COMPUTER ROOMS AND OTHER ELECTRONIC EQUIPMENT AREAS

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March 2012

National Fire Protection Association
Fire Analysis and Research Division

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Abstract
In 2006-2010, there were an estimated 209 reported U.S. structure fires per year that started in electronic equipment rooms. Associated annual average estimated losses in 2006-2010 five, civilian injuries, and $11.9 million in direct property damage. No deaths were reported.

Most non-home electronic equipment room fires (78%) begin with electronic equipment as equipment involved in ignition (33%) or with electrical distribution or lighting equipment (29%) or heating, ventilating, or air conditioning equipment (16%). Detectors were reported present in 77% of non-home structure fires beginning in electronic equipment rooms, and sprinklers were reported in 35% of those fires.

Keywords: fire statistics, computer, compute room, electronic equipment

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We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

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Computer Rooms and Other Electronic Equipment Areas

Electronic equipment areas include computer rooms and data processing centers, as well as control centers, radar rooms, telephone equipment rooms, and telephone booths. It is not possible to separate the different types of room and areas in this category.

In 2006-2010, there were an estimated 209 reported U.S. structure fires per year that started in electronic equipment rooms.
Associated annual average estimated losses in 2006-2010 were no civilian deaths, 5 civilian injuries, and $11.9 million in direct property damage.

Table 1 shows estimated fires and losses from 1980 to 2010. There was a substantial decline from 1980 to the late 1980s, then no sustained consistent trend from the late 1980s to the late 1990s. The switch to NFIRS Version 5.0 resulted in a large drop immediately, even though the available categories for coding area of origin had not changed. There was a more modest decline from 2000 to 2004, and there has been a roughly level trend since 2004.

Table 2 shows that one- or two-family homes and apartments – the two types of homes – are two of the four leading property-use groups accounting for electronic equipment room fires. Office buildings and schools (pre-K to grade 12) account for the other leading shares of these fires.

Tables 3-4 show the trends in these fires for homes and excluding homes, respectively. Both trends show similar large drops when NFIRS Version 5.0 was introduced. Because the available categories and definitions of area of origin did not change when NFIRS Version 5.0 was introduced, and there was no dramatic decline in the number or the configuration of electronic rooms and areas around 1999, the explanation for these sharp declines may involve a much more conservative application of the label of electronic equipment room or area.

Specifically, it may be that the sharp drop in numbers indicates a greatly reduced tendency to refer to a room as an electronic equipment room simply because electronic equipment was used in the room and started the fire. Ideally, the label would be used only for rooms or areas that are entirely or almost entirely devoted to electronic equipment (and based on the examples cited, this should be office-type electronic equipment, not entertainment-type electronic equipment). Because such dedicated rooms are extremely rare in one- or two-family homes, the large share of such fires reported for one- or two-family homes suggests that many of these reported fires are for home offices or other such rooms where electronic equipment is central to the room's function.

The rest of this report will focus exclusively on electronic equipment room fires in structures other than homes. This should bring us closer to the kinds of rooms and spaces most appropriately called computer rooms.

We could be even more sure that we are examining only traditional computer rooms if we narrowed the focus to the property use group called defense, computer or communications centers – where the entire building may be devoted to electronic equipment – but these properties accounted for only eight electronic equipment room fires per year in 2006-2010, which is too few fires for meaningful statistics. In computer centers alone, there were only 1.5 reported structure fires per year that began in electronic equipment rooms.

Electronic equipment room fires accounted for less than 0.1% of all 2006-2010 structure fires and of all home fires; 0.1% of all non-home structure fires; 4.4% of all computer, defense, or communications center fires; and 7.8% of all computer center fires.

Note that fires attributable to the hazards in electronic equipment rooms may begin not in the rooms themselves but in adjacent concealed spaces, including wall spaces and ceiling/floor concealed spaces, where a considerable volume of electric cabling can normally be found. These fires cannot be identified because concealed spaces are not coded as to the type of room adjacent to the concealed space.

Most non-home electronic equipment room fires (78%) begin with electronic equipment as equipment involved in ignition (33%) or with electrical distribution or lighting equipment (29%) or heating, ventilating, or air conditioning equipment (16%).
Table 5 shows the specific leading types of equipment involved. Most but not all of the involved electronic equipment is office-type equipment. Two leading types of electrical distribution or lighting equipment – uninterrupted power supply and surge protector – account for larger shares of fires than are usually seen in other analyses. These types of equipment are particularly associated with the use of electronic equipment. Most but not all of the involved heating, ventilating and air conditioning equipment is specifically cooling and ventilation equipment, as one might expect given that electronic equipment is more likely to need cooling than heating.

