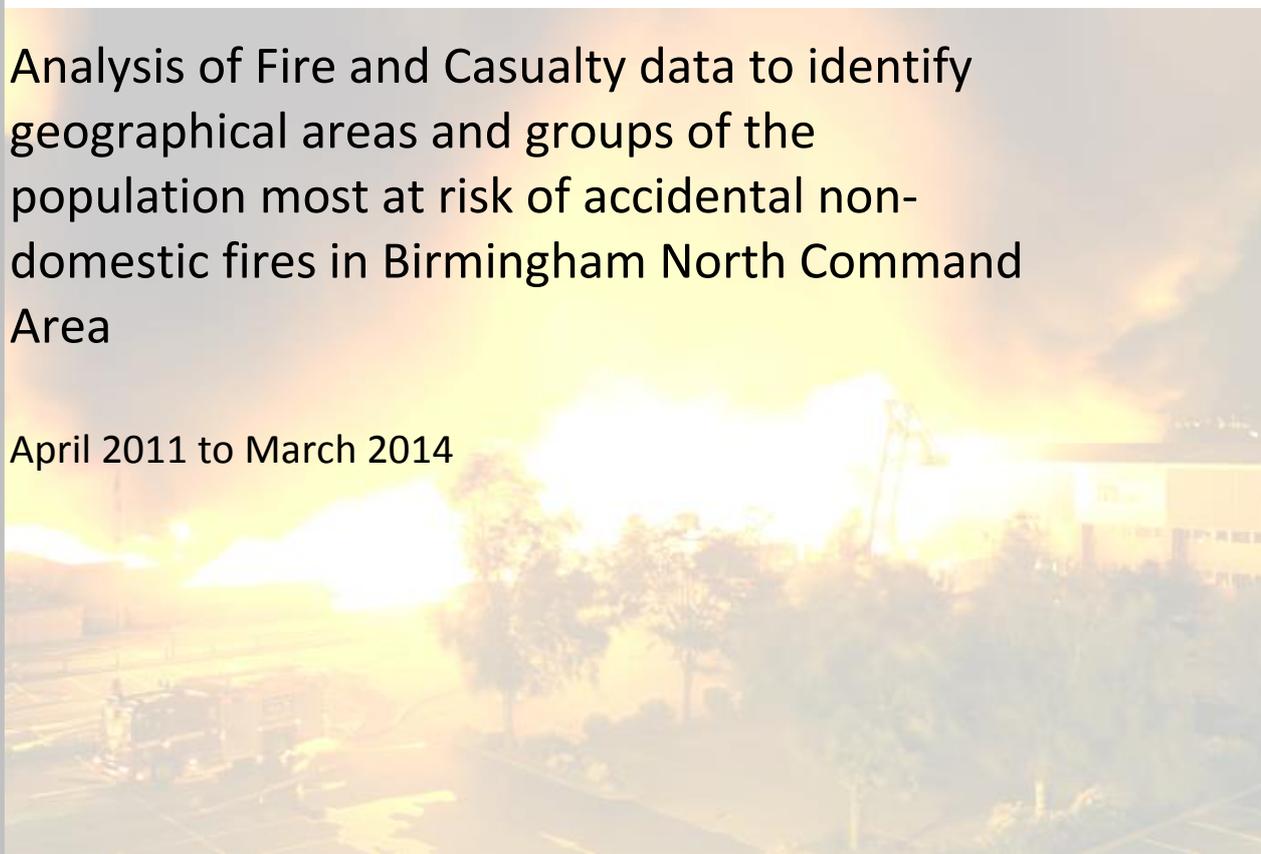


# ACCIDENTAL AND DELIBERATE FIRES IN NON-DOMESTIC PROPERTY IN BIRMINGHAM NORTH

Analysis of Fire and Casualty data to identify geographical areas and groups of the population most at risk of accidental non-domestic fires in Birmingham North Command Area

April 2011 to March 2014



Data Intelligence Hub  
(DATE)  
Final v.1

**Restricted: For Internal Use Only**

## **Introduction**

The following document presents the results of the analysis of primary fires at non-domestic premises in Birmingham North between April 2011 and March 2014.

During this period there were 506 accidental and 160 deliberate fires at non-domestic premises

There are currently approximately 33,700 non domestic properties in Birmingham North<sup>1</sup>

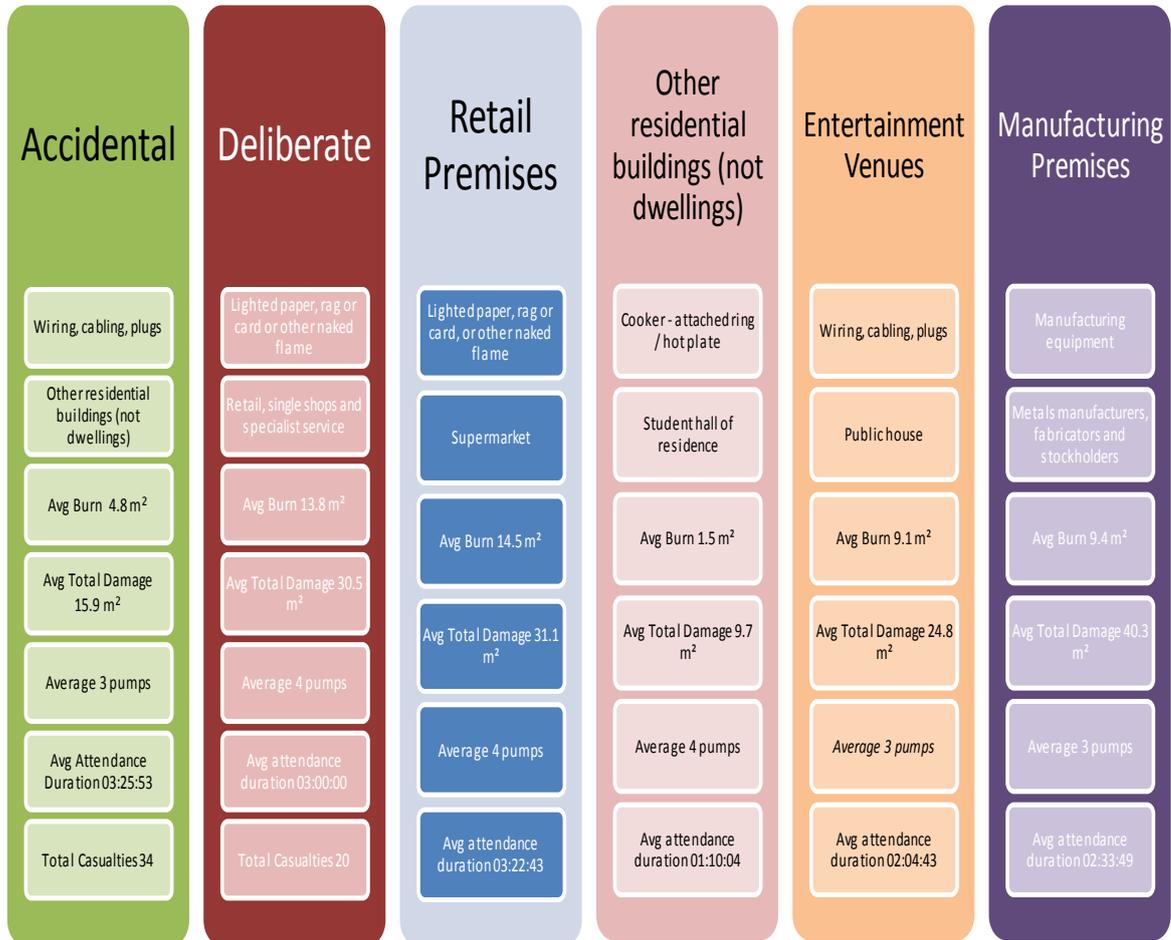
Although non-domestic property fires are fewer than dwelling fires, the impact of fire in non-domestic buildings extends further than just the effects on the business or owner of the property. The economic impact on the business for instance may in turn indirectly affect life, as unemployed people are more at risk of accidental dwelling fires due to their being at home for longer periods of time.

