

# **Mesa Fire Department**

2004 Fire Report –Residential/Commercial Structural Data

3-Year Summary Report –Residential Structural Statistical Data

3-Year Summary Report –Commercial Structure Statistical Data

5-Year Summary Report –Inspection Statistical Data

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## **Executive Summary**

The purpose of this document is to record and track different trends in the City of Mesa's structural fire loss. The format of this document will be used to analyze Mesa's structural fire problem annually and over a period of five years when new information becomes available. The analysis of this information may then be used to institute programs to strengthen the education and awareness level of city officials and Mesa residents of specific fire problems.

The system used by firefighters, known as the National Fire Incident Reporting System (NFIRS), logs different information about fires, such as: dollar losses, injuries, deaths, ignition factors, materials involved in ignition, types of materials ignited, area of fire origin, smoke alarm performance and sprinkler performance, which is then logged into the mainframe computer programs Host and Firehouse. This document examines both the calendar year of 2004 and a 3-year summary (2002-2004) to track trends in various fields of information from data entered into the reporting system.

After analysis of this document, it is readily apparent that the lack of sprinkler systems and the dollar losses related to their absence is a major problem for the City of Mesa. In residential properties without sprinkler systems, the overall difference in dollar losses in 2004 is 99.9% higher than in properties that do have sprinkler systems. Through public awareness, the City of Mesa may see more residential sprinkler system installations that would, in effect, dramatically reduce the total dollars lost to fire.

The information gathered on smoke detectors presence and operation is also a major concern in fire related losses. According to the three-year summary report for residential properties, smoke detectors were not present in 40% of the reported fires. Of the detectors that were present, the smoke detector was recorded as not operating in 32% of the fire cases.

Injury rates are higher among residential properties than commercial properties and primarily stem from fires started in kitchen/cooking areas. Fires are started in these areas by fixed stationary surface units, i.e. stovetops, in 50% of the reported cases. The highest numbers of injuries are found in one/two family dwellings, followed by apartments.

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**Mesa Fire Department**  
Fire Prevention Division  
An Internationally Accredited Fire Department



# City of Mesa

-Fire Prevention and Investigation-  
Structural Fire Loss Report

Within the last five years Mesa has grown to the 40<sup>th</sup> largest city in the United States with 14,338 operating businesses and a total land area of 170.7 square miles. According to the 2000 population Census, there were 396,375 residents living in Mesa, which is a 38% growth rate over the last decade. Currently, in 2005, there are approximately 450,000 residents with a growth rate of 13.6% since 2000, which is just over double the national growth rate of 5.1%. There are currently 17 operating fire stations serving and protecting the City of Mesa. Considering the projected growth of Mesa, an additional 8 fire stations are currently planned for the City of Mesa in the future.

Within the City of Mesa, Fire Prevention falls under the Community Services Division, and employs 18 positions. The Fire Marshal, Deputy Chief Bob Horn, is in charge of the Fire Prevention Subdivision. Fire Prevention staff is composed of a Fire Investigator Supervisor, two Fire Inspection Supervisors, six Inspectors, two Investigators, one Fire Protection Engineer, two Prevention Assistants and two Administrative Support Assistants and one Administrative Support Assistant Supervisor.

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# City of Mesa

## 2004 Fire Report

### Residential/Commercial Structural Statistical Data

#### Fires

Residential structure fires typically take place in One/Two Family Dwellings and Apartments. Both, One/Two Family Dwellings and Apartments add up to 99% of all residential structure fires. A small portion of Figure 1-A accounts for all other residential properties, such as hotels, motels and others. Mesa's residential structural fires are consistent with the national average for One/Two Family Dwelling (72.7%), Apartments (22.5%) and Other (4.8%) based on *Fire in the United States, 13th Edition*.

Commercial fires in Mesa are not nearly as concentrated as the residential fires and do not reflect the national average. Although Store/Office properties contain the largest numbers of fires both nationally (18.1%) and locally (45%), Mesa had more than double the fires than the national average according to Figure 1-B. Following Store/Office properties are Public Assemblies (22%) and Storage (10%), which were much different than the national average of 4.5% for Public Assemblies and 18.1% for Storage.

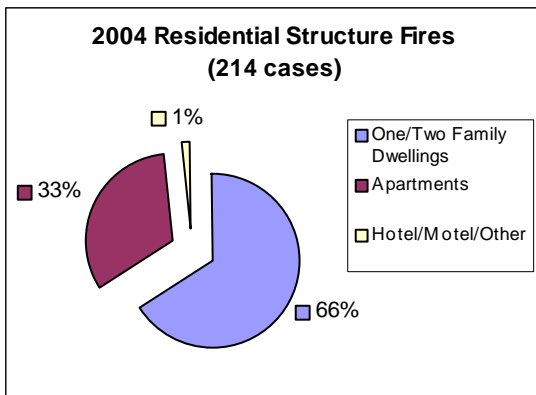


Figure 1-A. Residential Structure Fires

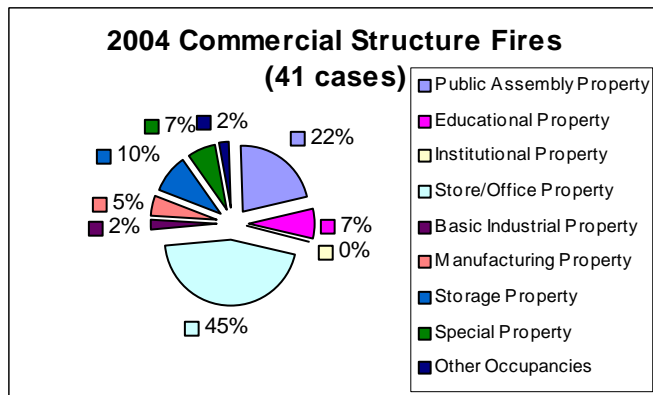


Figure 1-B. Commercial Structure Fires

## Fatalities/Injuries

In 2004, there were three fire fatalities in residential properties and no reported fatalities in commercial properties. Of the fatalities in Figure 2-A, all were males and two were over the age of 65. Fire fatalities typically occur among elderly males and are recorded as the highest national fatality rate. Nationally, second to elderly males are children of both genders under the age of four. Among residential properties, the largest numbers of injuries have occurred where the majority of fires have occurred. A total of 62% of the recorded injuries were in One/Two Family Dwellings and the following 38% were in Apartments. According to *Fire in the United States, 13th Edition*, the high numbers of Apartment related injuries may be due to the significantly smaller space than One/Two Family Dwellings, which may lead to a more rapid fire exposure time. No injuries were reported in any other residential properties. In commercial properties, there were a total of three injuries that occurred during the reported fires. There were two injuries in Storage properties and one in Other properties.

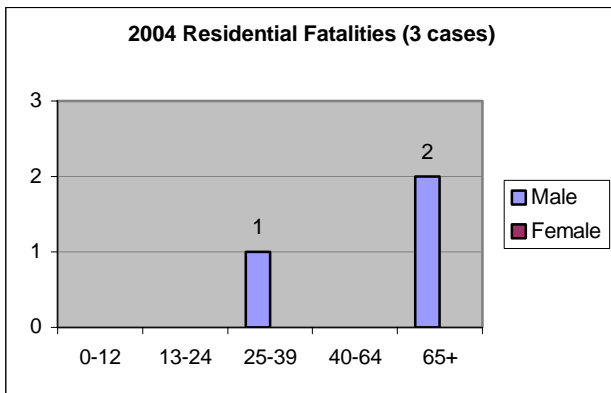


Figure 2-A. Residential Fire Fatalities

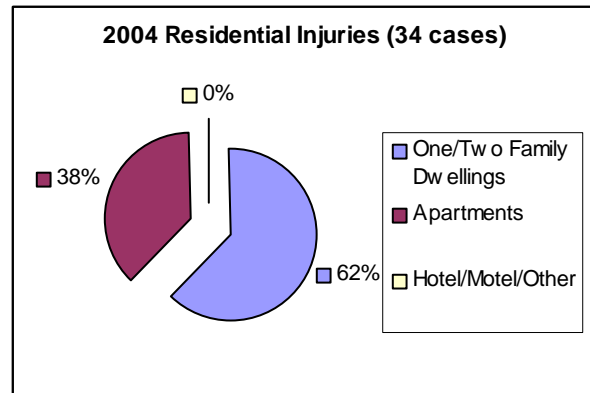


Figure 2-B. Residential Fire Injuries

## Dollar Loss

Dollar losses are typically much higher in residential fires than commercial fires. The presence of sprinkler systems in many commercial structures is the leading factor for this trend. The dollar loss in residential structures was about 25% higher than commercial structures, with the greatest loss in One/Two Family Dwellings. The dollar loss for One/Two Family Dwellings was 69.4% and Apartments were 30.54%. Although Mesa's Apartment percentage is higher than the national average, these numbers are similar with, national averages of 75.7% for One/Two Family Dwellings and 18.3% for Apartments. The highest dollar losses in commercial properties occurred in Storage and Store/Office properties with 34% and 33% respectively. Nationally, Store/Office has the highest dollar loss (24.3%) followed by Manufacturing (22.4%).

