

REVIEW ON SAFETY CODES RELATING TO KARAOKE ESTABLISHMENTS AND FIRE SAFETY MANAGEMENT

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ABSTRACT

Consequent to an arson fire occurring in a karaoke bar in the Hong Kong Special Administrative Region (HKSAR, formerly Hong Kong), the incident has aroused considerable public concern about the safety aspects of karaokes. A unified control scheme on the safety aspects of karaokes has been proposed by the SAR Government with a consultation paper issued. New regulations proposed in that consultation paper are reviewed, with references to the existing safety regulations for karaokes. The three points most concerned by the karaoke industry are outlined with the possible consequences of implementing these new regulations. In particular, the effect of increasing the corridor width from 1.05 m to 1.2 m on the fire environment is discussed with the aid of the two-layer zone model FASTLite. Finally, the importance of fire safety management is pointed out with a preliminary proposal.

1. INTRODUCTION

Karaoke has been a popular public entertainment in the Hong Kong Special Administrative Region (HKSAR, formerly Hong Kong) for over ten years. More than 400 karaokes have been registered since 1990. They are usually located at basement storeys, low-rise, high-rise commercial buildings and hotels. Each karaoke has its own style, decoration, group of customers and acoustic instrumentation. In most cases, food, snacks, beverages and wines are served. These lounges are regarded as ideal places for social gathering. It is likely that karaokes can maintain their business even under the Asian economic depression as they attract customers from a wide range of age groups.

The 1997 arson karaoke fire [1] has attracted much public attention on the safety provisions of karaokes. It is probably because of the high land price and for customer privacy, karaokes are partitioned into small boxes accessed through long and narrow corridors.

Surprisingly, there are no specific regulations on karaoke safety. The SAR government is now beginning to consider seriously the safety aspects. At the moment, safety facilities for accidental fires in karaokes are mainly monitored by the Buildings Department (BD) and the Fire Services Department (FSD). A licensing system under public entertainment regulations is considered to be more effective in monitoring karaokes. Before implementing regulations, a "Consultation paper on licensing control of karaoke establishments" [2] was issued for soliciting different opinions.

Before making comments on that consultation paper [2], a review study comparing the current practice with the proposed regulations is necessary. Since no big accidental fires in karaokes were reported in the past years except the arson case in 1997, the existing safety schemes, both regulations and operational practices, are quite satisfactory in dealing with accidental fires. Therefore, whether the target of the SAR Government is to control the problem of 'accidental fires' or 'arson fires' has to be spelled out clearly, bearing in mind that the associated cost will be very expensive.

2. THE KARAOKE FIRE

A tragic fire broke out in a karaoke on 25 January 1997, killing 17 people [1,3-5]. The karaoke occupied four levels in a 18-storey high-rise commercial building [1], with 29 boxes on the second floor and 31 lounges on the third floor [4]. As reported, the karaoke was attacked by two ignited Molotov cocktails, which were hurled into the stairway at the first level and the lounge lobby at the second level. Only sparks and small volume of smoke were reported initially, but fire spread in a few minutes. The alarm was sounded at 3:59 a.m. and the firemen arrived at 4:03 a.m. Flames spread quickly to the upper levels through the staircases with several explosions. The fire officers suspected that it was an arson fire because of the fast rate of fire spreading in the club [1], appearing due to fuel spillage rather than just burning furnitures or ordinary combustible items. Flames were found coming out of the windows with glass broken into pieces and fell like a shower. Large volume of smoke spread from the corridors into the small karaoke boxes through the air ducts and vents

of the mechanical ventilation and air-conditioning (MVAC) systems.

There were 80 customers and 20 staff inside the karaoke, all trying to escape through the corridors filled with smoke. Because the boxes were designed with sound insulation and the people were singing loudly, the fire alarm signals were not noticed until some customers discovered the fire accidentally while looking through the small window of the door [5]. People were then very frightened and yelled for help. As the corridors were full of smoke, they were trapped in the rooms and corridors of the three upper levels. The management staff paid great efforts to help customers evacuate but failed.

