

REVIEW OF FIRE SAFETY LEGISLATION IN HONG KONG

C.H. Yeung

City University of Hong Kong, Hong Kong, China

(Received 12 March 2009; Accepted 22 July 2009)

ABSTRACT

In this paper, a review had been made to the fire safety legislation in Hong Kong. Relevant academic papers published in mainstream journals were also surveyed and discussed. It has been pointed out in the literatures that the local government is taking an “incremental” or “ad-hoc” approach in which fire legislation is added or expanded in response to every tragic fire incident without a total fire safety concept. It is further found that it is the worldwide trend in migrating towards performance-based fire codes (PBFC) to meet the global challenge on economic development and technological innovation. Moreover, fire safety management is strongly advocated to complete the total fire safety equation. While the fire record in Hong Kong is good in terms of number of fatalities and casualties, it is high time to re-think on the development and implementation of PBFC in Hong Kong. Suggestion on revamp of the current fire safety legislation will also be presented.

1. INTRODUCTION

Hong Kong (now the Hong Kong Special Administrative Region since its reunification to the People’s Republic of China in 1997) is renowned as a world class urban city with dense population. Owing to its topography, only some 15.8% of the total land area of 1092 square kilometers is considered as developable [1]. In order to house a population of about 7 million, a lot of high rise residential buildings have been built since 1960s. On the other hand, a number of complicated structures to cope with the economic development with special architectural features (such as the Chek Lap Kok Airport [2]) have been constructed recently. With the growing concern on energy efficiency, many more green and environmental-friendly buildings (such as using double skin curtain wall) are also designed and constructed [3].

While Hong Kong has a good fire record in terms of low life loss figure per 100,000 persons [4], several tragic fires did occur in the past history. A notable example is the Garley Building Fire [5].

Walters and Hastings [6] had analysed 11 fires occurred in Hong Kong over the period from 1984 to 1998. These fires had caused 102 deaths and 258 injuries. The local citizens are becoming apprehensive for whether they are safe when the building is on fire. In this paper, a review will be targeted on the local fire safety legislative system, with the deficiencies identified, and the way forward explored.

2. RESEARCH METHODOLOGY

In this review exercise, the legislation including ordinances and regulations in Hong Kong relating

to fire safety will be studied. Moreover, extensive literature survey will be conducted to identify what other research workers had commented on the legislation. In general, academic papers will be extracted from those main stream journals on fire safety engineering and fire safety management which have undergone the “peer review” process to make sure that they are of publishable quality. Typically, the enlisted journals include the following:

- Disaster Prevention and Management
- Facilities
- Fire and Materials
- Fire Safety Journal
- Fire Technology
- International Journal on Engineering Performance-based Fire Codes
- Journal of Applied Fire Science
- Journal of Fire Protection Engineering
- Journal of Fire Sciences
- Property Management
- Various Conference Proceedings

Since the review is focused on local legislation, there are only 4 papers found to be of direct relevance. Nevertheless, there are many publications incidental to the commentaries which throw light on the possible development of the local codes.

3. WHY LEGISLATION

Canovan [7] had once pointed out that during medieval and early modern times; most cities in the world were devastated by fire at least once. Law was therefore developed increasingly to control the danger from fires. He further proposed that

legislation on fire safety might serve a number of functions:

- Criminal liability for arson and safety standards for electrical goods and chemicals aim to minimize outbreaks of fire.
- Fire separation and distance requirements between buildings aim to prevent the spread of fires.
- Regulations on means of escape and access for fire-fighters aim to reduce the risks to persons in case of fires.
- Regulations on flammability of contents and the handling of explosives aim to keep the fire hazard under control for buildings in use.

The purpose of having fire safety legislation can also be viewed from the theoretical perspective of disaster prevention. In order for a disaster such as a conflagration to occur, there must exist some pre-conditions, both internal and external, that turn an incident into a disaster [8]. The internal pre-conditions are personal or internal to the organisation and hence could not be easily regulated through legislation, whereas the external pre-conditions can be regulated through appropriate legislation. It is then the government function to provide a regulatory framework and external environment leading to a level of fire safety which is acceptable to the general public.

