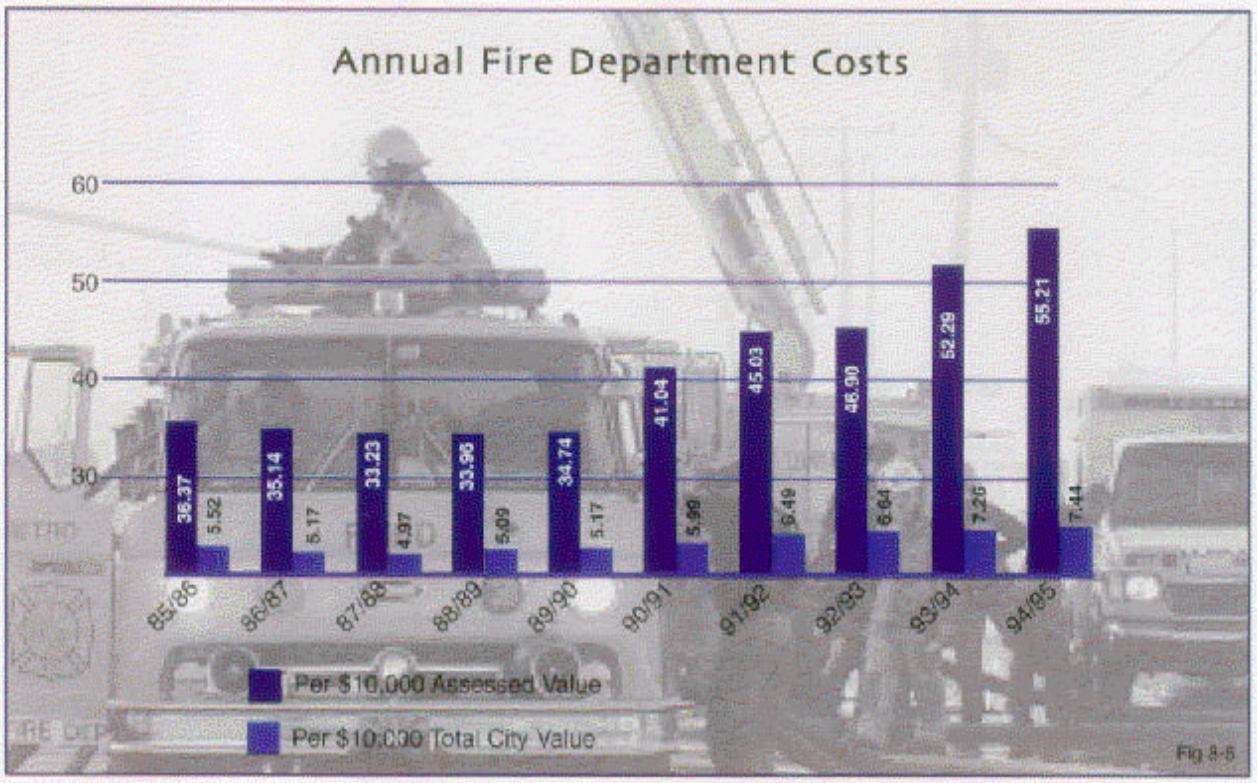
Statistics

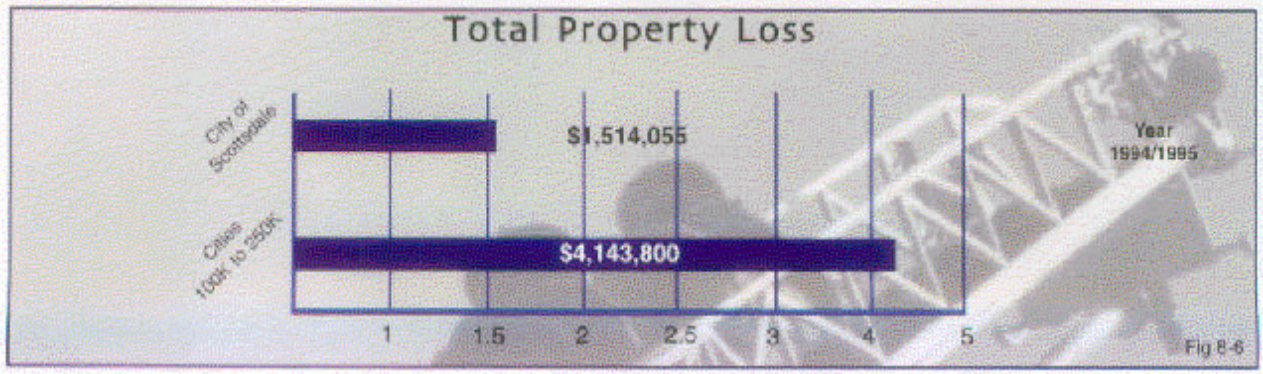

Annual Scottsdale Structural Fire Loss
MILLIONS
2.0
1.5
1.0
.5
2,488,566
1,045,350
1,203,294
632,730
2,051,925
602,475
789,670
2,401,540
749,675
1,125,175
85/86
86/87
87/88
88/89
89/90
90/91
91/92
92/93
93/94
94/95
Fig 8-1

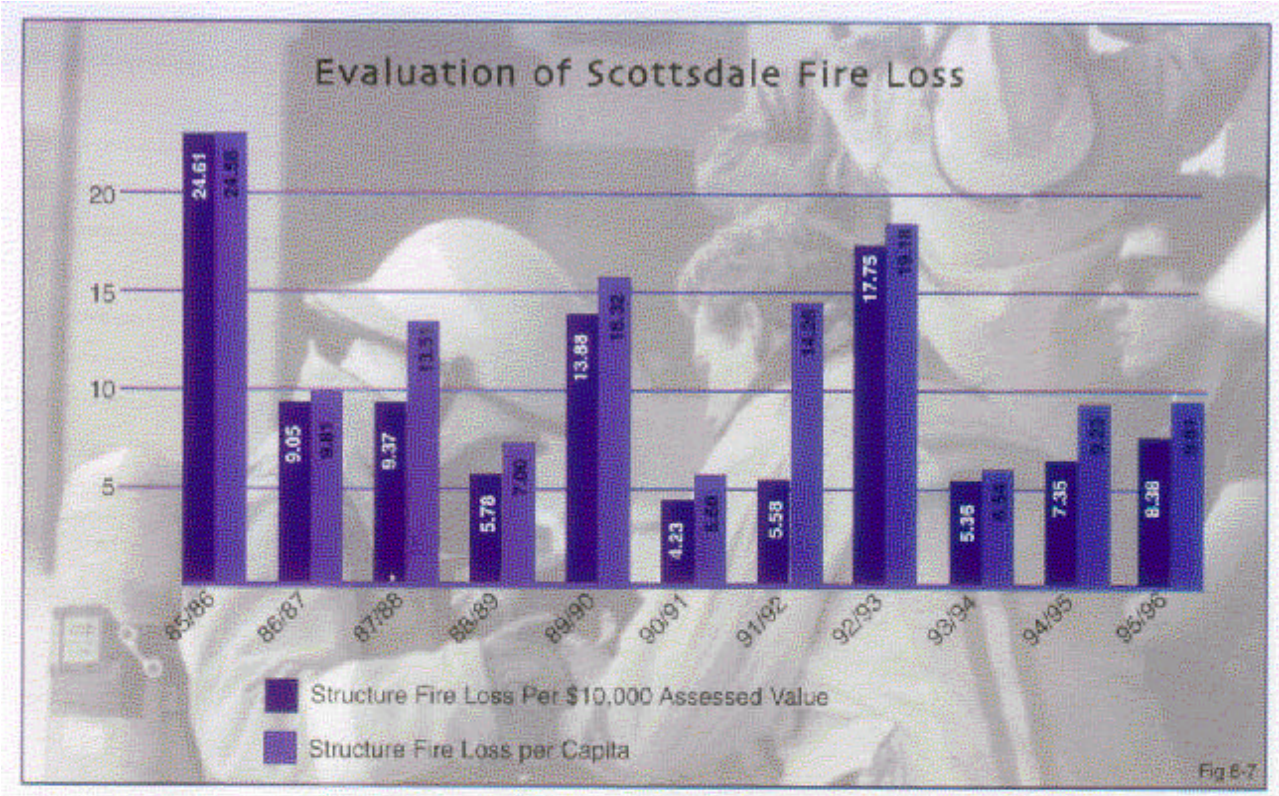

Annual Fire Department Cost per Capita
DOLLARS
60
50
40
30
31.10
33.66
34.27
38.36
39.28
43.67
44.66
43.48
47.12
51.48
85/86
86/87
87/88
88/89
89/90
90/91
91/92
92/93
93/94
94/95
Fig 8-2

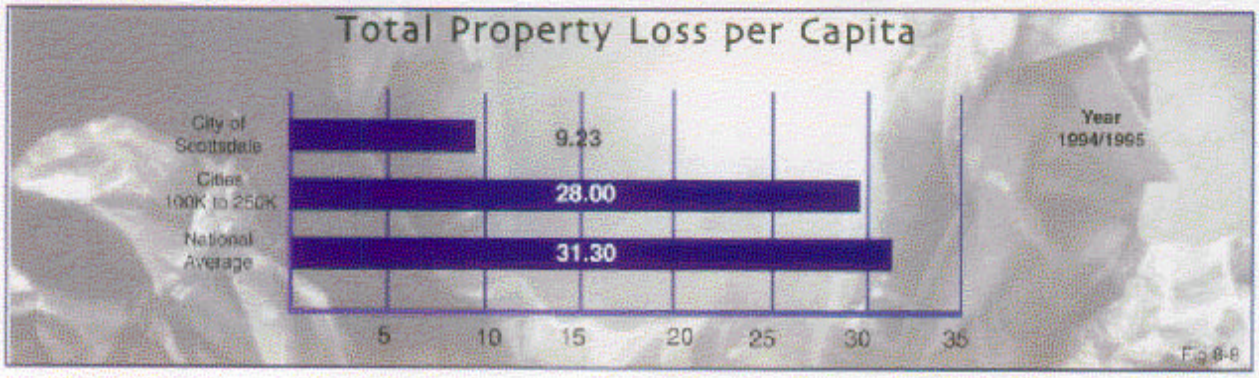

Structure Fires per 1,000 Population
2.5
2
1.5
1
.5
1.87
1.76
2.36
Year 1994/1995
City of Scottsdale
Cities 100K to 250K
National Average
Fig 8-3


Total Fires per 1,000 Population
8
7
6
5
4
4.82
5.48
7.90
Year 1994/1995
City of Scottsdale
Cities 100K to 250K
National Average
Fig 8-4


Annual Fire Department Costs
60
50
40
30
36.37
5.52
35.14
5.17
33.23
4.97
33.96
5.09
34.74
5.17
41.04
5.99
45.03
6.49
46.90
6.64
52.29
7.26
55.21
7.44
85/86
86/87
87/88
88/89
89/90
90/91
91/92
92/93
93/94
94/95
Per $10,000 Assessed Value
Per $10,000 Total City Value
Fig 8-5


Total Property Loss
City of Scottsdale
$1,514,055
Cities 100K to 250K
$4,143,800
1
1.5
2
2.5
3
4
5
Year 1994/1995
Fig 8-6


Evaluation of Scottsdale Fire Loss
20
15
10
5
24.61
24.86
9.05
9.81
9.37
13.31
5.78
7.09
13.88
15.92
4.23
5.26
5.58
14.26
17.75
18.18
5.35
6.54
7.35
9.23
8.38
85/86
86/87
87/88
88/89
89/90
90/91
91/92
92/93
93/94
94/95
95/96
Structure Fire Loss Per $10,000 Assessed Value
Structure Fire Loss per Capita
Fig 6-7


Total Property Loss per Capita
City of Scottsdale
Cities 100K to 250K
National Average
9.23
28.00
31.30
5
10
15
20
25
30
35
Year 1994/1995