Over 100 firemen, 15 fire engines, 4 water jets, 8 breathing-apparatus teams and a 50 m hydraulic ladder were gathered by 4:07 a.m. There were 58 people who managed to escape by themselves and 42 people (20 from the rooms on the fourth level; 7 from the third level; and 15 from the corridor on the second level [1]) were rescued by the hydraulic ladder from the rear staircase of the building. It demonstrated that the FSD is very efficient and the firemen are well-trained. Unfortunately, there were 11 women and six men with ages between 16 and 42 killed and another 13 people injured. Moreover, the karaoke was extensively damaged. The possible reasons for casualties were due to the large volume of smoke liberated and the fast fire spreading rate throughout the building.

3. EXISTING CONTROL AND LEGISLATION

At present, the fire regulations applied to karaokes are grouped under public entertainment such as those for general restaurants. A summary on the existing regulations on karaokes is listed in Table 1 [6-35]. These may be regarded as the basic guidelines covering the fundamental aspects on fire, structure, health and public safety [36]. Karaokes operating under a Business Registration Certificate (BRC) [27] are controlled only by the requirements applicable to the buildings in which they are located [2]. Fire exits and safety installations are governed by the two departments: BD and FSD.

In 1991, karaoke lounges were allowed in residential blocks without the necessity to apply for a fire safety permit [37]. The only regulation applicable to these lounges is that the windows should not be sealed. However, complaints made to the Environmental Protection Department (EPD) on the noise produced were recorded [37].

Karaokes opened jointly with or in restaurants are issued with the General Restaurant (GR) Licence [28] or the Light Refreshment Restaurant (LRR) Licence [29], under the Public Health and Municipal Services Ordinance (Cap. 132) granted by the Provisional Urban Council and Provisional Regional Council ('Municipal Councils'). Those located in clubs or club-houses are registered with the Certificate of Compliance under the Clubs (Safety of Premises) Ordinance (Cap. 376) [30], and so are licensed by the Office of the Licensing Authority of the Home Affairs Department (HAD). Those in hotels or guesthouses having the Hotel or Guesthouse Licence under the Hotel and Guesthouse Accommodation Ordinance (Cap. 349) [31] are also licensed by the Office of the Licensing Authority, HAD.

Some karaokes may have the Liquor Licence or Club Liquor Licence [32,33] issued under the Dutiable Commodities (Liquor) Regulations, Dutiable Commodities Ordinance (Cap. 109), by Liquor Licensing Boards of the Provisional Urban and Regional Councils.

Others may just be licensed with the BRC [27] under the Business Registration Ordinance (Cap. 310), registered at the Business Registration Office of the Inland Revenue Department (IRD). According to statistical data in 1997 [38], there were 209 karaokes without any other licences other than a BRC.

4. CODES REVIEW

Regulations on fire safety and ventilation safety aspects are briefly reviewed. In the HKSAR, fire safety is ensured by the implementation of various statutory regulations on building protection and on the provision of active fire services installations. The systems are mainly responsible by the FSD while the Building Authority (BA) undertakes the responsibilities for the safety aspects on the building structures and evacuation routes. For the ventilation safety aspects, the provision of MVAC systems in karaokes is also discussed.

- **Building protection:**

Fire compartments are spaces enclosed by fire barriers on all sides [e.g. 20]. They can limit fire spread; restrict fire severity by limiting the available oxygen amount; keep occupants away from the fire origin and allow more time for occupants to escape. The fire-resistance period of the construction materials should be long enough to allow people to escape.

Protected means of escape are protected corridors, lobbies and staircases as mentioned in the Means of Escape (MoE) Code [9]. Obstruction to means of escape is liable to a fire hazard under the Fire Services Ordinance

(Cap. 95) [12]. Goods stored in common areas may hinder the egress of occupants, impede the rescue by the fire fighting operations and help fire spread.

