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Fire Research Note

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FIRES IN HOTELS

by

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SUMMARY

Recent loss of life in hotel fires and similar occupancies in which there are large numbers of people at risk has prompted this study of reports of hotel fires attended by fire brigades, of which the annual frequency is about 700. The reports used for the study were those of fires attended during 1966.

The proportion of fires that occur during sleeping hours in hotels is nearly twice that in private dwellings. 'Smoking materials' is the most frequently reported cause, accounting for over 20 per cent of the fires, compared with about 9 per cent in private dwellings. Fires attributed to cooking and space heating appliances, electric wire and cable, are also quite common.

About 20 per cent of the fires start in kitchens - these are mainly during the day-time; fires starting in bedrooms and bedsitters amount to 17 per cent of the total. About 11 per cent of the fires start in halls and bars; nearly half of these are discovered during the sleeping hours and smoking materials account for a high proportion of them.

About 53 per cent of the fires are tackled before the arrival of the brigade and nearly half of these are extinguished before the arrival of the brigade. About three-quarters of the fires which require brigade attention are confined to the room of origin.

At least half of the fires occur in premises built before 1900. Most of the hotels have timber floors and timber is also prominent in the construction of the roofs. There is evidence to suggest that fires in older buildings are more likely to spread than those in more recent ones.

One incident, in which there was extremely rapid spread, led to five deaths. During the year there were nine fatal and 41 non-fatal casualties. In those incidents involving casualties which spread beyond the room of origin, the spread nearly always resulted from a door being left open or from an unenclosed staircase.

KEY WORDS: Building-public, Casualties, Fire cause, Statistics, Fire-statistics.

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Introduction

Recent loss of life in fires in hotels, flatlets and other occupancies in which large numbers of people are at risk has prompted this investigation into fires in hotels. The annual incidence of fires in hotels has not increased rapidly in recent years, the numbers of fires in hotel premises in the United Kingdom¹ in the years 1963-1966 were 658, 616, 667 and 689 respectively.

A general analysis has been made of all fires in hotel buildings in 1966 in the United Kingdom, except those confined to single compartment buildings, e.g. garden sheds belonging to the hotels. A more detailed survey has been made of a 1-in-5 sample of reports, looking particularly into aspects such as fire spread and the usage of various constructional materials.

Time of occurrence of fires

Several factors might be expected to influence the monthly frequency pattern of hotel fires. Some hotels are open all the year, whereas others, particularly at coastal towns, are open only during the summer months. In 1966 there was a slight peak in fire frequency during the Spring, but this could easily have happened by chance, since the weather can affect both hotel bookings and the use of heating equipment. The monthly frequencies are given in Table 1.

Table 1. Month in which fires occur

Month	No. of fires	Per cent
January	60	9.2
February	37	5.7
March	65	10.0
April	69	10.6
May	67	10.3
June	54	8.3
July	46	7.1
August	40	6.2
September	46	7.1
October	53	8.2
November	64	9.9
December	48	7.4
TOTAL	649*	

*Excluding 40 fires confined to single compartment buildings (see Introduction)

Table 2. Time of call to fires in relation to day of week

Day of week	Time of call						TOTAL
	Midn't to 5.59 am	6.00 to 9.59 am	10.00 to 3.59 pm	4.00 to 7.59 pm	8.00 to 11.59 pm	Not called or unknown	
Sunday	18	5	23	13	12	5	76
Monday	10	8	21	19	26	2	86
Tuesday	11	6	30	28	33	5	113
Wednesday	14	5	26	16	13	2	76
Thursday	20	7	28	24	17	7	103
Friday	13	5	24	17	23	2	84
Saturday	26	11	16	31	22	5	111
TOTAL	112	47	168	148	146	28	649

The time of call to fires in relation to the day of week is shown in Table.2. There is no real variation in daily fire pattern apart from Saturday, when overnight fires are slightly higher than expected and fires during the period 10.a.m. to 3.59 p.m. are lower. Over 18 per cent of hotel fires occur during the period between midnight and 6 a.m., compared with less than 10 per cent in private dwellings during the same hours. Thirty-two per cent of the fires in dwellings occur during the hours 10.0 a.m. to 4 p.m., whereas only 25 per cent of hotel fires occur in this period and this, presumably, reflects the difference in the occupation. As the table shows, the worst period of the day for hotel fires is from 4 p.m. onwards, corresponding to the period during which there is likely to be most activity.

