

Refuse Chute Fires in Public Housing Estates (2011 – 2013)

The Singapore Civil Defence Force (SCDF) responds to all reported fires in Singapore for firefighting and fire investigation. The archiving of detailed records for all these fires has enabled these studies for the purposes of public education and fire prevention.

The SCDF Fire Analysis Report series aim to make sense of similar fires seen over the years. Each report will provide details on the trends, patterns and other findings from the analysis of a specific type of fire or fire-related topic. Relevant examples of actual fire incidents will also be presented. In addition, fire safety tips or references to sources of information relating to fire prevention will be provided.

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Key Findings

- Refuse chute fires constitute about 28.2% of all fires that SCDF responds to in a year.
- On the average, there are 102 refuse chute fires every month.
- Refuse chute fires constitute about 39.3% of all residential fires.
- There are more refuse chute fires on Saturdays and Sundays.
- Refuse chute fires occur most frequently from 1 pm – 2 pm with another smaller peak from 6 pm – 7 pm.
- Chinese New Year eve sees exceptionally high number of refuse chute fires every year.

Number of Refuse Chute Fires

Refuse chute fires constitute about 28.2% of all reported fires in Singapore as shown in Figure 1. The number of refuse chute fires ranged from 1,210 to 1,264 for the 3-year period from 2011 to 2013 which works out to a monthly average of 102 cases [1,2,3].

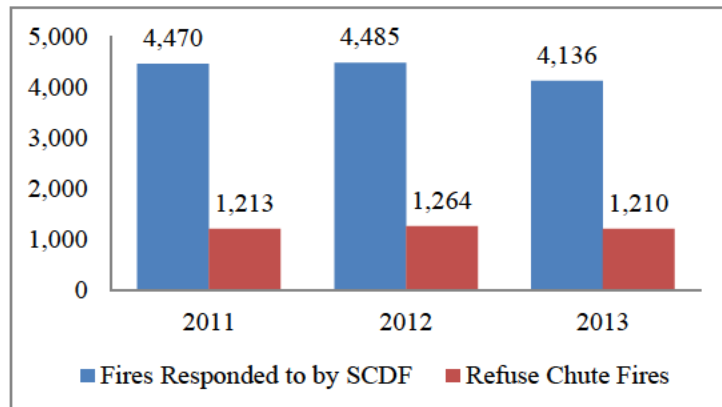


Figure 1. Refuse chute fires (2011 – 2013)

As seen in **Figure 2**, the proportion of refuse chutes fires¹ is noted to be on the rise throughout the 3-year period.

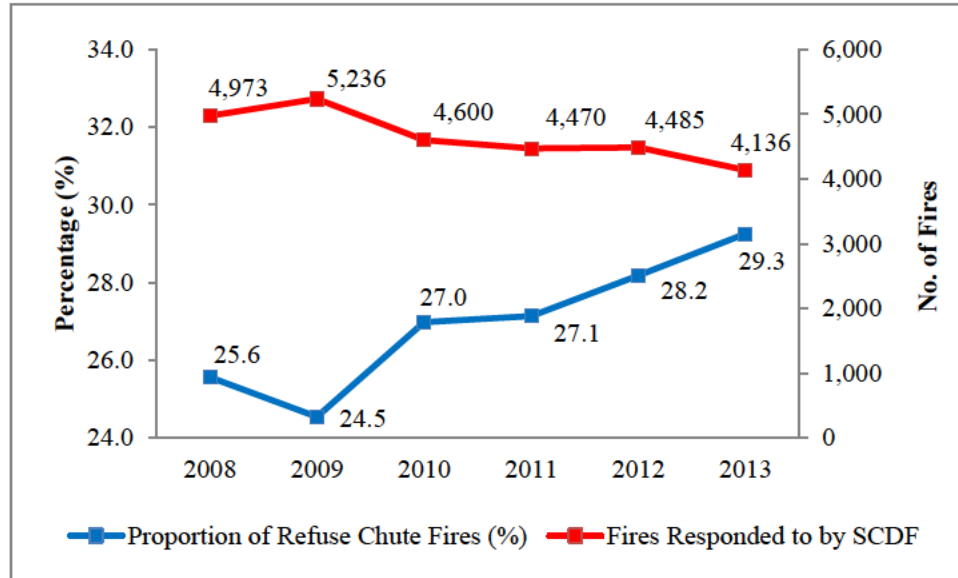


Figure 2. Proportion of refuse chute fires (2008 – 2013)

Refuse chute fires make up the bulk of the fires seen in residential premises from 2011 – 2013. This is followed by fires involving discarded items and fire involving unattended cooking as seen in **Figure 3**.

