

Looming danger, complacency all round

DR. NIZAMUDDIN AHMED

ONE-dimensional application of technology is not only a futile exercise in architecture but could pose a threat to safety and security of persons and property. Therein lies its futility.

While the growing number of stylish shopping centres with new materials and new application of old materials are hoping to take the breath away, there could be literal truth in it because one vital aspect of deep, enclosed and populated buildings fire prevention, precaution and control has been largely ignored.

Bangladesh's fortunate track record, totally unplanned, in not having had any serious large-scale fire despite complete ignorance, reckless indifference and utter negligence has given air to imprudent complacency among owners and architects.

Shopping centres can become dangerous from a fire safety point of view for several reasons.

The bulk of the users the shoppers are visitors to the building, now blown into fashionable complexes, and thereby are often not aware of its geography. Most importantly many will not be able to find a way to escape because of unfamiliarity with the surroundings. Height, as is the case in the building type under scrutiny, can be an added hazard.

One of the major design oversights in our shopping centres is that adequate alternative routes or openings to escape from a fire are not provided. This will mean initially congestion, then suffocation, panic and eventually trapping people to their death.

The modern shopping complex is enclosed and introvert in plan. Having the space air-conditioned for comfort also makes egress a difficult proposition. Added to that are contemporary lightweight materials, invariably combustible, to furnish the interior.

Of whatever routes to escape are available in existing corridors, the stacking of excess goods for display and storage as well as dumping of garbage defeats the purpose. The corridors in many public buildings (office, shopping complex, cinema hall) are much like our roads, taken over by shops, hawkers and parked vehicles with only enough space left rather kindly for one moving vehicle to pass through somehow. A dangerous and fatal situation may occur should a large number of people need to use such a

corridor to escape from a fire.

Overzealous security arrangement in shopping centres ensures that nothing comes in but disregards the fact that it often means that nothing can go out easily, not even people fleeing from a fire.

Regular maintenance and routine inspection of building elements are almost unknown in Bangladesh. This lack of responsibility may cause a fire, for instance, from worn out electrical wiring, particularly in ageing buildings. With more combustible materials used in enclosed (air-conditioned) space it is only a matter of time before more fires take place.

One major worry in existing shopping centres is that Means of Escape is in total disarray. For this reason, in case of fire, casualties will be high.

Loss of property due to a fire will also increase because of poor or no fire fighting preparedness in the house, either in the form of equipment or drill of regular users. Fire fighting units, not expected to save life because they cannot possibly be expected to reach a premises on fire within the stipulated time of escape (2.5 minutes) will often find approach to a building, including shopping centres, impossible because of crammed road condition or tight location of target.

Then there is the perennial shortage of water.

We are playing a very dangerous waiting game. The time to act is now.

Nayma Khan's findings from researching well-known shopping centres in Dhaka City should make us ponder and hopefully make the concerned professionals aware.

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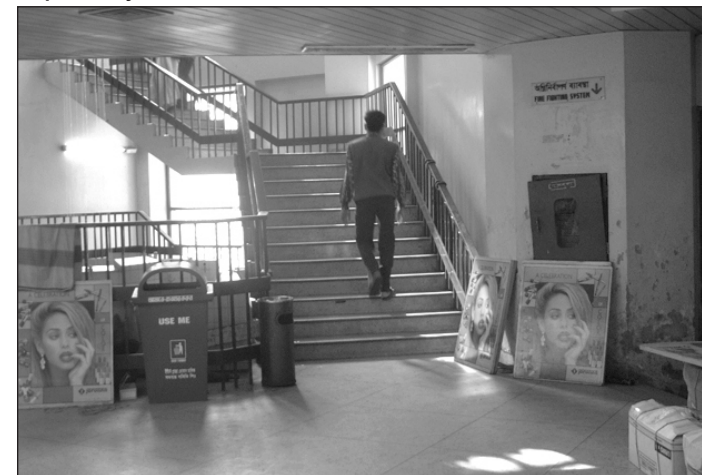
No provision to enclose the escalator to restrict the spread of fire.



Too much use of combustible material in interior.



Haphazardly stored material narrows the effective width of the corridor.



Fire escape stairway does not discharge people to outside.

