

Building Fire Scenarios—Some Fire Incident Statistics

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ABSTRACT

The fire engineering approach to designing building fire safety systems requires information on fire occurrences in different types of buildings. In this paper, data collected by the Australian Fire Incident Reporting System (AFIRS) in its first four years of operation is used to determine common and hazardous fire scenarios for a range of building types. It is found that, whereas cooking fires are common in all those building types that contain kitchens or cooking areas, such fires do not spread and cause deaths, but for buildings that contain lounge and sleeping areas, fires involving upholstered furniture cause more deaths, and relatively more damage. In some building types there are insufficient fires to identify the most hazardous scenarios.

KEYWORDS: Building fire scenarios, fire statistics, fire engineering.

INTRODUCTION

With the growth in fire engineering as a discipline comes the need for more data, some of it in the form of statistics. For instance, the fire engineering approach requires definitions of fire scenarios. Fire statistics can be used to determine common and hazardous scenarios and this paper seeks to identify such scenarios in various building types. It is not concerned with the relative hazard of different occupancies or with providing data for risk assessment purposes.

As single residential and outbuildings are seldom the subject of fire engineering assessment, they are not discussed in this paper. However, some general tabulations include data for all buildings, and whenever this is the case, it is stated.

AN OVERVIEW OF AUSTRALIAN FIRE STATISTICS

Until recently, Australian fire statistics have been very limited in scope. Australian researchers have relied on New South Wales statistics, AFPA Bulletins and limited ABS data, usually in conjunction with overseas data [1,2]. In the Warren Centre Fire Safety and Engineering Project [3] the statistics used came from New South Wales, Canada and the USA.

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In the Warren Centre study, individual fatalities in New South Wales were itemised, showing Occupancy, Cause, Area of Origin, Material Ignited First and other parameters [3]. However, the limited data did not allow hazardous scenarios to be positively identified for different building types of building. The advent of the Australian Fire Incident Reporting System [4], and the resultant collection of statistics into an electronic database [5], now allows more 'in-depth' analysis of Australian fire data, though, as will become apparent, difficulties remain.

Australian Fire Incident Reporting System (AFIRS)

AFIRS is incorporated in the Australian Standard AS 2577 [4]. The data presented in this paper was collected using the 1983 edition and covers the period from July 1989 to June 1993. Selected AFIRS data has been tabulated and published[6–8] but the bulk of the data exists only in electronic form and is accessed by requesting specific cross-tabulations.

The estimated coverage of Australia for each year is given in Table 1. Data presented in this paper is directly from the AFIRS database and has not been adjusted for coverage.

Cross-tabulations were specified by the appropriate codes for each data element of concern. The depth of search was determined by both the data elements available and the number of entries for a particular combination of data elements.

Fire Occurrence by Building Type

Buildings throughout Australia are classified according to the Building Code of Australia (BCA) [9]. However, AFIRS does not use the BCA classes.

Therefore the correlation of fire data with the BCA classes is only approximate. The AFIRS 'Fixed Property Use' classes used to provide data for each BCA class is shown in Table 2.

The AFIRS Fixed Property Use codes have three levels (represented by three-digit codes) but only that level (1, 2 or 3) which can be sensibly correlated with the BCA Building Classes has been used. The fires were selected as 'type of situation found = 11' (structure fire) and 'structure type = 1 or 2' (building with one or more than one Fixed Property Use). For the period 1989–1993, the number of fires for any one of the BCA Building Classes listed did not exceed 5,000 (Table 2). These small populations limit the depth to which the fire data can be analysed.

TABLE 1. Estimated AFIRS coverage of Australian fire data [6–8]

Year	Estimated AFIRS coverage (%)
1989–1990	81
1990–1991	85
1991–1992	85
1992–1993	85

TABLE 2. Occurrence of building fires^a by building type, 1989–1993

BCA building class	AFIRS fixed property use	Fires
2 Apartments	Apartments (42)	4,976
3 Hotels and boarding houses	Hotels etc. (43–49)	2,554
5 Offices	Offices (59)	1,606
6 Shops	Shops (50–58)	3,887
7 Carparks and warehouses	Storage (8)	2,930
8 Factories	Industrial & manufacturing (6–7)	2,959
9a Health care buildings	Institutional (3)	2,268
9b Assembly buildings	Public assembly (1)	2,427
	Educational (2)	1,384
All buildings	All^b	48,802

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Includes Fixed Property Uses 40 & 41 (dwellings), 9 (special property) and 0 (unclassified), not listed in this tabulation.

