

SURVEY ON FIRE SERVICE INSTALLATIONS FOR OFFICE BUILDINGS IN HONG KONG

E.C.L. Pang and W.K. Chow

Research Centre for Fire Engineering, Area of Strength: Fire Safety Engineering
The Hong Kong Polytechnic University, Hong Kong, China

J. Zhu

Department of Fire Protection Engineering, Southwest Jiaotong University, Chengdu, Sichuan, China

ABSTRACT

Buildings constructed in different ages would have different fire service installations. In Hong Kong, the first code on fire service installations (FSI) was implemented in 1964. There were eleven revisions up to 2005, with different new additional requirements specified. There are concerns on fire safety provisions in non-industrial workplaces, especially for offices in those old highrise buildings, consequent to the big Garley Building fire.

Basically, four periods on fire codes implementation can be identified as 1960s, 1970s, 1980s and 1990s. There are statutory requirements on improving the fire safety provisions for buildings constructed after 1973. However, those old buildings constructed decades ago might not be able to comply with the new requirements. Apart from financial problems, there are also technical problems on structural loading, limited space, inadequate water and power supply. Fire safety in offices in old industrial buildings is a concern.

In this paper, FSI in office buildings constructed in different times will be reviewed. Four examples were selected in those four different ages to survey the FSI provided. To comply with the updated requirement, new FSI should be considered. In fact, FSI was upgraded in some examples. Proper implementation of fire safety management is necessary to achieve total fire safety.

KEYWORDS: Commercial buildings, Building codes, Fire safety management

INTRODUCTION

Fire codes are usually upgraded after big fires. Consequent to the big Garley Building fire¹ in Hong Kong, the fire safety provisions for office buildings and other non-industrial workplaces were enhanced. More requirements are specified for those old buildings with little or even no fire safety protection. Fire service installations (FSI) requirements in the older FSI codes in 1994 were modified² by adding sprinklers inside toilets and requiring visual alarms in commercial buildings. The Fire Safety (Commercial Premises) Ordinance³ was amended. Those commercial premises required to improve fire safety and the corresponding requirements were classified. More circular letters^{4,5} were issued by the Fire Services Department (FSD) on repair and maintenance.

FSI required inside those premises which might be used for offices are now clearly specified.^{3,6,7} The following was specified in Circular Letter No. 1/98 and incorporated in the updated version of the FSI code⁸:

Any building constructed or used as offices, business, trade or any entertainment after 23 March 1973 should have FSI including automatic sprinkler system, automatic cut-off devices for mechanical ventilating system, emergency lighting, fire hydrant and hose reel system, manual fire system and fire extinguishers.

It is observed that most of the buildings constructed by 1998 would not have all the above FSI. The fire load density and occupant loading in such buildings can be very high. For those buildings with inadequate hardware provisions, fire protection systems are required to be upgraded. Proper software fire safety management should be implemented as suggested in the total fire safety concept. Before deciding on appropriate action, difficulties for offices, especially in Small and Medium Size Enterprises (SMEs), to comply with new codes are discussed. Four examples are taken to demonstrate the non-compliance.

Offices in SMEs are commonly found in old industrial buildings. Land costs in these buildings are relatively low (rent of HK\$1 per square foot), much lower than in commercial buildings (rent of HK\$50 per square foot). FSI in such old industrial buildings are inadequate, for example, staircase pressurization systems are not installed.

Limitations on non-industrial function within an industrial building were listed in FSD Circular Letter No. 4/96. However, other building uses such as factory outlets are now located inside industrial buildings. High transient occupant loading in this mode of operation would definitely violate the statutory requirement.

FIRE CODES REVIEW

Basically, four periods on fire codes implementation can be identified as 1960s, 1970s, 1980s and 1990s.

Period 1: 1960s

The first edition of codes of practice on FSI was issued in 1964⁹. There, allowed fire load density was not yet specified. Only two FSI were required for commercial buildings subject to the following architectural features:

- Fire hydrant/hose reel system had to be installed for commercial buildings with two storeys or more with floor area over 5,000 ft² (about 465 m²) or 6 storeys in height;
- Sprinkler system was required for some listed premises only such as compartments over 250,000 ft³ (about 7080 m³), bowling alleys, scenery docks, stages and basements of theatres.

The above specification explains why FSI was not installed in many lower old commercial buildings.

Period 2: 1970s

In referring to the first edition of codes of practice on FSI in the 1970s¹⁰, there was one major change regarding commercial buildings. Fire alarm systems are required to install in buildings with high fire/life risks including office blocks.

