

Designing for fire safety: Case study Dhaka II

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CONTINUED FROM PREVIOUS (27 MARCH) ISSUE

In Bangladesh, legislation for fire safety in buildings is incorporated in rules framed under Building Construction Act, 1952.

The pertinent laws are Building Construction Rules, 1996 (Original in Bangla ইমারত নিৰ্মাণ বিধিমালা, ১৯৯৬), which was applicable all over Bangladesh till 2006, when Dhaka Metropolis was given the Dhaka Metropolis Building Construction Rules, 2006 (Original in Bangla ঢাকা মহানগর ইমারত নিৰ্মাণ বিধিমালা, ২০০৬), applicable to the Dhaka Metropolis planned area, as defined under The Town Improvement Act, 1953. The government then instituted the Dhaka Metropolis Building Construction Rules, 2007, followed by the Dhaka Metropolis Building Construction Rules, 2008 (DMBCR), which still stands till date. The rest of the country is still governed by the 1996 Rules.

The other relevant rules for fire prevention, precautions and control are Bangladesh National Building Code, 1993 (lawfully binding since 2006), the Fire Prevention & Control Act, 2003 (Original in Bangla অগ্নি প্রতিরোধ ও নিৰ্বাপন আইন, ২০০৩) the Factories Act, ২০০০ [Fire Prevention & Control Act, 2003] BUT the current 2008 rules completely sidelines the Fire Services, the main government authority to deal with fire matters.

The frequent change of rules for Dhaka Metropolis, three rules in three successive years, has given rise to belief in some quarters that the change was caused by vested interest groups. Two examples may suffice.

(1) In the DMBCR 2006, the maximum number of floors with one exit (staircase) permitted in an apartment building was SIX, as is the stipulation of the Bangladesh National Building Code 1993. Unfortunately, the Dhaka Metropolis Building Construction Rules 2008 allows TEN stories apartment building with one staircase/exit, and each floor can have FOUR apartments. That is forty apartments set around one staircase. This can become very dangerous, particularly if the apartments are designed as air-conditioned space. The rule should go back to maximum SIX floors for one staircase because it reduces vertical travel distance.

(2) The 2006 DMBCR empowered the Fire Services & Civil Defence by stating that 'all aspects of fire prevention, control and public safety shall be governed by the অগ্নি প্রতিরোধ ও নিৰ্বাপন আইন, ২০০৩ [Fire Prevention & Control Act, 2003] BUT the current 2008 rules completely sidelines the Fire Services, the main government authority to deal with fire matters.

The Building Construction Rules, 1996 has meagre rules for fire safety under a section titled 'Emergency exit & other necessary arrangements'. The 1996 rules state that

- emergency exit, separate from stair and lift lobby, must exist within 25m from any point on a floor
- elevator/escalator will not be considered as emergency exit
- necessary number of fire extinguishers or alternate arrangement in any visible space, with written operational instruction, and fire alarm for quick exit must be provided.

The 25m distance to an emergency exit from any point on a floor will result in two staircases at a distance of 50 metres, which renders the rule a fallacy because if one of the staircases is on fire, the distance of someone at the attacked staircase (any point on a floor) is 50 metres from the emergency staircase (the other safe staircase). However, by international standards the 50 metres distance is about correct for escape design.

The phrase 'necessary number of fire extinguishers' in the 1996 rules is at best ambiguous because legislation has to be far more specific, e.g. say, one extinguisher for 450m² of floor area in a room of normal height with at least two extinguishers per floor.

The DMBCR 2008 has defined fire-related aspects, such as Fire door, Fire-resistant material, Fire stair (with fire door) and Hazardous building (prevalent fire risk, non-existent Means of Escape).

It also specifies minimum floor area per person for different building types, [e.g. 18m² for residential buildings, and 10m² for office (Table 1)], and exit width per person for space with sprinkler and without.

- Clause 59 cha of 2008 DMBCR is specific to safety. It states
- Building users shall ensure fire safety of as per Porishisto 1
- All buildings (if applicable) shall have signage showing emergency exits
- Mechanical means of vertical transportation shall not be used as Fire Exit

What is this Porishisto 1? It refers to Means of Escape via exits and doorways from a place under fire/smoke to a place of safety that will be safe from attacked area, smoke, and fire. It spells out that lift, escalator, moving path, etc cannot be used as Means of Escape

Porishisto 1 requires that (Clause 2)