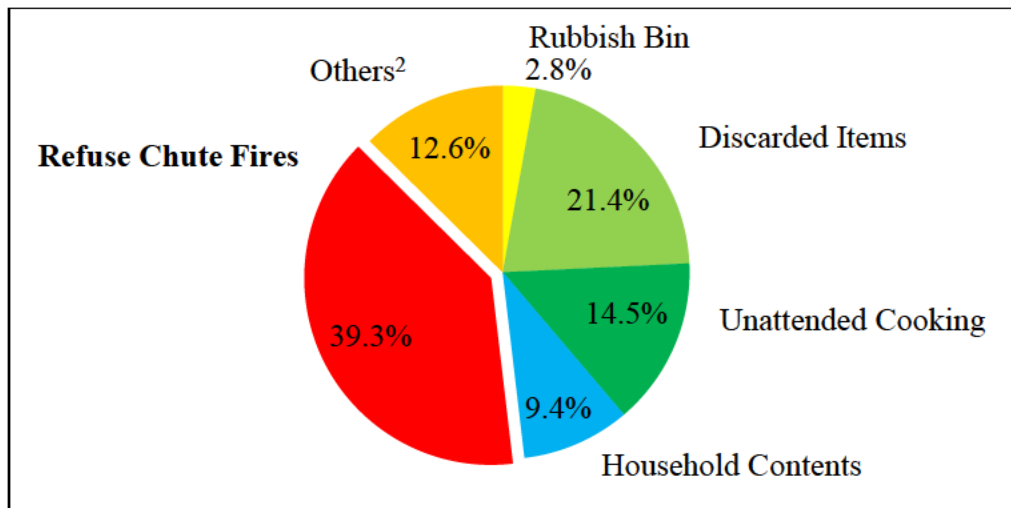


Figure 3. Breakdown of residential fires (2011 – 2013)

¹ This refers to the number of refuse chute fires in a year against the total number of reported fires in that same year

² These include electrical fires, gas fires and fires involving items placed along the corridors or at the void decks

Time of Occurrence

As seen in **Figure 5**, the number of refuse chute fires is generally low in the early morning between 3 am and 7 am. After 7 am, the number of incidents rises sharply and peaks between 1 pm to 2 pm. Thereafter, it decreases gradually, with another localised peak at 6 pm to 7 pm. From 11 pm onwards, the number of refuse chute fires would start to decline. This overall trend in the hourly breakdown of refuse chute fires (2011 – 2013) is noted to be similar to that seen in the preceding 3-year period between 2008 – 2010 [4].