In the last edition of codes of practice on FSI in the 1970s¹¹, besides the change from English units to SI units, it was the first time that the criteria for commercial buildings to install sprinkler system were mentioned.

Period 3: 1980s

The codes of practice on FSI published in 1986¹² was the first copy which had listed the requirements for commercial buildings in a systematic way and the systems required were quite similar to the current ones.

Period 4: 1990s

While Circular Letter No. 2/94 stated the replacement of the 29th edition of FOC Rules¹³ by the Loss Prevention Council (LPC) Rules for automatic sprinkler installations, the corresponding localization amendments were also listed for reference. The main influence of this change is that double layer installation with false ceiling is no longer regarded as single layer in pipe sizing.

It is not possible for some old buildings to install sprinkler system fully complied with the LPC Rules. Alternative installations known as 'improvised sprinkler systems' are allowed as announced in the FSD Circular Letter No. 4/96⁶. Such automatic system would reduce the spread of fire, and better than having nothing.

As observed in 1960s, FSI was not yet specified for commercial buildings with less than 6 storeys, except public entertainment premises. Fire hydrant/hose reel systems were required for commercial buildings since 1970s. Sprinkler system was only required for commercial buildings taller than 30 m or 10 floors. Lower buildings should have automatic detection systems. More requirements on FSI were specified in 1980s, even more from 1980s to 1990s. For example, smoke extraction system was introduced. Areas of application are modified. Two codes of practices^{14,15} on passive fire safety provision were implemented in 1980s.

DIFFICULTIES IN UPGRADING OLD BUILDINGS

All buildings complied with the local codes at the time they were built. However, with the development in fire science, more and more requirements regarding fire safety are being imposed on new constructions. Therefore, the owners of older buildings should improve the standard of fire safety provisions in their buildings. As the developers would optimize their designs according to the codes at that time, there may be limitations while introducing new installations for these buildings.

As revised before¹⁶, the most common problems for enhancing fire safety in these old buildings are limited structural loading, restricted area for installations, unavailable water source and inadequate power supply, apart from the financial and managerial obstructions. These problems are related to different authorities and utility companies with so many interactions among various parties.

In the survey, a non-highrise commercial building was found to have no FSI. This building was then required to install many new FSI. However, the power supply system was not sufficient to operate such applications. The water source for the whole building could not meet the minimum requirement for fire services. The staircase was too narrow for installing hydrant outlet. Such extreme cases are very rare now due to the enforcement of new requirements imposed by FSD²⁻⁸ and redevelopment by developers.

EXAMPLE BUILDINGS

Four buildings constructed in different periods of time in the 1960s, 1970s, 1980s and 1990s were selected as examples with the following reasons: they are typical examples for the period; and the installations are available for studying, though may not be in detail.

Example Building One (EB1)

It is a multi-purpose building in To Kwa Wan (as shown in Fig. 1) constructed before the publication of the first codes of practice on FSI and there was no FSI installed. Since the owner was quite concerned about the fire safety inside, lots of renovation works were carried out in the 1990s which involved hose reel system, fire extinguishers, improvised sprinkler system, emergency lighting and manual fire system as shown in Figs. 2a to e.

There were many arguments on the FSI required in the building. A proposal by the contractor for unusual situation was agreed by both FSD and the owner. As the owner had adequate resources, the installed FSI complied with all the new requirements.

Additional electricity supply was not necessary. One new essential power switch as shown in Fig. 2f is sufficient. It is installed in one of the staircases (escape routes) with fire rated materials to cover up the cables.

However, the manual pump starter for sprinkler system has deteriorated as in Fig. 2g. Of course, there are other minor problems observed during the site visit mainly due to improper management and maintenance.