- Buildings used by the public (unlike the 2006 rules this clause absolves private residential buildings) shall have enough number of MoE by which people can escape unaided quickly and safely during a fire or any other emergency
- Exit cannot be used in any way as to hinder Means of Escape
- Exit and corridor of exit access cannot be used as supply or return air duct
- For change of grade of 300mm, ramp must be installed, and height of steps shall be max 200mm if not used by the disabled and the elderly
- Exits must be visible and signposted. Premises with multiple exits or exit accesses AND those used by public which may be immersed in darkness should have illuminated signs to display exit location and direction
- Building owner or tenant shall ensure the safety of all users. The authority can order to rectify flawed exit of existing building

Porishisto 1 (Clause 3) has specification for

- Exit location, e.g. exit path shall not be through any locked room
- At least one side of an auditorium type building for public assembly shall face a road, which side may have the main exit and at least half of the users should be able to use this as their Means of Escape.
- The exits must be so located that they ensure a continuous Means of Escape for all parts of a building



Figure 2 Extensive but essential security measures by fixed grille may make buildings unsafe in a fire by preventing exit. Such grille may be made partly operable for safety of inmates.

Porishisto 1 (Clause 4) has specification for number of users.

- The floor area per person shall be used to determine maximum number of users in a building, which shall be considered for designing exits; e.g.

Building class	Area per person
A. Residential building	18m ² gross
F. Office	10m ² gross
H. Warehouse	30m ² gross

- In assembly halls, the number of users shall be determined from the number of seats. For seats without hand-rest the number of users shall be calculated by considering every 500mm length as one user.
- Usable area shall not be more than 0.3m² per person



Figure 3 Various types of fire extinguishers are used for various types of fire. Misuse can be fatal.

Porishisto 1 (Clause 5) has specification for exit width per person for stairs, ramp and door is given in Chawk 2, separately for space with sprinklers and without; e.g.

Building type	mm per person without sprinklers			mm per person with sprinklers		
Residential, Office, Factory	8	5	4	5	4	4
Health	25	18	10	15	12	10
Assembly	10	7	5	7	5	5

Porishisto 1 further provides Clause 6: specifications for corridor and passage; e.g. width should be 0.9m for less than 50 users and 1.1m for more than 50 users, 2.4m in hospitals

Clause 7: specifications for assembly aisles; e.g. unobstructed aisles must lead to exits

Clause 8: specifications for doors, wherein it is specified that every space shall have at least one door, and that the number of users for one door and the



Figure 5 Providing a door is not a solution; the door must be planned as an exit.

travel distance shall be as per Chawk 3; e.g.

Clause 9: specifications for stairs, which states that the width

Building type	Maximum number of users for one door	Maximum Travel Distance (m)
A. Residential	12	23
D. Health	50	23
H. Warehouse	30	30

of stairs shall be determined from number of users (Chawk 1) and the exit width per person (Chawk 2), but shall not be less than that defined in Chawk 4); e.g.

Clause 10: specifications for ramps, which states that slope

Building type	Min. stair width (m)
Apartment	1.0
Educational +150 persons	2.0
Religious	1.5

shall not be more than 1:12 and that the top surface shall be non-slip and not dangerous to use

Clause 12: specifications for number of exits, such as that in Chawk 5; e.g.

Clause 13: specifications for travel length, which states that

Building type	Maximum stories	Max. users per floor and travel distance
Apartments, hotels	10	Max. 4 apartments per floor & 23m
Educational, Health, Factory	2	50 persons & 23m
Warehouse	1	30 persons & 30m

the distance between two stairs in a building, shall be as follows.

Building type	Travel length
All others	25m
Commercial, warehouse	30m
Factory	45m

The Fire Prevention & Control Act, 2003 (Original in Bangla অগ্নি প্রতিরোধ ও নিৰ্বাপন আইন, ২০০৩) has the following definitions:

- Clause 2: Definitions
- Workshop: Building or space used for processing combustible materials
- Multi-storied building: 7 storied and above
- Commercial building: bank, insurance, financial inst, shopping complex, business & mercantile, government office
- Bhaban: imarat, tin-shed, multi-storied building, cottage, kutcha, semi-pucca, pucca, etc
- Warehouse: building or space used for preservation, storage, pressing, separation and trading of combustible materials

Some other clauses of interest are

- 4. Annual license for warehouse required, which shall be provided if the Director-General of Fire Service and Civil Defence (DG) is satisfied regarding its fire prevention and control measures. The government shall be the appellate authority for those whose application shall be



Figure 6 Water being so scarce it requires conscious effort on the part of the architect and the building owner to have enough to douse a fire; BNBC 1993 has specific recommendations.

rejected.

