

# Introduction of High-Rise Building Firefighting in Hong Kong

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# Background



## Introduction – Hong Kong



# Background



Hong Kong is located at the South-eastern Part of China



# Background



Hong Kong is located at the South-eastern Part of China

- Hong Kong covers Hong Kong Island, Lantau Island, the Kowloon Peninsula and the New Territories, including 262 outlying islands.
- Between Hong Kong Island and the Kowloon Peninsula lies Victoria Harbour, one of the world's most renowned deep-water harbours.
- Total area: 1,106.34 square kilometres
- Land developed: less than 25%
- Country parks and nature reserves: 40%

# Background

British colony 1842-1997

Special Administrative Region of The PRC



# Background



## Demographic Information

- There are 7.2 million Hong Kong people packed in this 1,106 km<sup>2</sup> city
- The 4<sup>th</sup> most densely populated city in the world

# Background



## Demographic Information

### Largest Built-up Urban Areas in the World: 2016

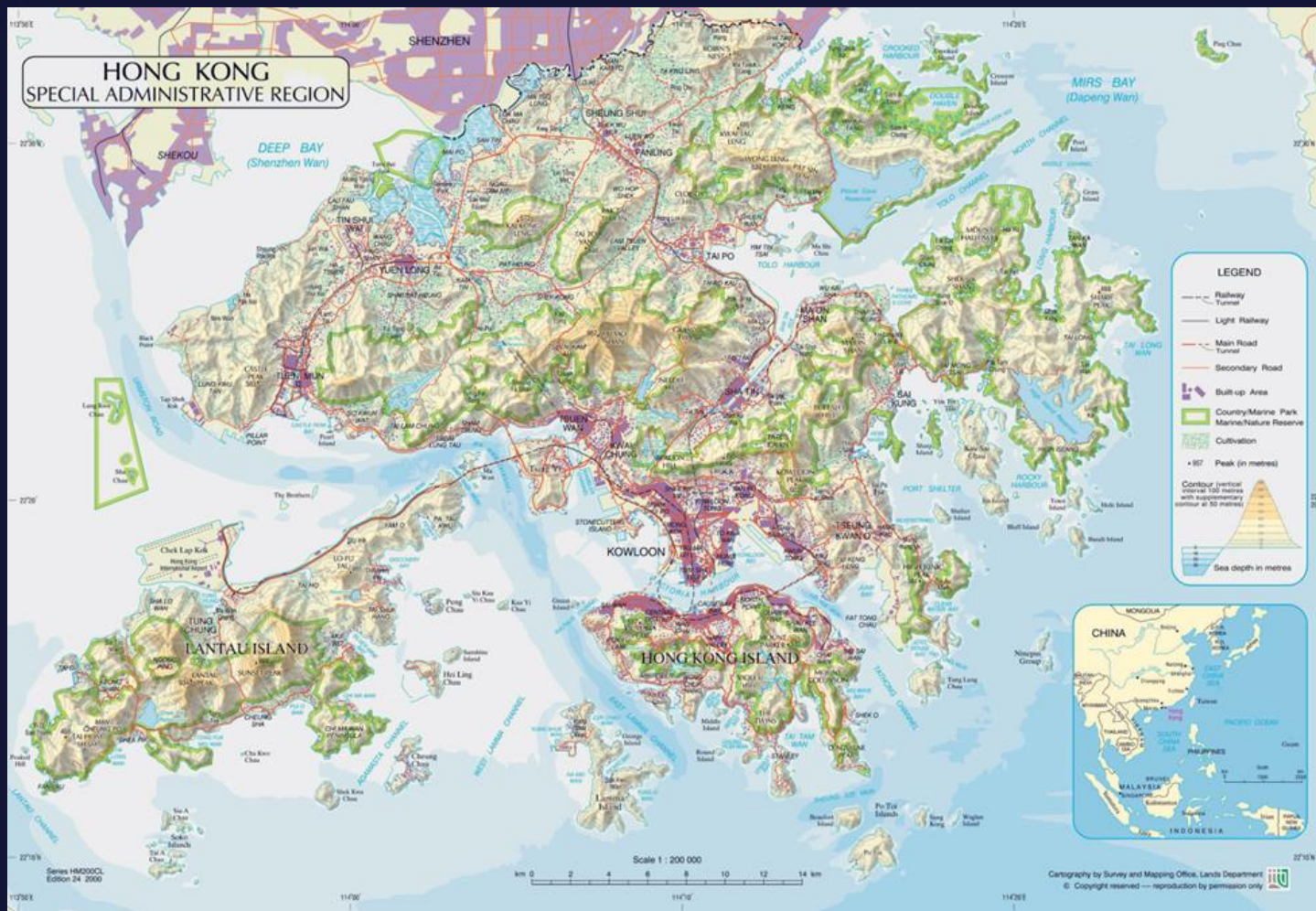
Rank	Geography	Urban Area	Population Estimate	Land Area		Population Density	
				mi2	m2	per mi2	per m2
1	Japan	Tokyo-Yokohama	37,900,000	3,300	8,547	11,500	4,400
9	United States	New York, NY-NJ-CT	21,445,000	4,585	11,875	4,500	1,700
31	France	Paris	10,950,000	1,098	2,848	9,600	3,700
<b>51</b>	<b>Hong Kong SAR</b>	<b>Hong Kong</b>	<b>7,330,000</b>	<b>110</b>	<b>285</b>	<b>66,600</b>	<b>25,700</b>
103	Germany	Berlin	4,105,000	520	1,347	7,900	3,000
104	Australia	Sydney, NSW	4,100,000	786	2,037	5,000	1,900
334	Sweden	Stockholm	1,565,000	160	414	9,500	3,700
417	Finland	Helsinki	1,230,000	247	641	4,800	1,800