Summary of the 10 Year Study

	1985/1986	1986/1987	1987/1988	1988/1989	1989/1990	1990/1991	1991/1992	1992/1993	1993/1994	1994/1995	1995/1996
Population	114,993	120,541	124,562	127,553	130,720	133,949	139,050	145,920	155,270	164,090	174,000
S. Miles	183	183	183	183	183	183	183	183	183	183	183
Total Housing Units	58,503	61,854	64,473	66,894	69,028	70,450	72,930	72,930	80,140	84,750	89,750
City Cash Value	$6,818,621,467	$7,842,040,540	$8,586,700,202	$9,612,481,388	$9,923,032,524	$9,758,327,949	$9,562,174,238	$9,561,737,164	$10,081,538,114	$11,361,092,745	$11,848,571,223
Assessed Value	$1,011,329,426	$1,154,751,678	$1,284,940,157	$1,440,604,450	$1,477,813,369	$1,425,378,617	$1,378,888,764	$1,352,922,240	$1,399,126,179	$1,530,088,317	$1,591,800,942
Total City Budget	$63,546,742	$75,657,722	$85,409,250	$88,346,349	$90,942,888	$104,260,769	$110,201,298	$120,580,148	$131,282,065	$142,944,434	$160,143,495
Fire Dept. Budget	$3,576,665	$4,057,569	$4,268,940	$4,892,637	$5,134,046	5,849,172	$6,209,823	$6,344,765	$7,315,995	$8,447,653	$10,161,405
Fire % of City Budget	5.63%	5.36	5.54	5.54	5.65	5.61	5.63	5.26	5.57	5.91	6.35
Cost per Capita	$31.10	$33.66	$38.36	$38.36	$39.28	$43.67	$44.66	$43.48	$47.12	$51.48	$58.40
Fire Stations	6	6	6	6	6	6	6	6	7	8	8
Emergency Incidents	10,626	9,614	10,114	10,814	11,408	11,939	12,701	14,203	16,105	18,066	19,208
Total EMS Incidents	3,758	4,248	4,697	5,125	5,646	5,646	6,059	7,346	9,025	11,619	12,464
Total Fire Incidents	844	810	881	864	803	817	848	742	820	808	985
Structural Fires	97	95	128	113	125	173	135	129	111	142	240
Structural Fire Loss	$2,488,586	$1,045,350	$1,203,294	$832,730	$2,051,925	$602,475	$769,670	$2,401,540	$749,675	$1,125,175	$1,334,075
Total Fire Loss	$2,826,492	$1,182,125	$1,682,864	$892,680	$2,133,850	$749,955	$1,983,000	$2,799,190	$1,015,500	$1,514,055	$1,672,935
Avg. per Res.	$11,740	$10,350	$10,723	$4,754	$9,616	$4,561	$11,007	$32,844	$10,011	$7,663	$7,538
Avg. per Com.	$41,083	$12,028	$9,723	$11,019	$26,045	$2,569	$1,559	$4,939	$5,331	$9,294	$3,768
Cost per 10K of Value	$5.25	$5.17	$4.97	$5.09	$5.17	$5.99	$6.49	$6.64	$7.26	$7.44	$8.58
Cost per 10K of Ass/Value	$35.37	$35.14	$33.23	$33.96	$34.74	$41.04	$45.03	$46.90	$52.29	$55.21	$63.84
Str/Fire Loss per 10K of AV	24.61	$9.05	$9.37	$5.78	$13.88	$4.23	$5.58	$17.75	$5.36	$7.35	$8.38
Fire Loss per Capita	$24.58	$9.81	$13.51	$7.00	$16.32	$5.60	$14.26	$19.18	$6.54	$9.23	$9.61
Total Fires per 1,000	7.34	6.72	7.07	6.77	6.14	6.10	6.10	5.08	5.28	4.92	5.66
Structure Fires per 1,000	0.84	0.79	1.03	0.89	0.96	1.29	0.97	0.88	0.71	0.87	1.38

IX

Case Studies

CASE STUDY 1

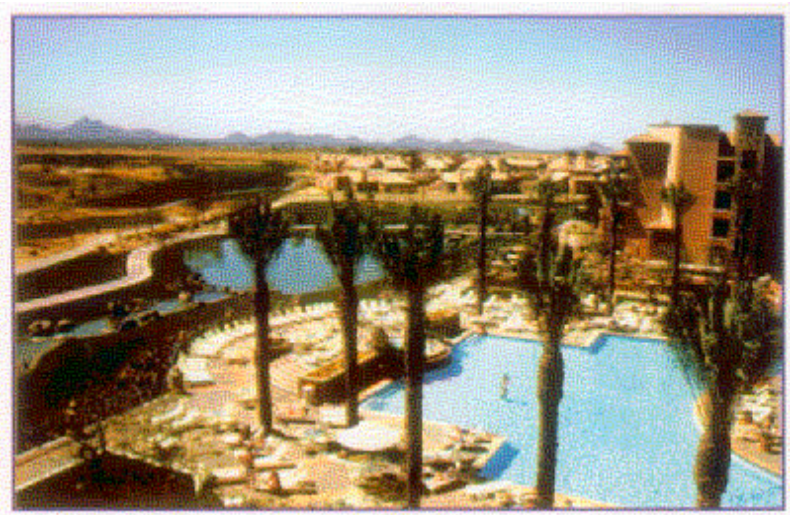
Date: **June 19, 1988**
Location: **7575 E. Princess Drive**
Time: **1726 hours**
Occupancy: **Resort**
Cause: **Ambulance Explosion**
Activation: **5 heads**
Total Loss: **$50,000**
Total Potential: **$50,000,000**
Flow Time: **20 minutes**

Narrative:

This major resort covers 450 acres, the main complex has 400 visitor rooms, eight lounges, over 77,000 square feet of meeting and ballroom space, and covers a total of 186,288 square feet. The development was able to use many of the advantages outlined in the city's fire ordinance. The normal fire flow requirements for this complex could not be supplied by the City of Scottsdale infrastructure at the time the facility was constructed. A protection system was developed and designed which used the grey water lake system to provide sprinkler protection for the complex. This primary system has a 2.5 million gallon water capacity, 2000 gpm fire pump, a complete grey water fire protection loop with ten sprinkler zones and five grey water fire hydrants. In addition to the self contained grey water system, the city provided a 8" domestic loop with standard hydrants to serve as backup protection.

The fire was caused by an accidental ambulance explosion with extension to the structure. Fire and ambulance crews had responded to the resort for a minor medical incident. The emergency crews staged their vehicles in the underground parking / delivery area of the complex. When the medical incident was stabilized, the fire crews cleared the scene and were returning to quarters. Before the medical crews had returned to the ambulance unit a fuel leak developed, resulting in an engine compartment fire. The fire crews returned to the complex and found a well involved fire in the vehicle which was being accelerated by the oxygen carried on the unit. As crews began suppression activities the ambulance experienced an explosion. Five sprinkler heads in the area activated, controlled the extension of the fire, and provided major assistance to fire suppression crews.

The complex used an open design with extensive walkways and courtyards connecting the various features of the resort (CS1-1)



An overall view of the resort and the direct connection to the Tournament Players Club. The requirements for 360 degree access was modified due to complete automatic sprinkler protection. (CS 1-2)

The Scottsdale Princess Resort uses this 2.5 million gallon grey water feature and a 2,000 (CS1-1) fire pump to provide the initial supply for the automatic sprinkler system. (CS 1-3)

Two hydrants near the access to the underground parking. One hydrant uses grey water and the other is connected to an 8" domestic supply. (CS1-4)

View of the loading dock area and the involved ambulance unit. Five sprinkler heads activated and helped control the fire. (CS 1-5)

A closer view of the damage associated with the explosion. The sprinkler pipe remained intact. (CS1-6)

A closeup view of the shattered window and interior damage from projectiles launched during the explosion. (CS1-7)

Extensive fire and structural damage to the ambulance unit. (CS1-8)

CASE STUDY 2

Date: **August 20, 1986**
Location: **7510 E. Thomas**
Time: **1435 hours**
Occupancy: **Multifamily Residential**
Cause: **Electrical**
Activation: **1 head**
Total Loss: **$1,500**
Total Potential: **$1,000,000**
Flow Time: **7 minutes**

Narrative:

This fire was due to a malfunctioning electric fan, igniting an apartment fire on the bottom floor of a three story, 64 unit complex. The unit was unoccupied at the time of the incident with the exception of a small dog who was not injured. This was the first City of Scottsdale residential type activation due to fire. The fan shorted, extended to a combustible chair and resulted in a working interior fire. First notification to news outlets indicated that quickly extinguished, nominal damage fires were not newsworthy events. A major incident was dispatched to obtain the needed response from news organizations and get the success story of the sprinkler protection properly covered. One sprinkler head activated, extinguished the fire, notified the fire department, and flowed for a total of seven minutes. There was no structural damage and only $1,500 in minor smoke and water damage to the furniture. Fire department crews secured the sprinkler system, replaced the head, and removed the water from the structure. Occupants did not require relocation.

Typical three story multi-family complex of Type V construction. (CS2-1)

Point of origin is on the left side of the chair. Note minimal damage to surround ing combustibles. (CS2-2)

An overall view of the main living area. Only minor water damage to ceiling, walls, and interior furnishings. Note the wall wetting action from the specially designed residential sprinkler head. (CS2-3)

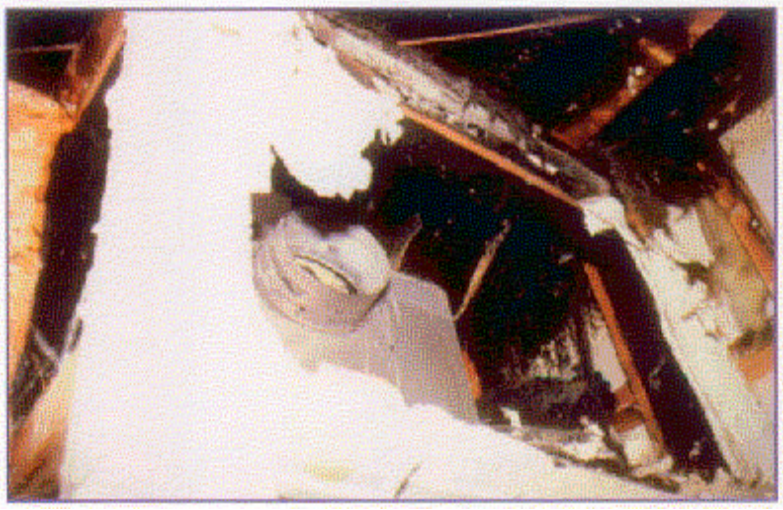
CASE STUDY 3

Date: **February 6, 1989**
Location: **11333 N. 92nd Street**
Time: **1129 hours**
Occupancy: **Multi-family**
Cause: **Electrical**
Activation: **2 heads**
Total Loss: **$12,000**
Total Potential: **$623,000**
Flow Time: **10 minutes**

Narrative:

The testing of a newly installed electrical air handling unit caused this fire in the first floor of a two story apartment complex. The building was under construction and close to completion and being prepared for its final Certificate of Occupancy. The fire burned for some time in the unprotected, concealed wall and ceiling space before being discovered by electricians. The fire had extended through open combustible vertical voids to the second floor, at which point it vented into the protected living area where a residential sprinkler head activated and halted any additional extension and fire damage. Fire crews quickly located and controlled the concealed fire in the ceiling of the first floor unit. Total fire damage was $10,000 and the estimated water damage was $2,000. The incident provides a good example of the effectiveness of active sprinkler protection, even on fires that these systems are not designed to control. The activation of the sprinkler system on the second floor did not extinguish the fire, however, it was a major contributor to controlling and reducing the fire impact on the structure.

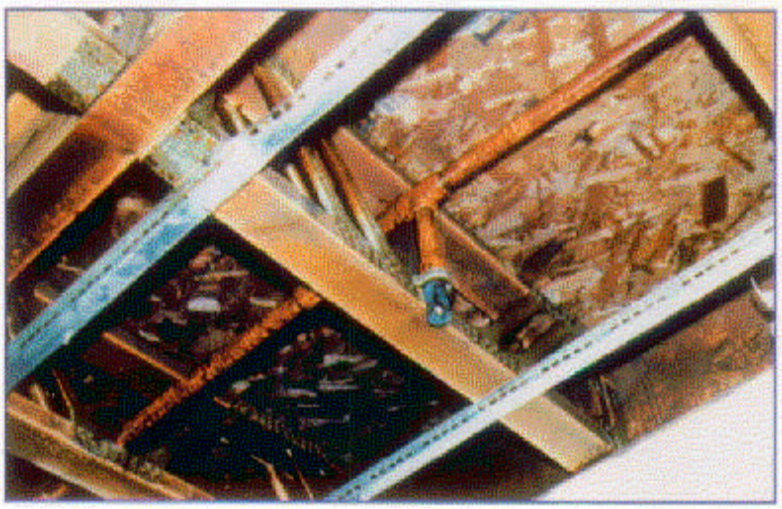
Two story multi-family complex with Type V construction. (CS3-1)



Point of origin was a faulty concealed air handling unit. (CS3-2)

Overhead fire traveled to adjoining units through open combustible spaces. (CS3-3).

Fire extended vertically to the second floor where it activated an automatic sprinkler head. The activation helped control further spread of the fire and prevented additional structural damage. (CS3-4)



The CPVC sprinkler pipe in the concealed truss space did not fail, even with direct exposure to the fire's gases. (CS3-5)

An example of rapid fire spread through an unprotected, combustible, concealed space. (CS3-6)

CASE STUDY 4

Date: **December 28, 1987**
Location: **9000 E. Corrine Drive**
Time: **1545 hours**
Occupancy: **Single Family Residence**
Cause: **Garage Fire**
Activation: **1 head**
Total Loss: **$0**
Total Potential: **$200,000**
Flow Time: **10 minutes**

Narrative:

This fire occurred when the resident placed hot fireplace coals into a combustible box and placed the container in the garage prior to leaving the home. The residence was unoccupied at the time of the incident. The structure was located in a new development with active construction. A sprinkler contractor and a fire inspector heard the local sprinkler alarm bell and responded to the residence. On their arrival, water was flowing from inside the garage door. The door was opened and the situation was investigated. A cardboard box had ignited in the garage which contained an extensive fuel load. One sprinkler head had activated and controlled the fire prior to it spreading to the 8 multiple adjacent exposures. The residence was secured and a note left for the owner to contact the fire department for information on the fire that had occurred in the structure.

The outside view of the newly completed residence that had just experienced a garage fire. (CS4-1)

The fire started from ashes in a paper bag placed next to combustible materials (CS4-2)

The heavy fire load included a boat and numerous other combustibles. (CS4-3)

CASE STUDY 5

Date:	**June 19, 1987**
Location:	**8000 E. Via Desirto**
Time:	**1730 hours**
Occupancy:	**Single Family Residence**
Cause:	**Smoking I garage fire**
Activation:	**None**
Total Loss:	**$50,000**
Total Potential:	**$144,000**
Flow Time:	**None**

Narrative:

The resident of this single family residence emptied hot smoking materials into a combustible container in the garage. Occupants then relocated to their backyard. The fire in the container extended to the vehicles and additional combustibles within the structure. The first notification of this incident was received from a neighbor advising of a fully involved garage fire. The first fire unit arrived in under five minutes and fire control was completed in less than 10 minutes. The spread of the fire was stopped in the kitchen after breaching the built-in, one-hour garage protection. Smoke and heat demarcation is visible throughout the residence.

