

High-Rise Building in Jordan

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Abstract—The subject of this paper is the high-rise buildings in Jordan, which is focused on identifying the different concepts of higher building, and research in the historical sequence during civilizations with a focus on the period after the Chicago Fire. Then the emergence of higher construction in Jordan, which increases the height of 12-story building at the University of Jordan Hospital in 1973, up to 13 floors and the continued construction of high-rise buildings and turning facades of many buildings of stone facades to glass facades. It contains nine sections; the first section is an introduction. The second section explains the meaning of high-rise buildings. The third section is the structural solutions. The fourth section deals with the high-rise buildings in Jordan. The fifth section is an analytical study. The sixth section is about the discussions. The seventh section covers results. The eighteenth section Acknowledgements and the nineteenth section is the References.

1. INTRODUCTION

Human thought of raising himself physically since ancient times, but the nature and characteristics of his body did not allow him to do that, and with the scientific and technical progressive was able to achieve his dream to being above and physically rise to high-rise buildings using the elevators. This paper deals with the high-rise buildings and its creation and development in Jordan [1].

The aims of this paper is to shed light on the developments and changes that have occurred for high buildings in architecture, construction fields, and it's globally Technology since 1880 until now, and the impact of it's on the Jordanian architecture from 1970 until now.

The methodology depends on three phases: First: survey and field studies carried out by the researchers and their students. Secondly: the Architectural historical books and specialized periodicals. Third: available data on the World Wide Web sites for information (Internet).

2. THE CONCEPT OF HIGH-RISE BUILDINGS.

The term high-rise buildings due to the eighties of the nineteenth century, after the establishment of the Marshall Field Building Insurance in New York City in 1883 [2], which

was carried out of a structural metal, after that Chicago considered the city of modern skyscrapers [3].

A high-rise building defines as that building which forces and wind pressure is greater than the effect of the other powers. It's known as, as high-rise buildings, is permanent use residential buildings or offices, or any other functions. Its considered a high-rise building if it was multi-storey, very height, and be longer than the height that people are accustomed to, and requires vertical Elevator or vertical movement inside. Also it is known as; First: building consists of six floors and above. Second it is high building more than or about 17 meters. Third it is more than the height of 25 storey's. And identified the body of high buildings and architecture of Chicago city in 1997, standards that are based on the classification of the world's tallest buildings as four metrics are not necessary to mention here [4].

According to that there is no clear definition of high-rise buildings. If the building height increase to 23–150 meters it is considered a high-rise building, but if more than that it should name the skyscraper [5].

2.1. Concept of higher buildings in Jordan and classification

High-rise buildings intended in the Jordanian legislation means "any building height increases height scheduled for street level, or top street level attributed upon the occurrence of a land on two (or more) different street level" [6, 7]. It is intended; First: rise residential buildings up to four floors. Second: the rise of a commercial use rise buildings up to 72 meters (articles 33.34 of the Rules),.. Third: the rise of the industrial use of buildings up to six storey's. [8].

Building legislation allows the establishment of high-rise buildings in specific areas of the city with the exception of green housing areas, rural housing, agriculture houses, private houses, industrial and craft areas, and near airports.

The system itself has identified those high-rise buildings in Amman as; First, high-rise buildings of the General

provisions, and secondly: high-rise buildings of especial provisions of [8, 9].

High-rise buildings in Jordan can be classified, from the point of view of the researchers into three categories they are first: Low-rise buildings up to four stories or less. Second, medium-rise buildings, which range 5-11 stories. Third, high-rise buildings that have 12 floors and above, the paper will focus at the third category.

Higher buildings began in Jordan as a result of economic conditions experienced by the general Arab region and Jordan in particular, because the financial transfers for Jordanians abroad, the encourage of the state to the banks and give them a lot of facilities, and encourage the successive Jordanian governments to encourage investment in the economic and tourism sectors. The establishment of the state to implement many of the development plans.

Higher buildings in Jordan began with bank buildings, hotels, and major commercial centers, concentrated mostly in Amman city. Has contributed to enter Jordan free trade agreements, and cooperation with the European market and European countries, and the Arab states, and the polarization of many international bodies and international shares in the establishment of such high-rise buildings and organizations [1].

3. STRUCTURAL SOLUTIONS FOR HIGH BUILDINGS.

The structure of high-rise buildings are divided into two main sections, namely; internal construction, outer construction; internal construction in high-rise buildings resist horizontal forces using internal elements of resistance within them, through solid frames of steel or reinforced concrete, or the use of tubes containing tangled frameworks, resist bending forces, or through shear walls [10]. The external construction in high-rise buildings is constructions that are resistant to the side horizontal forces, using resistance elements located on the outer surface of these buildings [10].

