

# Analyzing Dynamic Technology in Dynamic Tower, Dubai A Study Based On Dynamics

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**Abstract**—Although we live in a Dynamic World filled with movement, the method of designing in architecture is totally static, the building looks the same all the time. Dynamic Architecture is a design concept in motion in which the building can rotate, revolve, swivel or pivot. This paper describes and analyzes the Dynamic tower in Dubai proposed by David Fisher. It is the first building in four dimensions evolves from time and space. It is majorly focused on two concepts: industrial approach and dynamic architecture .It is dynamic because each floor can rotate independently from the others allowing the building to change its' shape continuously. It is green because it produces its own energy from the wind and from the sun and it is industrially produced being made of prefabricated modules that can be assembled on site. The purpose of the study is to understand about dynamics, its building functionalities and the feasibility of the construction of the building. Some examples are Suite Vollard, Brazil and Sharifi Ha House. These green buildings will change the skyline of the cities not only due to their dynamic shape but mainly as they may finally help us to enjoy nature.

**Keywords:** Dynamic architecture, green building, prefab skyscraper, rotating skyscraper, sustainability, time.

## 1. INTRODUCTION

“Life is the moment, it’s about keeping up with time. Time designs the world, we live in” is rightly said by David Fisher (Fisher, 2008). The concept of Dynamic architecture is based on the desire to have buildings that adjust themselves with the natural environment. Dynamic Tower is the first building in motion. It has seventy floors which rotate separately again and again to shape the building. The design is proposed by David Fisher, an Italian architect. According to Dr. Fisher, time is the most powerful dimension of life because it is tightly linked with relativity. His new skyscraper, the Rotating Tower, is “shaped by life, designed by time” (Fisher, 2008).

He wanted to design a building which will give equal benefits to all the residents. He came up with the idea of rotation into his building [1]. This idea helped him to achieve his goal. The Design is proposed in Dubai. Dubai has grown at a surprising pace over the past few years. Their leaders have inspired the region, the world by their desire to innovate and bring them to reality. Thereby proposing a mixed-use rotating tower with the first 20 floors will be for retail space, next 15

for a hotel, next 35 floors residential apartments and the top 10 floors luxury villa-style apartments [2]. The wind turbines are horizontally located between floors and solar panels are provided on the rooftops. By combining motion and self-electric generating property of the building shows that it is environmental friendly in nature.



**Fig. 1: An illustration of Rotating tower depicting endless shapes.**  
Source: Infinity studio, 2007

## 2. FUNDAMENTALS OF DESIGN

The principle of design is symmetrical which provides stability to the structure of the building. A fixed concrete core that includes services will be accommodated in the center which will enhance the seismic resistance of the building. The complete rotation of the building takes 180 minutes.

The Dynamic building in Dubai has 80 floors with the total height of 420m. Also, the size of unit will be 124 square meters with a parking space inside the unit [3]. The building has the ability to generate two times power as much power it uses for the functioning of the building. Each floor of the skyscraper is a personalized apartment with the ability to rotate independently. Each unit will be pre-fabricated with

high-quality finishing, reducing the cost and construction time. (Prakash, 2017)

### 3. METHODOLOGY

#### 3.1 The Shape of the building

The first methodology of the dynamic building is related to the shape of the building, which changes continuously. Each floor can rotate individually, changing the shape of the building allowing residents to decide their light exposition and view. The building takes on shape imposed by time, never appearing the same as compared to earlier constructed buildings of monotonous facades [4].

#### 3.2 Construction of the building

The second methodology of the building is the method of construction. The construction site is ecologically sound for the benefits of the city, keeping it clean, green and quiet with less traffic [5]. The rotating tower is the first industrial skyscraper in which ninety percent of the building is prefabricated and assembled on a central core. The core is the only part that is built with traditional reinforced concrete poured on the site. This new way of building, based on dividing the construction process, provides savings in terms of both time and money. Instead of 2000 thousand workers which will be required for a regular skyscraper of 80 floors, only 70 specialized workers will be required on the site and part of the production is totally pre-fabricated, the tower is expected to cost about 23% less than a traditional building. The floor will be of steel structure becoming a platform with a cantilever up to 15 m.[6]

The building is constructed in two main phases as follows:

- 1) Construction of central core.
- 2) Prefabrication and assembling of units on site

**3.2.1 Construction of central core:** The central core of about 22m diameter will take around six months for construction which will carry the vertical loads. The construction is based on slip forms technique[7], which will fasten the construction process, building a floor every two days. This structural design of single concrete core increases the building's earthquake resistance compared to other skyscrapers [8]. In central core, all elevator and staircase are built by the traditional concrete reinforced method. After two months of the work, the first pre-fabricated unit will reach the job site, complete with all the plumbing, electric and air conditioning system .