Please note, all maps are available in PDF format from the Data Hub's Alfresco site.

<sup>1</sup> Extract from the Gazetteer, October 2014

## Summary

The table below summarises the main features of different types of incidents:



## Temporal analysis

Table 1 illustrates the temporal distribution of non-domestic fires in Birmingham North.

Day/Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	Yellow	Orange	Green	Yellow	Orange	Green	Yellow	Green	Yellow	Yellow	Orange	Yellow	Green	Orange	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Yellow	Orange
Tuesday	Yellow	Yellow	Green	Yellow	Green	Yellow	Green	Orange	Yellow	Orange	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Orange	Orange	Red	Yellow	Green	Yellow	Yellow	Yellow
Wednesday	Red	Yellow	Green	Orange	Green	Orange	Green	Orange	Yellow	Orange	Yellow	Yellow	Orange	Yellow	Yellow	Red	Orange	Orange	Orange	Orange	Orange	Orange	Yellow	Green
Thursday	Green	Green	Green	Green	Green	Yellow	Green	Yellow	Orange	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Orange							
Friday	Yellow	Orange	Green	Green	Green	Green	Orange	Yellow	Yellow	Yellow	Yellow	Orange	Yellow	Yellow	Orange									
Saturday	Green	Green	Green	Green	Green	Green	Yellow	Green	Yellow	Yellow	Yellow	Orange												
Sunday	Green	Green	Yellow	Green	Green	Yellow	Green	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Orange	Orange	Orange	Orange	Orange	Orange

Table 1 – Fires at non-domestic premises in Birmingham North per hour and day

It shows that, over the course of a week, non-domestic fires are more likely to take place between **1500-1900** and **2000-2300**, and on **Wednesdays** and **Mondays**. Almost 16% of all **arson** fires occurred between **2000 and midnight on Saturday & Sunday evenings**

Chart 1 is the seasonality chart for non-domestic fires in Birmingham North. If the column is a positive number (above the 0) then the number of incidents in that month is higher than expected, if the column is a negative number then the number of incidents in that month is lower than expected (the values on the vertical (y) axis are relative values).

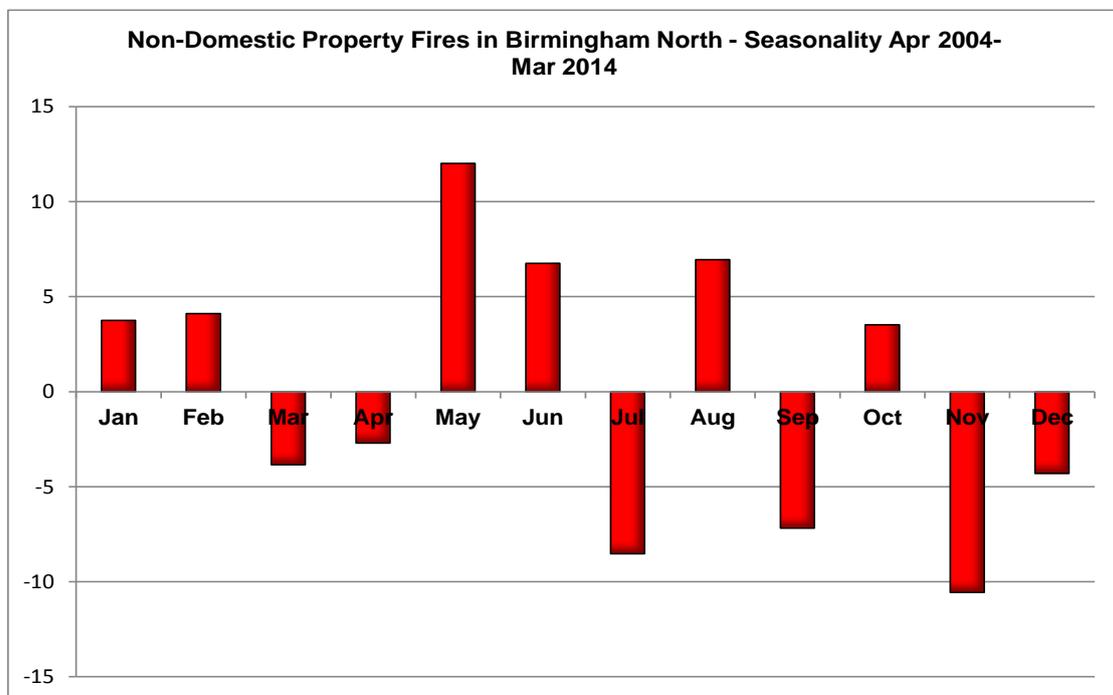
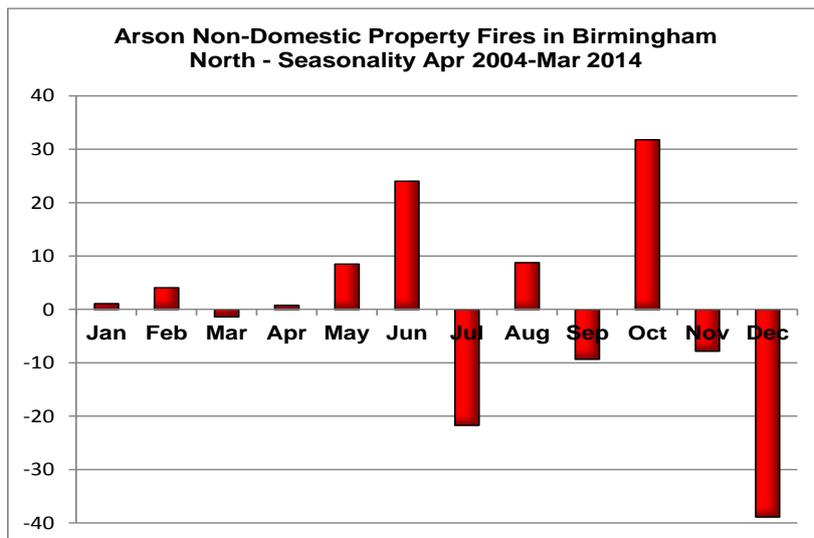
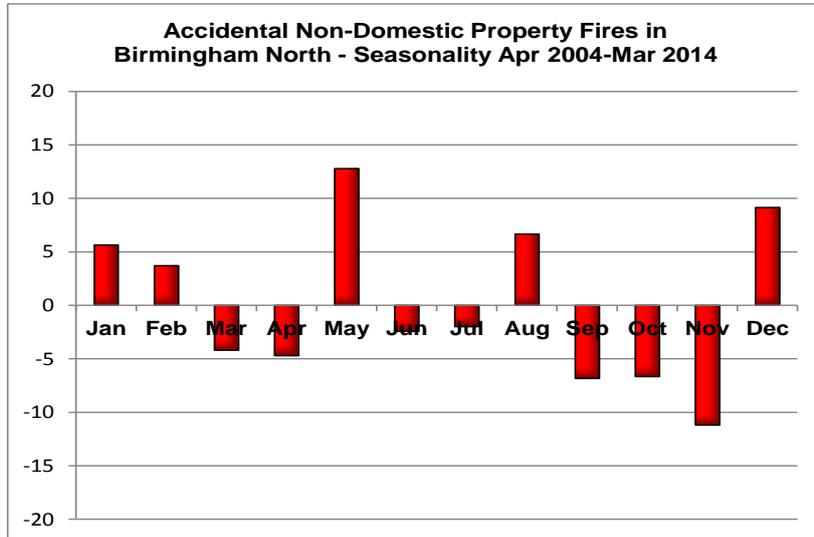


Chart 1 – Seasonality – Non-domestic fires in Birmingham North

It shows that non-domestic fires tend to take place in the **May, June** and in **August**. Separating accidental and deliberate fires shows that accidental fires are more likely in May and December, while deliberate fires are more likely in October and June.



## Location

An overall risk score for each property type group was obtained using a harm matrix and a probability matrix<sup>1</sup>. This was then used to rank LSOAs (Lower Super Output Areas) in both boroughs to identify geographical areas which may be more at risk.