4. HIGHER BUILDINGS IN JORDAN.

At the beginning of the twentieth century building heights in Amman was 3 or 4 floors; then mid-rise buildings appeared higher than 4 floors. Origins and evolution can be divided of buildings in the Jordan into three phases: phase 1 the low-rise buildings, phase 2 the mid-rise buildings, and the phase 3 high-rise buildings.

The height of any building in Jordan in the sixties of the twentieth century did not increase more than six floors, with the exception of the old Arab Bank building in downtown Amman. And stone tower for an hour in the court-yard of the Islamic Scientific College School in 1952, with height of 21

meters [11]. Rubin building then held in 1961 in Abdali area, up 10 floors, and in 1961. The insurance company building was up 11 floors.

University of Jordan Hospital building was the first high building in Jordan with 13-storey in 1972 (Fig. 1) [12]. The highest busy building in the Jordan until 2003 was the Royal Hotel is a rise of 105 meters. (Fig. 2) shows the occupied high-rise buildings of the occupied in Jordan until the preparation of this paper as their names, and year of construction, number of floors.

There is only one tall building outside Amman it is King Abdullah University Hospital, in Ramtha town, in rise up to 16 floors Picture () [13].

Photos in tables (3, 4) show height of these previous buildings. It is noted that some of the earlier buildings, as Jordan hotel building,, have been built in several stages unlike other buildings.

4.1. Proposals of high buildings in Jordan

Building by-laws of Amman city was adjudge in 03/05/2005 to allow the establishment of high buildings in different parts of the city. Amman municipality allowed in 2007 the establishment of high buildings in several locations in Amman. It gathered some high buildings in several locations and areas that respond to market needs, within areas that can accommodate urban expansion and population density, especially with regard to infrastructure. In addition to the above investment laws permit to establish high buildings is not applied by the buildings law and building bye-laws as the building of the Royal Hotel was allowed.



Fig. 1: University of Jordan Hospital.



Fig. 2: The Royal Hotel.

5. AN ANALYTICAL STUDY OF HIGH BUILDINGS

Most buildings in Jordan and Amman especially in using stone facades. The stones added land marks to Amman, and added to them special architectural character and aesthetic, this material encouraged architects to be creative in a wide variety, and produce good architecture in Jordan in general and Amman in particular, succumbed to heritage of Islamic civilization, Roman, and Greek city. Many of the Jordanian architects of have confirmed that Islamic art is very, security and a reference for them.

Numerous styles of architecture in Jordan cannot be counted, and numerous architectural multiple cultures that carry Jordanian architects graduates from various international schools and returned after graduation to carry with them what they taught.

The majority of the external walls of high buildings were built in 2003 by concrete or reinforced concrete as a building Housing Bank building, or built by concrete walls clad with stone as the Royal Hotel building, or covered with marble or granite tiles as the UAE building. The exterior facades are performed for a limited number of high buildings of glass entirely as Rotana Hotel building and Jordan Towers Gate 1.2.

It is noted locally and due to lack of economic visibility study of the highest buildings as Housing Bank when it was constructed that more than 50 % of its spaces, and stories is operated or leased so far.

5.1. Reasons that led to built high buildings.

There are many of the reasons and motives that led to built of high-rise buildings in Jordan these reasons lead to take the necessary precautions to make it safe, and the most important reasons that could be reached during this paper led to built high buildings as follows:

1. High prices of land in the world in general, and Jordan in particular, and the lack or non-availability of suitable land for construction in urban centers and commercial areas.
2. The availability of capital and major financial institutions, considering the vertical height is more suitable than the horizontal expansion
3. The emergence of high buildings as centers of giant trading powers, and the desire of owners to modernity and uniqueness to signify the technological development.
4. Show the social and economic status of some institutions and individuals.
5. Reduce distances in the cities for people and vehicles, to control the urban environment.
6. Activation of local financial investments and re in domestic attract investments abroad in addition to attracting foreign investment.
7. Increase employment opportunities for different sectors of the Jordanian citizens.

In addition to what has already appeared helped to start the race of the construction of high buildings and towers; First economic factors. Second, lack of arable land for building, and high prices dramatically, to consider, especially in big cities

The last third of the twentieth century and beyond conditions required to establishment of high buildings, to meet the needs of local, Arab and foreign investors, in addition to the cultural phenomenon of mind.

6. DISCUSSIONS

This paper study requires to know government and popular attitudes of higher construction, and find out the advantages to keep them, and see the disadvantages to reduce them, and therefore give some suggestions or recommendations that may help to continue to build high buildings

6.1. Advantages of high building

Most advantages of high building, increased investment and commercial revenue, and reduce the cost of some infrastructure items at reasonable; like water networks, electricity networks, and roads networks sewage systems if it studied in a scientific and reasonable and integrated in areas where will be the towers. And keep the operators of these high buildings for noise pollution, the sounds of car traffic, and achieve a better standard of industrial environmental lighting and ventilation.

