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PEOPLE

Ensuring safety in high-rise buildings: Pre and post-construction

An article by Daleep Thusu

VP, building services (design & PMC), REPL



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High-rise buildings are no less than modern marvels. In India, where the population is constantly growing and people in the cities are crunched for space, such buildings offer a perfect solution to the problem. However, the construction and management is a challenging task. Safety is one of the biggest concerns. Due to their sheer size, high-rise buildings are always at great risk from natural as well as man-made causes.

Planning

Tall buildings consume huge amounts of resources. Not only financial but material, human and environmental resources are consumed during the construction of these buildings. It is either impossible or extremely resource-consuming to redo anything that goes wrong during the construction. Therefore, it is extremely important to be careful and sure about everything during the planning stage.

Site selection is perhaps the most important stage in the planning of a project. The stability of the soil and its load-bearing capacity are important considerations while selecting land for a project. Tendency of natural calamities like earthquakes, floods, cyclones, etc is also an important consideration. During the planning stages, technologies like GIS and GPS are being used to assist the planners to select the project sites. These tools monitor natural conditions and analyze historical data to predict future events and suggest the safest project sites. These tools can also analyze the impact of climate change in the area and forecast the impact of climate change on a particular site.

Once the site is selected, comes the designing stage. Even after selecting the safest sites, the project designers need to have provisions for safety from various natural events. Tall buildings are constantly subjected to strong winds and even the slightest of earthquakes can have a severe impact on these buildings. Tools like BIM (Building Information Modeling) can help the designers conceive the best possible designs to mitigate the impact of such natural events within the constraint of their resources like capital, space, and time.

Every building has a certain life period. While handing over the buildings to the management for use, the developers should carefully communicate the period till which the building is safe for usage.

Construction

During the construction stage, generally, there aren't too many issues with the project's structural safety. However, the safety of the workforce becomes central at this stage. Injuries to the personnel at the project site can seriously hamper the progress of the project. Therefore, ensuring proper safety measures for the well-being of the people working at the site can be considered a significant input towards the safety of the project itself. Moreover, the safety and health of all persons involved on the project much have paramount importance.

Using fire and earthquake-resistant material (like base isolators) can enhance the structural safety of the building in many folds. During the construction stage, it is important to ensure that the highest quality and the adequate amount of construction material is being used. More often than not, in a bid to save costs, the contractors either downgrade the quality of the construction material or use a lesser than recommended amount of material like steel reinforcement, cement, and concrete. The role of the project management consultants becomes extremely important at this stage in ensuring the right quality assurance programme and also quantity of material being used as per design.

Post-construction

The most important stage for the safety of a project comes when people start living in it. In case of an event like a fire or earthquake, the people living on higher floors need special provisions and mechanism to evacuate safely. Provisions like smoke detection and water sprinkling systems prove to be lifesavers in such times. Having easily accessible fire escapes should be an integral part of the building design. The management in high-rise buildings should ensure that proper fire escape plans and floor plans are placed on all floors and at prominent locations. It should also ensure periodic dissemination of safety information to all the residents and workers in these buildings. Whenever possible, safety drills and training should be conducted from time to time.

Assembly area needs to be earmarked while planning the buildings, in case of earthquake. Also, structural safety audit should be carried out on completing of the high-rise buildings in order to rule out any inadequacy or structural deformation. Use of corrosion resistant steel, high tensile structural steel (having higher ductility & better fracture toughness), and fire resistance steel (with improved yield stress at higher temperature). Earthquake resistant steel to withstand forces generated due to seismic collision and HPC/HSC would add to the quality characteristics of high-rise buildings. Also, to improve the quality, it is highly recommended that we should adopt global audit system for quality assessment like CONQUAS (Construction Quality Assessment System).

While it is literally impossible to have completely risk-free buildings, careful planning, construction and management can lower the risks significantly. Building safety has come a long way in the past few decades however we still hear incidents of building fires and collapses from time to time. Technology is helping make high-rise buildings safer every day, however, it is also the shared responsibility of the developers, managers, and residents.

DALEEP THUSU

HIGH-RISE BUILDINGS

RUDRABHISHEK ENTERPRISES (REPL)