# BUILDING TECHNOLOGY

Disasters impose huge social and economic costs on societies. By reducing exposure and adopting new strategies to increase resilience, these costs can be reduced. While experience from recent disasters provides useful lessons, a more effective guide to building resilience can be based on systematic scientific risk surveillance and ranking. Since a strategy built on this basis is common to a range of disasters, regardless of their cause, implementing these strategies can be an important investment. It is urgent that national governments build resilience strategies into national, as well as international cooperation and development assistance plans[1].

It is not possible to prevent disasters, but we can prevent or limit their impact by making buildings strong enough to resist their destructive forces. In the case of disasters like earthquake, hurricane, cyclone, flood etc., it is possible, to neutralize their harm by applying basic engineering and planning principles that are inexpensive and not beyond the skills of most building industries. The use of appropriate building technology may certainly help in reducing the adverse impact of disasters up to an extent[2].

## Safer Building Construction[2, 3]

The extent of damages to buildings and infrastructure, in disaster affected areas is colossal. These are primarily due to the fact that the buildings for various uses like residential (housing - individual and group housing), educational (schools, colleges, places of learning), institutional (health centers, hospitals), assembly (community centers, cinemas, auditoria, terminals), business (offices), mercantile (shopping, trade, commerce), storage (warehouses, godowns, sheds), industrial (factories, production units) are all damaged partially or fully due to unsafe design and construction from natural disaster related forces and effects. While these buildings could well be safe from dead and live loads and forces, these are not planned / designed / built to take care of the lateral / other forces due to earthquakes (from below the ground), wind load (forces above the ground), landslides, storm surges / flooding etc. Equally bad are the structures for infrastructure for water supply (water tanks, distribution network), electric supply (electric towers, transmission/distribution system), sewerage (treatment plants), electrical installation, communication / transportation (telecommunication network, roads, bridges, railway lines/systems, airports, ports, bus terminal) etc.

Wide variety of construction types and building materials are used in urban and rural areas. These include local materials such as mud, straw and wood, semi-engineered materials such as burnt brick and stone masonry and engineered materials such as concrete and steel. The vulnerability of the different building types depends on the choice of building materials and building technology adopted. The building vulnerability is generally highest with the use of local materials without engineering inputs and lowest with the use of engineered materials and skills. The basic vulnerability class of a building type is based on the average expected seismic performance for that building type. All buildings have been divided into type A to type F based on the European Macro seismic Scale (EMS-98) recommendations. The buildings in type A have the highest seismic vulnerability while the buildings in type F have the lowest seismic vulnerability.

A building of a given type, however, may have its vulnerability different from the basic class defined for that type depending on the condition of the building, presence of earthquake resistance features, architectural features, number of storey’s etc. It is therefore possible to have a damageability range for each building type considering the different factors affecting its likely performance. Some variations in building type are therefore defined as A, B, B+ etc.

These choices must take into account environmental, economic, social, institutional, and technical factors. The size and scale of the project as well as the geographic concentration of the area also play a significant role in the decision-making process. Ignoring these factors or making the wrong decisions about them can significantly affect whether or not stakeholders are satisfied with the construction and whether or not the resulting housing solution is sustainable.

## Promoting Safer Building[3]

An in-depth analysis of the various elements that can help promote safer building construction identifies the following three critical areas of action:

- **Awareness**

Most of the communities are not fully aware of the vulnerability of any city, town, and village to disaster proneness (wind zone, seismic zone based on vulnerability atlas etc.) and the attended risks, the effect and impact of loads, forces due to disasters on the different elements and types of buildings made of different materials. The location specific damage that could be expected and the risk mitigation actions that should be taken for a safer habitat are beyond the general knowledge level of community. While at the Governmental and Professional level, there could be a larger awareness of the situation, even here specific action areas have not been forthcoming.

- **Appreciation**

There is a lack of appreciation among the general public and building delivery system on the perceptible difference between safe and unsafe buildings in the context of the disaster related additional forces, loads and effects. The 'appreciation' needed at the community level, professional level (building delivery group / construction artisans) is a major motivating factor to propel safer building construction practices.

As an important precursor to promote safe building construction in disaster prone / vulnerable areas is the strong intervention needed to create not only 'awareness' but 'appreciation' levels among the community and professional delivery modes.

- **Application**

Safer building construction in disaster prone areas to deal with the disaster resistant features can only be ensured when there is an enabling environment for application of the appropriate norms for ensuring structural safety, fire safety and health safety to deal with disaster related response. The enabling environment can come through appropriate regulatory mechanism where the existing building regulatory media viz. the building bye-laws, regulations, planning standards, development control rules or building codes operating in the city or town do have adequate technical provisions to deal with the same. Equally important is the enforcement system as part of the building regulatory mechanism at the time of building permit before starting for the construction ensuring appropriate quality control during construction and at the time of furnishing completion certificates, and issue of occupancy certificate by the local bodies (municipality, city municipal corporation or other regulating agency having jurisdiction).

## References

[1] http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-22-s1.pdf
[2] http://saarc-sadkn.org/theme_tech_building.aspx
[3]http://www.adpc.net/v2007/ikm/ONLINE%20DOCUMENTS/downloads/ADUMP/PSB.pdf