Special Analysis Package
Computer Equipment and Computer Areas

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Introduction

Computer equipment and computer areas are not uniquely identified in the national fire incident data bases. Instead, computer equipment is part of a larger category of electronic equipment, which also includes telephone equipment and some other types of equipment that will be factors only in a few select types of properties (e.g., radar, x-ray equipment, transmitter).

Similarly, computer or data processing areas are coded as part of a larger category of electronic equipment areas which also includes telephone equipment rooms and telephone booths, control centers, and radar rooms.

This statistical analysis therefore unavoidably covers all electronic equipment rooms and electronic equipment. The incidents that follow in the illustrative narrative section, however, have been screened for computer-related fires only.

Note, too, that computer equipment (or other electronic equipment) need not be located in a room or area dedicated to such equipment. Conversely, a fire in a room that is dedicated to such equipment need not start with the equipment. For example, fire could start in trash or in the room's wiring system.

Overview of Fires in Electronic Equipment Areas

Table 1 shows that more than a thousand structure fires a year are reported to U.S. fire departments as originating in electronic equipment rooms or areas. There was a fairly steady decline in such fires from 1980 to 1989. Since then, the number leveled off until 1991 and then rose to nearly the levels of 1987-1988, where it remained in 1992-1995. The 1996 total was the highest since 1985, but the 1997-1998 totals fell back to 1995 levels. Civilian deaths have been rare but have been reported in four of the last eight years. Reported civilian injuries ranged from 10 to 96 a year. Injury totals have varied widely from year to year, with no steady trend, but multi-year averages suggest a long-term downward trend. Direct property damage unadjusted for inflation has averaged roughly $20-30 million a year in recent years, but 1994 and 1997 were both above that range. With

adjustment for inflation, it would be clear that the long term trend is down.

Table 1 shows that during 1994-1998, there were an average of 1,259 structure fires per year originating in electronic equipment rooms or areas, with an annual average of one civilian death, 23 civilian injuries and $31.05 million in direct damages. Table 2 shows that one- and two-family dwellings (which include manufactured homes) collectively ranked first among properties with these fires, as they do for structure fires generally. General business offices ranked second and apartments ranked third. Hospitals ranked fourth; under the definitions, an x-ray room that was not an operating room would qualify. Among the other property groups, only restaurants had 2% or more of the fires.

Because homes (one- and two-family dwellings and apartments) dominate the totals, it is necessary to remove them in order to focus on properties that have the kind of electronic equipment rooms or areas one normally imagines when that term is used. Table 3 shows the trend since 1980 in electronic equipment room fires in structures excluding homes. As in Table 1, the total has generally declined. The 1998 total was the second lowest in the period studied, and recent totals have been just under a thousand. Associated civilian fire deaths have been rarer, with none since 1993.

Table 4 shows that most electronic equipment room fires in structures other than homes began with electrical distribution system equipment or "other equipment," a category that includes electronic equipment. Table 5 then provides a more detailed breakdown of the fires by equipment involved in ignition. Grouped in this way, the largest group of fires was the group of fires in which no equipment was involved. Electronic equipment accounted for the second largest number of fires. Fuses, circuit breakers, and other over current protection devices; and the fixed wiring of the room had the next highest fire totals. These four groups accounted for nearly half of the fires and nearly two-thirds of the associated direct property loss.

Table 2 indicates that office properties, including general business offices, bank buildings, and other specialized, unclassified, or unknown-type offices, constitute the only occupancy group with

enough electronic equipment room fires to justify separate analysis. Tables 6 and 7 provide a breakdown of those fires by major cause and equipment involved in ignition. Table 6 shows the same two leading causes as in Table 4, but with the order reversed, indicating a larger role for fires starting with electronic equipment in office electronic equipment room fires than in all non-home electronic equipment room fires. This is not surprising, given that electronic equipment rooms in office buildings are more likely to be the kinds of rooms (e.g., computer rooms, telephone switchgear closets) we think of. Table 7 compares to Table 5 as Table 6 compared to Table 4, with Table 7 showing essentially the same leading types of equipment, but also showing more fires starting with electronic equipment than with no equipment involved, unlike Table 5.

Overview of Fires Starting with Electronic Equipment

In view of Table 5, it may not be surprising that there were fewer structure fires starting with electronic equipment than there were structure fires starting in electronic equipment rooms. (See Table 8.) There had been a generally downward trend in the number of fires until 1993, but there has been considerable year-to-year variation, and the last four years studied have all showed historically high totals. Associated property losses (unadjusted for inflation) have shown a generally upward trend, also highly variable from year to year. Table 9 shows a similar trend still applies when home fires are excluded.

Table 9 shows that during 1994-1998, there were an average of 605 fires per year in structures excluding homes and starting with electronic equipment, with an annual average of no civilian deaths, 11 civilian injuries, and $17.79 million in direct damage. Note that these figures show a lower number of fires (and associated property damage) than those originating in electronic equipment rooms (944 per year in 1994-1998) but much higher than for electronic equipment fires (and associated property damage) originating in electronic equipment rooms (120 per year in 1994-1998). The two fire problems overlap only slightly.

Table 10 shows that one- and two-family dwellings, including manufactured homes, ranked first with no close second in the number of electronic equipment fires. Apartments, general business offices, and hospitals ranked second, third, and fourth, with no other property class close to those.

Fire Protection Equipment

Tables 11 and 12 show the performance of automatic suppression equipment in fires originating in electronic equipment rooms in all structures excluding homes or in office buildings only, respectively. Table 13 shows performance in fires starting with electronic equipment, in structures excluding homes. Of fires originating in electronic equipment rooms in structures excluding homes and with known automatic suppression equipment performance, 40% were in properties with automatic suppression equipment present, and the average property damage per fire was 76% lower with such equipment. Of fires originating in electronic equipment rooms in office buildings and with known automatic suppression equipment performance, 49% were in properties with automatic suppression equipment present, and the average property damage per fire was 58% lower with such equipment. Of fires starting with electronic equipment in structures excluding homes and with known automatic suppression equipment performance, 45% were in properties with automatic suppression equipment, and the average property damage per fire was 70% lower with such equipment.

Tables 14 and 15 show the performance of automatic detection equipment in fires originating in electronic equipment rooms in all structures excluding homes or in office buildings only, respectively. Table 16 shows performance in fires starting with electronic equipment, in structures excluding homes. Of fires originating in electronic equipment rooms with known automatic detection equipment performance, 62% were in properties with automatic detection equipment present, and the average property damage per fire was 66% lower with such equipment. Of fires originating in electronic equipment rooms in office buildings and with known automatic detection equipment performance, 79% were in properties with automatic detection equipment present, and the average

property damage per fire was 91% lower with such equipment. Of fires starting with electronic equipment in structures excluding homes and with known automatic detection equipment performance, 68% were in properties with automatic detection equipment present, and the average property damage per fire was 61% lower with such equipment.

Extent of Flame and Smoke Damage

Tables 17 and 18 show the extent of flame damage for fires originating in electronic equipment rooms in structures excluding homes and in office buildings, respectively. Table 19 shows comparable data for fires starting with electronic equipment in structures excluding homes. In all cases, most fires had flame damage confined to the object of origin, but property damage was much more likely to occur in larger fires.

Tables 20 and 21 show the extent of smoke damage for fires originating in electronic equipment rooms in structures excluding homes and in office buildings, respectively. Table 22 shows comparable data for fires starting with electronic equipment in structures excluding homes. In all cases, half or more of the fires had either no smoke damage at all or smoke damage confined to the object, area, or room of origin, but most of the property damage occurred in fires where smoke spread extended beyond the floor of origin.

Communications, Defense, and Document Facilities

Properties wholly dedicated to computer or telecommunication activities are a comparatively small part of the U.S. fire problem. During 1994 to 1998, computer and data processing centers averaged 19 structure fires per year, no reported civilian deaths, less than one civilian injury per year, and $2.18 million per year in direct property damage. All communications, defense, and document facilities combined (which includes defense radio and radar sites, police and fire communications

centers, telephone exchanges, and document centers and record repositories) averaged 200 structure fires per year, no civilian deaths and 4 civilian injuries per year, and $7.10 million per year in direct property damage.

Table 1. Structure Fires
Originating in Electronic Equipment Rooms, by Year

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
1980	1,600	0	35	$27.72
1981	1,626	0	69	$27.92
1982	1,510	0	39	$13.77
1983	1,212	0	96	$22.37
1984	1,370	0	23	$11.47
1985	1,356	0	30	$15.08
1986	1,328	0	57	$17.86
1987	1,261	0	24	$11.02
1988	1,263	0	26	$37.82
1989	1,124	0	47	$26.09
1990	1,134	0	35	$33.12
1991	1,125	2	24	$30.02
1992	1,200	0	73	$20.20
1993	1,238	1	29	$17.10
1994	1,195	2	18	$44.28
1995	1,227	0	10	$21.90
1996	1,335	3	36	$21.42
1997	1,255	0	31	$37.54
1998	1,281	0	21	$30.10
Annual Average 1994-98	1,259	1	23	$31.05

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin.

Source: National estimates based on NFIRS and NFPA survey.

Table 2. Structure Fires
Originating in Electronic Equipment Rooms, by Specific Property Use
Annual Average of 1994-1998 Fires

Specific Property Use	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
One or two-family dwelling	238	1	6	$2.48
General business office	107	0	2	$1.77
Apartment	78	0	4	$0.87
Hospital	55	0	0	$0.23
Restaurant	28	0	0	$0.65
Hotel or motel	24	0	1	$0.75
Unknown-type office property	21	0	0	$0.06
Bank building	16	0	0	$0.08
Electrical appliance or electronic equipment manufacturing facility	15	0	2	$0.34
Nursing home	15	0	0	$0.01
College classroom building	13	0	0	$0.53
High school	13	0	0	$0.02
Radio or radar site	12	0	0	$1.88
Supermarket	12	0	0	$0.05
Elementary school	12	0	0	$0.02
Unknown-type communications defense, or document center	11	0	0	$0.73
Telephone exchange or central office	11	0	0	$0.61
Medical, research, or scientific office	10	0	0	$0.11
Mall	10	0	0	$0.10
Metal product manufacturing facility	10	0	0	$0.39
Electrical equipment manufacturing facility	10	0	0	$0.40
General warehouse	9	0	1	$0.07
Church or chapel	9	0	0	$0.17
Iron or steel manufacturing facility	9	0	0	$0.31
Water supply system	8	0	0	$0.13
Market or grocery store	8	0	0	$0.02
Electricity transmission or distribution system	7	0	0	$0.97
Fire, police, or industrial communications center	7	0	0	$0.14
Sawmill, planing, or wood product mill	6	0	1	$0.11
Electric generating plant	6	0	0	$0.12
Police station	6	0	0	$0.00
Clinic	6	0	0	$0.00
Newspaper, magazine, or other print or publishing firm	6	0	0	$0.03
Unclassified office property	5	0	0	$0.99
Motor vehicle repair or paint shop	5	0	0	$0.06
Radio or television studio	5	0	0	$0.12
Computer or data processing center	5	0	0	$0.21