The map below shows that, overall, the area most at risk of fires in non-domestic buildings are around the city centre. This is heavily influenced by the number of retail and entertainment premises in this area, as both these property types are within the high-scoring range.



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<sup>1</sup> See Appendix A

## Property type

**Retail premises, other residential buildings (not dwellings) and entertainment venues** incurred 56% of both accidental and deliberate fires at non-domestic premises:

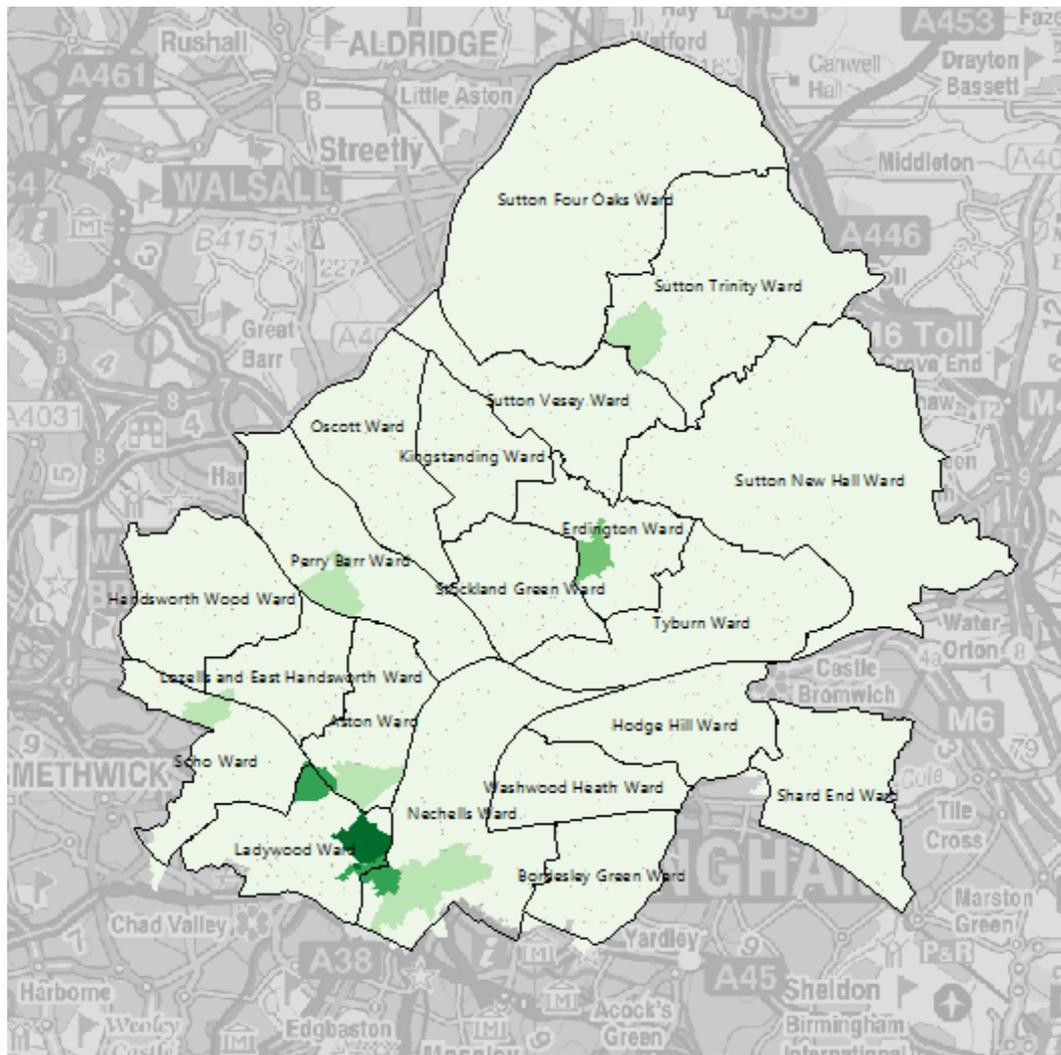
Property Type Grouped	Arson	Accidental	Total
Retail, single shops and specialist service premises	49	103	152
Other residential buildings (not dwelling)	17	104	121
Entertainment, dining, recreation and venues	18	82	100
Manufacturing / Industrial premises (e.g. factories)	7	61	68
Health	10	50	60
Education	10	32	42
Office, administration and call-centre buildings	4	33	37
Law and order	27	3	30
Buildings used for bulk storage	7	18	25
Other type of building	4	3	7
Public utilities (Gas, electric, water, phone)	1	5	6
Emergency services	2	3	5
Organisation premises	1	2	3
Places of worship	0	3	3
Agricultural buildings	2	0	2
Transport buildings	1	1	2
Animal accommodation, breeding and vets	0	1	1
Laboratories	0	1	1
Studios	0	1	1
Grand Total	160	506	666

Almost 18% of Accidental fires had the source of ignition as wiring, cabling or plugs while 13% started in fluorescent lights. Almost **one third** of fires which were deemed **accidental** showed **wiring insulation (eg electrical wire)** as the item mainly responsible

**Retail premises:**

**Location**

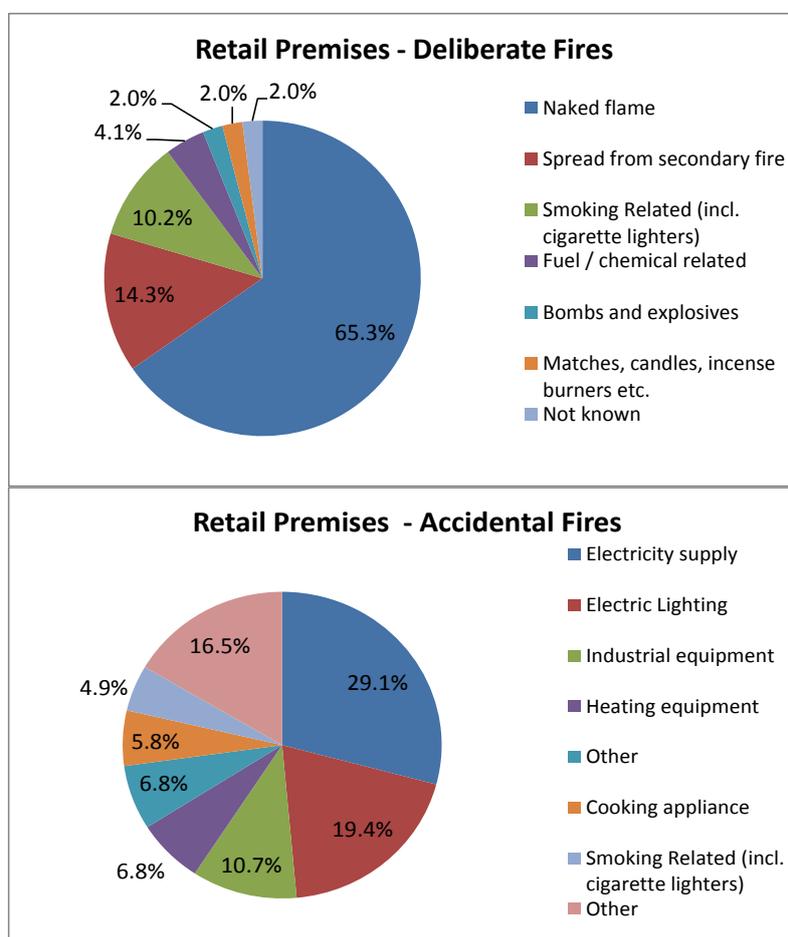
Using the same risk calculation but for **retail, single shops & specialist service premises** only, the map below shows the areas most at risk. Unsurprisingly, they are in the city centre, and town centres in Erdington, Sutton Coldfield & Perry Barr



**Supermarkets** incurred the highest number of total incidents at retail premises, with 17: ten accidental and seven deliberate fires.

