

A comparative analytical study of the evolution of the construction of tower buildings according to the different technology of the era

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Abstract:

Egypt is now witnessing a wide architectural and urban renaissance. Starting a new century with a new republic full of developments in the construction and architecture field and a new capital full of skyscrapers that is been classified as one of the fourth generation cities. For the first time on the land of Egypt, the highest skyscrapers in Africa and the highest tower on the African coast are being built. The highest construction, electronic and information technologies in these skyscrapers are used. The research specialized in the development of the formation and construction of tower buildings according to the differences of technologies with the changes of time. Starting from mud tall buildings and stone tower buildings to the first example of a steel skyscraper "the Eiffel Tower" that has built in the time of industrial revolution. The research is interested in studying some of the modern technologies that has used in Burj Khalifa -the tallest skyscraper in the world- as well as future expectations for skyscrapers. Then an analytical comparison between some of the elected towers is been made. That is to study and prove that the difference in construction materials and in technology of the era led to the development of the formation and construction of tower buildings.

Keywords:

Architectural Art, Tower Buildings ,Architectural formation, Skyscrapers, Age Technology.

Research problem:

The world is witnessing qualitative developments towards the use of high-tech technology in all areas of life, including architecture, and the research problem lies in the lack of research that compares the old and the modern in general and in documenting the development of the technology used in tower buildings according to the difference and development of technology in each era, and depending on the difference in the local building material used Especially in tower buildings, where tall or tower buildings - or what was recently called skyscrapers - are considered a modern feature and a global trend for construction and evidence of the development of architecture and construction techniques in the world. And even exceed it sometimes, and we will try through research to study and document such buildings according to the progress of time and the difference of the era, and study them and prove or deny that they are highly efficient and achieve the principles of sustainability as well as green architecture and also the principles of environmentally friendly architecture.

Research Methodology :

The research methodology focuses on studying and analyzing the different construction and formation methods in the construction of tower buildings, old and new, and making an analytical comparison of some famous tower building models, so that the objectives of the research can be achieved and its conclusions made and by proving that each age has its own technology and each place has its own local building material that may be used in construction. The traditional tradition of tower buildings, and the matter has changed in the modern era. With the development of construction techniques from the mechanization of construction, the methods of pre-casting, prefabrication, pre-manufacturing, and the use of the same international building material, namely concrete and reinforced concrete, and achieving or ignoring the principles of sustainable, green, and environmentally friendly architecture, some types of international tower buildings have been constructed using high-tech methods, **and the following approaches have been followed:**

First: the referential approach to fabricate the scientific material necessary to cover buildings in the historical and modern eras.

Second: The analytical approach, in order to analyze what is possible of scientific material as well as its extracted results.

Third: the comparative approach, by making a comparison at the end of the research between the old and modern tower buildings and their future perceptions.

Fourth: The plastic approach, and this is an inevitable matter, and it is necessary to clarify every piece of information that may need some form, and this method is indispensable in all scientific research, whether theoretical or laboratory practical.

research aims :

The use of traditional technology is widespread in all developing and poor countries, although they differ in terms of method, but they are all characterized by the fact that they require intensive labor and do not need capital or large savings, which is what poor and developing countries need, as there are many labor forces and unavailable capital. Here, the need to use concrete in construction as a modern building material appeared, and because of the use of concrete, modern methods of construction appeared and developed, and therefore it became one of the objectives of the research to prove that technology has a role in the development of tower buildings throughout history, so tower buildings are the character of modern construction in the era Modern, which is one of the most important features of globalization in construction, and this type of building neglected the principles of sustainable architecture and ignored environmental and environmentally friendly architecture, which we will try to discuss through the study.

1. Introduction to the research:

It was necessary to study the development of the techniques used in construction in general and in tower buildings in particular, where tower architecture and elongation in the structure are considered a modern feature and character. The formation of tower buildings has evolved over time as a result of the development of the unit used in construction, whether by changing the material it is made of, changing its shape, or changing it as a whole, and using modern materials and building units that are in line with the requirements of the modern era. (1)

And after the Second World War and after the discovery of energy, thinking about new ways of building came when the need to build large numbers of buildings appeared in record time and thinking about the vertical expansion of cities, so just relying and thinking about the well-known traditional methods was considered a waste of time, because they need long periods of time. In addition to relying on methods of transportation, warping and primitive processing, in addition to the need for a lot of labor, which called for thinking about shifting towards the use of modern methods that rely on machines and machinery, which can produce better and in a faster time, and iron is considered one of the most important and latest materials used In construction, and this is due to its many advantages and its ability to bear weights more than any other building material, and with the discovery of electric elevators at the beginning of the twentieth century, high rises appeared in buildings, skyscrapers and towers whose height may soon exceed a kilometer, and the term “skyscraper” appeared in the century Twenty, which means the highest construction designed by humans or the modern tower with a metal structure. Since ancient times, man has instinctively sought to rise in constructions, which is what the research seeks To study it, it was necessary for man to create skyscrapers as a natural evolution of the use of steel construction technology. (1)