7. For multi-storied or commercial building, the DG's certificate is a must, whatever may be in any other law

8. For existing multi-storied or commercial building the way-out to comply with the Act is provided

9. The fire services have been given powers during fire-fighting, such as the right to control crowd, remove building, stop water supply of others, etc

10. Service charge shall be required for places where there is no brigade

11. As fire services collect water from any source to control fire obstruction by others is prohibited

12. The fire services have the right to enter any premises in a systematic manner

28. The government can frame rules under the Act

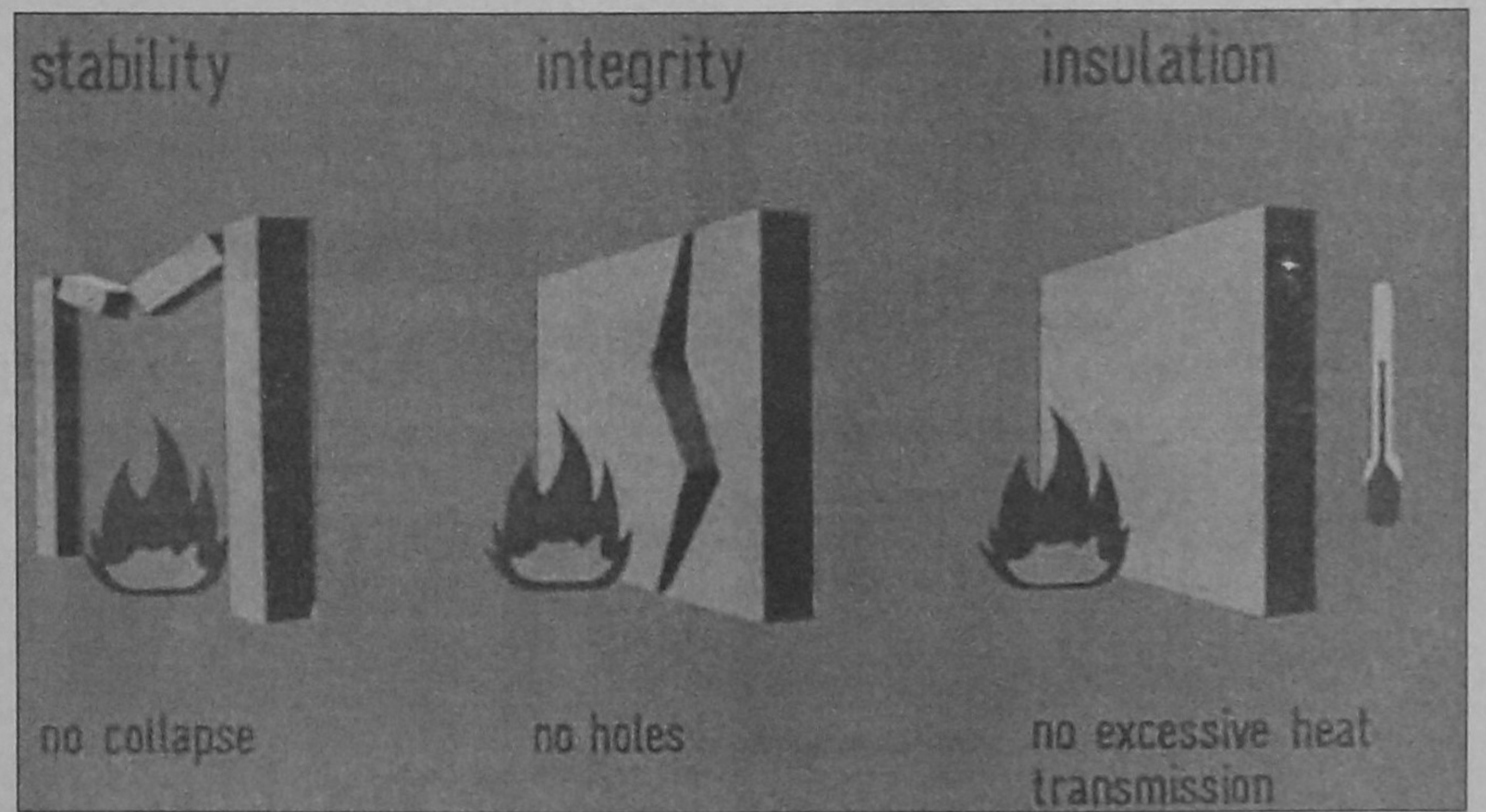


Figure 7 Fire resistance criteria of building elements

It is necessary to know the effects of fire in order to design to prevent and control fire. They are: heat, smoke and radiation. Heat will burn combustible materials, smoke will hinder breathing (and is usually the primary killer) and radiation will keep people away from a fire and also convey fire to adjacent areas.