Top 5 Retail, single shops and specialist service premises	Accidental	Arson	Grand Total
Supermarket	10	7	17
Department store	11	4	15
Other type building related to retail or commercial services	4	7	11
Vehicle repair and servicing garage	9	2	11
Clothing	9	0	9

Accidental fires at retail premises were most likely to be due to **faults in equipment or appliances** (46.0%), with **wiring, cabling and plugs on shop floor/showroom/display hall** the most recorded circumstances for a fire to occur.

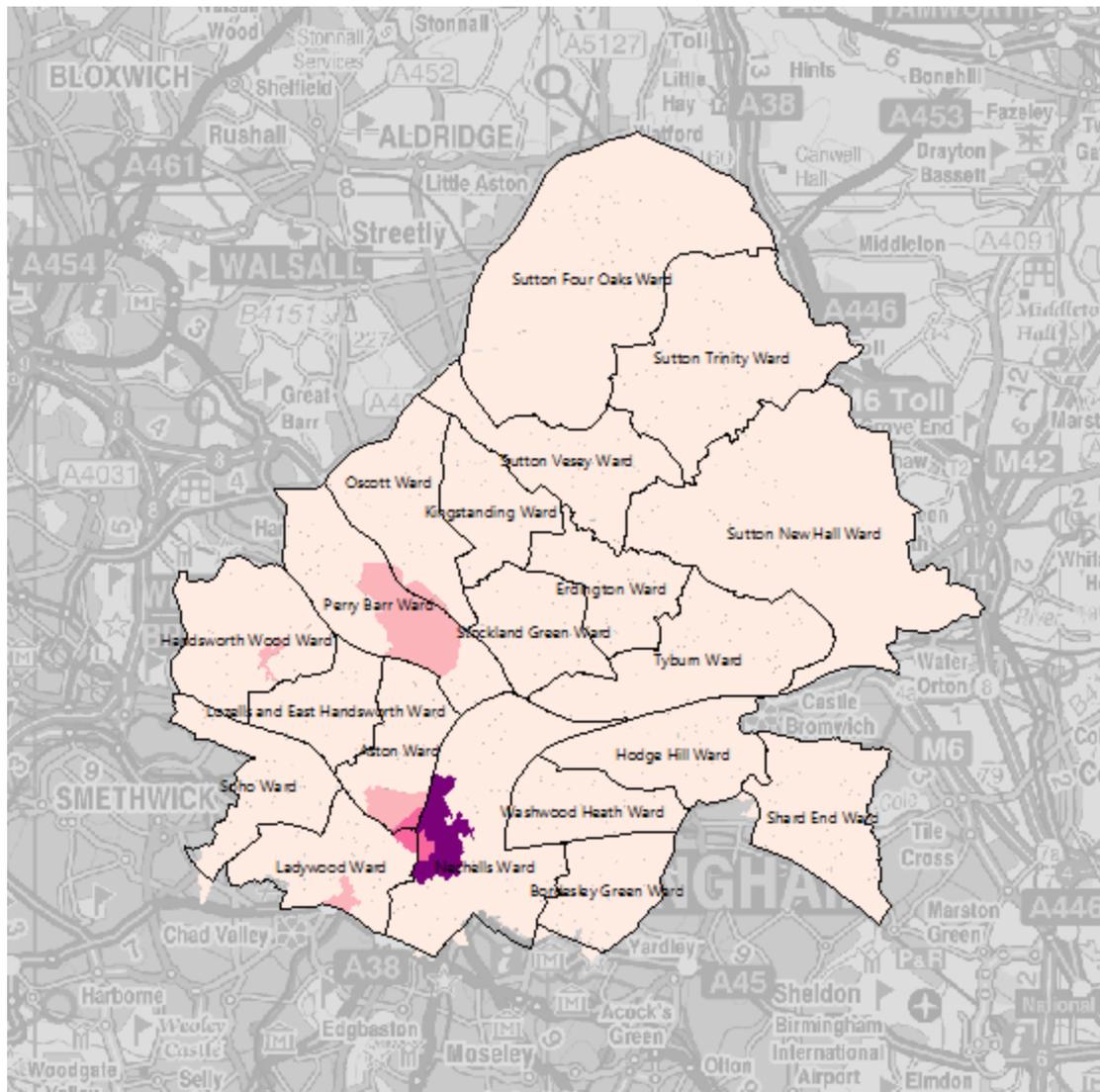


In 43% of incidents at retail premises there was no smoke/heat detector or fire alarm system present in the property. Eight had an alarm that was not working. Unsurprisingly, the average resulting burn and total damage tended to be greater at properties where there was no alarm. 10 of the 11 vehicle repair and services premises did not have an alarm system installed.

Average burn and total damage resulting from fires at retail premises was greatest at 'recycling, reclamation or disposal' facilities, which is likely due to the nature of the goods present on that type of property.

***Other residential buildings (not dwelling)***

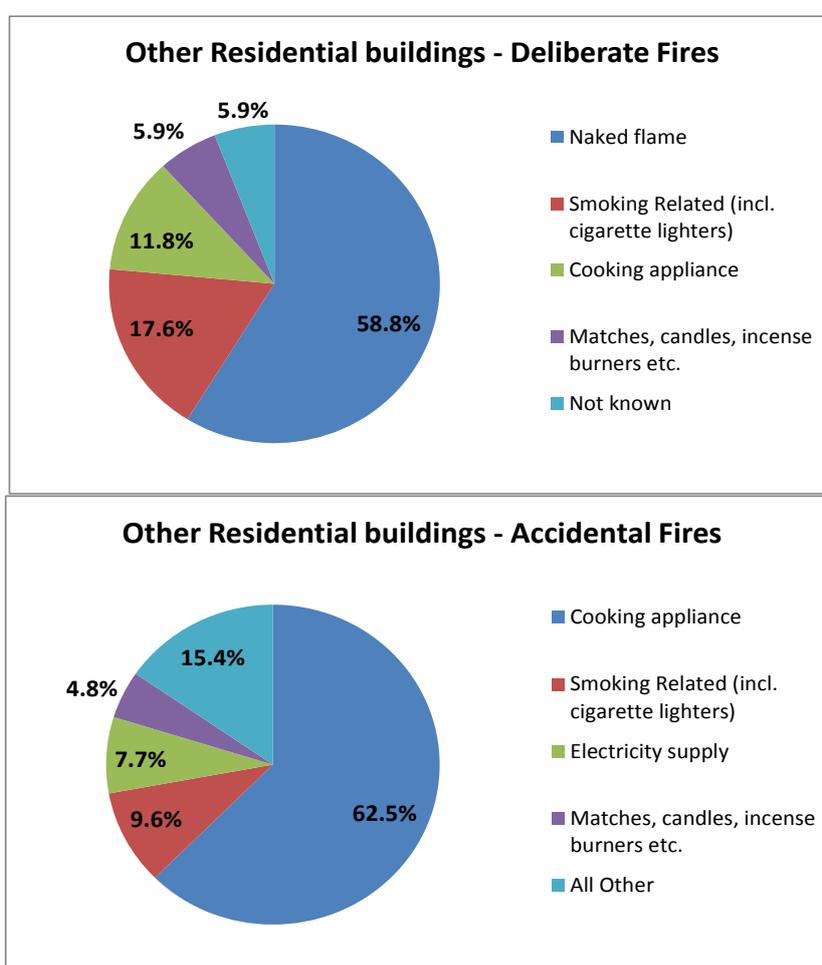
High risk areas in this property type are centred around student halls of residence



**Student hall of residence (not shared house)** incurred the highest number of incidents with 38 over the three year period, 97.4% of which were accidental

Top 5 Other residential buildings (not dwelling)	Accidental	Arson	Grand Total
Student hall of residence (not shared house)	37	1	38
Old peoples home	16	3	19
Hotel / motel	16	1	17
Hostel for Homeless People	10	3	13
Nursing / care home (incl. people with disabilities)	9	3	12

Accidental fires in other residential building (not dwelling) were mostly due to **cooking left on or unattended** (31.7%)