Table 2. Structure Fires
Originating in Electronic Equipment Rooms, by Specific Property Use
Annual Average of 1994-1998 Fires (Continued)

Specific Property Use	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Plastic product manufacturing facility	5	0	0	$0.14
Specialty food store	5	0	0	$0.03
Engineering, architectural, or other technical office	5	0	0	$0.41
Department store	5	0	0	$0.01
Car washing facility	5	0	0	$0.00
Printing, publishing, or allied industry facility	4	0	0	$0.06
Unknown-type food or beverage store	4	0	0	$0.05
Unclassified specialty shop	4	0	0	$0.03
Unknown-type facility for care of the sick	4	0	0	$0.00
Unknown-type manufacturing property	4	0	0	$0.29
Self-service laundry or dry cleaning establishment	4	0	0	$0.03
Public service station	4	0	0	$0.00
Clothing store	4	0	0	$0.07
Religious education facility	4	0	0	$0.07
Unknown-type eating or drinking establishment	4	0	0	$0.02
Tavern	4	0	0	$0.01
Large variety store (at least 10,000 square feet)	4	0	0	$0.00
Unknown-type prison or jail	4	0	1	$0.00
Hog product production facility	4	0	0	$0.50
Unclassified agricultural structure	4	0	0	$0.08
Arena or stadium	4	0	0	$0.04
Men’s prison	4	0	0	$0.02
Outbuilding, excluding garage	4	0	0	$0.01
Machinery manufacturing facility	4	0	0	$0.01
Unclassified special property	4	0	0	$0.11
Unclassified manufacturing property	4	0	0	$0.05
Barn or stable	4	0	0	$0.05
Church hall	4	0	0	$0.01
Appliance store	3	0	0	$0.42
Junior high school	3	0	0	$0.05
Instrument manufacturing facility	3	0	0	$0.03
Unknown-type nonresidential school property	3	0	0	$0.03
Rehabilitation center	3	0	0	$0.00
Unknown-type general item store	3	0	0	$0.01
Mental institution	3	0	0	$0.00

Table 2. Structure Fires
Originating in Electronic Equipment Rooms, by Specific Property Use
Annual Average of 1994-1998 Fires (Continued)

Specific Property Use	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Photographic supply store or still photography studio	3	0	0	$0.52
Country club	3	0	0	$0.18
Paper, pulp, or paperboard manufacturing facility	3	0	0	$0.16
Unclassified manufacturing property	3	0	0	$0.11
Unknown-type residential property	3	0	0	$0.04
Vocational or trade school	3	0	0	$0.03
Fire station	3	0	0	$0.01
Unclassified general item store	3	0	0	$0.00
Dormitory, fraternity or sorority house, or barracks	3	0	0	$0.00
Tool shed	3	0	0	$0.07
Idle property (i.e., some or all property from previous use still on site)	3	0	0	$0.04
Soft drink manufacturing facility	3	0	0	$0.03
City club	3	0	0	$0.02
Unknown-type utility property or energy distribution system	3	0	0	$0.02
Unknown-type storage property	3	0	0	$0.01
Cattle product production facility (e.g., milking house)	3	0	0	$0.01
Laundry or dry cleaning pick-up store	3	0	0	$0.00
Library	3	0	0	$0.00
Unknown-type motor vehicle sales or service facility	3	0	0	$0.00
Paper, pulp, or paperboard product manufacturing facility	3	0	0	$0.00
Other known	222	0	3	$7.00
Unknown	14	0	0	$4.64
Total	1,259	1	23	$31.05

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 3. Structure Fires Excluding Homes Originating in Electronic Equipment Rooms, by Year

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
1980	1,416	0	31	$27.32
1981	1.432	0	69	$27.57
1982	1,366	0	36	$12.16
1983	1,038	0	96	$21.30
1984	1,221	0	19	$10.76
1985	1,189	0	24	$14.53
1986	1,146	0	57	$16.39
1987	1,101	0	24	$9.80
1988	1,083	0	26	$35.74
1989	937	0	42	$23.67
1990	956	0	35	$30.33
1991	880	2	20	$24.16
1992	949	0	65	$18.42
1993	933	1	25	$15.30
1994	949	0	10	$40.95
1995	939	0	4	$18.05
1996	997	0	23	$17.69
1997	945	0	16	$35.56
1998	887	0	14	$26.27
Annual Average 1994-98	944	0	13	$27.71

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin.

Source: National estimates based on NFIRS and NFPA survey.

Table 4. Structure Fires Excluding Homes Originating in Electronic Equipment Rooms, by Major Cause Annual Average of 1994-1998 Fires

Major Cause	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Electrical distribution equipment	416	0	6	$7.91
Other equipment	283	0	6	$11.92
Appliance, tool or air conditioning	72	0	0	$0.77
Natural cause	42	0	0	$1.59
Incendiary or suspicious	41	0	0	$3.66
Heating equipment	35	0	0	$0.20
Open flame, ember, or torch	16	0	0	$0.17
Exposure (to other hostile fire)	13	0	0	$1.37
Smoking material (i.e., lighted tobacco product)	12	0	0	$0.07
Cooking equipment	9	0	0	$0.04
Other heat source	4	0	0	$0.02
Child playing	1	0	0	$0.00
Total	944	0	13	$27.71

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown major cause have been proportionally allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 5. Structure Fires Excluding Homes
Originating in Electronic Equipment Rooms, by Equipment Involved in Ignition
Annual Average of 1994-1998 Fires

Equipment Involved in Ignition	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
No equipment involved	133	0	1	$5.14
Electronic equipment	120	0	4	$8.92
Fuse, circuit breaker, or other overcurrent protection device	96	0	3	$1.07
Fixed wiring	91	0	1	$2.23
Unknown-type electrical distribution equipment	76	0	2	$3.40
Transformer	71	0	0	$0.41
Unclassified electrical distribution equipment	38	0	0	$1.67
Meter or meter box	24	0	0	$0.39
Separate motor or generator	21	0	0	$0.08
Light fixture, lampholder, or sign	20	0	0	$0.09
Switch, receptacle, or outlet	16	0	0	$0.02
Office machine	16	0	0	$0.14
Central air conditioning or refrigeration equipment	15	0	0	$0.01
Cord or plug	15	0	0	$0.23
Unclassified special equipment	13	0	0	$0.23
Central heating unit	12	0	0	$0.01
Television, radio, VCR, or phonograph	10	0	0	$0.27
Room air conditioner	10	0	0	$0.00
Torch	10	0	0	$0.14
Unclassified appliance	10	0	0	$0.80
Other known equipment involved in ignition	123	0	1	$2.46
Total	944	0	13	$27.71

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown equipment involved in ignition have been proportionally allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 6. Office Building Structure Fires
Originating in Electronic Equipment Rooms, by Major Cause
Annual Average of 1994-1998 Fires

Major Cause	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Other equipment	68	0	1	$0.98
Electrical distribution equipment	56	0	0	$1.53
Appliance, tool, or air conditioning	15	0	0	$0.09
Heating equipment	9	0	0	$0.02
Natural cause	7	0	0	$0.02
Smoking material (i.e., lighted tobacco product)	4	0	0	$0.05
Incendiary or suspicious	4	0	0	$0.53
Cooking equipment	2	0	0	$0.00
Open flame, ember or torch	1	0	0	$0.00
Other heat source	1	0	0	$0.00
Exposure (to other hostile fire)	0	0	0	$0.18
Total	167	0	2	$3.41

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown major cause have been allocated proportionally. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 7. Office Building Structure Fires
Originating in Electronic Equipment Rooms, by Equipment Involved in Ignition
Annual Average of 1994-1998 Fires

Equipment Involved in Ignition	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Electronic equipment	38	0	1	$0.32
No equipment involved	21	0	1	$0.47
Fuse, circuit breaker, or other overcurrent protection device	13	0	0	$0.25
Transformer	12	0	0	$0.05
Fixed wiring	12	0	0	$0.07
Office machine	7	0	0	$0.10
Central heating unit	5	0	0	$0.00
Unclassified electrical distribution equipment	5	0	0	$0.01
Unknown-type electrical distribution equipment	4	0	0	$1.02
Unclassified special equipment	4	0	0	$0.19
Light fixture or sign	4	0	0	$0.08
Room air conditioner	4	0	0	$0.00
Separate motor or generator	4	0	0	$0.02
Switch, receptacle, or outlet	3	0	0	$0.00
Meter or meter box	3	0	1	$0.02
Cord or plug	3	0	0	$0.05
Unclassified appliance	3	0	0	$0.05
Other known equipment involved in ignition	23	0	0	$0.71
Total	167	0	2	$3.41

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown equipment involved in ignition have been allocated proportionally. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 8. Structure Fires
Starting with Electronic Equipment, by Year

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
1980	1,155	0	3	$5.78
1981	1,438	0	4	$9.87
1982	937	0	16	$5.11
1983	759	0	18	$12.47
1984	1,055	0	21	$7.96
1985	1,042	7	27	$9.03
1986	946	0	20	$9.06
1987	933	7	44	$10.33
1988	834	0	29	$17.60
1989	922	0	23	$12.71
1990	891	12	23	$13.16
1991	762	0	25	$16.69
1992	953	3	24	$7.47
1993	908	3	108	$13.07
1994	947	8	39	$45.26
1995	1,044	3	17	$17.80
1996	1,098	0	35	$18.77
1997	1,061	0	18	$20.02
1998	1,062	4	36	$23.36
Annual Average 1994-98	1,042	3	29	$25.04

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition.

Source: National estimates based on NFIRS and NFPA survey.

Table 9. Structure Fires Excluding Homes Starting with Electronic Equipment, by Year

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
1980	771	0	3	$4.68
1981	964	0	4	$8.82
1982	725	0	13	$4.52
1983	590	0	15	$10.78
1984	723	0	9	$4.86
1985	777	0	22	$8.12
1986	641	0	0	$6.77
1987	627	0	9	$9.21
1988	536	0	12	$16.04
1989	599	0	2	$8.98
1990	567	0	12	$10.74
1991	509	0	3	$9.93
1992	581	0	7	$4.71
1993	534	0	77	$9.82
1994	573	0	4	$37.58
1995	641	0	5	$15.20
1996	614	0	21	$9.62
1997	618	0	4	$12.55
1998	581	0	20	$14.02
Annual Average 1994-98	605	0	11	$17.79

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition.