However, one must bear in mind that legislation and enforcement cannot be extended without limits and hence compromising societal resources. Canovan [7] stressed that education and publicity to achieve a public sense of responsibility for fire safety should be the long term goal.

4. THE BUILDING FIRE SAFETY LEGISLATION IN HONG KONG

Hong Kong had once been under the British Colonial Administration for over a hundred years. The local legislation and the relevant codes are more or less modelled on the British Law.

Fire safety aspects of buildings in Hong Kong are regulated under the Buildings Ordinance (BO) [9] and Fire Services Ordinance (FSO) [10] with the Buildings Department (BD) and Fire Services Department (FSD) as the Authority having Jurisdiction (AHJ) respectively. In principle, the Ordinances are developed to address the three key areas of the fire safety equation: passive fire protection, active fire protection, and the fire safety management aspects.

4.1 Legislation on Passive Fire Protection of Buildings

The BO is set up to maintain a minimum safety and health standards in the design, construction, maintenance, alteration and usage of a building. The building developer or property owner must engage an "Authorised Person" (AP) (an architect, structural engineer, or building surveyor registered with the BD) to carry out the design and supervision of the building works. At the same time, the works must be carried out by a Registered General or Specialist Contractor (RC). Furthermore, where the works entails structural content, a separate "Registered Structural Engineer" (RSE) must be employed to handle and certify the structural design, calculation and details.

Currently, there are 14 building regulations under the BO. Amongst these regulations, the Building (Planning) Regulations [11] specifies the planning requirements for amenities and safety, in which fire safety include the provisions of fire escapes and access for fire fighting and rescue. On the other hand, the Building (Construction) Regulations [12] lay down the requirements of structural design, use of material and the requirements of fire resisting construction to prevent the spread of fire and maintain structural stability.

To enable the design professionals to get an understanding on the "deem to satisfy" requirements, BD had also published 3 Code books, namely the "Code of Practice for the Provision of Means of Escape in Case of Fire" [13], "Code of Practice for Provision of Means of Access for Firefighting and Rescue Purposes" [14], and the "Code of Practice for Fire Resisting Construction" [15]. These Codes of Practice aim to amplify the relative regulations.

4.2 Legislation on Active Fire Protection of Buildings

Under the BO, the FSD is empowered to issue the fire certificate for a building to endorse the fire services installations (FSI) as indicated in the submitted building plans. Prior to the issuance of an Occupation Permit (OP), the BD has to be satisfied that the relevant fire certificate had been endorsed by FSD to this effect. This arrangement also applies to alteration and addition works in buildings. As far as FSI is concerned, the Fire Service (Installations and Equipment) Regulations [16], and the Fire Service (Installation Contractors) Regulations [17] are directly relevant.

The Fire Service (Installations and Equipment) Regulations requires that all installation, inspection and maintenance works of FSI shall only be carried

out by Registered Fire Services Installation Contractors (RFSIC). It also prescribes that the owner of FSI which is installed in any premises shall keep the FSI in efficient working order at all times and to have the FSI be inspected by a RFSIC at least once in a year. To this end, a “Codes of Practice on Minimum Fire Services Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment” (MFS) [18] has been published to spell out the types of fire engineering systems to be installed in a particular type of building occupancy together with the technical specification on testing and periodic maintenance requirements. Any FSI is deemed to be in efficient working order if it complies with the MFS.

Within the ambit of the Fire Service (Installation Contractors) Regulations, there are three classes of RFSIC, i.e.

- Class 1 : Contractors who are fit to carry out works for fire detection systems.
- Class 2 : Contractors who are fit to carry out works for installations which contain pipes and fittings to carry fire extinguishing medium. Typical examples are fire hydrants and sprinkler systems.
- Class 3 : Contractors who are fit to carry out works for portable equipment such as fire extinguishers.