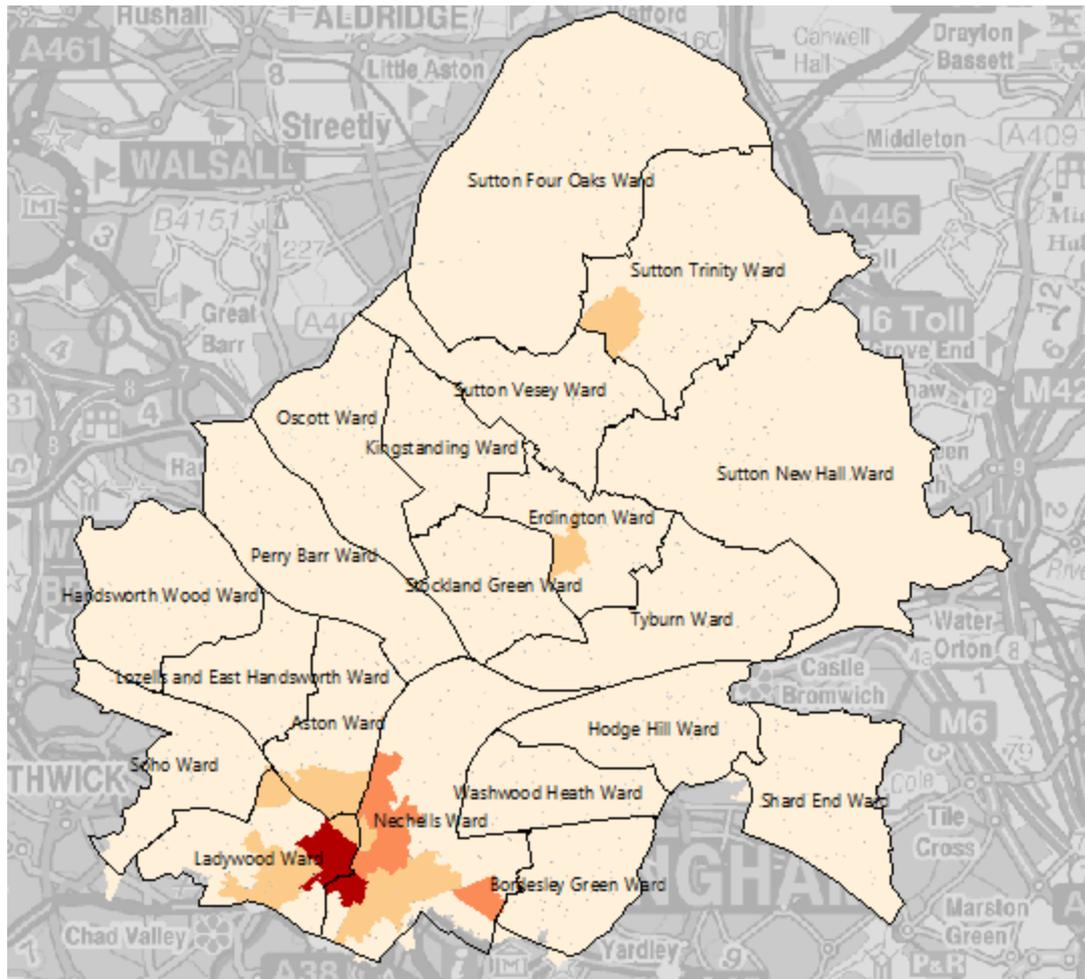
The largest number of incidents 70 (57.9%) started in the **kitchen**, while 9 (7.5%) started in a **bedsitting room** and 7 (5.8%) started in the **bedroom**

Just over a third of arson incidents were in properties with no alarm

Fires at other residential buildings resulted in eighteen injuries over the three years analysed, only one of which went to hospital for treatment.

**Entertainment venues:**

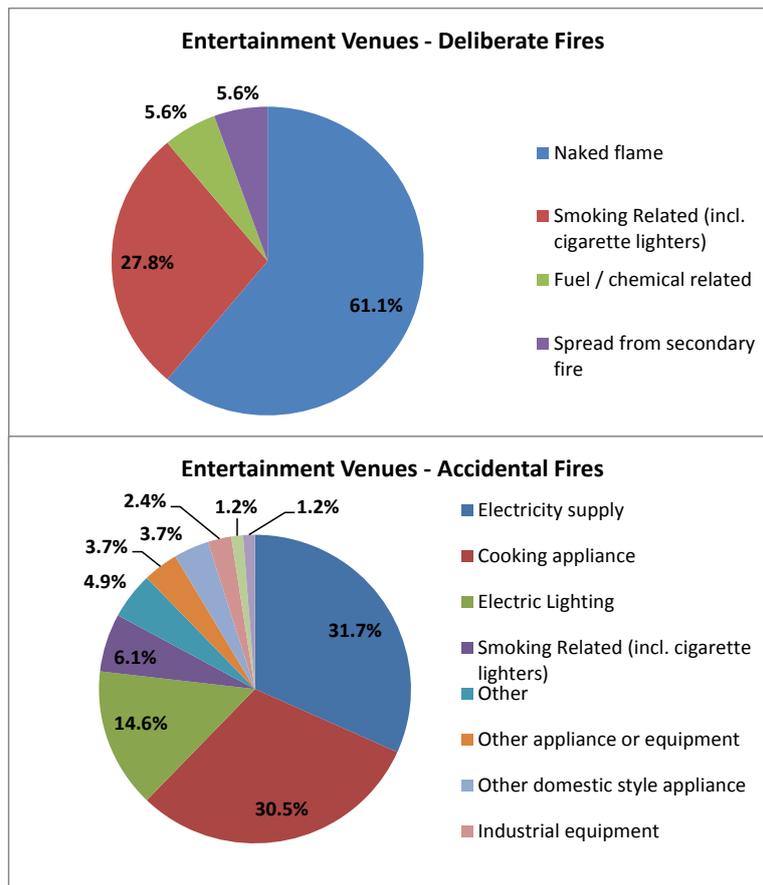
High risk areas again form around the city and town centres as there are more of these venues in these areas



**Pubs** were the main entertainment venues affected by fire for both accidental and deliberate fires, representing 20.0% of incidents (20), followed by **fast food and takeaway outlets** (14.0%, 14 incidents).

Top 5 Entertainment, dining, recreation and venues	Accidental	Arson	Grand Total
Public house	15	5	20
Fast food and takeaway outlet	13	1	14
Cafe	5	2	7
Fish and chip shop	7		7
Bookmaker	3	3	6
Indian and Asian restaurant	5	1	6

**Wiring, cabling or plugs** were mostly responsible for fires at entertainment venues (24 incidents, 29% of accidental incidents)