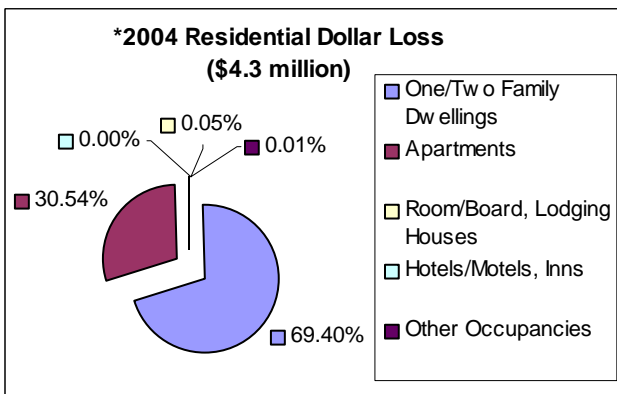


Figure 3-A. Residential Dollar Loss

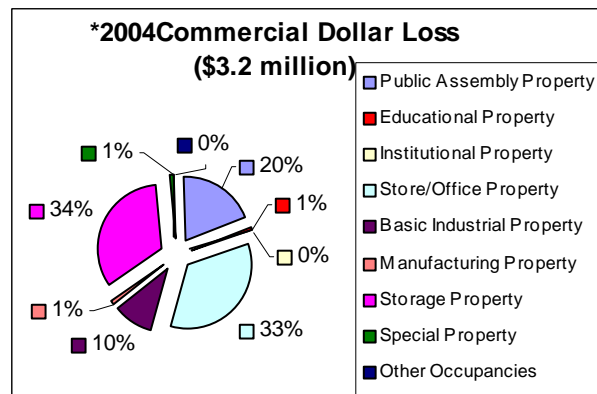


Figure 3-B. Commercial Dollar Loss

\*Data gathered from Sprinkler Activations 1999-2005 worksheet

## Area of Fire Origin

When examining areas of fire origin, the kitchen/cooking area has the largest volume of fires (52%) for residential properties. Second to kitchen/cooking areas was sleeping areas < 5 people in residential properties (17%). Nationally, the leading area for residential fires was also kitchen/cooking areas followed by sleeping areas < 5 people. For commercial properties in Mesa, areas of storage (36%) accounted for the most fires, followed by kitchens/cooking areas (24%). In Mesa, the areas with the least amount of fires were lounge areas (2%) for residential properties and lobbies/entrances (4%) for commercial properties.

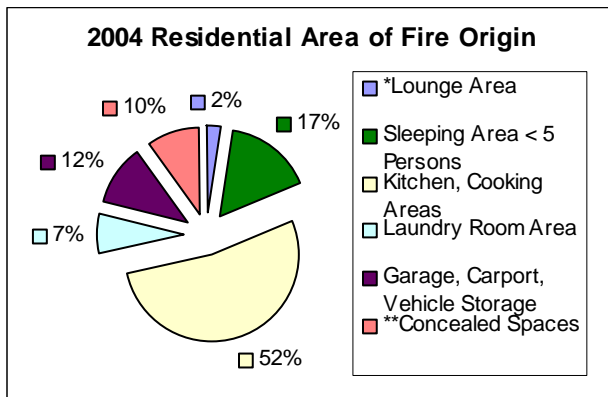


Figure 4-A. Residential Area of Fire Origin

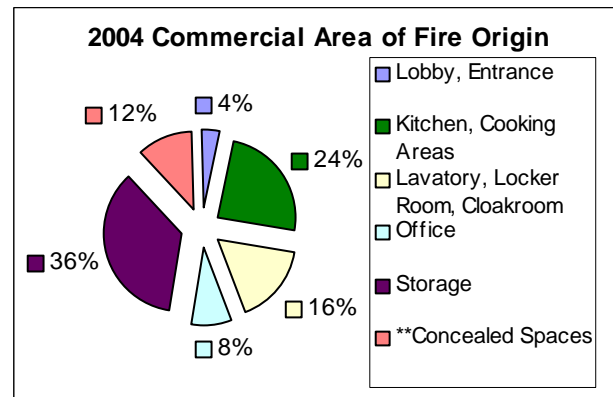


Figure 4-B. Commercial Area of Fire Origin

\* Lounge Area consists of: Living, Common, TV, Family, Music, Sitting, Recreation Rooms and Dens

\*\*Concealed spaces include: Crawl Space, Floor/Ceiling, Roof/Ceiling and Wall Space

## Ignition Factor

An ignition factor is the action that caused a fire to start. In residential properties, the leading cause was abandoned/discarded materials with 27%, followed by incendiary (25%). Children playing had the least incidents, with 5% of the top ignition factors. In commercial properties, the leading cause was short circuit/ground fault with 28% of the leading ignition factors. Mechanical failure/malfunction accounted for 24% of the commercial ignition factors. The national data is very different from what Mesa recorded in commercial properties, with incendiary as the leading cause for commercial ignition factors.

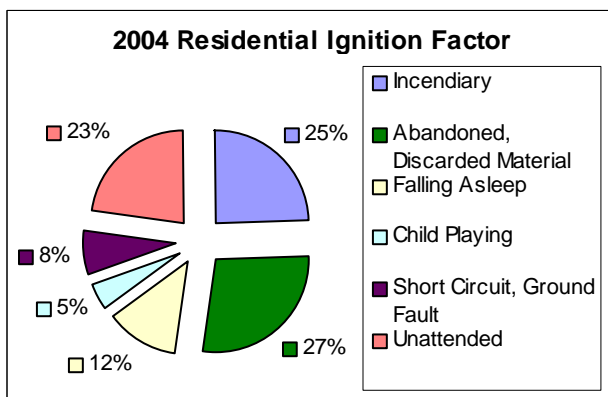


Figure 5-A. Residential Ignition Factors

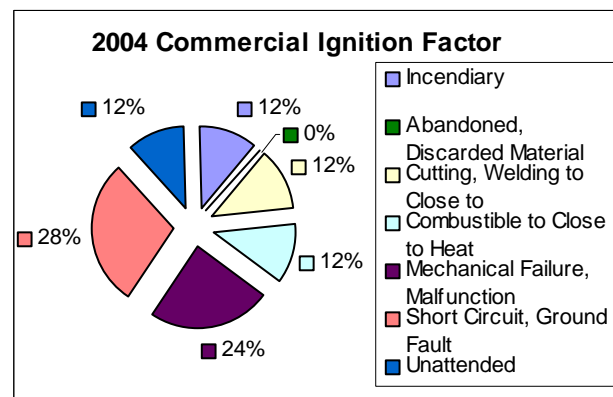


Figure 5-B. Commercial Ignition Factors

## Form of Heat of Ignition

In residential properties, proper operating electrical equipment was the leading form of heat of ignition (28%) for 2004. As shown in Figure 6-A, the second highest form of heat of ignition is cigarettes with 22% of the top heat forms. Cigarettes, matches, lighters and candles/tapers, which account for 46% of the top heat forms, are commonly found throughout residential properties. Matches and lighters account for the lowest percentages, each totaling 5%. The top two forms of heat of ignition in commercial properties are open flame/sparks (32%) and hot objects (24%), followed by electrical equipment arcing and fuel-powered objects with 16% each. Heat from flame spread did not cause any ignitions (Figure 6-B).

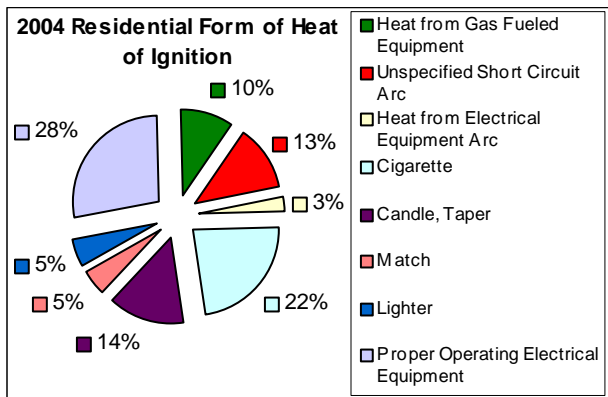


Figure 6-A. Residential Form of Heat of Ignition

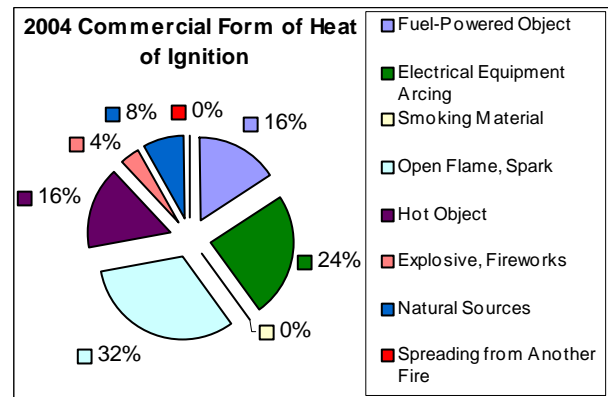


Figure 6-B. Commercial Form of Heat of Ignition

## Type of Material Ignited

The types of materials ignited, according to Figures 7-A, do not lean toward any one particular material for residential properties, although hardboard/plywood is the highest with 26%. On the other hand, wood/paper accounts for nearly half (42%) of material types ignited in commercial properties. The residential materials with the lowest percentages are cotton/rayon/cotton fabric, sawn wood and food/starch, each with 10%. The types of material ignited for commercial properties with the lowest values (3%) are volatile solids (chemical) and natural products.

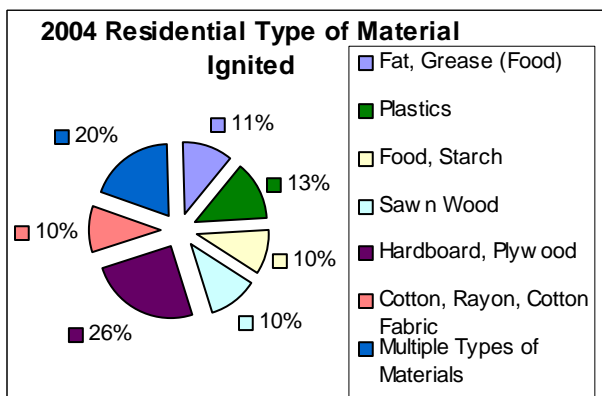


Figure 7-A. Residential Type of Material Ignited

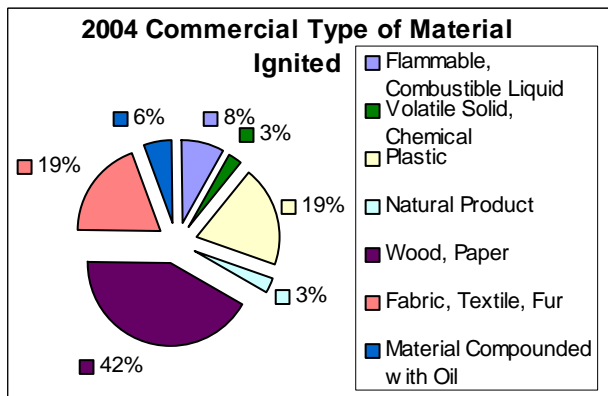


Figure 7-B. Commercial Type of Material Ignited

## Equipment Involved in Ignition

Of the different types of equipment involved in ignition, fixed stationary surface units account for 50% of the top forms of ignition equipment in residential properties. A form of a fixed stationary surface unit is a stovetop. Following that was fixed wiring with 17% and fixed, stationary ovens (11%). In residential properties, indoor fireplaces represent 3% of the recorded data. In commercial properties, service/maintenance equipment was the leading type of equipment involved in ignition (29%), followed by both, cooking equipment (22%) and electrical equipment (22%). The lowest value in Figure 8-B was represented by: heating systems, processing equipment and special equipment with 4% each.