The results of a typical garage fire. (CS5-1)

The point of origin which consisted of smoking materials in a combustible container. The interior of the garage sustained extensive damage and breached the one hour fire protection envelope. (CS5-2)

Extensive damage to the kitchen area. This is where suppression crews halted the extension of the fire. (CS5-3)

Although the fire never reached the dining area, smoke and heat damage were significant. (CS5-4)

Smoke and heat damage extended throughout the living area despite the fact that the fire never extended into the area.
(CS5-5)

Severe smoke damage well away from the actual fire. (CS5-6)

CASE STUDY 6

Date: **July 31, 1995**
Location: **13000 N. 103rd Place**
Time: **1000 hours**
Occupancy: **Single Family Residence**
Cause: **Arson**
Activation: **1 head**
Total Loss: **$1,500**
Total Potential: **$138,000**
Flow Time: **10 minutes**

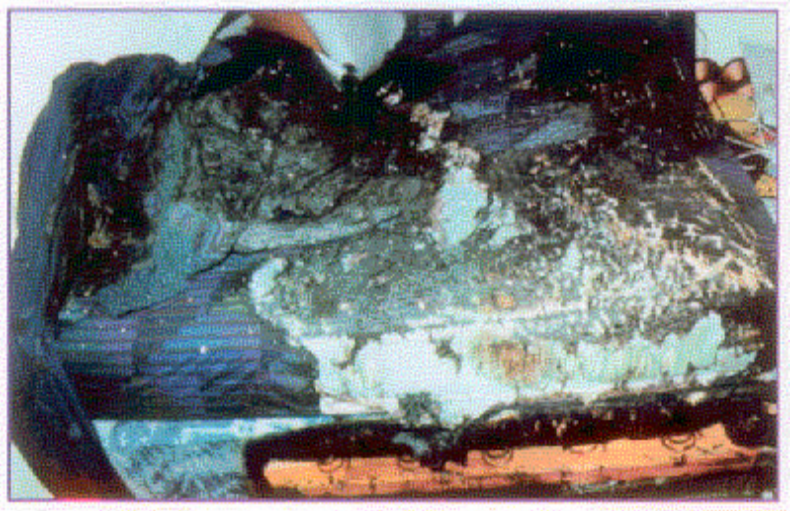
Narrative:

An arsonist used flammable liquid to ignite this house fire. A 21 year old occupant was sleeping in a bedroom at the time of the incident. A second party poured gasoline over the sleeping occupant and in the bedroom before igniting the materials. The sleeping occupant received only minor burns from his contact with the flammable liquid. Total damage was contained to the room of origin as a result of a single sprinkler head activation. Extensive damage to the structure would have occurred along with a probable fire fatality if not for the installation of the system.

This is an excellent example of the effectiveness of the residential systems ability to address flammable liquid fires and to protect the people in the room of origin.

A typical suburban Scottsdale home consisting of lightweight construction and a heavy tile roof. (CS6-1)

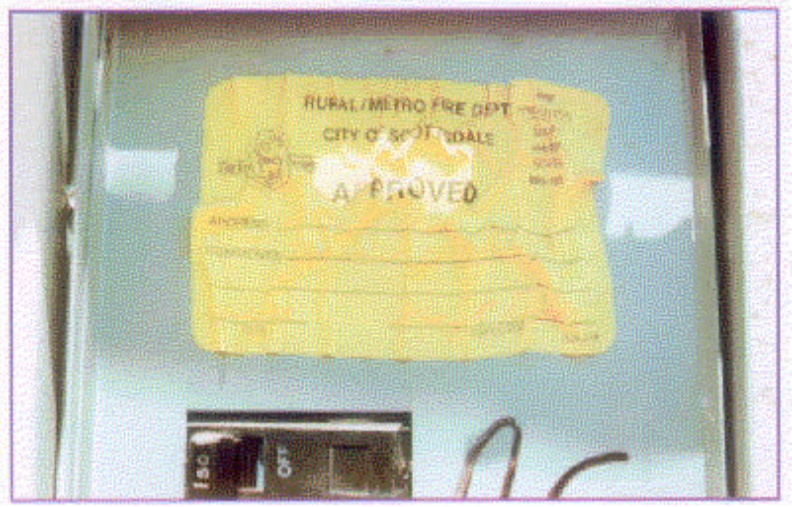
The activated sprinkler head caused only minor damage to the finish of the ceiling area. (CS6-2)



The bed where gasoline was poured over a sleeping man was quickly extinguished by the residential system. (CS6-3)

Obvious pour patterns extend from the bed where the occupant was sleeping at the time of the arson. (CS6-4)

Another view of the poured gasoline as it extends out of the bedroom. Notice only minor damage from the flash fire prior to the sprinkler suppressing the flames. (CS6-4)



The final inspection certificate for the sprinkler system that saved the occupant's life is still on display in the electrical panel box. (CS6-6)

CASE STUDY 7

Date: **July 12, 1993**
Location: **12000 E. Altadena Road**
Time: **0735 hours**
Occupancy: **Single Family Residence**
Cause: **Arson**
Activation: **13 heads**
Total Loss: **$15,000**
Total Potential: **$325,000**
Flow Time: **10 minutes**

Narrative:

This fires arsonist used a large amount of flammable liquid to advance the flames. Fire crews responded to reports of a fully involved residential structure. Fire crews arrived to find a large two story home with heavy smoke but little fire. Investigators found high volumes of combustibles and flammable liquid had been used throughout the structure, most likely to ensure total destruction of the home. The arsonist failed to disable the residential sprinkler system before setting the fire. A total of 13 heads activated and completely controlled the fire. Although the system is only designed to flow 26 gpm with two sprinkler heads activated, and was never designed to control accelerant fires of this magnitude, the system was able to contain the damage to only $15,000. The rapid suppression of the fire by the sprinkler system also assisted arson teams in their investigation by maintaining much of the evidence.

The front of the large two story residence in Scottsdale is Type V construction. The home was valued at $325,000. (CS7-1)

The rear of the large structure. Note little evidence of any fire. (CS7-2)

The interior hall and stair case. The clothes and other combustibles were combined with flammable liquid to accelerate the fire. There was heavy soot and smoke damage but very little structural damage as a result of the fire. (CS6-3)

CASE STUDY 8

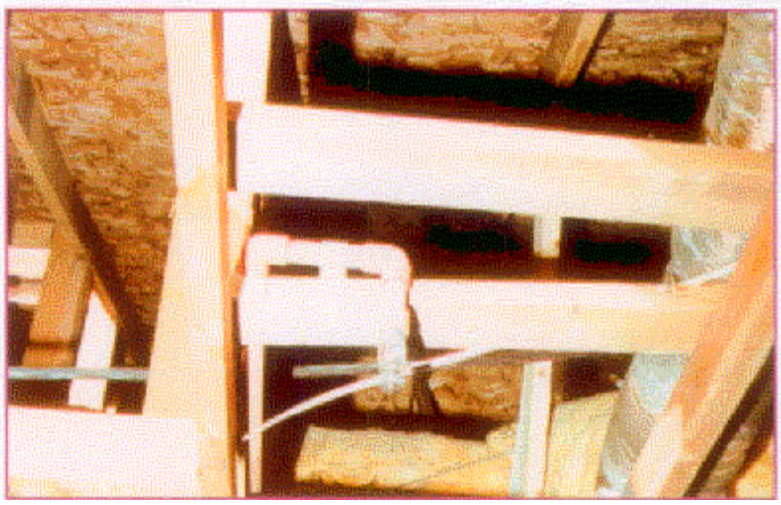
Date: **May 6, 1994**
Location: **9600 E. Happy Valley Road**
Time: **1411 hours**
Occupancy: **Single Family**
Cause: **Arson**
Activation: **2 sprinkler heads**
Total Loss: **$1,300**
Total Potential: **$130,000**
Flow Time: **15 minutes**

Narrative:

The arsonist of this building chose to attempt to destroy it in its most vulnerable state. The building was under construction and in the open frame stage. The residential sprinkler system had received its initial pressure test and the contractor had left the water supply active. Without the compartmentalization features of drywall, the fire quickly spread along the open framing members. Two sprinklers activated and controlled the fire. Despite open frames and the use of an accelerant, the sprinkler system performed beyond its intended design and gave the arson team a clean crime scene to investigate.

The structure in its most vulnerable state. Open framing with exposed combustible construction products throughout the

The area of the flammable liquid pour. Note the placement at the base of the highly combustible framing. (CS8-2)



Even with minor fire spread above the sprinkler system, the steam conversion and overspray were able to keep the fire from racing through the attic. (CS8-3)

CASE STUDY 9

Date: **July 27, 1987**
Location: **5000 N. 85th Street**
Time: **2330 hours**
Occupancy: **Single Family Residence**
Cause: **Smoking Material**
Activation: **None**
Total Loss: **$50,000**
Total Potential: **$85,000**
Flow Time: **None**

Narrative:

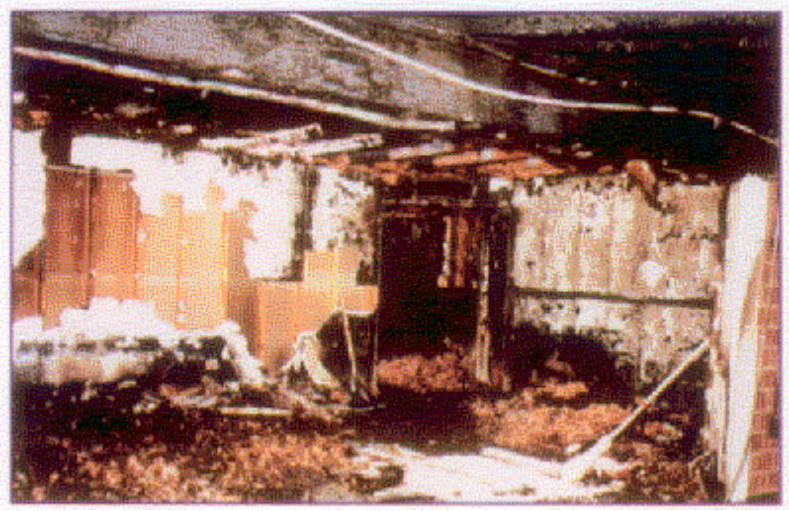
Careless discarding of smoking material caused this tragic incident. Fire crews were responding to a non-emergency assignment when they discovered a working fire in a single family residence. The crew requested a first alarm assignment, secured a water supply, and initiated rescue procedures and fire attack. The first unconscious victim was quickly located and removed from the structure. All of these initial actions were taken before notification would have been received from the public.

This review provides an excellent example of an incident where even with all the traditional, reactive fire protection measures working in the citizen's favor, two people were not able to survive this typical residential fire. The home was single story, approximately 1600 square feet with block construction and a composition roof. The two victims were a 53 year old woman and her 23 year old son. They were not in the high risk category as defined by NFPA There was a smoke detector present but it is unclear if it was working. The fire crews that discovered the incident had less than a one minute response. Rescue of the first victim occurred in less than four minutes. Advanced life support treatment was provided on the scene to both occupants. One victim did not survive the evening and the second succumbed to complications two days later.

With the support and approval of the surviving family members and responsible insurance agency, this dramatic incident was used as a public education training event. The fire department conducted guided tours of the structure for members of the general public. This day allowed several hundred citizens to experience the tremendous impact that a single, local residential incident can have on a family and the community.

Overall view of single story, block construction, composition roof structure. Other than the ventilation hole cut by suppression crews, and burned wood at the top of the entrance, it is difficult to identify this home experienced a major interior fire. (CS9-1)

A closeup view of the structure the evening of the fire. Upon arrival fire crews had flames rolling out of the front door over their heads and the dispatch center had not yet received a 911 call from the public. (CS9-2)



Remainder of the room of origin. The fire in this room vented through the back arcadia door and extended through the hallway opening in the right center of the photograph. (CS9-3)

An example of heavy fire extension into the kitchen area. (CS9-4)

The first victim was a 23 year old male who collapsed in the doorway of his bedroom and was found leaning against the white dresser in the lower right portion of the photograph. (CS9-5)

A closeup of the first victim's location. Notice the smoke and heat demarcation in the bedroom area of the home. (CS9-6)

The second victim, a 53 year old female, was located still in her bed. (CS9-7)

Agreements were reached with the relatives, insurance companies, and community leaders to allow for this tragic event to be used as an important educational experience. (CS9-8)

Several hundred citizens took the opportunity to tour the structure. Small groups were directed through the house by fire investigators, who explained cause, origin and the dramatic effects of residential fires. (CS9-9)

X

Appendix

FIRE SPRINKLER ORDINANCE

SCOTTSDALE ORDINANCE #1709

A Joint Effort

of

City of Scottsdale
3939 North Civic Center Plaza
Scottsdale, Arizona 85251

and

Rural/Metro Fire Department
8401 East Indian School Road
Scottsdale, Arizona 85251

FIRE SPRINKLER ORDINANCE

SCOTTSDALE ORDINANCE # 1709

CONTENTS

SECTION I

SPRINKLER ORDINANCE FACT SHEET

SPRINKLER ORDINANCE FACT SHEET

Event

The City of Scottsdale on June 4, 1985, passed a comprehensive Sprinkler Ordinance. This Ordinance places the City of Scottsdale first in the nation in a situation where technology has surpassed conventional means of fire protection in the fire and development communities. The cost of this approach to overall fire protection is minimal in comparison to the life safety and property protection results achieved.

Effective July 5, 1985, all new multi-family and commercial structures for which building permits are issued will be sprinklered. The Ordinance also requires that, effective January 1, 1986, all new single family residences for which building permits are issued be sprinklered.

History

The City of Scottsdale passed its first major sprinkler ordinance in September of 1974. The purpose of this Ordinance was to require fire sprinklers in all new mercantile, industrial and commercial structures that were in excess of 7,500 square feet in area on the first floor, two stories or more in commercial buildings and three or more stories in hotel or apartment complexes.