Location of fires

Table 3 shows the place of origin of fires in relation to the time of day. Over 20 per cent of fires start in kitchens, these mainly occur during the day time. Fires in bedrooms and bedsitting-rooms account for nearly 17 per cent of the fires and a surprisingly high proportion of these occur during the day. Fires starting in halls and bars amount to about 11 per cent of the total; nearly half of these occur during the sleeping hours.

Table 3. Place of origin of fires in relation to the time of day

Place of origin	Time of call						TOTAL
	Midn't to 5.59 am	6.00 to 9.59 am	10.00 to 3.59 pm	4.00 to 7.59 pm	8.00 to 11.59 pm	Not called or Unknown	
Lounge, common room etc.	10	1	2	4	8	3	28
Dining room, restaurant	6	1	4	1	2	-	14
Kitchen	9	9	45	39	27	4	133
Bedroom,bedsitter	22	6	28	18	23	11	108
Bar	19	3	3	3	9	1	38
Hall	11	4	4	4	9	2	34
Storage areas	8	4	16	18	12	2	60
Boiler room	-	1	10	7	5	-	23
External structure and fittings, roof chimney	5	3	11	15	7	-	41
Other(specified)	7	2	16	11	8	-	44
Unknown,not stated	15	13	29	28	36	5	126
TOTAL	112	47	168	148	146	28	640

Causes of fire

The principal known cause of fires in hotels is smoking materials, which accounts for over 20 per cent of the fires, compared with about 9 per cent of those in private dwellings. The second most prominent known cause in hotels is electric wire and cable, which accounts for 10 per cent of the fires.

Fires attributed to gas cooking in hotels are slightly higher in number than those attributed to electric cooking while in dwellings fires due to electric cooking, outnumber those due to gas cooking by nearly two-to-one. This difference may be brought about by a preference for gas cooking appliances in hotels.

The proportions of fires in hotels due to electric and gas space heating are both slightly higher than the proportions in private dwellings. In contrast oil space heating accounts for nearly 7 per cent of fires in dwellings compared with one per cent in hotel fires. The causes of fires in hotels and private dwellings in 1966 are compared in Table 4.

Table 4. Causes of fires in hotels and private dwellings, 1966

Supposed cause of fire	Hotels		Private dwellings	
	No. of fires	Per cent	No. of fires	Per cent
Smoking materials	132	20.3	3050	8.9
Cooking appliances-electric	44	6.8	5059	14.8
-gas	49	7.6	2644	7.7
-other	12	1.9	733	2.1
Space heating - electric	36	5.5	1487	4.3
- gas	11	1.7	287	0.8
- solid fuel	17	2.6	2664	7.8
- oil	7	1.1	2290	6.7
Central heating - oil	11	1.7	175	0.5
Wire and cable	65	10.0	2751	8.0
Other electrical appliances	63	9.7	3448	10.1
Chimney(not confined to)	35	5.4	1967	5.7
Malicious ignition	19	2.9	462	1.4
Children with fire	4	0.6	1900	5.6
Matches, tapers, naked lights	14	2.2	756	2.2
Rubbish burning	13	2.0	80	0.2
Other known causes	48	7.4	2587	7.6
Unknown	69	10.6	1911	5.6
TOTAL	649		34251	

An attempt was made to ascertain who or what was to blame for the fire in a 1-in-5 sample of reports (130 fires). It was thought that in 11 incidents, some action of guests was to blame; the staff were thought to be at fault on 43 occasions and outsiders on 5. Faults connected with appliances also led to 43 fires. Two other fires resulted from dogs overturning heating appliances. In the remaining 26 the fault or error could not be allocated.

The causes of the fires are related to the time of the call to the fire brigade in Table 5. Of the 132 fires attributed to smoking materials, 45 occurred during the period midnight to 6 a.m. In fact 40 per cent of the fires during that period were accounted for by smoking materials.