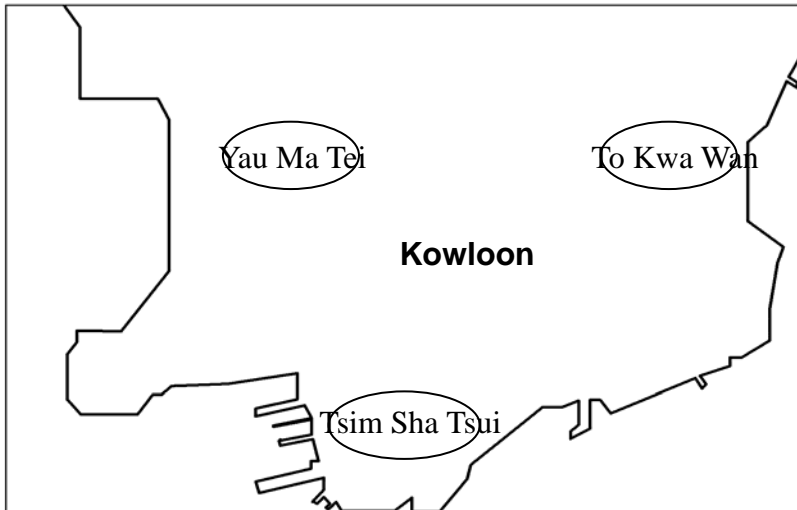
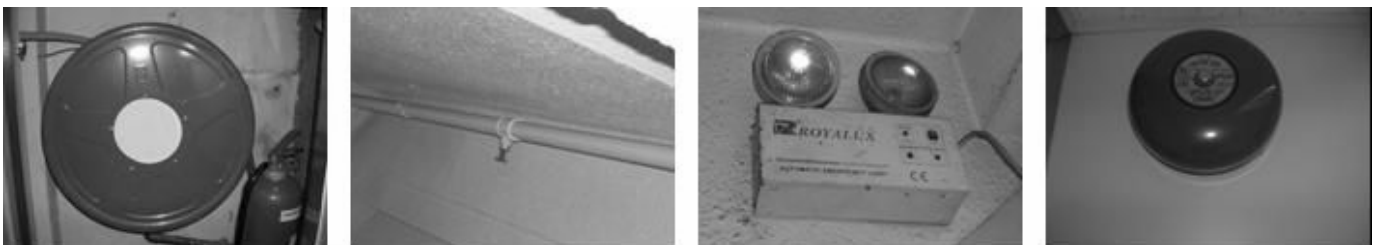


FIGURE 1. Areas surveyed



(a) Hose reel and fire extinguisher (b) Sprinkler installed (c) Emergency light (d) Alarm bell



(e) Manual alarm call point (f) Essential power switch (g) Deteriorated sprinkler pump manual starter

FIGURE 2. Fire systems for EB1

Example Building Two (EB2)

It is a composite building with a restaurant in Yau Ma Tei as in Fig. 1 which has been in use since 1971 and it should have complied with the codes at that moment. Sprinkler system was added for the premise as in Fig. 3 few years ago in accordance with the legislative requirement.

Since other required FSI were not checked in detail, renovation works in the premises were not clear. To the best knowledge, the management like to cover up those equipments with better outlook and compatible colours. Hence, those equipments are not easy to be activated, found or noticed. The problems are on slower response for the detectors and sprinklers; people might not fight against the fire by hose reel; and the occupants have to spend more time on locating the exits.

Example Building Three (EB3)

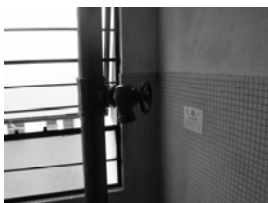
It is a commercial building in Tsim Sha Tsui (as in Fig. 1) completed in 1983, and it is found to have satisfied the local codes at the time of construction. Since this building is managed by a management company with high reputation in the market, FSI installed in the building are still kept in good working conditions according to statutory requirement as shown in Figs. 4a and b. It is a good example for other building owners.

On the other hand, there were fewer difficulties encountered because at the time of construction, most FSI required which need higher structural load and more spaces such as separated plant rooms and water tanks had already been introduced in the local codes. It is more comfortable for all relevant parties since it seemed to have less direct impact on the owners, though there are still some difficulties.

With the advance in technology, some improvements could be made to further enhance the fire safety in the building. Of course, the rent for such commercial building is comparatively higher than other examples mentioned in this paper. Also, the expectation of the users and the attitude of the owners are other determining factors.



FIGURE 3. Sprinkler in the restaurant in EB2



(a) Fire hydrant



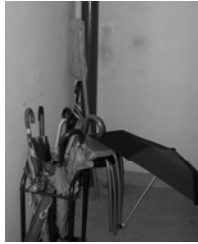
(b) Fire detector, concealed sprinkler and emergency exit sign

FIGURE 4. Fire systems in EB3

Example Building Four (EB4)

The commercial building was built in 1994 and located again in Yau Ma Tei. Basically, there should not be major modifications inside the premises as those obvious FSI are easily found.

However, the alternations done by the end-users or the corresponding contractors are more interesting. One of the owners believes that some of the fluorescent lamps in his office should be equipped with batteries backup for emergency lighting but there is none after cutting off the power supply for the office. Also, improper use of public area and obstructions of escape route are always found within the premises of SMEs as shown in Figs. 5a and b.