The research studies and makes an analytical comparison of the towers since the beginning of their idea and construction, as in Yemen, which were established and built entirely from green raw clay, then studied stone, its formation and its use in construction and mentioned an example of stone towers such as the Leaning Tower of Pisa, then the first example of a skyscraper in the world, which is the Eiffel Tower Which kept pace with the era of the industrial revolution, which was built entirely of steel, which is the most important example of the development of construction techniques recently, especially since the era of the industrial revolution, and Egypt was keeping pace with this development in high-rise construction that appeared and spread throughout the world in the twentieth century. This was reflected in it, as the Cairo Tower was built, which is considered the highest land

Research Results :

1. Recently, the competition between the countries of the world in construction has become to prove and invent newer technologies in building the tallest skyscrapers.
2. The research proved that technology or technology is the basis for all progress and development in all fields of production, especially industrial, including architectural and construction.
3. The height in the traditional building does not mean devising traditional techniques to deal with this height, including the bolt and the bar, which is a passage on the upper floors that connects the towers to each other.
4. The discovery of energy in the era of the industrial revolution and beyond led to the possibility of forming steel as a building material, as well as the rediscovery of concrete with the use of iron in construction, which opened the way for the imagination of architects for unprecedented engineering formations, and it also had the greatest impact on the development of construction and its rise to create modern skyscrapers and reach heights unprecedented in human history.
5. Innovating new technologies for pumping concrete in tall skyscrapers may open the way for building higher than the mile height.

6. Technology has no limits or end as long as there is a need for it and its mechanisms are available "thought, raw material and energy", and the prevailing proverb matches with it: need is the mother of invention or technology.

7. The discovery and emergence of the electric elevator and the development of its operating technology reflected the aspiration to increase the height of tower buildings, and with the invention and development of matter and its properties using nanotechnology, this may lead to the work of cables and elevators that may precede the speed of sound and light, which will lead to the construction of buildings as high as space, which may link Space stations on Earth in the future through these highly developed elevators such as the "space elevator".

8. A tower building with multiple functions and uses needs scientific competence capable of managing its affairs to provide a distinguished service stemming from the technological development and information revolution.

9. The newly built tower block, or the so-called skyscrapers, has become a global international product. Its designers did not differentiate between one geographical environment and another, so it needs a review in the use of building and construction techniques, as well as building materials that are suitable for each environment to preserve its architectural identity.

Recommendations:

In light of the tremendous architectural and urban revolution and renaissance that Egypt is witnessing, and the amazing development in the world of construction and architecture, with which we are ushering in a new century, and keeping pace with the highest international technologies, and a new capital full of skyscrapers with the latest architectural design, and the expansion of building new cities that can be classified It is one of the fourth generation cities in which the highest construction, electronic and informational technologies are used, and in which also the highest skyscrapers in Africa are being built - for the first time on the land of Egypt, which is the iconic tower in the New Administrative Capital with a height of 385 m, and the highest tower on the African coast in the new city of El Alamein with a height 200m,

the research recommends the following:

1. The necessity of continuing to study the methods of developing the technology of construction materials and their units in order to try to find what is better and more advanced in the future to build smart and environmentally friendly skyscrapers.
2. The need to study and document the traditional building methods that are the origin of the local architectural identity, which constitute the traditional building and the development of the techniques of those methods and methods within the framework of sustainability and the local architectural identity.
3. Giant architectural projects are considered the contemporary architectural boom, and they are a kind of artistic cultures coming to our developing countries, and their dissemination and identification through the audio-visual and print media is very important.
4. The research proved the role of technology in the development of tower buildings, and recommends following the analytical approach to the building's primary components or referring to the design thought of its basic elements, which is an approach that would help to understand the origin of the primary elements to form the building in general and the role of technology in developing it to what it is. right Now.

5. Architectural and urban laws and regulations in particular that pertain to the construction, construction and design of skyscrapers and tower buildings with a new architectural boom must be enacted in order to be sustainable, energy-saving and environmentally friendly buildings.
6. The architectural product (skyscrapers) is a plastic art product and a construction product with different compositions that needs competence and scientific ability that achieves efficiency, safety and security for the structure on the one hand and for the human environment on the other.
7. The research recommends moving towards computerized and electronic building technology used in the formation and construction of modern tower buildings, especially environmentally friendly and energy-saving technology that achieves the principles of sustainability.
8. The research recommends studying the components and elements of fourth generation cities and proving or denying that they achieve the economy and the principles of sustainable, green and environmentally friendly architecture.

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