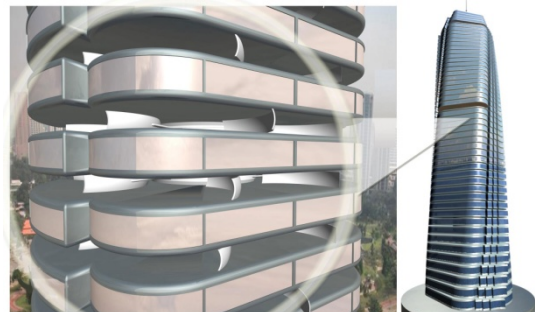
**3.2.2 Prefabrication and assembling of units on site:** The industrial pre-fabrication process will result in high-quality production as compared to site construction finishing. The pre-fab units, made of steel, aluminum, carbon materials, are installed offering luxury finishing and very fast construction time, usage of the limited number of workers, thus reducing site risks and enabling cost savings.



**Fig. 2: Modules are assembled around the central core of the tower.**  
Source: Infinity studio, 2007

#### 3.3 Technology and Luxury of the building

The third methodology of building involves combining technology and luxury with the environment. The building wind turbines are horizontally located between floors and solar panels will be provided on the rooftops. Each turbine will produce 46000KwH of energy per year. This will give energy to 12 apartments [10]. There are around 420 apartments and 70 turbines. Therefore, 35 turbines will provide the energy required by the entire building. The remaining half energy will be used for the surrounding buildings [11]. Therefore, the Rotating Tower also becomes a "green power plant" producing green energy for the city.



**Fig. 3: Horizontal wind turbines placed between the tower's floors.**  
Source: Infinity studio, 2007

### 4. ADVANTAGES OF THIS BUILDING OVER REGULAR BUILDING

There is a cost saving of 20% as compared to traditional building methods. There is a 30% reduction of construction time. The assembling process will require around 90 workers

on the site, instead of 2000 workers required in a traditional one.[2]

Due to the pre-fabrication process in the factory, it will be possible to customize each apartment according to owner's desires. This will offer luxury living standards and excellent quality.[9]

All the quality standards can easily be checked since all the units are manufactured in factories where monitoring will be easy as compared to the building site.

In this construction process, workers will operate in comfortable and functional environment conditions because most of the assembling work will be done in the factories. [12]

The modules will be pre-assembled in the factory removing all the negative factors like no requirement of big space around the building, endless loading, unloading, waste material, noise and traffic.

## 5. DISADVANTAGES OF DYNAMIC BUILDING:

The initial capital cost is very high because of special types of equipment in construction and modern construction techniques like pre-fabrication. The overall construction cost is around 355 million dollars. On the long front, it may be beneficial as it will generate the huge amount of electricity.

Care should be taken will transporting pre-fabricated units from industry to the site to avoid damage to units.

High skilled specialized labor will be required during the time of construction.

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## 7. CONCLUSION

The design of Dynamic building faces challenges due to the changing form of the structure. It is an interesting piece of Architecture that catches the human attention.

From a cultural perspective, the rotating tower can be considered moving art; changing shape in rhythm. The cladding of the building will reflect the city around it, and this reflection will only be decorated by its constant motion. This "sculpture" has a dual purpose; it is a living environment on one hand, and skyscraper-size performance art on the other.

## REFERENCE

- [1] Fisher, D. (2017). Dynamic architecture, rotating tower: yes, but will it fly? *INSEAD Knowledge* .
- [2] Fisher, D. (2008). Rotating Tower Dubai. *Council on Tall Building and Urban Habitat*, 8.
- [3] Prakash, J. R. (2017). Dynamic Building. *Imperial Journal of Interdisciplinary Research*, 1749-1951.
- [4] Fisher, D. (2008). *Dynmaic Revolution*. Retrieved September 20, 2017, from Dynamic Architecture: <http://www.dynamicarchitecture.net/>
- [5] McMenamin, C. (2015, October 30). *Advantages of using prefabrication on my construction project*. Retrieved from PERFORMANCE WITH INTEGRITY.
- [6] Sahil S. Kasawar, P. P. (2017). Dynamic Rotating Skyscraper. *International Advanced Research Journal in Science, Engineering and Technology* , 81-84.
- [7] Fisher, D. (2006). *Patent No. US 2006/0230691*. United States of America.
- [8] Anderson, D. H. (2017). *Concrete structures*. Retrieved from Seismic Resilience: <http://www.seismicresilience.org.nz/topics/superstructure/commercial-buildings/concrete-structures/>
- [9] *Prefab vs Traditional Homes: What's the Difference?* (n.d.). Retrieved from Revolution: <https://revolutionprecasted.com/blog/prefab-homes-vs-traditional-homes-whats-the-difference/>
- [10] Calvin, B. (2010). Upwardly Mobile: Rotating Towers Becoming a Reality. *VERTICAL UPDATE High-Rise News & Updates for Las Vegas*.
- [11] Crespo, A. d. (2007). *Conceptual Design of a Building with Movable Parts*. MASSACHUSETTS : MASSACHUSETTS INSTITUTE OF TECHNOLOGY .
- [12] Taranath, B. S. (2016). In *Tall Building Design: Steel, Concrete, and Composite Systems*. CRC Press .