

# Refuse Chute Fires in Public Housing Estates (2008 – 2010)

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.

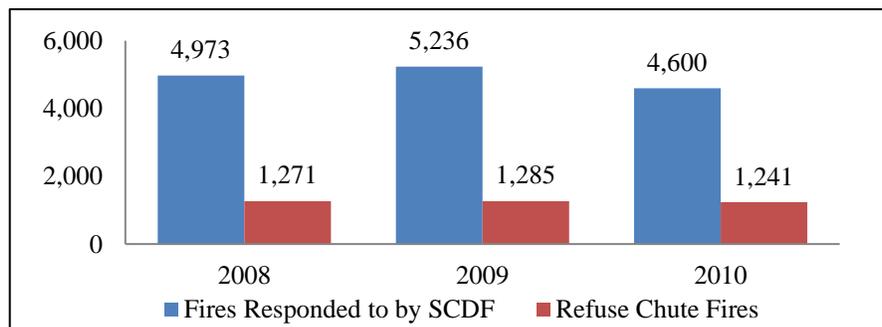
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## Key Findings

- Refuse chute fires constitute about 25% of all fires that SCDF responds to in a year.
- On the average, there are 105 refuse chute fires every month.
- Refuse chute fires constitute about 37% of all residential fires.
- There are more refuse chute fires on Saturdays and Sundays.
- Refuse chute fires occur most frequently from 12 pm – 1 pm. There are 2 smaller peaks at 6 pm – 7 pm and 10 pm – 11 pm.
- Chinese New Year eve sees exceptionally high number of refuse chute fires every year.

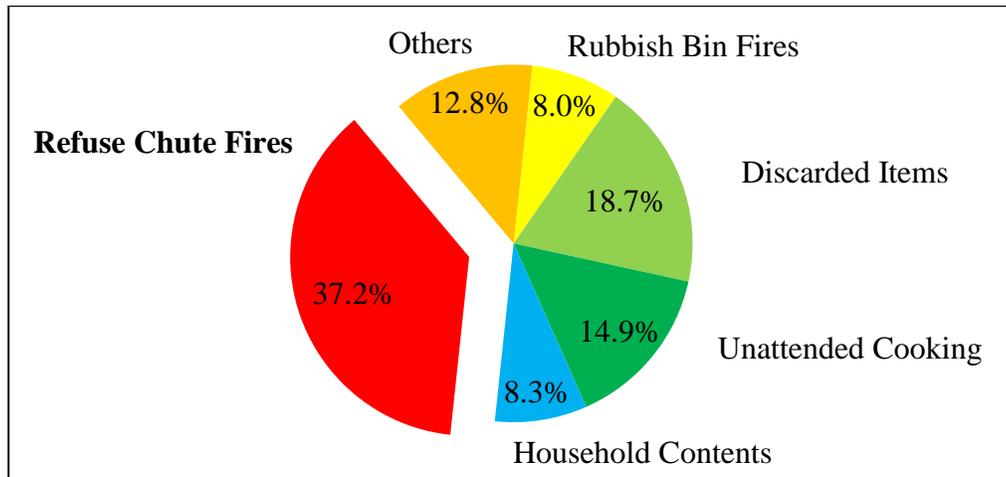
## Number of Refuse Chute Fires

Refuse chute fires constitute about 25% of all reported fires in Singapore as shown in **Figure 1**. The number of refuse chute fires ranged from 1,241 to 1,285 for the 3-year period from 2008 to 2010 [1,2,3]. This works out to an average of 105 cases each month.