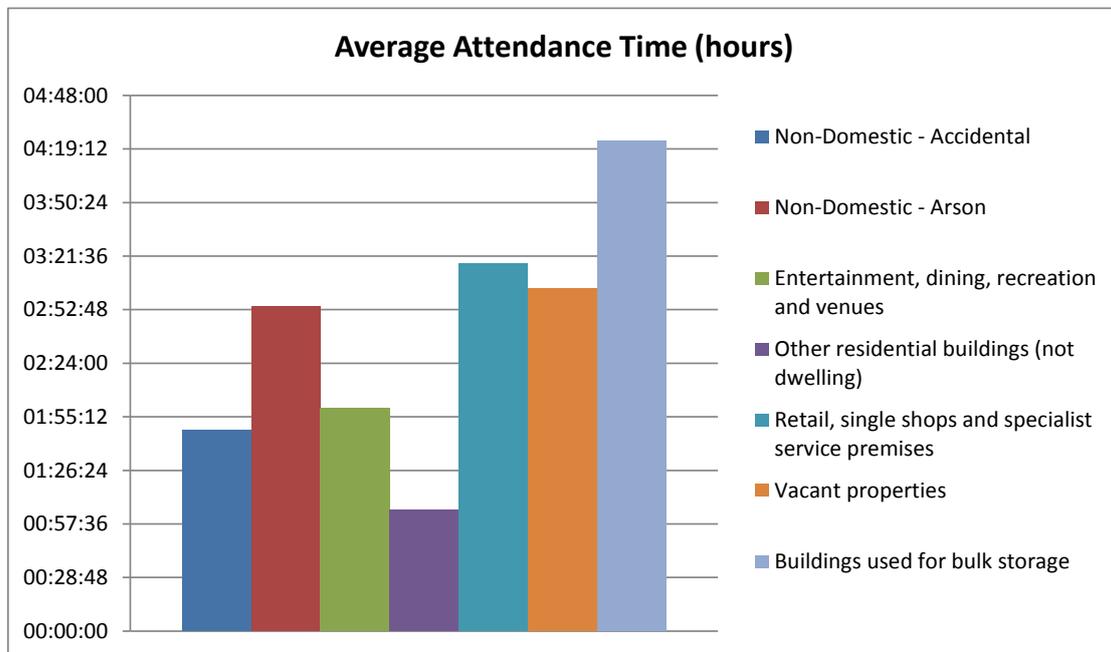


**Faults in equipment or appliances** (including overheating) were the most likely cause of accidental fires (41.5%). **Wiring insulation (eg electrical wire)** was the most likely first item ignited, with 27.5% of all incidents (45% of accidental fires); the first item ignited in deliberate fires was **paper/cardboard**.

Overall, deliberate incidents tended to result in greater burn and total damage. This is likely linked to most deliberate incidents taking place at vacant premises: as there are no occupants, it takes longer for someone to notice the fire, especially as most did not have an alarm installed.

Fires at entertainment venues resulted in just seven injuries over the three years analysed, only one of which went to hospital for treatment.

The graph below shows the average time spent in attendance at various types of incidents, including vacant premises:



**Chart 2 - Average duration of attendance at incidents (hours)**

Most time was spent at incidents involving **buildings used for bulk storage**.

**COMAH sites:**

At time of writing there were three top tier COMAH sites within Birmingham North, and four lower tier COMAH sites.

While sites affected by the COMAH regulations have the potential to result in major incidents involving serious damage and harm to people and the environment, the likelihood of such incident happening is reduced by their preparedness. Both lower- and top-tier sites are required to produce an on-site emergency plan, prepared by the operator, detailing the emergency procedures in place if an accident were to affect the site, and top-tier also have to have an off-site emergency plan, prepared by West Midlands Fire Service ERP Team, which details the coordinated multi-agency response if an incident at the COMAH site were to have off-site consequences.

**Heritage sites:**

There are 523 grade I, II\* and II listed buildings in Birmingham North, approximately 280 of which are non-domestic buildings, including shops, offices, churches, pubs and schools.

Historical buildings are at heightened risk of fire for a variety of reasons: they are often built from easily-ignited materials, they may have open fires and chimneys which can be in poor condition, their status as listed properties may prevent modifications such as fire doors to be installed, and in some cases they are situated in isolated surroundings delaying the firefighters' arrival.

There have been approximately 13 incidents<sup>2</sup> at grade I, II, and II\* listed non-domestic buildings in the last three financial years. All were accidental, and most were grade II listed.

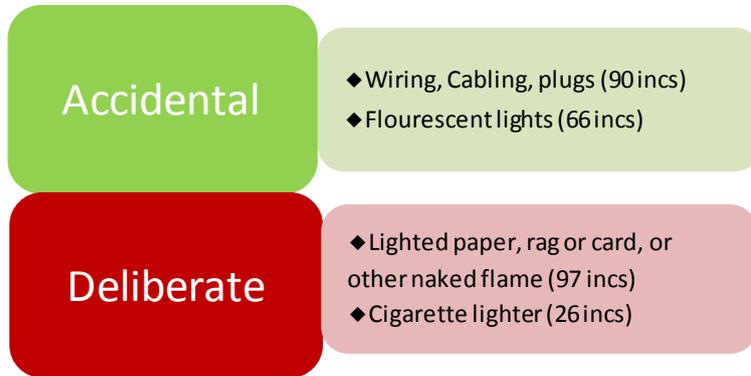
Over a third of incidents (38.5%, 5 incidents) were due to faulty wiring, cabling or plugs.

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<sup>2</sup> This figure was obtained through manually comparing the list of listed buildings and incident data, therefore some incidents may not have been included

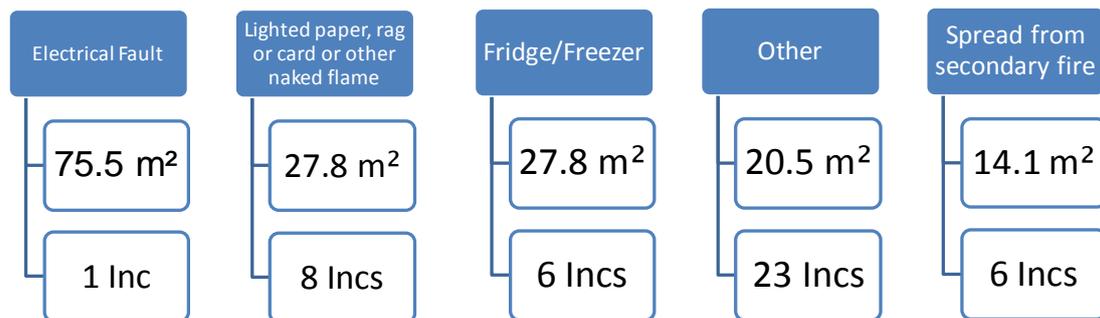
## Source of ignition

The greatest ignition source for accidental fires was wiring, cabling and plugs (17.8%), while for deliberate fires it was lighted paper, rag or card, or other naked flame (60.6%).



### Ignition source - Accidental fires

Although **Wiring, cabling, plugs** caused the largest number of incidents, they resulted in only minimal burn damage. The known accidental ignition source resulting in the greatest burn damage (75.5 sq m on average) was '**electrical fault**', however there were only one such incident,



**Figure 1 - Accidental incidents: Top 5 ignition sources for average burn damage**

The ignition sources which resulted in the greatest average burn damage had very few incidents

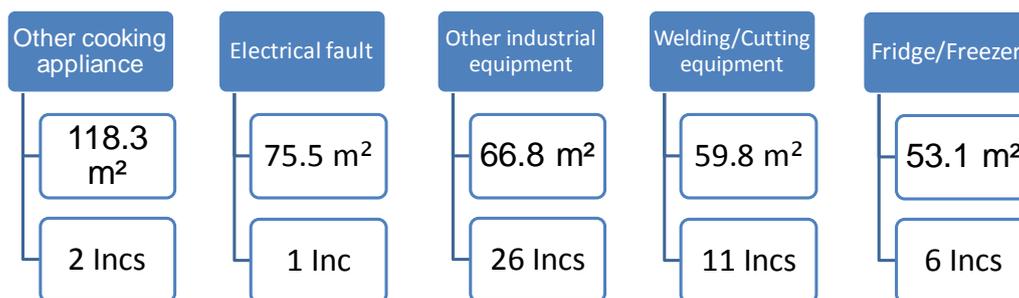


Figure 2 - Accidental incidents: Top 5 ignition sources for total burn damage

The table below shows that, of the five ignition sources causing in the highest number of incidents, ‘**other industrial equipment**’ resulted in the greatest average burn and total damage.

Source Ignition	Average Burn Damage m <sup>2</sup>	Average Total Damage m <sup>2</sup>	Number of Incidents
Wiring, cabling, plugs	3.9	11.4	90
Fluorescent lights	0.3	0.7	66
Cooker - attached ring / hot plate	0.8	7.2	50
Other industrial equipment	9.1	66.8	26
Smoking materials (cigarettes, cigars etc.)	1.9	13.8	24

Table 2 - Accidental incidents: Top 5 ignition sources and resulting average damage

### Ignition source - Deliberate fires

Over 60% of deliberate fires in non-domestic premises were ignited by a naked flame.