Table 5. Causes of fires in relation to the time of day

Supposed cause of fire	Time of call						TOTAL
	Midn't to 5.59 am	6.00 to 9.59 am	10.00 to 3.59 pm	4.00 to 7.59 pm	8.00 to 11.50 pm	Not called or not known	
Smoking materials	45	6	24	16	33	8	132
Cooking appliances							
- electric	-	5	19	14	6	-	44
- gas	3	4	13	13	13	3	49
- other	-	-	5	4	2	1	12
Space heating							
- electric	3	1	12	5	12	3	36
- gas	2	2	1	2	3	1	11
- solid fuel	1	-	6	8	11	1	17
- oil	2	-	1	3	1	-	7
Central heating							
- oil	7	1	4	4	2	-	11
Wire and cable	8	5	16	10	23	3	65
Other electrical appliances	13	5	17	13	14	1	63
Chimney (not confined to)	2	4	11	11	6	1	35
Malicious ignition	5	1	-	7	4	2	19
Children with fire	-	1	-	2	1	-	4
Matches, tapers naked lights	1	2	5	2	3	4	14
Rubbish burning	-	-	6	7	-	-	13
Other known causes	4	3	16	16	8	1	48
Unknown	23	7	12	11	14	2	69
TOTAL	112	47	168	148	114	28	649

As the table shows, at least one-third of the fires associated with electric wire and cable occur after 8 p.m. It is possible that this is accounted for by the greater use of electricity for lighting, subsidiary heating, etc., at that time of the day. About 84 per cent of the fires thought to have been started by cooking appliances, which in themselves account for over 15 per cent of hotel fires, happened in the period 10 a.m. to midnight. Electric cooking appears to be most likely to cause fires between 10 a.m. and 4 p.m., the mid-day period, whereas gas cooking fires are more prominent during the latter part of the day. A fairly similar pattern occurs with space heating fires - 77 per cent occurring

in the same fourteen-hour period. It is possible that these fires will decrease as more hotels change to full central heating.

Chimney and stove pipe incidents, also more frequent during the day, accounted for about 5½ per cent of hotel fires. Malicious ignition is also more commonly reported in hotels (2.9 per cent) than in dwellings (1.4 per cent) - incidents of malicious firing by hotel staff were noted - but fires resulting from the activities of children were almost unknown in hotels. The relation between the place of origin of the fires and their supposed causes is shown in Table 6.

Table 6 Cause of fires in relation to the place of origin

Supposed cause of fires	Place of origin											TOTAL
	Lounge, common room, etc.	Dining room, restaurant, etc.	Kitchen	Bedroom, bed-sitter	Bar	Hall	Storage areas	Boiler room	External structure, roof space chimney	Other (specified)	Unknown	
Smoking materials	5	1	9	27	18	12	20	1	6	9	24	132
Cooking appliances	-	1	40	1	-	-	1	-	-	-	1	44
-electric	-	-	47	1	-	-	-	-	-	-	1	49
-gas	-	1	11	-	-	-	-	-	-	-	-	12
-other	-	-	-	-	-	-	-	-	-	-	-	-
Space heating	1	-	1	21	1	1	1	-	1	3	6	36
-electric	-	-	-	5	-	-	1	-	-	-	5	11
-gas	3	1	1	1	1	-	1	1	-	-	8	17
-solid fuel	2	-	-	1	-	2	-	-	-	-	2	7
-oil	-	-	-	-	-	-	-	11	-	-	-	11
Central heating	2	-	-	6	6	7	3	1	3	5	32	65
-oil	7	2	3	11	5	-	3	-	6	13	13	63
Wire and cable	1	-	4	10	3	2	-	1	11	1	2	35
Other electrical appliances	1	1	-	8	-	1	2	-	-	-	6	19
Chimney (not confined to)	-	-	-	1	-	-	1	-	1	-	1	4
Malicious ignition	-	1	2	1	-	1	-	1	-	3	5	14
Children with fire	-	-	-	1	-	-	5	2	5	-	-	13
Matches, tapers, naked lights	-	4	10	3	-	2	9	3	5	3	9	48
Rubbish burning	6	2	5	10	4	6	13	2	3	7	11	69
Other known causes	6	2	5	10	4	6	13	2	3	7	11	69
Unknown	6	2	5	10	4	6	13	2	3	7	11	69
TOTAL	28	14	133	108	38	34	60	23	41	44	126	649

One thing to note is that fires due to careless disposal of smoking materials originate in several places, being common in bedrooms (one-quarter of bedroom fires), bars (nearly fifty per cent of the fires) and in storage areas. Most of the fires in bars and storage areas which were thought to have started through the careless disposal of smoking materials were discovered in the night. (see Table 3). These fires can smoulder for several hours before they are detected. Careless discarding of cigarettes in bedrooms is known to be a frequent cause of fatalities, not only in hotels, but also in private houses.