Historically, fire experts have agreed that to minimize fire threat, a fire must be detected and suppressed while it is still small. Fire may smolder before bursting into flame, but once flame appears, it may only take two minutes for that fire to spread to the contents, walls and ceiling of an entire room. Experience and testing now show a far more effective step is to install quick response sprinklers in all residences and buildings, which reduces the loss of property damage by 80 percent and minimizes loss of life by 97.5 percent.

Due to Rural/Metro Fire Department's (RMFD) prime focus on fire prevention, they have been studying the use of quick response sprinkler systems for several years. In 1982, RMFD conducted the first sprinkler tests in Arizona of the quick response sprinkler systems. These tests were very successful in showing the immediate fire suppression action and reliability of the systems. From that point until now, RMFD and the City have continued their study and believe, in terms of future development of the City, that sprinkler systems provide the most efficient, cost effective and reliable method of protecting the life safety and property of the citizens.

SECTION 2

FIRE CODE - ADOPTING ORDINANCE

FIRE CODE - ADOPTING ORDINANCE

WHEREAS, Ordinance No. 1310 of the City of Scottsdale amended Title 9 of the Scottsdale Revised Code, relating to the Fire Code, and adopted the 1979 Edition of the Uniform Fire Code;

WHEREAS, the International Conference of Building Officials and the Western Fire Chiefs Association have subsequently published the Uniform Fire Code, 1982, Edition;

WHEREAS, studies conducted by the National Fire Protection Association and other organizations interested in fire prevention have established that certain benefits will accrue to cities adopting new fire prevention techniques;

WHEREAS, the above-referenced studies indicate that the adoption of a fire code requiring sprinkler systems in all commercial and residential facilities will result in reduced fire loss and fewer fire casualties, reduced costs for fire fighting apparatus and personnel, and for related water lines;

WHEREAS, the studies indicate that other benefits resulting from proposed changes in the Fire Code include a substantial reduction in the amount of water required for fire fighting purposes, increased design freedoms, and reduced insurance rates for industrial and commercial structures;

WHEREAS, the City Council desires to obtain the above enumerated benefits for the City of Scottsdale and its inhabitants;

WHEREAS, Ordinance No. 1310, and the Uniform Fire Code, 1979 Edition do not contain the provisions necessary to make these benefits available to the City, but the necessary provisions are contained in Ordinance No. 1709 and the Uniform Fire Code, 1982 Edition;

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Scottsdale, Arizona, as follows:

SECTION 3

ORDINANCE 1709

ORDINANCE 1709

AN ORDINANCE OF THE COUNCIL OF THE CITY OF SCOTTSDALE, MARICOPA COUNTY, ARIZONA, AMENDING TITLE 9 OF THE SCOTTSDALE REVISED CODE, RELATING TO THE FIRE CODE: AMENDING TITLE 5 OF THE SCOTTSDALE REVISED CODE, RELATING TO THE BUILDING CODE, ADOPTING THE 1982 EDITION OF THE UNIFORM FIRE CODE, ADOPTING REVISIONS THERETO.

BE IT ORDAINED by the Major and Council of the City of Scottsdale, Arizona, as follows:

SECTION I

9-201 Adoption of Code; copies on file;

A That the document or Code which is on file in the office of the City Clerk of the City of Scottsdale marked, known and designated as "The Uniform Fire Code 1982 Edition and Uniform Fire Code Standards, 1982 Edition" as published jointly by the International Conference of Building Officials, and the Western Fire Chief's Association, and each and all of the regulations, terms and provisions of said code and all appendices, now on file in the Office of the City Clerk of the City of Scottsdale are hereby referred to, adopted and made a part hereby as if set forth at length in this ordinance, and the same shall be and is declared to be the Fire Code of the City of Scottsdale.

B. Three copies of the Fire Code of the City of Scottsdale adopted by this ordinance shall at all times remain in the office of the City Clerk of the City of Scottsdale and be open to inspection by all persons interested therein.

9-202 Establishment of Bureau of Fire Prevention

A. The Uniform Fire Code, as amended herein, shall be enforced by the Bureau of Fire Prevention of the fire Department of the City which is hereby established and which shall be operated under the supervision of the Chief of the Fire Department.

B. A report of the Bureau of Fire Prevention shall be made annually and transmitted to the City Manager of the City. The report shall contain all proceedings under this chapter, with such statistics as the Chief of the Fire Department may wish to include therein. The Chief of the Fire Department shall also recommend any amendments to this chapter which, in his judgment, are desirable.

9-203 Definitions

A. "Chief" shall mean the Chief of the Fire Department.

B. "Fire Department" as used in this chapter, shall mean the Rural/Metro Fire Department or in the event that the City shall provide its own fire protection service shall mean that organization.

C. "Heath Care Facility" means a structure suitable for use as a hospital either general or specializing in the treatment of certain diseases, or suitable for use as a clinic, rehabilitation center, therapy facility, outpatient clinic, nursing home, blood bank, ambulance facility, extended care facility or any combination of the forgoing and shall also include all the customary and necessary supporting services and equipment which include, but are not limited to, dispensary, pharmacy, parking facilities, laundry facilities, nurses' and interns' residences, offices and administration buildings, cafeterias and food service facilities, research, laboratory and diagnostic facilities, education facilities, medical and surgical equipment, tools and machinery, but shall not include such items as fuel and stored energy and supplies or disposable items which are customarily deemed to result in a current operating charge.

D. "Municipality" or "City" as are used in this chapter or in the Uniform Fire Code, shall mean the City of Scottsdale.

E. "Uniform Fire Code" means the Uniform Fire Code, 1982 Edition.

9-204 Explosives and blasting agent; Storage of

The limits referred to the 1982 Uniform Fire Code, in which storage of explosives and blasting agents is prohibited, are hereby established for the entire city.

9-205 Flammable liquids; Storage of

The limits referred to in Section 79.501 of the Uniform Fire Code prohibiting storage a of flammable liquids in outside above ground tanks, are hereby established for the entire city. The definition of `flammable combustible liquids" as used in this Section means Class 1 flammable liquids as defined in Section 79.102(a) and Article 9 of the Uniform Fire Code.

9-206 Bulk storage of liquefied petroleum cases

The limits referred to in Section 82.105(a) of the Uniform Fire Code, restricting bulk storage of liquefied petroleum gas, are hereby established for the entire city.

9-207 Amendments to the Uniform Fire Code

The Uniform Fire Code is locally amended and changed as follows:

Article 2 Organization, authority, duties and procedures

Section 2.108 to read:

This code shall not be construed to hold the public entity, Rural/Metro Fire Department, or any officer or employee responsible for any damage to persons or property by reason of the inspection or reinspection authorized herein or by reason of the approval or disapproval of any equipment or process authorized herein, or for any action in connection with any other official duties.

Section 2.302 Building and Fire Advisory Board

Reference to the `Board" or "the Board of Appeals" in this code shall mean the City of Scottsdale Building Advisory Board of Appeals as established and referred to in Title 2, Chapter 4, Article 6, subsection 2-461 of the Scottsdale Revised Code. The formation, term of office, qualifications of board members, removal, jurisdiction, procedure, quorum, and appeals procedure are hereby adopted and incorporated by reference as though fully set forth herein.

Article 10 General provisions for fire safety

Section 10.206 to read:

No person shall place or keep any post, fence, vehicle, growth, trash, storage or other material or thing near any fire hydrant, fire department connection or fire protection system control valve that would prevent such equipment or hydrant from being immediately discernible or in any manner deter or hinder the fire department from gaming immediate access to said equipment and hydrant. Minimum clearance shall be not less than 3 feet in all directions for the above named fire protection equipment.

Section 10.206 (b) to read:

Areas directly in front of fire hydrants, fire department connections or fire protection system control valve shall be painted to indicate "No Parking", when such connections are not on a public street.

Section 10.206 (c) to read:

All fire department connections shall be located within four feet of the curb line of an access road or public street or as otherwise specified.

Section 10.206 (d) to read:

Fire department connections shall be within appropriate distance of afire hydrant with approved fire flow, as approved by the Chief prior to installation.

Section 10.206 (e) to read:

The Chief may establish fire lanes on private property to provide for access and set-up for firefighting equipment apparatus and vehicles. All fire lanes shall be marked in the following manner:

A. Fire lane signs per Traffic Engineering Detail #101.

B. Curb and street or driveway painted to indicate "Fire Lane". It shall be unlawful for any vehicle, equipment or device to park in or block the fire lane. Any vehicle, equipment or device found parked in or blocking a fire lane shall be cited by police.

Section 10.307 Fire alarm systems, Sec. 10.307 (e)

All buildings equipped with fire alarm systems, automatic or manual, with elevators located in protected buildings shall comply with the Ansi Standard A17.1b-1983.

A. Elevators, three floors and less, shall return to the ground floor and open doors upon activation of the building fire alarm.

B. Elevators, four or more landings, shall return to the ground floor and open car doors upon activation of the building fire alarm. These elevators shall also be equipped with fire service per Ansi Standard A 17.1.

A. A fire service key box shall be located on the ground floor next to the entrance of all elevators.

B. All elevators shall remain out of service until the fire alarm has been reset.

Section 10.309 (a) Sprinkler Systems, is amended to read:

Automatic sprinkler systems shall be installed and maintained in operable condition in the occupancies and locations set forth in this section.

(1) In the following locations in all occupancies and structures for which a building permit is issued after the passage of this ordinance. Group R, Division 3 and Group M residential structures for which a building permit is issued before January 1, 1986, shall not be subject to the requirements of this section.

A. In every story of all buildings.

B. At the top of rubbish and linen chutes and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Sprinkler heads shall be accessible for servicing.

C. In protected combustible fiber storage vaults as defined in the Fire Code.

(2) Group A Assembly Occupancies.

(3) Group E Educational Occupancies:

A. In any enclosed usable space below or over a stairway.

(4) Group I Occupancies, except:

(1) In hospitals of Type I and II fire-resistive and II one-hour construction, the automatic sprinkler system may be omitted from operating, delivery, cardiac, x-ray and intensive care rooms and patient sleeping rooms not exceeding 450 square feet in area when each such room provided with smoke detectors connected to a continuously attended station or location within the building. Increases for area and height specified in Sections 506 (c) and 507 shall not apply when this exception is used.

(2) In jails, prisons and reformatories, the piping system may be dry, provided a manually operated valve is installed at a continuously monitored location. Opening of a valve will cause the piping system to be charged. Sprinkler heads in such systems shall be equipped with fusible elements or the system shall be designed as required for deluge systems in U.B.C. Standard No. 38-1.

(5) Group H Hazardous Occupancies:
   A. In paint spray booths or rooms where hazardous chemicals and magnesium, and calcium carbide are located, as provided in the Fire Code.
(6) Group B, Business, Division 2 Occupancies:
   A. In buildings used for high-piled combustible storage, fire protection shall be in accordance with the Fire Code.
(7) Group R, Residential, Division 1 Occupancies:
   A. In every story of Group R, Division 1, Apartments, townhouses, timeshares, and condominiums.
(8) All Occupancies.
(9) In all basements or cellars of all buildings, subject to the provisions of paragraph "(1)" herein.

Section 10.309 (c)

When the automatic fire extinguishing system described above is installed, the following reductions from the requirements of this Code are permitted:

1. Commercial sprinkler systems in structures up to 7500 square feet and three floor levels or less in the light hazard group may be supplied from the domestic water system.
2. All R-1 occupancies three floor levels or less may use an approved domestic water supply in areas not used for assembly.
3. Fast response sprinkler heads are to be used in all R-1 occupancies and multi-family dwellings.
4. All sprinkler systems connected to a domestic water supply must use fast response sprinkler heads with small orifices for low water discharge.
5. Multi-family, hotels, motels, resorts, timeshares and condominiums may have up to six units supplied by domestic water with calculations approved by fire department.

Section 10.312 Wet standpipes to read:

General:

A. Wet standpipes shall be required in all occupancies where floor area exceeds 10,000 square feet per floor.
B. Required wet standpipes may be an integral part of an approved sprinkler system provided calculations for required fire flow have been submitted with sprinkler plans.

Section 10.314 Fire hydrants

A. Residential streets shall have fire hydrants on an average spacing of between one thousand feet and a maximum of one thousand three hundred twenty feet.
B. Educational, industrial, commercial, institutional, mercantile, multi-family housing and storage areas shall have fire hydrants on an average spacing of seven hundred feet.
C. Subsections (a) and (b) of this section may be modified by the Chief of the Fire Department or designee when features of the area, building construction details or practical difficulties prohibit the enforcement of the code, provided that the spirit of the code shall be observed, public safety secured and substantial justice done.

ARTICLE 11 Asphalt Kettles

Section 11.403 (a) amended to read:

1. A permit shall be obtained from the Fire Department by all operators or owners of asphalt or tar kettles at least forty-eight hours prior to starting work on any structure within the city limits.
2. It shall be unlawful to transport or permit to be transported any asphalt kettle beneath which is maintained any open fire, heated coals or ashes over any highway, road or street. Asphalt kettles shall not be used inside of or on the roof of any building.

Section 11.403 (b)

There shall be at least one approved fire extinguisher of a minimum 20 B.C. classification within thirty feet of each asphalt kettle during the period such kettle is in use, and one additional 20 B.C. classification fire extinguisher on the roof being covered.

Section 11.403(c) amended to read:

Every kettle shall be equipped with a tight fitting cover. Every kettle shall have an operable gauge or thermostat at all times when in use.

Section 11.403 (d) added to read:

The fuel source shall be a minimum of twenty-five feet from the kettle and supported in an upright position during operation of the kettle.

Article 12 Exit signs

Section 12.114 (a)

At every required exit doorway, and whenever otherwise required to clearly indicate the direction of egress, an exit sign with letters having principal stroke not less than three-quarter inch wide and at least six inches high shall be provided from all areas. In interior stairways, the floor level leading directly to the exterior shall be clearly indicated.