Source: National estimates based on NFIRS and NFPA survey.

Table 10. Structure Fires
Starting with Electronic Equipment, by Specific Property Use
Annual Average of 1994-1998 Fires

Specific Property Use	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
One- or two-family dwelling	349	3	10	$5.81
Apartment	88	0	9	$1.44
General business office	77	0	1	$0.78
Hospital	73	0	0	$0.41
Unknown-type facility for care of the sick	18	0	0	$0.05
Bank building	15	0	0	$0.11
Restaurant	14	0	0	$0.75
Unknown-type office	13	0	0	$0.17
Medical, research, or scientific office	12	0	0	$0.06
Nursing home	11	0	2	$0.01
Electrical appliance or electronic equipment manufacturing facility	9	0	2	$0.18
Public service station	9	0	0	$0.14
Hotel or motel	8	0	0	$0.07
Fire, police, or industrial communications center	8	0	0	$0.04
College classroom building	7	0	0	$0.04
Dwelling garage	7	0	0	$0.04
Elementary school	7	0	0	$0.00
Church or chapel	6	0	0	$0.28
Police station	6	0	0	$0.00
Unclassified specialty shop	5	0	0	$0.21
Computer or data processing center	5	0	0	$0.37
Supermarket	5	0	0	$0.04
Clinic	5	0	0	$0.02
Unclassified office	5	0	0	$0.01
Unknown-type residential property	4	0	0	$0.10
Specialty food store	4	0	0	$0.07
Engineering, architectural, or other technical office	4	0	0	$0.05
Unknown-type food or beverage sales store	4	0	0	$0.01
Telephone exchange or central office	4	0	0	$0.80
Metal product manufacturing facility	4	0	0	$0.01
Fire station	4	0	0	$0.03
Unknown-type prison or jail	4	0	1	$0.00
Mall	3	0	0	$0.15
General warehouse	3	0	0	$0.07
Unknown-type metal or metal products manufacturing facility	3	0	0	$0.04

Table 10. Structure Fires
Starting with Electronic Equipment, by Specific Property Use
Annual Average of 1994-1998 Fires (Continued)

Specific Property Use	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Sawmill, planing, or wood product mill	3	0	0	$0.03
Dormitory, fraternity or sorority house, or barracks	3	0	0	$0.02
High school	3	0	0	$0.00
Junior high school	3	0	0	$0.02
Tavern	3	0	0	$0.00
Instrument manufacturing facility	3	0	0	$0.02
Electrical equipment manufacturing facility	3	0	0	$0.01
Market or grocery store	3	0	0	$0.00
Unknown-type communications, defense, or document center	3	0	0	$0.00
Boarding, rooming, or lodging home	3	0	0	$0.06
Other known	193	0	1	$6.92
Unknown	15	0	0	$5.57
Total	1,042	3	29	$25.04

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 11. Structure Fires Excluding Homes Originating in Electronic Equipment Rooms, by Performance of Automatic Suppression Equipment Annual Average of 1994-1998 Fires

Automatic Suppression Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Equipment present	379	0	7	$3.89
Equipment operated	52	0	1	$1.74
Equipment didn't operate but fire not too small	14	0	0	$0.20
Fire too small to activate equipment	313	0	5	$1.95
No equipment present	551	0	6	$23.66
Unclassified	14	0	1	$0.16
Total	944	0	13	$27.71

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown performance of automatic suppression equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 12. Office Building Structure Fires Originating in Electronic Equipment Rooms, by Performance of Automatic Suppression Equipment Annual Average of 1994-1998 Fires

Automatic Suppression Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Equipment present	81	0	1	$0.98
Equipment operated	7	0	0	$0.61
Equipment didn't operate but fire not too small	3	0	0	$0.00
Fire too small to activate equipment	72	0	1	$0.36
No equipment present	84	0	1	$2.44
Unclassified	1	0	0	$0.00
Total	167	0	2	$3.41

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown performance of automatic suppression equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 13. Structure Fires Excluding Homes Starting with Electronic Equipment, by Performance of Automatic Suppression Equipment Annual Average of 1994-1998 Fires

Automatic Suppression Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Equipment present	273	0	8	$3.58
Equipment operated	34	0	1	$1.49
Equipment didn't operate but fire not too small	8	0	0	$0.23
Fire too small to activate equipment	230	0	7	$1.86
No equipment present	320	0	2	$14.17
Unclassified	13	0	0	$0.04
Total	605	0	11	$17.79

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Electronic equipment fires with unknown performance of automatic suppression equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 14. Structure Fires Excluding Homes Originating in Electronic Equipment Rooms, by Performance of Automatic Detection Equipment Annual Average of 1994-1998 Fires

Automatic Detection Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Detector present	589	0	6	$9.00
Detector operated	372	0	3	$6.79
Detector didn't operate but fire not too small	121	0	2	$1.96
Fire too small to activate detector	96	0	1	$0.25
No detector present	335	0	6	$15.24
Unclassified	19	0	2	$3.46
Total	944	0	13	$27.71

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown performance of automatic detection equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 15. Office Building Structure Fires Originating in Electronic Equipment Rooms, by Performance of Automatic Detection Equipment Annual Average of 1994-1998 Fires

Automatic Detection Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Detector present	132	0	1	$0.70
Detector operated	90	0	1	$0.63
Detector didn't operate but fire not too small	20	0	0	$0.01
Fire too small to activate detector	21	0	0	$0.05
No detectors present	33	0	1	$1.95
Unclassified	2	0	0	$0.76
Total	167	0	2	$3.41

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown performance of automatic detection equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 16. Structure Fires Excluding Homes Starting with Electronic Equipment, by Performance of Automatic Detection Equipment Annual Average of 1994-1998 Fires

Automatic Detection Equipment Performance	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Detector present	410	0	8	$8.15
Detector operated	229	0	4	$7.56
Detector didn't operate but fire not too small	92	0	3	$0.42
Fire too small to activate detector	89	0	1	$0.17
No detectors present	178	0	2	$9.01
Unclassified	18	0	1	$0.64
Total	605	0	11	$17.79

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Electronic equipment fires with unknown performance of automatic detection equipment have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 17. Structure Fires Excluding Homes Originating in Electronic Equipment Rooms, by Extent of Flame Damage Annual Average of 1994-1998 Fires

Extent of Flame Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
Confined to object of origin	626	0	9	$9.13	$14.6
Confined to area of origin (part of room)	127	0	2	$2.70	$21.3
Confined to room of origin	79	0	1	$2.85	$36.1
Confined to fire-rated compartment of origin	4	0	0	$0.11	$30.3
Confined to floor of origin	11	0	0	$1.03	$89.4
Confined to building of origin	86	0	1	$10.97	$127.1
Beyond building of origin	11	0	0	$0.92	$87.0
Total	944	0	13	$27.71	$29.4

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown extent of flame damage have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 18. Office Building Structure Fires
Originating in Electronic Equipment Rooms, by Extent of Flame Damage
Annual Average of 1994-1998 Fires

Extent of Flame Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
Confined to object of origin	127	0	1	$0.54	$4.3
Confined to area of origin (part of room)	21	0	0	$0.58	$27.9
Confined to room of origin	10	0	0	$0.37	$37.8
Confined to fire-rated compartment of origin	0	0	0	$0.06	$134.7
Confined to floor of origin	1	0	0	$0.00	$4.3
Confined to building of origin	7	0	0	$1.84	$269.4
Beyond structure of origin	0	0	0	$0.02	$42.0
Total	167	0	2	$3.41	$20.5

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown extent of flame damage have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 19. Structure Fires Excluding Homes
Starting with Electronic Equipment, by Extent of Flame Damage
Annual Average of 1994-1998 Fires

Extent of Flame Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
Confined to object of origin	426	0	7	$9.17	$21.6
Confined to area of origin (part of room)	79	0	1	$1.46	$18.4
Confined to room of origin	42	0	2	$1.05	$25.2
Confined to fire-rated compartment of origin	4	0	0	$0.13	$32.7
Confined to floor of origin	8	0	0	$0.31	$40.7
Confined to building of origin	40	0	0	$5.44	$135.1
Beyond building of origin	7	0	0	$0.23	$33.8
Total	605	0	11	$17.79	$29.4

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Electronic equipment fires with unknown extent of flame damage have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 20. Structure Fires Excluding Homes
Starting with Electronic Equipment, by Extent of Smoke Damage
Annual Average of 1994-1998 Fires

Extent of Smoke Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
No smoke damage	145	0	1	$1.48	$10.2
Confined to object of origin	193	0	2	$5.05	$26.2
Confined to area of origin (part of room)	131	0	1	$0.70	$5.3
Confined to room of origin	166	0	4	$1.46	$8.8
Confined to fire-rated compartment of origin	15	0	1	$0.35	$22.7
Confined to floor of origin	71	0	1	$2.27	$32.0
Confined to building of origin	190	0	3	$13.38	$70.4
Beyond building of origin	32	0	0	$3.01	$95.2
Total	944	0	13	$27.71	$29.4

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Electronic equipment fires with unknown extent of smoke damage have been allocated. Sums may not equal totals because of rounding error

Source: National estimates based on NFIRS and NFPA survey.

Table 21. Office Building Structure Fires
Originating in Electronic Equipment Rooms, by Extent of Smoke Damage
Annual Average of 1994-1998 Fires

Extent of Smoke Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
No smoke damage	23	0	0	$0.01	$0.6
Confined to object of origin	38	0	0	$0.12	$3.2
Confined to area of origin (part of room)	26	0	0	$0.06	$2.3
Confined to room of origin	29	0	0	$0.09	$3.2
Confined to fire-rated compartment of origin	4	0	0	$0.27	$71.7
Confined to floor of origin	20	0	1	$0.36	$17.9
Confined to building of origin	24	0	0	$2.31	$94.6
Beyond building of origin	2	0	0	$0.19	$106.8
Total	167	0	2	$3.41	$20.5

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown area of origin. Electronic equipment room fires with unknown extent of smoke damage have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Table 22. Structure Fires Excluding Homes
Starting with Electronic Equipment, by Extent of Smoke Damage
Annual Average of 1994-1998 Fires

Extent of Smoke Damage	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Average Loss per Thousand Fires (in Thousands)
No smoke damage	113	0	0	$0.43	$3.8
Confined to object of origin	148	0	2	$5.76	$38.8
Confined to area of origin (part of room)	84	0	1	$0.18	$2.2
Confined to room of origin	95	0	1	$1.11	$11.7
Confined to fire-rated compartment of origin	11	0	0	$0.37	$32.7
Confined to floor of origin	43	0	4	$3.26	$75.5
Confined to building of origin	92	0	3	$4.69	$50.9
Beyond building of origin	18	0	0	$1.98	$109.5
Total	605	0	11	$17.79	$29.4

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires, civilian deaths and injuries are estimated to the nearest one; and direct property damage is estimated to the nearest ten thousand dollars and has not been adjusted for inflation. Statistics include a proportional share of fires with unknown equipment involved in ignition. Electronic equipment fires with unknown extent of smoke damage have been allocated. Sums may not equal totals because of rounding error.

