



What FSMs need to know about One-way Emergency Voice Communication (EVC) Systems (SS 546:2009 Requirement)

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Why use Fire Alarm System?

(2016 FSM Briefing)



A **Fire Alarm System** is intended to enable a fire to be detected at a sufficiently early stage so that people who are at risk can be made safe either by **Escaping From The Fire**, or by the **fire being extinguished** (also to prevent extensive property damage).

Neither of these measures can be used until people are made aware of fire.

Escaping From The Fire – ‘EVACUATION’

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Why use one-way EVC System?

- ① The primary purpose of the one-way EVC system is to enable announcements to be made, both manually and automatically to individual, or collective groups of zones, to facilitate a **Quick and Orderly Evacuation** of occupants in the building in an **Emergency Situation**.
- ② The effectiveness of the Emergency Voice Communication System depends on the quality of the announcements. It shall be heard **Loud and Clear**. The building shall be zoned such that it shall be possible to make announcements to individual floor. Staircase cores may be group into one zone where appropriate.

One-way EVC system mandatory requirements?

The requirements are specified in :

- ✍ **Code of Practice for Fire Precautions in Buildings 2013 (Fire Code 2013) - by SCDF**
 - **Chapter 8 :**
 - **Building with gross floor area greater than 5000m² or having a total occupant load exceeding 1000 persons or**
 - **Building more than 24m in habitable height**

- ✍ **Code of Practice for Emergency Voice Communication System in Buildings (SS 546-2009) - by Enterprise Singapore**

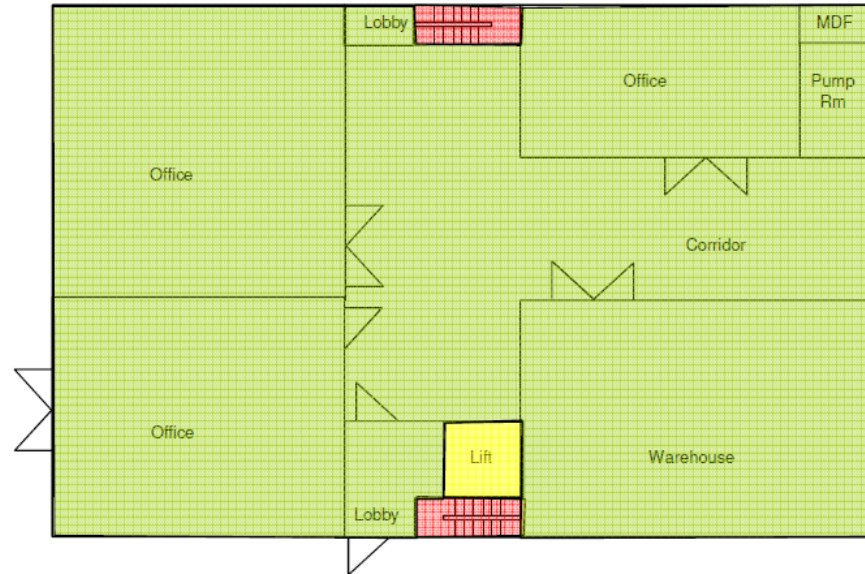
One-way Emergency Voice Communication System - Zoning