**Figure 1. Refuse chute fires (2008 – 2010)**

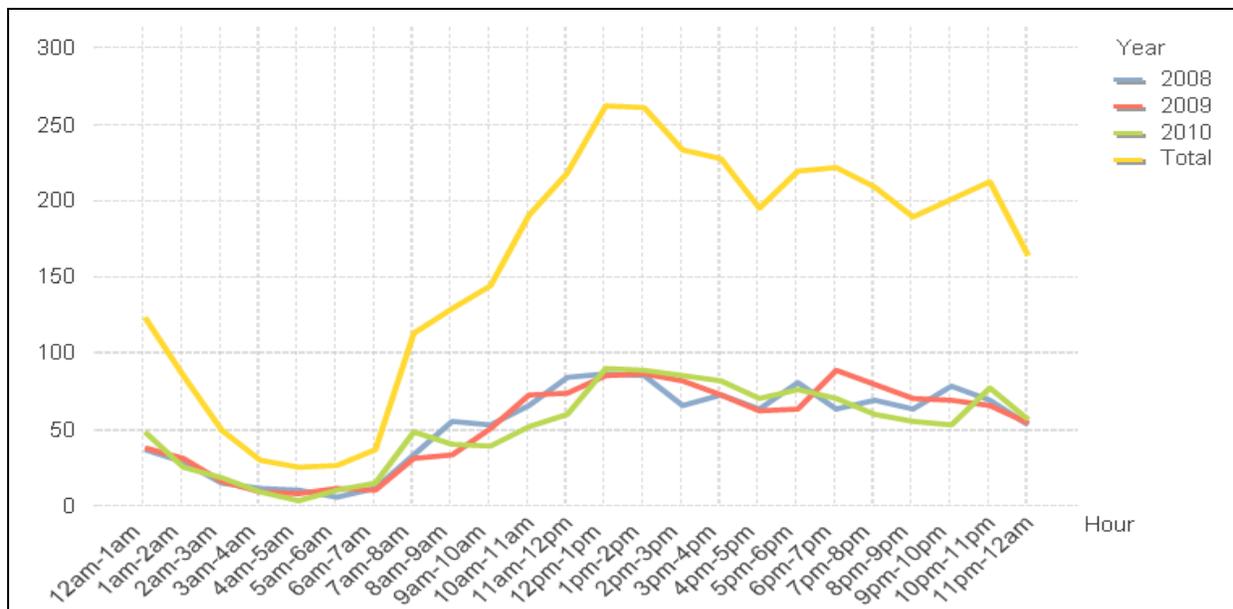
Refuse chute fires also make up the bulk of the fires seen in residential premises. This is followed by fires involving discarded items and fire involving unattended cooking as seen in **Figure 2**.



**Figure 2. Breakdown of residential fires (2008 – 2010)**

### Time of Occurrence

As illustrated in **Figure 3**, the number of refuse chute fires is consistently low in the early morning between 4 am and 7 am. After 7 am, the number of incidents rises sharply and peaks between 12 pm to 1 pm. Thereafter, it decreases gradually, with another 2 localised peaks at 6 pm to 7 pm and 10 pm to 11 pm. From 11 pm onwards, the number of refuse chute fires would start to decline.

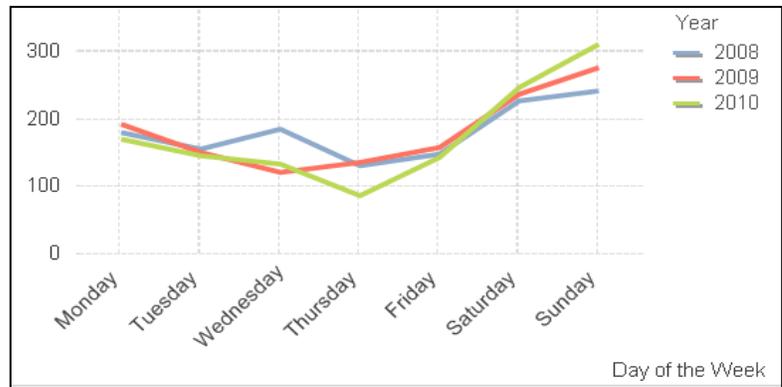


**Figure 3. Occurrence time of refuse chute fires (2008 – 2010)**

### Day of Occurrence

**Figure 4** shows that refuse chute fires are typically lowest on Wednesdays or Thursdays. Thereafter, the number of refuse chute fires would increase and peak on Sundays before it goes on the decline through till mid-week.

