



## Fires and related incidents in Dubai, United Arab Emirates (2006–2013)



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### ABSTRACT

Fire incidents in Dubai, United Arab Emirates, reported to the Forensic and Mechanical Engineering section of the Dubai Police Forensic Laboratory during 2006–2013 were reviewed. A detailed examination of more than 5000 incidents, representing a wide range of fire types is presented. Statistical comparisons on the type of incident and the cause and origin of the fire have been evaluated. City areas covered by each police station are also identified. The outcomes of the study indicate that more than one third of the total number of incidents involved motor vehicles and these accounted for more than half of all deliberately set fires in Dubai. A further one third of the incidents reviewed were in residential units. Electrical failures were shown to pose the highest risk of accidental fire and the Bur Dubai Police Station was the busiest in terms of fire investigation caseload.

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### Introduction

Fire safety has always been a critical issue and concerns are growing in the Middle East in relation to building damage. Dubai is home to hundreds of high-rise buildings, constructed using a variety of flammable materials generating concern in relation to fire safety. Recent national codes have begun to address fire safety in particular risk to life and protection of property, however many existing buildings may not comply with these codes. The selection of suitably flame-retardant building materials is also important in structural design.

Typical fire development occurs over four consecutive stages: Incipient, Growth, Fully Developed and Decay [1]. It is important not to underestimate the behaviour of fire and the different characteristics of each stage. Despite the provision of new active control technologies, such as sprinkler systems and smoke detectors, full fire prevention can still not be achieved. These preventive measures may only be effective in the pre-flashover stages of a developing fire [1] and become ineffective as the fire develops to flashover and steady burning, where the involvement of fire fighters becomes critical.

The Forensic and Mechanical Engineering section of the Dubai Police Forensic Laboratory (DPFL) is the principal source for fire statistics in the emirate. The data shown in this study only corresponds to incidents which were attended by DPFL. DPFL provides reports describing the origin and possible causes of each fire.

The Dubai Municipality assesses the effects of fire on existing building materials and the reports from agencies can be presented as evidence in the courts. The current work presents an evaluation of fire trends in Dubai as reported by the DPFL across the period 2006–2013.

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## Data collection

The cases reported in this review occurred during the period 1 January, 2006 to 31 December, 2013 and which were examined by the Forensic and Mechanical Engineering section at the DPFL [2]. Data was gathered through reference to the reports produced by the DPFL where the nature of the incidents have been subdivided into a variety of groups presented in Table 1.

Fire deaths and injuries are reported through the Directorate General of Civil Defence, in Dubai, and include only cases which were attended by the Fire and Rescue services [3].

The total number of deaths and injuries over the 8-year period were 112 and 361 respectively, the highest number of deaths being in 2010 (30) and the highest number of non-fatal injuries being in 2008 (87). This data is presented in Fig. 1.

It should be noted that DPFL covers the emirate of Dubai and, occasionally, the Northern Emirates, excluding the capital emirate, Abu Dhabi, which is served by its own forensic services [4]. Incidents known to have occurred, but not classified in a specific category, have been presented as 'Others'. A description of the most common incidents, or those of particular interest, within each category follows.