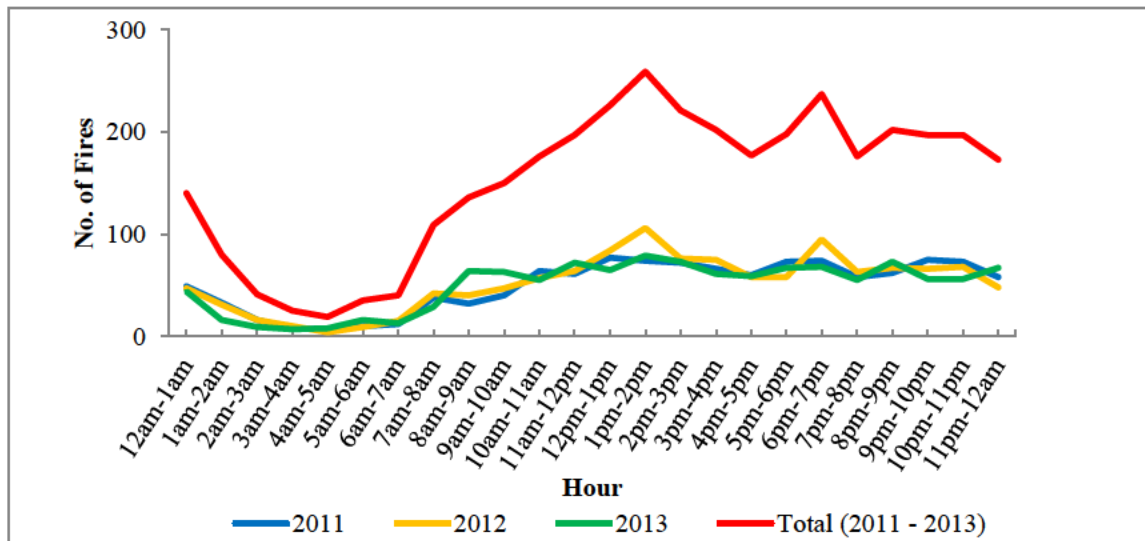


Figure 5. Occurrence time of refuse chute fires (2011 – 2013)

Day of Occurrence

Figure 6 shows that refuse chute fires are typically lowest near mid-week. From there, the number of refuse chute fires rises to peak on Sunday. Thereafter, refuse chute fires will dip to the lowest point in the mid-week. Such a trend was also observed in the preceding 3-year period from 2008 – 2010 [4].

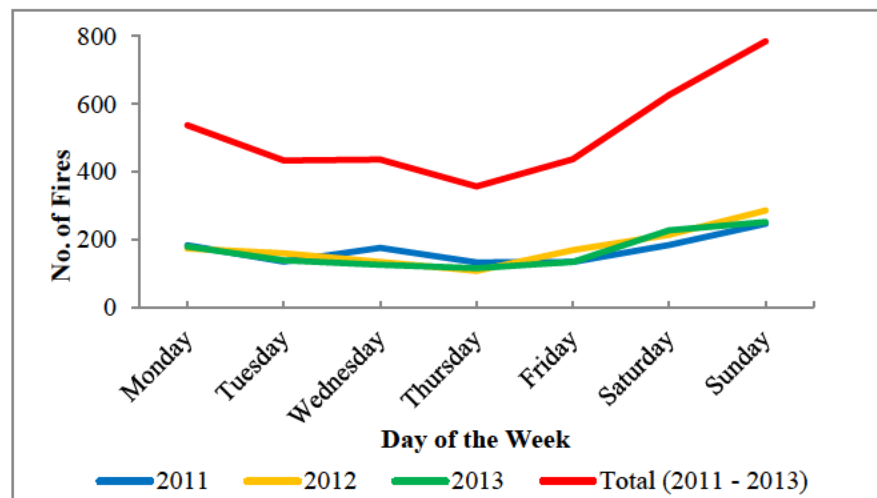


Figure 6. Refuse chute fires by day of the week (2011 – 2013)

Month of Occurrence

In the study on refuse chute fires from 2008 – 2010, it was found that the months that coincide with Chinese New Year (CNY) holidays have unusually high numbers of refuse chute fire. This pattern is similarly observed for 2011 – 2013.

The first day of the CNY falls on 3 February, 23 January and 10 February for 2011, 2012 and 2013 respectively [5,6,7]. Accordingly, February 2011, January 2012 and February 2013 were the months which saw exceedingly high numbers of refuse chute fire as evident in **Figure 7**.