Over half (21) of the 36 fires in bedrooms were due to electric fires, and most of these resulted from either overturning or combustible materials being too close to the appliances. All eleven incidents involving oil fired central heating occurred in boiler rooms. There were 8 fires in which an electric blanket was blamed; twice as many were due to electric lighting. Seven incidents happened in lifts. Malicious ignition was reported more often in bedrooms than anywhere else.

In sixty-one fires in hotels, bedding or upholstery was ignited, 27 of these by smoking materials. Eighty-seven incidents involved food, in all but one of these a cooking appliance was responsible. Lagging or insulation was ignited on 71 occasions, 26 of these being through wiring, 8 through lighting and most of the remainder through other electrical appliances. Of the 88 fires in which paper or waste materials were ignited, over one-half (58) were started by smoking materials. In 115 fires, structural materials were ignited - thirty one being attributed to chimneys and flues and 20 to electric wire and cable.

Extent of fires

About three-quarters of the fires in hotels were confined to the room of origin, a slightly lower figure than the 82 per cent of fires in private dwellings that are similarly confined. Hotel fires, however, are no more likely to spread than the average indoor fire. Table 7 shows the extent of the fires in relation to the time of call to the fire brigade. Only just over 60 per cent of hotel fires during the hours Midnight to 6 a.m. were confined to the appliance or room of origin, whereas during the rest of the day, over 75 per cent of the fires did not spread beyond the room of origin.

Table 7 Extent of fires in relation to the time of call

Extent of fire	Time to call						TOTAL
	Midn't to 5.59 am	6.00 to 9.59 am	10.00 to 3.59 pm	4.00 to 7.59 pm	8.00 to 11.50 pm	Not called unknown	
Confined to:							
exterior components	4	3	6	6	6	-	25
appliance	9	8	40	33	33	3	126
room of origin	58	24	99	87	77	23	368
common service space	4	4	4	6	9	2	29
floor of origin	11	1	8	4	10	-	34
building of origin							
-single storey	3	2	1	-	1	-	7
-multi storey	22	4	9	9	8	-	52
Spread beyond the building of origin	1	1	1	3	2	-	8
TOTAL	112	47	168	148	146	28	649

Fires in storage areas are most likely to spread, although they are not very frequent during the night (see Table 3). Even in the daytime these fires can remain undiscovered for sometime. In kitchens, however, fires are less likely to spread than in other rooms - only 10 per cent of fires in hotel kitchens did in fact spread beyond the kitchen. Fifty-nine of the 133 fires in kitchens involved the cooker or appliance only. Fires in lounges tended to be slightly larger than average and one one-third of them started during sleeping hours (see Table 3). Of the 34 fires in halls, only 5 spread from the hall and stairs; it appears likely that an open door assisted fire spread in each of these incidents.

Table 8. Cause of fires in relation to the extent of fire

Supposed cause of fires	Extent of fire								TOTAL
	Confined to							Extended beyond building of origin	
	Exterior components	Appliance	Room of origin	Common service spaces	Floor of origin	Building single-storey	Building multi-storey		
Smoking materials	6	-	95	12	9	1	7	2	132
Cooking appliances									
-electric	-	18	21	-	2	-	3	-	44
-gas	-	25	21	-	2	-	1	-	49
-other	-	7	5	-	-	-	-	-	12
Space heating									
-electric	-	-	30	1	-	-	5	-	36
-gas	-	-	9	-	-	1	1	-	11
-solid fuel	-	-	14	-	-	-	3	-	17
-oil	-	1	2	-	1	-	3	-	7
Central heating									
-oil	-	7	3	-	-	-	1	-	11
Wire and cable	3	20	31	6	2	1	2	-	65
Other electrical appliances	4	34	21	2	1	-	1	-	63
Chimney(not confined to)	1	-	27	1	-	1	4	1	35
Malicious ignition	-	-	13	1	3	-	2	-	19
Children with fire	1	-	3	-	-	-	-	-	4
Matches, tapers, naked lights	-	-	11	1	2	-	-	-	14
Rubbish burning	5	-	4	-	2	1	-	1	13
Other known causes	3	13	24	2	1	1	3	1	48
Unknown	2	1	34	3	9	1	16	3	69
TOTAL	25	126	368	29	34	7	52	8	649