Table 1: Codes and licences related to existing karaokes

Licences Locations	Fire safety aspects	Ventilation safety aspects	Other aspects
HKSAR	Building protection: Buildings Ordinance, Chapter 123 (Cap. 123) [6] Building (Planning) Regulations, Chapter 123 subsidiary legislation (Cap. 123 sub. leg.) [7] Code of Practice for Fire Resisting Construction [8] Code of Practice for the Provision of Means of Escape In Case of Fire (commonly known as the MoE Code)[9] Code of Practice for the Provision of Means of Access for Firefighting and Rescue Purposes [10] Active systems: Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection and Testing of Installations and Equipment (The Code) [11] Fire Services Ordinance (Cap. 95) [12] Fire Service (Installations and Equipment) Regulations (Cap. 95 sub. leg.) [13] FSD Circular Letter No. 7/95, Automatic fire detection system - Design and maintenance considerations [14] Fire Safety Standards for General (Fast Food) Restaurants (Explanatory Notes/ Standard Requirements/ Fire Precautions) PPA/101(D)- 1, 2 & 3 [15]	Building (Ventilating systems) Regulations (Cap. 123 sub. leg.) [21] Ventilation (Urban Council) By-laws (Cap. 132 sub. leg.) [22] Ventilation of Scheduled Premises (Urban Council / Regional Council) By-laws (Cap. 132 sub. leg.) [23] FSD Circular Letter No. 1 (Vent)/90, Changes of services provided by the FSD in respect of ventilating systems [24] FSD Circular Letter No. 2/90, Ventilation/ air conditioning control systems [25]	Business Registration Certificate (BRC) [27] General Restaurant (GR) Licence and Provisional GR Licence [28] Light Refreshment Restaurant (LRR) Licence [29] Certificate of Compliance for clubs [30] Hotel or Guesthouse Licence [31] Liquor Licence [32] Club Liquor Licence [33] Regulations 162(1) and 162(3) of the Places of Public Entertainment Regulations (Cap. 172) [34] Food Business (Urban Council / Regional Council) By-laws (Cap. 132 sub. leg.) [35]
Others	British Standard (BS) 476 - Fire tests on building materials and structure, Part 7, Method of test to determine the classification of the surface spread of flame of products [16] BS 5306 - Fire extinguishing installations and equipment on premises, Part 2, Specification for sprinkler systems [17] BS 5499 - Fire safety signs, notices and graphic symbols, Part 1, Specification for fire safety signs [18] BS 5588 - Fire precautions in the design, construction and use of buildings, Part 4, Code of practice for smoke control using pressure differentials [19] National Fire Protection Association (NFPA) 101 - Life Safety Code [20]	American National Standards Institute/ American Society of Heating, Refrigeration and Air-conditioning Engineers 62-1989, Ventilation for acceptable indoor air quality [26]	

- Fire services installations:

Fire services installations should be able to minimize fire damage, protect life and property. Their functions are to detect and extinguish fire, give warnings and ensure safe egress of occupants. Typical active fire services systems are based on the Code [11] which was updated in 1998. According to the Code, different premises having different functions should possess the minimum installations specified. The BA under the Buildings Ordinance (Cap. 123) [6] will not approve the layouts of the premises if they do not meet the minimum requirements.

Typical active systems required for existing premises such as basement storeys, low-rise, high-rise commercial buildings and hotels, in which karaokes are located are summarized in Table 2 [11]. They are also described in the codes [7,9,13,14,16-19] with a summary shown in Appendix A.

- Ventilation safety aspects:

Control of the MVAC systems should be actuated automatically by smoke detectors and manually backed up so that smoke and contaminated air generated in the fire compartments can be confined. In addition to the statutory requirements in the Code [11], the Building (Ventilating Systems) Regulations (Cap. 123 sub. leg.) [21], the Ventilation (Urban Council) By-laws (Cap. 132 sub. leg.) [22] and the FSD Circular Letter No. 1 (Vent)/90 [24] should be followed. Under the Food Business (Urban Council/Regional Council) By-laws (Cap. 132 sub. leg.) [35], fire certificates will be issued if the systems comply with the Ventilation of Scheduled Premises (Urban Council/ Regional Council) By-laws (Cap. 132 sub. leg.) [23].