With the increase in complexity of building design, other sophisticated FSI including audio/visual advisory system, emergency lighting, pressurization of staircase, smoke extraction system, and ventilation/air-conditioning control system have been incorporated in the MFS since 1990. However, there is no appropriate Class of RFSIC at the moment to take up such advanced fire protection installations and FSD only promulgated Circular Letter to designate Class 2 Contractors to certify such installations.

For fire safety purpose in particular, building ductwork systems are also regulated by the FSD by virtue of the Building (Ventilating Systems) Regulations [19] which prescribes the fire dampers of the ventilating systems be certified by a Registered Ventilation Contractor.

4.3 Legislation on Licensing of Business Operation

Due to the presence of specific hazard relating to individual business characteristics, the law requires the operators of the following businesses to obtain a licence before operation:

- Restaurants/food business
- Clubs/clubhouses

- Educational establishments/schools
- Hotels/Guesthouses
- Child care centres
- Drug dependent person treatment and rehabilitation centres
- Massage establishments
- Bedspace apartments
- Residential care homes for elderly
- Karaoke establishment within restaurants
- Amusement games centres
- Places of public entertainment

The miscellaneous ordinances or requirements governing the licensing process had been summarized in the literature [20]. Again, BD and FSD are the advisors to the respective licensing authorities on the technical aspects of the fire safety measures on passive and active fire protection. After all, the legislation aims to impart to the business operators a responsibility in providing a fire safe environment for their customers or visitors.

In order to control the manufacture, storage or usage of any “dangerous goods” in a building, a Dangerous Goods Ordinance [21] is in force. Under the Ordinance, there is the Dangerous Goods (Application and Exemption) Regulations [22] which categorises 11 types of dangerous goods together with their maximum exempted quantity. Other than Category 1 dangerous goods (explosives) which comes under the jurisdiction of the Commissioner of Mines, the rest 10 Categories of dangerous goods are within the ambit of such regulation. Any building owner or occupier who intends to use or store any dangerous goods in excess of the exempted quantities shall apply for a licence from the FSD.

4.4 Legislation on Upgradation to Aged Commercial Buildings

Apart from the BO and FSO which are fundamental to regulate fire safety, there are other ordinances which were enacted to improve the fire safety measures to aged commercial buildings consequent to tragic fire incidents.

In 1994, a bank fire occurred which took 13 lives [23]. The government then convened an investigation team which recommended that those “prescribed commercial premises” (PCP) (i.e., banking, off-course betting centres, jewelry or goldsmith’s business on premises that have a security area, supermarket, shopping arcade) with a high and changing population to have the fire safety measures upgraded [24]. This tragedy ultimately led to the enactment of the Fire Safety (Commercial Premises) Ordinance [25] which came into operation in 1997.

During the interim period, unfortunately, another tragic fire occurred inside an aged high-rise commercial building in 1996 [5] which killed 39 and injured 81 people. Later on in 1998, the aforesaid ordinance was further extended to cover the entire building of those “specified commercial building”, which are commercial buildings constructed before 1987 when sprinkler installation was not a mandatory requirement at that time [26]. In essence, the ordinance aims to bring the fire safety standard of those aged commercial buildings to present day standard through the retrofitting of sprinkler system and other FSI, as well as the enhancement of construction on passive fire protection.

4.5 Legislation on Fire Safety Management

The main objective of fire safety management is to ensure that in case of fire, all the safety measures provided will be available and occupants will be able to use them; and they can be guided to escape to a place of safety [27].

Fire safety management can also be defined as “the application by a manager of policy, standards, tools, information and practices to the task of analyzing, evaluating and controlling fire safety” [28]. Normally, such a function is embedded as part of the daily building management responsibilities of the property manager, or the property management agent.

