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FIRE SAFETY ENHANCEMENT IN RESIDENTIAL AND COMMERCIAL BUILDING BY PROTECTIVE MEASURES

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ABSTRACT

The twentieth century was a time of great change and growth in society as well as in fire safety. As we begin a new century, it is important to reflect on these changes, as well as the fire safety challenges in the future. The overriding fire safety challenge we face is to focus on reducing the cost of fire to our society. This will require national and international leadership, focus, resources, and motivation. The key to our future success is research: policy, scientific, and field research. Through these efforts, we can come to understand the fire problem, what fire safety efforts and measures are effective, and how these effective measures can be implemented to reduce the cost of fire in our society.

Performance based fire safety codes have been implemented in many countries around the world. Implementation of these codes has induced more complex building constructions or landmarks such as Burj Khalifa in Dubai, The Shard in London or The Bird's Nest in Beijing. Also ordinary buildings such as office buildings are becoming more complex due to an increasing demand on spectacular and state of the art buildings. These complex buildings have challenged fire safety engineers because standard solutions cannot be applied. On the contrary it gives the opportunity to be innovative and develop new solutions. However the safety level in the building should still be sufficient according to current regulation. Fire safety engineering tools including various models to predict evacuation times and different software to calculate time until critical conditions occur have been developed.

Mixed methodologies i.e. quantitative and qualitative methods were adopted in this research. There are three research methods adopted i.e. observation, and questionnaire. Observations were carried out to identify any problems encountered.

I.INTRODUCTION

Fire is one of the greatest threats to the occupants, fabric and the structure. The object of fire safety legislation, quite rightly, concentrates on the saving of lives and prevention of injury to persons. However, in the case of a protected structure, additional consideration needs to be given to minimizing damage in the event of fire. Many protected structures may be particularly vulnerable too because of their remoteness or lack of occupancy. Older buildings may be more vulnerable too because of traditional construction techniques which included the extensive use of timber in concealed spaces or because of unrecorded alterations, such as the installation of services, which created routes through the fabric for the spread of smoke and fire.

IJARSE
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Compromise from all sides will often be needed to resolve conflicting requirements of fire safety and architectural conservation. Where possible, planning officials and fire officers should liaise during the course of a planning application, to ensure the best solution is found. This can be done by using the mechanisms available under Section 13 of the Fire Services Act 1981.

In the interests of good conservation, consultation between the applicant, the planning authority and the fire authority should take place, where possible, at a pre-planning stage. It is generally of advantage to all concerned to resolve any major issues at an early stage.

If we can understand the fire safety aspects, and we know what are the actual problems encountered in those buildings, appropriate measures can be taken to enhance fire safety standards.

II. APPLICATIONS FOR WORKS TO ENHANCE FIRE SAFETY

Where the planning authority considers that an application for works to a protected structure would require alterations to enhance fire safety that have the potential to adversely affect the character of the building, the planning authority should consult the fire authority. Where the fire officer advises that extensive or potentially unacceptable works may be required, the planning authority may then request that the applicant submit a fire risk analysis as further information in order to allow an assessment of the full impact of the proposed development on the structure. It may be advisable for the applicant to engage a specialist fire consultant in order to achieve a satisfactory level of fire safety with minimal intervention into the fabric of the structure.

2.1 Means of Escape in Case of Fire

The safe escape of occupants from a building in the event of fire is of primary importance. However, with a protected structure it may be neither practicable nor appropriate to comply with particular requirements of TGD-B of the Building Regulations. For this reason, compensating measures are allowed to be provided when dealing with an existing building. These measures include all or some of the following:

a) Enhanced levels of life safety protection by automatic fire detection and alarm systems
b) Reduced travel distances;
c) Enhanced smoke-control measures;
d) Pressurization of stairway enclosures
e) Protection to escape routes from places of special fire risk
f) Enhanced performance of fire doors
g) Additional structural fire-protection measures such as increased levels of compartmentation of the building.

There may be special requirements for providing means of escape for people with disabilities, which will also have to be considered.

2.2 Lighting and signing of escape routes

The need for the lighting and signing of escape routes should be carefully considered so as to reduce the impact on the character of the interior while clearly defining the routes. In certain sensitive interiors, the applicant may be required to install specially designed fittings that suit the location while fulfilling fire-safety requirements.