5. THE CONSULTATION PAPER

The “Consultation paper on licensing control of karaoke establishments” [2] was issued jointly by the Urban Services Department (USD) and the Regional Services Department (RSD), proposing stricter licensing control for increasing safety by the USD, the RSD, the FSD and the BD. It aimed at soliciting public opinions especially from the restaurants and karaoke trades, fire safety and building safety professionals and club owners. Asking for comments from the public, particularly from the professionals and academics, is common.

The SAR government is very open in accepting comments and criticisms.

In the consultation paper, the new term ‘Karaoke Establishments’ was defined. It means any premises upon which the business of karaoke activity is carried on, whether on its own account or in connection with other business activities, to which the general public may be admitted with or without payment, but does not include bona-fide restaurants [2]. It was proposed that the same safety standards should be applied to all lounges. Further, tighter regulations on fire services installations and equipment, building safety, health and public safety were proposed on existing and newly established karaokes.

The consultation paper was of great concern to the karaoke owners [39]. A Karaoke Requirements Concern Group representing 59 karaokes was established. In general, they believe that all existing karaokes satisfy all current licensing requirements. New regulations, which seem to be proposed based on an arson fire, do not give strong reasons on saying that the existing karaokes are not safe under accidental fires.

Despite the above facts, most karaoke owners agreed to implement most of the recommendations. They are also very concerned about the fire safety aspects as nobody will go to a karaoke which is potentially dangerous. However, there are three points which are of main concern to the industry:

- The minimum internal width of the corridors are required to be expanded from 1.05 m to 1.2 m.
- The wall separating the cubicles and the corridors should be able to withstand the fire for at least 1 hour.
- All ‘dead-ends’ should be eliminated.

Note that most karaokes followed the MoE Code [9] by the BD when they were first constructed. Existing karaokes not satisfying the above three points have to be reconstructed or demolished. Rooms and partitions have to be dismantled and redesigned with an estimated cost higher than HK\$1,000 million (160 karaokes, each with decoration cost higher than HK\$7 million). The whole business may be wiped out with over ten thousand karaoke employees losing their jobs. Therefore, whether the additional construction and refurbishment works are necessary for the existing karaokes must be considered carefully.

On ventilation safety, all the MVAC systems installed are required [2] to comply with the statutory requirements. According to the Code [11], there is a requirement on the override control

Table 2: Active systems required in existing premises and additional requirements proposed for karaokes

Fire safety aspects Business natures of buildings	Buildings listed in [11]						Buildings listed in [2]		
	Basement storeys		Commercial buildings		Hotels		Curtain-walled buildings/ basement floors	Premises	Premises holding restaurant licences
	<230m ²	>230m ²	High rise	Low rise	High rise	Low rise	>126m ²		
Active systems									
WATER BASED SYSTEMS									
Automatic sprinkler systems • Sprinkler systems		R	R	R	R	R	A		
Hose reel and fire risers • Fire hydrant/ hose reel systems	R	R	R	R	R	R			
NON-WATER BASED SYSTEMS									
Gas protection systems • Automatic fixed installations other than water	R	R	R	R	R	R			
Smoke management systems • Pressurization of staircases • Static or dynamic smoke extraction systems • Ventilation/ air conditioning control systems		R	R	R	R	R			
DETECTION AND ALARM SYSTEMS									
• Audio/ visual advisory systems • Automatic actuating devices • Fire alarm systems • Fire detection systems	R	R	R	R	R	R			
OTHERS									
• Emergency generators • Emergency lighting • Exit signs • Fire control centre • Fireman’s lifts • Portable hand-operated approved appliances	R	R	R	R	R	R			
ADDITIONAL									
• Ventilating systems including automatic cut-off devices • Audio-visual advisory systems which can interrupt the musical systems in case of alarms • Alarm bells at individual cubicles • Low level directional signs • Exit routes indication plans for each individual cubicle • Manual fire alarm systems with operating switches at specific locations • Automatic fire alarm systems	A	A	A	A	A	A			A