2.4.1.6 a

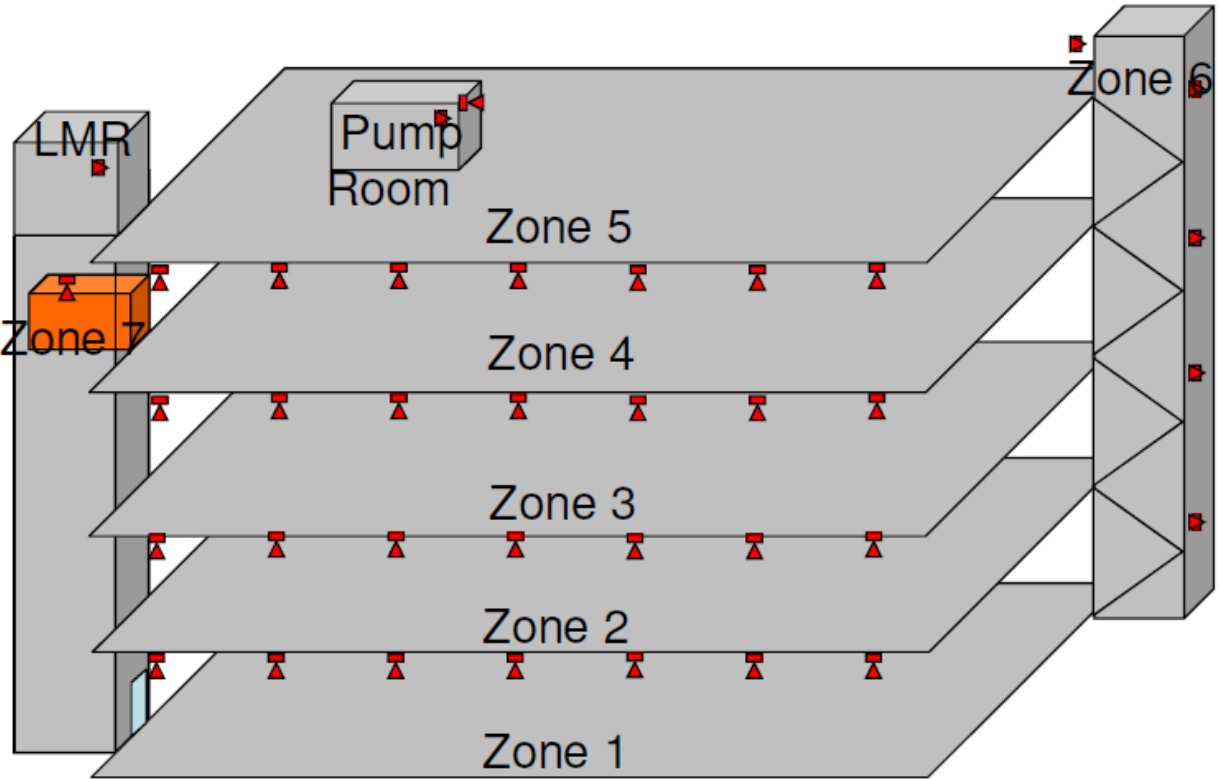
Loudspeakers shall be grouped so that they can be controlled by zone, floor area and escape staircases

zoning requirements:

1. One zone per floor
2. One zone for all staircases



One-way Emergency Voice Communication System - Zoning



What is One-way EVC System made up of?

Components forming the System - 5 Items

- ① Ceiling Loudspeakers
- ② Box Loudspeakers
- ③ Horn Loudspeakers
- ④ Control Station
- ⑤ Emergency Alarm Call Station



One-way Emergency Voice Communication System – Loud Speakers

Loud Speakers - Design

- ① Speaker selection
- ② Estimate required sound level
- ③ Determine speaker spacing
- ④ Speaker layout
- ⑤ Determine speaker load
- ⑥ Determine speaker cable size



What is One-way EVC System made up of?

Loudspeakers



Areas required to install sufficient quantity of loudspeaker.

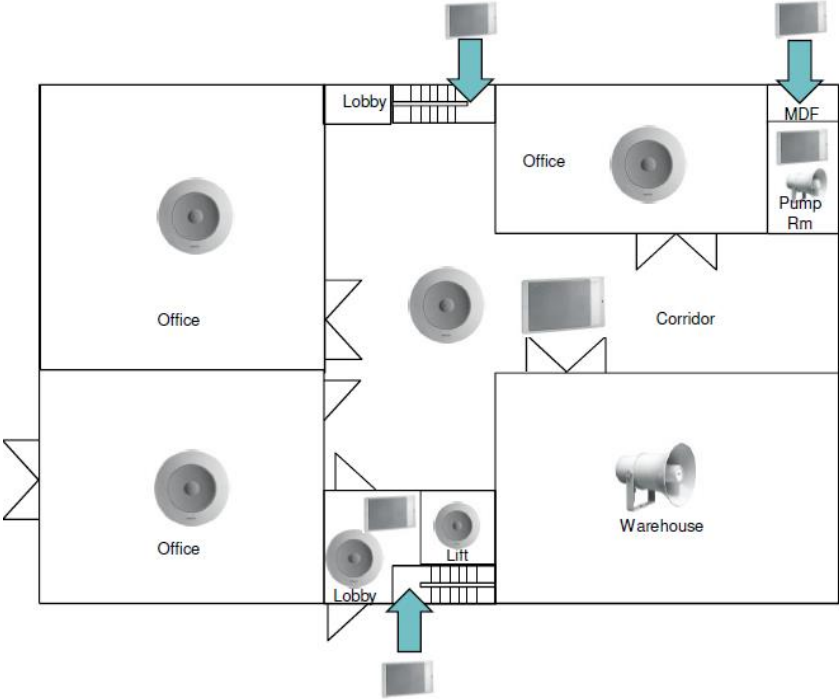
- Habitable room
- Basement areas
- Escape staircases
- Staircase lobbies and lift lobbies forming parts of the means of escape
- Main entrance lobby
- Corridors leading to exits
- Service areas where people may be working
- Area of refuge
- Assembly areas
- Lift cars and
- Any other locations as may be required by the relevant authority