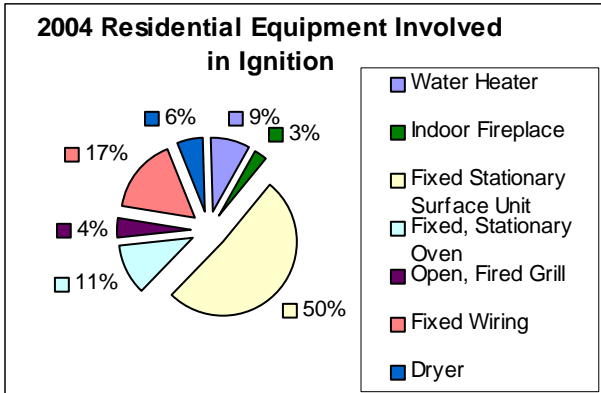


Figure 8-A. Residential Equipment Involved in Ignition

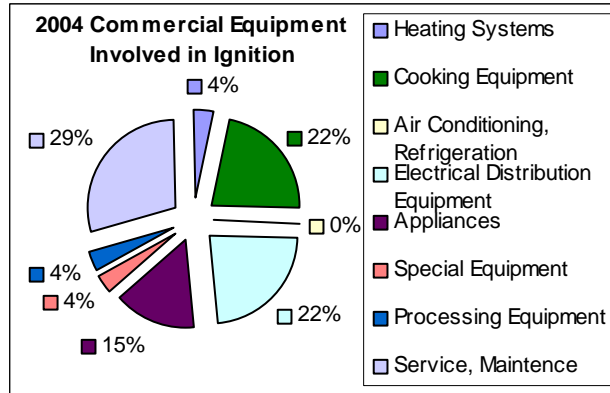


Figure 8-B. Commercial Equipment Involved in Ignition

## Smoke Alarm Performance

Smoke detectors are an important tool used to save lives in the occurrence of a fire. In 28% of the fire cases, detectors were reported as present and operating. The residential values recorded in Figure 9-A mirror the national trends, although the national value for unknown is higher (42.1%). It was unknown if smoke detectors exist for 30% of the fires reported. Smoke detectors were not present in 29% of Mesa's residential fires.

In commercial properties, the greatest value recorded in Figure 9-B was unknown with 39% of the total. Following the unknowns is no detectors present (37%) with a value nearly double the amount of detectors present/operated (20%). The number of detectors in Figure 8-B that were present and did not operate or did not activate because the fire was too small had a value of 2% each.

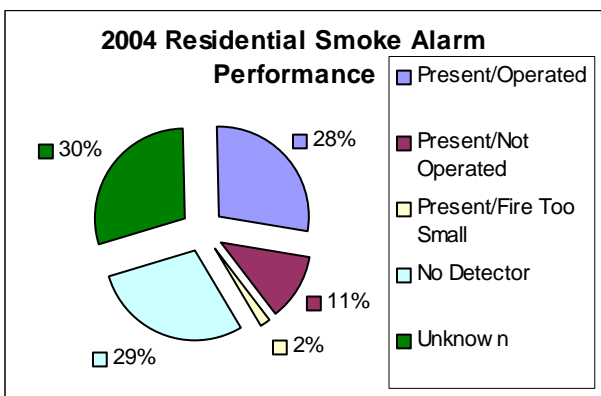


Figure 9-A. Residential Smoke Alarm Performance

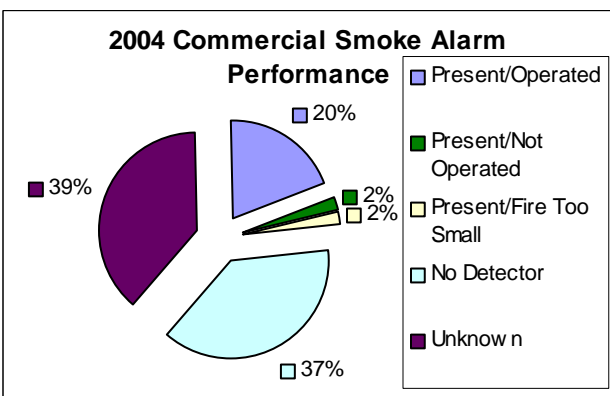


Figure 9-B. Commercial Smoke Alarm Performance

## Sprinkler Performance and Sprinkler Based Dollar Loss

Sprinkler systems are a major contributor to the reduction of dollars lost to fires in both residential and commercial properties. Although the amount of sprinklers present in residential properties was very low (1.4%), they saved the owner an average of \$21,927 dollars per fire. Residential properties are estimated to lose an average of \$883 dollars if a sprinkler system is installed, as opposed to losing an average of \$22,810 dollars without a sprinkler system, which totals a 96% reduction per fire in direct dollar loss. The values recorded in Figure 10-A are very similar to national trends of 91.3% not present, 2.5% present and 6.2% unknown. In Mesa, the number of sprinkler systems not present in residential properties was 89.2%, present 1.4% and unknown 8.5%.

In commercial properties, sprinkler systems were reported as being present and operating in 13.7% of the fire cases. Sprinkler systems were reported as not being present in 60.8% and unknown for 15.7% of Mesa's recorded fires. Nationally, sprinklers were not present in 75.7% and present in 14.5% of the recorded fires. In commercial properties where sprinklers were present, an average dollar loss of \$60,642 per fire was lost, as opposed to an average dollar loss of \$89,643 dollars for properties without sprinkler systems. There was a savings of \$29,001 dollars or a 32% reduction in dollar loss for commercial properties in 2004.

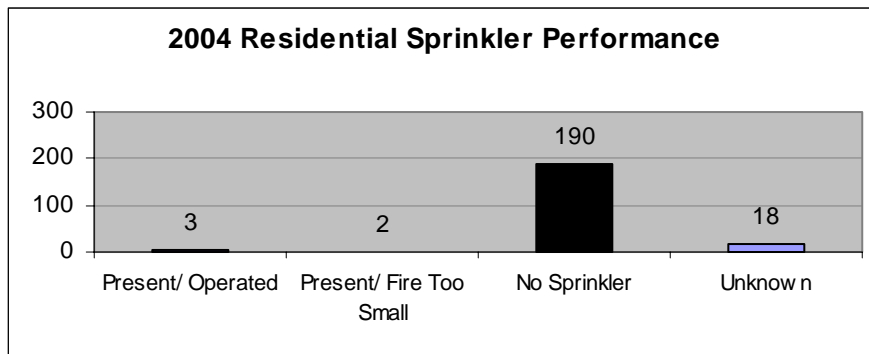


Figure 10-A. Residential Sprinkler Performance

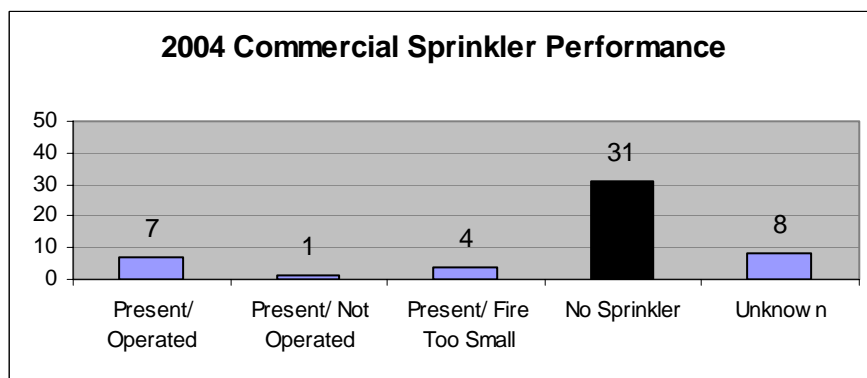
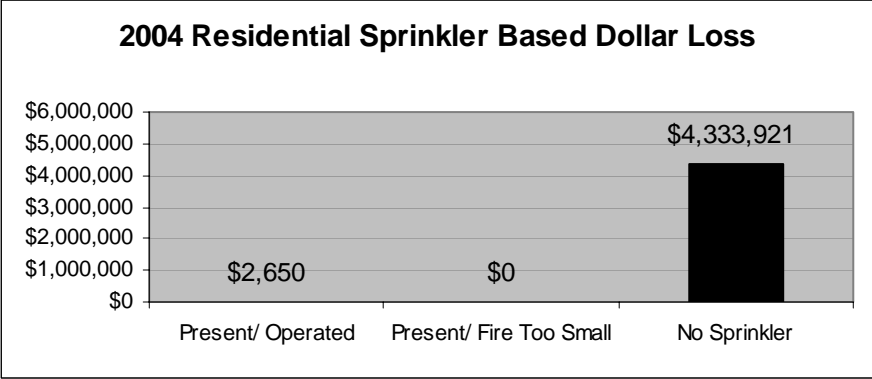
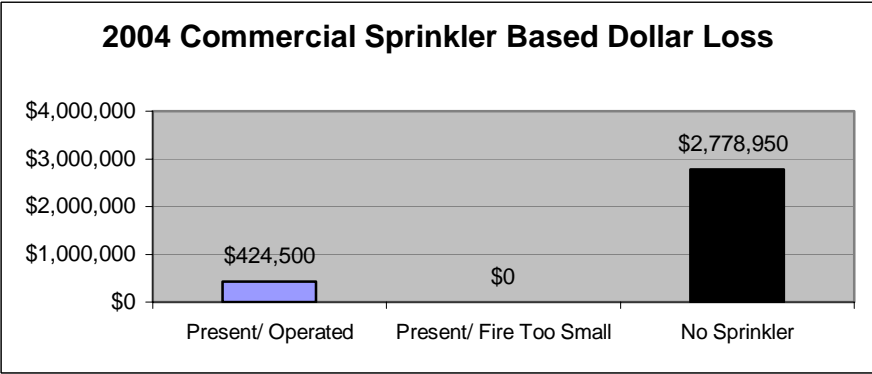


