

HOMES AND GARDENS

Raising quake-resistant structures



APRIL 12, 2019 17:17 IST

UPDATED: APRIL 12, 2019 17:17 IST

Seismic base isolation technology is now the in-thing in Japanese structural engineering. By M.A. Siraj

Akira Wada, Professor Emeritus, Tokyo Institute of Technology, is a world-renowned expert in structural engineering with specific focus on seismic structural design. He has designed several tall buildings in earthquake-prone Japan which can withstand seismic shocks and avert the human casualties with no immediate danger of collapse. He served as the President of the Architectural Institute of Japan (AIJ) and was awarded the coveted Fazlur R. Khan Lifetime Achievement Award named after the architect of Chicago's Sears Towers. He was in Bengaluru to address a three-day conclave of structural engineers and architects under the aegis of Institute for Research Development and Training of Construction Trades and Management (INSTRUCT) earlier this w



Q: How has been the pace of research in structural engineering in seismic regions?

A: As urban civilisation has extended its sway, people have come to live in smaller spaces and high-rise buildings which are more prone to seismic hazards. While the life expectancy of man is averaging at 80, the life of buildings ranges between 40 and 100 years. Interval of big earthquakes hitting one place may range from 100 to 2,000 years. Optimists tend to think that next big earthquake will not visit them till they are alive. It may be convenient to think so, but grappling with aftermath of disasters is very difficult.

Since Japan is prone to seismic activity, efforts were directed at finding solutions in the field of earthquake engineering during the last 100 years. The development of seismic isolated structures, the passive controlled structures and seismic retrofit technologies point to some of the stages the advancements made. There have also been researches on use of high and low strength steel, high strength concrete and new materials for building structures.

Seismic Base Isolation is being talked about as the latest in the quake-resistant technologies...

Seismic Base Isolation or Base Isolation is meant to protect a structure against earthquake forces by decoupling the superstructure from its substructure resting on a shaking ground, thereby protecting the integrity of the building (or even non-buildings such as statues).

The foundation in this technique comprises horizontal rubber bearings alternated by layers of steel. The bearings can range from 0.8 metres to 1.5 metres and may be 40 cm thick. Such bases can ensure safety and integrity of even 50-storey structures. Nearly 4,000 buildings have used this technology in Japan. Bridgestone, a Japanese MNC, has been manufacturing these bearings.

Most earthquakes have happened on the two sides of the Pacific Ocean during the last 200 years and public buildings have increasingly incorporated this technology. The new airport of San Francisco was built on this principle. The new Beijing airport has also been raised on seismic isolation base technique.

Has there been commensurate progress on the legislation front to persuade the builders to incorporate this technology?

Seismic design regulations have been enforced in Japan. In fact, the number of buildings that have collapsed in large earthquakes has been dramatically reduced after use of this technology.

Tokyo, one of the largest cities in the world, is the capital of a heavily earthquake-prone country. If an earthquake of the magnitude of Japanese scale 7 were to hit the city, it can

number of buildings likely to collapse or burn is estimated at 610,000 and the number of stranded workers, students and others unable to return home due to disruption of transport will be as high as eight million. The economic losses including the decline in productivity and services could be as high as 96 trillion Yen, which is nearly equivalent to the Japanese annual general budget.

Though the focus of the seismic-resistant technology should be primarily on reducing human casualties, it should also aim at making the cities resilient. It could be achieved by bringing such elements that can ensure that building could be used after some repairs and continuous use just after earthquake. People don't want to return to the buildings placed under the red tags by disaster combat teams. Similarly one cannot stay in a city where hundreds of buildings have collapsed. Thought must be invested in raising quake-resilient cities.

Printable version | Apr 15, 2019 6:18:25 AM | <https://www.thehindu.com/life-and-style/homes-and-gardens/raising-quake-resistant-structures/article26819495.ece>

© The Hindu

