



# Fighting Fire in High Rises

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**D**isasters in India today are a sorry state of affairs. Fire has taken a plunge ahead in man made disasters. Its extrinsic effects have metamorphosed through the centuries as a result of industrial, technological and military development. The Great London Fire, 1666 the Chicago fire of 1871, the explosion at WTC in 2001 and the Pataguay Supermarket Fire in 2004 are some of the well-known fire disasters.

## Highrise Buildings

Construction has gone vertical for the past two decades. The imposing facades might add to the global trend but how safe are they? The National Building Code of India (NBC) defines buildings of 15m or

more in height as highrise buildings. The design of highrises in response to fire design services includes the design of smoke detectors, fire alarm systems, automatic sprinkler systems and egress systems. Mass evacuation is a critical issue in highrise buildings especially when fire is there at more than one location.

## Indian Status

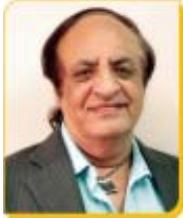
India observes 14<sup>th</sup> April as the National Fire Services Day each year in commemoration of the fire fighters who lost their lives in the Mumbai Port Trust fire breakout in 1944. The Dabwali school fire in 1995, the Uphaar tragedy in 1997 and the recent fire in November 2008 that engulfed Hotel Taj in

Mumbai as a result of terror attacks have routed India. The youngest mountain ranges of Himalayas are the most vulnerable stretches of the world as far as forest fires are considered.

Recently buildings in Surat underwent checks for fire safety and most of them have not fulfilled the optimum conditions. Fire officials reportedly found out that many buildings were equipped with fire safety systems which were not in working conditions. In some, cases, the systems were developed only upto half of the height. For fire prevention, it is vital to have a periodic inspection of all buildings.

The NBC prescribes norms for highrise buildings including the specifications for lifts, basements,

construction, illumination and modes of exit, transformers, air conditioning, fire alarm systems and fire control rooms. The NBC and IS Codes to a great extent have suggested norms for fire safety.



Famed architect **Prem Nath** who is in the process of creating the highrise Skydham residential building in Mumbai for sustainable sky living, in response to this says, "IS Codes and NBC are generally very up-to-date. However what lacks is their strict implementation."

## Prevention

The best managed disasters are undeniably the disasters which can be prevented. The effects of fires can always be minimized if not prevented.

Architecturally, there should be some considerations while designing a building for fire safety. When an architect builds, besides considering the escape routes incase of a fire, the building as a property needs to be saved. Also, precautions should be taken to protect the adjacent buildings from looming large under the fire threat.

Many times following the architect's construction users add walls etc to their houses which should definitely be scrutinized.

## Compartmentalization

Compartmentalization is a concept through which fire is kept within the minimum possible areas of the buildings, areas where the risk of fires is very high. It can be achieved through floor separation, roof separation or wall separation. Generally, escape routes like corridors and staircases are injected with fresh air and the pressure of air is kept higher than the rest of the building. Judicious compartmentalization helps in confining a fire to its source, prevents it from further spreading, limits its size and segregates the area which has a higher fire risk from other critical areas.

## Fire Protection and Fire Fighting Equipment

It's a well-known fact that during fire disasters more than the fire, the casualties are caused by smoke and stampede. Fire needs to be contained at a source since there is a saying that the first five minutes of a fire can dictate the

next five hours. For this, a number of safety features that prevent the spread of fire and control smoke should be planned while executing any design. These include fire dampers, smoke venting systems, automatic operated vents and electrical isolation switches.

Architect Prem Nath adds, "There are many fire rated products available in the market, yet there is a need to choose the right product and specification/certification; i.e. there is a difference between just a fire rated door installed and a 2 Hr. fire rated door with fire rating certification. Similar is the case with interior products like carpets, ply, framing materials, and so on."



**Rafiullah Khan**, Business Unit Head, of Buds & Soma, a firm in Chennai dealing in Fire alarm systems and fire detection system while talking of

fire alarms says, "There are two types of alarms, conventional and addressable." For prevention or early detection of fire the firm deals in fire alarms which consist of control panel, detectors (smoke, heat, & LPG), MCP- glass break (manual Call points), siren, auto dialer with 5-9 nos memory to play the pre-recorded audio message to the saved



numbers. **M Vasu**, founder of Varsha Electricals, a premier electrical contracting company in Bangalore says, "It is imperative to

have measures in the building whereby sufficient number of safety extinguishers CO<sub>2</sub> can be put to get proper fillings."