Exception:

Main exterior exit doors which obviously and clearly are identified as exits, need to be sign posted when approved by the Chief.

Section 12.113(c) Illumination of Exit signs

Exit signs shall be lighted with two electric lamps of not less than fifteen watts each, in the following manner:

1. Two separate sources of supply shall be provided for the following occupancies:

A. Group A. Division 1 occupancies.
B. Division 2 and 2.1 of Group A occupancies with an occupant load of over five hundred persons.
C. Group 1 occupancies with an occupant load of over one hundred persons.
D. Group R, Division I occupancy with an occupant load over one hundred persons.
E. Group B, Division 2 occupancy with an occupant load over five hundred persons.

2. Separate circuits, one of which shall be separated from all other circuits in the building and independently controlled, shall be required for all other occupancies with an occupant load or floor area requiring two or more exits.

Article 77 Explosives and blasting agents

Section 77.308 Threatening to damage by use of fire or explosives

A. Any person who willfully makes any threat, or conspires to threaten or conveys false information knowing the same to be false, concerning an attempt or alleged attempt being made or to be made, to kill, injure, or intimidate any individual or unlawfully damage or destroy any building, vehicles or other real or personal property by means of an explosive, blasting agent, or fire, shall be guilty of a misdemeanor punishable by a fine of not exceeding three hundred dollars or imprisonment for a term not exceeding three months, or both such fine and imprisonment.

Article 79 Warning labels for containers of liquids

Section 79.106 (a) Amended to read:

(a) Areas in which hazardous chemicals are stored or used shall be marked with warning signs in compliance with National Fire Protection Standard #704M, Fire Hazards of Materials, 1980 Edition.

9-208 Penalties

Any person, firm, association, partnership or corporation violating any of the provisions of this code shall be deemed guilty of a Class One misdemeanor, and each said person shall be deemed guilty of a separate offense for each day or portion thereof, during which any violation of any of the provisions of this Code is committed, continued or permitted, and upon conviction of any said violation, such person shall be punishable by a fine not to exceed one thousand dollars or imprisonment for a tern not to exceed six months, or by both such fine and imprisonment. The application of the above penalty shall not be held to prevent the enforced removal of prohibited conditions.

Section 11 Design Freedoms

A. The following design criteria, shall be applied to all multi-family dwellings, single family dwellings, and subdivisions throughout the City. . These design criteria shall be in addition to and shall supplement any other design criteria contained in this Ordinance and in the Uniform Fire Code, 1982, as adopted.

1. Emergency Access to Structures
   Every building hereafter constructed shall be accessible to Fire Department apparatus by way of one access roadway, unless in the written opinion of the Fire Chief or designee, additional access points are necessary to protect the health, safety and welfare of the citizens.
2. Access Around Structures
   Access around structures must, in the written opinion of the Fire Chief or his designee, be sufficient for Fire Department apparatus. The 360 degree access around structures is no longer mandatory.
3. Street Width (non-hillside development)
   a. Minimum street width shall be 28 feet from back of curb to back of curb or larger.
   b. Cul-de-sacs shall not be longer than 2000 feet.
   c. Cul-de-sacs 1200 feet or less are not required to have a fire hydrant located on the cul-de-sac.
4. Main Size
   a. Main size in cul-de-sacs of 1200 feet or less in length may be reduced from 8 inch to 6 inch, based on minimum pressure and flow necessary to provide proper functioning of domestic and fire protection appliances.
   b. Further reductions may be permitted with written approval of the City Manager or designee.
5. Use of non-potable water for fire protection
   a. All commercial structures for which a building permit is issued after June 30, 1985, adjacent to golf courses using non-potable or reclaimed water for irrigation with sufficient storage capacity on site, may be sprinklered using this supply.
   b. Irrigation systems shall be designed to meet the Fire Department's standards of gallons per minute flow and pressure necessary to supply adequate fire flow.
   c. Standby power supply for pumping station supplying fire flow shall be provided.
   d. Fire hydrants on domestic supply shall be placed in close proximity to the Fire Department connection for structural sprinkler systems to provide a secondary water supply.
   e. Fire hydrants placed on approved non-potable systems shall be properly marked and placarded to indicate a non-potable water supply exists in this system. Non-potable water supplies shall use approved material for construction of all mains and supply lines and shall have the written approval of the City Manager or designee.
   f. All water inlets shall be required to have sufficient straining and filtering capacity to eliminate all foreign objects from blocking sprinkler orifice. Chlorination of inlet lines shall be required.
7. Fire alarms
   a. All manual pull stations shall be eliminated, except Group I, Institutional Occupancies.
   b. Audio visual requirements for structures shall be limited to those necessary for adequate warning of an emergency situation.
   c. All sprinkler supply valves shall be provided with tamper control.
   d. All structures with an excess of 100 sprinkler heads shall be required to be monitored by an approved central station.
   e. Residential sprinkler supply shall have a tamper and flow control with local alarm.
   f. All sprinkler supply control valves are to have tamper and monitoring capabilities.

g. Owner option of local or central station monitoring of activation of flow is permitted in residential occupancies.
h. All smoke detectors shall be of the single station type and are not required to be monitored.

8. Fire Extinguisher Placement
   a. Fire extinguishers shall be located a maximum of 150 feet apart in all occupancies.
   b. A minimum of one fire extinguisher shall be required in all occupancies. Single family dwellings are excluded from this requirement.
   c. In all occupancies, the location of fire extinguishers is determined by Fire Department written standard.

SECTION II Severability

Should any section, paragraph, sentence, clause or phase of this Ordinance or the application of same to a particular set of persons or circumstances be declared unconstitutional or invalid for any reason, the remainder of such ordinance shall not be affected thereby, it being the intent that the provisions of this Ordinance are severable.

SECTION III

That the Scottsdale Revised Code, Sections 5-103.D.2, 5-103.D.3, 5-103.17.2 (b), 5-103.x.2,5-103.x.3, and 5-103.L, relating to the Building Code, are amended to read:

5-103.F.2.(b)

(b) Special Provisions. Group R, Division 1 Occupancies more than two stories in height or having more than 3,000 square feet of floor area above the first story, shall be not less than one hour fire resistive construction throughout except as provided in Section 1705(b)2.

Storage or laundry rooms that are within Group R, Division 1 Occupancies that are used in common by tenants shall be separated from the rest of the building by not less than one hour fire resistive occupancy separation.

Every apartment house three stories or more in height or containing more than 15 dwelling units and every hotel three stories or more in height or containing 20 or more guest rooms shall have an approved fire alarm system as specified in the Fire Code.

Exception: An alarm system need not be installed in buildings not over two stories in height when all individual dwelling units and contiguous attic and crawl spaces are separated from each other and from public or common areas by at least one hour fire resistive occupancy separations and each individual dwelling unit has an exit direct to a yard or public way.

For Group R, Division 1 Occupancies with a Group B, Division 1 parking garage in the basement or first floor, see Section 701 (a). For attic space partitions and draft stops, see Section 2516(f).

As a substitution for area separation walls and associated parapets, common walls of townhouses may be constructed entirely of non-combustible materials approved for a four hour fire resistive time period. The walls should terminate at the underside of roof sheathing and no penetration is allowed between units.

5-103.K.2

2. Section 3305(g) is amended by adding the following to the list of exceptions.
   5. Corridor walls and ceilings need not be of fire resistive construction within office spaces having an occupant load of 100 or less when the entire story in which the space is located is equipped with an automatic sprinkler system throughout and smoke detectors are installed in the corridors in accordance with their listing.
   6.5 Elevator vestibule doors in office buildings when the building is 3 stories or less in height and the elevator door itself is of fire resistive construction.

5-103.K.3

Section 3305(j) corridor substitution. Three eights inch tempered glass with low temperature sprinkler heads, installed on each side, as approved by the Fire Department, may be used as a substitute for 1/4" wire glass in one hour fire resistive corridors. When tempered glass is substituted for wire glass, the total area of all openings in any portion of an interior corridor shall not exceed 50% of the area of the corridor wall of the room which it is separating from the corridor.

5-103.L

L. Chapter 38

1. Section 3802(b) is amended to read:

   Section 3802(b) In all occupancies, except Group R, Division 3, Group R, Division 1 standard plan townhouses, and Group M residential structures for which a building permit is issued before January 1, 1986, an automatic sprinkler system shall be installed.

   1. In every story or basement or cellar of all buildings, when the total floor area of the building exceeds zero (0) square feet. See section 3802(g) for exceptions for Group I Occupancies. Fire resistive substitution in accordance with the provisions of Section 508 is allowed for this subsection provided that the automatic sprinkler provided is not otherwise required by any other provision of Chapter 38 or any other section of this Code.
   2. At the top of rubbish and linen chutes and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Sprinkler heads shall be, accessible for servicing.
   3. In protected combustible fiber storage vaults as defined in the Fire Code.

PASSED AND ADOPTED BY THE COUNCIL OF THE CITY OF SCOTTSDALE, ARIZONA this 4th day of June 1985.

HERBERT R. DRINKWATER, Mayor

ATTEST:

ROY R. PEDERSON, City Clerk

By
BETTY WARREN, Deputy City Clerk

APPROVED AS TO FORM:

WILLIAM E. FARRELL, City Attorney

SECTION 4

WHAT SCOTTSDALE ORDINANCE 1709 WILL DO FOR YOU

WHAT SCOTTSDALE ORDINANCE 1709 WILL DO FOR YOU AS A DEVELOPER AND BUILDER

1. **Water and Hydrant Systems**
   - A. Double hydrant spacing
     1. Commercial hydrant spacing will change from 330 feet on center to 700 feet on center with special attention to on-site hydrants.
     2. Residential hydrant spacing will be 1,000 to 1,300 feet, up from the normal 660 feet. This will allow for hydrant placement at the entrance to cul-de-sacs with possible reduction in main size in cul-de-sacs.
   - B. Reduced main size required in projects
     Due to the reduction of the required amount of water, mains in projects can be reduced in size (8" main to 6" main).

2. **Water Storage**
   - A. Smaller water storage tanks can be required due to the smaller fire flow demand.

3. **Use of Reclaimed Water…"Gray Water"B**
   - A. The use of golf course watering systems for commercial fire protection will reduce the need for large water mains as part of the project.
   - B. Major reduction of storage for commercial buildings, due to the on-site storage of golf course water.

The reduction of water storage for standby fire protection allows the City of Scottsdale to use the supply for other projects thus reducing the chance of a water shortage.

4. **Fire Department Access**
   - A. Two means of access to residential projects will not be required.
     1. Better security of project.
     2. Possible additional building lot
        (Second access for emergency vehicles.)
   - B. Access Around buildings
     1. 360 degree access no longer required
     2. Reduction of fire lanes
     3. Reduction of on-site fire hydrants
     4. Land use returned to developer and builder

5. **Street Width**
   - A. In non-hillside projects, streets may be reduced to 28', back of curb to back of curb.

6. **Cul-de-Sacs**
   - A. The new code allows cul-de-sac length to go to 2,000 feet, 1,400 feet longer than existing code. More prime lots. Better use of land. Less traffic in residential setting.

7. **Fire Alarm Requirements**
   - A. All manual pull stations shall be eliminated (except in health care occupancies).
   - B. Single station smoke detectors in all occupancies, not required to be monitored.
   - C. Fire alarms not required in multi-family buildings with twelve or more units.

8. **Fire Extinguisher Placement**
   - A. Fire extinguishers now can be a maximum of 150' apart. (The old code is 75' maximum.)

9. **Building Code**
   - A. The Ordinance removes all requirements in the building code that commercial structures have a minimum fire rating. (Nonfire rated structures are now permitted.)

SECTION 5

MYTHS ABOUT SPRINKLERS

MYTHS ABOUT SPRINKLERS

People say, "Sprinklers cause water damage."

But in fact, tests by various fire departments and the U.S. Fire Administration have proven that sprinklered properties have far less damage from water than unsprinklered properties . . . up to 85% less.

People say, "Sprinklers are too expensive to install."

But in fact. installation of sprinklers will reduce the cost of homeowners' insurance to a point where the system will be paid for in as little as five years. Add this savings to reduced building requirements and slower fire department growth, and the citizens' savings is ongoing.

People say, "Sprinklers all trip if one is activated by fire."

But in fact, 98% of all fires in homes are controlled with the activation of one sprinkler head. In most commercial buildings, three heads control the fire.

People say, "Sprinkler heads trip for no reason, causing unnecessary water damage."

But in fact, only one in 16,000,000 trip without being damaged by some means other than fire.

Some people say, "Sprinkler heads look bad in the home."

But in fact, changes in sprinkler head design have resulted in sprinkler heads that are small with no more than 3/4" protruding from the finished wall.

Some people say, "Piping may cause water leaks in their home."

But in fact piping systems for sprinklers are tested at 200 pounds per square inch for two hours. This is approximately two to three times greater than the water pressure used in homes or for the sprinkler system under normal conditions.

Some people say, "Smoke detectors will do the job, why sprinkler?"

But in fact, smoke detectors and sprinklers can reduce the loss of life by 98.5% . . . an increase of 48.5% over smoke detectors alone.

Some people say, "Why do I have to place sprinklers in my home; they might trip while I am on vacation?"

But in fact, sprinklers trip at 165 degrees. This temperature can only be reached in a home with a true fire, not by any other means.

Some people say, "If I have a fire and I am not home, the water will do more damage than the fire."

But in fact, all systems will have a local alarm bell on the outside of the building to alert people that the home has a water flow 'aside. The flow switch may also be monitored by an alarm company that would notify the fire department of the flow.

Some people say, "How can sprinklers save water?"

But in fact, water storage and pipe size can be reduced with a savings of up to 50% of the water required in standard fire hydrant systems.