The Building Management Ordinance (BMO) [29] enforced by the Home Affairs Department (HAD), facilitates the incorporation of owners of flats in a building in providing management. HAD can further impose mandatory management of buildings that are not managed or poorly managed. A Code of Practice on Building Management and Maintenance (BMM) [30] had been published under Regulation 44(1) of the BMO to lay down the details of the management and safety for the communal areas of a building. Fire safety forms part of the elements within the Code. In general, it requires the owner or property manager to properly maintain both the passive and active fire protection measures and not to block the escape route. If the owner fails to comply with the fire safety aspects, FSD can issue a “Fire Hazard Abatement Notices, Direction, or Orders” to the owner or even to institute prosecution.

Although the BMO provides for governance on building management with respect to fire safety, the role of the property manager is not well-defined. In the scene of Hong Kong where clusters of high-rise buildings are built, the importance of fire safety management is increasingly revisited [31]. Walters and Hastings [32] had stated that “if the government is serious about improving fire safety

in buildings in Hong Kong, they should address the role and responsibility of the property managers in the fire legislation”. In a recent study, Tsui and Chow [20] also recommended that the property management company should appoint a suitably qualified fire protection manager to take account of the total fire safety issues such as preparation and implementation of a structured fire safety management plan, as well as the coordination with the fire safety management personnel of tenants and occupiers.

5. PARADIGM SHIFT FROM PRESCRIPTIVE CODE (PC) TO PERFORMANCE-BASED FIRE CODES (PBFC)

The present arrangement of fire safety legislations is primarily prescriptive in nature. Both the BO and FSO give clear guidance on how a building is to be designed and constructed with specific requirements on passive and active fire protection details as amplified in the Code books. The design professionals must follow the Codes strictly in order to get the approvals from the AHJ. While those traditional buildings are designed in accordance with the PC with success, the unprecedented change brought about by the innovative design and technological advancement has created the impetus for fostering the PBFC. By the term performance-based, we aim at a building performance which satisfies the fire safety goals, in contrast to the prescriptive approach which simply describes an acceptable solution.

Another key driver for switching to PBFC stems from the social-economic development. In May 1997, the Organisation for Economic Co-operation and Development (OECD) produced a Report on Regulatory Reform on the need for a change in government attitudes towards regulation [33]. The report covers many areas of regulation where performance-based regulations have taken over prescriptive regulations. It is envisaged that PBFC allows for greater economic development with the market, rather than the government, determining the most efficient way to meet standards.

To meet the changing need for the fire safety design of sophisticated structures and to tie in with the advanced countries in advocating the Performance-based approach [e.g. 34] the BD had released a Practice Note (PNAP) in 1998 [35] to allow the AP to adopt the Performance-based approach. By virtue of the PNAP, AP may have an option in their building design where a particular aspect of the existing Codes, say the means of escape, cannot be fulfilled. The Performance-based design is generally viewed as an alternative rather

than a waiver of the PC, whereby the designer is required to demonstrate its equivalence to the PC. The designer must submit his Performance-based proposal for vetting by the Fire Safety Committee under the Chairmanship of an Assistant Director of the BD. While the PNAP provides a preliminary framework for implementing the PBFC, there is no mention on the post-occupancy evaluation on total fire safety, or how the fire safety management scheme is monitored.

6. CONCLUSION

Fire safety in buildings comprises three elements namely passive fire protection, active fire protection, and the fire safety management. The fire safety legislations in Hong Kong spinning around these three elements were enacted several decades ago. They are primarily descriptive in nature. Every time a tragic fire occurs, the AHJ try to tighten the legislation or to extend its coverage to other part of the building as a political reaction. While this approach is understandable, Walters and Hastings [6] have criticised that “this prescriptive and incremental approach to legislation lacks any form of rigorous scientific analysis; it is at best ad hoc and may well result in unnecessary disruption and expense to building owners and occupiers for very little reduction in risk to life”. Traditionally, the industry professionals just stick to the relevant Codes of Practices to get a fast-track approval from the AHJ and the rationale on the requirements of the Codes are usually taken for granted. In fact, the PC may not even give a rational solution to some complicated building design [3].