## Results and discussion

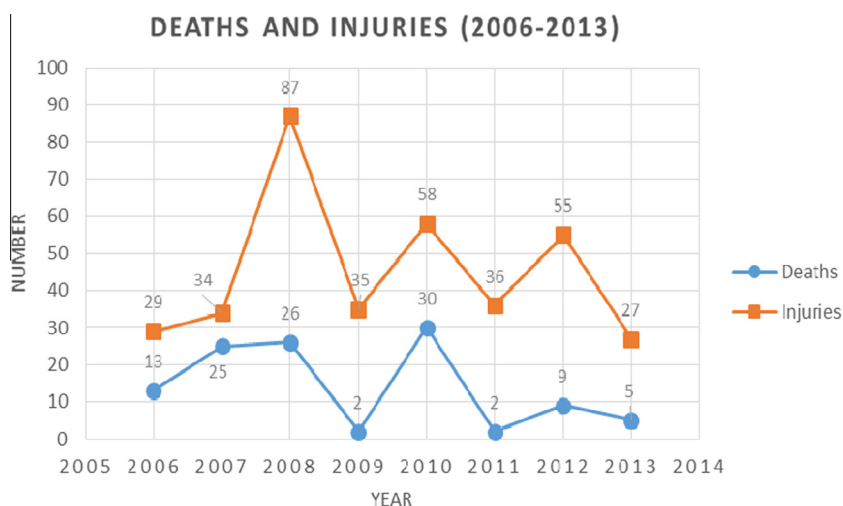
### Number of fires per year (2006–2013)

The overall number of declared fire incidents for the period 2006–2013 was 5490 and the annual data is presented by year in Fig. 2. The highest number of fires on an annual basis was of 838 in 2008, dropping to between 618 and 682 in subsequent years.

**Table 1**

Number of fire incidents in Dubai, UAE, from 1/1/2006 to 31/12/2013.

Type of event	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
Motor vehicles	268	269	295	243	255	238	235	266	2069	37.7
Residential units	174	224	249	177	142	170	223	190	1549	28.2
Commercial stores	94	60	87	75	89	63	80	94	642	11.7
Industrial plants/storage places	50	60	83	53	57	43	47	35	428	7.8
Construction sites	15	31	44	28	14	17	14	8	171	3.1
Electrical sign boards	19	11	23	24	19	19	21	16	152	2.8
Government establishments	8	5	5	7	18	9	10	11	73	1.3
Ships and boats	6	9	6	11	9	12	8	6	67	1.2
Used tyres and solid waste	6	7	6	5	1	10	12	5	52	0.9
Self-immolation	2	7	6	10	7	1	8	4	45	0.8
Others	29	39	34	27	39	36	24	14	242	4.4
Total	671	722	838	660	650	618	682	649	5490	100.0



**Fig. 1.** Deaths vs. injuries in Dubai for the period 2006–2013.

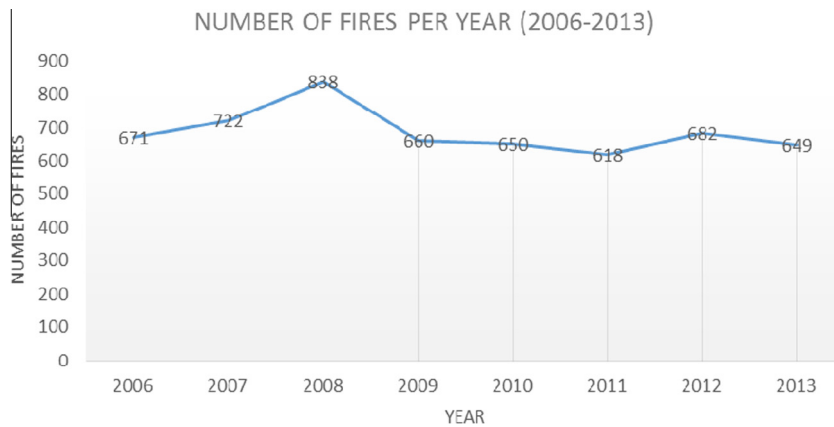


Fig. 2. Number of fires per year in Dubai (2006–2013).

### Fire incidents by area of police coverage

By GPS (Global Positioning System), Dubai is divided into 991 community areas [5], with the population concentration in each varying with social and commercial trends. Fig. 3 presents an aerial map of the city indicating those areas with the highest population concentration, numbered 1–10 in descending order. The most densely populated area is Muhaisnah 2nd with 163,212 inhabitants recorded in 2013 accounting for 7.37% of the entire population of Dubai. This area includes thousands of labourers with the majority working in the construction industry. Table 2 summarises the ten communities with the highest populations in 2013.