Incase of fire fighting a number of manual and automatic systems work. These include portable fire extinguishers, hose reel systems, pressurized hydrant systems, total



flooding systems and sprinkler systems. For fire fighting, Buds & Soma have come up with multipurpose fire extinguishers of type ABC. (A-Solids like wood, papers, cloth, etc; B-for liquids, like kerosene etc; C-Electrical fire.)

Electric service switches should also be inspected. The purpose of an electric service switch is to disconnect all the electric services in a building except emergency equipment. It is important therefore to station this apparatus at a readily accessible spot near the point the

Markets are abundant with different types of detectors, smoke alarms etc. Murli Techno Pvt Ltd., a Mumbai based firm into the manufacturing of ISI Mark Fire Fighting Equipment, and also the authorized distributors for advanced firefighting technology GmbH, Germany has water mist technology for fire fighting products. **Mr Milind Jadav**, Marketing Manager of the company says, "The USP of these products is that they require less water, hence the collateral damage is very less. These can be applied

the considerations that should be in mind are the demographics of the occupants, their age groups and disabilities, the difficulties that the occupants and the staff might face using the escape equipment, the time needed for total evacuation and analysis of the cost to reach to optimum safety solutions.

The code also maintains that the requirement of a helipad is important for tall buildings since the conventional evacuation is impractical. Internationally, there have been several cases where people have collected on the rooftops of burning buildings due to non availability of staircases for escape during fire and they have been rescued from there using helicopter sorties.



service conductors enter the building.

Automatic fire venting through the use of roof vents is not generally applicable in multi-storey buildings. In such cases, as the code prescribes specially designed mechanical ventilation systems (making use of exhaust ventilation, plenum ventilation and balanced ventilation methodologies) or pressurization methods have to be resorted to. Spongy roofs have also been new construction concerns in fire engineering for which it is important that the pre-fire plans of a building show the type of roof and its supports.

directly on the electric fire or oil fire."

## Size of Windows

The amount of air supplied to a burning fire in a room remains proportional to the window area. In case of a smaller window, the oxygen supplied is less, hence the fire can cease out.

## Means of Evacuation

A review of programmes has shown that it is not practical to attempt full evacuation of a highrise building gutted with a major fire. In such cases, phased evacuation is preferable. In case of evacuation

## Evacuation Elevators

A lift system, intended for evacuation must offer protection against heat flames, smoke, water, over heating of machine room equipment and loss of electrical power. In Model building codes, such as the International Building Code and referenced standards, one can now notice the criteria needed for elevators that are specially designed to remain functional in emergencies. These are termed as "evacuation elevators," and they incorporate back-up power supply, pressurization and ventilation systems to prevent smoke build-up. There is also a possibility of emergency personnel being able to operate standard elevators in certain emergencies with a special key. Also in some cases, it may be possible to evacuate people with disabilities.

## Staircases

Generally, the number or size of emergency exit stairways falls short by codes. In cases where a second fire stairway is not possible escape chute method can provide a practical alternative. If an evacuation is required the chute can support

other means of escape to minimize the time taken for occupants to egress buildings during emergencies. The NBC considers fire towers as the safest escape route. Fire towers are enclosed staircases which can only be approached from the various floors through their landings or lobbies which are separated from both the floor areas and the staircase by fire-resisting doors, and are open to the outer air. It also stresses on installing double throw switches to ensure that lighting in staircase and corridors doesn't get connected to two sources of supply continuously.

## Egress Solutions

The NBC defines 'egress' as a continuous and unobstructed way of travel from any point in a building or structure to a place of comparative safety. This is the most important component of the NBC as a whole as far as life safety of the occupants is concerned.

Generally, in most of the modern buildings there are no signs or indication of the fire exit routes and thus people are not aware of which way to run for safety. The Egress system has proved useful over the years. The attack on

the WTC twin towers saw many survivors following the building's photo-luminescent egress path markings to direct themselves to safety. The components of an egress system consists of the exit access (the route occupants must follow to reach the exit), the exit (a protected path, which allows the occupants to leave the building without risk from the fire) and the exit discharge (a planned path to direct the occupants safely away from the incident).

The egress system takes into account the occupant loading, their mobility and their location, the floor layout, building design and travel design. After finalizing the egress routes, photo luminescent light fixtures are used to highlight the exit paths so that they can direct the occupants to leave the space to go into a safe zone.

## Use of Materials

The fire rating of elements is an important step in fire safety which encapsulates that all structural elements must have minimum fire resistance. This need proper structural design of RCC structures following codal provisions and specifications. If a fire occurs in a

room with materials of low thermal conductivity, temperature will be high as there will be little heat to escape, but the heat penetration into the material structure or building structure will be less because of low conductivity and so the effect of the fire on the structure will be reduced.