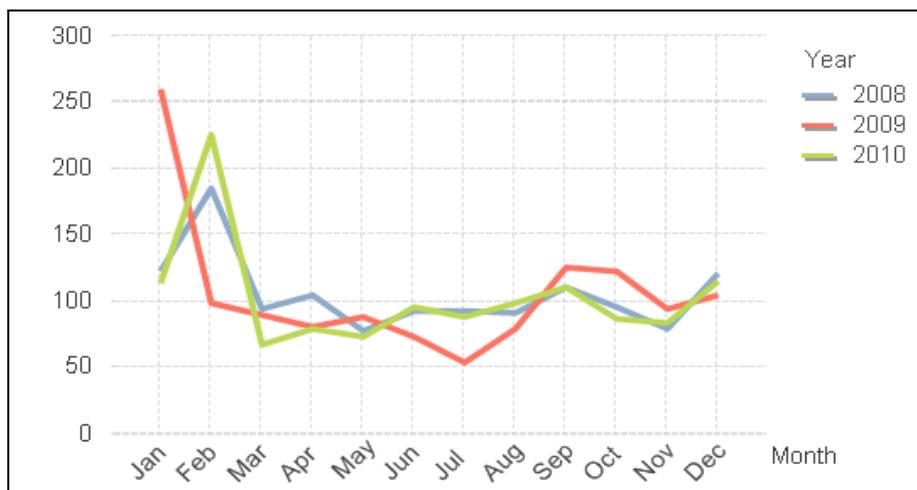
The number of refuse chute fires is much higher on Saturdays and Sundays as these are non-working days where residents are more likely to be at home.



**Figure 4. Refuse chute fires by day of the week (2008 – 2010)**

### Month of Occurrence

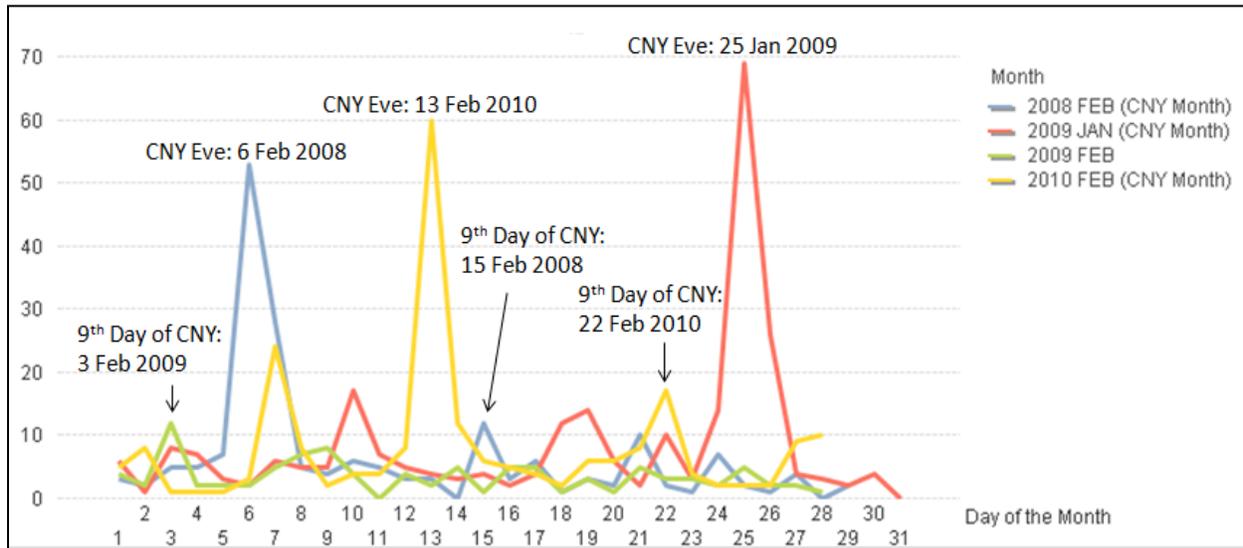
A monthly breakdown revealed that there are exceptionally more occurrences of refuse chute fires in February 2008, January 2009 and February 2010 as shown in **Figure 5**. It is noted that these 3 months all contained the Chinese New Year (CNY) holidays [4,5,6]<sup>1</sup>.



