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High Rise Buildings: An Overview

Mr. Digvijay Dhanraj Patil[1], Ms. Nikita Sunil Chavan[2], Prof. Priyanka S. Patil[3]

[1] *Department of Project & construction Management, MITCOM, MIT-ADT University, Pune.*
[2] *Department of Project & construction Management, MITCOM, MIT-ADT University, Pune.*
[3] *Department of Project & construction Management, MITCOM, MIT-ADT University, Pune.*

ABSTRACT

High-rise buildings have been rapidly increasing worldwide due to unavailability of land in populated areas and their primary role as essential buildings in modern cities and capitals. High rise buildings are commonly constructed in densely populated cities or urban areas. Constructions of high rises a building provides the comfort living standard for the people and also help in the planning of the cities. The main purpose of this paper is to present the construction, design, safety Construction, quality control and execution of the work of high rise building using the different techniques and for the growing of population demand of the high rise building. Also for the high rise building the requirements that are essential for it are mentioned.
High-rise constructions are also known as "Vertical cities" have the ability to alleviate urban sprawl. Indian cities are seeing massive demographic changes.
Migration from adjacent villages causes urban sprawl, increased housing demand, and a rise in land prices.
Housing has evolved into a revenue-generating enterprise.
Given this demand, while high-rise residential structures have become a solution in metropolitan areas, they remain elusive in India's tier II cities. In these cities, low-rise or mid-rise high-density housing forms have emerged. The majority of the high-rise projects are still proposals.

1. INTRODUCTION

High-rise buildings investment projects or towers reflect a component of the economic power of the country and a sign of its feature. A number of countries seek to achieve their progression by motivating the preparation of comprehensive plans to construct high-rise investment projects to enhance their prestige and economic power.

The construction of high-rise buildings started at the end of the 19th century. High-rise building investment projects (towers) show a component of the country's economic power and a distinguishing trait. A lot of countries attempt to advance by inspiring the development of comprehensive plans to build high-rise investment projects in order to boost their status and economic might. Funding such programmers is a critical component of their success in nations such as Malaysia, Hong Kong, the United States, the United Kingdom, Japan, and others. Diverse and substantial investments are made after thorough feasibility studies to ensure that such projects achieve the desired status and economic rewards for investors. High-rise structures are frequently notable architectural projects that symbolise the state of the science and technology process, as well as unique construction methods, and are being developed in response to rising metropolitan populations and land scarcity.

Tall buildings have qualities that set them apart from other structures. These are well-known architectural designs that embody scientific and technological progress while simultaneously decreasing technology.

2. OBJECTIVE

- To choose the optimum method for high rise construction by researching several methods, contrasting them, analysing them and deciding how to manage them the project and cost effectiveness.
- To determine which factors have the most influence on project management parameters.
- To comprehend the impact of numerous factors on the development of high-rise buildings.

3. NEED OF THE STUDY

High rise buildings are quite different from typical story buildings. So, the project's completion will be impacted by the actions taken beginning with the planning phase. Urban infrastructure development will be necessary to surround the structure. All phases of construction will require careful planning for the utilities and building services. Both the management and the safety standards are substantially increasing. Other elements that support this include:

1) The need for towering buildings has risen due to the rapidly expanding urban population.
2) Neglecting human factors at the expense of life quality.
3) To decide which new studies in this area should be prioritized.
4) The experts need to be up to date on high-rise buildings.

4. METHODOLOGY (CASE STUDY – PUNE CITY)

Pune, which is the second largest city in Maharashtra after Mumbai, is the seventh-largest metropolis in all of India. The 243.84 sq. km. of land under the control of the Pune Municipal Corporation (PMC) is home to 2.54 million people divided into 144 wards. Known as the Detroit of India, the city has a long history of urban development, having served as a pre-colonial historical centre, a significant military hub under British rule, a rapidly expanding industrial hub after independence, and now a developing metropolis. Pune is also known as the "Queen of the Deccan" due to its favourable environment, historical significance, educational importance,

dynamic culture, and rising information technology centres. Population of the Pune Municipal Corporation is 2.54 million.