Here are some other cause related parts of the non-home electronic equipment room fire problem, showing number and share of estimated reported structure fires per year in 2006-2010.

Cause		
Intentional	5	(4%)
Heat source		
Lightning	3	(2%)
Item first ignited		
Wire or cable insulation	67	(46%)
Unclassified item	19	(13%)
Appliance housing or casing	7	(5%)
Papers	5	(3%)
Interior wall covering	5	(3%)
Structural member or framing	5	(3%)
Cooking materials	5	(3%)

In half the fires where the first ignited item is known and specified (that is, excluding unclassified items), wire or cable insulation is the first item ignited. It is reasonable to estimate that the insulation is usually part of the same equipment providing the heat source. Other leading items first ignited are examples of fixed combustibles (interior wall covering, structural member or framing) or moveable combustibles (papers) that may be located too close to overheated equipment. Appliance housings and casings could be part of the equipment that is the heat source or could be part of a portable device left too close to the equipment that is the heat source.

Detectors are reported present in three out of four (77%) non-home structure fires starting in electronic equipment rooms or areas.
Average direct property damage per fire was 60% lower when detectors were present.

Only 11% of reported non-home structure fires beginning in electronic equipment rooms with detectors present were deemed too small to activate an operational detector. The other fires split between 86% where detectors operated and only 3% where detectors did not operate. For the fires where detectors operated, 79% alerted occupants, 18% alarmed when no occupants were present, and in 3% occupants failed to respond to a sounding alarm.

The type of detectors reported favored smoke detectors but were varied:

Smoke detectors	59	(52%)
More than one type of detector present	22	(20%)
Combination smoke and heat detector	20	(17%)
Water flow detector for sprinklers	9	(8%)
Other or unclassified detector	2	(2%)
Heat detector	1	(1%)
Total fires per year with detectors present	113	(100%)

Automatic extinguishing equipment was reported present in 48% of non-home structure fires in electronic equipment rooms, with 35% specifically reporting the presence of sprinklers (excluding partial systems and systems with no sprinklers in the fire area).
When automatic extinguishing equipment was reported present, sprinklers were reported in 72% of the fires. Wet-pipe sprinklers were reported for 90% of the fires with sprinklers present, compared to 7% for dry-pipe sprinklers and 3% for other sprinklers. When the extinguishing equipment reported was not sprinklers, halogen systems accounted for 49% of the equipment, compared to 43% for carbon dioxide systems and 8% for other, unspecified special hazard systems.

When wet-pipe sprinklers were present, 56% of fires were reported as too small to activate operational sprinklers. In the remaining fires, sprinklers operated in 93% of the fires and were deemed effective every time they operated. These percentages are comparable to reliability and effectiveness percentages for sprinklers in most properties.

Appendix A provides additional details on statistical methodology. Appendix B provides narratives on selected incidents.

NFPA 75, *Standard for the Protection of Electronic Computer/Data Processing Equipment*, is the NFPA standard most relevant to and most useful on this subject.

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

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions) As Reported		In 2010 Dollars	
1980	1,600		35		$27.7		$73.4	
1981	1,630		69		$27.9		$66.8	
1982	1,510		39		$13.8		$31.0	
1983	1,210		96		$22.4		$48.9	
1984	1,370		23		$11.5		$24.0	
1985	1,360		30		$15.1		$30.5	
1986	1,330		57		$17.9		$35.5	
1987	1,260		24		$11.0		$21.1	
1988	1,260		26		$37.8		$69.7	
1989	1,120		48		$26.1		$45.9	
1990	1,130		35		$33.1		$55.3	
1991	1,130		24		$30.0		$48.0	
1992	1,200		73		$20.2		$31.4	
1993	1,240		29		$17.1		$25.8	
1994	1,200		18		$44.3		$65.1	
1995	1,230		10		$21.9		$31.3	
1996	1,340		36		$21.4		$29.8	
1997	1,260		31		$37.5		$50.9	
1998	1,280		21		$30.1		$40.2	
1999	760	(680)	0	(0)	$14.4	($14.1)	$18.8	($18.5)
2000	360	(360)	0	(0)	$7.8	($7.8)	$9.8	($9.8)
2001	230	(200)	0	(0)	$4.6	($4.6)	$5.7	($5.7)
2002	280	(260)	16	(16)	$19.7	($19.7)	$23.9	($23.9)
2003	270	(230)	2	(2)	$10.8	($10.8)	$12.7	($12.7)
2004	200	(180)	0	(0)	$5.2	($5.2)	$6.0	($6.0)
2005	210	(170)	11	(11)	$37.1	($37.0)	$41.4	($41.3)
2006	200	(200)	0	(0)	$11.5	($11.5)	$12.4	($12.4)
2007	220	(190)	2	(2)	$19.4	($19.4)	$20.4	($20.4)
2008	220	(180)	10	(10)	$9.5	($9.5)	$9.6	($9.6)
2009	210	(180)	10	(10)	$11.6	($11.6)	$11.7	($11.7)
2010	190	(150)	2	(2)	$7.3	($7.3)	$7.3	($7.3)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Statistics in parentheses exclude fires reported as confined to trash, fuel burner or boiler, chimney or flue, cooking vessel, computer or incinerator. Fires are rounded to the nearest ten; civilian injuries to the nearest one; and direct property damage to the nearest hundred thousand dollars. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution*. Inflation adjustment to 2010 dollars is done using the consumer price index. 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, 2006-2010

