

FIRE SAFETY ENGINEERING IN A HOTEL

H.H. Wu

Department of Building Services Engineering, The Hong Kong Polytechnic University, Hong Kong, China

ABSTRACT

Preliminary studies on the management of fire safety in hotels were reported. Problems of hotel fires are discussed. Fire safety and training desired, problems related to the building services systems, roles of hotel management are outlined.

Keywords: building services system, total fire safety, fire safety plan, staff training

1. INTRODUCTION

Accidental fire might happen in a hotel which cannot be prevented. Fire brigades are almost called out to deal with fires everyday. Some fires were quite small but some might be quite serious, causing death or injury. There are many ways for fires [e.g. 1,2] to start in hotels and there are special risks, particularly at night, of fires spreading rapidly by way of staircases and lifts. Above all, there are problems arising from, and relating to, the occupants.

First, there are guests: adults and children, the elderly, in good or not so good health; people who, in the event of fire, are taken by surprise, particularly if the outbreak is at night when they are asleep. They are in a building which they are not familiar with and where the other occupants, staff and guests, may speak a different language. Visitors attending functions such as weddings, sales drives, dances, meetings and conferences, may be even less familiar with the hotel.

Secondly, there are trained staff who are aware of their surroundings and with the opportunity of knowing the hotel perfectly. They are part of an organized community answerable to their superiors and should have received some training in emergency procedures. However, some staff might be of temporary appointment, particularly during the high business season. In many hotels, staff change frequently and there is also the problem that staff are not always familiar with the language of the country. Furthermore, the complexity of hotel services also presents big fire hazard, e.g. laundry, kitchen equipment and storage/use of gas and dangerous goods.

2. HOTEL MANAGEMENT RESPONSIBILITY

Hotel management is responsible for protecting the lives of guests and staff in the event of fire. This is both a moral obligation and a 'commercial' obligation (as part of the services rendered). Management is also responsible for ensuring the smooth running of the business and for its protection against the direct and consequential effects of a fire.

In order that rescue operations and fire fighting by the fire brigade can be carried out as efficiently as possible, the details have to be planned in advance. This pre-planning requires regular consultation and meetings between the hotel management and the fire brigade with the aims of:

- Identifying the areas which present particular risks [3,4];
- Ensuring that access facilities are adequate; Approach by fire brigade vehicles and equipment is not obstructed and immediate use can be made of hydrant, dry risers and foam inlets;
- Examining the layout of the building so that fire brigade officers can work out a plan of attack; a plan of the premises should be given to the fire brigade, and duplicate plans should be readily available at the hotel.
- Arranging for people to assist the fire brigade on their arrival; certain staff should have the duty of meeting the fire brigade, directing them to the fire and informing them of any occupants who may be trapped.

3. SMOKE EFFECT AND BUILDING SERVICES SYSTEM

Although it is important to predict the spread of fire within a hotel [5], it is equally important to consider the spread and effect of smoke created by the fire as it burns.

In addition to suffering from the physical and chemical effects of heat such as the generation of toxic fumes and/or asphyxiation as the fire consumes the available oxygen, the inhabitants of a burning hotel building may be adversely affected by the smoke [6].

There is a natural reluctance in people to walk through smoke and this, combined with the reduced visibility and associated obscurity of escape routes [7], exit doors and exit signs, often contributes to panic, especially in unfamiliar surroundings. The toxic effects of smoke are particularly dangerous in hotels when people are likely to be asleep.

Building services systems also have a lot of impacts on hotel fire safety:

- Electrical System – Overloading and short-circuiting are main contributing factors. Hence, electrical safety is very critical in hotel fire safety.
- Laundry Equipment – Overheat of lint and dust in laundry. Hence, regular maintenance and cleaning are crucial.
- Kitchen Equipment – Regular maintenance and cleaning on equipment to remove oil and debris.
- Air-conditioning System – Maintenance and cleaning of equipment to remove dusts, damper/filter maintenance and proper selection of insulation.
- Lift and Escalator – Proper maintenance of equipment on electrical safety and dust removal are important. Lift shaft and escalator bottom void are critical for fire safety.
- Fire Services Installation – Of course, this must be properly maintained.

4. HOTEL STAFF TRAINING AND PROCEDURES OFFERED BY HOTEL MANAGEMENT

For hotel fire safety, we have to note:

- Fire service installation (FSI)
- Passive building construction (PBC)
- Risk factor (RF)
- Fire service management (FSM)

The local guesthouse and hotel ordinance [8] has specified some guidelines on the above.

For a proper fire safety plan [9], it consists of:

- Fire maintenance plan – all equipment and facilities must be properly maintained by Engineering and Housekeeping department. Preventive and predictive maintenance plan and schedule are crucial.
- Fire prevention plan
- Fire action plan – liaison with fire brigade and all Government departments are important.
- Training plan – this is commonly practiced in all chain hotels and is treated as top priority.