5. CONSTRUCTION METHOD

- Types of High-Rise Buildings Structural Systems.
- Braced frame structural system.
- Rigid frame structural system.
- Wall-frame system (dual system)
- Shear wall system.
- Core and outrigger structural system.
- Infilled frame structural system.
- Flat plate and flat slab structural system.

6. CHALLENGES OF DESIGNING AND CONSTRUCTION

- Lightweight Structures
- Wind Loads and Earthquake Load
- Soil Interactions
- Efficient Vertical Transportation System
- Construction and Fire Safety
- Use of Information Technology

7. TYPES OF HIGH-RISE BUILDINGS

The security, fire, and life safety requirements of a structure are greatly influenced by its function. High-rise structures can be divided into various categories based on their principal purpose.

1) Office buildings — An office building is defined as a "structure designed for the conduct of business, generally divided into individual offices and offering space for rent or lease."

2) Buildings used as hotels – "The term 'hotel' is an all-inclusive designation for facilities that provide comfortable lodging and generally, but not always, food, beverage, entertainment, a business environment, and other 'away from home' services." There are hotels that include apartments as well. This kind of occupation is later handled in mixed-use buildings and is known as hotel-residences.

3) Residential and apartment structures - A residential building is made up of individual residences where people might dwell or frequently visit. Each home, which might be an apartment, a house, a tenement, or a condominium, has separate kitchen and bathroom facilities. A building with multiple living units is referred to as an apartment building. Apartment buildings are any buildings having three or more independent living units, each with its own kitchen and bathroom, regardless of whether they are called apartment houses, condominiums or garden apartments.

4) Mixed-use structures - Office space, apartments, homes, and hotel rooms can all be found in various parts of a mixed-use structure. The hotel residences trend differs noticeably from its predecessors, such as fractional/timeshare hotel units, which are not entirely owned, or condo hotels, which are entirely owned hotel rooms without, for example, kitchens. In addition to having kitchens and all the other features a homeowner would expect in a conventional home, hotel homes also offer services like housekeeping and room service, as well as restaurants, spas, and gyms.

8. THE NEED OF HIGH RISE BUILDINGS

First, the exploding population, largely urban, creates an increasing demand for tall buildings. The ever increasing population and growing economies in major cities of the world mean increasing urbanization globally and the continuing rise in population density in urban areas. Arable land areas are constantly being eaten away by urban spreading through suburban developments. The tall building can accommodate many more people on a smaller land than would be the case with low-rise building on the same land. A tall building is in effect a vertical transformation of horizontal expansion.

Human elements in urban planning have been clearly neglected at the expense of livability and quality of life. Cities' outward development into the suburbs has resulted in longer travel times and bottlenecks. The idea of travelling for an extended period of time to and from work is damaging to the commuter's social well-being and resulting in fuel and productivity losses. Building clustering in the form of tall buildings in densely populated places provides an opportunity to create open spaces such as playgrounds, plazas, parks and other communal spaces by freeing up ground level space. Tall structures have an impact on the city fabric at the level where they meet the ground, in addition to their impact on the city skyline.

One of the most significant benefits that high-rise buildings provide to customers is that they typically have well established occupier profiles - in other words, personalized neighborhoods. High-rise buildings also have all of the modern facilities, such as swimming pools, gymnasiums, grand entrance lobbies and high-speed lifts. Because high-rise property prices are higher than in smaller projects in the same neighborhood, developers tend to include a plethora of extra amenities and features.

9. REQUIREMENT FOR HIGH RISE BUILDING

Because of the paucity of land, high rise buildings are being built at a quick pace, and the demand for high rise buildings is also quite high for the rising population. There are various requirements that must be met while developing a high-rise structure. The most important necessity of a high rise building is its safety and health facilities. Planning is the most important need for any sort of structure development. To complete the task on time, high rise building construction requires careful planning.