Property Use	Fires		Civilian Injuries		Direct Property Damage (in Millions) As Reported	
One- or two-family home including manufactured home	43	(21%)	3	(56%)	$2.5	(21%)
Office building including general office building	27	(13%)	0	(9%)	$1.4	(12%)
Apartment or multi-family home	20	(9%)	0	(0%)	$0.0	(0%)
School grades pre-K through 12	20	(9%)	0	(0%)	$1.2	(10%)
Manufacturing facility	11	(5%)	0	(0%)	$0.7	(6%)
Defense, computer or communications center	8	(4%)	0	(0%)	$0.7	(6%)
Library or museum	6	(3%)	0	(0%)	$0.6	(5%)
Unclassified store or office	5	(3%)	0	(0%)	$0.3	(2%)
Prison or jail	4	(2%)	0	(0%)	$0.1	(1%)
Unclassified storage property	4	(2%)	0	(0%)	$0.1	(1%)
Department store	4	(2%)	0	(0%)	$0.3	(2%)
College classroom building	3	(2%)	0	(0%)	$0.0	(0%)
Grocery or convenience store	3	(1%)	0	(0%)	$0.0	(0%)
Clinic or doctor's office	3	(1%)	0	(0%)	$0.0	(0%)
Utility or distribution system	3	(1%)	0	(0%)	$0.2	(2%)
Unclassified residential property	3	(1%)	0	(0%)	$0.0	(0%)
Service station or vehicle sales, service or repair facility	3	(1%)	0	(0%)	$0.2	(1%)
Place of worship or funeral property	2	(1%)	0	(0%)	$0.3	(2%)
Hotel or motel	2	(1%)	0	(0%)	$0.0	(0%)
Studio or theatre	2	(1%)	0	(0%)	$0.1	(1%)
Unclassified special property	2	(1%)	0	(0%)	$0.0	(0%)
Warehouse	2	(1%)	0	(0%)	$1.9	(16%)
Nursing home or residential board and care facility	2	(1%)	0	(0%)	$0.0	(0%)
Eating or drinking place	2	(1%)	0	(0%)	$0.0	(0%)
Hospital or hospice	2	(1%)	0	(0%)	$0.0	(0%)
Unclassified institutional property	2	(1%)	0	(0%)	$0.0	(0%)
Club	2	(1%)	0	(0%)	$0.0	(0%)
None	1	(0%)	0	(0%)	$0.0	(0%)
Other known property use	17	(8%)	2	(35%)	$1.1	(9%)
Unknown property use	1	(0%)	0	(0%)	$0.0	(0%)
Total	209	(100%)	5	(100%)	$11.9	(100%)
All homes	63	(30%)	3	(56%)	$2.5	(21%)
Structures excluding homes	146	(70%)	2	(44%)	$9.3	(79%)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten; civilian injuries to the nearest one; and direct property damage to the nearest hundred thousand dollars. 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. Home Structure Fires Originating in Electronic Equipment Rooms, by Year