Table 8 shows the causes of fires in relation to the extent of spread. It can be seen that only 51 per cent of the fires of which the cause was recorded as 'unknown' were confined to the room or appliance of origin compared with 76 per cent of all hotel fires in 1966. A known cause which tends to give rise to some of the more extensive fires is smoking materials; of the 132 fires attributed to this cause, only 95 (72 per cent) were confined to the room of origin. Apart from malicious ignition incidents, most other fires of known cause appeared to be more easily confined. Only 8 of the 105 fires associated with cooking appliances spread beyond the room of origin. These fires nearly always result from an act or omission on the part of the hotel staff, but are usually tackled by them

fairly promptly.

Method of extinction in relation to size of fire

The methods of extinction used in the fires are shown in Table 9 in relation to their extent. In 159 (about 25 per cent) fire-fighting activities before the arrival of the brigade were successful (this is about the same as the proportion of all fires in buildings) and 52 of these fires were confined to the appliances at which they originated.

Of the 490 fires which required brigade assistance, 368 were confined to the room of origin or to the appliances involved. Fifty-two fires spread beyond the floor of origin and eight beyond the building of origin. Jets from pumps and hydrants were required in 65 fires, only nine of which were confined to the room of origin. The method of extinction of fires is related to the extent of fire in Table 10.

Among the fires extinguished by the fire brigade a number were tackled before the brigade arrived and this initial attack on the fire would be expected to have some influence on its final size. To obtain some indication of the effect a 1 in 5 sample of the reports was examined and the methods used in the initial fire-fighting were related to the extent of the fire and to the methods adopted by the brigades. The results are shown in Table 10.

It is clear from the table that some form of initial fire-fighting before the arrival of the brigade had the effect of reducing the probability that a fire would eventually spread beyond the room of origin and the probability that it would require the use of hose reels or jets from pumps or hydrants for its final extinction. It is, however, not possible to assess from these figures the relative effectiveness of different forms of first-aid fire-fighting.

Table 9. Method of extinction of fires in relation to their extent

Method of extinction	Extent of fire								TOTAL
	Confined to							Extended beyond the building of origin	
	Exterior components	Appliance	Room of origin	Common service spaces	Floor of origin	Building single-storey	Building multi-storey		
<u>Extinguished before the arrival of the fire brigade by:</u>									
Removal	-	15	7	1	-	-	-	-	23
Chemicals and/or chemical extinguishers	2	16	27	2	1	-	-	-	48
Smothering, sand, earth, etc.	-	10	8	-	-	-	-	-	18
Water from buckets	-	-	29	2	1	-	-	-	32
Other small means (including garden hose)	1	11	20	2	-	-	-	-	34
Hose reel jets (including internal hose-reels)	-	-	3	1	-	-	-	-	4
+ Total	3	52	94	8	2	-	-	-	159
<u>Extinguished by fire brigade by:</u>									
Removal	-	21	14	1	-	-	-	-	36
Chemicals and/or chemical extinguishers	1	25	13	4	1	-	-	-	44
Smothering, sand, earth etc.	-	8	2	-	-	-	-	-	10
Water from buckets	2	1	22	2	1	-	1	-	29
Other small means (including garden hose)	-	4	17	1	1	-	-	-	23
Hose reel jets (using water in tank only)	16	14	172	11	12	3	8	5	241
Hose reel jets (using more water than that in tank)	1	1	14	1	3	-	8	-	28
Jets from internal hose reel or inside hydrant (possibly with hose reel jet as well)	1	-	11	1	1	-	-	-	14
Jets from pumps and hydrants	1	-	9	-	13	4	35	3	65
Total	22	74	274	21	32	7	52	8	490
TOTAL	25	126	368	29	34	7	52	8	649