One-way Emergency Voice Communication System – Loud speakers

- Areas requiring one-way emergency voice communication (2.4.1.2.2) :
- habitable rooms
 - basement areas
 - escape staircases
 - staircase lobbies
 - main entrance lobby
 - corridors
 - service areas
 - areas of refuge
 - assembly areas
 - lift cars
 - any other areas required by authorities

Speaker Selection

Common Types of Loud Speakers



One-way Emergency Voice Communication System – Loud Speakers

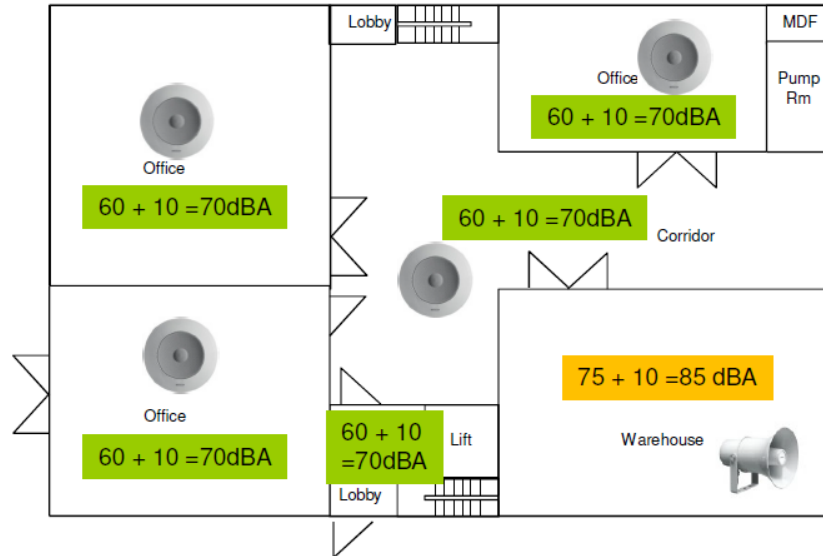
Typical Ambient Noise Level (SS546)

Location	Typical Level (dBA)	Comments
Domestic kitchen	45	quiet, no activity
Rural garden	50	good breeze in trees, birdsong
General offices	50	financial institution
Suburban train carriage	58	slow speed, quiescent
Restaurants/canteen	65	financial institution
Call centre office	67	financial institution
In a carriage of a train	69	high speed (app. 160km/h)
Saloon bar of pub	70	typical weekday crowd
Football match crowd noise	95	30,000+ seater stadium
Pop concert (indoors)	100	at the mixer riser