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions) As Reported		In 2010 Dollars	
1980	190		4		$0.4		$1.1	
1981	190		0		$0.4		$0.9	
1982	140		3		$1.6		$3.6	
1983	170		0		$1.1		$2.3	
1984	150		4		$0.7		$1.5	
1985	170		6		$0.5		$1.1	
1986	180		0		$1.5		$2.9	
1987	160		0		$1.2		$2.3	
1988	180		0		$2.1		$3.8	
1989	190		6		$2.4		$4.3	
1990	180		0		$2.8		$4.7	
1991	250		4		$5.9		$9.4	
1992	250		8		$1.8		$2.8	
1993	310		4		$1.8		$2.7	
1994	250		8		$3.3		$4.9	
1995	290		6		$3.8		$5.5	
1996	340		13		$3.7		$5.2	
1997	310		15		$2.0		$2.7	
1998	390		7		$3.8		$5.1	
1999	350	(350)	0	(0)	$2.7	($2.7)	$3.6	($3.6)
2000	130	(130)	0	(0)	$2.8	($2.8)	$3.5	($3.5)
2001	50	(50)	0	(0)	$0.4	($0.4)	$0.4	($0.4)
2002	100	(80)	16	(16)	$2.5	($2.5)	$3.0	($3.0)
2003	50	(50)	0	(0)	$2.2	($2.2)	$2.6	($2.6)
2004	50	(50)	0	(0)	$2.2	($2.2)	$2.6	($2.6)
2005	70	(50)	4	(4)	$1.0	($1.0)	$1.1	($1.1)
2006	50	(50)	0	(0)	$7.4	($7.4)	$7.9	($7.9)
2007	60	(50)	2	(2)	$1.6	($1.6)	$1.7	($1.7)
2008	90	(60)	10	(10)	$0.9	($0.9)	$0.9	($0.9)
2009	60	(40)	2	(2)	$2.2	($2.2)	$2.2	($2.2)
2010	60	(30)	0	(0)	$0.7	($0.7)	$0.7	($0.7)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Statistics in parentheses exclude fires reported as confined to trash, fuel burner or boiler, chimney or flue, cooking vessel, computer or incinerator. Fires are rounded to the nearest ten; civilian injuries to the nearest one; and direct property damage to the nearest hundred thousand dollars. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution*. Inflation adjustment to 2010 dollars is done using the consumer price index. 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 Year

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions) As Reported		In 2010 Dollars	
1980	1,420		31		$27.3		$72.3	
1981	1,430		69		$27.6		$65.9	
1982	1,370		36		$12.2		$27.4	
1983	1,040		96		$21.3		$46.5	
1984	1,220		19		$10.8		$22.5	
1985	1,190		24		$14.5		$29.4	
1986	1,150		57		$16.4		$32.6	
1987	1,100		24		$9.8		$18.8	
1988	1,080		26		$35.7		$65.9	
1989	940		42		$23.7		$41.6	
1990	960		35		$30.3		$50.6	
1991	880		20		$24.2		$38.6	
1992	950		65		$18.4		$28.6	
1993	930		25		$15.3		$23.1	
1994	950		10		$40.9		$60.2	
1995	940		4		$18.1		$25.8	
1996	1,000		23		$17.7		$24.6	
1997	950		16		$35.6		$48.3	
1998	890		14		$26.3		$35.1	
1999	410	(330)	0	(0)	$11.6	($11.4)	$15.2	($14.9)
2000	240	(240)	0	(0)	$5.0	($5.0)	$6.3	($6.3)
2001	180	(150)	0	(0)	$4.3	($4.3)	$5.2	($5.2)
2002	180	(180)	0	(0)	$17.2	($17.2)	$20.9	($20.9)
2003	210	(180)	2	(2)	$8.6	($8.6)	$10.2	($10.2)
2004	140	(130)	0	(0)	$3.0	($3.0)	$3.5	($3.5)
2005	140	(120)	7	(7)	$36.1	($36.0)	$40.3	($40.2)
2006	160	(160)	0	(0)	$4.2	($4.2)	$4.5	($4.5)
2007	160	(140)	0	(0)	$17.8	($17.8)	$18.7	($18.7)
2008	130	(120)	0	(0)	$8.6	($8.6)	$8.7	($8.7)
2009	150	(140)	8	(8)	$9.4	($9.4)	$9.5	($9.5)
2010	130	(120)	2	(2)	$6.6	($6.6)	$6.6	($6.6)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Statistics in parentheses exclude fires reported as confined to trash, fuel burner or boiler, chimney or flue, cooking vessel, computer or incinerator. Fires are rounded to the nearest ten; civilian injuries to the nearest one; and direct property damage to the nearest hundred thousand dollars. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution*. Inflation adjustment to 2010 dollars is done using the consumer price index. Statistics include a proportional share of fires with unknown area of origin.