*Source: Demographia, World Urban Areas, 13th Annual Edition: 2017:04*

# Background



## Demographic Information





# Background



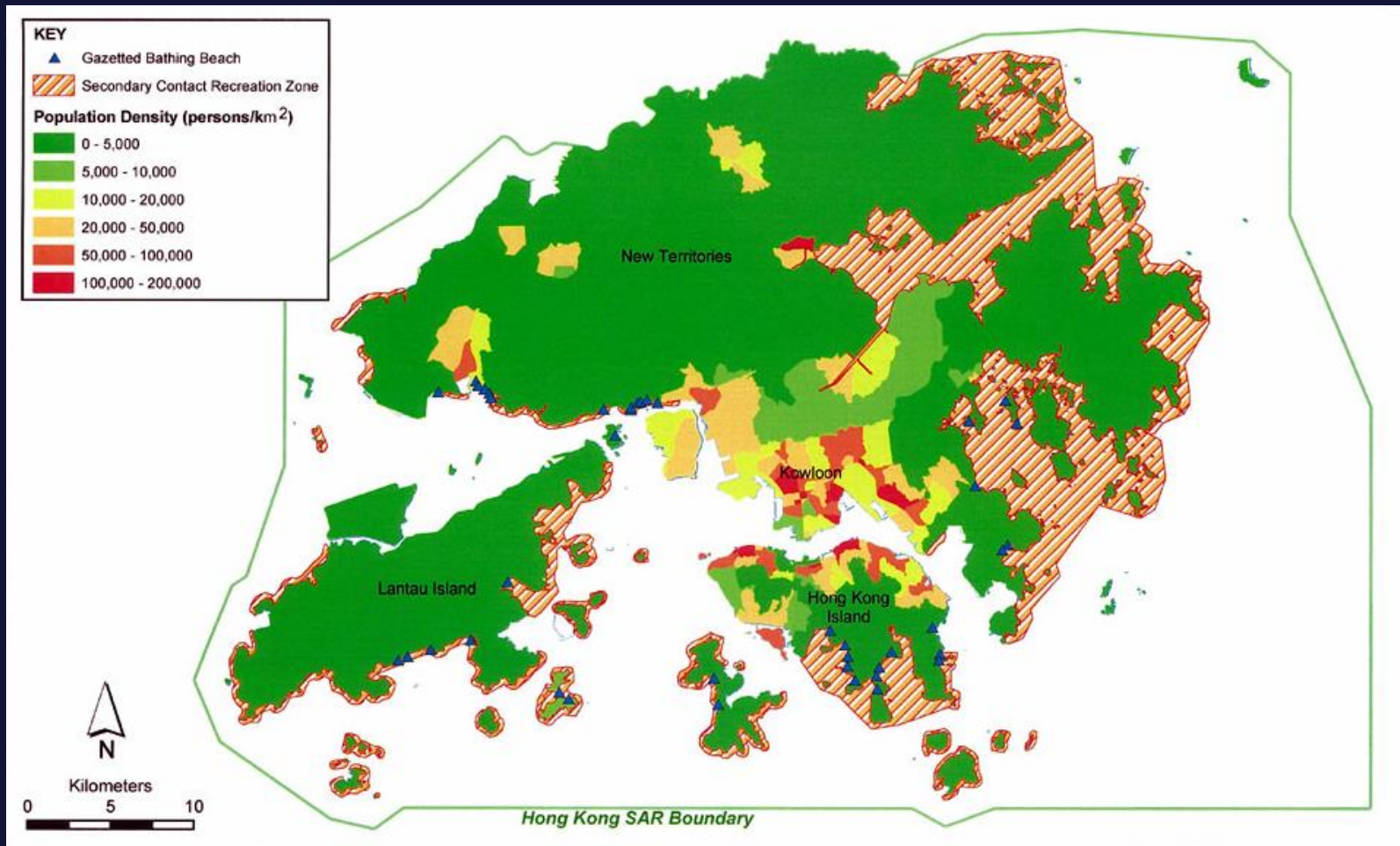
## Demographic Information

Because of historical, political, and geographical reasons, only 23.7% of Hong Kong's land is developed out of which only 6.8% land is used for housing.

# Background



## Demographic Information



# Background



## Demographic Information

- Many of the city's 7 million residents live in high rise apartments
- Hong Kong has an estimated 7,827 buildings more than 35m tall

# Background



## The Hong Kong Fire Services Department



# Background



The Hong Kong Fire Services Department

- 9,561 uniformed and 740 civilian members
- The Department has 626 operational appliances and vehicles
- A fleet of 21 vessels provides firefighting and rescue services within Hong Kong waters

# Background



The Hong Kong Fire Services Department

- There are altogether **81** fire stations, **39** ambulance depots and **6** fireboat stations strategically located to provide emergency responses for all areas.
- The graded response time for building fire calls is **6 minutes for built-up areas** and **9 to 23 minutes** for areas of more dispersed risk/isolated developments.

# Background



## 5.3 火警類型 Classification of Fires

種類 Types	數目 Number
商用樓宇 Commercial premises	393
住宅樓宇 Domestic buildings	1,383
電火 Electric	69
工廠大廈 Factory buildings	99
虛報火警 False Alarms	3,375
屋邨 Housing estates	1,124
社團樓宇 Institutional buildings	163
其他 Others	1,269
公眾地方 Public areas	403
寮屋 Squatter areas	104
山火 Vegetation	537
車輛 Vehicles	271
船火 Vessels	21
警鐘誤鳴 Unwanted Alarms	28,901
<b>總計 Total</b>	<b>38,112</b>

- The Hong Kong Fire Services Department (HKFSD) responded to 38,112 in 2016.
- About 36,000 occurred in high rise buildings

# High Rise Buildings in HK



## Fire Safety Provisions



# High Rise Buildings in HK



## Fire Service Installations

F.S. Installations and Equipment	Commercial		Domestic			Hotel		Industrial		Institutional	
	low rise	high-rise	low rise ≤3 storeys	low rise >3 storeys	high-rise	low rise	high-rise	low rise	high-rise	low rise	high-rise
a. Audio/visual advisory system	Y	Y				Y	Y			Y	Y
b. Automatic actuating devices	Y	Y				Y	Y	Y	Y	Y	Y
c. Automatic fixed installation other than water	Y	Y				Y	Y	Y	Y	Y	Y
d. <b>Emergency generator</b>	Y	Y			Y	Y	Y	Y	Y	Y	Y
e. <b>Emergency lighting</b>	Y	Y			Y	Y	Y	Y	Y	Y	Y
f. <b>Exit sign</b>	Y	Y			Y	Y	Y	Y	Y	Y	Y
g. Fire alarm system	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
h. <b>Fire control centre</b>		Y				Y	Y	Y	Y		Y
i. Fire detection system	Y	Y				Y	Y	Y	Y	Y	Y
j. Fire hydrant/hose reel system	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
k. <b>Fireman's lift</b>	Y	Y			Y	Y	Y			Y	Y
<b>Firefighting and rescue stairway</b>									Y		
Fireman's lift or firefighting and rescue stairway								Y			
l. Portable hand-operated approved appliance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
m. <b>Pressurization of staircase</b>		Y				Y	Y		Y		Y
n. Sprinkler system	Y	Y				Y	Y	Y	Y	Y	Y
o. Static or dynamic smoke extraction system	Y	Y				Y	Y	Y	Y		
p. Ventilation/air conditioning control system	Y	Y				Y	Y	Y	Y	Y	Y