Fig. 3. Map of Dubai indicating regions with highest population, ranked 1–10 in descending order [5,6].

**Table 2**  
Community areas in Dubai with the ten highest population concentrations [6].

Community	Population	% of total population in Dubai
1. Muhaisnah 2nd	163,212	7.37
2. Jebel Ali industrial 1st	111,267	5.03
3. Al Qouz industrial 2nd	98,390	4.44
4. Al Karama	75,393	3.41
5. Hor Al Anz	62,104	2.81
6. Al Muraqbat	55,961	2.53
7. Naif	52,806	2.39
8. Alsuq Alkabeer	46,851	2.12
9. Dubai Investment Park 1st	47,108	2.13
10. Alqusais 1st	43,978	1.99
Total	757,070	34.22



Fig. 4. Map of the city of Dubai indicating the location of each police station.

Fig. 4 illustrates the locations of the 11 police stations and their catchment areas, while Table 3 presents the number of fire incidents by catchment area over the indicated period. Nine of the police stations lie within the inner boundaries of the city of Dubai, while the remaining two serve the rural towns of Alfaq'a' and Hatta.

It is clear from the data presented in Table 3 that the Bur Dubai Police Station deals with the most fires, with a total of 1498 incidents, followed by Alrashidiya (725) and Jebel Ali (706). There is also, with a few exceptions a general downward trend across the region for the number of reported fire incidents. Bur Dubai Police Station serves a highly populated area in the centre of new developments, including the Financial District and a mixed-use Downtown area of Burj Khalifa. Alrashidiya Police Station serves various residential areas located near Dubai International Airport and other low-rise developments, such as the International City, although none of the ten communities indicated in Table 2 are within its area of coverage. By contrast, Jebel Ali Police Station is located within an industrial zone on the border with Abu Dhabi, and covers Jebel Ali Industrial 2nd, the second highest in population density in Dubai with a population over 100,000 people.

**Table 3**  
Number of fire incidents in Dubai by police station coverage zones (2006–2013).

Police station	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
1. Bur Dubai	182	218	253	175	169	152	178	171	1498	27.3
2. Al Rashidiya	60	62	104	84	98	93	105	119	725	13.2
3. Jebel Ali	62	77	90	100	88	87	106	96	706	12.9
4. Al Qusais	57	65	66	71	56	87	82	69	553	10.1
5. Al Rufaa	72	63	70	57	59	46	51	45	463	8.4
6. Muraqabat	64	56	84	48	49	55	56	45	457	8.3
7. Naif	40	14	39	15	24	19	21	17	189	3.4
8. Lahbab	2	6	8	9	16	9	12	8	70	1.3
9. Alfaq'a' town	2	4	2	2	7	3	4	8	32	0.6
10. Hatta town	1	4	5	3	0	2	2	5	22	0.4
11. Nadd Alsheba	0	0	0	0	1	0	1	1	3	0.1
Northern emirates	118	136	97	75	58	42	48	46	620	11.3
Sea ports	8	9	11	11	17	16	8	13	93	1.7
Airports	3	4	5	5	5	4	5	6	37	0.7
Court-directed	0	4	4	5	3	3	3	0	22	0.4
Total	671	722	838	660	650	618	682	649	5490	100.0

### Motor vehicle fires

Motor vehicles include automobiles, buses, motorcycles and trucks, as well as fires resulting from traffic accidents. The number of incidents within this category was the greatest of all groupings and, according to Fig. 5, the number of such incidents increased slightly from 2006, reaching a maximum of 295 incidents in 2008. There has been a decline since 2008 with an average figure of 247 incidents in the subsequent 5-year period, 16% less than the 2008 peak figure.