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

Equipment Involved in Ignition	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Electronic equipment	**48**	**(33%)**	**NA**	**(NA)**	**$3.1**	**(33%)**
Computer	15	(10%)	NA	(NA)	$1.0	(10%)
Unclassified computer device	14	(10%)	NA	(NA)	$0.8	(9%)
Unclassified electronic equipment	11	(7%)	NA	(NA)	$1.2	(13%)
Other known electronic equipment	8	(6%)	NA	(NA)	$0.1	(1%)
Electrical distribution or lighting equipment	**42**	**(29%)**	**NA**	**(NA)**	**$4.3**	**(46%)**
Uninterrupted power supply	10	(7%)	NA	(NA)	$0.2	(2%)
Unclassified electrical wiring	6	(4%)	NA	(NA)	$0.9	(9%)
Surge protector	5	(4%)	NA	(NA)	$0.0	(0%)
Unclassified power transfer equipment	5	(3%)	NA	(NA)	$0.5	(6%)
Panelboard, switchboard, or circuit breaker board	4	(3%)	NA	(NA)	$0.0	(0%)
Fluorescent light fixture or ballast	3	(2%)	NA	(NA)	$0.0	(0%)
Other known electrical distribution or lighting equipment	9	(6%)	NA	(NA)	$2.7	(29%)
Heating, ventilating and air conditioning equipment	**23**	**(16%)**	**NA**	**(NA)**	**$1.4**	**(15%)**
Fan	7	(5%)	NA	(NA)	$0.1	(1%)
Unclassified heating, ventilating or air conditioning equipment	7	(5%)	NA	(NA)	$0.4	(4%)
Air conditioner	4	(3%)	NA	(NA)	$0.2	(2%)
Other known heating, ventilating or air conditioning equipment	5	(3%)	NA	(NA)	$0.7	(7%)
Other known equipment	**19**	**(13%)**	**NA**	**(NA)**	**$0.1**	**(1%)**
Toaster, toaster oven, or counter-top broiler*	5	(3%)	NA	(NA)	$0.0	(0%)
Telephone switching gear, including PBX	2	(1%)	NA	(NA)	$0.0	(0%)
Other known other known equipment	12	(8%)	NA	(NA)	$0.1	(1%)
No equipment involved	**13**	**(9%)**	**NA**	**(NA)**	**$0.4**	**(5%)**
Total	**146**	**(100%)**	**2**	**(100%)**	**$9.3**	**(100%)**

NA -- Not available because equipment involved is unknown for all injuries.

* Based on one reported confined fire.

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten; civilian injuries to the nearest one; and direct property damage to the nearest hundred thousand dollars. 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.

Appendix A.
How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit http://www.nfirs.fema.gov/. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.
NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.
Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger 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.

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 in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; 3) the number and nature of non-fire incidents; and (4) 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 results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf.

Projecting NFIRS to National Estimates

As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both 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 database -- 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.

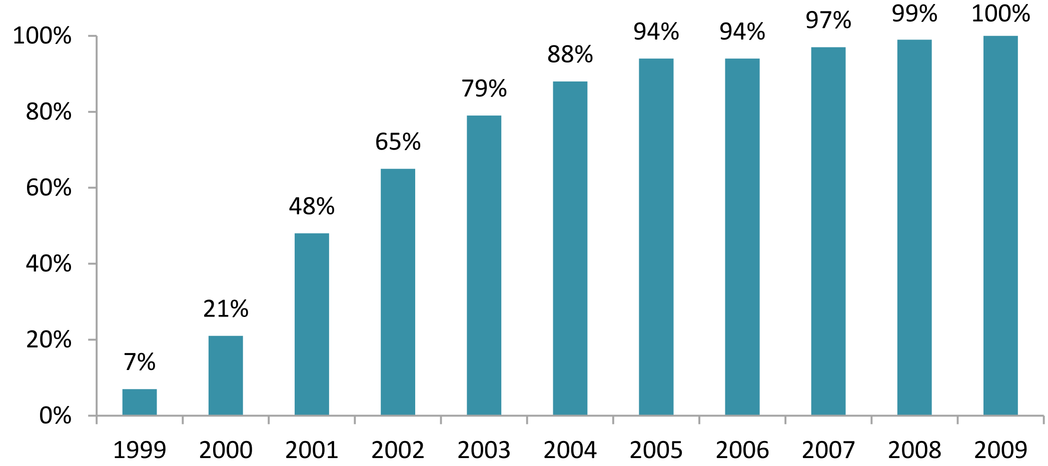
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at http://www.nfpa.org/osds or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types.

Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term "all fires" refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Cause of Ignition: This field is used chiefly to identify intentional fires. "Unintentional" in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or "other" (unclassified)." The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

Factor Contributing to Ignition: In this field, the code "none" is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for "not reported" when no factors are recorded. "Not reported" is treated as an unknown, but the code "none" is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, "mechanical failure or malfunction." This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;
26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.

Entries in "electrical failure, malfunction" (factor contributing to ignition 30-39) may also be combined into one entry, "electrical failure or malfunction." This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;

33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
30. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: “Heat from open flame or smoking material, other.” NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette;
62. Pipe or cigar;
63. Heat from undetermined smoking material;
64. Match;
65. Lighter: cigarette lighter, cigar lighter;
66. Candle;
67 Warning or road flare, fuse;
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping “smoking materials” includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by

$$\frac{\text{All fires}}{\text{(All fires – blank – undetermined – [fires in which EII =NNN and heat source <>40-99])}}$$

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

Code Grouping	EII Code	NFIRS definitions
Central heat	132	Furnace or central heating unit
	133	Boiler (power, process or heating)
Fixed or portable space heater	131	Furnace, local heating unit, built-in
	123	Fireplace with insert or stove
	124	Heating stove
	141	Heater, excluding catalytic and oil-filled
	142	Catalytic heater
	143	Oil-filled heater
Fireplace or chimney	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility
	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector
	228	Battery charger or rectifier
	229	Battery (all types)
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight
	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast

	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
	243	Decorative or landscape lighting – low voltage
	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment
Portable cooking or warming equipment	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
	641	Breadmaking machine

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.

Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as “mattresses and bedding.” In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as “clothing.” In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply “bedroom.” Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.

Appendix B. Selected Fire Incidents in Computer Center Buildings or in Electronic Equipment Rooms or Areas in Structures Excluding Homes

A. Computer Center Buildings But Not in Electronic Computer Rooms

April 1985, California

Transient arrested in incendiary fire

Although a deliberately set fire damaged this computer center, responding firefighters 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 façade. 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 façade 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 façade. The dry wood ignited quickly and the flames traveled up along the façade's underside.

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

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.

July 1981, Ohio

Back-up power batteries short circuit and cause fire

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

The fire was reported at 12:10 am by a private central supervisory alarm company. Responding firefighters found heavy smoke filtering throughout the first floor of this three-story, fire resistive building of masonry construction. Firefighters 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.

B. Electronic Equipment Rooms or Areas – Servers or Main Frames

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 firefighter 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 firefighters 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.

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 firefighters 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). Firefighters 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. Forth-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.

June 1980, 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, firefighters observed flames at the base of a terminal. Firefighters 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.

C Electronic Equipment Rooms or Areas – Multiple Microcomputers

2004, Massachusetts

Fire damages school

Firefighters were already responding to a 5:22 am municipal master box alarm from a middle school when a passerby called 911 to report the fire. The fire department immediately sent additional resources.

The unoccupied four-story, wood-and-brick building had a pitched roof covered with slate tiles. Its smoke and heat detection system was connected to a municipal fire alarm system.

Firefighters arrived within five minutes of the alarm to find smoke and flames venting from a window on the second floor.

As one crew of firefighters advanced a 1 3/4-inch hose line to the second floor, others established a water supply and raised aerial ladders to the second floor. They brought the fire, which started in a computer classroom, under control within a few hours.

Property damage, limited to the room of origin, was estimated at $500,000. No one was injured.

Kenneth J. Tremblay, 2005, "Firewatch," *NFPA Journal*, July/August, 16.

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.

D. Electronic Equipment Rooms or Areas – Control Rooms

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 area 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 $5,000 in damage to the structure.

E. Other or Unknown-Type Computer Rooms or Areas

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 ¾" 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 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 am. 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.

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.

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 ire 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.

Firefighters 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 firefighters 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.

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 firefighters 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.

F. Telephone Switching Centers or Telephone Equipment Rooms

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 departments were notified and responded to the scene within two minutes.

Firefighters 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. Firefighters 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 was considered suspicious.

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.

Firefighters 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 from at http://www.nfpa.org/fireinvestigationsnon-residential NFPA.

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. Firefighters 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.