**Figure 5. Refuse chute fires of the months (2008 – 2010)**

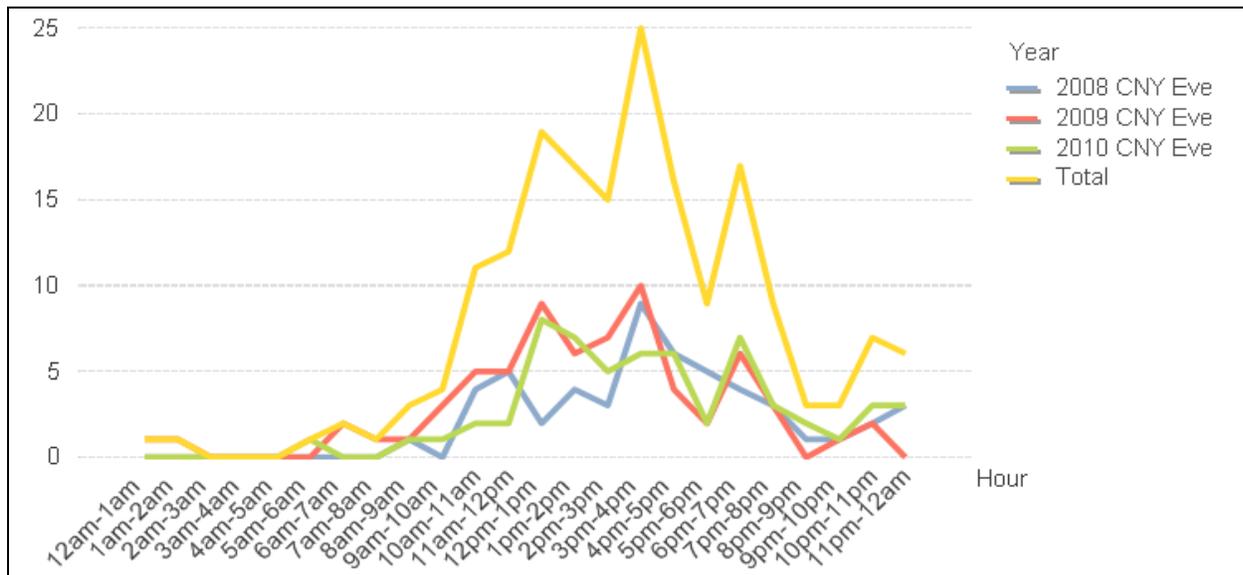
A breakdown by day of the 3 CNY months revealed that there is consistently very high numbers of refuse chute fires on the eve of CNY (see **Figure 6**). A recurring smaller peak is also observed on the 9<sup>th</sup> day of CNY, which coincides with the day where the Chinese pray.

<sup>1</sup> Chinese New Year Holidays fall on 7 – 8 February 2008, 26 – 27 January 2009 and 14 – 15 February 2010



**Figure 6. Refuse chute fires for the CNY months for 2008 – 2010**

As shown in **Figure 7**, the time of occurrence for refuse chute fires on CNY eve is similar to the overall trend as presented earlier where the numbers pick up sharply after 7 am and taper off after midnight. The peaks at 12 pm – 1 pm and 6 pm – 7 pm which were noted from the overall trend are still evident but appear as localised peaks. The highest number of refuse chute fires on CNY eve is registered between 3 pm – 4 pm.



**Figure 7. Time of Occurrence of Refuse Chute Fires on Chinese New Year Eve (2008 – 2010)**

## Type of Refuse Chutes on Fire

There are predominantly 2 types of refuse chute systems in PHEs [7]<sup>2</sup> – Individual Refuse Collection System (IRCS) and Centralised Refuse Chute (CRC) as seen in **Figure 8** and **Figure 9** respectively.



**Figure 8. An IRCS chute**



**Figure 9. A CRC chute with RHE**

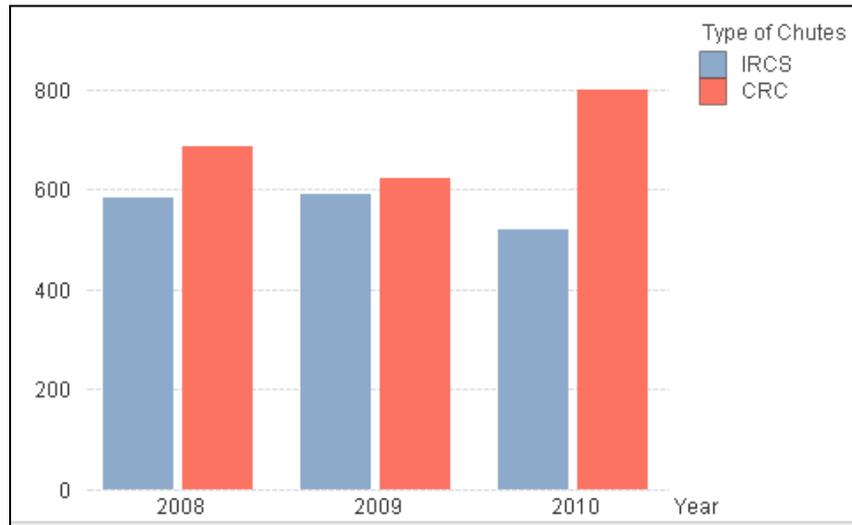
For IRCS, 2 adjacent households would share a refuse chute where they would dispose refuse through a hopper located in their households. The refuse is collected at the bin that is housed at the bottom of the refuse chute. The refuse is then manually collected by maintenance workers and consolidated at bin centres for collection.