In 2008, the Ministry of Interior instituted a new federal Traffic and Transportation Law (12/2007) which became effective from 1 March, 2008 [7] and was accompanied by a new set of regulations (127/2008) relating to the introduction of a penalty point system on driver licences, an increase in traffic offence penalties, vehicle impounds and, for some violations, the possibility of imprisonment. In 2009, the police recorded 29 deliberate vehicle fires which had dropped to 24 by 2012. This is equivalent to a rate of 2.8 per 100,000 in 2009 dropping to a rate of 2.1 per 100,000 in 2012 [8–10].

When the ignition sources relating to vehicle fires (2009–2013) as examined in more detail (Table 4) it was evident that electrical cause was the most prevalent with 38% of all incidents suggested to have ignited by this means. Mechanical-related incidents accounted for 14% of recorded vehicle fires with lesser percentages attributed to a variety of other causes.

### Fire in residential units

This category included all fire incidents which occurred at premises used for residential purposes, such as villas, apartments and hotels. Observed is a steady increase in fire incidents in homes during the first three years of the study period up to a maximum in 2008. During this period, Dubai underwent significant population growth as a consequence of the completion of several building projects in 2008 and the number of individuals permanently residing in Dubai was estimated to be 1.64 million by the end of 2008 [8]. It was also estimated that 805,000 workers visited Dubai during the day, bringing the total population to 2.45 million on a daily basis. This represented a growth of 16% in population between 2006 and 2008. Interestingly and despite a steady population growth [9], the frequency of residential fires cases dropped to a low of 142

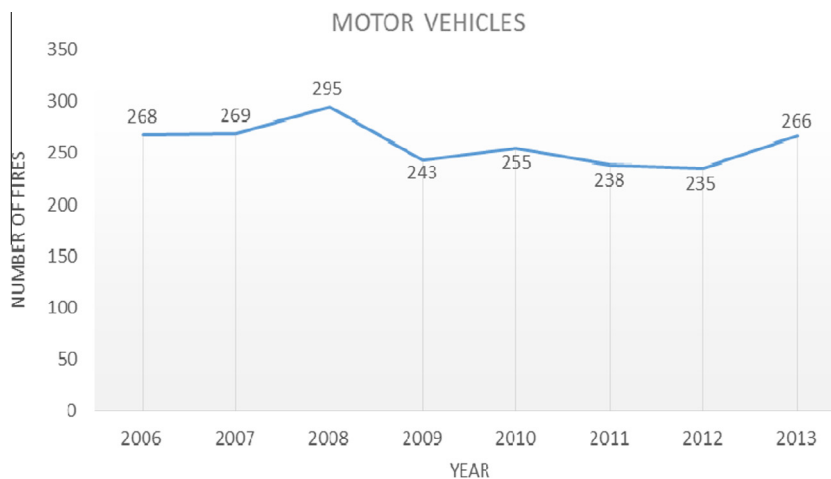


Fig. 5. Number of motor vehicle fires per year (2006–2013).

**Table 4**  
Ignition sources of fires related to motor vehicles in 2009 and 2012.

Type	Frequency 2009	%	Frequency 2012	%
Arson	29	11.93	24	10.21
Electrical-related	76	31.28	90	38.30
Mechanical-related	40	16.46	33	14.04
Fuel-related	21	8.64	9	3.83
Car crash	14	5.76	19	8.09
Smoking materials	14	5.76	18	7.66
Others	31	12.76	14	5.96
Not declared due to waiver	2	0.82	24	10.21
Unknown	16	6.58	4	1.70
Total	243	100.00	235	100.00

in 2010. The population of Dubai was estimated at 2.21 million at the end of 2013 with 190 residential fires recorded in that year.

Fig. 6 illustrates the actual number of fires in residential properties and Fig. 7 presents the frequencies of residential fires per year. A sharp increase in the number of residential fires was observed in 2008 with a recorded increase of almost 20% on the 2006 figure. By contrast, the sharp decline in residential fires in 2010 (7.45) presented a rate per 100,000 population far lower than for example the United States' (120 fires per 100,000 population in 2010) [11,12].