# High Rise Buildings in HK



## Fire Service Installations

Domestic buildings	low rise ≤3 storeys	low rise >3 storeys	High-rise
a. Emergency generator	-	-	Y
b. Emergency lighting	-	-	Y
c. Exit sign	-	-	Y
d. Fire alarm system	-	Y	Y
e. Fire hydrant/hose reel system ★	-	Y	Y
f. Fireman's lift	-	-	Y
g. Portable hand-operated approved appliance	Y	Y	Y

### Domestic buildings

the aggregate flow shall be not less than 900 l/min. (i.e. any 2 FH outlets each with a flow of 450 l/min at a running pressure of not less than 350 kPa)

# High-rise Buildings in HK



## Firefighting Operation

# Firefighting Operations



## Initial Attendance – Building Fires

- All initial calls to building fires are classified as **No. 1 Alarm Fire**; except
- **No. 2 Alarm Fire** for special areas such as: -
  - Water restricted area;
  - Squatter area;
  - Dangerous Goods storage;
  - Large shopping mall;
  - Hospital;
  - Cinema;
  - others

# Firefighting Operations



## Initial Attendance – Hydraulic Platform (HP)



### 1. Senior / Station Officer (Incident Commander)

1. Senior Fireman

4. Fireman

- The crew members will go to the affected floor and obtain water from the fire hydrant outlet from at least 2 floors below;
- Lay hoses to the affected unit and commence firefighting

# Firefighting Operations



## Initial Attendance – Light Rescue Unit (LRU)



### 1. Principal Fireman

1. Senior Fireman

4. Fireman

- The crew members will land all lifts to G/F;
- go to the affected floor with breaking-in tools;
- Set up BA Entry Control Point;
- Break into the affect unit and conduct search and rescue

# Firefighting Operations



## Initial Attendance – Major Pump (MP)



### 1. Station Officer

1. Senior Fireman

4. Fireman

- Obtain water supplies from street fire hydrant;
- Feed Fire service inlets;
- Lay hose from pump outlet to affected floor through unaffected (rear) staircase;
- Set up BA Entry Control Point at rear staircase landing;
- Break into the affect unit and conduct firefighting operation

# Firefighting Operations



Initial Attendance – Turntable Ladder / Snorkel (TL)



## 1. Principal Fireman

1. Senior Fireman / Fireman

- Water Tower;
- Aerial rescue



# Firefighting Operations



## Initial Attendance – Ambulance (Amb)



1. Principal/Senior Ambulanceman

1. Ambulanceman

- Casualty treatment

# Firefighting Operations



Additional Attendance – Major Pump



- Defective Fire Service Installation of the building
- Industrial buildings with no or partially sprinklers protection
- Multiple calls received

# Firefighting Operations



## Additional Attendance

### Search and Rescue (SAR) Group

- The objective of the 'Search and Rescue (SAR) Group Strategy' for high-rise building fire is to **expedite search and rescue in a safe and systematic manner**

# SAR Group



## Mobilizing

- The SAR Group will be turned out when multiple assistance calls were received; or
- Upon request by the initial Incident Commander

# SAR Group



## Formation

- 1 pumping appliance (HP/MP)
- 1 rescue appliance (MRU/LRU)
- 1 Reserve Heavy Pump (RHP)
  - For conveyance of fan



# SAR Group



## Objectives

- Maintenance of smoke free staircase(s) by effecting roof ventilation;
- conduct snatch search and rescue along staircases and common areas on the topmost two floors of the affected building (Task A); and
- Search and Rescue/Evacuation (Task B)

# SAR Group



Strategy – 3-stage approach

- Stage 1
  - Effect **ventilation to the roof** floor; and
  - then conduct search and rescue along staircases and common areas on the **topmost two floors** of the affected building; and

# SAR Group



Strategy – 3-stage approach

- Stage 1
  - Carry out search and rescue/evacuation to the **reported units** with priority of action being accorded to those assistance calls reporting serious life threatening conditions



# SAR Group



Strategy – 3-stage approach

- Stage 2
  - Conduct search and rescue to **common areas and staircases** on **5 floors** above the fire floor

# SAR Group



Strategy – 3-stage approach

- Stage 3
  - Conduct search and rescue/evacuation to common areas and staircases for the **rest of the floors above**

# Firefighting Operations



## Additional Attendance

### Communication Support Team (CST)

- The objective of the CST is to enhance radio communication for crews; and
- Provide information to Senior Commanders at HQ