Source: National estimates based on NFIRS and NFPA survey.

Appendix A: How National Estimates Statistics Are Calculated

Estimates are made using the National Fire Incident Reporting System (NFIRS) of the Federal Emergency Management Agency's (FEMA's) United States Fire Administration (USFA), supplemented by the annual stratified random-sample survey of fire experience conducted by the National Fire Protection Association (NFPA), which is used for calibration.

Data Bases Used

NFIRS provides annual computerized data bases of fire incidents, with data classified according to a standard format based on the NFPA 901 Standard. Roughly three-fourths of all states have NFIRS coordinators, who receive fire incident data from participating fire departments and combine the data into a state data base. These data are then transmitted to FEMA/USFA. Participation by the states, and by local fire departments within participating states, is voluntary. NFIRS captures roughly one-third to one-half of all U.S. fires each year. More than one-third of all U.S. fire departments are listed as participants in NFIRS, although not all of these departments provide data every year.

The strength of NFIRS is that it provides the most detailed incident information of any national data base not limited to large fires. NFIRS is the only data base capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. (The NFPA survey separates fewer than 20 of the hundreds of property use categories defined by NFPA 901 and solicits no cause-related information except for incendiary and suspicious fires.) NFIRS also captures information on the avenues and extent of flame spread and smoke spread and on the performance of detectors and sprinklers.

The NFPA survey is based on a stratified random sample of roughly 3,000 U.S. fire departments (or just over one of every ten fire departments in the country). The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined by the NFPA 901 Standard; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; and (3) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results.

The NFPA survey begins with the NFPA Fire Service Inventory, a computerized file of about 30,000 U.S. fire departments, which is the most complete and thoroughly validated such listing in existence. The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities protect fewer people per department and are less likely to respond to the survey, so a large number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

Projecting NFIRS to National Estimates

To project NFIRS results to national estimates, one needs at least an estimate of the NFIRS fires as a fraction of the total so that the fraction can be inverted and used as a multiplier or scaling ratio to generate national estimates from NFIRS data. But NFIRS is a sample from a universe whose size cannot be inferred from NFIRS alone. Also, participation rates in NFIRS are not necessarily uniform across regions and sizes of community, both of which are factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second data base - the NFPA survey - is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

There are separate projection formulas for four major property classes (residential structures, non-residential structures, vehicles, and other) and for each measure of fire severity (fire incidents, civilian deaths, and civilian injuries, and direct property damage).

For example, the scaling ratio for 1996 civilian deaths in residential structures is equal to the total number of 1996 civilian deaths in residential structure fires reported to fire departments, according to the NFPA survey (4,080), divided by the total number of 1996 civilian deaths in residential structure fires reported to NFIRS (1,504). Therefore, the scaling ratio is 4,080/1,504 = 2.71.

The scaling ratios for civilian deaths and injuries and direct property damage are often significantly different from those for fire incidents. Except for fire service injuries, average severity per fire is generally higher for NFIRS than for the NFPA survey. Use of different scaling ratios for each measure of severity is equivalent to assuming that these differences are due either to NFIRS under-reporting of small fires, resulting in a higher-than-actual loss-per-fire ratio, or possible biases in the NFIRS sample representation by region or size of community, resulting in severity-per-fire ratios characteristic only of the over sampled regions or community sizes.

Note that this approach also means that the NFPA survey results for detailed property-use classes (e.g., fires in storage structures) may not match the national estimates of the same value.

Calculating National Estimates of Particular Types of Fires

Most analyses of interest involve the calculation of the estimated number of fires not only within a particular occupancy but also of a particular type. The types that are mostly frequently of interest are those defined by some ignition-cause characteristic. The six cause-related characteristics most commonly used to describe fires are: form of the heat that caused the ignition, equipment involved in ignition, form or type of material first ignited, the ignition factor that brought heat source and ignited material together, and area of origin. Other characteristics of interest are victim characteristics, such as ages of persons killed or injured in fire.

For any characteristic of interest in NFIRS, some reported fires have that characteristic unknown or not reported. If the unknowns are not taken into account, then the propensity to report or not report a characteristic may influence the results far more than the actual patterns on that characteristic. For example, suppose the number of fires remained the same for several consecutive years, but the percentage of fires with cause unreported steadily declined over those years. If the unknown-cause fires were ignored, it would appear as if fires due to every specific cause increased over time while total fires remained unchanged. This, of course, does not make sense.

Consequently, most national estimates analyses allocate unknowns. This is done by using scaling ratios defined by NFPA survey estimates of totals divided by only those NFIRS fires for which the dimension in question was known and reported. This approach is equivalent to assuming that the fires with unreported characteristics, if known, would show the same proportions as the fires with known characteristics. For example, it assumes that the fires with unknown ignition factor contain the same relative shares of child-playing fires, incendiary-cause fires, short circuit fires, and so forth, as are found in the fires where ignition factor was reported.

Rounding Errors

The possibility of rounding errors exists in all our calculations. One of the notes on each table indicates the extent of rounding for that table, e.g., deaths rounded to the nearest one, fires rounded to the nearest hundred, property damage rounded to the nearest hundred thousand dollars. In rounding to the nearest one, functional values of 0.5 or more are rounded up and functional values less than 0.5 are rounded down. For example, 2.5 would round to 3, and 3.4 would round to 3. In rounding to the nearest one, a stated estimate of 1 could be any number from 0.5 to 1.49, a roughly threefold range.

The impact of rounding is greatest when the stated number is small relative to the degree of rounding. As noted, rounding to the nearest one means that stated values of 1 may vary by a factor of three. Similarly, the cumulative impact of rounding error - the potential gap between the estimated total and the sum of the estimated values as rounded - is greatest when there are a large number of values and the total is small relative to the extent of rounding.

Suppose a table presented 5-year averages of estimated deaths by item first ignited, all rounded to the nearest one. Suppose there were a total of 30 deaths in the 5 years, so the total average would be 30/5 = 6.

In case 1, suppose 10 of the possible items first ignited each accounted for 3 deaths in 5 years. Then there would be 10 entries of 3/5 = 0.6, rounded to 1, and the sum would be 10, compared to the true total of 6.

In case 2, suppose 15 of the possible items first ignited each accounted for 2 deaths in 5 years. Then there would be 15 entries of 215 = 0.4, rounded to 0, and the sum would be 0, compared to the true total of 6.

Here is another example: Suppose there were an estimate of 7 deaths total in 1992 through 1996. The 5-year average would be 1.4, which would round to 1, the number we would show as the total. Each death would represent a 5-year average of 0.2.

If those 7 deaths split as 4 deaths in one category (e.g., smoking) and 3 deaths in a second category (e.g., heating), then we would show 4 x 0.2 = 0.8 deaths per year for smoking and 3 x 0.2 = 0.6 deaths per year for heating. Both would round to 1, there would be two entries of 1, and the sum would be 2, higher than the actual rounded total.

If those 7 deaths split as 1 death in each of 7 categories (quite possible since there are 12 major cause categories), then we would show 0.2 in each category, always rounding to 0, and the sum would be 0, lower than the actual rounded total. The more categories there are, the farther apart the sum and total can -- and often do -- get.

Note that percentages are calculated from unrounded values, and so it is quite possible to have a percentage entry of up to 100%, even if the rounded number entry is zero.

Selected Customized Narratives

The following incidents were selected because the level of detail available to NFPA made them particularly appropriate as examples of fires involving electronic equipment or electronic equipment rooms. Incidents are presented in chronological order, from most recent to oldest.

September 1995, California

Single automatic sprinkler controls fire in check sorting archive.

While operating a check sorting machine on the second floor of the six story (plus basement) bank building, an occupant noticed smoke coming from it. The fire department estimated detection occurred less than five minutes after ignition. The occupant notified a supervisor, who called the fire department at 1:05 am, less than two minutes after fire was discovered. Fire officers arrived 12 minutes later and were met by employees who had evacuated the building, but they incorrectly directed officers to an electrical room. Officers found heavy smoke on the second floor and determined that the fire was not in the electrical room. A room-to-room search brought the officers to the computer room, where the fire was being controlled by a single automatic sprinkler, part of a complete-coverage, wet-pipe system. Sprinkler operation was centrally monitored, but the sprinkler operated after the fire had already been reported. Officers extinguished the fire using a 3/4" line.

Fire damage to the 100' x 500' fire-resistive building was limited to $10,000 out of a $31 million value. Contents damage totaled $270,000 out of a $5 million value. There were no injuries or deaths. The cause was determined to be a short circuit arc.

May 1995, Florida

Second computer monitor to have problems causes fire.

Fire began in a rear first-floor office of a nine-story concrete block office building. A hallway smoke detector activated and alerted a night security guard, who erroneously responded to the basement after silencing the alarm. When she returned to her desk, the alarm sounded again. In all there was a 23-minute delay from detection until the fire department was notified.

Investigators traced the fire to a computer monitor in the office. The office manager reported another monitor of the same type had recently been sent out for repairs after emitting smoke. Fire damage was $125,000 to the building and $275,000 to the contents, out of a total building and contents value of $20 million. There were no deaths or injuries.

May 1994, Ohio

Carpeted walls in computer room lead to total loss of store

Computers were added to this appliance store to help deal with business growth, and the owners installed carpeting on the wall to reduce noise caused by the computers and printers. The carpeting was too close to wall-mounted outlets, leading to pyrolysis of the carpeting and an early morning-fire.

The single story, concrete block building measured 177' x 154' and was closed for the night. Although heat detectors were placed throughout the building, fire was first detected by a passing motorist, who called the public safety dispatch center. The fire department responded at 3:30 a.m. Firefighters began with an interior attack but were forced out by deteriorating conditions. The building had no sprinklers. The $3.3 million building and contents were a total loss.

March 1994, Wisconsin

Single automatic sprinkler controls fire in computer uninterrupted power supply unit

Just after 1:00 a.m., fire began from undetermined causes inside a computer uninterrupted power supply unit in the corner of a computer storage room of a graphics company printing and office facility. The facility was operating with a reduced staff when operation of the water flow alarm provided notice of the fire, to occupants and to the alarm monitoring company, which called the fire department.

Firefighters responding to the alarm at the irregularly shaped, 351,000 square foot, single story, metal and block building found a fire that had spread from the unit to nearby cables, then up the wall and across the ceiling, where it activated a single sprinkler which controlled the fire. The system was a wet system with partial coverage confined to "below the ceiling". Water damage pushed the total loss up to $125,000, but this was against a total value of approximately $40 million. Fire officials said "if the sprinkler had not knocked the fire down, the consequences could have been disastrous".