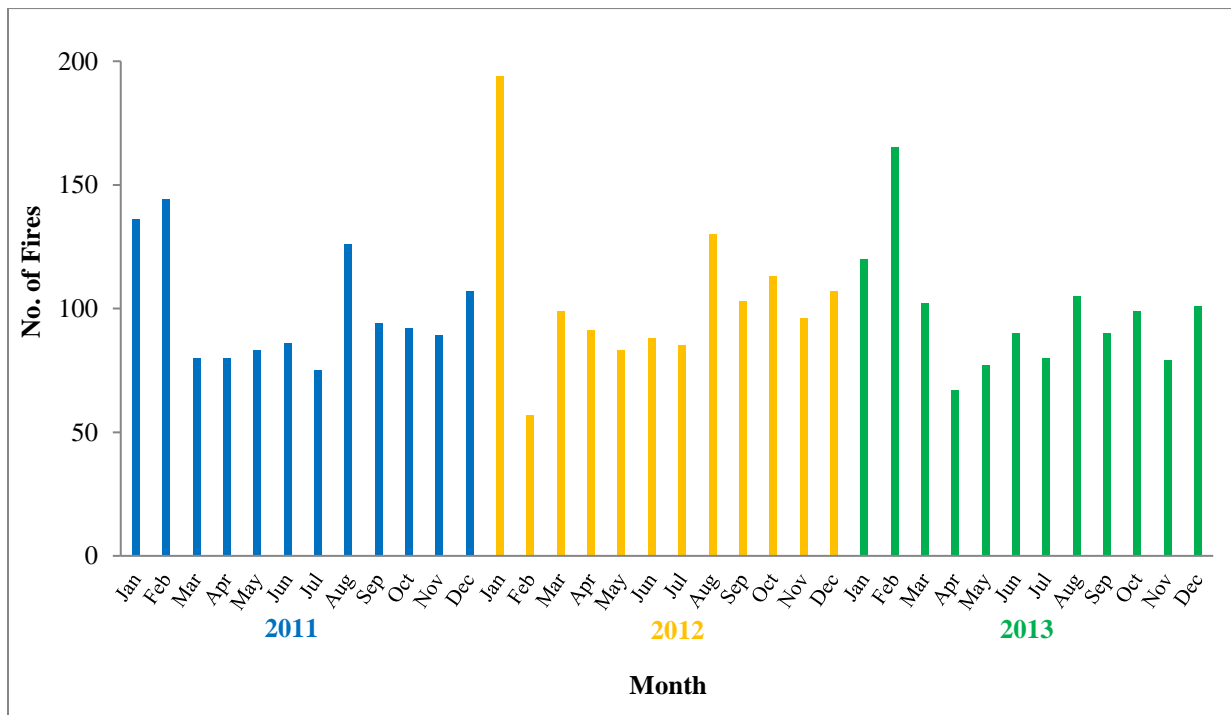


Figure 7. Refuse chute fires of the months (2011 – 2013)

A breakdown by day of the 3 CNY months revealed that most of the fires occurred on the eves of CNY as seen in **Figure 8, 9** and **10**. A recurring smaller peak is also always observed on the 9th day of CNY which coincides with the occasion where the Chinese traditionally pray.