# Communication Support Team



## Mobilizing

- The CST will be turned out to No. 3 Alarm Fire or above; or
- Upon request by the initial Incident Commander

# Communication Support Team



## Formation

- 1 appliance from designated stations
- The crew will collect the following item from the Mobile Command Unit (MCU)\*
  - Repeater for handheld radios
  - Spare batteries for handheld radio
  - Spare batteries for TIC
  - Video camera

\* Standard attendance for NO. 3 Alarm Fire

# High-rise Buildings in HK



## Difficulties in Firefighting Operation

# Difficulties in Firefighting



Population within building - Population density of Hong Kong: 66,600/km<sup>2</sup>

**Table 2-2 Dwelling Space and Average Dwelling Space Per Person in Hong Kong and Other Selected Cities**

	Hong Kong	Singapore	Seoul	Tokyo	Shanghai	Taipei
Average floor area per dwelling (m <sup>2</sup> )	43.5	86.8	63	64	102	102
Average number of persons per dwelling	2.9	3.5	2.5	1.99	2.97	2.59
Average floor area per person (m <sup>2</sup> )	15	24.8	25.2	32	34.5*/ 17.5#	39

\* refers to floor area which includes public areas such as staircases and common corridor, etc.

# refers to residential area which includes bedroom only, excluding areas of living room, kitchen, lavatory, corridors, etc).

Source: Data based on Ming Pao (3 December 2014)