Figure 10-B. Commercial Sprinkler Performance



**Figure 10-C. Residential Sprinkler Based Dollar Loss**



**Figure 10-D. Commercial Sprinkler Based Dollar Loss**

# Mesa Fire Department

## 3 Year Summary Report

### Residential Structural Statistical Data

2002	2003	2004
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**Table 1- Fire and Fire Loss by Property Type**

One/Two Family Dwellings	157	126	140
Fatalities	0	2	1
Injuries	21	19	21
Dollar Loss (\$)	6,754,295	4,233,552	3,395,966
Apartments	71	59	71
Fatalities	0	1	2
Injuries	24	13	13
Dollar Loss (\$)	1,071,020	2,645,964	1,494,408
Room/Board, Lodging Houses	3	1	1
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	2,000	900	2,500
Hotels/Motels, Inns	3	3	1
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	43,500	2,500	0
Other Occupancies	1	3	1
Fatalities	0	0	0
Injuries	1	0	0
Dollar Loss (\$)	10,000	40,000	500

**Table 1-Fire and Fire Loss by Property Type**

## Fires

Over the three years 2002-2004, the data shows that the majority of residential fires in Mesa fall under the classification One/Two Family Dwellings, accounting for 66% of the total residential fire calls. Apartment fires are second to that of One/Two Family Dwellings and account for 31% of Mesa's residential fire calls. Although these numbers total 97% of all residential fire calls, it is very similar to the national average of 72.7% for One/Two Family Dwellings and 22.5% for apartments. Based on Figure 1-A, 2002 had the most fire calls (235) while the number of fire calls increased 12% from 2003 to 2004.

## Fatalities

All fatalities have occurred in One/Two Family Dwellings and Apartments over the years 2002-2004. Typically, the majority of these fatalities are composed of elderly males. According to the data gathered, there have been a total of 6 fatalities with 83% in the 65+ age group. There was 1 fatality in the 25-39 age group, accounting for the remaining 17%. Of all the fatalities, 83% were males.

## Injuries

In Mesa, the majority of injuries (54%) have occurred in One/Two Family Dwellings, and Apartments (45%). All other residential properties account for less than 1%. The highest numbers of injuries occurred in 2002 accounting for 41% of all injuries for the stated years. The number of injuries dropped 30% from 2002 to 2003. There was a 6% increase in the number of injuries from 2003 to 2004.

## Dollar Loss

The residential property dollar loss from fires has been declining over the years 2002-2004. Each year, One/Two Family Dwellings and Apartments have the greatest dollar losses, with an average of \$4,794,604 and \$1,737,131 respectively. Although the dollar loss for 2003 is lower than the previous year, its average rate of \$36,059 dollars lost per fire is the highest of all three years. The rate for 2004 is 37% lower than that of 2003. The percentage of dollar loss for One/Two Family Dwellings (73%) is slightly lower than the national average of 75.6%. The dollar loss for Apartments (26%) is higher than the national average of 20.2%. The dollar loss for all other residential properties is 1/2 of 1%.

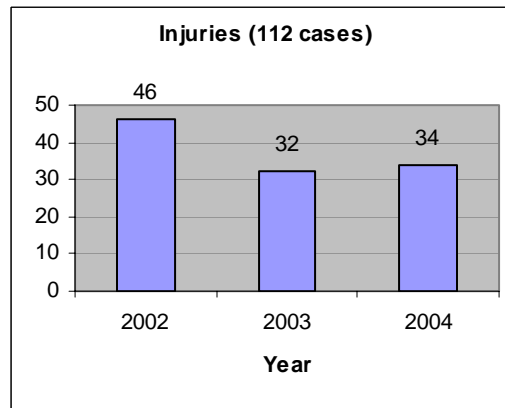
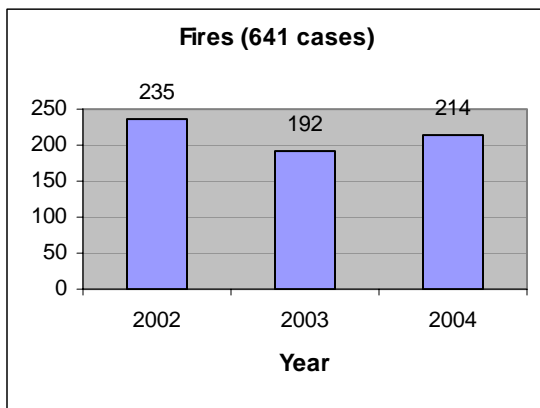


Figure 1-A. Fire by Property Type

Figure 1-B. Injuries by Property Type

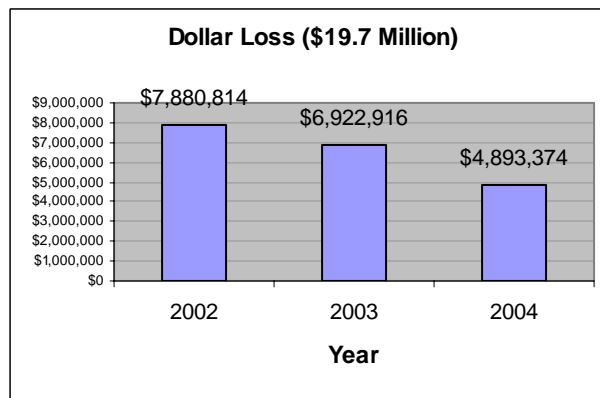


Figure 1-C. Fatalities by Property Type

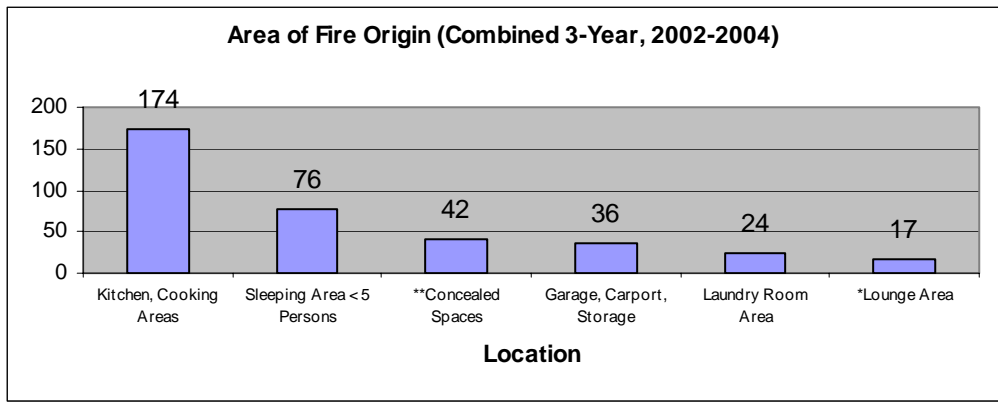
Figure 1-D. Dollar Loss by Property Type

<b>Table 2- Area of Fire Origin</b>		2002	2003	2004
NFIRS #				
14	*Lounge Area	5	9	3
21	Sleeping Area < 5 Persons	30	26	20
24	Kitchen, Cooking Areas	63	48	63
26	Laundry Room Area	7	8	9
47	Garage, Carport, Vehicle Storage	15	7	14
**7	**Concealed Spaces	19	11	12

\* Lounge Area consists of: Living, Common, TV, Family, Music, Sitting, Recreation Rooms and Dens

\*\*Concealed spaces include: Crawl Space, Floor/Ceiling, Roof/Ceiling, Wall Space

This portion of the text is used to help the viewer visualize areas of residential properties where fires are occurring. These six areas were chosen because of their high rates of fires. Referring to Figure 2, the kitchen has the highest number of fires, 47% of the total recorded. The kitchen accounts for more than double the number of fires in any part of a residential property. This may be due to the high rate of both the stovetop and oven caused fires. The second highest area of fire origin is sleeping areas of less than five people with 20% of fires for the recorded years. National data determined that the three highest areas of fire origin are: kitchens, sleeping areas and lounge areas. Surprisingly, lounge areas in Mesa's residential properties are the lowest of all the selected areas, amounting to about 5% of the total fires reported.