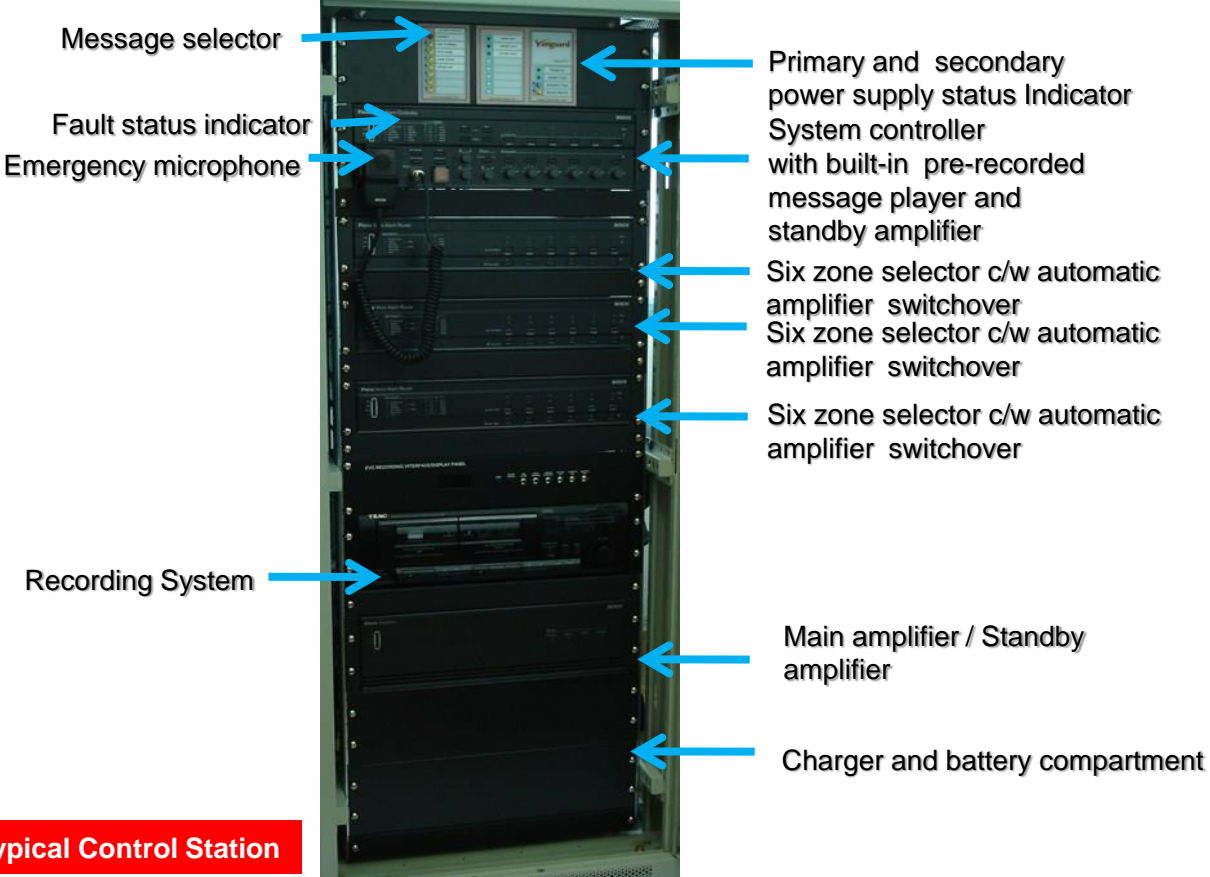
2.4.1.2.3

Minimum sound level 65dBA or 10dBA above ambient, whichever higher but shall not exceed 105dBA

Estimate Required Sound Level



One-way Emergency Voice Communication System – Control Station



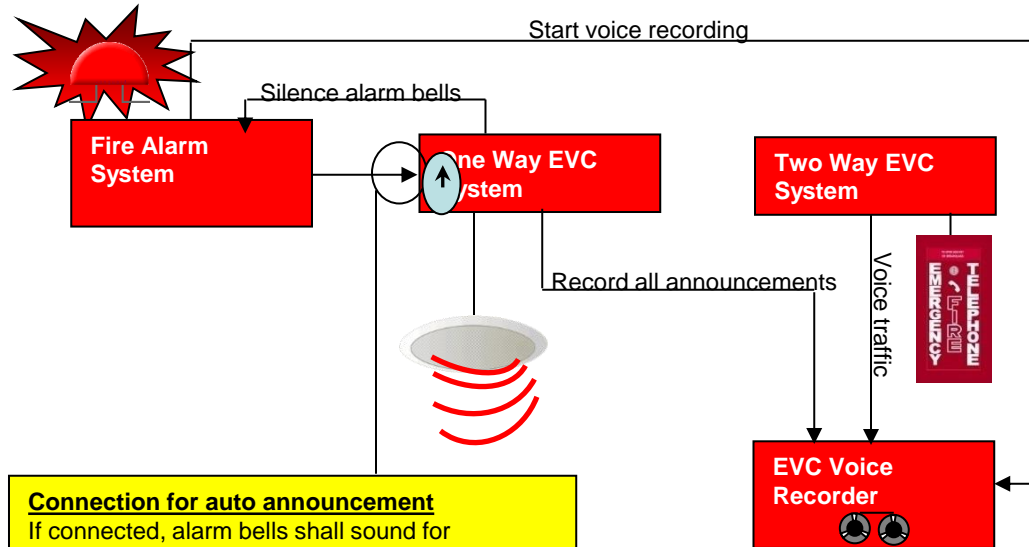
A Typical Control Station

What is One-way EVC System made up of?