9.1 Planning:

The initial prerequisite for any sort of building construction is planning. To complete the task on time, high rise building construction requires careful planning. Material estimation and material requirements must be specified prior to beginning building activity. Before the construction begins, how the work should proceed, what the requirements and steps to be taken, what kinds of problems may arise and how to deal with them; are all important tasks that must be included in the planning and scheduling of work from excavation, foundation construction, to finishing through erection of frame and walls. The other required factors in a planning are security, quality assurance, testing, and regular investigation of the works being conducted.

9.2 Construction, quality control and work execution:

High-rise buildings are well-designed structures that require extensive study, pre-planning, pre-engineering work, final design and plan, construction, and execution. Another thing to keep in mind during this procedure is quality assurance. Throughout the construction period, the quality of work done, the quality of materials used, and the quality of manpower must be maintained. The entire life of the building and its strength are determined by the elements described and depicted in the diagram.

9.3 Security and the environment:

Fire safety and protection are required: Because of the smokes and hot gases that travel from one room to another in the building, a fire may occur. A fire in a high-rise building is extremely dangerous since it will damage the entire structure as well as have an impact on human life and property. As a result, fire safety and fire protection are required for high-rise buildings. For the safety of the fire in the high rise building, many fire resistant techniques must be employed. For fire protection, fire extinguishers, sprinklers, fire alarms, smoke detectors, and other devices must be installed. Every floor must have all fire-resistance techniques.

10. Demand of high rise building in India

People wish to live in a tranquil environment with adequate facilities due to overcrowding and traffic pollution. High-rise buildings are being built in accordance with popular demand. Most people are looking for high-rise buildings with adequate facilities for both residential and working purposes. Also, due to the growing population and scarcity of land, people are unable to find the ideal place to settle, so the demand for high-rise buildings is increasing. The demand for high-rise buildings is also increasing for city management. In India, there is a lot of high-rise building construction going on.

11. ADVANTAGES:

1) One advantage of having a big number of skyscrapers in y our city is the variety of panoramas it affords.
   These vistas may be so stunning that people flock to them, providing money to the firm or city where they are located .
2) Another obvious advantage is the amount of space available. These structures have so much inner space that they could house more than one organization. The existence of multiple businesses in the same building decreases the amount of space needed in the city.
3) Another advantage of skyscrapers is their symbolic value. The tower's significance could be that a disaster occurred in that region, and they are creating a memorial to it and naming the structure after it. This might be a tremendous benefit to the city because it could act as a major lure for visitors, resulting in increased revenue.
4) They become cost-effective when they provide high-value floor space in densely populated wealthy areas.
5) There would be nothing to bother guests, allowing them to relax and enjoy the city's cityscape from a magnificent vantage point.

12. DISADVANTAGES:

1) One of the skyscraper's primary considerations is its safety. These large structures are significantly more likely to be harmed by a natural disaster due to their size.
2) Because the greater the construction, the more foundation is necessary, there may be major consequences if there is a natural disaster and the foundation breaks.
3) The cost of the structures themselves is another substantial expense in building construction. Because these structures are so large and expensive, many people believe they aren't worth the money.
4) The high environmental cost of its construction, as well as the electricity consumption of the lifts and lifts, has been a detriment. This disadvantage may be mitigated by new technology.
5) Extremely tall structures People will become detached from nature and their surroundings as they lose contact with the roads and the ground.

13. CONCLUSION

High-rise construction projects encounter numerous problems both before and during the construction phase. Many elements influence project management parameters, which should be avoided to reach required building standards. A proper control mechanism is essential to solve the obstacles that the construction sector has while creating high-rise buildings.

The application of isolation technology in the high-rise building structure with enlarged base and multi tower in the high-intensity area can greatly reduce the seismic response, which is an effective means to improve the structural safety of the structure. Considering the structural characteristics, economy, and building quality of the project, it is a preferred implementation scheme to adopt the interlayer isolation technology in the multi tower structure with enlarged base.