R Required in the current code [11].
A Added items in consultation paper [2].

of the MVAC systems in case of a fire. It aims at confining the air movement in the fire compartment and the associated override control methods are described. In addition, both automatic and manual override control of the mechanical ventilating systems are stated. Further, automatic cut-off devices are required in the MVAC systems [2], though there are no detailed descriptions on the cutting-off mechanisms nor locations of the devices to be installed.

6. DISCUSSIONS

Most of the new requirements proposed in the consultation paper [2] as listed below are reasonable concerning fire and ventilation safety, though some karaokes such as those in premises with only BRC may not be covered. Because of the specific features of the karaokes with small boxes, long corridors and transient presence of the occupancy, uniform and standardized regulations on all karaoke establishments can ensure a better inspection on karaoke safety under the control of a licensing scheme administered by a licensing authority, rather than several bodies.

Some good points are listed in the consultation paper [2]:

- Audio and visual advisory systems which can interrupt the musical systems would inform occupants about the emergency conditions and actions to be taken.
- Exits at low levels would give better indication on the exit directions in case of fires, even when the corridors are long, with low suspended ceilings and full of smoke.
- Exit routes indication plans in each box would show clearer floor layouts and directions of egress to staircases.
- Alarm bells at individual boxes would ensure the signals to be heard more easily and people can escape in a shorter time.
- Manual alarm systems with operating switches proposed near each exit, at main entrance, cashier's counter, reception area and waiting area would ensure system activation in case of fires.
- Automatic cut-off devices to be installed in MVAC systems would prevent smoke spreading from one room to the others.

Other requirements such as providing additional active systems to extinguish fires, giving early

warning signals by detectors and controlling smoke movement by MVAC systems are reasonable.

Of the three points most concerned by the industry, further research data have to be provided to justify the decision to increase the corridor width from 1.05 m to 1.2 m. Obviously, the escape rate would be faster in a wider corridor under the same evacuation plan. However, if there is a good evacuation plan, the time taken for occupants to leave the karaoke with 1.05 m corridors can still be reasonably fast. It applies to the third point of concern as well. Further studies with fire evacuation model and full-scale burning tests are essential. No scientific conclusion can be drawn without those studies. Unfortunately, there is no support from the SAR government to carry out those well-planned experimental studies.

For the second point, it is obvious that partitioning the space into small boxes will confine the fire in the burning compartment, provided that the materials would not be ignited easily for fire spreading. The requirements of all false ceilings, partitions, wall furnishing, draperies and curtains to be made of fire resisting materials or treated with fire retardant paint or solution as listed in the consultation paper [2] would delay the ignition time of those materials and thus increase the chance of confining the fire. Imposing these requirements on the new karaoke establishments seems reasonable. An important point to note is on the fire spreading along the walls. There are some standard tests for assessing the fire spreading of those walls and lining materials. Perhaps, fire behaviour of partitioning materials in existing karaokes can be improved by spraying appropriate protective coatings as an alternative passive protection means. However, this point was not mentioned in the consultation paper [2].

7. CASE STUDY: WIDTH OF CORRIDOR (PRELIMINARY SIMULATIONS)

Effect on the fire environment due to increasing the width of corridors can be studied using fire models. The fire zone model in FASTLite [40] developed at the Building and Fire Research Laboratories, National Institution for Standards and Technology can be taken as a good design tool for such purpose. The two key parameters on the fire environment: the smoke layer temperature and the smoke layer interface height can be predicted.