It is vital that adequate provision is made to ensure all full- and part-time employees and shift workers are given regular appropriate training in what to do in case of fire in order to achieve quick and safe evacuation of themselves and the guests.

Staff should be instructed and trained in matters which will be their particular responsibility in the event of a fire. These will include:

- department heads;
- supervisors;
- deputies;
- house services/reception staff;
- engineering and maintenance staff.

In order to ensure the continuity and effectiveness of the training programme, which should be based upon written instructions and notices, it is important that records should be kept of all training.

In addition to the preceding procedures, engineering and maintenance staff should receive training in the actions that they need to take, such as closing down the plant, machinery and processes that might contribute to the spread of smoke and flames or create hazardous conditions if left unattended.

5. FREQUENCY OF TRAINING AND PROCEDURES – FIRE SAFETY MANAGEMENT

- Day and night staff

Staff should be trained at least once in every period of twelve months – preferably twice. For staff who are employed at anytime during the night, the training requirements are increased to once in every period of three months.

- New staff

On their first day at work, new staff should be given basic training on the location and use of escape routes and in evacuation procedures. In addition, they should be issued with a personal copy of written fire precautions and procedures.

Follow up training, ideally two thirty-minute sessions to be held within one month of the basic training, should be arranged to reinforce and expand the information given at the initial induction session.

- Training syllabus

The following matters should be considered in any training programme:

- how to raise the alarm;
- actions to be taken on discovering a fire;
- actions to be taken on hearing a fire alarm;
- calling the fire brigade;
- location and use of extinguishers and escape routes;
- dealing with disabled persons and evacuation procedures.

- Evacuation drills

Fire Evacuation drills, which should not involve guests, are recommended to take place at least once a year and preferably once every six months.

Evacuation training should form part of the fire precautions training discussed previously and should include:

- knowledge of the fire alarm signal;
- knowledge of the nearest escape routes and fire exits;
- knowledge to help disabled persons, including an understanding of different disabilities, i.e. physical, mental, hearing, sight disabilities and possible reactions in the event of a fire;
- location of the fire assembly area;
- the importance of ensuring attendance at the roll call, and if necessary reporting any persons missing or known to be still in the hotel;
- dangers of re-entering the evacuated hotel unless authorized to do so;
- work shift identification;
- extent of drill;
- optimum evacuation time;
- date;
- total evacuation time;

- approximate number of participants;
- date of next drill.

6. FIRE WARNING SYSTEMS

A fire warning system consists of detectors and manual call points (break glass units) strategically situated throughout a building, which are connected to a control indicator panel. Depending on the fire warning system installed, information will be displayed at the control panel. In the case of conventional systems, “zone” indication will be given. In the case of addressable systems, the location of the actuated detector or break glass point will be given as an automatic liquid crystal display (LCD) at the control panel. This may also be provided as a hard copy by connecting a printer to the system.

In addition, the fire warning system may also include the connection of relay contacts which may be regarded as the interface between the warning system and the main building services, such as lifts, air conditioning systems, dampers etc. Operation of the warning system will prevent these services from working, or will change their mode of operation, i.e. lifts will automatically go to ground level and stay there. Air conditioning systems will be switched off and dampers will close down all open ducts or orifices, in order to prevent the spread of fire or smoke throughout the building.

Due to the lack of response to smoke, heat detectors are not suitable for most areas in a hotel and are only installed in areas where smoke detectors could give unwanted alarms e.g. kitchens.

Ionisation detectors are less liable to be activated by steam than optical detectors and are suitable for installation in guest bedrooms.

Optical point detectors detect an obscuration and/or scattering of a focused light beam by the smoke particles. Ambient light conditions must be considered for the siting and use of these detectors. In contrast to ionisation smoke detectors, optical systems respond more effectively to dense, heavy particulate smoke.

Although smoke detectors generally provide acceptable protection in hotels, there are known problems with false alarm caused by tobacco, etc. and certain chemical fires, e.g. involving alcohol, which will not activate smoke detector systems as smoke may not be evolved in the combustion reaction.

Manual call points are the square “break glass” appliances strategically located around the hotel.

Generally, no pointing in a building should be further than 30 m from a call point, although this distance should be reduced where there are specific fire hazards.

The signals – bells, sirens, hooters, public addresses, etc. – incorporated into the electrical alarm system should be distinctive and the warning devices should be sited so as to ensure that a common warning signal is perceptible throughout the hotel. In parts of the hotel where background noise levels may be excessive, or in any other situation where a normal type of sounder may be ineffective, e.g. where deaf persons are employed, visual signals should be used to supplement the audible alarms. Tests have proven that a flashing white strobe is the most suitable for this purpose.