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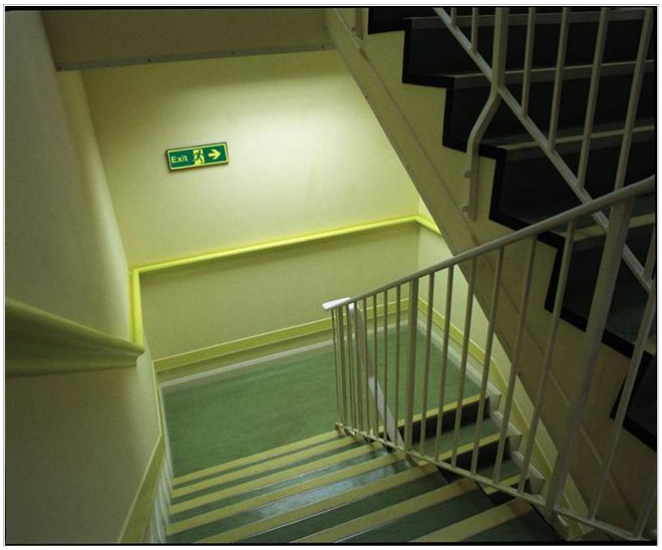

Figure 3.1: Signing of escape routes

2.3 Fire-protected lobbies and corridors

Where proposed alterations to provide enhanced fire protection would require the inclusion of protected lobbies, corridors or staircases into the interior of a protected structure, works may be necessary which would have a serious impact on the character of the building. This could include works to upgrade the fire resistance of walls, floors, ceilings, staircases or door cases.

2.4 Fire detection and alarm system

A fire-detection and alarm system is an essential part of the fire-safety strategy for all buildings. The early detection of fire is of great benefit in reducing damage and danger to both life and property. Automatic detection systems can detect the presence of fire from smoke, heat or infra red/ultraviolet radiation and other emissions. Some buildings may require a different form of detection system for different locations. The character of an important interior can be harmed by the inappropriate design or intrusive location of a detection system and its associated wiring, for example, smoke detectors mounted on a decorative ceiling.

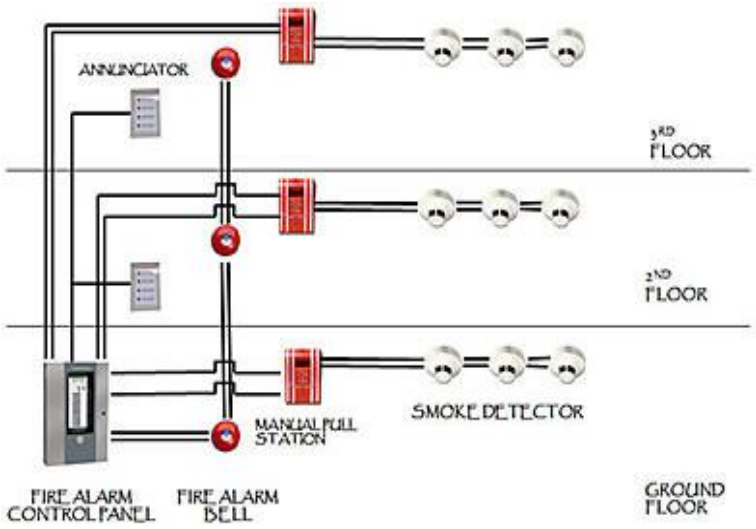

Figure 3.2 : Circuit diagram of fire detection and alarm system

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2.5 Escape routes and exit

The use of external escape stairs should be avoided where possible because of their large and usually negative impact on the external appearance of the building. In addition, the requirement for windows or doors adjacent to an external escapes stairs to have adequate fire resistance. Where the installation of an external escape stairs is unavoidable, it should be carefully designed and efforts made to locate it inconspicuously. Escape stairs should not be permitted on principal elevations nor where they would impact on important views of the structure.

2.6 Access and Facilities for the Fire Service

Where a protected structure is sited in a remote location away from a mains water supply, consideration needs to be given to the necessity for an adequate water supply for fire-fighting. Where an application is received for works to such a building, the planning authority could consider, as a condition of permission, the provision of water storage tanks or otherwise adjacent to the protected structure. The appearance and siting of such water storage should not adversely affect the character of the protected structure. Consideration should be given to upgrading, or improving access to, existing water features located adjacent to the building such as ornamental lakes or fountains, which could serve as water sources. Alternatively, underground water-holding tanks could be provided where the construction of these would not disrupt important areas of hard landscaping or gardens.