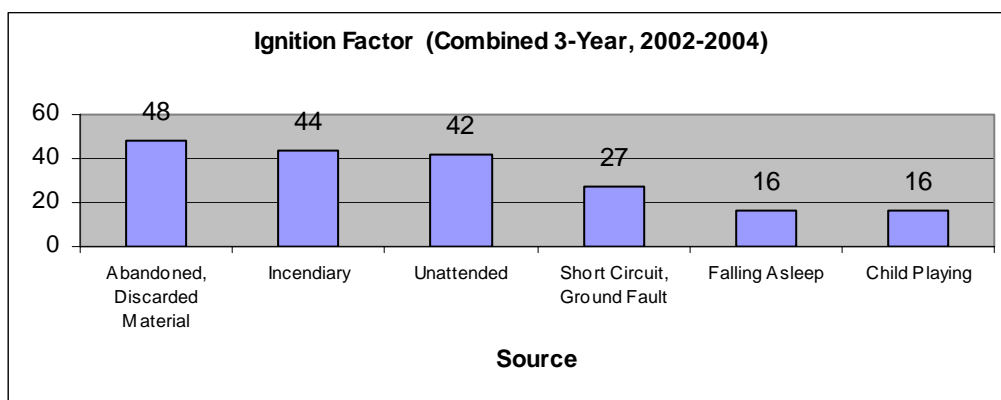


**Figure 2-Leading Locations for Fire Origins in Residential Properties**

**Table 3- Ignition Factor**

		2002	2003	2004
NFIRS #				
11	Incendiary	13	15	16
31	Abandoned, Discarded Material	20	10	18
33	Falling Asleep	3	5	8
36	Child Playing	9	4	3
54	Short Circuit, Ground Fault	12	10	5
73	Unattended	8	19	15

An ignition factor is essentially what causes a fire to start. It is not the actual material that catches fire, but is the action that leads to the starting of a fire. The possibilities of what these materials may be is close to endless. Referring to Figure 3, the highest ignition factor is abandoned and discarded materials at 25% of the recorded data. Incendiary and unattended are the second and third leading factors, respectively, amounting to about 22% each. Abandoned, discarded material and unattended account for 47% of all ignition factors and can be directly related to the carelessness and disregard of the dangers of fire by property owners.

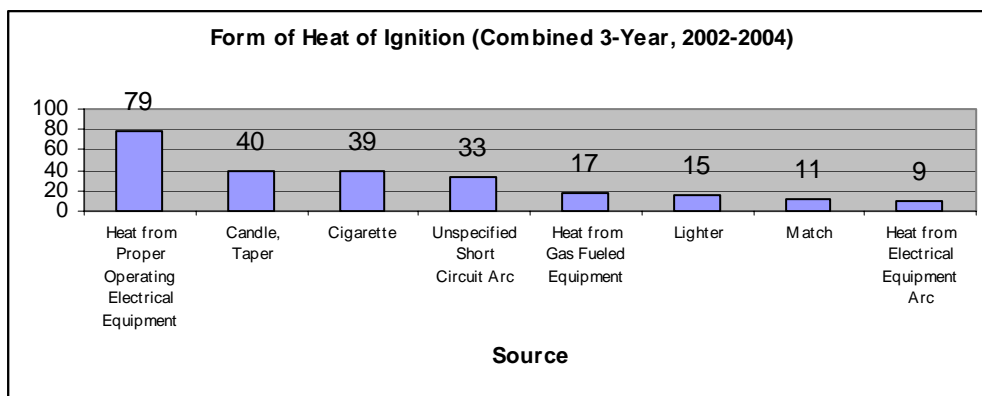


**Figure 3- Leading Ignition Factors for Residential Properties**

**Table 4- Form of Heat of Ignition**

		2002	2003	2004
NFIRS #				
12	Heat from Gas Fueled Equipment	5	4	8
24	Unspecified Short Circuit Arc	12	11	10
29	Heat from Electrical Equipment Arc	5	2	2
31	Cigarette	10	11	18
44	Candle, Taper	20	9	11
45	Match	4	3	4
46	Lighter	5	6	4
56	Heat from Proper Operating Electrical Equipment	30	26	23

The form of heat of ignition is the material that caused a fire. It may take the form of an ember, a hot object, electricity or an open flame. Typically, people generally assume that cigarettes are the leading cause of all fires. Although they account for 16% of all fires caused in Mesa, the leading cause, 33%, is heat from properly operating electrical equipment. Nationally, the leading cause of fire is cooking, followed by heating. Other forms of heat of ignition are cigarettes (16%), candle/taper (17%) and matches and lighters combined for 11%.

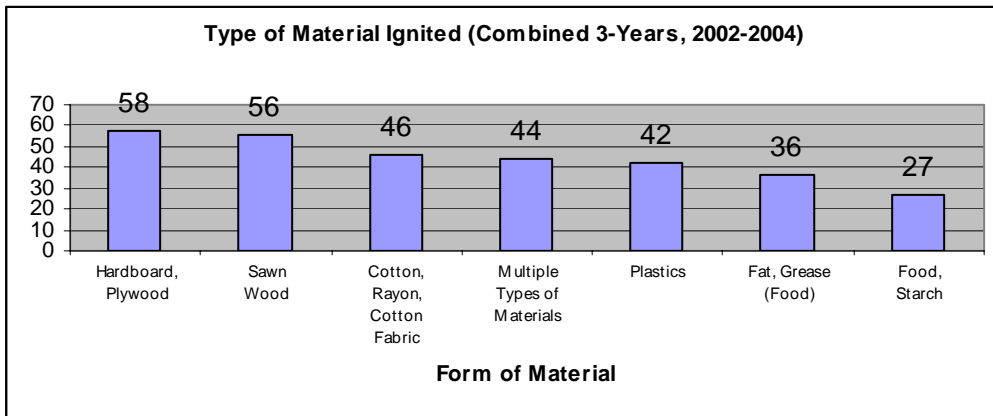


**Figure 4- Form of Heat of Ignition in Residential Properties**

**Table 5- Type of Material Ignited**

		2002	2003	2004
NFIRS #				
31	Fat, Grease (Food)	13	11	12
40	Plastics	20	8	14
57	Food, Starch	9	8	10
63	Sawn Wood	21	24	11
65	Hardboard, Plywood	17	15	26
72	Cotton, Rayon, Cotton Fabric	15	20	11
97	Multiple Types of Materials	12	11	21

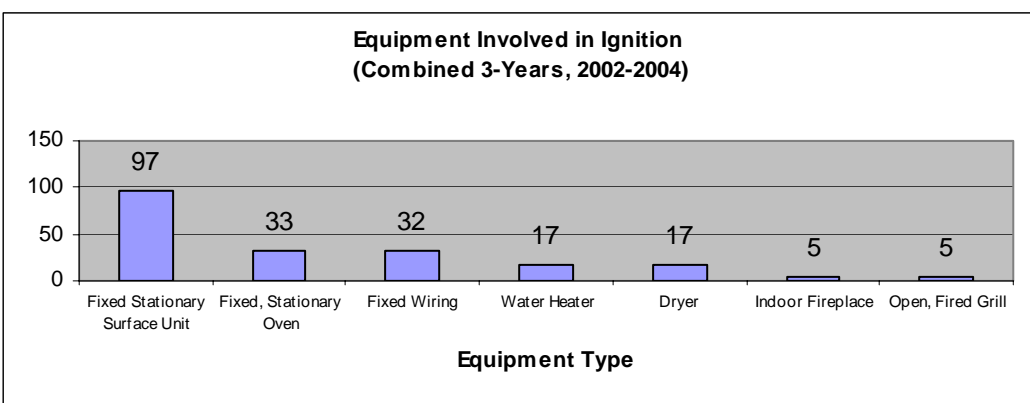
The type of material ignited is the first type of material ignited in a fire. In 19% of residential fires in Mesa for the selected years, hardboard/plywood was the first item ignited. Fat/grease and food/starch combines to ignite 20% of Mesa's fires over the selected years. Fat/grease and food/starch are grouped together since they are primarily associated with cooking. Cotton, rayon, and cotton products account for 15% of material ignited. Plastics alone are responsible for 14% of the material ignited.



**Figure 5-Types of Materials Ignited in Residential Properties**

<b>Table 6- Equipment Involved in Ignition</b>		2002	2003	2004
NFIRS #				
12	Water Heater	8	3	6
14	Indoor Fireplace	2	1	2
21	Fixed Stationary Surface Unit	35	27	35
22	Fixed, Stationary Oven	14	11	8
26	Open, Fired Grill	1	1	3
41	Fixed Wiring	12	8	12
52	Dryer	7	6	4

Figure 6 is used to determine what was the primary source of equipment that started a fire. The largest numbers of types of equipment involved are fixed stationary surface units at 47%. The classification of fixed stationary surface units includes stovetops. The stationary units percentage is three times higher than any other type of equipment. Following fixed stationary surface units was fixed/stationary ovens with 16% of the listed equipment types. The two forms of equipment with the least incidents are indoor fireplaces (2%) and grills with 2%.

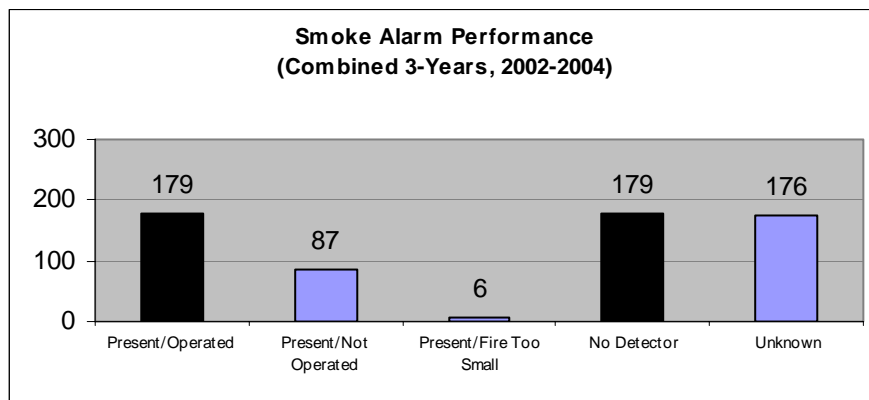


**Figure 6- Equipment Involved in Ignition in Residential Properties**

**Table 7- Smoke Alarm Performance**

		2002	2003	2004
NFIRS #				
1,2	Present/Operated	65	54	60
3,4	Present/Not Operated	36	27	24
5	Present/Fire Too Small	1	1	4
8	No Detector	62	56	61
9,0	Unknown	61	51	64

Smoke detectors and their performance are important to look at when analyzing fire statistics. A smoke detector may be the only means of being warned about a fire. Figure 7 shows that there are an equal amount of detectors present that did not operate, as there are not present. About 32% of the time detectors were present but did not operate. The malfunction of a smoke detector may be caused by two main factors: a drained battery or an outdated detector. Typically, a smoke detector life span is stated on the packaging box or directions/instructions included with the detector. Of the smoke detectors that were present 66% were recorded as operating. This was more than double the national average of 29.8% present and operating.