Part of a karaoke (length 15 m, width 7.05 and height 3 m) as shown in Fig. 1 is considered. Two karaoke boxes each of size 3 m by 3 m, one taken as a fire room and the other to be an adjacent room

for studying the consequence of a fire were assumed. A corridor of width 1.05 m was designed. All the rooms and corridors were constructed by plywood partition boards. Doors of width 1 m and height 2 m were used at the fire room and adjacent room to the corridor. There were two doors to the outside at the two ends of the corridor, each taking the width of the corridor and height 2 m. Doors in the other rooms were assumed to be closed so that a 3-room structure is considered.

A fire due to burning polyurethane chair with wood frame and cotton fabric was assumed in the fire room. Initial temperature was taken as 20°C.

The smoke layer temperature and smoke layer interface height were predicted by FASTLite 1.1.1 [40] released in October 1997. The average values over the steady-burning period, from 150 s to 300 s, of the smoke layer temperature T_{Uav} , lower layer temperature T_{Lav} , and smoke layer interface height y_{av} at each room are shown in Table 3. The values of the maximum smoke layer temperature T_{Umax} , its corresponding lower layer temperature T_{Lmax} and corresponding smoke layer interface height y_{max} are shown in that table as well.

The simulations were repeated with the corridor width increased to 1.2 m. Results on the smoke layer temperature, lower layer temperature and smoke layer interface height are also shown in Table 3.

It is observed that the smoke layer temperature, lower layer temperature and smoke layer interface height in the corridor did not change when the corridor width was expanded from 1.05 m to 1.2 m. Whether the corridor width has to be increased remains an open question for further debate.

However, the above simulations only considered the physical environment without taking into account the human behavior. In other words, the evacuation pattern was not studied. The escape time might be shortened when the corridor width is increased from 1.05 m to 1.2 m. There are computer packages, e.g. buildingEXODUS [41], available elsewhere for calculating the evacuation process in different buildings. However, the parameters inside those computer packages might not be suitable under local conditions as psychological factors of citizens in the HKSAR have to be included. To the best of knowledge, no large-scale study of this kind for local people was reported in the HKSAR, though such studies are planned to be carried out at The Hong Kong Polytechnic University (PolyU).

Therefore, it is quite unclear whether the width of corridor in existing karaokes should be increased. This point must be studied carefully, since there will be economic impact on the prospect of the karaoke industry due to the associated high refurbishment cost.