The fire resistance criteria of building elements are stability, integrity and insulation (Figure 7). Stability will ensure that there is no collapse of structural elements in a fire. Integrity will ensure that the wall or slab on fire does not develop any holes. Insulation will ensure that no excessive heat is transferred from the side of the fire to the other.

Stability, integrity and insulation of building elements shall help to create compartments that will retain fire and smoke within an area of a particular size in a building. Every floor in a building can be a compartment, such that when one floor (compartment) catches fire, all the others are safe. That is from where we shall continue our discussion in the next instalment of this series.

TO BE CONTINUED



Figure 1 Buildings constructed under the 1996 rules defy rhyme, reason or logic

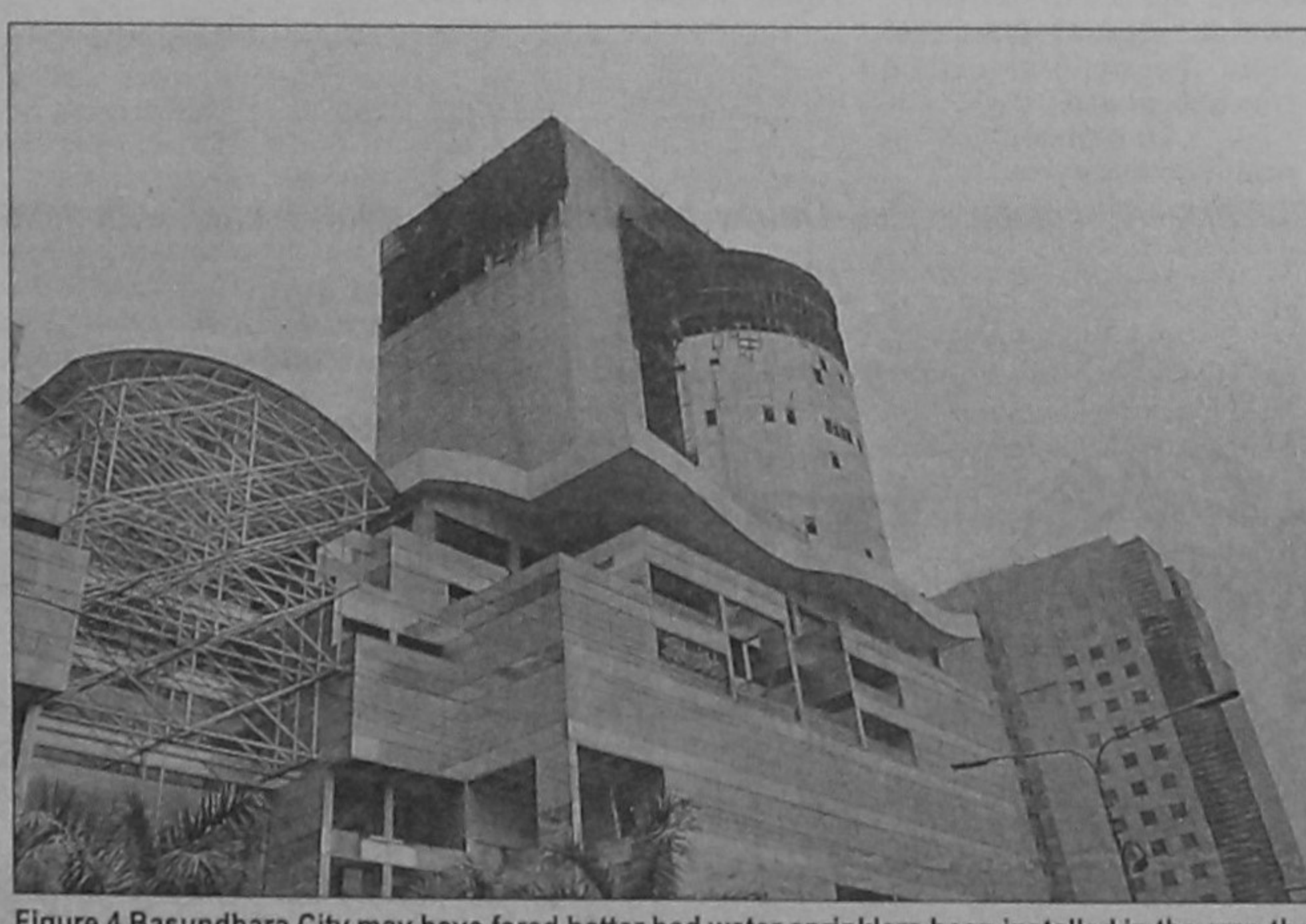


Figure 4 Basundhara City may have fared better had water sprinklers been installed in the area that was extensively damaged by fire recently.