October 1993, Virginia

Computer paper placed against baseboard heater leads to serious fire

Fire began in a freight terminal closed for the night, as a result of computer paper being placed against an electric-powered baseboard heater in a first floor computer room. Fire burned for an estimated one to two hours until an employee opened the door to the room, creating a backdraft that threw the employee against a metal cage area. The employee suffered cuts and burns and was treated at a hospital.

The injured employee ran across the street to report the fire, and the fire department was notified 10-15 minutes after fire was detected. They responded to the single story, 65' x 100', concrete block building with no detectors or sprinklers to find fire still confined to two offices, with the help of the concrete block walls and slab ceiling. Firefighters used two handlines to control the fire, which took 35-40 minutes. Damage was estimated at $400,000.

January 1992, Michigan

$1.5 million fire in corporate headquarters damages microfilming equipment

An employee reporting to work smelled smoke and discovered a fire in the second floor microfilming room of this two-story office headquarters of unprotected, noncombustible construction. The employee notified the fire department via telephone and exited the building. Fire fighters arriving at the scene reported fire as visible from second story exterior windows of this building with a ground floor area of 650,000 square feet.

The fire was extinguished within 45 minutes, with a majority of the fire damage occurring in the vicinity of the microfilm room and damage occurring on both floors. Several microfilm printers and a quantity of stored microfilm were damaged during the fire. The building was not equipped with any automatic detection or suppression systems. The fire was suspected to have been caused by a malfunctioning microfilm printer but its cause remains officially undetermined. Property loss from this fire is estimated to be approximately $1.5 million.

January 1992, Connecticut

Automatic sprinklers control fire in telephone equipment room

An early evening fire alarm signal was received at a proprietary alarm station approximately one-half mile from this three-story office building of fire resistive construction. The signal indicated a problem in the telephone equipment room, located on the 27,000-square-foot ground floor of the building. Security guards and the public fire department were notified and responded to the scene within two minutes.

Fire fighters found smoke circulating throughout the building due to the fact that the building ventilation systems were operating. The fire was confined to the telephone equipment room where it started, with control being achieved by a single sprinkler located in the room. The type and coverage of the sprinkler system were not reported. Fire fighters turned off the ventilation system and completed extinguishment within a short time. Although smoke spread throughout the building, fire, heat, and water damage was confined to the telephone equipment room. Five electronic data processors inside the room, as well as numerous personal computers, were damaged during the fire which caused an estimated $700,000 property loss. The fire is still under investigation and is considered suspicious.

September 1991, California

Computer malfunction heavily damages two-story office building

An electrical short circuit in the power unit of a computer processing unit was the cause of this fire in a two-story office building of wood frame construction. A passerby discovered the early evening fire and notified the fire department via 911.

The building was not equipped with any automatic detection or suppression systems and had a ground floor area of 9000 square feet. The fire spread from the processing unit through a wall outlet into a concealed wall space, extending above a suspended ceiling and into the second floor via exterior windows.

Three fire fighters were injured when the second story floor area collapsed over the area of origin, trapping them in burning debris. These fire fighters were quickly rescued and the fire was contained to approximately one quarter of the building. Smoke, heat and water damage was considerable throughout the remainder of the building. Damage to building and contents was estimated at $3.75 million.

October 1990, Arkansas

Computer malfunction fills high-rise office building with smoke

On-duty security guards at this twenty-one-story bank and office building detected an odor of smoke in the main lobby and phoned the fire department. The fire department arrived within three minutes and started searching for the source of the smoke. A fire was found approximately 30 minutes later in a second floor bank office.

A computer terminal experienced an electrical malfunction and ignited. Fire spread to an adjacent office and file room via an air handling unit. The building was not equipped with automatic detection or sprinkler systems. There were duct-mounted smoke detectors which did not activate.

The fire was confined to the area of origin, but smoke spread throughout this building of unprotected noncombustible construction. Property damage from this unintentional fire was estimated at $2 million.

December 1989, Ohio

Short circuit in copy machine triggers multi-million dollar fire in data center

Security guards at this state-owned office building received a fire alarm activation for a copy and storage area on the 36th floor. The guards verified that there was an actual fire and dialed the 911 connection to the state police to report the fire. The police then notified the city fire department. Fire fighters arrived approximately 25 minutes after the fire's initial discovery to find a copier fire that had spread to nearby trash and paper storage and extended to adjoining rooms. After a considerable

effort the fire was contained to the floor of origin, with smoke, heat, and water damage to several other floors of this 41-story, fire-resistive building.

Although the building was fully equipped with automatic smoke detectors, it was only partially sprinklered, from the basement through the fifth floor. Ironically, the building was scheduled to be completely sprinklered within six months following this incident. An electrical short circuit was reported to be the cause of the fire in the copier machine. Fire damage was estimated at over $2 million and included the loss of a state agency computer system.

May 1988, Illinois

Telephone switching station fire disrupts telephone lines, causing $90 million in damage*

A telephone facility 200 miles from this switching station received a late afternoon power failure signal from the station. Thirty minutes later the first fire alarm signal was received from the station's complete smoke detection system. A delay in reporting this fire alarm activation as well as a failure of the local phone system resulted in an additional 40 minutes before the fire department was notified. Notification of the fire department was via a passerby who drove to the combined fire and police station to report the fire.

Fire fighters arrived approximately four minutes after notification to find the two-story, nonsprinklered, fire-resistive building full of heavy black smoke. A fire was discovered in a small area of the first floor and was attacked with extinguishers. This attack was unsuccessful due to the fact that the equipment involved in the fire was still energized and so continually restarted the fire. Multiple attempts to cut power to the equipment were unsuccessful. The fire was finally extinguished six and a half hours after the fire department's arrival. Although flames were confined to an area approximately 30 ft. x 40 ft. on the first floor, the entire building filled with smoke, causing extensive equipment damage.

As a result of this, the switching station could no longer handle the three and a half million calls normally routed each day. Local and long distance service were disrupted to the surrounding area for periods ranging from several days to four weeks.

An electrical fault probably caused by an armored cable sheath that became energized by a damaged DC power cable was determined to be the cause of this fire, which caused approximately $90 million in damage to the switching facility.

*A complete fire investigation on this incident is available through the Fire Investigations Department of NFPA. For more information call 617-984-7473.

December 1987, Florida

Incendiary computer fire destroys office building

A patrolling officer discovered this early morning fire in a one-story office building. The fire department was notified and found a fire in the computer room that had extended to an adjacent filing room and into a concealed attic area. Smoke and heat damage occurred throughout the remainder of the structure.

The building was of unprotected ordinary construction with concrete block walls and a wooden roof and was not equipped with an automatic detection system. Although automatic sprinklers were installed in the building, the system was not operational at the time of this incident because it was not required for the type of occupancy for which the building was being used.

Fire investigators determined the fire was incendiary. An unknown flammable liquid was spread on the carpet of the computer room and ignited. Damage to the structure and contents was estimated at $290,000.

December 1987, New York

Automatic sprinkler system extinguishes fire in computer room

A central alarm company received a fire alarm activation shortly before noon and promptly notified the fire department. Maintenance personnel in the building quickly investigated the fire alarm and found a fire in the seventh floor computer room had been extinguished by a single sprinkler head located in the room.

Fire fighters arrived several minutes after notification and immediately shut off the sprinkler control valve upon observing that the fire had been extinguished. Fire, smoke, and heat damage was contained to the room of origin of this ten-story office building of fire resistive construction, with some water damage occurring on the floor below the computer room.

The fire was determined to be incendiary in origin, with a box of computer paper ignited below an operator terminal and adjoining design computer. The fire damage was estimated to be approximately $100,000.

July 1987, Hawaii

Incendiary fire damages the top floor of an office building

An on-duty custodian discovered a fire in a computer room on the ninth floor and notified the fire department via 911. Arriving fire fighters encountered a heavy smoke condition on the ninth floor, located the fire in the area of the computers, and brought the fire under control approximately eighty minutes after its discovery. The fire spread throughout the office area on the ninth floor causing $290,000 damage to the structure and contents. The building was constructed of concrete and unprotected steel framing and was not protected by automatic detection or suppression systems.

Investigators have determined that the fire was incendiary. An unknown accelerant was poured in the vicinity of several computer banks and ignited.

April 1987, Minnesota

Computer fire causes extensive smoke damage to computer manufacturing plant

An early morning fire in a first floor manufacturing area was first discovered when an automatic smoke detector in the area sent a signal to the plant's security station. A guard sent to check on the alarm discovered a computer on fire and immediately phoned the fire department. Fire fighters arrived several minutes later and extinguished the fire using dry chemical and carbon dioxide hand extinguishers.

Although this three-story building was equipped with a wet pipe automatic sprinkler system, the sprinklers had not activated. Heat from the fire melted a light fixture directly over the fire, causing the light fixture to drop down, creating a space for heat to rise into an area above the sprinkler system and away from the heat-activated sprinkler heads.

Actual fire damage was confined to the computer of origin, but considerable smoke damage occurred throughout the first floor. This building was of unprotected noncombustible construction with a ground floor area of 180,000 square feet. Damage to the building and contents was determined to be in excess of $450,000. The cause of the fire was determined to be an electrical malfunction of a computer component. The component overheated, igniting internal wiring.

March 1987, California

Computer malfunction in high rise

An undetermined malfunction within a computer bank caused a fire in a computer room on the ninth floor of this 32-story, fire resistive building. This room serves as a command and control room and is approximately 1000 square feet in area. Although the fire was confined to the area of origin, smoke and soot extended to adjacent areas of the ninth floor. Due to the time of day (lunch hour), only 400 of the 3000 occupants were present in the building and were forced to evacuate. The fire caused an estimated $100,000 in damage to one computer system and $5000 in damage to the structure.

February 1987, New York

Electrical fire in telephone switching station causes $32 million loss

Telephone officials received an early morning fire alarm signal from a switching station and dispatched a guard and a switching technician to check on the facility. These individuals searched the four-story building of fire resistive constructive and discovered a fire inside the mainframe distribution center, located on the 9000-square-foot ground floor. These employees then notified the fire department approximately 22 minutes after the first alarm indication had been received. Fire fighters arrived within three minutes and brought the fire under control in approximately two hours.

The fire caused extensive damage to the mainframe and surrounding cable racks. Water damage was considerable in the first floor and basement level, with smoke damage throughout the structure. The cause of the fire was reported to be electrical in origin. Damage to the structure and mainframe was estimated to be approximately $32 million.