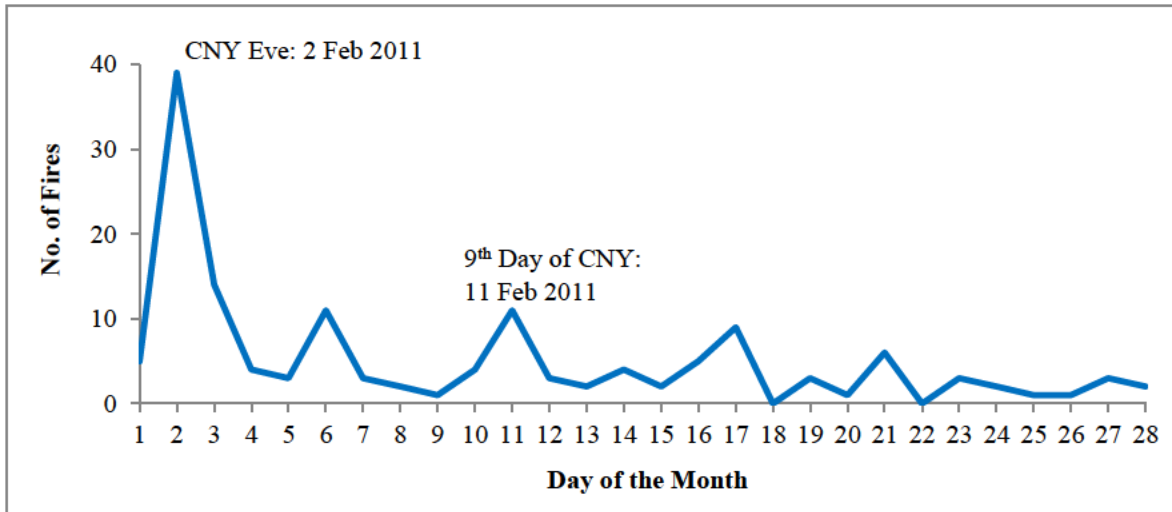


Figure 8. Refuse chute fires for the CNY month of February 2011

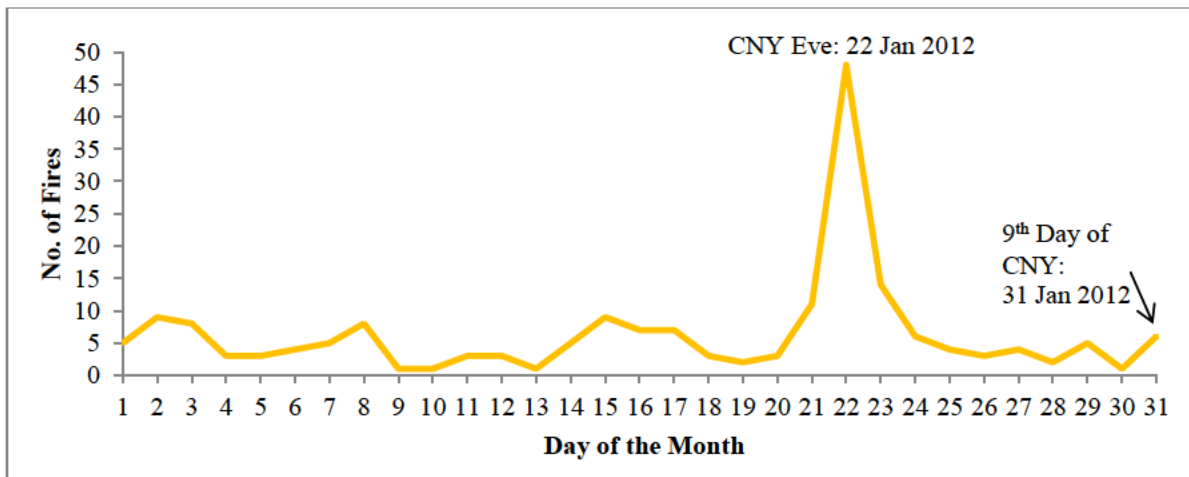


Figure 9. Refuse chute fires for the CNY month of January 2012

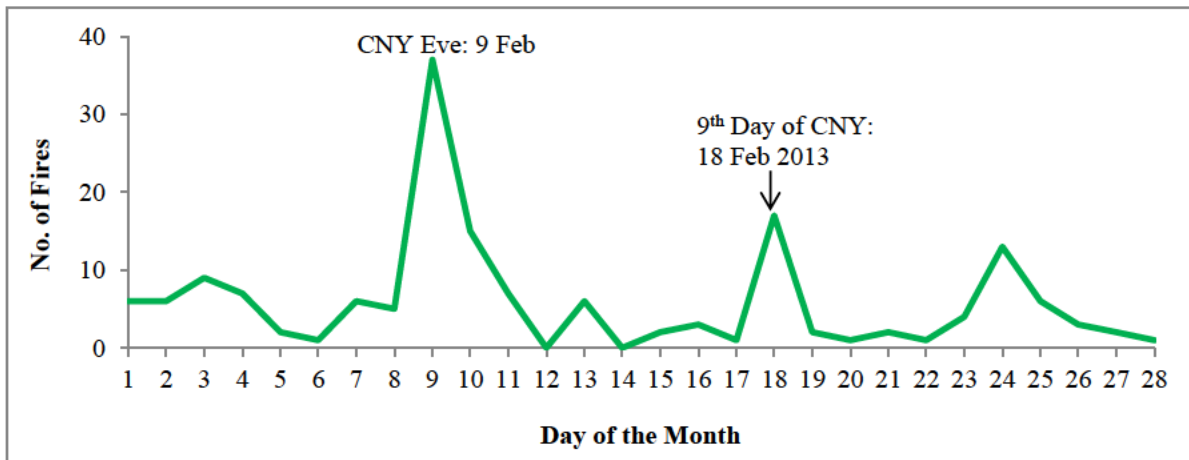


Figure 10. Refuse chute fires for the CNY month of February 2013

Fire Safety Provisions in Refuse Chutes

Refuse chute fires do not present as a major fire risk to residents as refuse chutes are built with due fire safety considerations. The existing fire safety provisions in Singapore requires residential refuse chutes to be protected with 30-minute fire resistance³ rating door and 1-hour fire resistance rating wall [9]. Hence, a fire would generally be contained within the compartmentalised refuse chute shaft. In addition, the Refuse Handling Equipment (RHE) that consolidates refuse at the base of the Centralised Refuse Chute (CRC) may also be installed with heat detector and sprinkler system for fire extinguishment [10].

From the Case Files

Case #1: February 2011, Bukit Merah

It was close to midnight when SCDF received an emergency call from a resident reporting a refuse chute on fire. When SCDF responders arrived, blast effects have damaged the roller shutter of the bin centre (see **Figure 11**). On further investigation, it appeared that the blast occurred from within the Refuse Handling Equipment (RHE) as its contents were emptied out (see **Figure 12**).



Figure 11. Blast effects were observed

A ruptured aerosol can with burn marks was recovered amongst the refuse as shown in **Figure 13**. The blast effects were likely to have come about as a result of the rupturing of the aerosol can. It is fortunate that the incident happened late at night when there were no workers in the bin centre.

³ Fire resistance is defined in BS 476: Part 20: 1987 [8] as the time for which an element of building construction is able to withstand exposure to a standard temperature/time and pressure regime without a loss of its fire separating function or loadbearing function or both.



Figure 12. Refuse in the RHE were emptied out



Figure 13. A ruptured aerosol can recovered amongst the refuse

Case #2: March 2011, Toa Payoh