New shopping centres of Dhaka City: Are they safe from fire?

NAYMA KHAN

SHOPPING centres are part of the urban life and meet the needs of the civic community. The concept of a shopping centre is by no means new in Bangladesh. Shops and markets are as old as the communities. The demand for more retail outlets and user comfort gave rise to the concept of shopping centres in course of time.

Our concern is the new and growing trend of development of introvert planning for multi-storied shopping centres, which is giving rise to worries about fire safety, particularly that of escape.

In the developed countries, with advancing building technology, designing of shopping centres have become more complex and specialized. Today no shopping centres in the developed world could be responsibly designed or executed without special regard to design for fire safety in all its aspects.

But in our country, the shopping centres have failed to incorporate the factor of fire safety in the overall design process. Not only that most of the shopping centres do not have any alternate route of escape in case of an emergency. The risks have increased the potential danger of fire hazard in these multi-storied shopping centres.

This study concentrates on the fire safety aspect, especially on Means of Escape; that is, to find out the situation existing with regard to exit routes within in introvert planning and under conditions of mechanical ventilation.

Seven fully air-conditioned shopping centres of Dhaka city were surveyed to study the present condition of Means of Escape, and to identify the problems and deficiencies, so that a recommendation have been made to improve a standard guideline for evolving a design criteria for Means of Escape to ensure safer shopping in Dhaka city.

The markets were chosen randomly but were distributed well within the entire city limits. Aspects studied include location, setback, primary access, circulation, travel distance, number of exits, dimension of exit openings, protected (from fire) corridor, lighting condition and escape staircase.

Haphazard growth of innumerable marketplaces and shopping centres over the past decades has transformed the city into a city of shops. Partial conversion of residential areas for commercial purpose has been part of the expansion.

Due to the unplanned, uncontrolled development, compelling changes in land use, mostly participated by the rapid growth of population, increasing industrial and economic activities, and short supply of land have resulted in enhanced demand for compact planning of shopping centres. At present the market has shifted from open roadside development to introvert conditioned environment.

Eastern Plaza, Rapa Plaza and Rifles Square may be cited as an example of such a trend. These shopping centres also make use of increased electricity as well as more electrical and mechanical equipment. Flammable material are used more widely as interior carpets, drop ceiling, facing woodwork and lightweight partitions. Added to this is lack of fire precaution, prevention and control measures. All these contribute to an increasing danger from fire accident in shopping

centres.

According to Bangladesh Fire Service and Civil Defence. One hundred and seventy-four fires were reported in shopping centres in 2001 causing a loss of Taka 5,67,835/-. Most of the multi-storied and fully air-conditioned shopping centres are introvert and being designed without taking any consideration of safety measure. Most of the shopping centres lack adequate Means of Escape, a danger premise. A large number of people, such as workers and shoppers, are at risk.

One of the major drawbacks is that the building code has not been enacted for fire prevention, precaution, and control in different building types, including shopping centres where large mixed gathering is expected.

It is the obvious responsibility of architects, planners and engineers to ensure a fire-safe shopping environment through use of certain planning and design tools. Reid said, "when people die in fires, the most architecturally significant factor is that the building did not provide for their escape".

To ascertain the present trend in designing Means of Escape in introvert multi-storied air-conditioned shopping centres, a reconnaissance survey was conducted on some selected shopping centres, located in and around residential-cum-commercial areas

Name	Location
Eastern plaza	Hatirpul
Karnafuli Garden City shopping complex	Shantinagar
Rifles Square	Dhanmondi
Rapa Plaza	Mirpur Road
Navana Shopping Complex	Kamal Attaturk Road
Issa kha Shopping Complex	Karail
Iqbal Centre	Banani

of Dhaka City. They are:

The contemporary trend is developing shopping centres as multi-storied buildings in congested areas with introvert planning and increased use of electrical equipment. Most of the introvert shopping centres are air-conditioned that need special considerations to tackle the increased danger of fire hazard. A number of shopping centres have been constructed without ensuring minimum safety from fire for the users and employees. Added to this peril is the lack of safety awareness and emergency drill among the users and employees.