April 1985, California

Transient Arrested in Incendiary Fire

Although a deliberately set fire damaged this computer center, responding fire fighters successfully protected the $3 million worth of computer equipment inside it.

The computer center was a flat-roofed structure of ordinary construction 150 feet long and 100 feet wide. Although it was only one story high, it appeared to have two stories because it was fronted by a deceptive 50-year-old wooden facade. The building was not equipped with any type of fire detection or suppression equipment.

A passerby noticed smoke coming from the roof of the building around 1:02 pm and called the fire department. First-in fire companies thought they had a well-involved attic fire and had a second alarm struck. When fire crews entered the center, however, they found no evidence of fire and launched an exterior attack on the building's badly deteriorated and extremely dry facade instead. The second alarm companies were put to work covering the threatened computer equipment inside, diverting the smoke and water that seeped into the structure.

Fire investigators arrested a man they found sitting on a nearby fire hydrant when they learned that he had placed a lighted match inside a ground-level hole in the facade. The dry wood ignited quickly and the flames traveled up along the facade's underside.

No one was injured and the computers were undamaged. Losses to the building were set at $45,000.

April 1984, Texas

Room Air Conditioner Cause of Fire

A fire that started in a window-mounted air conditioner in an unsprinklered storage room caused major damage to computer equipment and supplies.

The 1,500-square-foot building was being used by an airline as a regional reservation center, including the copying of computer data. Information regarding various airline schedules and fares was copied from "hard disc" computer files to "floppy disc" files. The floppy discs were then mailed to travel agents for their use. Computer equipment in use at the facility included several hard disc and floppy disc drives, five computer terminals, and two printers. Supplies included 5,000 to 6,000 floppy discs in boxes piled five to six feet high, computer manuals, and plastic disc cases stored in a storage room. A window-mounted air-conditioning unit was also located in the storage room.

At 5:58 pm, employees arriving at the main building reported a fire at the computer building. Security guards immediately notified the fire department and alerted the plant emergency organization. The plant emergency organization arrived at the fire location at 6:00 am and found heavy smoke and flames coming from the south side of the building. They shut down the service utilities to the building as fire department personnel arrived.

Fire fighters entered the building and found the window-mounted air-conditioning unit in flames and the fire spreading to nearby storage. They quickly extinguished the fire, and fire damage to the structure was confined to the immediate area surrounding the air-conditioner. However, damage to the computer equipment and related supplies was extensive.

Investigators suspect that a blower motor in the air conditioner shorted out, igniting wiring inside the appliance before extending to nearby combustibles. Damage was estimated at $160,000.

September 1982, California

Halon System Extinguishes Fire

The fixed automatic halon gas extinguishing system and prompt employee action contributed to the successful extinguishment of a fire in an electronic cabinet in a computer room.

The halon system contained more than 1,200 pounds of gas delivered through ten nozzles. Discharge of the gas automatically sounds local audible and visual alarms and closes air-conditioning dampers and doors. The facility was also provided with automatic sprinklers.

An electronic component (a capacitor) on an amplifier circuit board shorted and ignited the circuit board, according to fire officials. The fire then spread vertically and ignited 18 other circuit boards. The automatic suppression extinguished the fire in the concealed cabinet.

One of four employees working in the computer room at the beginning of the day detected a burning odor. While the employees searched for the source, smoke began coming from the top vents of the

computer cabinet. One of the employees called the on-site fire department at 8:29 am, while another shut off power to the room and two others went to get fire extinguishers.

As fire fighters entered the corridor leading to the computer room, the automatic system activated and extinguished the fire.

There were no injuries at this fire. Damage was contained to the computer cabinet and was estimated at $15,000.

May 1982, Michigan

Computer Center Battery Deterioration Leads to Fire

This computer center battery room was located on the basement level of a one- story protected non-combustible building, operating as a metal parts manufacturing facility. The battery room, located in the partial basement, contained other electrical equipment for the building, including an uninterruptible power supply (UPS) system for the computers. The batteries for the UPS system were in a separate cut-off room which was provided with adequate exhaust ventilation, smoke detection system, and automatic sprinkler protection. Above the battery room on the first floor were the offices and a large computer facility.

Reportedly, on a Saturday afternoon, all the computers were powered down and shut off so that system maintenance could be conducted the following day. After 8:30 pm, all the equipment was shut off and only the lights remained on in the building. A monitored central station received a power trouble alarm at 9:04 pm, a smoke detector alarm at 9:05 pm and finally a water flow alarm at 9:08 pm. The police department was notified and they dispatched the public fire department. The automatic sprinklers were operating and had already extinguished the fire when the fire department arrived four minutes after they were notified. Both the basement and the first floor hallway had filled with smoke. The fire department immediately opened the large doors at the rear of the building to ventilate the smoke from the building.

Employees were called in to assist with the clean-up operations. After about an hour, when the smoke was cleared from the building, the fire department returned to the station. All the fused sprinkler heads were replaced the following morning and then the sprinkler system was returned to service.

Approximately 15 batteries were visibly damaged by the fire or the heat of the fire. The exact number of batteries damaged by the fire would not be known until proper tests were performed. All the electrical equipment throughout the basement required cleaning due to the heavy smoke condition. Smoke damage to the fire floor was minimal. The dollar loss for this fire reportedly was $100,000.

The reported cause of this fire was the deterioration of the lead calcium batteries which caused an internal short in one of the batteries and resulted in a small explosion and ensuing fire.

November 1981, California

Overheated Computers Cause Fire in Office

This computer sales, service, and repair center was located on the first floor of a two-story unprotected ordinary warehouse type building. Evidently, after an employee exited the building and the building janitorial services left one-half hour later, the fire department received a call from a motorist who reportedly had seen fire breaking out of windows in the computer office area. The fire department responded promptly and contained the fire before it penetrated the non-combustible cut-off walls around the computer office separating the other tenants. In two hours, the fire extinguishment was complete.

Nearly all of the combustible office equipment within the office area was consumed. Smoke and heat damage extended throughout the 6500 square foot area occupied by the computer firm.

The probable cause of this fire was reportedly overheating within the electronic equipment in the office area, some of which was left energized at the close of the business day. The damage reported as a result of this fire amounted to a total of $862,692, of which approximately 13% was structure damage and the balance was contents damage.

October 1981, California

Mainframe Memory Card Fire Caught Quickly

Employees familiar with the equipment rapidly extinguished a small fire in a computer before it could do significant damage.

The fire occurred at about 6:40 am on a Friday in this electronics manufacturing plant during normal plant operations. Operators smelled smoke and noticed a small column of smoke rising from one of the two central processing units (CPU). They immediately pulled the manual alarm and shut down only the affected system. Opening the cabinet door, they saw a 6-inch area of flame, which they extinguished with a halon extinguisher. The air conditioner was switched to exhaust to remove a minor amount of smoke. Meanwhile, the rest of the computer room continued to operate.

Investigation revealed that the fire was caused by a short circuit to a memory card that was mostly consumed by the fire. There was also some other minor component damage in the memory section. The system was back on line at 2 pm the same day, with no business interruption.

The fire department was not called because the fire was extinguished immediately. Operators have been instructed to notify the fire department in all future fires.

The damage from this incident was reported to be $15,000.

September 1981, California

CPU Fire Self-Extinguishes

This unattended continuous operating computer center within an unprotected noncombustible building experienced a fire in one of its central processing units. The evidence of fire was detected by a smoke detector within the processing unit and a signal was transmitted to a security guard station. At about the same time an alert employee walking by the windows of the computer room noticed the flames and smoke coming from the unit and placed a call to the in-plant fire department. A security guard and a fire fighter arrived shortly and encountered a smoke-filled room. The security guard entered the room to shut off the electrical power to the computer units and air conditioning, which was separate from the lights and smoke detectors. The public fire department was notified; however, the fire self-extinguished prior to their arrival. The in-plant fire fighters placed fans in the room to remove the smoke. The adjacent units in the room were checked before the electric power was restored to them.

The cause of this fire was attributed to an electrical short circuit or electrical insulation malfunction in one CPU circuit board. The heat generated during the fire burned part of the board away and melted sixteen other memory units. Generally, the circuit boards in the surrounding area were charred, scorched, or blackened.

The early detection of this fire by the smoke detector and the prompt and appropriate response of the employees and in-house fire department minimized the damage of this fire. The damage was essentially confined to the one processing unit with no external smoke damage. The dollar loss associated with this fire was $42,500.

July 1981, Ohio

Back-Up Power Batteries Short Circuit and Cause Fire

An early-morning fire in a battery room spread smoke throughout a computer data center building, causing approximately $150,000 in damage.

The fire was reported at 12:10 am by a private central supervisory alarm company. Responding fire fighters found heavy smoke filtering throughout the first floor of this three-story, fire-resistive building of masonry construction. Fire fighters located the fire in an electrical switchgear room and quickly extinguished the blaze with one pre-connected 1-1/2-inch hoseline. The fire was confined to the room of origin.

Fire officials said the fire was caused by a short circuit in a short-term battery bank used for back-up power, during the time required for the emergency generator to start. The main power had been shut down for repairs and the bank of 120 1.8-volt nickel calcium batteries connected in series was being used to run the computers. As a result of a short circuit, 12 of the batteries overheated and caught fires. When the fire came in contact with the acid inside the batteries, and with their plastic casing, it produced heavy smoke throughout the first floor level. Officials indicated that computer tapes stored in a room located 40 feet down the hallway were saved by a halon total flood system installed in the storage room.

June 1981, Maryland

Arson Damages Terminals at Computer Training Center

An early morning fire of incendiary origin in a computer center training facility located on the fourth floor of a seven story unprotected fire resistive rental office building caused damage to leased computer terminals. The fire was discovered in the third floor lounge which was located directly below the enclosed terminal room.

The fire department was summoned and extinguished the fire using several small hose streams. The prompt response of the fire department enabled them to confine the fire to the third floor lounge and the fourth floor.

A fire was deliberately started in a sofa or chair in the lounge area. The damage associated with this fire was reported to be $90,000. The terminals were primarily damaged by the heat and smoke of the fire.

November 1980, New Hampshire

Arson Fire Set in Multiple Locations

This data processing center was located on the second floor of a footwear manufacturer in a two-story building of ordinary construction. The computer room was approximately 525 square feet in area and was partitioned off from an adjoining office area by wood paneling on 3/8-inch gypsum board on wood studs. The first floor was used for office spaces and a kitchen area. The basement was utilized as a process manufacturing area. The building was fully sprinklered with an automatic wet-pipe system.

The plant was shut down during the Thanksgiving holiday. At 1:15 am, the local fire department responded to the plant on receipt of a waterflow alarm. The first fire fighters arriving on the scene encountered multiple fires on the second floor. Three of these were in the corridor area and consisted of small piles of paper. A portable extinguisher was used to extinguish these fires (no automatic sprinklers were operating in this area). Fire fighters forced the locked door to the computer room and extinguished two more small paper fires. On entering the adjoining office, they found two sprinklers operating that had controlled two more small fires.