Emergency Alarm Call Station



Interfacing to Fire Alarm & Messages



Connection for auto announcement

If connected, alarm bells shall sound for 15seconds before voice announcement is broadcasted.

If EVC not provided, alarm bells shall sound for 3 minutes before it can be silenced.

Interfacing to Fire Alarm & Messages



Pre-recorded Message

The recording should be made, where possible, by persons trained in the proper use of the microphone

Alert messages shall be broadcast in a minimum of 2 cycles and continue until manually silenced or superseded, manually or automatically, by an evacuation message or by a 2nd alert messages

Evacuation messages shall be broadcasted in a minimum of 2 cycles and continued until manually silenced.

NOTE: Time gap between the 2 cycles and the next two cycles are important.

- * Too short – listeners might not realize that the message has ended
- * Too long – listeners' safety could be put at risk while they await a repeat message for clarification

Interfacing to Fire Alarm & Messages

Pre-recorded Messages



1 Alarm Activated with chime.wav



2 False Alarm with Chime.wav



3 Evacuate with chime.wav



4 Back to normal with chime.wav



5 Alarm Testing with Chime.wav



6 Testing Over with Chime.wav

Interfacing to Fire Alarm & Messages



Live Voice Message

Only by operators trained in the proper use of the microphone

The operator should broadcast agreed standard messages, reading from a readily available and durable script, except when a fire officer or trained person in authority needs to make special announcements. Live voice emergency messages should be preceded by a pre-announcement tone.

Alert and evacuation messages shall be broadcasted in a minimum of 2 cycles.

NOTE: The duration, format and wording of an emergency message are important.

*** If the message is too long, listeners might not take in all the details and may await repeats.**

*** If the messages is too short, it might not convey sufficient information.**

Interfacing to Fire Alarm & Messages

Important Note



When any message is announced, the Alarm Bells and Strobe Light shall not be activated

Sounding of Alarm Bells will affect the **Clarity** and **Intelligibility** of the message being broadcasted

Strobe Light shall only activated when Evacuation Message is announced for hearing impaired to Evacuate

Interfacing to Fire Alarm & Messages

Sample Messages

Assuming a fire occurs at the 31st storey of a 50-storey building, the fire safety committee (usually leads by the Fire Safety Manager during fire emergency) of the office building executes the Fire Emergency Plan using the One-way and Two-way EVC systems to communicate between Fire Command Centre (FCC) and various storeys.

The fire emergency begins with the main fire alarm panel located at FCC indicating that an alarm on 31st storey has been activated.

Interfacing to Fire Alarm & Messages

(A) Alert Messages

i. FCC TO ALL STOREYS (by one-way EVC System)

“Attention –drawing signal’

“Ladies and gentlemen, your attention please.

A fire alarm has been activated in the building.

We are investigating the cause of the alarm.

Please remain calm and standby for further instructions.”

- (REPEAT)



Interfacing to Fire Alarm & Messages



(A) Alert Messages

If recorded alert message is activated by fire alarm signal, the alert message should continue until manually silenced or until superseded, manually or automatically, by an evacuation message or by a 2nd alert message.

Interfacing to Fire Alarm & Messages

(A) Alert Messages

ii. FCC TO 31ST STOREY (by one-way EVC System)

“Attention please, will the Fire Warden on the 31st storey report the cause of the alarm?”



- **(REPEAT)**

Interfacing to Fire Alarm & Messages

(A) Alert Messages

iii. FIRE WARDEN (31ST STOREY) TO FCC (by two-way EVC System)

“A fire has occurred on this storey”



- (REPEAT)

Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

iv. FIRE WARDEN (31ST STOREY) TO FCC (by two-way EVC System)

“The fire is spreading. 1st phase or partial evacuation is necessary.”



- **(REPEAT)**

Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

- v. **FCC TO 29th, 30th, 31st, 32nd and 33rd STOREY**
(by one-way EVC System)

**“Ladies and gentlemen, your attention please.
There is a fire emergency situation on the 31st storey.
All occupants please evacuate now, using the nearest exit
staircase.”**



- **(REPEAT)**

Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

Following the above announcement, fire wardens on 29th, 30th, 31st, 32nd and 33rd storey will lead the occupants on their respective storeys down the exit staircase to the assembly area.