Fire Spread in Buildings

The degree to which the fire has spread is estimated from data for the AFIRS field 'Extent of Flame Damage' (Table 3). For those building fires in which the field 'Extent of Flame Damage' was not filled in, there is no data extracted, leading to a discrepancy between totals in this tabulation and Table 2.

In 36.9% of cases flame damage was confined to the object of origin, whilst in 75.4% of cases, flame damage did not extend beyond the room of fire origin. Only 20.7% of building fires spread beyond the room of fire origin.

Deaths and Injuries

The relationship between the spread of fire and the occurrence of injuries and deaths was explored (Table 4). The term 'Injury' is defined as 'requiring (a) treatment by a medical practitioner; or (b) at least one day of restricted activity immediately following the incident' [4]. As there is uncertainty about the level of hazard associated with injuries, hazardous scenarios will be related to the occurrence of deaths.

The number of deaths from building fires that are confined to the object or the room of origin is less than the number of deaths from building fires that extend beyond the room of origin, even though the number of such fires is greater. The reason(s) for this are subject to speculation but may be related to fire severity.

TABLE 3. Extent of flame damage in building fires^a, 1989–1993

Extent of flame damage	Fires	Percentages
Confined to the object of fire origin	16,353	36.9
Confined to part of room or area of origin	9,964	22.5
Confined to room of origin	7,099	16.0
Confined to the fire-rated compartment of origin	279	0.6
Confined to the floor of origin	969	2.2
Confined to structure of origin	6,954	15.7
Extended beyond structure of origin	969	2.2
Not a structure fire	502	1.1
Unknown	1,208	2.7
Subtotal	44,297	100
Not filled in ^b	4,505	
Total^c	48,802	

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Determined from differences in totals in received tabulations.

^c Data from Table 2.

TABLE 4. Injuries and deaths in building fires^a by extent of flame damage, 1989–1993

Extent of flame damage	Fires	Injuries		Deaths	
		Occupants	Firefighters	Occupants	Firefighters
Confined to object of fire origin	16,353	420	47	6	0
Confined to part of room or area of origin	9,964	567	52	29	0
Confined to room of origin	7,099	598	85	37	1
Confined to fire-rated compartment of origin	279	52	7	6	0
Confined to floor of origin	969	127	35	17	0
Confined to structure of origin	6,954	579	363	118	2
Extended beyond structure of origin	969	142	38	10	0
Not a structure fire	502	9	0	1	0
Unknown	1,208	33	9	2	0
Not filled in	4,505	155	113	25	2
Total	48,802	2,682	749	251	5

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

Common and Hazardous Fire Scenarios

The data for 'Area of Fire Origin' (Table 5) indicates that fires most commonly start in kitchens and other cooking areas. Most of these fires obviously involve cooking, but such fires are not necessarily the most hazardous, as they are less likely to spread beyond the room of fire origin than most other fires (Table 6), and they are less likely to cause death and injury than some other types of fire (Table 7).

TABLE 5. Area of fire origin in building fires^a, 1989–1993

Area of fire origin	Building fires
Kitchen, cooking area (24) ^b	12,168 ^c
Sleeping area (21, 22)	5,447
Lounge area (14)	4,224
Service areas (6)	2,012
Laundry (26)	1,903
Other part of building	19,292
Outside building	1,391
Unknown	2,365
Total	48,802

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Numbers in parentheses are AFIRS codes.

^c 9038 kitchen fires involved cooking equipment.

TABLE 6. Building fires^a – extent of flame damage by equipment involved in ignition, 1989–1993

Equipment involved in ignition	Extent of flame damage				
	Confined to object or room of fire origin (1–3) ^c	Spread beyond room of fire origin (4–7)	Other, unknown	All fires ^b	Spread beyond room of fire origin (%)
Cooking equipment (2) ^c	7,832	513	432	8,777	5.8
Heating equipment (1)	3,346	595	222	4,163	14.3
No equipment	9,764	3,672	356	13,792	26.6
Other, unknown	12,474	4,391	700	17,565	25.0
Total	33,506	9171	1,520	44,297	20.7

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Data does not match Table 2 as it does not include cases where 'Extent of Flame Damage' was not filled in.