Fire escape routes should be well designed so that shoppers and customers, who get caught inside the shopping centres, can find the quickest and safest route out of the fire and onto a safe designated assembly area. Spaces within a shopping centre, which have no direct access to the outside, should be provided with a route protected from fire that leads to safety.

In designing an enclosed shopping centre, the following should be remembered:

The Means of Escape from the large and thus often complex buildings

An enclosed shopping centre is of a high potential risk because of the large size of the building with numerous shops, and users of different sizes and behaviour

Injuries due to burns, smoke inhalation, asphyxiation, building collapse or heart attack or shock are suffered by people who become frightened or panicky when they are trying to escape from a building on fire

The most architecturally significant

factor, if people die in a fire, is that the building did not provide for their escape.

The general principle applied in relation to Means of Escape is that it should be possible to turn away from the fire and escape to a place of safety. This usually implies that alternative escape routes should be provided. The first part of the route will usually be unprotected (e.g. within a shop and corridor). Consequently this must be of limited length, to minimize the time that occupants are exposed to the fire hazard. Even protected horizontal route should be of limited length due to the risk of premature failure. The second part of the escape route is generally in a protected stairway designed to be non-combustible and resistant to the ingress of flames and smoke.

Escape planning must ensure that "no matter where the fire and no matter where the occupant, there will remain a route for that occupant to safety". Such an approach calls for the principal of alternative routes, which according to Reid is "the conventional wisdom".

The number of escape routes and exits required depend on the maximum travel distance that is permitted to the nearest exit and the number of occupants in the shopping area or storey. According to the Bangladesh National Building Code 1993 (BNBC), the capacity of the means of exit should be adequate for the occupant load of the area

direction and 45m in case of alternative exits.

The maximum distance between two escape exits, say on two sides of a shopping mall, should not be more than 90m (295ft). Thus, no one should be more than 45m (147 ft) from a protected point. Exit should be sighted to ensure that there is no dead-end within the shopping centre. A major axiom is that escape should be possible in a direction away from the source of fire.

According to the BNBC, the maximum travel distance depends on the occupancy load. For shopping centres with one exit, the maximum travel distance is 23 m for the occupants of 50.

Vertical escape route should be provided through protected stairs of sufficient numbers and adequate space. Generally, the rules requiring alternative Means of Escape mean that more than one stairway is required. The width of the stairs should allow the total number of people in the storey or building subjected to fire to escape safely within the stipulated time. The width should be at least of that of the exits serving it, and it should not reduce in width as it approaches the final exit.

According to the BNBC, the minimum width of the stair in a shopping centre should be 1.5m (5'-0"). But is this the case in practice?

Each internal staircase should be contained in its own fire-resisting enclosure and should discharge either directly or by means of protected passageways, to a final exit. A central rail must divide wide stairways.

Compartmentation is necessary to contain the fire and to keep the fire relatively small by dividing up a building into fire-tight cells or units by means of fire resisting walls and

floors so that the threat develops slowly and does not spread quickly. It is essential that the compartment should survive a burnout of its combustible contents without the collapse of the fire-resisting separating elements. Fire should not penetrate either horizontally or vertically to an adjacent compartment through the communicating openings.

In multi-storied building, it would be difficult for people of all the upper floors to reach a place of safety at the ground level within the stipulated time. Likewise, in a large shopping centre it is impractical to totally evacuate the building, housing thousands of people. In these circumstances, it is better to provide a place of safety within the building in refuge cells that are constructed free from smoke and fire.

The study examined the condi-

tion, including problems and deficiency, of Means of Escape in the new look shopping centres of Dhaka City.

In Dhaka, most of the shopping centres are located in and around residential-cum-commercial areas, often on designated residential plots. Due to high price of land, most of the shopping centres are designed as multi-storied buildings, introvert planning being in vogue.

According to the Building Construction Rules 1996, popularly known as RAJUK rules, shopping centres and commercial buildings may be constructed without any setback from the sides of the plots designated for commercial development. The alarming issue is that this setback advantage in a commercial area has been applied to shopping centres in residential areas. For instance, Rapa Plaza on Mirpur Road in Dhanmondi. Although Mirpur Road has been reportedly declared as commercial, being in a residential area, the building should have abided by rules applicable in a residential area. (Building Construction Rules 1996, clause) This violation affects the climate and socio-economic environment at micro level. In many cases, the adjoining buildings have windows facing each other, which may help fire to spread from one building to another.