ORDINANCE NO. 2939

AN ORDINANCE OF THE COUNCIL OF THE CITY OF SCOTTSDALE, MARICOPA COUNTY, ARIZONA, AMENDING CHAPTER 36, ARTICLES II AND III OF THE SCOTTSDALE REVISED CODE RELATING TO THE FIRE CODE, ADOPTING THE 1994 EDITION OF THE UNIFORM FIRE CODE AND ADOPTING REVISIONS THERETO, AND DECLARING AN EMERGENCY.

BE IT ORDAINED by the Council of the City of Scottsdale, Maricopa County, Arizona, as follows:

Section 1. Chapter 36, Article 11, Fire Code, Sections 36-16 through 36-18 are hereby amended to read per Exhibit "A" attached hereto and incorporated herein by reference.

Section 2. The immediate operation of the provisions of this Ordinance is necessary for the preservation of the public peace, health, safety and welfare, an emergency is declared to exist, and this Ordinance shall be in full force and effect from and after its final passage and adoption by the City Council.

PASSED AND ADOPTED by the Council of the City of Scottsdale this 30th day of September, 1996.

CITY OF SCOTTSDALE, an
Arizona municipal corporation

By: _____
Sam Kathryn Campana, Mayor

ATTEST

_____
Sonia Robertson, City Clerk

APPROVED AS TO FORM:

_____
Fredda J. Bisman, City Attorney

EXHIBIT A
to
ORDINANCE NO. 2939

ARTICLE II. FIRE CODE
DIVISION 1. GENERALLY

Sec. 36-16. Definitions

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning.

Chief means the chief of the fire department.

Duly authorized agent shall mean an individual employed by Rural/Metro Fire Department who has been appointed by the fire chief, in writing, to have the authority to issue civil fire code violations. Such authorization shall be filed with the City Clerk.

Fire Department means the Rural/Metro Fire Department or, in the event that the City shall provide its own fire protection service, that organization.

Hillside landform area is defined as any parcel of land or portion thereof with surface slope that can easily exceed 15%. Where major collection streets have a maximum grade of 9%, and minor and local collector streets have a maximum grade 12°/a, and local residential streets have a maximum grade of 15%.

Nicet means the national institute for the Certification of Engineering Technologies, 1420 King Street, Alexander, VA 22314-2915.

Uniform Fire Code means the Uniform Fire Code, 1994 edition.

Uniform traffic complaint shall mean the form approved by the State Supreme Court in their Rules of Procedure in Civil Traffic Violation cases.

Sec. 36-17. Assumption of Jurisdiction; Adoption.

(a) Pursuant to the provisions of A.R.S. section 41-2163(a)(2), the City of Scottsdale, having in effect a nationally recognized fire code, does hereby assume jurisdiction from the State Fire Safety Committee for prescribing and enforcing minimum fire prevention standards with the City of Scottsdale, except for state or county owned buildings and public schools.

(b) The Uniform Fire Code, 1994 edition, the Uniform Fire Code Standards, 1994 edition, as published jointly by the International Fire Code Institute and all appendices are adopted by reference and shall be the fire code of the city. One copy of same shall at all times remain in the office of the City Clerk and be open to inspection.

Exceptions: 1. UFC appendices 1-C, IIB, II-D, IV-A, VI-D are adopted as code.
2. UFC appendices II-F, and III-B are deleted from adoption.

Sec. 36-18. Amendments.

The Uniform Fire Code, 1994 edition, is amended in the following respects:

Section 101 is amended by adding subsection 101.6.1 as follows:

"101.6.1 Conflicting References. When the 1994 Uniform Fire Code Standards are in conflict with the National Fire Protection Association (NFPA) Standards, which are incorporated by reference, The Most stringent shall apply, except as amended in this ordinance."

Section 103, Subsection 103.1.4 is amended to read:

"103.1.4 Board of Appeals "Reference to the "board" or "the board of appeals" in this code shall mean the building advisory board of appeals as established and referred to in Chapter 31, Article II of the Scottsdale Revised Code. The formation, term of office, qualifications of board members, removal, jurisdiction, procedure, quorum, and appeals procedure are hereby adopted and incorporated by reference as though fully set forth herein."

Section 216-0 is amended by adding the following:

Division 4

"Group R, Division 4 occupancies shall be residential group care facilities for ambulatory, nonrestrained persons, who may have a mental or physical impairment (each accommodating one (1) to ten (10) clients or residents, excluding staff). Restraint of any occupants requires a Group I occupancy classification."

Section 901, subsection 901.4.2 is amended to read and 901.4.3.1 is added as follows:

"901.4.2 "Fire Apparatus Access Roads. The chief may establish fire lanes on public and private property for

access and set-up for firefighting equipment apparatus and vehicles. See fire department written standards. All fire lanes shall be marked m the following manner:"

"1. Fire lane signs per Traffic Figure 10-3, Section 10, Design Procedures and Criteria; and/or

2.Curb and/or street or driveway painted Red to indicate fire lane and labeled "FIRE LANE NO PARKING" to indicate fire lane."

"It shall be unlawful for any vehicle, equipment or device to park in or block the fire lane. Any vehicle, equipment or device found parked in or blocking a fire lane shall be cited by police or the fire department."

"901.4.3.1. Fire Hydrants. All fire hydrant barrels aboveground shall have a prime coat plus two (2) coats of fire hydrant yellow paint."

"901.4.3.2. Reflective Markers. All fire protection equipment, fire department inlet connections and hydrants shall be clearly identified by installation of reflective blue markers. See also section 1001.7."

Section 902, subsection 902.2.2.1.1 is added and 902.4 is amended as follows:

"902.2.2.1.1 City of Scottsdale Design Standards. For road construction details, see City of Scottsdale Design Standards."

"902.4 Key Boxes. When access to or within a structure or an area is unduly difficult because of secured openings or where immediate access is necessary for lifesaving or firefighting purposes, the chief is authorized to require a key box to be installed in an accessible location. The key box shall be a type approved by the chief and shall contain keys to gain necessary access as required by the chief"

"A key box shall be required on all commercial structures that contain off-site monitored fire systems or when required by the chief. The key box shall be installed in a location adjacent to the MAIN entrance of the structure. 4'00" (1219.2mm) to 6'-0" (1829.8mm) above finished grade."

Section 903, subsection 903.4.2, 903.4.2.2 are amended and 903.4.2.1, 903.5.1, 903.5.2, 903.5.3, 903.5.4 are added as follows:

"903.4.2 Fire Hydrant Spacing. Fire hydrants shall be spaced at the following maximum on center distances, measured on the street:

"1. R-3 Developments, Non-Hillside. One thousand two hundred (1200) feet (365, 760 mm) on center."
"2. R-3 Developments, Hillside. Six hundred (600) feet (182,880mm) on center. (Fire department interprets street grades to range from 9% to a maximum grade of 15%)
"3. All commercial and R-1 mufti-family developments, Seven hundred (700) feet (213,360mm) on center.

"Fire hydrants shall be accessible to the fire department apparatus by roads meeting the requirements of section 902.2. See City of Scottsdale Design Standards and policy manual for design and construction details."

"903.4.2.11 Dead-ends. On cul-de-sacs in residential and commercial developments, the maximum distance to a hydrant shall not exceed one half ('/z) of the maximum allowable distance between fire hydrants designated in 903.4.2."

Exception: Hillside shall have a maximum of six hundred (600) feet (182,880mm) from a hydrant to the dead end.

"903.4.2.2, Subsections 903.4.2 and 903.4.2.1 of this section may be modified by the chief of the fire department or designee when features of the area, building construction details or practical difficulties prohibit the enforcement of the code, provided that the spirit of the code shall be observed, public safety secured and substantial justice done."

"903.5.1 Fire Department Connections. Fire department connections shall be located within four (4) feet (1219.2mm) to eight (8) feet (2438.4mm) of the curbline of an access road or public street, or as otherwise T 'fed, or as approved by the chief The access to the fire department connection shall be at curb grade. See fire department written standards."

"903.5.2 Distance to Hydrants. Fire department connections in all occupancies shall be within 350 feet (106,680mm) of afire hydrant with approved fire flow, or as otherwise designated, or as approved by the chief prior to installation."

"EXCEPTIONS:
"1. In H occupancies the fire department connections shall be within 150 feet (45.720mm) of afire hydrant with approved fire flow."
"2. R-3 Residential and R-1 Mufti-family residential occupancies."

"903.5.3 Supply Line. The fire department connection line shall be a wet line with the check valve at the hose connection above grade. See fire department written standards."

"903.5.4. Wall Mounted. Systems may have wall mounted fire department connections only on light and ordinary hazard systems when there are no structural openings or combustible hangings within 15 1 et (4572mm) horizontally or vertically from inlet connection. See fire department written standards."

"903.5.5 Group R, Division I. In Group R, Division 1 occupancies the wall mounted fire department connection shall be accessible on the street side (access side) of the building located below the alarm bell at the main system control valve in accordance with fire department written standards."

Section 1001, Subsection 1001.4.1 and 1001.7.2 are amended and 1001.3.1, 1001.5.1.1, 1001.7.2.1 are added as follows:

"1001.3.1 Plan Certification. All fire alarm plans submitted to the fire department for review and approval shall bear a review certification of a minimum level II NICET (National Institute for the Certification of Engineering Technologies) and a completed certificate of completion. See U.F.C. standards 10.4."

"1001.4.1 On Site Plans. Plans and specifications shall be submitted to the fire department for review and approval prior to construction. One set of fire department approved plans shall be on the job site at all times."

"1001.5.1.1 Annual Inspection. Sprinkler system in commercial and mufti-family occupancies shall be inspected annually and tested in accordance with N.F.P.A. 25 and City of Scottsdale sprinkler standards by a contractor with an Arizona State L-16 license."

"1001.7.2 Clear Space and Access. A 3 foot (914.4mm) clear space shall be maintained around the circumference and in the access way to front of fire hydrants, exterior fire protection control valves and fire department inlet connections except as otherwise required or approved by the chief."

"1001.7.2.1 No Parking. A 15 foot (4572mm) wide no parking area directly in front of the fire protection equipment shall be maintained free from vehicle obstructions."

Section 1002, subsection 1002.1 is amended to read:

"1002.1 General. A minimum of one (1) portable fire extinguisher shall be installed in all occupancies."

Exceptions:

"1. R-3 occupancies (i.e., one-family residences) and sprinklered R-1 occupancies (i.e., mufti-family residences) 3 stories or less."

"2. Sprinklered open parking garages."

"3. Occupancies where an extinguisher is in a secured accessible location within 75'-0" (22,860mm) maximum travel distance of all portions of the occupancy."

"Portable fire extinguishers shall be in accordance with U.F.C. Standards. In all occupancies, the location of fire extinguishers are designated by fire department standard or as may be determined by the chief."

Section 1003, Subsection 1003.1.2 is amended and subsection 1003.1.3 is added as follows:

"1003.1.2. Standards. Fire extinguishing systems shall comply with U.B.C. Standards Nos. 9-1, 9-1, 9-3 applicable National Fire Protection Association Standards, Section 1003.2.1 and fire department written standards."

"Exceptions:

1. Automatic sprinkler systems may be connected to the domestic water supply main when approved by the chief and the water department, provided the domestic water supply is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements. In R-3 occupancies fire sprinkler piping shall connect to the domestic supply after the meter and after the main domestic shut off valve. Other than the combined shut off valve there shall be no connection for any purpose between the water meter and the fire sprinkler connection. All sprinkler systems connected to the domestic water supply must use quick response sprinkler heads with small orifices for low water discharge."

"1003.1.2.1 All fire sprinkler plans submitted to the fire department for review and approval shall bear a review certification of a minimum level III NICET Technician (National Institute For the Certification of Engineering Technologies) in accordance with fire department written standards."

"1003.1.3 Modifications. For additions, alterations and repairs see 1003.2.9

Section 1003, Subsection 1003.2.1, 1003.2.2, 1003.2.3, 1003.2.4, 1003.2.5, 1003.2.6. and 1003.2.8, 1003.2.9 are amended and subsection 1003.2.7 is added as follows:

"1003.2.1 General. An automatic sprinkler system shall be installed and maintained in operable, condition in all occupancies, structures and locations as set forth in this section."

"For special provisions on hazardous chemicals and magnesium, aerosol products, and calcium carbide, see Sections 1003.2.1 and Articles 48, 49, 79, 80, 81 and 88."

"1003.2.2 An automatic sprinkler system shall be installed throughout all levels of all new Group A, B, E, F, H, 1, M, R S and U occupancies of more than zero (0) square feet and m protected combustible fiber storage vaults as defined in the Fire Code in accordance with Section 1003, fire department written standards and as set forth in this section. In building service chutes, sprinkler heads shall be accessible for servicing. There shall be no sprinkler deletions in bathrooms."

Exception: "The following accessory structures shall be exempt from fire sprinkler requirements:

1. Gazebos and ramadas for residential and public use.
2. Independent restroom buildings that are associated with golf courses, parks and similar uses.
3. Guardhouses for residential and commercial developments.
4. Detached carports for residential developments.
5. Barns, horse stalls and agricultural buildings for private, residential, non-commercial use, not exceeding 1,500 square feet (139.35m2).
6. Detached storage sheds for private, residential, non-commercial use, not exceeding 1,500 square feet (139.35m2).
7. Detached 1, 2 and 3 car garages (without habitable spaces) in existing R-3 developed parcels which contain existing non-sprinklered subdivision requirements (i.e., 700 foot (213,360mm) hydrant spacing.
8. For fuel dispensing canopies, see 5201.9.1"

"1003.2.3. Group A Occupancies.

"1003.2.3.1 General. An automatic sprinkler system shall be installed throughout Group A occupancies in accordance with Section 1003.1.2 thru 1003.2.2 and 1003.2.3."