^c Numbers in parentheses are AFIRS codes.

TABLE 7. Injuries and deaths in building fires^a by equipment involved in ignition, 1989–1993

Equipment involved in ignition	Injuries		Deaths	
	Occupants	Firefighters	Occupants	Firefighters
Cooking equipment (2) ^b	511	30	11	0
Heating equipment (1)	252	69	38	0
No equipment	814	244	92	2
Other, unknown	1,105	399	110	3
Total	2,682	749	251	5

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Numbers in parentheses are AFIRS codes.

After kitchens, the next most common areas of fire origin are sleeping and lounge areas (Table 5). Both these areas typically contain soft furniture, either bedding or upholstered seating. This is significant, given that data on flame spread (Table 8) and deaths and injuries (Table 9) both include such items among the materials ignited first.

TABLE 8. Building fires^a – extent of flame damage by form of material ignited first, 1989–1993

Form of material ignited first	Extent of flame damage				
	Confined to object or room of fire origin (1–3)	Spread beyond room of fire origin (4–7)	Other, unknown	All fires ^b	Spread beyond room of fire origin (%)
Mattress, pillow (31) or bedding (32)	2,008	501	34	2,543	19.7
Cooking materials (76)	6,450	344	391	7,185	4.8
Upholstered furniture (21)	701	282	11	994	28.4
Other form of material	21,645	5,245	983	27,873	18.8
Other, unknown	2,612	2,799	291	5,702	49.1
Total	33,506	9,171	1,710	44,297	20.7

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

^b Data does not match Table 2 as it does not include cases where 'Extent of Flame Damage' was not filled in.

TABLE 9. Injuries and deaths in building fires^a by form of material ignited first, 1989–1993

Form of material ignited first	Injuries		Deaths	
	Occupants	Firefighters	Occupants	Firefighters
Mattress, pillow (31) or bedding (32)	356	44	34	0
Cooking materials (76)	459	28	12	0
Upholstered furniture (21)	107	18	17	0
Other form of material	1,220	361	86	3
Other, unknown	540	298	102	2
Total	2,682	749	251	5

^a Type of situation = 11 (structure fires); structure type = 1 or 2 (buildings).

Fires involving heating equipment, which is the second most common form of equipment involved in ignition, are less likely than most to spread beyond the room of fire origin. These latter fires include 653 chimney fires of which only 7.8% spread beyond the room of fire origin.

The importance of other sources in hazardous scenarios is highlighted by examining the occurrence of deaths (Table 7). Cooking equipment is implicated in only about 4% of fire deaths and heating equipment in 15% of fire deaths, whilst 37% of fire deaths are known to involve heat sources other than equipment.

When comparing form of material ignited first (Table 8), fires involving upholstered furniture and bedding are five times and three times respectively more likely to spread beyond the room of fire origin than fires involving cooking materials.

A similar picture emerges from occupant deaths (Table 9). Fires involving bedding are three times more likely to cause death than fires involving cooking materials, whilst fires involving upholstered furniture are one and a half times more likely to cause death than fires involving cooking materials. If it is assumed that fires involving bedding and fires involving upholstered furniture have similar causes, and the data seems to suggest this (e.g. Tables 10 and 11), then the overall number of deaths from fires involving soft furniture is over 4 times that from fires involving cooking materials.

TABLE 10. Most common scenarios for fires in apartment buildings^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Kitchen (24)	Cooking equipment (2)	1,609
Sleeping room (21)	Nil (98)	377
Lounge (14)	Nil (98)	193
Laundry (26)	Dryer (52) or washing machine (53)	135
All	All	4,976
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Unattended (73), misuse of heat (3) or accidentally turned on (72)	Cooking materials (76)	1,345
Incendiary (1) or suspicious (2)	All	575
Short circuit, ground fault (54) or other electrical failure (55)	All	587
Abandoned, discarded material, incl. cigarettes etc. (31) or falling asleep (33)	Upholstered seating (21), mattresses (31) or bedding (32)	255
All	All	4,976

^a Fixed Property Use = 42 (apartments).