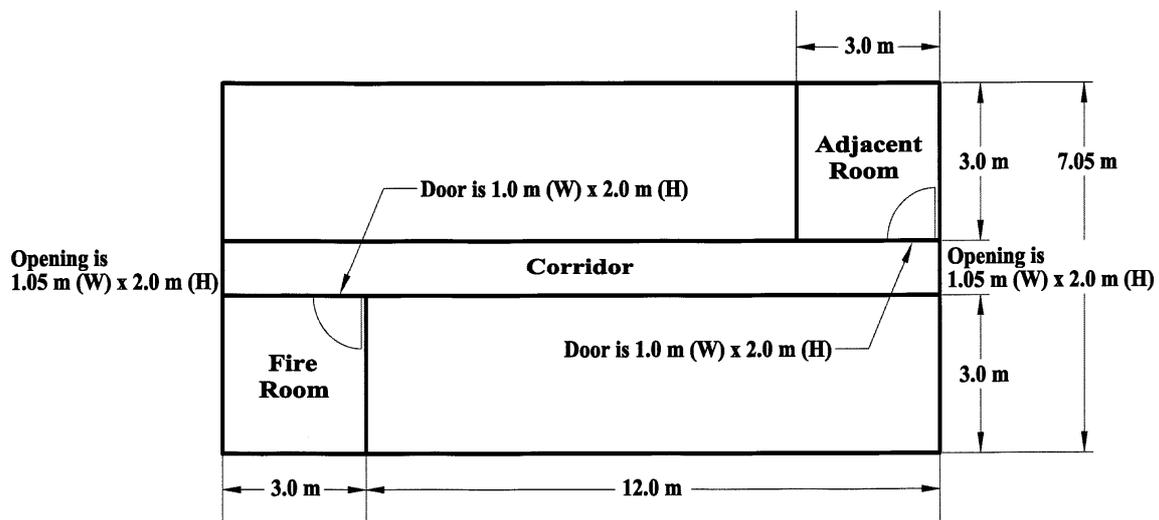


Fig. 1: Layout of karaoke

Table 3: Fire environment in the rooms of the karaoke

	Corridor width = 1.05 m			Corridor width = 1.2 m		
	Fire compartment	Corridor	Adjacent room	Fire compartment	Corridor	Adjacent room
Average smoke layer temperature $T_{Uav}/^{\circ}C$	193	104	54	188	104	57
Average lower layer temperature $T_{Lav}/^{\circ}C$	36	22	21	35	22	21
Average smoke layer interface height y_{av}/m	1.18	1.42	1.15	1.24	1.42	1.17
Maximum smoke layer temperature $T_{Umax}/^{\circ}C$	199	112	60	193	112	63
Corresponding lower layer temperature $T_{Lmax}/^{\circ}C$	39	22	22	38	22	22
Corresponding smoke layer interface height y_{max}/m	1.19	1.44	1.22	1.26	1.44	1.24

8. FIRE SAFETY MANAGEMENT

A very important part on providing safety is missing in the consultation paper [2], that is on “fire safety management”. It is important for the karaoke staff to have training on fire safety management. A fire safety officer should be appointed and perhaps, a licence should be issued to those qualified personnel. The fire safety officers should have good knowledge and training so that they can take necessary actions in case of a fire. Therefore, those with fire services training are very suitable candidates.

Two modes of operation: normal mode and emergency mode should be considered in designing fire safety schemes.

In normal mode of operation, the fire safety officers should:

- ensure all the escape routes are clear and staircases are not blocked (e.g. by rubbish bins);
- ensure the fire load density is less than the maximum allowed value;
- avoid storing excessive amount of alcohol;
- ensure all the fire services systems including portable extinguishers are in good order (e.g. sprinkler heads are not blocked by goods);
- have regular fire drills and practise fire evacuation when there is no business;
- keep abreast of the latest knowledge in fire control and protection;
- ensure all staff are trained to use suitable fire extinguishers;

- train and inform junior staff on their roles in case of a fire;
- understand the indoor air movement pattern and identify the ‘downstream’ area of MVAC systems where smoke will be accumulated.

Actions to be taken in emergency mode of operation are:

- evacuate customers in stages and in good discipline, corresponding to the zoning of other fire protection systems such as fire detection system;
- avoid chaotic situation;
- report to FSD as soon as possible;
- control the fire if it is judged to be the most appropriate action;
- ensure all the fire dampers in MVAC systems are in operation.

The karaoke described previously with the arson fire was well-equipped with fire protection system which satisfied the existing regulations. However, the fire safety management was not planned properly. Even if the building is well-equipped, a big fire can be resulted. Therefore, good fire safety management must be worked out carefully in order to provide a safe environment in karaokes even when all the active fire protection systems are not functioning properly. It is particularly important in places where earthquakes are likely to occur, as after which, all water supplies might be cut-off.

9. CONCLUSION

Safety codes related to three aspects of karaoke safety are reviewed: building protection, fire services installations and ventilation.

Safety requirements on the provisions of building protection, fire services installations and ventilation aspects for public places such as karaokes in the HKSAR, one of the biggest cities in the world, should be up to the international standard for life and property protection. Most of the key items are covered in the new regulations proposed in the consultation paper [2], with the understanding that it aims at a tighter control for higher safety level.

For the safety aspects of the building structures, required parameters related to the provision of means of escape are specified by the BD. The number of occupants, the limitations on the direct and travel distance, and the building use govern the minimum number of exit routes. Further, integrity of the buildings should be ensured so that they will not collapse. Fire and smoke should be confined in the ignited areas with fire-resisting enclosures.

The requirements on the fire services systems for various types of buildings essentially aim at providing proper design, installation and maintenance for the premises.