"1003.2.3.2 Stairs. The automatic sprinkler system shall also be installed in enclosed usable space below or over a stairway in Group A, Divisions 2.2.1, 3, and 4 occupancies."

"1003.2.3.3 Amusement Buildings. An automatic sprinkler system shall be installed in all amusement buildings. The main water flow switch shall be electrically supervised. The sprinkler main cutoff valve shall be supervised. When the amusement building is temporary, the sprinkler water supply system may be of an approved temporary type.

"Exception:
An automatic sprinkler system need not be provided when the floor area of a temporary amusement building is less than one thousand (1,000) square feet (92.9m2) and the exit travel distance from any point is less than fifty (50) feet (15,240mm)."

"1003.2.4 Group E Occupancies.

"1003.2.4.1 General. An automatic sprinkler system shall be installed throughout all Group E occupancies in accordance with section 1003.1.2 thru 1003.2.4.1 and 1003.2.4."

"1003.2.4.2 Stairs. The automatic sprinkler system shall be installed in enclosed usable space below or over a stairway."

"1003.2.4.3 Sprinklers. Quick response sprinkler heads are to be used in all occupied areas in accordance with U.L. listing."

"1003.2.5 Group H Occupancies.

"1003.2.5.1 General. An automatic sprinkler system shall be installed throughout all Group H occupancies in accordance with Section 1003.1.2. thru 1003.2.5.2 and 1003.2.5."

"1003.2.5.2 Group H Division 6 Occupancies. In buildings containing Group H, Division 6 occupancies, the design of the sprinkler system shall be not less than that required under U.B.C. Standard No. 9-1 for the occupancy classifications as follows:"

Location	Occupancy Hazard Classification
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Exit corridors	Ordinary Hazard Group 2

"When the design area of the sprinkler system consists of a corridor protected by one row of sprinklers, the maximum number of sprinklers that need to be calculated is 13."

"1003.2.6 Group I Occupancies.
"1003.2.6.1 General. An automatic sprinkler system shall be installed throughout Group I occupancies in accordance with Section 1003.1.2 thru 1003.2.2 and 1003.2.6."

1003.2.6.2 Sprinklers. Quick response sprinkler heads are to be used in all occupied areas in accordance with U.L. listing."

"Exceptions:
In jails, prisons and reformatories, the piping system may be dry provided a manually operated valve is installed at a continuously monitored location. Opening of the valve will cause the piping system to be charged. Sprinkler heads in such systems shall be equipped with fusible elements or the system shall be designed as required for deluge systems in NFPA Standard No. 13 and U.B.C. Standard No. 9-1."

"1003.2.7 General. An automatic sprinkler system shall be installed throughout all Group M occupancies in accordance with Section 1003.2.2."

"1003.2.8 Group R Occupancies."

"1003.2.8.1 Group R-1. When Attic Protection is Required. In Group R., Division 1 occupancies, an automatic sprinkler system in accordance with NFPA Standard 13-R as modified by fire department written standards, shall be installed throughout every apartment house three or more stories in height or containing more than 15 dwelling units, and every hotel three or more stories in height or containing 20 or more guest rooms. Residential or quick response standard sprinkler heads shall be used in the dwelling unit and guest room portions of the building. Standard sprinkler heads shall be used to protect the attic with a minimum 4 head or 500 square feet (46.5m2) calculated area. Occupant notification shall be in accordance with Article 10. There shall be no sprinkler deletions in bathrooms, closets, containing any electrical or mechanical equipment, foyers, garages, accessible areas under interior stairs or landings, or exterior balconies, covered patios or landings or attics.

"1003.2.8.2 Group R-1. When Attic Protection is Not Required. In Group 4., Division 1 occupancies an automatic sprinkler system in accordance with NFPA Standard 13-R as modified by fire department written standards, shall be installed throughout every apartment house 2 or less stories in height and containing 15 or less dwelling units and every hotel 2 or less stories in height and containing 19 or less guest rooms. Residential, or quick response standard sprinkler heads shall be used in the dwelling units, guest rooms, convening corridors, and all occupied areas. There shall be no sprinkler deletions in bathrooms, closets containing any electrical or mechanical equipment, foyers, garages, accessible areas under interior stairs or landings, or exterior balconies, covered patios or landings."

"1003.2.8.3 Group R-3. Occupancies Under 7500 Square Feet (697.5m2). In Group R, Division 3 occupancies an automatic sprinkler system m accordance with NFPA Standards 13-D, as modified by fire department written standards, shall be installed throughout every building. There shall be no sprinkler deletions in bathrooms, closets containing mechanical or electrical equipment, foyers, garages, or accessible areas under interior stairs or landings."

"1003.2.8.4 GROUP R-3 OCCUPANCIES 7500 SQUARE FEET (697.5M2) OR MORE. IN GROUP R, DIVISION 3 OCCUPANCIES 7500 SQUARE FEET (697.5M2) OR MORE AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH NFPA STANDARD 13-D AS MODIFIED IN 1003.2.8.4.1 AND FIRE DEPARTMENT WRITTEN STANDARDS, SHALL BE INSTALLED THROUGHOUT EVERY BUILDING. THERE SHALL BE NO SPRINKLER DELETION IN BATHROOMS, CLOSETS CONTAINING MECHANICAL OR ELECTRICAL EQUIPMENT, FOYERS, GARAGES OR ACCESSIBLE AREAS UNDER INTERIOR STAIRS OR LANDINGS."

"1003.2.8.4.1 CALCULATED AREAS. THE CALCULATED AREA SHALL BE INCREASED FROM UP TO 2 HEADS IN A COMPARTMENT TO UP TO 4 HEADS IN A COMPARTMENT."

"1003.2.8.5 Group R, Division 4. In Group R, Division 4 occupancies, an automatic sprinkler system in accordance with NFPA Standard 13-D as modified by fire department written standards shall be installed throughout every building. There shall be no sprinkler deletions in bathrooms, closets containing mechanical or electrical equipment, foyers, garages, or accessible areas under interior stairs or landings."

"1003.2.8.6 Domestic Water Supplies. R-1 occupancies may have up to six (6) units supplied by domestic water."

"1003.2.8.7 Sprinklers. Systems supplied by domestic water must use quick response residential sprinkler heads with small orifices for low water discharge throughout all occupied areas in accordance with U.L. listing and fire department written standards."

"1003.2.9 Additions, alterations and repairs.

"1003.2.9.1 General. When additions, alterations and repairs within a twelve month period exceed the value of any existing structure or building by twenty-five (25) percent in all B, E, F, H, I, M, U, S and R occupancies and ten (10) percent in A occupancies, an automatic fire sprinkler system shall be installed throughout the entire structure or building in accordance with this section. See Scottsdale amendments to the 1994 Uniform Building Code."

"1003.2.9.2 Partial Systems Prohibited. In all new additions to existing buildings and structures an automatic sprinkler system shall be installed in accordance with this section. There shall be no partially sprinklered compartments. Sprinklered and unsprinklered parts of a structure shall be separated in accordance with all applicable codes and standards."

"Exception:
Structures in existing R-3 developed parcels which contain existing nonsprinklered requirements (i.e., seven hundred foot (213,360mm) hydrant spacing."

"1003.2.9.3 Furring, or other means of altering or modifying room sizes for the purpose of deleting fire sprinklers from compartments such as closets is prohibited without resubmittal of building plans thru building department review."

Section 1004, Subsections, 1004.1.1, 1004.2 and 1004.5 are amended to read:

"1004.1.1 General. Standpipes shall comply with the requirements of this section, fir department written standards and U.B.C. Standards."

"1004.2 Where Required. Wet 2 "/z" standpipe systems with two-and-one-half inch outlets are required per table 1004-a and in all structures that exceed ten thousand (10,000) square feet (929m2) when 360 degree access is not provided as defined in 902.2.1."

"Exception:
1. Single story structures are not required to have hose valves, except in those interior portions of the building that exceed 150 feet (45,720mm) of travel from an emergency access road."
2. Unless required by table 1004-a hose valves are not required in Group R, Division 1 occupancies with exterior open egress (stairs, landings, walkways)."
3. Required wet standpipes may be an integral part of an approved sprinkler system and may be connected to the sprinkler systems' horizontal cross mains. Calculations for required fire flow shall be submitted with sprinkler plans.
4. Unless required by table 1004-a hose valves are not required in Group R, Division 3 occupancies."

"1004.5 Location of Class III standpipes. Class III standpipe systems shall have outlets located as required for Class I standpipes in Section 1004.3 and shall have Class II outlets as required in Section 1004.4."

"Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems."

"Exceptions:
1. In buildings equipped with an approved automatic sprinkler system, risers and laterals which are not located within an enclosed stairway or smoke proof enclosure need not be enclosed within fire resistive construction.
2. Laterals for Class II outlets on Class III systems need not be protected."

"In buildings where more than (1) Class II standpipe is provided, the standpipes may be interconnected at the bottom of the outlets may be interconnected through the sprinkler system horizontal cross mains."

Section 1007, Subsections 1007.2.9.1.1 exception 2 is amended, are deleted and 1007.2.1.1.1, 1007.3.3.7.1, 1007.3.4.4. are added as follows

"1007.2.1.1.1 Occupant Notification System Required. In new B, F and M occupancies, as defined in the Uniform Fire Code and Uniform Building Code, a fire alarm system shall be required and installed as specified under corresponding uses in NFPA 101, Life Safety Code, 1994 edition. When Section 1007.2.12 or other specific sections of the Uniform Fire Code are more stringent, they shall apply."

"1007.2.9.1.1 General
2. A separate fire alarm system need not be installed in buildings which are protected throughout by an approved supervised fire sprinkler system conforming to sections 1003 and 1003.2.1 and having a local alarm to notify all occupants. Notification shall be by audio-visual devices in compliance with the National Fire Protection Association. A bell shall also be installed at each riser and fire department pumper connection location on the access side of the building. See fire department written standards."

"Exception:
1007.3.3.1.1 Delete Manual Pulls. All manual pull stations shall be eliminated, except Group H and 1, hazardous and institutional occupancies or as required by the chief."

"1007.3.3.7 Annunciation.

"1007.3.3.7.1 Alarm Zones. Fire alarm systems shall be divided into alarm zones when required by the chief. When two or more alarm zones are require visible annunciation shall be provided in a location approved by the chief."

"1007.3.3.3.6 Audio-Visual. Requirements for structures shall be limited to those necessary for adequate warning of an emergency situation."

"1007.3.3.7.1. Multi-level Structures. All multi-level structures are required to have a flow switch and tampered control valve per floor. See fire department written standards."

"Exception:
R-1 and R-3 occupancies. See fire department written standards."

Section 1008 is added as follows:

"1008 Smoke detection devices.

"1008.1 When Required. Working smoke detection devices shall be installed and maintained in all new and existing dwelling living units, (built, manufactured or occupied) in the city, to include all R-1 and R-3 occupancies as defined in the U.B.C.."

"1008.2 Installation.
(b) The devices shall be of a type and installed (deployed) in accordance with:
1. Nationally recognized and approved independent testing agencies such as Underwriters Laboratories and Factory Mutual.
2. Nationally recognized standards such as NFPA 101, 72E 72 and 1994 Uniform Building Code.
3. Manufacturer's listing and specifications."

"1008.3 Owner Landlord and Occupant Responsibilities.

"1008.3.1 Devices Provided and Maintained. In a dwelling unit occupied under the terms of a rental agreement or under a month-to-month tenancy:

1. At the time of each occupancy the landlord shall provide smoke detection devices in working condition and, after written notification by the tenant, shall be responsible for replacement; and

2. The tenant shall keep the devices in working condition by keeping charged batteries in battery operated devices, by testing the devices periodically, and by refraining from permanently disabling the devices."

1008.3.2 Written Notification. If a landlord or owner did not know and had not been notified in writing of the need to repair or replace a smoke detection device, the landlord's or owner's failure to repair or replace the device may not be considered as evidence of negligence in a subsequent civil action arising from death, property loss, or personal injury."

"1008.3.3 Definitions. In this section, `dwelling unit', "landlord', `rental agreement', and `tenant' have the meanings given in Arizona Revised Statutes."

"1008.3.4 Records and Maintenance. The landlord or owner of any rental property shall inspect all smoke detection devices as required under 1008 annually and a record of all inspections and maintenance activities shall be kept by the landlord or owner and available for inspection upon request by the chief. See Fire Department Written Standards."

Section 1009 is added as follows:

"1009 Elevator Recall.
All buildings equipped with fire alarm systems, automatic or manual, with elevators located in protected buildings shall comply with the Current ANSI Standard A17.1b.

(a) Elevators, three (3) floors and less, shall return to the ground floor and open doors upon activation of the building fire alarm.
(b) Elevators, four (4) or more landings, shall return to the ground floor and open car doors upon activation of the building fire alarm. These elevators shall also be equipped with fire services per ANSI Standard A17.1.
(c) A fire service key control box shall be located on the ground floor next to the entrance of all elevators.
(d) All elevators shall remain out of service until the fire alarm has been reset."

Section 1102 is added as follows: is amended by adding Subsections 1102.6 and 1102.6.1 as follows:

"1102.6 Residential Portable Barbecues."

"1102.6.1 General. A person shall not construct, erect, install, maintain or use any incinerator or barbecue it or fixed or portable barbecue equipment or so burn any combustible material as to constitute or occasion a fire hazard by the use or burning thereof or as to endanger the life or property of any person thereby. In R-1

occupancies no person shall place, use or keep individual fixed or portable barbecues on or under any attached covered patios, balconies, covered walkways. Stairs or roof overhangs and USE shall be located not less than 5 feet (1524mm) from any building or structure, or other combustible material."

"1102.6.2 Storage. Storage of barbecues on or under balconies will be allowed in accordance with the fire department written standards."

