

Shielding buildings from the terrorist threat

With the threat of terrorism taking centre stage, experts have begun to think of ways of protecting buildings from terrorist acts. **T. RAMACHANDRAN** outlines the recent guidelines drawn up in this regard by the Indian Institute of Technology, Kanpur, and focusses on what experts say can be done more to deal with this threat.

The threat of terrorism has become serious enough for experts to actively think of ways to "terror-proof" buildings, or counter and minimise the

damage caused to them by terrorist acts. The Indian Institute of Technology, Kanpur (IIT-K), with the support of the Gujarat State Disaster Mitigation Authority

(GSDMA), has come up with guidelines on measures to mitigate the effects of terrorist attacks on buildings.

For a long time, terrorism had not been regarded as a

threat to be addressed from the engineering and construction standpoint. As new technologies evolved and structures became larger and complex, engineering efforts focussed on dealing with natural disasters, such as earthquakes, and risks associated with human activity, such as storage of hazardous material. And over time, regulations and guidelines on dealing with these had been put in place.

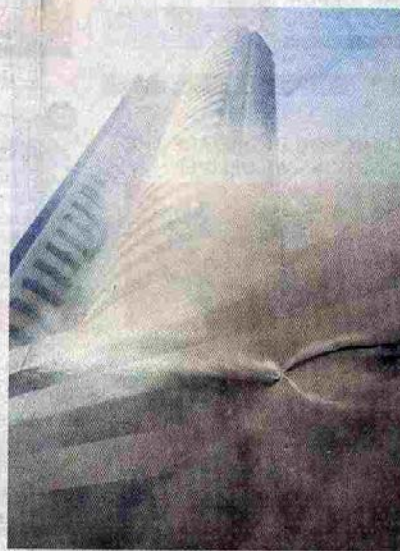
Dramatic change

Post 9/11, this scene changed dramatically. The destruction of the World Trade Center towers savagely brought to centre stage the scale of devastation that could be caused to a building and its inhabitants by a massive terror strike.

This single act of terrorism, unlike other attacks in the past, got the experts to urgently think of countering terrorist threats in all possible ways, including those related to building engineering and design. As a result, building bylaws in the U.S. were changed to deal with terrorist threats as well.

Has the time now come for authorities in India to think of formally coming up with design- and engineering-related codes and other measures to counter the terrorism risk?

"Yes, there is no time to lose," responded C.V.R. Mur-



CLEAR AND PRESENT DANGER: A smoke-engulfed Bombay Stock Exchange building after it was targeted by terrorists in 1993. — THE HINDU PHOTO LIBRARY

thy of the IIT-K, when *PropertyPlus* posed this question to him. "While common structures may not be able to address these issues yet, the critical and lifeline structures should be viewed urgently

from this perspective. The main effort is to prioritise our built environment, and identify structures with large risk (to life and property)," explained Prof. Murthy, author of the IIT-K-GSDMA guide-

lines. Then, it is important to identify technical persons to undertake the analysis, design, detailing, retrofitting and construction of not only existing buildings but also new ones. Resources will have to be found for undertaking this exercise for existing structures, which will be a demanding one. "For new structures, it will be an incremental cost, but for existing structures, the costs can sometimes be prohibitive," he said.

The expert opinion is that recommendatory design guidelines to mitigate the effects of terrorist attacks on buildings in India can be evolved "easily and quickly." However, drawing up mandatory design standards are a different matter altogether.

Lifeline structures

However, it will not be necessary to make such norms mandatory for all buildings, but only "critical and lifeline" structures.

Prof. Murthy explains that examples of such critical buildings are those that house mass congregations (religious places, schools, stadiums and so on); those of critical value for national defence; those required for ensuring continuity of governance and critical businesses; lifeline structures (dealing with power, water, transportation, railway, roads, airway, waterway, hospitals, communica-

tion, fire-fighting, local administration, schools, food centres and so on); and buildings of national historical value (heritage structures, monuments and so on). Other categories can be drawn up based on local, regional and national considerations, and on the level of associated risk.

And such guidelines should be made applicable to all parts of the country since "today's terrorists seem to know no geographical barriers," he suggested.

There are challenges in formulating such guidelines. Lack of adequate data is one such challenge.

The guidelines acknowledge that the related codes will have to strike a balance between various kinds of commercial and social priorities.

Such regulations, when developed, will most likely have to deal with zoning of the neighbourhood, site planning, architectural aspects, structural analysis and design, construction quality control and supervision and maintenance regimes.

State governments will need to accord more importance to developing strategies and introducing measures to counter the terrorism risk. The building development strategies will require changes in the building bylaws related to site planning, architectural considerations and structural aspects.

Steps for risk reduction

Terrorist acts in buildings can take the form of an explosion, an armed attack, a biological, chemical, nuclear and radiological attack or arson. Covert acts of terror, such as cyber terrorism, are possible. And the related threat to buildings can be countered on four fronts — intelligence, deception, physical and operational protection and structural hardening. The "IIT-K-GSDMA Guidelines on Measures to Mitigate Effects of Terrorist Attacks on Buildings" say that whether the building is new or old, the formal process of risk reduction has five steps — threat identification and rating; asset-value assessment; vulnerability assessment; risk assessment; and formulating mitigation options.

The guidelines focus much on countering terrorist blasts or explosions. They point out

that India has codes related to blast above ground (IS:4991-1968). This standard provides a definition of blast.

Measures to make buildings earthquake-resistant can help in bettering the blast resistance of buildings. The Indian seismic code IS:1893 (1)-2002, ductile detailing code for RC structures IS:13920-1993 and earthquake-resistant construction guidelines IS:4326-1993 deal with this aspect of building construction.

Provisions are also available for resisting wind effects on structures, particularly due to cyclones, and fire-resistant design of structures.

But the current Indian codes do not deal with the progressive collapse of buildings. Research has to be taken up for developing suitable guidelines.

Securing existing buildings against terrorist attacks involves four

strategies with increasing levels of penetration:

- deter the attacker from accessing the target (passively by providing obstructions, or actively by using tactical moves and weapon deployment)

- detect the attacker before the penetration of the site or entry through building-access points (actively through security surveillance)

- deny the attacker the opportunity to cause a disproportionate damage to assets (by building hardening measures that reduce the damaging effects of blasts and biological, chemical, nuclear and radiological attacks)

- devalue the asset in such a manner as to have little consequence in terms of loss and thereby reduce the attraction for attackers to consider targeting the asset (by moving critical facilities/operations out of that asset).

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