TABLE 11. Most common scenarios for fires in hotels and boarding houses^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Kitchen (24)	Cooking equipment (2)	405
Sleeping room (21)	Nil (98)	307
Lounge (14)	Nil (98)	109
Laundry (26)	Dryer (52) or washing machine (53)	80
All	All	2,554
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Incendiary (1) or suspicious (2)	All	424
Misuse of heat (3), unattended (73) or accidentally turned on (72)	Cooking materials (76)	263
Short circuit, ground fault (54) or other electrical failure (55)	All	297
Abandoned, discarded material, incl. cigarettes etc. (31) or falling asleep (33)	Upholstered seating (21), mattresses (31) or bedding (32)	151
All	All	2,554

^a Fixed Property Use = 43–49 (boarding house, hotels, dormitories, units and other residential) and 410, 412–419 (dwellings other than one-family and unclassified dwellings).

When the different frequencies of cooking fires and soft furniture fires are taken into account (Table 8), the death rate from fires involving soft furniture can be estimated to be over eight times that for fires involving cooking. However, not all buildings contain sleeping facilities. In the next section, fire scenarios for some particular building types are analysed.

FIRE SCENARIOS BY BUILDING TYPE

The number of deaths and injuries due to fire varies according to the building type (Table 12). The data for Table 12 has been drawn from annual published compilations [6–8]. As the compilations concentrated heavily on residential categories, a more complete breakdown of

building types is not possible. Note also that the published statistics refer to ‘Structure Fires’ rather than the more specific ‘Building Fires’ data obtained from the electronic database [5].

TABLE 12. Injuries and deaths in all structure fires^a by building type, 1989–1993 [6–8]

BCA building class	AFIRS fixed property use	Fires	Injuries		Deaths	
			Occupants	Firefighters	Occupants	Firefighters
1 Single dwellings; not categorised	Dwellings (41)	27,483	1,526	291	174	2
2 Apartments	Apartments (42)	5,606	464	46	38	2
3 Hotels & boarding houses	Hotels etc. (43–48)	1,789	157	36	28	0
Other, unknown residential	Other, unknown residential (40, 49)	298	17	2	3	0
Total residential	Residential (4)	35,176	2,165	375	244	4
All other building categories, unknown	All non-residential, unknown (0–3, 5–9)	23,617	551	405	14	0
Total^b	All	58,793	2,716	780	258	4

^a Type of situation = 11 (structure fires); structure type = all.

^b These totals differ from the totals in Tables 2, 7 and 9 by inclusion of data for structures other than buildings.

In the following subsections, factors defining the scenarios for various building types are discussed. In Tables 10, 11 and 13–19 certain codes have consistently been grouped because of their similarity. In cases where there is insufficient data, no breakdown of codes is attempted.

Apartment Buildings

The AFIRS data is extracted as ‘Fixed Property Use’ = 42 (apartments). There appears to be a good correspondence between BCA Building Class 2 and the AFIRS classification. The data in Table 10 shows the most common combinations of ‘Area of Fire Origin’ and ‘Equipment Involved in Ignition’ on the one hand, and ‘Ignition Factor’ and ‘Form of Material Ignited First’ on the other, for apartment buildings.

Both tabulations indicate that cooking fires are the most common fire. However, as previously discussed, cooking fires are not the most hazardous fires, usually being confined to the room of origin, and rarely causing fatalities. The second most common ‘Area of Origin’ of apartment fires is the bedroom and does not involve any ‘equipment’. When this information is considered in conjunction with the information that upholstered seating and bedding are often the first materials ignited when ‘discarded materials’ or ‘falling asleep’ are listed as ignition factors, a scenario of bedroom or lounge room fires originating in soft furniture (possibly through the agency of smoker’s materials) emerges. That this is a hazardous scenario is confirmed by data in Table 9 showing that, overall, fires in which bedding is the ‘First Material Ignited’ cause more deaths than any other.

Hotels and Boarding Houses

For logistical reasons, the AFIRS data for these building categories was obtained by subtracting data for Fixed Property Uses 411 (one-family dwellings) and 42 (apartments) from 4 (residential). Therefore, there is only an approximate match between the AFIRS data and the BCA Building Class 3. Whilst a closer correlation would have been obtained by combining Fixed Property Uses 43–48, with the relatively small number of fires, it is unlikely that any scenario not already included in Table 11 would emerge.

The data in Table 11 shows that incendiary/suspicious fires are the most common, followed by cooking fires, but, as discussed previously, these are not the most hazardous. The most hazardous fires appear to be bedroom fires originating in soft furnishings, possibly from discarded smoker's materials.