# Difficulties in Firefighting



Population within building – Bedspace apartment

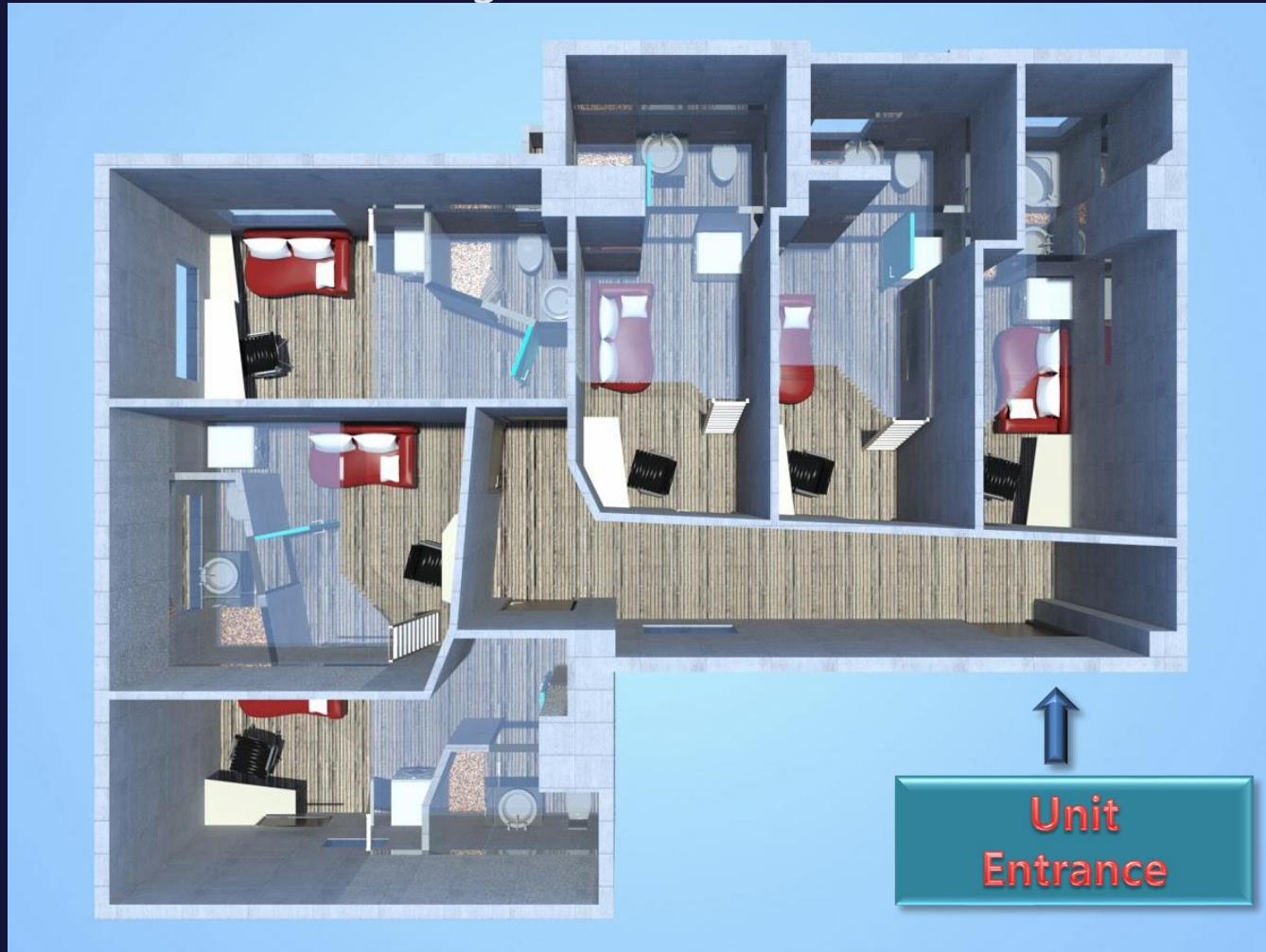




# Difficulties in Firefighting



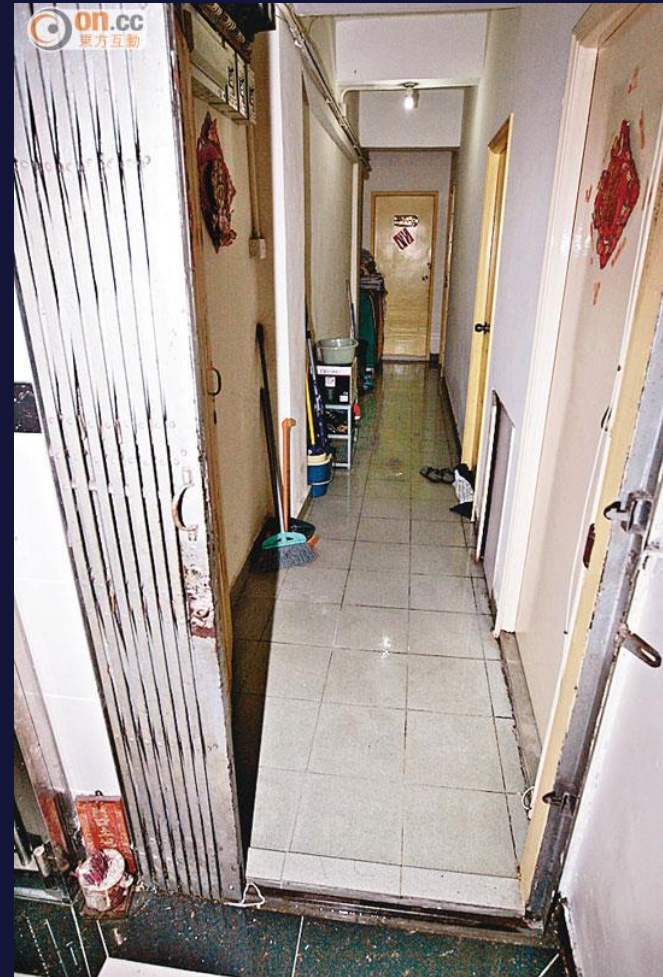
Population within building – Sub-divided Units



# Difficulties in Firefighting



Population within building – Sub-divided Units



# Difficulties in Firefighting



Population within building – Sub-divided Units



# Difficulties in Firefighting



Sing Boards – Obstruction to aerial rescue / firefighting



# Difficulties in Firefighting



Sing Boards – Obstruction to aerial rescue / firefighting



# High-rise Building Firefighting



## Conclusions

# High-rise Building Firefighting



## Conclusion

- Hong Kong is a very unique place
  - High population
  - Small area
  - A lot of high-rise buildings

# High-rise Building Firefighting



## Conclusion

- Good fire protection / building code
  - Most of the building is RCC structure
  - Good compartmentation – prevent fire spread



# High-rise Building Firefighting



## Conclusion

- Hong Kong has good infrastructure and town planning
  - Street fire hydrants
    - In urban area, 50m separation
  - Road network
  - High-rise building must have a major façade assessable by fire appliances

# High-rise Building Firefighting



## Conclusion

- Ample water supplies
  - Street fire hydrant system
  - Wet riser (stand pipe)
- Ample man power
  - Attending appliance
  - Supporting column (SAR, CST etc.)

# High-rise Building Firefighting



## Conclusion

- Challenges
  - Large amount of people;
  - Vertical fire spread (mostly from external)
  - Difficult in external rescue and firefighting

# High-rise Building Firefighting



# High-rise Building Firefighting



# High-rise Building Firefighting



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