**Figure 7- Smoke Detector Performance in Residential Properties**

**Table 8-A. Sprinkler Performance**

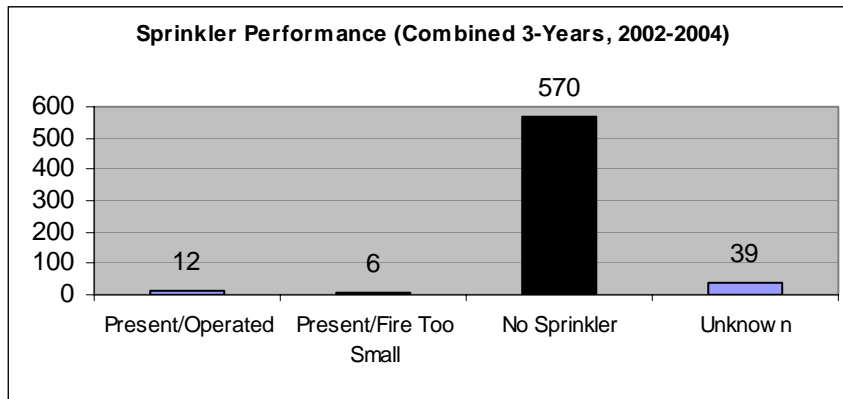
		2002	2003	2004
NFIRS #				
1	Present/Operated	3	6	3
3	Present/Fire Too Small	3	1	2
8	No Sprinkler	206	174	190
9,0	Unknown	13	8	18

**Table 8-B. Sprinkler Based Dollar Loss**

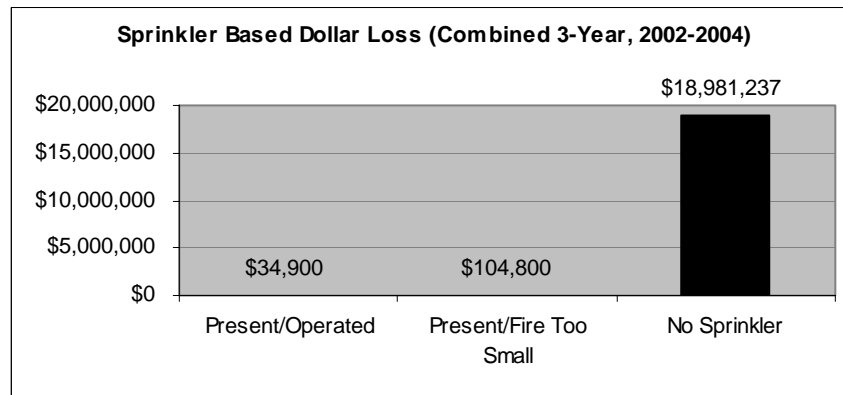
		2002	2003	*2004
NFIRS #				
1	Present/Operated	\$18,500	\$13,750	\$2,650
3	Present/Fire Too Small	\$101,800	\$3,000	\$0
8	No Sprinkler	\$7,755,850	\$6,891,466	\$4,333,921

\*Data taken from the Sprinkler Activations 1999-2005 document produced by Fire Investigators

Sprinkler systems can save lives and a great deal of money if a fire occurs where a systems is present. Residential properties that have sprinkler systems will greatly reduce the chance of a fire fatality and will only experience monetary losses averaging \$2,908 dollars per fire; where as, properties without sprinkler systems will lose an average of \$33,300 dollars per fire based on the data from Figure 8-B. There was a 99.8% reduction in the dollar loss with the application of a sprinkler system over the selected years.



**Figure 8-A. Sprinkler Performance**



**Figure 8-B. Sprinkler Based Dollar Loss of Residential Properties**

# Mesa Fire Department

## 3 Year Summary Report

### Commercial Structure Statistical Data

2002	2003	2004
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**Table 1- Fire and Fire Loss by Property Type**

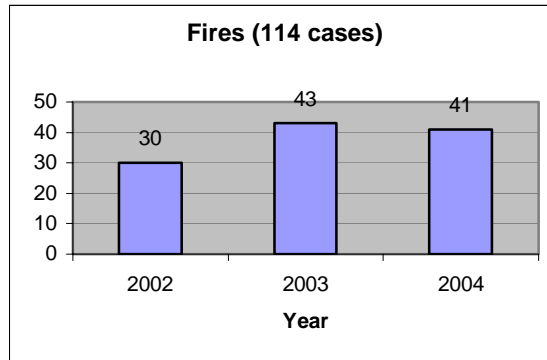
Public Assembly Property	6	8	9
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	26,099	277,700	180,200
Educational Property	4	5	3
Fatalities	0	0	0
Injuries	0	2	0
Dollar Loss (\$)	255,490	13,749	6,019
Institutional Property	3	1	0
Fatalities	0	0	0
Injuries	1	0	0
Dollar Loss (\$)	6,500	300	0
Store/Office Property	8	12	18
Fatalities	0	0	0
Injuries	0	2	0
Dollar Loss (\$)	211,220	966,250	307,300
Basic Industrial Property	0	0	1
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	0	0	90,000
Manufacturing Property	3	2	2
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	99	0	10,000
Storage Property	4	2	4
Fatalities	0	0	0
Injuries	2	0	2
Dollar Loss (\$)	5,500	10,200	318,375
Special Property	2	5	3
Fatalities	0	0	0
Injuries	0	0	0
Dollar Loss (\$)	0	52,000	6,500

**con't. Fire and Fire Loss by Property Type**

	2002	2003	2004
Other Occupancies	0	7	1
Fatalities	0	0	0
Injuries	0	3	1
Dollar Loss (\$)	0	63,200	500

**Fires**

Based on the data for the years of 2002-2004, the majority of commercial fires (33%) have taken place in store/office property. Store/office properties also have the highest values (18.1%) in national statistics for fires. The second and third highest amounts of commercial fires for Mesa are public assembly (20%) and educational property (10%). On average these values are approximately 10% higher than the national averages. Overall, the numbers of commercial fires are five and a half times lower than residential fires in Mesa.



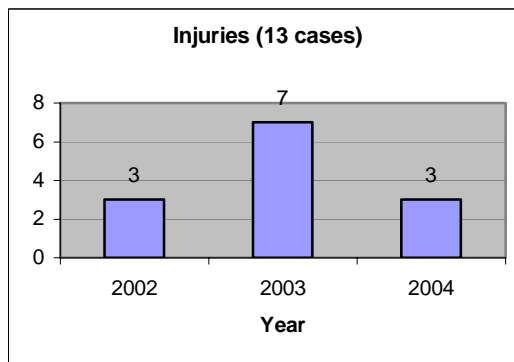
**Figure 1-A. Fire by Property Type**

**Fatalities**

There were no reported deaths in commercial structures in the years of 2002-2004.

**Injuries**

Injuries in commercial properties are much lower than residential properties over the stated years. In total, there have been 13 civilian injuries in all the reported cases of commercial fires for Mesa. Storage properties and other properties have the highest results with 31% each. Educational and store/office each have 15% of all the injuries reported. The final 8% falls under institutional. These results are much higher than the national statistics, which have 21.7% for store/office as the highest followed by 16.5% for manufacturing.



**Figure 1-B. Injuries by Property Type**

## Dollar Loss

The dollar loss in commercial structures was the highest in 2003 with 49% of the total dollar loss of the stated years. Store/office had the highest total monetary loss (53%) followed by public assembly property (17%). Mesa's store/office property is 25% higher than the national average 24.3%. The public assembly property dollar loss is also much higher (11.6%) than the national average of 5.4%. Although these values are much higher than the national averages, many of the other values are strikingly lower, such as manufacturing properties. The national average for manufacturing properties is 20.3%, whereas, Mesa's manufacturing dollar loss is less than one percent.

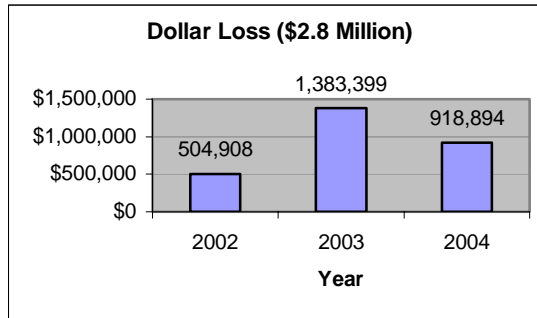


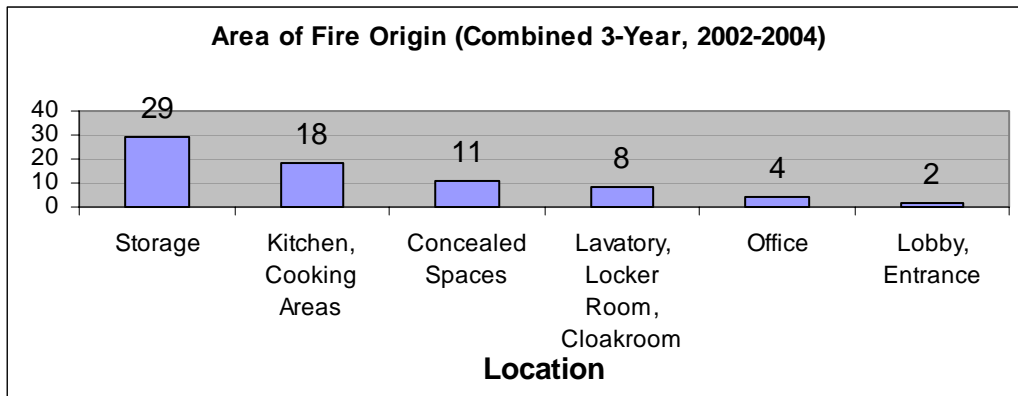
Figure 1-C. Dollar Loss by Property Type

**Table 2- Area of Fire Origin**

		2002	2003	2004
NFIRS #				
05	Lobby, Entrance	1	0	1
24	Kitchen, Cooking Areas	5	7	6
25	Lavatory, Locker Room, Cloakroom	1	3	4
27	Office	1	1	2
4	Storage	11	9	9
7	*Concealed Spaces	3	5	3

\*Concealed spaces include: Crawl Space, Floor/Ceiling, Roof/Ceiling, Wall Space

Areas of fire origin for commercial properties are classified differently than residential properties. Based on the use of the property and the contents, there are some other significant areas where fires may occur. Most noticeable in Figure 2 is the amount of fires starting in storage areas (40%) in the City of Mesa. According to the national statistics, incendiary is the number one cause of fires originating in storage areas. Likewise, incendiary is one of the leading causes of fires starting in Mesa's commercial properties. The second highest area, kitchen/cooking areas, accounts for 25% of all fire origins from 2002-2004. Lobbies/entrances and office areas have had the least amount of fires (8%) combined over the stated years.