Table 10. Effect of fire-fighting before arrival of brigade

Method of fire fighting before brigade arrived	No. of fires in sample	Spread beyond room of origin		Fire-fighting by brigade			
		No.	Per cent	None	Small means	Hose reels and jets	
						No.	Per cent
Buckets	14	1	7.1	6	2	6	42.8
Extinguishers	37	6	16.2	11	10	16	43.2
Internal hose-reel or hydrant	3	-	-	2	-	1*	33.3
Other methods (eg. removal)	20	-	-	12	3	5	25.0
TOTAL	74	7	9.5	31	15	28	37.8
No fire-fighting	56	13	23.2	-	18	38	67.9

*Internal hose reel

Age of hotels and constructional materials used

A noticeable feature of hotel buildings is their age. Although no comprehensive statistics are available, it would not be unreasonable to assume that the average age of hotels is between fifty and a hundred years. Some of the old coaching inns are possibly over 200 years old and it is certain that a large number of hotels were built as a result of the Industrial Revolution and the building of the railways. The number of more modern hotels is thought to be small, but older buildings have been altered in more recent times. It is thus highly likely that hotels were built to less exacting standards with regard to fire resistance and means of escape than they would be today. It can be assumed that the majority of hotels will have load-bearing brick or stone walls, timber floors with plastered ceilings and timber roofs either slated or tiled. Most staircases would originally have been open, but some of these have been enclosed in more recent times by means of doors. Internal partitions would be mainly timber lath and plaster or brick. It was not easy to examine all reports of hotel fires in respect of dates of construction and constructional materials used, so again a 1-in-5 sample was used. The dates of construction of hotels affected by fire is shown in Table 11.

Table 11. Date of construction
of hotels affected by fire, 1966

Date of construction	No. of fires.
Before 1600	3
1600 - 1699	4
1700 - 1799	4
1800 - 1849	10
1850 - 1899	47
1900 - 1919	31
1920 - 1939	12
1940 - 1959	3
1960 or later	7
Not stated	19
TOTAL	130

As the table shows, at least 50 per cent of the fires occurred in hotels built before 1900. Because of the lack of information on ages of hotels at risk it is impossible to say whether or not older buildings are a higher fire risk. It has been shown² that fatal fires in private dwellings are more likely to occur in older buildings, but it is difficult to deduce any similar facts in respect of hotels.

Analyses were made of the constructional materials used in hotels affected by fire. A fire can break out irrespective of the method of construction, but a combustible construction can assist fire spread. In the 1-in-5 sample of reports (130 incidents) at least 110 reported timber floors, though it is very rare for the floor to be recorded as assisting fire spread.

In 72 hotels affected by fire, the walls were brick; in another 36 they were stone. Timber was often used in the roof construction as previously mentioned, and almost invariably it would be supporting timber that would be involved first in the event of a fire spreading to the roof. Other combustible materials used in roof construction included asphalt, felt and thatch.

A detailed examination was made of the 20 fires in the 1-in-5 sample which spread beyond the room of origin. In nine instances, combustible construction was thought to have assisted fire spread; in two of these fires, there was thought to have been a delay in discovery. A door, either opened or insufficiently fire-resisting, was thought to have assisted fire spread in eleven of these 20 incidents. Failure of a wall or partition was considered to be a factor in six fires and upward spread through the ceiling occurred on eight occasions. In only three fires was a combustible floor recorded as assisting fire spread. An open door, with a resulting spread up a staircase, occurred in four of the fires. Fourteen of the fires (70 per cent) were discovered between 8 pm and 6 am. All but three of the incidents in the 1-in-5 sample in which fire spread beyond the room of origin were in hotels built before 1910 - this suggests that fires in older hotels are more likely to spread than those of recent construction. More details of these 20 fires are given in the Appendix.

Casualties, rescues and escapes

In the analysis of all fires (except those confined to single-compartment buildings), 30 incidents involved casualties. The worst incident in 1966 was at a hotel in Stornaway³, Outer Hebrides, which involved five deaths. It is thought that this fire was started by a carelessly discarded cigarette in a downstairs office. Because of highly varnished timber, particularly on the unenclosed staircase and near the place of origin, the fire spread rapidly. The hotel did have a fire alarm system, but this was probably not functioning properly. Although the fire occurred just after mid-day, it appears that guests in rear rooms were not aware of it. There was an external fire escape, the means of escape having been improved at this building some years before this fire. However, an extremely rapid spread occurred before the escape routes could be utilised. The attic floor was lined throughout with timber; this undoubtedly led to the early collapse of the roof. Apart from this incident, there were four other deaths in hotel fires in 1966 and 41 non-fatal casualties. In the thirty incidents involving casualties 26 people were rescued and another eleven escaped using unorthodox

escape routes. At least one-third of the hotel fires involving casualties started in bedrooms.