Offices

The correspondence between BCA Building Class 5 and the AFIRS Fixed Property Use 59 (offices) appears to be very good, though there may be minor anomalies resulting from differing definitions of 'office'.

The data in Table 13 shows that largest share of fires in offices are attributed to faults in electrical equipment, with lighting fixtures being the equipment most often cited. However, as shown in Table 12, there is insufficient data to determine which fire scenario is most hazardous.

TABLE 13. Most common scenarios for fires in offices^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
All	Electrical distribution equipment (4)	392
Office (27)	Lighting fixture, ballast, sign (46)	60
All	All	1,606
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Short circuit, ground fault (54), other electrical failure (55)	All	468
Incendiary (1) or suspicious (2)	All	383
Abandoned, discarded material, incl. cigarettes etc. (31)	Rubbish, trash, waste (75)	74
All	All	1,606

^a Fixed Property Use = 59 (offices).

Shops

The AFIRS Fixed Property Use classes for retail stores (51–58) may not correspond exactly with BCA Building Class 6. For instance, the AFIRS data includes public and private service stations (571, 572), and mercantile properties and offices that are unclassified (50) are included. The correspondence between the AFIRS data and the BCA Building Classifications could probably be described as no better than 'good'.

The data in Table 14 shows that, apart from possible arson cases, electrical causes are most often cited, and these are not restricted to any one location. No other ignition factors are particularly frequent. A scenario involving discarded cigarettes in waste paper baskets in sales areas can be postulated. The only other item of interest is the inclusion of welding operations. However, none of these scenarios match up with the more hazardous situations (Tables 7 and 9).

Carparks and Warehouses

The AFIRS data for these categories was extracted as 'Fixed Property Use' 8, Storage. Correspondence between BCA Building Class 7 and Fixed Property Use is probably best described as 'good'. Whilst carparks (Fixed Property Use 88, Vehicle Storage) could be treated separately, there is unlikely to be sufficient data to make this useful.

The data in Table 15 show that, arson aside, there are no obvious common scenarios. None of the factors associated with the more hazardous fires occur in the list (see Tables 7 and 9).

TABLE 14. Most common scenarios for fires in shops^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Sales, showroom (15)	Nil (98)	159
All	All	3,887
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Incendiary (1) or suspicious (2)	All	1,231
Short circuit, ground fault (54) or other electrical failure (55)	All	647
Abandoned, discarded material, incl. cigarettes etc. (31)	Rubbish, trash, waste (75)	109
Cutting, welding too close (35)	All	96
All	All	3,887

^a Fixed Property Use = 50–58 (retail shops, motor vehicle sales, other mercantile).

TABLE 15. Most common scenarios for fires in carparks and warehouses^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Garage, carport (47)	Nil (98)	305
All	Welding torches (87)	88
All	All	2,930
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Incendiary (1) or suspicious (2)	All	864
Short circuit, ground fault (54), other electrical failure (55)	All	302
Children playing (36)	All	187
All	All	2,930

^a Fixed property use = 8 (all storage).

Factories

BCA Building Class 8 spans two classes of AFIRS ‘Fixed Property Use’, viz. Basic Industry, Utility, Defence Property (6) and Manufacturing Property (7). The correspondence between BCA Building Class and ‘Fixed Property Use’ is probably best described as ‘reasonable’.

The most commonly cited cause overall in factories is electrical (Table 16), though such fires have not been shown to be hazardous [1–3]. The next most common ignition factor cited is incendiary or suspicious. Welding is another common ignition factor. Neither incendiary/suspicious or welding causes are cited amongst the fires spreading most often (Tables 6 and 8) or causing most deaths or injuries (Tables 7 and 9).

Health Care Buildings

The AFIRS ‘Fixed Property Use’ class used to provide data for these buildings was Institutional (3). This differs from the BCA Building Class 9a mainly by including institutions for care of the young and care of the aged. Greater correspondence could be obtained by excluding sub-classes 31 and 32. However the small amount of data available makes it unlikely that any more meaningful information would be obtained by doing this.