The deliberately set fires damaged the interior finish and office furniture in the corridor, office and computer area. There was some water damage reported to printouts, manuals, punch cards, and a disc tape. There was no reported damage to the computer equipment and associated equipment. Property loss was set at $10,000.

September 1980, Arkansas

Double Equipment Failure Causes Small Fire

This computer facility was located on the first floor of a two-story building operating as an automatic parts store and general office. The computer area, approximately 1,000 square feet in area, was partitioned off from the store area. The floor was not raised and all cabling was exposed and went into the suspended ceiling area that led to terminals apparently in offices on the second floor. Automatic fire protection was not provided.

At approximately 7:00 am, an employee noticed smoke coming from one of the processing units. The system was immediately shut down. The fire department was not notified nor was the use of portable fire extinguishers required. Damage to the CPU was limited to four memory boards, back plain, power supply, ventilation basket and an electrical fan. There was no smoke damage to the building or contents.

An unspecified short circuit was reported as the cause of the incident. The incident was also described as a double accident where failures occurred in two parts of the system. The first failure occurred to the power supply when the over- voltage protection failed, and the second occurred in conjunction with the first, when the protection device for the memory also failed.

The loss from this incident was $4,000.

July 1980, Alabama

Overheated Components Ignite Plastic Housing Within Computer

This computer center was located on the second floor of a two-story building of unprotected fire resistive construction. The fire occurred within a computer cabinet while the unit was operating. The fire, discovered by an operator in the room making adjustments to the system, was detected by the crackling noises and sparks coming from the cabinet. Upon seeing this situation, the operator shut down the AC power circuits and notified a rectifier operator to shut off the DC power to the unit. By this time, even with the unit de-energized, a fire had started in the unit. The employee began to battle the fire with CO_2 extinguishers. These extinguishers proved ineffective in fighting the intense fire.

The plant fire brigade arrived shortly and stretched hose lines, but water was not used due to the electrical equipment. Forty minutes after the fire started, the computer room was closed in an attempt to smother the fire. Forty-five minutes later, the room was opened and the remaining fire was extinguished with a dry chemical extinguisher. The fire was limited to one control unit.

The cause of the fire was attributed to overheated components which burned enough to ignite the plastic slot within the unit. A chain reaction with severe electrical arcing and fire developed due to the melting of adjacent plastic and shorting cards. The loss attributed to this incident was $200,000, which was primarily for the electronic equipment damage.

July 1980, California

Computer Circuit Board Fire Caused by Arcing

An electrical arc in a computer memory circuit board caused a small fire in the circuit board and several adjacent boards in the testing area of this fully sprinklered, one- and two-story building of reinforced-concrete construction, operating as an electronics manufacturing plant. The circuit boards were about 8 inches wide by 10 inches long and consisted of three voltage planes separated by epoxy, with epoxy on the outer surfaces. At about 7:30 pm, a computer memory console was undergoing testing. The testing was automatic, and personnel who work in the area were on a break and not in the testing area. A maintenance person in the area heard one of the overhead smoke detectors activate, went to the testing machine where he saw the fire, and extinguished the fire with the contents of a 20-lb. dry-chemical extinguisher.

The area where the fire occurred contained a halon extinguishing system below the floor and ionization detectors beneath the ceiling that sounded a local alarm only when activated. It was one of these detectors that the maintenance person heard.

The circuit boards in the testing area were mounted vertically, with about 3/8-inch clearance between boards. The arcing that caused the fire originated around one of the rivets that held a grounding aluminum angle to a circuit board that was near the middle of the stack of boards. Fire spread was aided by the epoxy coating around the boards.

The exact cause of the arcing was unknown but could have been due to a flaw in the epoxy coatings, excessive current due to failure of some other components, or improper alignment of the aluminum angle. The most likely cause, according to investigators, was misalignment of the rivet, which allowed current to flow from ground to one of the voltage planes. Similar problems had occurred in the past.

The loss from this incident was $100,000.

June l980, California

Circuit Board Fire Stopped by Extinguishers

A fire in a computer terminal was successfully extinguished with portable extinguishers.

The area of origin was a computer terminal room containing four units. The fire department was immediately notified. On their arrival, the terminal room and adjacent room were filled with smoke. On entering the room, fire fighters observed flames at the base of a terminal. Fire fighters using portable carbon dioxide extinguishers put out the fire. Cause of the fire was reported as an electrical fault igniting a printed circuit board within the terminal. Property loss was limited to one terminal and to smoke damage to walls and equipment within the terminal room and adjacent room. The automatic sprinklers in the room did not operate.

December 1979, Massachusetts

Supply Room Trash Fire Spreads via Stored Products

This data processing facility was housed in a one-story building of ordinary construction approximately 10,000 square feet in area. Fire protection consisted of a partial wet-pipe automatic sprinkler system.

On the day of the fire the facility had been closed for the Christmas holidays. At approximately 12:27 pm, a carpenter working in the building notified the fire department of a fire. On their arrival, fire fighters reported that the building was heavily involved in fire and they were unable to enter due to heavy smoke and intense heat. About ten minutes into the fire, the bar joists supporting the roof failed causing a partial collapse of the roof. Fire fighters were able to contain the fire using master streams and hand lines.

It was reported that the origin of the fire was in a janitor's supply room where trash containers had ignited. Cause of the ignition was not determined. The fire had spread to a wood cabinet and other combustible storage in the room. Factors contributing to rapid flame development were an overhead loft storage area that prevented sprinkler discharge from reaching the fire, and a large amount of paper products stored. Total loss to building and contents was estimated at $750,500.

April 1978, Michigan

Computer Facility Suffers $600,000 Loss

This computer and data processing facility was housed in a 3,500 sq. ft. steel on wood structure. It is not known if the building was protected by fire detection or suppression systems. Cause of the fire was not reported. Estimated loss was $600,000.

April 1976, Massachusetts

Office Building Fire Damages Millions in Computer Equipment

This four-story unprotected, steel-frame office building contained space for 19 companies. A data processing company was located on the third floor. Holes were made in the floor slabs between the first, second, and third floors to run electrical cables in steel conduit to serve the computer company. The area around the conduit at each floor was not properly sealed. As the years passed and the company expanded, it was necessary to install additional conduit, and the holes were made larger. These openings were located above a storage room used by one of the firms on the first floor.

The building was not protected with automatic sprinklers. The data processing company had an ionization-type smoke detection system in its computer area, but this system was connected to an internal alarm that sounded in that area only.

The exact cause of the fire was not known, but malfunctioning of an electrical wall receptacle located in the first-floor storage room was the most probable cause of the fire. Employees for several companies were at work on the first and third floors on the evening of the fire, but there was no one at work in the company where the fire started. As the fire developed in the storage room, heat and smoke spread through the openings for the electrical cables, and smoke traveled up to the third floor. Employees on the third floor smelled the smoke before the smoke detection system there sounded. The fire had spread to five or six rooms on the second floor and was much more intense on this level than on any other floor. The fire also extended to the area where the conduits terminated on the third floor. However, most of the damage in the computer area was due to heat and smoke, with very little actual flame damage. Steel trusswork supporting the second and third floors was substantially damaged, and as a result the floors sagged.

Total estimated damage approached $6 million, with $5 million attributed to damaged computer equipment and $330,000 to the building.

July 1975, Massachusetts

Display Controller Damaged by Cable Fire

This data processing room was located on the second floor of a warehouse. The computer input and output were accomplished by keyboard and video consoles through a display control unit. The data and video cables were protected by a metallic enclosure. The 115 volt AC power was connected to the consoles through a power outlet strip. The consoles and display controller were commonly grounded through the frame of the power outlet strip. These power strips were grounded by a cable attached to an end fitting.

A ground fault caused overheating of the ground cable and its insulation broke down. The current then arced from the ground cable to the metal panel of the outlet strip. This in turn created sufficient heat to ignite plywood paneling and PVC cable insulation. A nearby employee soon discovered the problem and with the help of maintenance personnel extinguished the fire. Shortly after the fire was discovered, the circuit breaker also tripped.

The overcurrent condition damaged solid state components in the display controller and necessitated the replacement of several hundred feet of cable.

October 1974, Government Classified Location

Several Computer Cabinets Damaged by Fire

This fire occurred in an unattended but operating computer complex housed in a 16 x 32 ft. windowless room. The fire was detected by a ceiling mounted smoke detector. Plant emergency personnel extinguished the fire using hose streams.

The origin of the fire was determined to be in the internal AC power distribution box at the bottom of the computer. It is believed that high resistance at a connection did not draw sufficient current to trip external circuit breakers. The fire was intensified by plastic circuit cards and styrofoam. Fire spread to adjacent components and was unimpeded because of the lack of separating panels between cabinets. Fire and smoke damage was confined to the room of origin. Loss to equipment and contents was estimated at $289,000.

September 1974, Ontario.

Cigarette Fire Damages Computer Supply Storage Room

On the morning of the incident, at approximately 5:30 am, a security patrolman smelled smoke in the area. He notified the guard room, which in turn alerted the shift manager and the public fire department. The shift manager responded with the plant fire truck and arrived at about the same time as the fire department. They found one sprinkler operating in the storage room. The fire department extinguished the remaining fire and then shut down the sprinkler system until the fused head could be replaced and the system restored.

The computer room was located in a research and development building, a two-story building of ordinary construction which was fully sprinklered by a wet pipe system. A corner of the computer room, measuring approximately 10 ft. x 10 ft., was partitioned and was used for storage of print-out paper, cards, disks and tapes.

Careless disposal of a cigarette was determined to be the cause. Smoking was permitted in this area. Air-conditioning ducts passed over the basement storage area and access was not restricted. Damage was confined to the storage area with no interruption to production. Estimated loss was $2,000.

June 1974, California

Arson Fire in Computer Room Costs Millions

The one-story building in which this fire occurred was 220 feet long by 60 feet wide and was of noncombustible construction. One part of the building housed offices, including a computer and associated data processing equipment. An attached 250-foot by 600-foot fully sprinklered section held 450,000 automobile tires and was equipped with automatic sprinklers and detectors and watch service. The value of the building and contents was about $9 million.

About 5 am, a few minutes after a guard had made his round, a young man got into the building, entered the 30 foot by 40 foot computer room, pulled computer tapes from their unlocked cabinets and scattered them about. Then he poured five gallons of gasoline in, on, and around the computer, and ignited it. The sprinkler waterflow alarm alerted the guards, but an explosion (probably a gasoline vapor-air explosion) occurred before they reached the building. The explosion damaged the computer, knocked out walls and windows, and seriously burned the arsonist. The six sprinklers that operated controlled the fire and protected the exposed tapes. Automatic detectors alerted the fire department through a direct connection. Security personnel used two pressurized water extinguishers and stretched a hose line but did not use it.