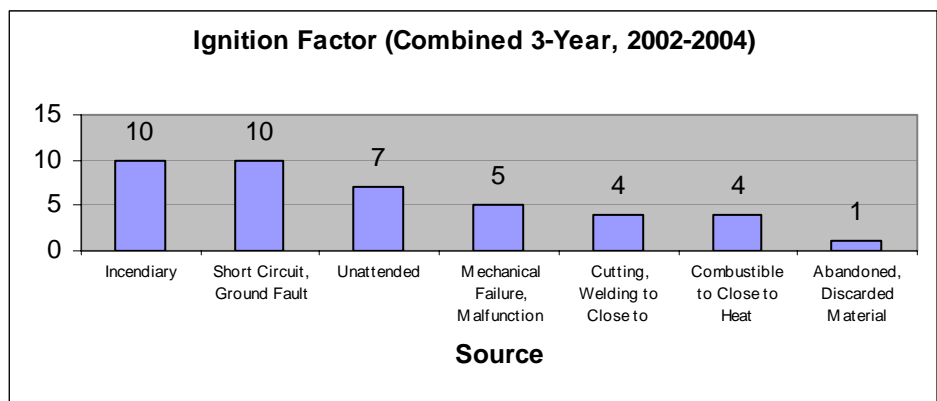


**Figure 2- Leading Ignition Factors for Commercial Properties**

**Table 3- Ignition Factor**

		2002	2003	2004
NFIRS #				
11	Incendiary	8	0	2
31	Abandoned Discarded Material	1	0	0
35	Cutting, Welding to Close to	0	2	2
46	Combustible to Close to Heat	2	0	2
50	Mechanical Failure, Malfunction	0	1	4
54	Short Circuit, Ground Fault	0	5	5
73	Unattended	3	2	2

The two ignition factors in Figure 3 with the highest recorded numbers (24% each) are incendiary and short circuit/ground fault. Short circuit/ground fault is a subtitle of electrical distribution, which is the second leading cause of fires (9.2%) based on national statistics. Nationally, incendiary has been the leading cause of fires across the United States. Unattended is the third leading commercial ignition factor for Mesa and makes up 17% of the leading causes of fires. Abandoned/discarded materials are the cause of the smallest amount of fires (2%) in Mesa.

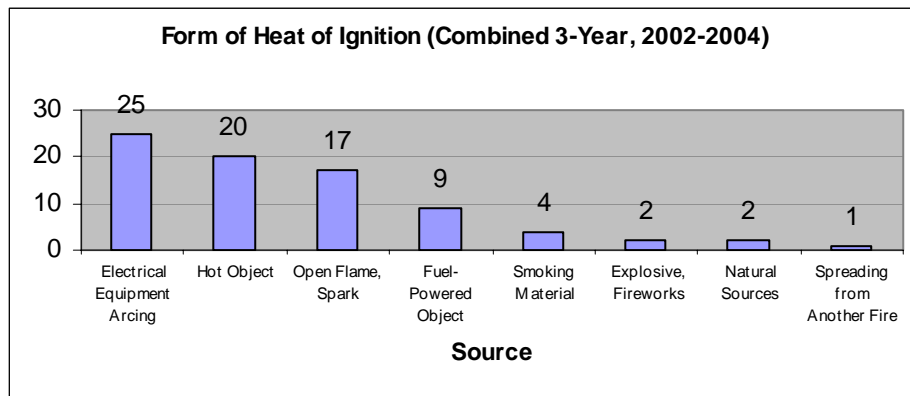


**Figure 3-Leading Ignition Factors for Commercial Properties**

**Table 4- Form of Heat of Ignition**

		2002	2003	2004
NFIRS #				
1	Fuel-Powered Object	2	3	4
2	Electrical Equipment Arcing	8	11	6
3	Smoking Material	3	1	0
4	Open Flame, Spark	6	3	8
5	Hot Object	6	10	4
6	Explosive, Fireworks	0	1	1
7	Natural Sources	0	0	2
8	Spreading form Another Fire	1	0	0

The form of heat of ignition is the type of fire produced that starts a fire. It may take the form of an ember, a hot object, electricity or an open flame. Typically these are much different from residential properties because of the type of equipment being used in various businesses. For commercial property, the largest numbers of fires were started with the form of heat of ignition of electrical equipment arcing followed by hot object and then open flame/sparks. The percentages of these top three forms of heat of ignition are: 31%, 25%, and 21% respectively. Fuel powered objects follow with 9% of the top forms of heat of ignition.

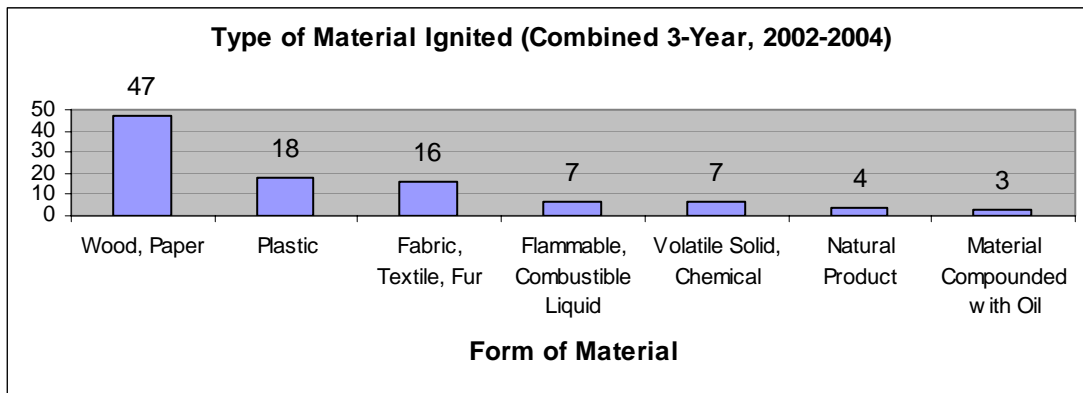


**Figure 4- Form of Heat of Ignition in Commercial Properties**

**Table 5- Type of Material Ignited**

		2002	2003	2004
NFIRS #				
2	Flammable, Combustible Liquid	2	2	3
3	Volatile Solid, Chemical	3	3	1
4	Plastic	4	7	7
5	Natural Product	2	1	1
6	Wood, Paper	16	16	15
7	Fabric, Textile, Fur	4	5	7
8	Material Compounded with Oil	0	1	2

The types of materials first ignited in commercial properties are products and byproducts that are used in many commercial businesses. The leading type of material that was ignited in commercial businesses was wood/paper with 46%. This value is close to three times higher than any other value listed in Figure 5. The second leading type of material was plastic, which accounted for 18% of the top types of materials ignited. Fabrics/textiles and furs were slightly lower than plastic with 16% of the top types of materials ignited. This is more than double the next leading causes: flammable/combustible liquids (7%) and volatile solids/chemicals (7%).

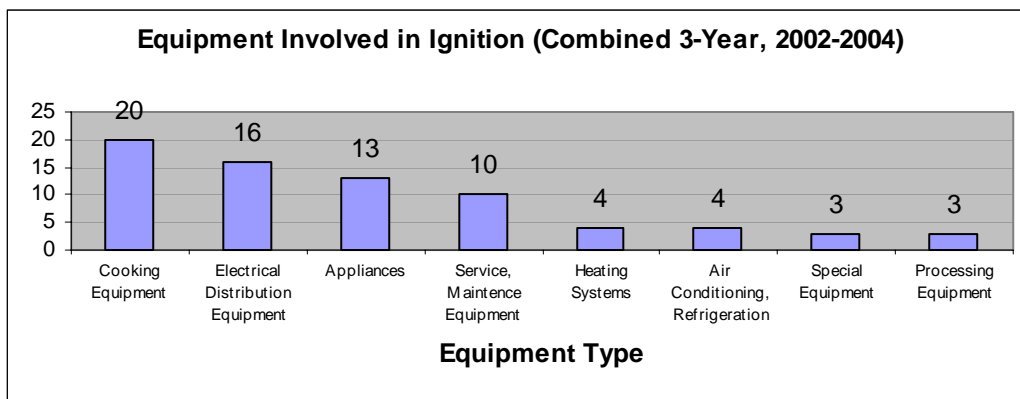


**Figure 5- Form of Heat of Ignition for Commercial Properties**

**Table 6- Equipment Involved in Ignition**

		2002	2003	2004
NFIRS #				
1	Heating Systems	2	1	1
2	Cooking Equipment	7	7	6
3	Air Conditioning, Refrigeration	3	1	0
4	Electrical Distribution Equipment	2	8	6
5	Appliances	2	7	4
6	Special Equipment	1	1	1
7	Processing Equipment	1	1	1
8	Service, Maintenance Equipment	0	2	8

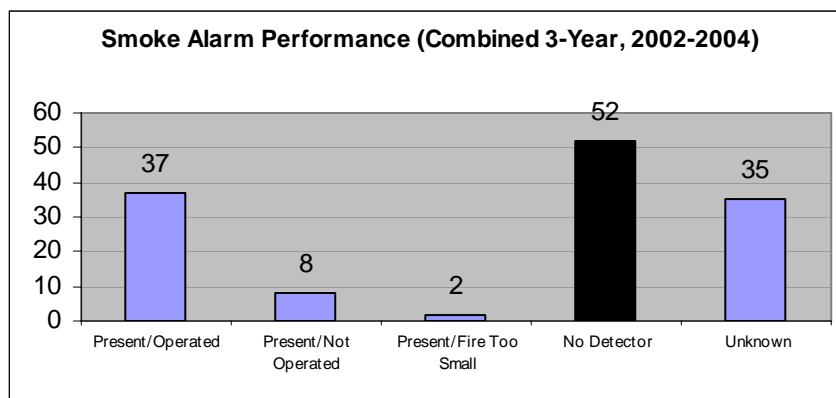
Of the different types of equipment involved in ignition, cooking equipment was the highest, with a total of 27% of the top forms of ignition equipment for commercial properties. Following cooking equipment was electrical distribution equipment, which accounted for 22% of the top equipment types. Special equipment and processing equipment were the lowest with 4% each.