Researchers must pay greater attention to serviceability issues such as floor vibration, lateral sway, and occupant comfort as high-rise buildings are progressively constructed with lighter parts. For the future generation of sustainable megastructures and ultra-high tall skyscrapers, innovative structural technologies must be created.

REFERENCES

1. K. Al-Kodmany and M. Ali "Skyscrapers and place making supporting local culture and identity," Archnet IJAR International Journal of Architectural Research, vol. 16, issue 2 , July 2012. 2. K. Rangawala "Contextual tall buildings in India," CTBUH 2010 World Conference – India, Remaking Sustainable cities in the vertical age, Feb. 3rd-5th 2010.
2. V. Chandwani, V. Agrawal, and N. K. Gupta, "Role of Conceptual Design in High Rise Buildings," International Journal of Engineering, vol. 2, issue 4, pp. 556-560, July-August 2012.
3. National Building Code of India 2005, Government of India, New Delhi.
4. L. Kanta Kumar, N. Sawant, and S. Kaur "Forecasting Urban growth bases on GIS, RS & SLUETH model in Pune Metropolitan area," International Journal of Geomatics and Gosciences, vol. 2, no. 2, 2011.
5. P. Ahluwalia. Security, safety of High-rise buildings and non-core Police duties. [Online].Available:http://www.assocham.org/events /recent/event_743/Pawanjit Ahluwalia a_Premier_Shield_Group.pdf
6. D. M. Sundrani, "Consumer perception towards tall buildings," Journal of Bussiness and management, vol. 4, issue 4, pp. 16-19. 8. J. R. Hall Jr, "High rise building fires," National Fire Protection Association, 2005.
7. A. Farouk, High rise buildings and how they affect countries progression, CASA E-LEADER, Zagreb, Croatia, 2011.
8. R. Piekarz, The influence of structural irregularities of framed tube of tall concrete building on the tube stiffness (in Polish) Wpływ nieregularności konstrukcyjnych powłoki ramowej betonowego budynku wysokiego na jej sztywność, Archives of Civil and Mechanical Engineering 6(2) (2006) 94. https://doi.org/10.1016/S1644-9665(12)60257-X
9. K.H. Ha, O. Moselhi, P.P. Fazio, Orthotropic Membrane for Tall Building Analysis, Journal of the Structural Division 104(9) (1978) 1495-1505.
10. W. McGuire, R.H. Gallagher, R.D. Ziemian, Matrix structural analysis, 2nd ed., CreateSpace, California, United States, 2015.
11. S. Salehuddin, N.L. Rahim, N.M. Ibrahim, Stability of a six storey steel frame structure, International Journal of Civil & Environmental Engineering 13(06) (2011). http://eprints.utm.my/id/eprint/26383 [34] R.D. Cook, D.S. Malkus, M.E. Plesha, R.J. Witt, Concepts and Applications of Finite Element Analysis, 4th ed., John Wiley & Sons, Inc., United States, 2001.
12. E. Simiu, D. Yeo, Wind Effects on Structures: Modern Structural Design for Wind, 4th ed., Wiley-Blackwell, New Jersey, United States, 2019.
13. S. Ankireddi, H.T.Y. Yang, Simple ATMD Control Methodology for Tall Buildings Subject to Wind Loads, Journal of Structural Engineering 122(1) (1996) 83-91. https://doi.org/10.1061/(ASCE)0733-9445(1996)122:1(83)

BIOGRAPHIES

1. Prof. Priyanka S. Patil
Assistant Professor, PCM Dept., MITCOM, MIT-ADT University, Pune

2. Mr. Digvijay Dhanraj Patil
Second Year student of MBA, PCM Dept., MITCOM, MIT-ADT University, Pune

3. Ms. Nikita Sunil Chavan
Second Year student of MBA, PCM Dept., MITCOM, MIT-ADT University, Pune