As a guide, the minimum sound level at any point in the premises should be 65 dB(A), or 5 dB(A) above the ambient noise levels, in guest rooms the sound level should be increased to 75 dB(A) or more.

In the event of a false alarm [10], it is important that the cause and extent of the problem is determined as quickly as possible. This is especially important where there is disruption to the fire warning system resulting in a substandard level of protection.

Common causes of false alarms include the following:

- mechanical and electrical faults, often resulting from the effects of vibration, impact or corrosion;
- ambient conditions such as heat, smoke or flame from cooking or work processes, fumes from engine exhausts, or high air velocities due to strong winds outside the building;
- work being carried out in a protected area without knowledge of, or in neglect of, the necessary precautions;
- communication faults arising from servicing or testing work carried out without prior notification to the fire brigade or central alarm station or arising from activities of the public telecommunications operator;
- electrical transients or radio interference;
- inadequate servicing;
- the building up of dust or dirt within a detector, or the entry of insects;
- change of use within the hotel;
- accidental or malicious operation of manual call points or detectors.

7. PORTABLE FIRE FIGHTING EQUIPMENT

In Hong Kong, it is a legal obligation to provide a means of fighting fire and ensure adequate maintenance. This requirement may be supported by a condition of insurance imposed by the insurance company. Fire extinguisher is a key element with the following points to note: -

- Quantities and type

Before deciding on the numbers and type of fire extinguishers that are required for a particular risk, reference should be made to local legislation and advice should also be sought from the fire services department.

Fire blankets should be provided in high or special risk areas, i.e. all kitchens and workshops.

- Suitability

Extinguishers are made in a number of sizes; the heaviest that can be considered portable weights 23 kg. The physical ability of those persons who are most likely to use them must, therefore, be considered. If the allocation of water extinguishers is to be based on the criterion floor area, then one 9 litre extinguisher should be provided for every 200 m² of floor area.

8. HOSE REELS

Hose reels are strongly recommended particularly where the attendance of the local fire brigade is doubtful and where floor areas are in excess of 800 m². They are the most effective extinguisher, depending on the class of fire. Once they are in action, a substantial volume of water can be provided, which will be equivalent to using several extinguishers at the same time. The water supply may also be controlled.

However, in accessing the need for provision of hose reels, the following points should be taken into account;

- portable fire extinguishers are very quickly discharged, often within 30 to 60 s;
- it may take some time for the first fire engine to arrive at the premises, so traffic conditions at peak times in addition to distance should be considered;
- hose reels are simple to operate, deliver an unlimited supply of water and can be quickly turned off.

9. WATER SPRINKLERS

Water sprinklers comprise a system of pipework, pumps, control valves and heat sensitive valves in the sprinkler heads which release water onto the seat of a fire. The rate at which the water is released will depend on the severity of the fire, given the nature of any combustible materials present. It is the flow of water which actuates any connected alarm systems. In larger buildings, it is usual to divide complete sprinkler systems into "installations" which are separate from other sprinkler installations with each operated by their own control valves.

- Obstruction of sprinkler heads

A clear space of at least 0.3 m should always be maintained below the level of the sprinkler head throughout the room.

For high-piled combustible stock, increased clearance of 1 m or more should be provided.

10. EMERGENCY LIGHTING (ESCAPE LIGHTING)

When the electricity supply to the normal lighting fails, emergency lighting is required to fulfill the following functions:

- to indicate early and unambiguously the escape routes and associated exit signs;
- to provide illumination along such routes allowing safe movement towards and through the exits provided;
- to ensure that fire alarm call points and fire fighting equipment provided along escape routes can be readily located;
- to ensure that changes of direction and levels are identified.

Emergency lighting is required not only on complete failure of the normal power supply but also on a localized failure if such a failure would present a hazard, e.g. failure of a single subcircuit on stairways.

Any new emergency lighting system should conform to the provisions of territorial legislation. The normal standards require that emergency lighting should maintain an adequate level of illumination for three hours, although in small hotels, e.g. those lower than three storeys, one hour is sufficient.

11. CONCLUSIONS

Hotel fire safety is very important as different occupancies and functions will be carried out inside the hotel and the guests usually are not familiar with the building layout. Some hotel owners only focus on the aesthetic or comfort and in return neglect the basic fire safety in hotel. The local prescriptive fire code is not sufficient and performance based fire code is advocated to reinforce the design of hotel fire installations. Further researches need to be carried out so as to reinforce this performance based practices in order to establish proper design and construction of fire service installation in hotels.

ACKNOWLEDGEMENT

This project is funded by a PolyU research grants under account number G-V676.

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