SCDF responders were dispatched to a refuse chute on fire on a Sunday afternoon. On arrival, one of the Individual Refuse Collection System (IRCS) chutes has caught fire and they extinguished the fire with buckets of water. The refuse bin inside the chute sustained heat damage. On sieving through, a burned rag was found as seen in **Figure 14**. The cause of fire was determined to be incendiary⁴.



Figure 14. A burned rag was found inside the bin amongst other refuse

Case #3: January 2013, Jurong West

A resident at the 12th storey noted a burning smell from outside her window and upon investigation, she saw white smoke emanating from the Centralised Refuse Chute (CRC) bin centre of her block.

She immediately called SCDF for assistance. The fire was contained within the RHE. As a result of the fire, the RHE sustained heat damage and burned paint tins were recovered amongst the refuse (see **Figure 15** and **16**).

⁴ An incendiary fire refers to one that is intentionally set with the intent to cause the fire to occur in an area where the fire should not be [11]



Figure 15. The RHE sustained heat damage



Figure 16. Burned paint tins were recovered amongst the refuse

Caution!

Household refuse typically consists of items made of plastics such as bottles and packaging. When plastic is burned, hazardous chemicals including hydrochloric acid, sulphur dioxide, dioxins, heavy metals and particulates are released. These emissions have harmful health effects [12]. While refuse chute fires are contained within the refuse chute, the smoke may seep through the refuse hoppers into households to affect residents.

Causes of Refuse Chute Fires

Besides the common causes of refuse chute fires due to the indiscriminate disposal of lighted materials and act of mischief [4], another potential cause could be one of electrical origin – short circuiting of discarded batteries. Batteries are commonly used to power household items such as clocks and toys. One of the battery types commonly found in households is the 9-volt battery (see **Figure 17**). It has positive and negative terminals close together. If a metal object touches both terminals, it can cause a short circuit. This can generate sufficient heat to cause a fire. Fires involving refuse have happened due to the disposal of 9-volt batteries together with other metal items [13]. SCDF has also responded to similar fire incidents where discarded batteries were consolidated within metal containers as seen in **Figure 18**.