1. The increasing in prices of construction materials, labor wages, increasing of land prices, increase the inflation rate, high cost of the buildings price, the average citizen's income cannot pay.
2. A number of people get used to to see the buildings that did not increase than six-storey and reject them, and with time they getting used to its vision and it become an integral part of the cityscape.
3. It leads during the establishment and operation to development local economy, the community development and finding a lot of regular jobs.
4. Increased social relations between certain groups when they want to be in one place.
5. Break the boredom in the sky line; they are also hallmarks of the various areas of the city and its neighborhoods
6. It constitute a tourist generate revenue for their owners, or users and supports the local economy
7. Reducing daily trips for employees in the towers and living away from them, in addition to providing green areas around it to be used in various activities. It can also be a new style in architecture and technology.

6.2. Disadvantages of high-rise buildings.

High buildings have defects like the most buildings as defects of form and composition, technology defects, defects of the transfer of expertise, environmental defects, and it is not logical in its inception.

Lack of physical discomfort and the emergence of some types of psychological problems that might be exposed to some of the buildings users. The vertical buildings is a major strain on the infrastructure, roads, walkways, parking and other services in particular if they were not calculated previous. It does not serve the local identity, or Arabic identity, or Islamic identity, as Khalifa tower in Dubai, and Rotana Tower in Amman.

The technical flaws are; adoption of high-rise buildings on the high and complex techniques; power supply disruptions form the building, leads stop of all elevators, as happened in the Gulf region, and as has happened in Jordan in 2006.

Sudden stop of power also leads to environmental problems related to the heating, cooling and ventilation, due to the inability to work moving glass parts in the external facades of the building, in the absence of the possibility of moving external glass facades of building, temperatures inside the building increases very high, so that the occupants of the building faces lot of problem of ventilation. And re-use part of air in the interior of the building ventilation may lead to the transfer of certain types of odors, microbes, germs from sick to healthy people. And increase traffic congestion in some areas, it caused a major disaster when its collapse for any reason. Also it have a significant effect globally and locally, as happened when the collapse of the Twin Towers in New York.

Environmental and psychological defects. High-rise buildings are more dangerous than ordinary buildings in case of fires or disasters occur, because the resulting combustion gases spread all stores of the building and cannot be easily controlled. High-rise buildings in cases of emergency evacuation and for any reason need a long time and cadres of qualified and trained to carry out this arduous process, which is difficult to control.

Staying in high-rise buildings for long period's lead, particularly if these buildings occupancy for the purposes of housing, to mental disorders and membership resulting from swing. And their glass windows need, particularly in desert areas air to the huge amounts of energy for air heating of the buildings in winter and cool in summer. It creates adverse external environment buildings to prevent the sun's rays and the formation of the shadow of the neighboring buildings lower altitudes. It is this kind of human buildings for attachment to the land, and with the time it increases exposure to inflection with the risk of developing some mental illnesses such as depression, loneliness, and others.

It also pay curiosity people, to living in this kind of buildings as a result of fascination and control over their minds.

The disadvantages of the transfer of expertise is observed that most of the high buildings designs carried out by foreign consulting firms, and the role of Arab or Jordanian consulting engineering offices or marginal role or secondary role, these offices often have a small percentage of the engineering design and supervision fees. Foreign consulting firms do not give adequate opportunity to Arabic or Jordanian consulting firms or engineering to get enough experience in the design and implementation of these projects. There are few number of local engineering offices or consultant offices that can do part of the engineering design or supervision.

The economic disadvantage – High-rise buildings need heavy financial costs which cannot people or many of the institutions needed to do and need to support the state or major financial institutions to carry out.

High buildings and skyscrapers in major cities came in response to an urgent need for spaces in urban areas severely overcrowded, and it is the only available place for further real estate development towards the top, but this consideration does not apply to many Arab cities as Amman city which enjoys abundant lands can be built a reason to high-rise buildings and towers projects in Jordan.

6.3. Suggestions and recommendations

It is necessary to study the existing legal, legislative, and executive measures to protect the city of Amman from high buildings, and implemented it in a relatively far from the currently populated areas elsewhere, and put them outside the

current city, and proposed to amend the current legislation and the development of its own and fits modern legislation, because the towers sites currently proposed will to more traffic and visual problems, and inefficient infrastructure in the city works now.