2.7 Management

Management issues in managing buildings mainly can be categorized into four:

- Duty and responsibility,
- Inspection and rectification,
- Control and enforcement, and
- Feedback and response.

Management has a duty and responsibility to ensure the buildings are sound and safe for occupant's at all material times. Therefore they should inspect and rectify all building defects, replace or repair every faulty fire safety system and carry out regular maintenance as necessary. Control and enforcement needs to be firmly done to ensure that no one tries to abuse the situation. However, the management must respond to the tenant's complaints and appropriate measures are been taken upon receiving any feedback from the tenants.

III. FIRE PREVENTION MEASURES

In the case of fire damage to protected structures, prevention is obviously better than cure. it is the duty of the persons in control of a number of specified building types to take all reasonable measures to guard against the outbreak of fire on such premises. However, a planning authority may have little opportunity to input into the operational practices that are undertaken in the management of a protected structure. The owners and occupiers of these buildings should be encouraged to take certain steps in order to prevent their building becoming endangered by fire. Such steps might include the preparation of a regularly monitored fire-safety plan.

A fire risk assessment should be carried out for the protected structure. This would be most useful in advance of preparing a detailed planning application. The likelihood of fire can be reduced by the identification of risks and

IJARSE
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their elimination or by the management of those which cannot be eliminated. Common causes of fire in protected structures include electrical faults, building or renovation work, arson and accidental fire from hearths, smoking, kitchens and the like. Many of these causes can be eliminated or minimized by the adoption of certain operational procedures such as banning smoking in or around the building or adjacent to flammable material such as thatch, the use of 'hot work' procedures during refurbishment work and the storing of combustible materials within the building. Staff training, where appropriate, should include maintenance and testing techniques as well as preparation for emergencies. Lightning may be a possible danger, particularly to large isolated structures. Where appropriate, these structures should be protected with earthed lightning-conductors.

IV. CONCLUSION

Fire safety in buildings should be seriously considered to ensure the optimum safety of people as the highest priority by various parties such as building residents, professionals in the construction industries and relevant government agencies. They should play a vital role to ensure all fire safety aspects are maintained at a relatively high standard or at least at an acceptable standard set by the relevant authority. This can be done by not allowing any risk elements to be placed in the buildings during the building's occupation even though the intention of doing that is as an *extra security precaution* such as double locked iron grill, iron grill fitted beyond the owner's property, some items placed in the escape routes, etc. All obstructions should be removed soon after they have been identified. Some sort of enforcement determination should be imposed such as a fine penalty to those committed, removing and destroying all items placed beyond their boundary and passing and any cost involved for doing so to the respective flat tenant. This sort of 'Hostile Education' is effective at educating people with a bad attitude to make them understand the risk posed to other members of the community. By understanding the consequences that residents will have to take if they did something that could have caused catastrophe to them and/or to others would help them to be more responsible about the fire safety in their own building. Therefore education and lessons concerning the impacts of fire, safety measures, necessary action to be taken if fire breakout and the risks that residents of the buildings would have to take should be always been done from time to time. There are proper places to put out all the unwanted items provided by the local authority. Every building has a rubbish collection centre for large items

From the observations of the research finding, it is evident that improvements in fire safety standards in the buildings in Delhi, Noida and Gurgaon are needed. Provision for escape route, i.e. corridors, fire doors and staircase design and specification, should be improved, along with the occupant's awareness of evacuation procedures in an emergency situation and how to use fire suppression systems. Also, regularly checking and auditing of fire safety aspects in building and strict enforcement of regulations to ensure that escape routes are safe for use at all times should be carried out. This suggestion is to ensure that the standard of fire safety in the buildings can be achieved. From the simulation studies, it is recognized that the escape routes specification proposed are reflected to the number of people simulated. The result may be different if the number of people used in the simulation is different.

The issues with which this work is consent are what are the current states of the escape routes in the buildings in Delhi, Noida and Gurgaon?; Does the escape route design and construction comply with the current regulation?; What are the optimum dimension of escape routes that can permitting all occupants to evacuate the building

IJARSE
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safely and fast?; What are the actions that the occupants of the buildings would do if a fire breaks out in their residential building?; What people perceptions when fire alarm goes off?; What factors that most motivating people to evacuate the building once the alarm sounded? What factors that most influencing the human behavior when they are in emergency situation e.g. in building fire? To answer these questions, investigations have been carried out and the outcomes are discussed in the relevant chapters. Summarize of the findings can be found in the following sub-sections.

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