## Fire Safety Plans

Fire safety plans should be implemented by having a thorough knowledge of the plan of the whole building and about the potential source of water outside the building. Panchkula based noted



architect **Sangeet Sharma** is of the view that fire safety codes are sufficiently indicated in the codes, but the implementation of them is very

important. According to him, "The application of codes is the purview of the authorities that understand the subject." For him, the installing of perfect fire systems is not enough; it is the application which is important.

Mock drills can help in making a fool proof plan. Information relative to fire safety systems should be well communicated to the occupants and the fire safety department.

## Passive and Active Fire Safety Facilities

According to the role they play in overall fire defence, fire safety facilities can be classified as active or passive. Passive facilities refer to issues connected to building design like the selection of fire resisting materials, compartmentalization, provision of fire exits, travel routes and fire rated doors. Active facilities include systems which are designed to give the warning of an outbreak of fire, containment and extinguishing of

## Some Key Features

- ◆ A place of safety within the building itself known as 'refuge' should be provided. This is a place which has sufficient fire resistance and is free from the ingress of smoke and fire.
- ◆ A staircase which terminates at the ground floor and a staircase to the basement should always have an entry from an open space.
- ◆ Fire resisting doors used to cut offs or fire breaks should be maintained in good working condition.
- ◆ Special care should be made to protect fire in basements or semi basements for the protection of columns supporting the super structure.
- ◆ It is preferable to avoid carpets and wooden doors.
- ◆ Awareness about fire safety should be made through the media. Also, it is important to impart elementary fire fighting training to occupants.
- ◆ Fire services need to have digital systems so that with the help of internet or quick detectors one can find out where the fire is.
- ◆ Kitchens need to have a smoke detector and a fire proof door or an alarm.
- ◆ Measures against electrical short circuit have to be taken by ensuring quality and fire resistant electrical materials.



fire. These include automatic facilities like fire alarms, total flooding, sprinkler, stairway pressurization systems, and manual facilities like hose reel, hydrant, portable extinguishers, public address systems and many others.

## Initiatives in India

Since Independence, a number of initiatives have been taken in India to strengthen fire safety measures in the country. Fire Force Bill, Fire Prevention and Safety Act for fire safety of buildings, Discipline Code for Fire Services, inclusion of the subject Fire Protection and Control in the 7th Schedule of the Constitution, model rules for provision of fire fighting equipment under the Factories Act, review of existing legislation, awareness programmes and delinking the state fire service administration from the control of the police are some of the major initiatives taken by the government of India. PFA (Poudre Fire Authority), Maharashtra Act has now been implemented in the state strictly. It is envisaged that

Karnataka will follow suit shortly. It has been found that majority of times the accidents happen due to defective wiring and carelessness. Both Khan and Milind emphasize that through marketing their companies are trying to raise the awareness of fire safety amongst people. Milind adds, "We have demos for fire fighting in the office and also train personnel for it."

When asked whether he think that there is any need for fire rating mechanism for different building materials, at the time of giving completion certificate Khan says, "Probably the Government fire service departments would have their methodology on such areas due to their rich experience in a wide service area from huts to multiplexes/multi storied buildings, we shall be glad to learn the same." However, Milind despondently admits that though there is none, the same should be incorporated. Architect Prem Nath informs that in case of fire rating mechanisms for different building materials generally what is recommended by the architects/

designers is then converted into a commercially viable product specification. Thus, what is required is a final certification by the Chief Fire Officer (CFO).

A key international event in India on fire safety and prevention will be the upcoming Fire India'09 Exhibition & Conference scheduled to be held at Mumbai in September'09. This is the seventh in the series of the highly successful Fire Safety Exhibitions held before. It aims to attract the best of fire equipment manufacturers, suppliers and service providers, showcasing an entire range of fire engineering products, latest machinery in fire appliances, new technologies for prevention, detection and fire suppression.

## What is Needed?

- (1) A properly analysed and designed Building Structure which can provide rated resistance to fire accident
- (2) Selection of proper safety against fire systems to suit type of building, materials used. Their installation, periodical maintenance and up keep and effective operation and use when needed.

One can have the best system installed but if they are not maintained and properly operated, than that is of no use.

## Conclusion

Conclusively, it is important to maintain fire safety. At the end of the day, it is not the mere implementation of the codes or the inspection of the buildings which matters. What matters are the lives and the safety of the buildings and their inhabitants, which is definitely invaluable to all.

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