Hong Kong has evolved from an industry-based economy into a knowledge-based economy. In par with other developed economies, it is necessary for Hong Kong to move to a performance-based fire safety regulatory framework, either to allow for innovative building design or to maintain its competitive advantage. It is glad to see that the AHJ have taken a first step to issue a PNAP on PBFC for the industry and definitely this is in the right direction. However, there are many issues yet to be resolved:

- The PNAP only puts focus on new construction projects and alteration/addition works to existing buildings. What should be done to those aged or dilapidated buildings where there are technical constraints in carrying out upgradation works? There may even be difficulties in financing the improvement works for multiple-ownership or multiple-tenancy buildings.
- As the fire engineering systems are getting more and more sophisticated, the current

scheme on registration of the Classes of RFSIC needs to be revamped to reflect such technological development. It is questionable that whether the existing Classes of RFSIC possess the expertise knowledge in certifying the advanced systems such as smoke management systems.

- The significance of fire safety management is increasingly recognized but how it is to be implemented is not yet clearly defined. The existing BMO only regulates fire safety management indirectly through the BMM Code. It has no sanction effect on the property manager. If PBFC is to be implemented with success, a formal scheme of instituting the fire safety management system should be established. Actually fire safety management is a “cradle to grave” business which requires a continuous monitoring of the hazard to make sure it is kept within the parameters of the Performance-based analysis and assumption [36]. In a local design example of the Langham Place, preliminary approach on transferring the knowledge document such as the fire safety management plan to the facilities management team has been stressed by the Consultant [37]. The existing structure of the property management industry with the property managers taking up fire safety management as their part time duties is not palatable. It is dubious whether they can realise the technical details of the fire safety plan. Since the application of PBFC to building design and operation requires a high level knowledge on fire safety engineering, it is suggested that the fire safety manager should have received specialised training, say with a master degree in fire safety engineering.

While the local government and the AHJ have taken the first step towards a performance-based approach, it is worth contemplating that there should be a great deal of work to be collaborated amongst the officials, local research institutions and the industry before arriving at a practice which suits the local environment. A more user-friendly Code book should be prepared by the AHJ for the industry practitioners to follow; and training for an adequate supply of fire safety engineering professionals should also be strengthened.

REFERENCES

1. Hong Kong Government, Hong Kong Government Publication, Hong Kong (1996).
2. C.M. Lam, “Fire safety strategies: New Chap Lap Kok International Airport”, Asiaflam 1995, Proceedings of International Fire Conference on Fire Science and Engineering, March 1995, Hong Kong, Inter Science Communication Ltd., London,