For CRC, households would dispose their refuse through a common hopper located at the common area of each floor. The refuse is consolidated in a mechanical Refuse Handling Equipment (RHE) housed inside the CRC bin centre located at the ground floor. The refuse would be conveyed directly onto the refuse truck when it reverses into the CRC bin centre for collection.

There are more fires occurring in CRC than IRCS for 2008 – 2010. In 2010, the difference is noted to be more significant as seen in **Figure 10**.

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<sup>2</sup> The Pneumatic Waste Conveyance System (PWCS) is an automated waste collection system which uses a vacuum type underground pipe network to collect household waste for disposal. According to Housing and Development Board, the system is currently test-bedded in 38 blocks in Yuhua.



**Figure 10. Breakdown of Fires Occurring in IRCS and CRC**

**From the Case Files**

Case #1: February 2010, Kallang

An occupant at level 4 heard ‘popping sounds’ coming from the refuse chute. Not knowing that there was a refuse chute fire, he opened his refuse hopper to investigate.

Upon opening the refuse hopper, it dislodged and injured the occupant. The refuse hopper may have been damaged by the fire and heat. The incident photographs are shown in **Figure 11** and **Figure 12**.



**Figure 11. The affected refuse chute**



**Figure 12. The dislodged refuse hopper**

Case #2: March 2012, Sengkang

SCDF responded to a case of fire at a CRC which had blast effects that damaged the roller shutter of the bin centre (see **Figure 13** and **Figure 14**) and the RHE (see **Figure 15**).



**Figure 13. Blast effects were observed**



**Figure 14. The damaged roller shutter**

2 aerosol cans were recovered amongst the refuse during investigations and 1 of them was observed to have burn marks with its top blown open as shown in **Figure 16**. The blast effects could have come about from the ruptured aerosol can.



**Figure 15. The damaged RHE**



**Figure 16. The recovered aerosol cans**

### Caution!

Most refuse chute fires are believed to start off as smouldering fires caused by discarded lighted materials lodged within the pile of refuse. Ohlemiller [8] and NFPA 921 (Guide for Fire and

Explosion Investigations) [9] cited that when a fire is smouldering, it yields a substantially higher conversion of fuel to toxic compounds than a flaming fire. While refuse chute fires are contained within the refuse chute which is a compartmentalised shaft, the smoke may seep through the refuse hoppers into households to affect residents.

### **Causes of Refuse Chute Fires**

Refuse chute fires are usually caused by the indiscriminate disposal of lighted materials such as embers from charcoal, cigarette butts and lighted incense materials into refuse chutes. Besides the lack of fire safety awareness in residents when disposing lighted materials, refuse chute fires may also be caused by deliberate action.

In a newspaper article [10], it was reported that some residents were accustomed to the old practice of refuse disposal by burning before burying it in their backyards in rural areas. These practices were continued by some even when they were relocated to the PHEs which have resulted in refuse chute fires. The intention was to disintegrate the refuse to reduce volume as well as rid the chutes of pests with the heat and smoke.

Another motivation is possibly one driven by mischief. The Singapore Police Force has mounted several operations in the PHEs that have led to the arrest of refuse chute arsonists [11,12].

### **Prevention of Refuse Chute Fires**

The public is urged to be more fire safety conscious when disposing refuse down the chutes. For instance, lighted cigarettes must be extinguished before disposal, charcoal embers must be doused with water before disposal.

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### **References**

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