"Exception:
If the fire department receives complaints or suspects the barbecue is being used, the fire department will require the barbecue be removed from the premises."

Section 1105 is amended by adding Subsections 1105.7 and 1105.8 as follows:

"1105.7 Permits Required. A permit shall be obtained from the fire department by all operators or owners of asphalt or tar kettles at least forty-eight (48) hours prior to starting work on any structure within the city limits."

"1105.8 Fuel Source. The fuel source shall be a minimum of twenty-five (25) (7620mm) feet from the kettle and supported in an upright position during operation of the kettle."

Section 5201 is amended by adding Subsections 5201.6.3.1 and 5201.9.1.

"5201.6.3.1 Unsupervised Dispensing Prohibited. Unsupervised dispensing is prohibited within the entire City."

"Exception: Unsupervised dispensing may be allowed by special permit by the chief for private commercial use only. Written request and documentation shall be submitted sowing compliance with 5201.6.3 and all other applicable codes and ordinances."

"5021.9.1 Fire Protection. Sprinkler protection shall be designed in accordance with the building code as required for ordinary hazard Group 2. (See U.B.C. Standard 9-1)"

"Exception: Automatic sprinklers may be deleted from detached canopies at motor vehicle fuel dispensing sits when:
1. The canopy does not exceed 1500 square feet (139.5m2), and
2. The canopy is covering a structure such as a pay booth when the interior is not accessible to the public. and
3. The structure, under the canopy, does not exceed 100 square feet (9.29m2)."

Section 5202 Subsections 5202.4.5 and 5202.10 are amended as follows and 5204.5.2.1 is added as follows:

"5202.4.5 Dispensing Inside Garages. Dispensing inside garages is prohibited within the entire City."

"5202.10 Motor Vehicle Fuel-Dispensing Stations Located Inside Buildings. Motor vehicle fuel-dispensing stations located inside buildings is prohibited within the entire City."

"5204.5.2.1 Storage of C.N.G. is Prohibited. The storage of C.N.G. in tanks outside of building is prohibited with the entire City."

"Exception: Installations for proprietary use may be approved by special permit by the chief."

Section 7701, Subsection 7701.7.2 is amended as follows, and 7701.9 is added as follows:

"7701.7.2 Limits Established by Law. The storage of explosives and blasting agents is prohibited within the entire City, except for temporary storage for use in connection with approved blasting operations provided; however, this prohibition shall not apply to wholesale and retail stocks of small arms ammunition, explosive bolts, explosive rivets or cartridges for explosive actuated power tools in quantities involving less than 500 pounds (226.8kg) of explosive material."

"7701.9 Threatening to Damage by Use of Fire or Explosives. Any person who willfully makes any threat, or conspires to threaten or conveys false information knowing the same to be false, concerning an attempt or alleged attempt being made or to be made, to kill, injure, or intimidate any individual or unlawfully damage or destroy any building, vehicles or other real or personal property by means of any explosive, blasting agent, or fire, shall be guilty of a misdemeanor."

Section 7901 is amended by adding Subsection 7901.9.5 as follows:

"7901.9.5 Hazardous Materials Placard. Areas in which hazardous chemicals are stored or used shall be marked with warning signs in compliance with National Fire Protection Standard 704, Fire Hazards of Materials."

Section 7902, Subsection 7901.2.2.1 is amended to read:

"7901.2.2.1 Locations Where Aboveground Tanks are Prohibited. The storage of Class I and Class II liquids in aboveground tanks outside of buildings is prohibited within the entire City."

"Exception: Installations of 2000 gallons (7,570.8L) or less aggregate quantity may be approved by special permit by the chief."

Section 7904 Subsection 7904.2.5.5.3 is amended to read:

"7904.2.5.5.3 Tanks for Gravity Discharge. Tanks with a connection in the bottom or the end for gravity dispensing of flammable or combustible liquids shall not be permitted within the entire City."

Section 8003.15 Carcinogens, irritants, sensitizers and other health hazard solids, liquids and gases deleted in its entirety.

Section 8202, Subsection 8202.1 the exception is amended as follows:

Section 8204, Subsection 8204.2 is amended to read: And table 8204-A is amended to read and footnote 5/5 is added as follows:

"8204.2 Maximum Capacity within Established Limits. Within the limits of the entire City, for the protection of heavily populated or congested commercial areas, the aggregate capacity of any one installation of liquefied petroleum gas shall not exceed 2,000 gallons (7570.8L) water capacity."

"Table 8204-1, Footnote 5/5
5/5 a container less than 125 gallons (473.21) may be located next to a block fence when the tank is not within 5 feet (1524mm) of a structure on adjoining property."

Section 9003, Subsection n2 is amended as follows:

"National Fire Protection Association
NFPA National Fire Codes
Battery Park, Quincy, MA 02269.

NFPA, National Fire Codes, the most recent editions in publication at time of ordinance approval."

Sec. 36-19 Classification of penalty.

" (a) Upon a finding of responsible to civil violation, the court shall impose a fine not to exceed two hundred fifty dollars ($250.00).
(b) Upon a conviction of a misdemeanor, the defendant shall be sentenced pursuant to the provisions of Section 1-8 of this Code.
(c) The application of the penalties provided for in paragraphs (a) and (b) of this section shall not be held to prevent the enforced removal of prohibited conditions."

Sec. 36-19.2 Civil violation, commencement of action.

" (a) A civil violation may be commenced by issuance of a citation or by long form complaint.
(b) The citation will be substantially in the same form as the Arizona Traffic Ticket and Complaint and shall direct the defendant to appear in Scottsdale City Court within ten (10) days after issuance of the citation.
(c) The citation will further notify the defendant that if he fails to appear on or before the date specified in the complaint, a judgment by default will be entered against him, and the court may, in its discretion, impose a civil sanction not to exceed two hundred fifty dollars ($250.00)."

(1) By having the defendant sign the citation with a promise to appear in court within ten (10) days of the issuance of the citation.
(2) If the defendant refuses to sign the citation by hand delivering a copy of the citation to the defendant.
(3) By mailing a copy of the citation to the person charged at his last known address, by certified or registered mail, return receipt requested.
(4) In the event service cannot be accomplished as set forth in (d)(1),(2) or (3), the state may serve the defendant by any means allowed by the Arizona Rules of Civil Procedure for the Superior Court."

" (e) Minor civil citations may be issued for non-compliance with the amended Uniform Fire Code, City of Scottsdale revised statutes sec. 36-16, 36-17 and 36-18. See City of Scottsdale revised statutes, Chapter 17, Article 5."

Sec. 36-19.3 Authority to issue citation.

"Any peace officer, the fire chief, or duly authorized agent of the fire chief may issue a civil citation pursuant to this chapter."

Sec. 36-19.4 Appearance.

"(a) The defendant shall, within ten (10) days of the issuance of the citation, appear in person or through his attorney in the city court and shall either admit or deny the allegations contained m the citation. If the defendant admits the allegation, the court shall enter judgment against the defendant and, in its discretion, may impose a civil sanction for the violation. If the defendant denies the allegations contained in the citation, the court shall set dates for a pre-trial conference and for trial of the matter."

"(b) If the defendant fails to appear for pre-trial conference or trial, the defendant's failure to appear shall be deemed an admission of the offense and the court shall enter judgment against the defendant and may, in its discretion, impose a civil sanction for the violation."

Sec. 36-19.6 Rules of procedure.

"The Arizona Rules of Court for Civil Traffic Violation Cases may be followed by the city court for civil violations of this chapter, except as modified or where inconsistent with the provisions of this article, local rules of the city court or rules of the Arizona Supreme Court."

Sec. 36-19.7 Collection of fines.

"Any judgment for civil sanctions taken pursuant to this article may be collected as any other civil judgment."

Sec. 36-19.8 Violations not exclusive.

"Violations of this chapter are in addition to any other violation enumerated within the Scottsdale ordinances and Code and in no way limit the penalties, actions or abatement procedures which may be taken by the city for any violation of this chapter which is also a violation of any other ordinance or Code provision of the city, or statutes of the state."

Sec. 36-19.9 Each day separate violation.

"Each day any violation of any provision of this chapter or the failure to perform any act or duly required by this chapter continues shall constitute a separate offense."

Sec. 36-20 Bureau of Fire Prevention.

"(a) The Uniform Fire Code shall be enforced by the Bureau of Fire Prevention of the fire department which is hereby established and which shall be operated under the supervision of the chief of the fire department."

"(b) A report of the Bureau of Fire Prevention shall be made annually and transmitted to the City Manager. The report shall contain all proceedings under this chapter, with such statistics as the chief of the fire department may wish to include therein. The chief of the fire department shall also recommend any amendments to this article which, in his judgment, are desirable."

DIVISION 2. Design criteria. New construction design criteria in fully sprinklered developments.

Sec. 36-36 Street width.

"The following apply to non-hillside R-3 developments: (see definitions section 36-16)

(1) The minimum street width shall be twenty-eight (28) feet (8534mm) from back of curb to back of curb or larger
(2) Cul-de-sacs shall not be longer than two thousand (2,000) feet (609.600mm).
(3) The maximum distance shall not exceed six hundred (600) feet (182,880mm) to any hydrant from the end of a cul-de-sac.
(4) See City of Scottsdale design standards and policies for design and construction details."

Sec. 36-37 Cul-de-sacs main size in R-3 developments.

"Main size in cul-de-sacs of one thousand two hundred (1,200) feet (365,760mm) or less in length may be reduced from eight (8) inches (203.2mm) to six (6) inches (152.4mm), based on minimum pressure and flow necessary to provide proper functioning of domestic and fire protection appliances. Further reductions may be permitted with written approval of the City Manager or his designee."

Sec. 36-38. Use of nonpotable water for fire protection.

"(a) All commercial structures for which a building permit is issued after June 30, 1985, adjacent to golf courses using nonpotable or reclaimed water for irrigation with sufficient storage capacity on site, may be sprinkled using this supply."
"(b) Irrigation systems shall be designed to meet the fire department's standards of galls per minute flow and pressure necessary to supply adequate fire flow."
"(c) Standby power supply for pumping station supplying fire flow shall be provided."

"(d) Fire hydrants on domestic supply shall be placed in close proximity to the fire department connection for structural sprinkler systems to provide a secondary water supply."

"(e) Fire hydrants placed on approved nonpotable systems shall be properly marked with grey caps and bonnets and placarded to indicate a nonpotable water supply exists in this system. Nonpotable water supplies shall use approved material for construction of all mains and supply lines and shall have the written approval of the City Manager or his designee."

"(f) All water inlets shall be required to have sufficient straining and filtering capacity to eliminate all foreign objects from blocking sprinkler orifice. Chlorination of inlet lines shall be required."

Sections 36-39 through 36-45 and Division 3 are added as follows:

Sec. 36-39 One Hour Construction.

"One hour construction has been deleted for all Group R occupancies per UBC and Scottsdale amended building code ordinance with exceptions (see UBC for exceptions)."

Sec. 36-40 Hydrant Spacing

" 1. Commercial and mufti-family (R-1) development hydrant spacing will be a maximum of 700 feet (213,360mm) on center.
2. Non-hillside. One and two family dwellings (R-3) development hydrant spacing will be a maximum of 1,200 feet (365,760mm) on center.
3. Hillside. One and two family dwellings (r-3) development hydrant spacing will be a maximum of 600 feet (182,880mm) on center.
4. Hillside cul-de-sacs. The maximum distance shall not exceed six hundred (600) feet (183,880mm) to any hydrant from the end of a cul-de-sac."

Sec. 36-41 Fire Flows
"Minimum fire flows shall be as follows:

" 1. Commercial and mufti-family (R-I) ---- 1,500 gpm (5678.11/min)
2. One and two family dwellings (R-3) ---- 500 gpm (1,892.71/min)
3. The chief may increase minimum flows based on review of hazard."

Sec. 36-42 Fire Department Access

" 1. Two means of access to single family residential (R-3) projects are not required.
2. 360 degree access may not be required to commercial and mufti-family (R-1) structures (except as maybe required for a specific occupancy by other sections of the code)."
3. See City of Scottsdale design standards and policies for design and construction details."

Sec. 36-43 Fire Alarm Requirements.

" 1. All manual pull stations are to be eliminated (except in Group H and I occupancies).
2. Fire alarm systems are not required in mufti-family (R-I) structures.
3. In all occupancies audio-visual devices shall be limited to those necessary for adequate warning."

Sec. 36-44 Fire Extinguishment Placement

" 1. In commercial occupancies fire extinguishers shall be installed at a maximum of 150 feet (45,720mm) apart, on center, in accordance with UFC Standards.
2. In single family (R-3) and mufti-family (R-I) occupancies fire extinguishers are not required."

Sec. 36-45 Zoning Increase

"As reflected in City of Scottsdale Zoning Ordinance is a 4% building construction density increase in single family (R-3) developments."

Division 3. Design criteria applicable to certain buildings or occupancies.

Sec. 36-46 Group R, Division 4 occupancies.

Group R, Division 4 occupancies (group care residence) shall meet the following requirements:

" 1 Existing structures with 1 to 5 clients.
(a) Interconnected smoke detectors shall be installed in all livable areas in accordance with City of Scottsdale amended U.B.C. 310.9.
(b) Posted evacuation map and emergency procedures per Fire Department.
(c) Portable fire extinguishers in accordance with U.F.C. Standards."

" 2. Existing structures with 6 to 10 clients and all new structures.
(a) Interconnected smoke detectors shall be installed in all livable areas in accordance with City of Scottsdale amended U.B.C. 310.9.
(b) Posted evacuation map and emergency procedures per Fire Department.
(c) Portable fire extinguishers in accordance with U.F.C. Standards.
(d) An automatic fire sprinkler system in accordance with amended U.F.C. Article 10."

XI

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