High-rise buildings need restudying and re-organizational and service fit high buildings, preferably find new regulatory areas for urban expansion away from the architectural and urban fabric of the existing urban areas especially the city of Amman. The measures taken by the Amman Municipality with respect to higher buildings is insufficient, and needs the right solution to organizational studies to be more comprehensive and more profound than currently exists. The economic feasibility study of high buildings, should including the city of Amman.

7. THE RESULTS

The construction of high buildings featured in terms of theoretical and practical locally, it must be at the implementation when taking a basic and important material and technical considerations, as the feasibility study of all aspects, and to study the supply and demand them, and attention to public safety of the building and its occupants. study of all aspects, and to study the supply and demand them, and attention to public safety of the building and its occupants.

Table 1: High Buildings in Jordan.

N	Building Name	Story	Year
1	Le Royal Hotel	30	2002
2	Tower building	22	1982
3	Housing Bank Complex	21	1982
4	Regency Palace Hotel	19	1980
5	Zara Tower-1	18	2000
6	Zara Tower-2	18	2000
7	Eemar Towers	18	2007
8	Expansion of the Arab Bank	18	2004
9	Landmark Hotel	16	1974
10	Holiday Inn Hotel	16	1999
11	Four Seasons Hotel	16	2000
12	Crown Plaza Hotel	16	1984
13	Amlak Hotels	16	?
14	Marriott Hotel	15	1982
15	Sheraton Hotel	15	?
16	Fhais commercial B.	15	?
17	Abdel-Hammed al- S.	15	?
18	Millennium Hotel	15	2010
19	Central Bank B. (2)	15	?
20	Grand Hyatt Hotel	14	1999
21	Jordan U. Hospital	13	1973
22	Emirates Air Lines B.	13	1999
23	Belle Vue Hotel	13	2000
24	Bank of Jordan	13	2010
25	Aqarco commercial center	12	1982
26	United Nation building	12	1974
27	Meridian Hotel	12	2001

28	Farah Hospital expansion	12	2008
29	Cairo Amman Bank	12	1997
30	Scientific College Hotel	12	?
31	Shapsough building	12	1982
32	Maram Enayah Building	12	?
33	Arab Jordan Bank	12	?
34	Dana Plaza Hotel	12	?
35	Marwan Abed Laat B -1	12	2008
36	Marwan Abed Laat B -2	12	2010
37	Marwan Abed Laat B -3	12	2010

The high-rise buildings represented in the last three decades, an important symbol, a capital control over most aspects of life. And therefore they are not expected to enter Jordan area specially the skyscrapers over the next few years, especially after the global financial crisis.

The establishment of high-rise buildings and towers are no longer confined to commercial uses and office buildings in major urban centers but extended to different continents and countries such as Jordan.

The technical progress trimmed dimensions and weights of steel sections and materials used in the buildings became much lighter than the old traditional buildings, then the construction of high-rise construction became more higher than the former buildings.

Vertical lifts lead to the loss of frequent areas in all stores of the building, and the loss of a large area of construction.

The safety and the quality control are of the most important issues to be taken into account in high-rise buildings, such as the use of anti-material fires.

It is noted that the majority of high-rise buildings built in the eighties of the twentieth century, because of the economic boom and the economic recovery in the fourth quarter from the same century.

The number of high-rise buildings list until the preparation of this paper are 37 "see table 1", And "Table 2" 15 buildings were occupied, with hotels in various categories, 19 buildings were served with different uses of business, and the remaining 3 buildings were occupied with residential uses.

The occupied of high-rise buildings in the city of Amman during the twentieth century number were (29 building), Despite the global economic crisis in recent years, Jordan is still going on in the work of establishing of high-rise buildings, where there are proposals to build 11 high towers in the coming years

Most of the towers and high-rise buildings located yet implemented within populated areas, and there are many suggestions that built high-rise buildings and towers at Queen

Alia International Airport road, in addition to the three areas within the Greater Amman Municipality as defined by the master plan for the city.

The researchers has observed during their field trips and personal relationship that a number of the architects and engineering supervision these projects which helps to transfer experience to them.

High-rise buildings and towers projects revive the Jordanian economy, and contribute to the commercial capital movement, it also contributes to the reduction of unemployment among engineers, technicians, and administrative functions, and a significant proportion between the Jordanian labors.

The busy high buildings in city of Amman concentrated until the preparation of this paper were in three main axis; the first axle extending from the first circle until the eighth circle. Second axle: extended from Al Hussain Mosque until University of Jordan. And the Third axle: connecting between the two axes from the ministry of internal affairs until the third circle. And 5 other residential buildings spread out the previous axes.

8. ACKNOWLEDGEMENT

The authors are grateful to the Applied Science Private University, Amman, Jordan, for the partial financial support granted to cover the publication fee of this paper.

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