As with the fires involving spread, there was a preponderance of old buildings amongst those hotels in which few were casualties, 25 (83 per cent) were of pre-1910 construction. In 14 incidents (47 per cent) the fire spread beyond the room of origin - nearly always through an open door or up an enclosed staircase, or both. These fires were distributed fairly evenly during the day, apart from a peak in the early hours when it is possible that casualties occurred as a result of people being unaware of the fire. In 12 fires (40 per cent), the injured persons are known to have been at the seat of the fire; in nine incidents persons are thought to have been trapped and in a similar number of incidents, casualties resulted from people being unaware of the fire.

Discussion

A large proportion of hotels in use in the United Kingdom are a hundred or more years old and consequently were not built to such stringent building regulations as are in force now. This implies an even greater necessity for care, particularly when flammable constructional materials are present. An open staircase is often a feature in the design and is frequently the means by which a fire can spread, particularly if doors are not left closed on discovery of a fire.

Another feature of hotel fire incidents is the large proportion attributed to smoking materials. Greater provision of ash trays and warning notices, particularly in rooms where there is considerable social activity, might help to remedy this situation. A good number of these fires are actually discovered during the early hours of the morning and may have been smouldering for several hours, this means that staff on late duty should make a thorough inspection of unoccupied rooms. A more positive approach to the fire-training of staff (including training in the use of extinguishers) could produce results.

Escape routes should be clearly marked and left unobstructed. Guests should be encouraged to make themselves aware of the emergency exists and it should be made clear what action they should take in case of fire.

Other major causes are cooking and space heating appliances. Fires in cooking appliances are generally small, usually because there is prompt action⁴ on discovery. An increased use of full central heating is to be commended, since this would lower the need for additional space heating and portable appliances which are easily overturned or against which furniture and clothing can be placed. There were 12 central heating boiler fires among the fires reported (11 oil fired and 1 solid fuel) one of which spread beyond the floor of origin and, since most hotels are likely to have at least some central heating at the present time, it appears that the fire danger is not large.

Conclusions

The annual fire incidence in hotels is between 600 and 700 and has not increased very much over the last few years. There is no real peak month for fires during the year. No appreciable variation from day to day during the week is apparent; the worst period during the day seems to be from 4 p.m. onwards, although, a good number of fires occur in the early hours - a higher proportion of hotel fires occur in the period midnight to 6 a.m. than in private dwellings during the same period. Kitchens and bedrooms are the rooms in which nearly 40 per cent of the fires originate. Half of the fires thought to have started in bars in the reports examined occurred during the period midnight to 6 a.m.

The most prominent cause of hotel fires particularly those in bedrooms, bars and storage areas, is smoking materials, which are responsible for about 20 per cent of the fires. Gas and electrical cooking appliances account for almost equal numbers of fires in hotels, whereas in private dwellings, electrical cooking appliances account for nearly twice as many fires as gas cooking appliances. Of the fires originating in kitchens 74 per cent result from faulty cooking appliances or the misuse of such equipment.

Fires that occur during sleeping hours tend to be larger than those at other times only 60 per cent being confined to the room of origin; the percentage so confined during the rest of the day being about 75. Fires in kitchens tend to be less extensive than in other rooms whereas fires that start in the lounge are larger than average. Fires resulting from smoking materials are also larger than average; these fires often smoulder and get out of hand following a build-up of heat in the affected room and the subsequent opening of its door.

From a 1-in-5 sample of reports it was estimated that attempts are made to extinguish the fire before the arrival of the brigade in about 53 per cent of hotel fires and this reduces the probable final extent of the fire.

In only four hotels involved in fire were internal hose reels a feature of the fire fighting equipment - this equipment was successfully used in three of the fires. In twenty-five per cent of hotel fires fire-fighting before the arrival of the brigade successfully extinguished the fire.