Figure 17. 9-volt batteries



Figure 18. Discarded batteries of various sizes stored in metal containers were involved in fires

Prevention of Refuse Chute Fires

Covering the terminal of batteries using masking tape or electrical tape before disposal may prevent short circuiting which may lead to fires [13]. The public is also urged to be more fire safety conscious and refrain from disposing lighted materials down the refuse chute. For instance, lighted cigarettes must be extinguished fully and charcoal embers must be doused with water before disposal.

References

- [1] Singapore Civil Defence Force, 2011, Fire, Ambulance and Enforcement Statistics, viewed 13 April 2016, https://www.scdf.gov.sg/content/scdf_internet/en/general/news/statistics/_jcr_content/par/download_18/file.res/Fire_Stats_2011.pdf
- [2] Singapore Civil Defence Force, 2012, Fire, Ambulance and Enforcement Statistics, viewed 13 April 2016, https://www.scdf.gov.sg/content/scdf_internet/en/general/news/statistics/_jcr_content/par/download_21/file.res/Fire_Stats_2012_.pdf
- [3] Singapore Civil Defence Force, 2013, Fire, Ambulance and Enforcement Statistics, viewed 13 April 2016, https://www.scdf.gov.sg/content/scdf_internet/en/general/news/statistics/_jcr_content/par/download_24/file.res/SCDF%20Fire%20Stats%202013.pdf
- [4] Singapore Civil Defence Force, 2016, Refuse Chute Fires in Public Housing Estates (2008 – 2010), viewed Nov 2016, https://www.scdf.gov.sg/content/scdf_internet/en/general/publications.html
- [5] Ministry of Manpower, 2010, Singapore Public Holidays for the Year 2011, viewed 13 April 2016, Available at <http://www.mom.gov.sg/newsroom/press-releases/2010/singapore-public-holidays-for-the-year-2011>

- [6] Ministry of Manpower, 2011, Singapore Public Holidays 2012, viewed 13 April 2016, Available at <http://www.mom.gov.sg/newsroom/press-releases/2011/singapore-public-holidays-2012>
- [7] Ministry of Manpower, 2012, Singapore Public Holidays 2013, viewed 13 April 2016, Available at <http://www.mom.gov.sg/newsroom/press-releases/2012/singapore-public-holidays-2013>
- [8] British Standard 1987, BS 476: Part 20: Fire Tests to Building Materials and Structures
- [9] Singapore Civil Defence Force 2010, Interpretation of Fire Code Part 5, viewed 13 April 2016, [http://www.scdf.gov.sg/content/scdf_internet/en/others/download_slides_forfssdseminar26oct2010/jcr_content/par/download_f7a7/file.res/Interpretation%20of%20Fire%20Code%20Part%205%20\(Mr%20Randy\).pdf](http://www.scdf.gov.sg/content/scdf_internet/en/others/download_slides_forfssdseminar26oct2010/jcr_content/par/download_f7a7/file.res/Interpretation%20of%20Fire%20Code%20Part%205%20(Mr%20Randy).pdf)
- [10] Bishan-Toa Payoh Town Council 2005, Town Council News, viewed 13 April 2016, <http://www.btptc.org.sg/E-news/Issues/issue%2067.pdf>
- [11] National Fire Protection Association (NFPA), 2014, NFPA 921 Guide for Fire and Explosion Investigations, Massachusetts: NFPA, p. 17
- [12] Massachusetts Institute of Technology, 2013, Can we safely Burn Used Plastic Objects in a Domestic Fireplace?, Massachusetts Institute of Technology, viewed 13 April 2016, <http://engineering.mit.edu/ask/can-we-safely-burn-used-plastic-objects-domestic-fireplace>
- [13] National Fire Protection Association (NFPA), 9-Volt Battery Safety, viewed 13 April 2016, <http://www.nfpa.org/~media/files/safety-information/safety-tip-sheets/9voltbatterysafety.pdf?la=en>