Electrical malfunctions, cooking appliances and gas leakages were the most listed causes of the incidents within the residential category accounting for over one third of all such fires recorded in 2010 and that data is presented in Table 5. Electrical malfunctions were identified as the cause of 37% of home fires. In other Asian countries such as

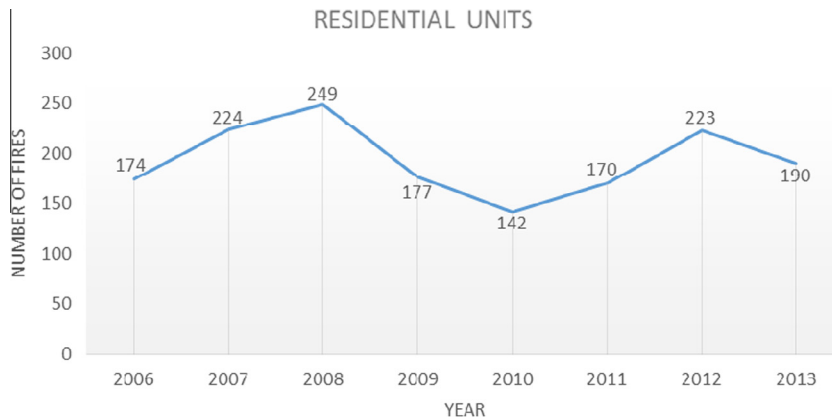


Fig. 6. Number of residential fires per year (2006–2013).

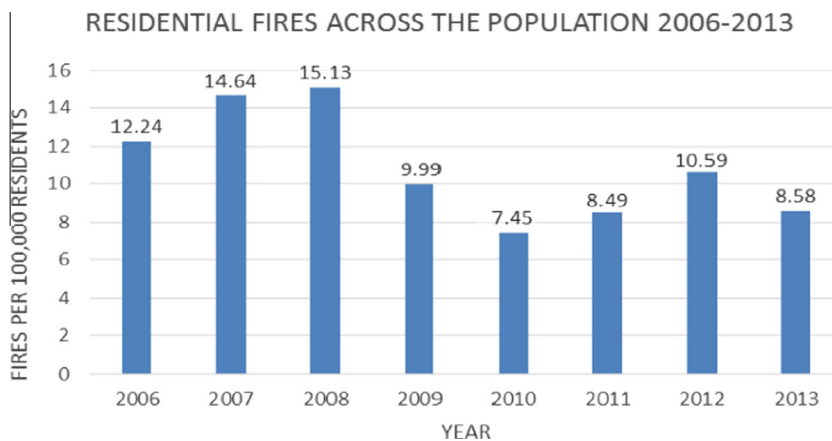


Fig. 7. Residential fires across the population, 2006–2013.

**Table 5**  
Causes of home fires in 2010.

Type of ignition source	Number of occurrences	Percentage
Electrical faults	53	37.32
Candle flame	23	16.20
Heating machines	20	14.08
Chimney flame	17	11.97
Deliberate	9	6.34
Children's carelessness	3	2.11
Religious norms	3	2.11
Gas leakage	3	2.11
Others	11	7.75
Total	142	100.00

Singapore, dissimilar reasons were identified, and rubbish chute fires accounted to 38% of residential incidents for the same period [13].

#### Construction sites

There was a sharp growth in fires within the construction industry between 2006 and 2008, increasing by 193% over these three years. This trend together with similar trends within residential buildings resulted in the relevant local authorities into taking urgent action to address the issue in relation to safety regulations.

Most of the causes of fire ignition on construction sites appear to have resulted from on-site negligence of workers which supports the view of Al Kaabi and Hadipriono, who suggested that the majority of contractors did not appreciate the importance of an awareness of health and safety among their workers [14]. This resulted in an extensive call across government institutions to develop a stricter code of practice, especially given the rising number of building approvals across the country and the influx of foreign labour.