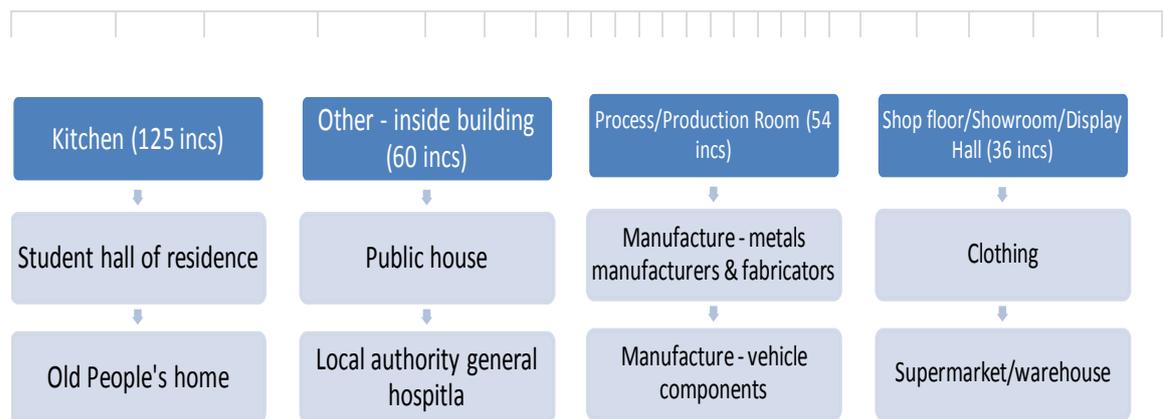
In over a third of deliberate incidents the first item ignited was **paper or cardboard** (35.6%, 57 incs), followed by **external structures or fittings** (14.4%, 23 incs)

Where the first item ignited was known, fires started using **gases** resulted in the greatest average burn & total damage (150.5 m<sup>2</sup>). **Floor covering** fires resulted in less burn damage (1.5 m<sup>2</sup> on average), but one of the highest average total damage (75.5 m<sup>2</sup>).

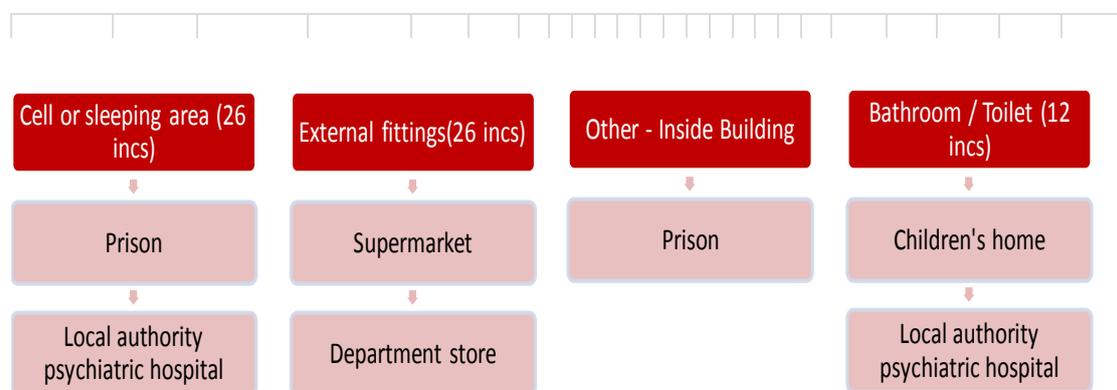
## Place the fire started

Due to the wide variety of premises included in the 'non-domestic' category, there is no one place where the fire started which would encompass all property types: overall, the place where the fire started with the greatest number of incidents is the kitchen, with 125 incidents (18.8% of all incidents).

For accidental incidents where the place where the fire started was specified, the diagram below shows in which type of property the top 4 were most likely to be:



The diagram below illustrates the same for the top 4 places where a deliberate fire started:



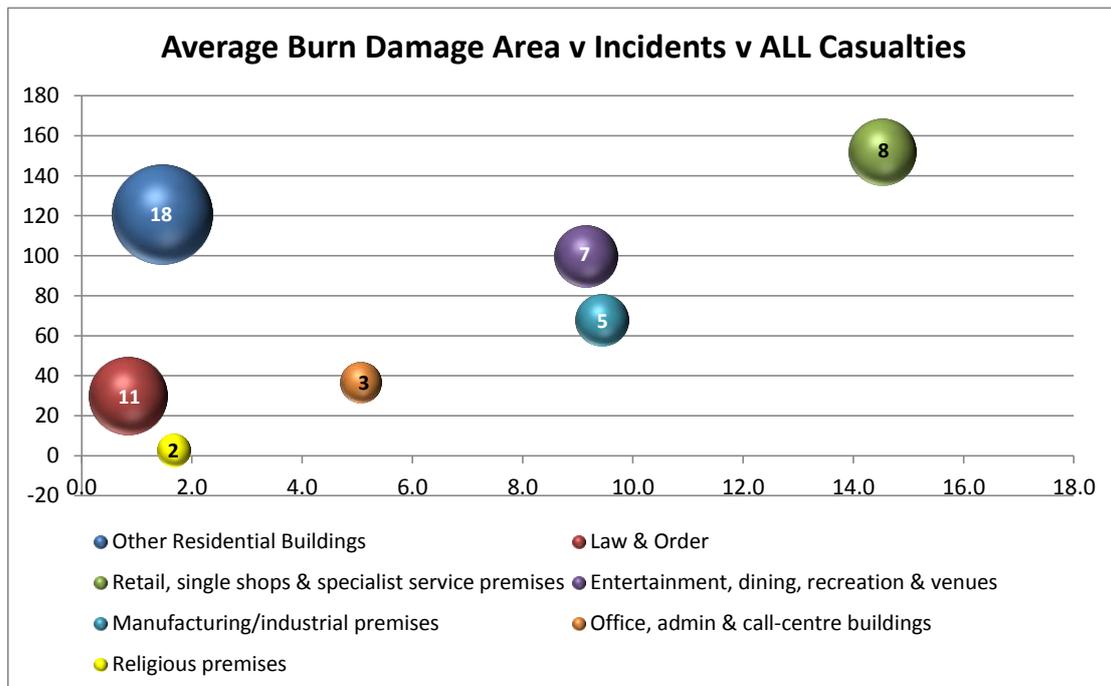
### Alarms and firefighting systems

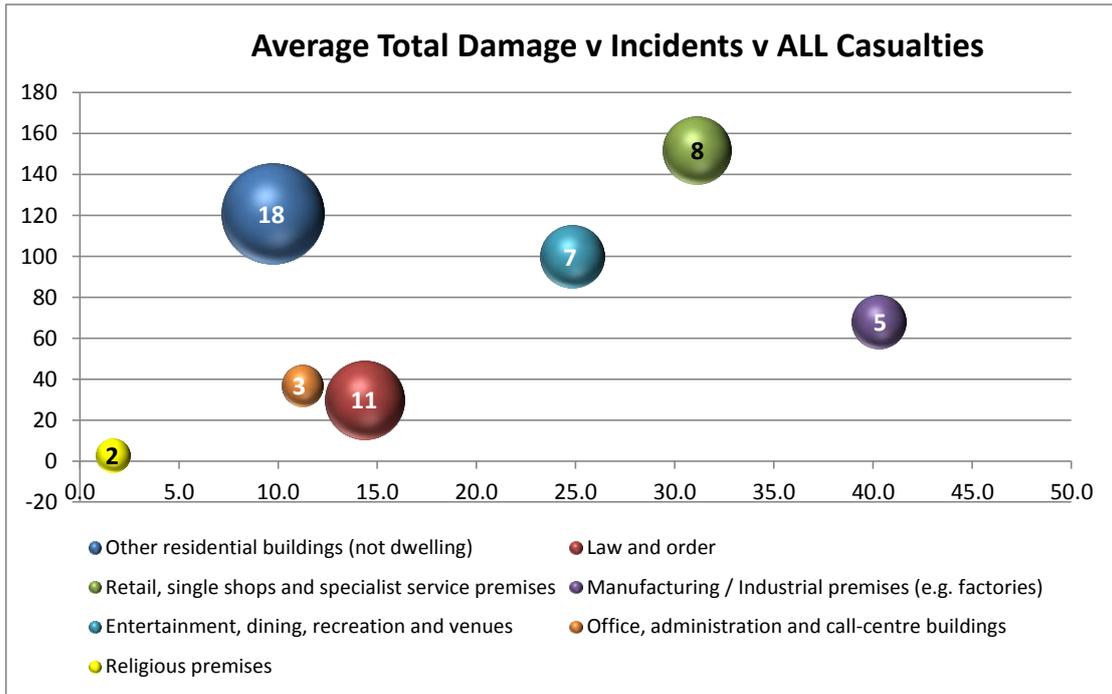
Only 41.7% of non-domestic fires were discovered by an automatic detector or alarm system. Non-dwelling residential buildings had the highest proportion of incidents discovered automatically (34.5%), while in entertainment, dining recreation & venues premises 62.9% of incidents were discovered by a person.