Large shopping centres, such as Rapa Plaza, Eastern Plaza and Rifles Square to name a few, invite huge traffic creating nuisance and hazard on major thoroughfares (Mirpur Road, Hatirpul road, Road 2 Dhanmondi) that serve large residential areas. In all cases the access road is characterised by heavy traffic congestion as well as encroachment by allied businesses.

Some shopping centres are located within 200 meter from a busy traffic node, which is prohibited by the Rules. For instance: Rapa Plaza, Navana Shopping Centre and Metalib Tower.

Most of the shopping centres do not have any planned waiting area for rickshaw and baby taxis. This will restrict access of fire fighter units in case of an emergency.

Most of the introvert, fully air-conditioned shopping centres surveyed in Dhaka City (Karnafuli Garden City, Eastern Plaza, Issa Kha Shopping Arcade) have one entry for huge numbers of customers. In a fire, when people will panic and rush to leave a building through the single way out, there will be congestion and possibility of high casualty.

Most of the shopping centres are accessed from the main road and do not have any alternative approach into the building for fire appliance. Should a fire break out in the backside of a shopping centre, it will hinder fire fighters from reaching the fire.

Daylight condition

The natural lighting condition of the introvert shopping centres is not satisfactory. Only forty percent of the shopping centres surveyed take some advantage of some daylight. About 60% of the shopping centres do not have any provision for natural lighting in the staircase, a Means of Escape. There is provision to admit daylight into the shop in only 20% of the cases studied.

Means of vertical circulation

Escalators, elevators and capsule lifts, used in the new trend shopping centres as means of vertical circulation, are not allowed as Means of Escape in case of a fire. About 80% of the shopping centres surveyed

use escalator for main vertical circulation. But there are no provisions to enclose the escalator to cut it off from the shaft to restrict the spread of fire to other floors.

Furthermore, lift lobby in the shopping centres surveyed are connected to a corridor or to a lobby space, making the fire spread easily to all the floors. Only Rifles Square has a separate lift lobby. But Rifles Square has two escalators on the two side of a staircase. In case of fire on any floor, there is no provision to restrict the use of escalator during the period of fire hazard and to restrict the spread of fire.

Occupant load

The capacity of means of exit should be adequate for the occupant load of the area served. Occupant load of the shopping centres surveyed has been calculated at the rate of one occupant per unit of floor area. According to the BNBC, 3m2 (32sf) per person is required in a shopping centre.

Circulation / corridor

In about 60% of the shopping centres surveyed, the circulation corridors are double loaded. Only

most of the shopping centres do not have sufficient exit routes. As result there is a chance of being trapped in case of fire. Navana Shopping Centre, Karnafuli Garden City Shopping Complex and Issa Kha Shopping Complex require three to four exit routes whereas they have only one exit route to escape in case of a fire. Eastern Plaza has the highest occupancy load, requiring more than six exit routes but there are only three exit routes from different floors, which are not directly discharging people to the outside.

Exit sign and symbol

Sixty percent of the shopping centres surveyed do not have any exit sign to indicate escape route. The others have illuminated exit signs of contrast colours. BNBC recommend that all required Means of Escape or exit access in building and area requiring more than one exit should be signpost. In Karnafuli Garden City exit signs are posted but it wrongly informs that the escalator is for escape, whereas BNBC recommends that escalator/lift should not be used as a Means of Escape.

Conclusion

Shopping centres in Dhaka are facing the dire need for taking appropriate fire safety measures related to Means of Escape. The occupancy load is alarmingly higher than the exit capacity. Should a fire break out in a shopping centre, most of the people would be trapped due to the lack of sufficient provision of Means of Escape.

Although all the surveyed shopping centres were designed by architects, but unfortunately they have failed to ensure proper Means of Escape.

In designing shopping centres, more number of accesses should be provided to ensure safe and quick escape. The escape route should be well lighted at all times, kept clear, unobstructed and should be indicated by signs and symbols. Fire fighting equipment should be installed in shopping centres according to the design needs.