Timber is prominent in the construction of hotels, particularly floors, over 80 per cent of the affected hotels had timber floors. Timber is also frequently used in the roof construction. This extensive use of timber is probably associated with the age of hotels - of those affected, at least 50 per cent were built before 1900. It is quite possible that fires in older buildings are likely to spread readily because of this usage of timber.

There were 5 deaths in one hotel fire in 1966: total deaths in hotel fires during the year amounted to nine, there were also 41 non-fatal casualties. At least one third of the hotel fires involving casualties started in bedrooms; again most of these incidents were in buildings at least sixty years old. The presence of an unenclosed staircase or an open door often led to the spread of fire, trapping people who were possibly not aware of the fire.

References

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2. Deaths in Fires in 1962 and 1963. Ministry of Technology and Fire Offices' Committee Joint Fire Research Organization Fire Research Technical Paper No 12, H.M.S.O., London 1965.
3. Five Deaths in Hotel Fire. 'Fire' January 1967.
4. CHAMBERS, E. D. Behaviour when faced with fat pan fires. Joint Fire Research Organization Fire Research Note No. 654.

APPENDIX

Details of fires in the 1-5 sample which spread beyond the room of origin

Date of construction	Time of call	Direction of spread					Spread aided by combustible construction	Remarks
		Through open door	Through wall or partition	Through ceiling	Through floor	Up open staircase		
Late 17th century (3 storeys)	1156	Yes	-	-	-	Yes	Yes	Confined to floor of origin, slight smoke spread.
1963 (1 st.)	2210	-	Yes	-	-	-	-	Fire affected adjoining garage.
1890 (3 st.)	0002	-	-	Yes	-	Yes	Yes	About $\frac{1}{4}$ of ground and first floors affected Delay in discovery
1900 (1 st.)	0040	-	-	-	-	-	-	Storage building, delay in discovery, route of spread not known
1945 (1 st.)	1828	-	Yes	-	-	-	Yes	Storage buildings, more than one affected.
1880 (3 storeys and basement)	0005	-	-	-	-	-	Yes	Most of floor damaged. Delay in discovery.
1900 (5 storeys and basement)	2354	Yes	-	-	-	-	-	Most of fourth floor affected, mainly heat and smoke damage
1905 (5 storeys and basement)	2124	Yes	Yes	Yes	-	Yes	Yes	Damage to floor of origin, severe, spread to fourth floor.
1902 (9 storeys and basement)	2021	Yes	-	-	-	-	-	Confined to basement floor, fire of doubtful origin.
1890 (2 st.)	1251	Yes	-	-	-	-	-	Confined to floor of origin. Spread assisted by draught.
16th century (2 storeys and basement)	2258	Yes	Yes	Yes	-	-	-	Most of first floor affected, slight spread to ground floor
1840 (4 storeys and basement)	0740	Yes	-	-	Yes	-	Yes	Apart from room, only damage was to the corridor through an open door.
1885 (3 st.)	0147	-	Yes	Yes	-	-	-	Spread from second floor to roof. Delay in discovery

APPENDIX (continued)

Date of construction		Direction of spread					Spread aided by combustible construction	Remarks
		Through open door	Through wall or partition	Through ceiling	Through floor	Up open staircase		
1910(3 st.)	0215	Yes	-	Yes	-	-	-	Ground floor damaged most of spread upwards. Delay in discovery.
Date not stated (2 storeys)	2123	-	-	Yes	-	-	Yes	Combustible ceiling assisted a sideways spread.
1820 (3 storeys and basement)	1110	Yes	-	-	Yes	-	Yes	Door open assisted spread across a combustible floor
1900 (2 storeys with attics and basement)	0117	Yes	-	-	-	Yes	-	Delay in discovery- arson suspected. Most of ground floor affected, spread up the staircase. Six people rescued. 1. Non fatal casualty.
1890 (5 storeys and basement)	0320	Yes	-	-	-	-	-	Arson fire, door deliberately opened to assist fire spread
1668 (3 st.)	2007	-	-	Yes	-	-	-	Spread to roof, but a comparatively small section affected.
1806 (2 st.)	0825	-	Yes	Yes	Yes	-	Yes	Vertical spread, affecting roof of one 'wing' of hotel.

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