TABLE 16. Most common scenarios for fires in factories^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
All	Electrical distribution equipment (4)	287
All	Welding torches (87)	229
Garage, carport (47)	Nil (98)	82
Product storage room (41)	Nil (98)	61
All	All	2,955
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Short circuit, ground fault (54), other electrical failure (55)	All	399
Incendiary (1) or suspicious (2)	All	357
Mechanical failure (51–53)	All	265
Cutting, welding too close (35)	All	244
All	All	2,955

^a Fixed Property Use = 6 (industrial) and 7 (manufacturing).

Cooking fires and fires involving electrical faults are most often cited (Table 17), with incendiary and suspicious ignition factors next most common. Two scenarios which occur relatively more frequently in health care buildings are laundry fires involving washing machines and dryers, and fires involving light fittings.

TABLE 17. Most common scenarios for fires in health care buildings^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Kitchen (24)	Cooking equipment (2)	371
Laundry (26)	Dryer (52) or washing machine (53)	142
All	Lighting fixture, ballast, sign (46)	124
All	All	2,268
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Short circuit, ground fault (54), other electrical failure (55)	All	447
Unattended (73), misuse of heat (3) or actively turned on (72)	Cooking materials (76)	333
Incendiary (1) or suspicious (2)	All	206
All	All	2,268

^a Fixed Property Use = 3 (institutional property).

Assembly Buildings

Public assembly buildings and schools, even though they are both covered by BCA Building Class 9b, will be treated separately because their fire histories were found to be different.

Public assembly buildings. The AFIRS 'Fixed Property Use' class used is Public Assembly Property (1). The most common fire ignition factor cited is incendiary/suspicious (Table 18), with unattended cooking fires being the second most common. Electrical factors are the only other common ignition factor cited.

TABLE 18. Most common scenarios for fires in public assembly buildings^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Kitchen (24)	Cooking equipment (2)	570
Lavatory, locker room (25)	Nil (98)	79
All	All	2,427
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Incendiary (1) or suspicious (2)	All	654
Unattended (73)	Cooking materials (76)	309
Short circuit, ground fault (54) or other electrical failure (55)	All	351
Abandoned, discarded material, incl. cigarettes etc. (31)	Rubbish, trash, waste (75)	79
All	All	2,427

^a Fixed Property Use = 1 (public assembly).

Schools. The AFIRS ‘Fixed Property Use’ class used is Educational (2). Educational includes residential schools, whereas these are excluded from BCA Building Class 9b, being included instead under BCA Building Class 3.

The main difference between fires cited for schools and those cited for public assembly buildings is the absence of cooking fires (Table 19). Incendiary/suspicious is the outstanding ignition factor, though, as discussed previously, these have not been found to be hazardous.

TABLE 19. Most common scenarios for fires in schools^a, 1989–1993

<i>A. By area of fire origin and equipment involved in ignition</i>		
Area of fire origin	Equipment involved in ignition	Fires
Small assembly area, inc. classrooms (13)	Nil (98)	187
Supply storage room (43)	Nil (98)	36
All	All	1,384
<i>B. By ignition factor and form of material ignited first</i>		
Ignition factor	Form of material ignited first	Fires
Incendiary (1) or suspicious (2)	All	686
Short circuit, ground fault (54) or other electrical failure (55)	All	155
All	All	1,384

^a Fixed Property Use = 2 (educational).

CONCLUSIONS

1. Three-quarters of all building fires are confined to the object of origin or room of origin.
2. Whilst cooking fires are the most common fire scenario, they are not generally hazardous, and cause relatively little property damage.
3. There is only sufficient data in the AFIRS statistics to do a three-way cross-tabulation of building fires, and then not in all circumstances.
4. The most common fire scenarios by building occupancy are:
 - apartments – cooking fires;
 - hotels, boarding houses – incendiary/suspicious in all areas and cooking fires in kitchen;
 - offices – electrical faults in all areas;

- shops – incendiary/suspicious fires in all areas;
 - carparks, warehouses – incendiary/suspicious fires in all areas;
 - factories – electrical faults and incendiary/suspicious fires in all areas;
 - health care buildings – electrical faults in all areas and cooking fires in kitchen;
 - public assembly buildings – incendiary/suspicious in all areas and cooking fires in kitchens; and
 - schools – incendiary/suspicious fires in all areas.
5. The most hazardous fire scenarios by building occupancy, are:
- apartments – fires started by smoker's materials in soft furnishings in lounge or sleeping area;
 - hotels and boarding houses – bedroom fires originating in soft furnishings, possibly from smoker's materials;
 - other buildings – insufficient data.

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