With the fire under control, fire officials shut down the sprinklers and sealed off the area. The central processing unit of the computer was about 50 percent destroyed. Overall, 22 percent of the value of building and contents was destroyed, for about $2 million in total damage. The arsonist was hospitalized with serious burns.

May 1973, Oklahoma

Small Fire Knocks Out Airline Reservations Center for 45 Minutes

This airline computer center facility was a two-story reinforced concrete building housing the computer center of a major airline carrier.

There was no automatic sprinkler protection in the engineering service room where the fire occurred. A smoke detection system was provided throughout with signals received in the main boiler room.

The fire was discovered by an electronic operator working in the engineering service room. He noticed smoke coming from the No. 1 rectifier. He used CO_2 extinguishers to put out small fires in burning insulation. The fire was out on the arrival of the public fire department.

The computers received all reservations for the airline. The ability to receive reservation data was interrupted for 45 minutes because of the loss of power.

It is believed that arcing occurred in an upper capacitor tray followed by arcing in a lower capacitor tray. The power cable to the trays loosened and struck a DC chock coil. Extensive shorting then occurred from the chock coils to ground. Property damage was estimated to be $50,000.

September 1972, New York

No Sprinklers and Inadequate Water Supply for Fire Fighting Mean Large Fire Loss

A fire of undetermined cause originated in the computer data storage area in the basement of an unsprinklered two-story reinforced concrete building. The computer room was located on the first floor directly above the storage area and up to the space within a raised floor beneath the computers. Conditioned air was forced up through openings to individual computer units.

At 12:34 am a smoke detector in the storage area signaled the police department, which then notified the fire department. At 12:45 am fire fighters arrived at the scene and ordered evacuation of personnel (the center was in operation at the time). An inadequate water supply was obtained from a nearby river and from a public fire hydrant about 3000 feet from the plant. The air-conditioning ducts collapsed, increasing the smoke and heat entering the first-floor computer area. Unable to control the fire with water alone, fire fighters used low-expansion foam in the basement. The fire was extinguished at 1:30 pm or about 13 hours after detection. The property damage was estimated at $6 million. In addition, the fire resulted in complete shutdown of the data-processing center. Nearly 150 employees had to be transferred to another plant, where temporary facilities were set up.

March 1972, Indiana

Remodeling Activities Ignite Fire in Bank Building

Workmen were remodeling a one- and two-story building with basement masonry joists, which was occupied as a bank. While cutting an "I" beam on the first floor, sparks ignited the combustible ceiling and spread to a concealed space. Unknown to the workers, slag also fell through holes around a column base and into the basement where it ignited combustible decorative materials.

Arriving fire fighters were hampered by the fact that the building faced onto a pedestrian mall and by the dense smoke being generated by the fire. A mainframe computer was located on the first story of the building. After about one hour of fire fighting operations, the fire broke through the roof and the first floor collapsed, dropping the computer and its associated equipment into the basement. Although the computer was a total loss, duplicate magnetic tapes, together with records which the bank employees were able to remove early in the fire, allowed the bank's record keeping operations to continue at another location. Total loss was $670,000.

October 1971, Maine

Fire Destroys Nearly All Business's Records

This fire occurred in a computer area of a 45 by 85 foot three-story wood-frame structure used as a general business office. Since there was no automatic fire protection, the fire burned for some time before discovery. A resident next door discovered the fire at approximately 3:15 am. The fire department response consisted of the ten engines, including mutual-aid response from four communities. The fire was controlled with water supplied by two tank trucks. The first-floor computer room, the exterior wall in that area, a portion of the first-floor ceiling and a concealed space above the computer room sustained extensive damage.

The point of origin of the fire was adjacent to a card sorter. The exact cause was not determined. Approximately 90 percent of the firm's business records were destroyed.

May 1970, California

Incendiary Device Ignites Computer Room Fire

A molotov cocktail was thrown through a window of the college business building spreading burning liquid throughout the 20-foot by 30-foot computer room. This room was located on the first floor of a two-story 228-foot long by 51-foot wide reinforced concrete structure. While the fire was confined to the computer room, the loss to the contents within the room was estimated at $750,000. There was no automatic fire protection at this facility.

April 1970, New Jersey

Suspected Arson Fire Damages Computer Room

This two-story office building was 80 feet wide by 220 feet long with concrete block walls, concrete floors, and metal deck with steel roof. It was sprinklered throughout except for the computer room, which was protected by a smoke detection system. The fire department responding to a water flow alarm found an intense fire in the tape storage area of the computer room. There was also a small fire in the second story stationery room which was located over one end of the computer room. The

second fire was extinguished by the action of automatic sprinklers. The fire in the computer room was basically confined to the tape storage area, but the heat generated did cause melting of plastic components on the computer console and electric fixtures throughout the computer room. The fire was believed to have been of incendiary origin.

April 1969, Colorado

Circuit Card Fire Fully Involves Building

A flight training center and pilot training simulator/computer facility was undergoing "debugging" tests before being put into full operation. During the night, while there was no one in attendance, a miniaturized circuit card ignited along with cards above it. Because of the high flow of cooling air in the cockpit area, the fire detector was not activated.

By the time the fire was discovered by a maintenance man, the facility was fully involved, although the fire-resistive building was unaffected. The fire department extinguished the fire by intermittent use of water spray. Piping for carbon dioxide protection for the simulator had been partially installed and was not operational. Damage was estimated at $850,000.

April 1969, Florida

Improper Cable Connection Leads to Multi-Million Dollar Fire

During wiring alterations in the electrical control room of this computer manufacturing facility, an improper cable connection had been made, whereby power was applied to the neutral conductor. As a result, heavy current in the neutral wires caused short circuits and overheated insulation. Subsequently a major short circuit occurred at a circuit breaker panel in the final test area for computers. That electrical fault generated smoke and intense heat that melted portions of the breaker assembly. Fire eventually developed in a tape storage cabinet, in two computer systems, and in other small amounts of combustibles near the circuit breaker panel.

Heavy smoke, particularly the smoke from the polyvinyl chloride cable insulation, barred access to the area. The public fire department, using self-contained breathing apparatus, unsuccessfully tried carbon dioxide extinguishers and then extinguished the relatively small fire with water from a spray nozzle supplied by a small hose.

The two computer systems located near the circuit breaker panel were heavily damaged by the fire, together with 150 square feet of raised floor panels. Over 50 computer systems and component parts were exposed to heavy corrosive deposits from the smoking polyvinyl chloride insulation, which broke down into hydrogen chloride and other decomposition products. The estimated dollar loss to the facility was $4,500,000. It did not include the loss from electrical disturbance. The electrical fault continued for a considerable period, as the circuit breaker was so damaged in the initial fault that it did not open. Power was finally disconnected at another substation.

October 1967, Massachusetts

Single Sprinkler Extinguishes Computer Fire

Fire started in a computer in a sprinklered cutoff room of a data processing facility . Operators telephoned the fire department and attempted to extinguish the fire using a 15-pound carbon dioxide extinguisher, but the fire was shielded by the steel cabinet of the computer. Smoke drove them out of the room in about five minutes, at which time one sprinkler (212°F dry system) began to operate.

Fire fighters with breathing apparatus also tried to extinguish the fire using three carbon dioxide extinguishers, but they were hampered by the dense smoke in the windowless room. The single operating sprinkler confined the fire to the computer and eventually extinguished it.

The fire is thought to have been caused by an electrical short circuit or malfunction of one of four cooling fans operating on 208 volts AC inside the computer. The materials that ignited and fed the fire included printed circuit boards made of epoxy-coated pressed paper and polyvinyl chloride insulation on wires and cables. Smoke damaged a magnetic information storage drum in the room, but the only information lost was the current day's work, which was easily replaced from available records. Tapes and other records were stored in separate areas.

August 1967, California

Analog Computer Ignited by Internal Short Circuit

A fire in the computer center, resulting from an electrical short circuit in the power supply inside an analog computer, started a fire in the computer before tripping the circuit breaker. An employee in an adjacent room saw smoke and called the fire department. Fire fighters venting the computer room found that one sprinkler at the ceiling had operated and confined the fire to the single piece of equipment. The computer's cabinet was badly distorted from the heat, and about 70 percent of its components were damaged or destroyed. Other data processing equipment in the room received smoke damage. The loss was estimated at $250,000.

March 1967, Illinois

Fire Damages Experimental Computer

Fire of undetermined cause started in plywood work tables in the computer workshop of this computer laboratory, which opened directly into the room containing the experimental multimillion-dollar computer under construction. No one was in the building at the time, and the fire was discovered by a passerby. A smoke detection system was being installed but was not yet in operation. Fire fighters had difficulty locating the fire in the heavily smoke-charged, windowless computer area, which was in the center core of the building. The fire caused heavy smoke damage and some heat damage, with dollar damage estimated at $250,000.

January 1965, Florida

$25 Million Loss at Space Vehicle Tracking Station

At this space vehicle tracking station, arcing ignited plastic insulation on electronic wires between transmitting and receiving models and computers. The wedge-shaped noncombustible building, approximately 11 stories high, was not subdivided and had no automatic fire protection other than a few portable extinguishers. The rapid buildup of heat and smoke kept fire fighters from entering the windowless building to fight the fire. The building was severely damaged and the contents, including several million dollars worth of computers and other electronic equipment, were destroyed. Total damage was estimated at $25 million.

March 1961, Pennsylvania

Card Punch Equipment Short Circuit Causes Fire

Although the card punch system was not in use in this electronics plant, it was still energized. A short circuit in a circuit breaker of the system was followed by fire, which was confined to the card punch machines. Carbon dioxide extinguishers that were discharged through enclosure openings extinguished the fire. Damage was estimated at $15,000.

March 1961, Massachusetts

Carbonized Wood Leads to Spontaneous Ignition

Carbonized wood in a power-pack enclosure of a digital and analog computer in this university computer room ignited spontaneously after the equipment had been continuously energized over a considerable period. Before sprinklers opened, the fire was discovered and extinguished by a watchman with carbon dioxide extinguishers and a small hose line with a spray nozzle. Damage was estimated at $30,000.

June 1959, Maryland

Lightning Fire Damages Computers

Lightning struck a window air conditioner, jumped to a water line, and ignited exposed paper and punch cards in the basement computer room of an unsprinklered two-story brick, wood-floored government office building. Installation personnel, aided by four outside fire companies, attacked the fire with extinguishers and standpipe hose lines. Six computers were damaged and many records and tapes were damaged or destroyed. Damage was estimated at $254,000.