(a) Public area



(f) Escape route

FIGURE 5. Blocking of escape route in EB4

EFFECT OF UPGRADING WORKS

In evaluating the performance of upgrading works for fire safety in those old buildings, statistical fire records for commercial premises in the last few years have to be reviewed. As compiled¹⁷⁻²⁰ by FSD, the number of fire cases decreased gradually for commercial buildings since 1999. It appears that upgrading the fire safety provisions is effective in providing better fire safety.

CONCLUSION

The concern from users about fire safety is an important aspect. Improper or illegal usages for some buildings are definitely not acceptable. With the improvement in fire science and new requirements imposed from time to time by the government, the owners should take up greater responsibility rather than waiting for warnings from the government or painful lessons learnt from big fires such as the one at Garley Building¹. The owners should notice the up-to-date information, have better protection for themselves and implement their social liability. Of course, there are lots of difficulties in upgrading older buildings but the core issue is the attitude of the management.

The four examples selected may not reflect all non-industrial buildings but it can give an idea that the fire safety level in older buildings is lower in general. For sprinkler systems, a full system must be more effective in fire control than an improvised system installed in the premises constructed before 1980s.

As a conclusion, the government should employ some new fit-in fire engineering considerations (hardware) to help SMEs upgrade their fire safety conditions. However, the software aspects have to catch up accordingly, which include the concerns of the liability of the owners, the standard of management for buildings and the awareness on fire safety of the general public.

ACKNOWLEDGMENT

This project was partly funded by the Occupational Safety and Health Council on “Fire safety provisions for workplaces in non-industrial sectors” with account number K-ZK32.

REFERENCES

1. South China Morning Post, Hong Kong, 21 November 1996.
2. Fire Services Department, Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installation and Equipment, Hong Kong Special Administrative Region, 1998.
3. Fire Services Department, FSD Circular Letter No. 1/98, Certification of Fire Service Installations and Equipment under the Fire Safety (Commercial Premises) (Amendment) Ordinance 1998, Hong Kong Special Administrative Region, 1998.
4. Fire Services Department, FSD Circular Letter No. 1/99, Repair/Maintenance of Building FSI, Hong Kong Special Administrative Region, 1999.
5. Fire Services Department, FSD Circular Letter No. 4/99, Shut-Down of Building FSI for Works, Hong Kong Special Administrative Region, 1999.
6. Fire Services Department, F.S.D. Circular Letter No. 4/96, FSD Circular Letters, Hong Kong Government, 1996.
7. Fire Services Department, FSD Circular Letter No. 2/94, Rules for Automatic Sprinkler Installations, Hong Kong Government, 1994.
8. Fire Services Department, Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installation and Equipment, Hong Kong Special Administrative Region, 2005.
9. Fire Services Department, Codes of Practice (Minimum Fire Service Installations and Equipment) and (Inspection and Testing of Installation and Equipment), Hong Kong Government, 1964.
10. Fire Services Department, Codes of Practice (Amended) (Minimum Fire Service Installations and Equipment) and (Inspection and Testing of Installation and Equipment), Hong Kong Government, 1970.
11. Fire Services Department, Codes of Practice (Amended) (Minimum Fire Service Installations and Equipment) and (Inspection and Testing of Installation and Equipment), Hong Kong Government, 1979.
12. Fire Services Department, Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection and Testing of Installation and Equipment, Hong Kong Government, 1986.
13. LPC Rules for Automatic Sprinkler Installations, The Loss Prevention Council, London, 1987.
14. Building Authority, Code of Practice on Provision of Means of Access for Fire Fighting and Rescue Purpose, Hong Kong Government, 1989.
15. Building Authority, Code of Practice Fire Resisting Construction, Hong Kong Government, 1989.
16. Chow, W.K. and Tsui, Fiona S.C., “Discussions on fire safety requirements for office buildings in Hong Kong”, Proceedings of BUEE2006, 8th International Symposium on building and Urban Environmental Engineering, held at Tokyo Institute of Technology, Tokyo, Japan, July 10-13, 2006, p. 185-189, 2006.
17. Fire Services Department, Hong Kong Fire Services Review 97-99, Hong Kong Special Administrative Region, 1997-1999.
18. Fire Services Department, Hong Kong Fire Services Review 2000-2001, Hong Kong Special Administrative Region, 2000-2001.
19. Fire Services Department, Hong Kong Fire Services Review 2002-2003, Hong Kong Special Administrative Region, 2002-2003.
20. Fire Services Department, Hong Kong Fire Services Review 2004-2005, Hong Kong Special Administrative Region, 2004-2005.