- UK, pp. 63-68 (1995).
3. W.K. Chow, "Short notes on internal voids in high-rise buildings-Are they safe?", *International Journal on Architectural Science*, Vol. 2, No. 1, pp. 15-17 (2001).
4. Geneva Association, *World fire statistics*, Geneva Association Information Newsletter (2002).
5. Hong Kong Standard, 22 November (1996).
6. M. Walters and E.M. Hastings, "Fire safety legislation in Hong Kong", *Facilities*, Vol. 10, No. 9/10, pp. 246-253 (1998).
7. P. Canovan, "Legislation on fire safety; Limits and achievements", *Interflam 1988*, pp. 209-212 (1988).
8. J. Reason, *Human error*, Cambridge University Press, Cambridge, UK (1990).
9. Laws of Hong Kong, *Building Ordinance*, Chapter 123, Hong Kong (2008).
10. Laws of Hong Kong, *Fire Services Ordinance*, Chapter 95, Hong Kong (2005).
11. Laws of Hong Kong, *Building (Planning) Regulations*, Chapter 123 Subsidiary Legislation F, Hong Kong (2008).
12. Laws of Hong Kong, *Building (Construction) Regulations*, Chapter 123 Subsidiary Legislation B, Hong Kong (1997).
13. Buildings Department, *Code of Practice for the Provision of Means of Escape in Case of Fire*, Hong Kong (1996).
14. Buildings Department, *Code of Practice for the Provision of Means of Access for Firefighting and Rescue Purposes*, Hong Kong (2004).
15. Buildings Department, *Code of Practice for Fire Resisting Construction*, Hong Kong (1996).
16. Laws of Hong Kong, *Fire Service (Installations and Equipment) Regulations*, Chapter 95 Subsidiary Legislation B, Hong Kong (2004).
17. Laws of Hong Kong, *Fire Service (Installation Contractors) Regulations*, Chapter 95 Subsidiary Legislation A, Hong Kong (2008).
18. Fire Services Department, *Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment*, Hong Kong (1998).
19. Laws of Hong Kong, *Building (Ventilating Systems) Regulations*, Chapter 123 Subsidiary Legislation J, Hong Kong (1998).
20. S.C. Tsui and W.K. Chow, "Legislation aspects of fire safety management in Hong Kong", *Facilities*, Vol. 22, No. 5/6, pp. 149-164 (2004).
21. Laws of Hong Kong, *Dangerous Goods Ordinance*, Chapter 295, Hong Kong (2004).
22. Laws of Hong Kong, *Dangerous Goods (Application and Exemption) Regulations*, Chapter 295 Subsidiary Legislation A, Hong Kong (2001).
23. South China Morning Post, 10 January (1994).
24. Hong Kong Government, "Considerations and recommendations on improvement measures made by the interdepartmental investigation team after a fire at the Hong Kong Bank on G/F Shek Kip Mei Estate 10 January 1994", Hong Kong (1994).
25. Laws of Hong Kong, *Fire Safety (Commercial Premises) Ordinance*, Chapter 502, Hong Kong (2004).
26. W.C. Chow, "Fire safety legislation", *Proceedings of the one day Symposium on Fire and Safety Systems in Buildings*, The Hong Kong Polytechnic and Hong Kong Institution of Engineers, 26 September 1991, Hong Kong, pp. 1.1-1.4 (1991).
27. H.L. Malhotra, *Fire safety in buildings*, Building Research Establishment Report, Department of the Environment, Building Research Establishment, Fire Research Station, Borehamwood, Herts, U.K. (1987).
28. D.J. Howarth and C. Kara-Zaitri, "Fire safety management at passenger terminals", *Disaster Prevention and Management*, Vol. 8, No. 5, pp. 362-369 (1999).
29. Laws of Hong Kong, *Building Management Ordinance*, Chapter 344, Hong Kong (2007).
30. Home Affairs Department, *Code of Practice on Building Management and Maintenance*, Hong Kong (2000).
31. W.K. Chow, "Review on fire safety management and application to Hong Kong", *International Journal on Engineering Performance-Based Fire Codes*, Vol. 3, No. 1, pp. 52-58 (2001).
32. M. Walters and E.M. Hastings, "But is fire the issue ...? The problems of managing multiple ownership buildings in Hong Kong", *Property Management*, Vol. 16, No. 4, pp. 229-235 (1998).
33. Organisation for Economic Co-operation and Development, *The OECD Report on Regulatory Reform: Synthesis Report*, OECD Publications, Geneva (1997).
34. A.H. Buchanan, "Implementation of performance based fire codes", *Fire Safety Journal*, Vol. 32, pp. 377-383 (1999).
35. Buildings Department, *Practice note for authorized persons and registered structural engineers 204: Guide to fire engineering approach*, Hong Kong (1998).
36. V.M. Brannigan and S.M. Spivak, "ISO quality standards for participants in performance-based regulation", *ASTM's role in performance-based fire codes and standards*, pp. 14-22 (1999).
37. S.C. Tsui and M.C. Luo, "Performance-based Fire Safety Design-A Long-term Commitment in Building Operation Management", *Joint Symposium on New Challenges in Building Services*, The Hong Kong Institution of Engineers and the Hong Kong Polytechnic University, 15 November 2005, Hong Kong, pp. 129-138 (2005).