The fire wardens will report clearance through the **two-way EVC System** before leaving their respective storeys for the assembly area.

Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

- vi. FIRE WARDENS OF 29th, 30th, 31st, 32nd and 33rd STOREY TO FCC (by two-way EVC System)

“ _____ storey is cleared”



Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

vii. FCC TO ALL OTHER STOREYS (by one-way EVC System)

“Ladies and gentlemen, your attention please.
SCDF has been informed of the emergency situation
and is on its way.”



- (REPEAT)

SCDF attends to the fire situation and brings it under control.

Interfacing to Fire Alarm & Messages

(B) Evacuation Messages

viii. FCC TO ALL OTHER STOREYS (by one-way EVC System)

“Ladies and gentlemen, your attention please. The fire emergency situation in the building is now under control. You may now resume your normal duties.”



- (REPEAT)

Interfacing to Fire Alarm & Messages



(B) Evacuation Messages

If the fire situation is not brought under control, the rest of the storeys will be evacuated on subsequent phases depending on the situation.

Notwithstanding the above, total evacuation may be declared in extreme cases.

Hence, the one-way and two-way EVC systems can be used by various stakeholders (Fire Safety Manager, Fire Wardens and SCDF Officers) to communicate from FCC to the respective storeys for phase evacuation (and/or total evacuation) of the building.

One-way EVC vs PA System

- **Public Address (PA) System can not be used as One-way EVC System as it does not comply with all the technical and supervisory requirement stated in SS546:2009. – Fire resistance cable, back up power supply and standby amplifier etc.**

Maintenance

① Objectives

to ensure continuous reliability of the EVC system

② Responsibility

building owner or owner representatives

- to engage manufacturer's representative or
- competent contractor
- owner representative with suitable experience and special training

Regular Testing and Inspection

As per SS 546-2009 Requirements



Inspection and testing of
One-way EVC System
at intervals not exceeding 3 (three) months.

Testing of One-way EVC System

Test the system in accordance with the following at intervals not exceeding **three months**:

- Measure the time required for the system to be capable of broadcasting in an emergency mode by the operator, or automatically on receipt of a signal from a fire or other detection system (where provided).
- Test that all non-emergency functions are disabled during emergency operation.



Testing of One-way EVC System

- Test that the system is able to broadcast warning and speech signals in one or more areas simultaneously.
- Ensure that speech intelligibility and sound pressure level requirements are satisfactory.
- Test that the system operator is able to receive indications of the correct functioning or otherwise.



Testing of One-way EVC System

- Check the standby battery power source to ensure that its capacity is adequate to meet the calculated requirements.
- Test that the failure of the communication link between the fire alarm system and the EVC is reported as a fault (where provided).



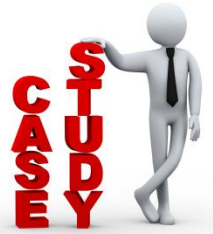
Testing of One-way EVC System

- Test to ensure that messages can be transmitted over all the loudspeakers using the microphone at the fire command centre.
- All loudspeakers shall be checked by actuating them selectively and collectively from the fire command centre.
- Where provided, all auxiliary functions should be tested.



“EVACUATION”

CASE STUDY



During a recent inspection by SCDF at a the Shopping Mall.

The exit doors with Electromagnetic (EM) locking device linked to the alarm system failed to automatically unlock when the building fire alarm was activated.

The evacuating shopper didn't break the glass of the emergency release button to unlock the door manually. This manual emergency release is a requirement by standard for all exit doors with EM lock.

Instead he left the exit staircase to look for alternative exits as seen from the CCTV. However before he can proceed further, the false alarm announcement was made and occupants resume their activities in the shopping mall.

The building manager and FSM explained that the software programme which controls the EM-locking device has been manually switched off. This should not be the case.

Any software installed in the interfacing PC / Graphic Station should be at the back end for access only by authorized personnel familiar with the system design. The operation of the interfacing PC / Graphic Station shall not affect the Fire Alarm System operation at all time.

A **Fire Hazard Abatement Notice** had been issued to the building to alleviate the fire safety non-compliance. **Notice of Fire Safety Offence** was also issued to the Building Owner and FSM.