In multi-storied shopping centres, compartmentalization and refuge system should be adopted. In low stored structure, arrangement of multiple points of access to the exterior is recommended so that evacuation can be horizontal, direct and simple. Where occupants do not have immediate access to a place of safety, alternative routes should be provided to reduce their chance of being trapped.

The whole subject matter of fire prevention, precaution and control including designing proper Means of Escape needs to be reviewed as legislation, provisions and services are grossly lacking. Awareness should be increased among the architects, the owners and the general people regarding the potential danger of fire and the possibility of injury and death, and loss of property.

The main problem is that the building code is not enacted. But there is no bar from following it voluntarily. It is the obvious responsibility of architects, planners, engineers and the concerned authority, such as RAJUK and DCC, to ensure a fire safe environment through proper physical planning and design.

The common and traditional attitude of violating the minimal existing legislation should be shunned by all concerned. Bangladesh, being a developing country, may not be able to afford the luxury of trial and test methods. Therefore, lessons learnt from the developed countries should provide a starting baseline.

Escape Stairway

According to the BNBC, the minimum width of the escape stair should be 1.5m (5'-0"). However, in most of the shopping centre surveyed we find that most of the shopping centres do not follow the code and the width of the stair is less than the requirement. In many cases the main open circulation stair is assumed as an escape stair in case of fire. But these do not discharge people to the outside. This is the situation in Issa Kha Shopping Centre and Iqbal Centre. In Karnafuli Garden City and Rapa Plaza the escape stairs continue to the basement. This is a very danger-

ous and unacceptable situation as people can get trapped at the bottom. Eastern Plaza has two protected staircase but it discharges people to the ground floor corridor, which is again not protected. Navana Shopping Centre and Rifles Square have protected stairways to discharge people directly to the outside.

Number of exit doorway

The fire grading committee (UK) report recommends 2.5 minute as the evacuation time to a place of safety. A 22-inch wide doorway allows 40 persons to escape in one minute. Therefore, from this thumb rule, the required no of doors/exits of the shopping centre can be calculated.

Case study: Eastern Plaza

Door width - 180 inch

No	Shopping Centre	Occupant Load (Person)
1	Rifles Square	1752
2	Rapa Plaza	1500
3	Karnafuli Gardencity Shopping Complex	2332
4	Eastern Plaza	6250
5	Navana Shopping Centre	1138
6	Issa Kha Shopping Complex	806
7	Iqbal Centre	

Number of exit door one

In one minute a 22-inch wide doorway allows 40 persons to escape

In one minute a 180-inch wide doorway allows 328 (328 x 2.5) persons to escape.

So in 2.5 minutes 820 (328 x 2.5) persons can escape.

According to BNBC, the occupancy load of Eastern Plaza is 6250. Therefore the market actually requires eight (6250 / 820) doorways of 180 inch wide.

So it is evident from the above calculation that 85% of the occupants of Eastern Plaza would be trapped in case of fire due to the lack of adequate number of doorways within the recommended time of evacuation.

By calculating all the shopping centre surveyed, we find that 66% of the shopping centres surveyed need more number of doorways than that existing to evacuate people within the safe 2.5 minutes.

A large number of people, about 75% in Karnafuli Garden City, 60% in Navana Shopping Centre and 50% in Rapa Plaza have a high probability to be trapped in the event of a fire. Only Issa Kha Shopping Complex and Rifles Square have sufficient number of escape doors to evacuate people in time.

Number of exit route

The number of exit route should be sufficient so that the occupants of the shopping centre can be evacuated from the building within 2.5 minutes. According to the BNBC, the number of exits in a shopping centre depends on the occupant load. By calculating the required number of exit routes for the shopping centre surveyed, we find that

50 people 800

110 people 900mm

220 people 1100mm

220+people extra 5mm per person

According to the code, the corridor should be free from any obstruction. But, it is seen that haphazardly stored material narrows the effective width of the corridor and casts unfavourable shadow on the circulation area.

In about 30% of the surveyed shopping centres, the corridor width has been reduced by the encroachment of display items. As the circulation corridors are used as horizontal escape route in case of fire, the display items on the corridor are an obstacle to free movement of the people. This is the situation prevailing mainly in Eastern Plaza and Karnafuli Garden City.

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