**Figure 6- Equipment involved in Ignition in Commercial Properties**

<b>Table 7- Smoke Alarm Performance</b>		2002	2003	2004
NFIRS #				
1,2	Present/Operated	13	14	10
3,4	Present/Not Operated	5	2	1
5	Present/Fire Too Small	0	1	1
8	No Detector	14	19	19
9,0	Unknown	5	10	20

Smoke detectors primary purpose is to alert persons inside a structure in the event of a fire. Of the detectors that were present, they were recorded as operating 79% of the time in the event of a fire. In commercial properties where fires occurred, 39% of the properties did not have smoke detectors. In 6% of the cases, smoke detectors were present but did not operate. According to Figure 7, the operation of smoke detectors was unknown in 26% of the reported fires in Mesa.



**Figure 7- Smoke Alarm Performance in Commercial Properties**

**Table 8-A. Sprinkler Performance**

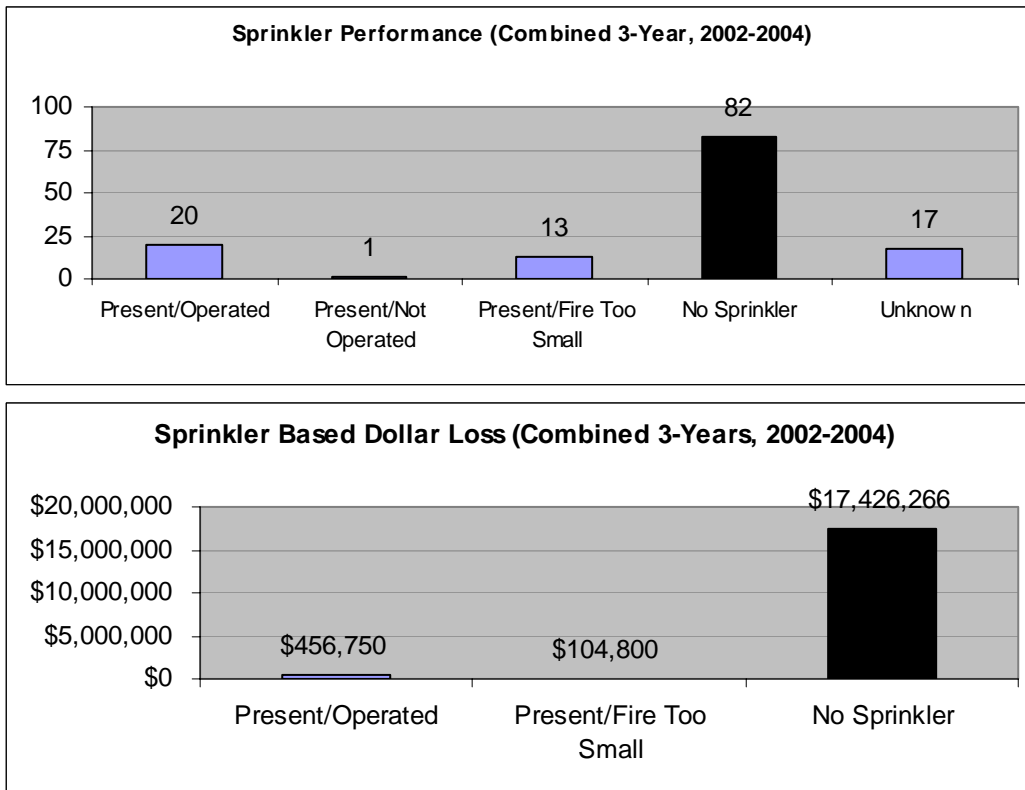
	2002	2003	2004
NFIRS #			
1 Present/Operated	5	8	7
2 Present/Not Operated	0	0	1
3 Present/Fire Too Small	4	5	4
8 No Sprinkler	23	28	31
9,0 Unknown	4	5	8

**Table 8-B. Sprinkler Based Dollar Loss**

	2002	2003	*2004
NFIRS #			
1 Present/Operated	\$18,500	\$13,750	\$424,500
3 Present/Fire Too Small	\$101,800	\$3,000	\$0
8 No Sprinkler	\$7,755,850	\$6,891,466	\$2,778,950

\*Data taken from Sprinkler Activation 1999-2005 document produced by Fire Investigators

Sprinkler systems are used to control the spread of a fire, saving lives and a large amount of money from fire damage. Commercial properties that have sprinkler systems are estimated to save \$189,677 per fire based on the data in Figure 8. Properties that do not have sprinkler systems will lose an average of \$212,515 per fire, whereas, a property that has a sprinkler system will lose an average of \$22,838 per fire. With the installation of a sprinkler system, commercial properties are estimated to have an 89% reduction in their dollar losses per fire occurrence. Of the properties that have sprinkler systems, they operated properly 95% of the time.



**Figure 8- Sprinkler Performance and Sprinkler Based Dollar Loss of Commercial Properties**

# Mesa Fire Department 5 Year Summary Report

## Inspection Statistical Data

2000	2001	2002	2003	2004	Average per Year	2004 Deviation From Average (%)
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### Regular Inspections Per Calendar Year

		2000	2001	2002	2003	2004	Average per Year	2004 Deviation From Average (%)
Regular Agency Assist	RAA	0	15	8	16	10	9.8	2.00%
Regular Citizen Assist	RCA	74	39	39	59	48	51.8	-7.30%
Regular Citizen Complaint	RCP	71	99	65	87	90	82.4	9.20%
Regular Defueling Tanks	RDT	9	4	0	0	0	2.6	-100%
Regular Engine Co Assist	REA	37	17	37	79	75	49	53.10%
Regular Evacuation Plan	REP	0	15	6	8	15	8.8	70.50%
Regular Extinguisher Insp	REX	13	3	1	0	0	3.4	-100%
Regular Fire Drill	RFD	0	0	2	8	8	3.6	122.20%
Regular Fire Lane	RFL	17	9	8	7	10	10.2	-2%
Regular Fire Marshall Plan Insp	RFM	2	3	0	1	6	2.4	150%
Regular FP Inspection	RFP	438	772	732	1198	1268	881.6	43.80%
Regular Improvement Permit	RIP	1582	945	156	31	0	542.8	-100%
Regular Knox Box	RKX	252	346	189	219	243	249.8	-2.70%
Regular Liquor License	RLI	6	43	52	64	36	40.2	-10.40%
Regular New Construction	RNC	0	0	0	6	4	2	100%
Regular Public Education Activ	RPE	44	27	8	4	9	18.4	-51.10%
Regular Primary Information	RPI	164	69	641	780	157	362.2	-56.70%
Regular Special Event	RSE	23	20	50	60	78	46.2	68.80%
Regular System Maintenance	RSM	39	73	39	143	194	97.6	98.80%
Regular Tax and License	RTL	0	12	28	36	16	18.4	-13%
Regular UG Tank Removal	RUR	2	4	12	9	11	7.6	44.70%
Regular Partnership Prog Deliv	PIP	5280	6761	5733	5797	4074	5529	-26.30%

2000	2001	2002	2003	2004	Average per Year	2004 Deviation From Average (%)
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**Follow Up Inspections Per Calendar Year**

Follow Up Agency Assist	FAA	0	7	16	3	4	6	-33.30%
Follow Up false Alarm	FAF	0	0	0	2	1	0.6	66.70%
Follow Up Citizen Complaint	FCP	36	55	30	56	51	45.6	11.80%
Follow Up Defuel Tank	FDT	1	0	0	0	0	0.2	-100%
Follow up Engine Co Assist	FEA	3	5	22	43	36	21.8	65.10%
Follow Up Evacuation Plan	FEP	0	0	0	2	3	1	200%
Follow Up Fire Extinguisher In	FEX	0	0	2	1	0	0.6	60%
Follow Up Fire Lane	FFL	3	0	13	1	3	3.4	-11.80%
Follow Up Knox Box	FKX	43	71	142	129	124	101.8	21.80%
Follow Up Liquor License	FLI	3	46	40	32	12	26.6	-54.90%
Follow Up FP Inspection	FPF	446	466	553	745	676	577.2	17.10%
Follow UP Primary Information	FPI	0	0	0	6	0	1.2	-100%
Follow Up Special Event	FSE	3	5	6	13	20	9.4	113%
Follow Up System Maintenance	FSM	44	34	27	55	76	47.2	61.00%
Follow Up Tax and License	FTL	1	3	9	6	2	4.2	-52.40%
Follow Up UG Tank Removal	FUR	0	0	4	0	0	0.8	-100%

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