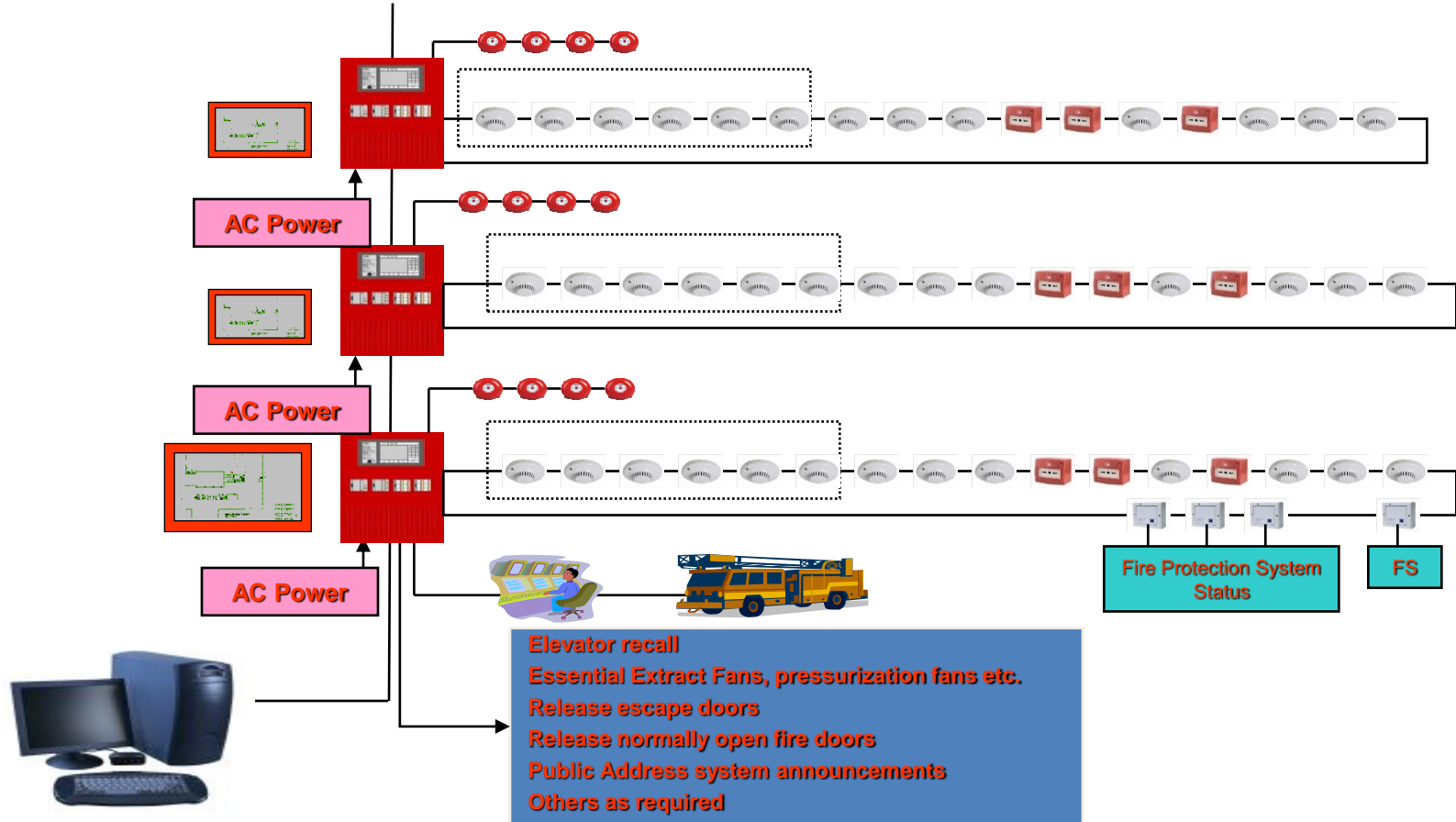
SCDF has inspected and tested the EM locking devices and confirmed that all exit doors of the buildings are in order
i.e. the EM locks will be released automatically on fire alarm activation.

“EVACUATION”

Critical system interface with FAS affect ‘EVACUATION’:

- Lift home to designated safe level – alternative landing
- EM lock releases for escape door / shutter
- EM lock releases for normally open fire doors
- Activate Smoke Control, Essential Extract Fans, Pressurization Fans, etc.
- Interfacing PC / Graphic Station function does not affect FAS operation
- BMS is to provide surveillance and monitoring, FAS shall operate independently at all times.

Typical Addressable Fire Alarm System Configuration





**Thank You
for your attention**