The delay between ignition and discovery, and between discovery and first call, is on average shorter when the fire is discovered by an automatic detector/alarm system, and the resulting damage (both burn and total) is also less significant than in fires discovered by a person.

### Damage / Casualties

The graphs below show that although **manufacturing / industrial premises (eg factories)** incurred the greatest total damage, **retail, single shops & specialist service premises** incurred the most burn damage. **Other residential buildings (not dwelling)** had the most casualties

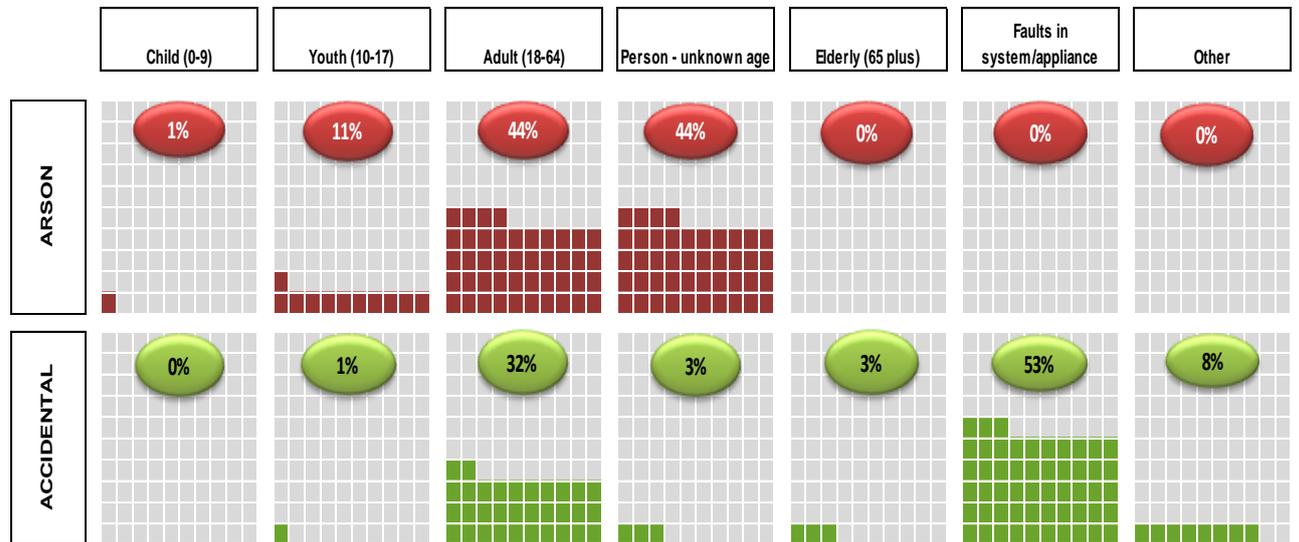




## Demographics:

*Caused by:*

Most accidental incidents were caused by faults in a system or appliance, while for most deliberate fires the person was either an adult or not identified:



## **APPENDIX A – Risk Scoring**

A risk score was developed based on the above analysis in order to identify which property type groups were most at risk of fire.

There are two components which make up the total risk score: the harm score and the probability score (see next pages for matrices).

Each property type group, as well as other groups which analysis revealed as potential risk such as vacant or heritage properties, is given a harm and a probability score, which are then multiplied to form a total score.

This allows us to then rank the property type groups in order of risk: High, Medium and Low.

The overall risk score was also used to rank LSOAs (Lower Super Output Areas) in both boroughs to identify geographical areas which may be more at risk.

This was done by multiplying the number of total properties of each type (obtained from the Gazetteer) by the total risk score for that type for each LSOA, therefore giving us a score for each property type for that LSOA. Adding them up provides the total score for that LSOA.

For example: according to the Gazetteer, in LSOA E01009448 in Sutton Trinity Ward there is one Education building (which scores 116) and one retail premise (which scores 261).

$(1 \times 116) + (1 \times 261) = 377$ . This LSOA scores a total of 377

### Level of harm matrix

To identify what the harm factor is for each property type group, five separate factors were looked at to establish the overall impact of fires at different property types:

Factor	Level of harm	score	Definition
Physical - Victim (Owners/ residents of property)	Death	4	Is this type of incident likely to result in the death or serious injury of an individual; or in less serious injury?
	Serious Injury	3	
	Minor Injury	2	
	None	1	
Psychological - Community	Extremely concerned	4	What level of psychological impact is this type of incident likely to have on the community as a whole?
	Significantly Concerned	3	
	Fairly concerned	2	
	Minor concern	1	
Economic - WMFS	Very High	4	How much economic impact does this type of incident have on your organisation (e.g. time cost, number of appliances, etc)
	High	3	
	Medium	2	
	Low	1	
Economic - Victim (Owners/ residents of property)	Very High	4	How much economic impact does this type of incident have on the victim? (e.g. damage size, cost of repairs, etc)
	High	3	
	Medium	2	
	Low	1	
Environmental	Very High	4	what is the likely environmental impact of this type of incident?
	High	3	
	Medium	2	
	Low	1	

Each property type group was scored on each of the factors above, to provide a total harm score.

## Probability Matrix

The probability score is obtained using a sliding scale as displayed below:

Proportion of Total Number of Incidents	Level of control or reduction	Score
10% and over	Uncontrolled (increasing)	18
	Controlled (stable)	17
	Reduction	16
8% and over	Uncontrolled (increasing)	15
	Controlled (stable)	14
	Reduction	13
6% and over	Uncontrolled (increasing)	12
	Controlled (stable)	11
	Reduction	10
4% and over	Uncontrolled (increasing)	9
	Controlled (stable)	8
	Reduction	7
2% and over	Uncontrolled (increasing)	6
	Controlled (stable)	5
	Reduction	4
1% and over	n/a	3
0.5% and over	n/a	2
0% and over	n/a	1

Each property type is given score based on the proportion of the total number of incidents it represents.

## Total Score

Below is the calculated risk score for each property type group for Birmingham North:

Property Type Groups	Level of Harm Score	Probability Score	Overall Risk Score	Level of Risk
Retail, single shops and specialist service premises	14.5	18	261	High
Manufacturing / Industrial premises (e.g. factories)	14.5	16	232	High
Entertainment, dining, recreation and venues	11.5	16	184	High
Other residential buildings (not dwelling)	11	16	176	High
Education	10.5	11	115.5	Medium
Health	7	15	105	Medium
Law and order	11	7	77	Medium
Office, administration and call-centre buildings	8.5	8	68	Medium
Buildings used for bulk storage	10	4	40	Medium
Other type of building	6	3	18	Low
Public utilities (Gas, electric, water, phone)	7.5	2	15	Low
Emergency services	7.5	2	15	Low
Organisation premises	10.5	1	10.5	Low
Places of worship	9	1	9	Low
Agricultural buildings	8	1	8	Low
Animal accommodation, breeding and vets	8.5	1	8.5	Low
Transport buildings	6.5	1	6.5	Low
Laboratories	6	1	6	Low
Studios	5.5	1	5.5	Low