In 2011, the Ministry of Interior imposed a nationwide set of regulations and a new code of conduct for safety measures [15]. According to the Institute for Social and Economic Research at Zayed University, only 16% of the total foreign labour force in the country in 2005 was educated to University level or above [16]. 11% of these workers were completely illiterate, while a further 16% could only read and write to a primary education level. Education amongst manual labourers was notably low and that a large number of unskilled workers were employed within the construction industry [16].

Aligned to these changes in safety awareness and legislation, the financial recession halted a large number of construction works across the country, for example on 9 March, 2010, the Real Estate Regulatory Agency (RERA) announced that out of 1100 approved multi-purpose projects in Dubai in 2009, 243 had either been cancelled or put on hold [17]. This figure was equivalent to 22.1% of the total projects during that year. Both of these events appear to have combined to dramatically reduce the number of building fires in the post 2008 period (Fig. 8).

#### Industrial plants and storage places

Fires associated with industrial activities and their related storage places such as recycling factories, spare parts storage and cement preparation sites are presented in Fig. 9. The average number of fires within these types of facilities over the period 2011–2013, was lower than for the 2006–2008 by 54% echoing the trend observed across the other building categories. The causes of ignition in this category varied from electrical faults (36%) to chemical reactions (8.5%) which was significant, as many of the affected sites involved the use of various kinds of hazardous chemicals. Some fires were also reported to have been caused by negligence and non-compliance with health and safety procedures at work.

#### Deliberate fires

During the study period 254 deliberate fires were recorded where the definition of a deliberately set fire was the “deliberate misuse of heat source or a fire of an incendiary nature” [18] and accounted to 4.6% of the total causes of fire ignition over the 8-year period. The majority of these fires related to motor vehicle incidents (58.3%), followed by residential units (22.1%), government establishments (5.9%) and commercial stores (5.1%). Deliberate fires at government establishments usually occurred in prisons and were started by detainees. There was no significant deliberate fire increase in any category over the indicated period of this study. It is probable that some of the causes for deliberately set fires in vehicles and commercial premises were for business insurance claims.



Fig. 8. Number of construction sites fires per year (2006–2013).



Fig. 9. Number of industrial fires per year (2006–2013).

The percentage of deliberate fires in Dubai during the 2010/2011 period was 5.4% which was less than the United Kingdom's figure for the same period (32.2% [19]). However, the percentage ratio of deliberate fires in Dubai to other fires rose from 5.4% (18.5:1) to 7.6% (13:1) in the following period (2011/2012).

## Conclusions

There are on average two fires a day in Dubai and the aim of this study was to explore and analyse the available data relating to fires within the urban areas in Dubai. The fire statistics used included data relating to the total number of fire incidents which had occurred over an eight year period (2006–2013). The data was characterised by fire type, the affected community areas and the recorded cause of ignition. Statistics on fire costs can be gathered from insurance claims and such costs are usually high. It is clear that national codes must emphasise life safety and safer environments rather than focus primarily on property damage [20], and it is equally important to raise awareness of and provide education relating to fire prevention.

Based on this study, the following conclusions could be drawn

- UAE Fire and Life Safety Code of Practice was introduced in 2011, and while there appears to have been a positive reduction in the overall numbers of fires in buildings more data needs to be gathered over a longer time frame to confirm these initial trends.
- Electrical sources of ignition were the major causes of fire amongst most categories listed and this suggests that a priority should be given to the development of appropriate safety standards for the safe use and maintenance of such equipment.
- More than half the total number of recorded deliberate fires occurred in motor vehicles. Similar trends are evidence in other countries such as the UK. It would be advantageous to disrupt this trend through the development of a multi-agency intervention strategy based upon education, crime prevention and the identification of high risk areas for such events.

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