For the ventilation aspects, as smoke spreads through the ductworks in case of fires, the fire compartment must be isolated by fire dampers which should be actuated automatically or manually. Cut-off devices should be stated clearly since some of the MVAC systems are designed for smoke venting and heat removal. Smoke systems should not be cut off during fires.

Some requirements associated with the building structures proposed in the consultation paper [2] are not yet well supported by scientific studies. The objectives might be worked out after the 1997 arson karaoke fire incident. The cost is estimated to be higher than HK\$1,000 million in order to enhance the fire facilities, dismantle, reconstruct, redesign the existing karaokes and also rent the premises. In compliance with the new licensing regulations, the karaoke industry will be forced to close down. Over ten thousand employees in the karaoke industry would lose their jobs and thus further increase the unemployment rate (provisional seasonally adjusted value from June to August 1999 was 6.1%). There is no strong evidence that the existing karaokes are not safe. Further investigations must be carried out in order to provide research data to support the requirements proposed.

In addition to installing the fire services systems and improving the fire responses of the building structures, proper fire safety management including staff training and social awareness on fire safety should be emphasized. A provisional list of safety management is listed on the above.

Finally, smoke is identified to be a key factor in fire casualties. Even when a fire breaks out in a karaoke with sufficient fire services systems installed as the one in the arson fire incident in 1997 [1,3-5], a catastrophe can still be resulted if there are inadequate smoke control facilities. Smoke management systems are essential for life safety. Smoke extraction system should not be provided as an isolated system but as a part of the whole fire protection system and designed in conjunction with the active fire suppression systems, means of escape and compartmentation. As corridors are the main escape routes for people in the karaokes, smoke control in corridors must be considered carefully.

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- Automatic fixed installations other than water can automatically detect, instantaneously attack fires with inert mediums and sound alarms.
 - Emergency generators are independently powered electrical generators of sufficient electrical capacities to meet the essential services provided.
 - Emergency lighting systems are artificial lighting systems designed to provide adequate illumination and indication of exit routes throughout the entire building.
 - Exit signs are internally fixed illuminated to indicate approved exit routes. They should conform to BS 5499: Part 1 [18] and the MoE Code [9].
 - Fire alarm systems are manually operated to give warnings of fires. Audio warning device and actuating point should be located at each hose reel point.
 - Fire control centres are compartments containing annunciator boards, controls and terminals of the Fire Protection and Life Safety Systems within the premises.
 - Fire detection systems detect smoke and heat automatically and give early warnings. They should follow the Rules of the Fire Offices' Committee according to the FSD Circular Letter No. 7/95 [14].
 - Fire hydrant/hose reel systems deliver water jets to the entire building for fire fighting.
 - Fireman's lifts allow safe access to at least alternate floors of the buildings. The Building (Planning) Regulations (Cap. 123 sub. leg.) [7] governs their provisions.
 - Portable hand-operated approved appliances are independent units for extinguishing and preventing fires. They should follow the Fire Service (Installations and Equipment) Regulations (Cap. 95 sub. leg.) [13].
 - Staircase pressurization systems prevent smoke egress by maintaining higher pressure within staircases than the adjacent parts of buildings. They should follow the MoE Code [9] and BS 5588: Part 4 [19].
 - Sprinkler systems contain sprinkler heads to discharge pressurized-water around fire origin and sound alarms. Requirements in BS 5306: Part 2 [17] should be followed.

APPENDIX A: FIRE SERVICES INSTALLATIONS QUOTED FROM THE CODES

- Audio/visual advisory systems provide additional advice by audio/visual indication to the occupants of safe directions of egress in fires.
- Automatic actuating devices can automatically control the movement of the automatic-actuated building components such as fire curtains and doors, etc., in case of fires.

- Smoke extraction systems can be automatically activated wherever fire services installations are activated. They remove smoke from the designated fire compartments.
- Additional requirements for the basements, high/low-rise commercial buildings and hotels on the acoustic/ thermal insulated and decorative linings within the protected means of escape should follow BS 476: Part 7 [16] or those linings should be made from approved fire retardant materials.

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