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Conceptual Innovation Design at Riga Building College, Latvia

Krista Svike, Sandra Laimovna

Abstract- Conceptual innovation design is a way for developing of competitiveness in architecture projects. Hereby, the formulation of requirements according to the design task is of essential importance [5], whereas these requirements should be met in accordance with the international level in the given area. The objective characteristics of shape and the means for its aesthetic organization are highly connected with contemporary innovative technologies. For instance, photovoltaic modules are hung on walls in a metrical order, wind turbines with their shape and dimensions actively participate in the formation of buildings. The principles of creation of form are greatly interconnected with innovations, while leaving their mark on the architecture image of buildings. All this is of high importance as well in the design of high and mega-high buildings where shape, function, construction, building technology, ecology and many other factors are indivisibly connected and determine contemporary architecture image. For example, the design of transportation systems in skyscrapers in cities with millions of inhabitants is a crucially important factor – here what matters is to reach a given point using the fastest way possible with the minimal loss of energy and time. In connection with the above-mentioned situation, at Riga Building College has been developed a project focusing on conceptual innovation design of panoramic elevators for serving high and mega-high structures – Super skyscrapers Competition № 100001360. This project, developed by Jurijs Eisaks, a second-year student at the College, has been supervised by Assoc. Prof. Dr. arch. Liudmila Aleksandrovaand Prof. Dr. arch. Yanko Aleksandrov from the University of Structural Engineering & Architecture, Sofia, Bulgaria according to a "Erasmus +" cooperation contract [3, 4].

Keywords: conceptual innovation design, sections, geometric shapes, orientation, different angles.

I. INTRODUCTION

The conceptual innovation design project has the objective to develop new ways for transportation of the people living or working in high or mega-high buildings, e.g. skyscrapers, situated in the central parts of cities with a population of several million people, e.g. new York, Tokyo, Hong Kong, etc. Direct connections among the highest floors of neighboring skyscrapers represent a unique opportunity for fast transportation without the typical need to get down to the ground floor.

II. THE TASK

The task has been to create new skyscraper structures, situated close to existing high-rise buildings, and develop a technology which will provide innovative ways for transportation with panoramic and speed elevators, with green spaces and gardens present at different floors of the skyscraper[1]. This task has been a pre-requisite for the creation of a new approach for transportation in skyscrapers. The development of floor elevator capsules with the dimensions of 6 x 6 meters, having their own internal elevators, cafeteria, aquarium, small vertical garden, etc. are shown and reviewed in [1]. An important condition for the construction of these skyscrapers is the availability of enough land, which could be provided by demolition of old buildings or the implementation of new building technologies [2]. Such a building technology has been used in the design of a skyscraper with a rooftop velodrome developed for the Super skyscrapers Velodrome Toronto 2015 design competition. There, an original construction technology has been used, using elevator lifting of floor constructions with the help of 6 "pushing" and 6 "puling" elevators, situated in four different kernels. Three-storey 8-shaped packages are built at ground level on a shuttering platform, situated between the two types of elevators. Vertical short girder walls, firmly connected to the three floors are used to suspend the floors to the uninterrupted gill-walls of the carrying kernels. The mounting is realized downwards, whereas the first three-storey 8-shaped packages are raised with the help of 24 elevators, belonging to two neighboring kernels. With the help of the girder walls these floors are suspended to the walls of the kernels. After the mounting of the first uppermost 8-shaped floor packages the shuttering platform is let down to the ground level.

With the help of another shuttering platform in the same way are mounted the following 8-shaped packages with the help of the elevators of the following kernels – 2 and 3, 3 and 4, 4 and 1 as well as the transverse packages, connecting the kernels 1 and 3, 2 and 4. In the free space, formed between the already mounted 8-shaped three-storey packages are situated "swinging" aquariums, which serve as vibrations extinguishers in case of earthquakes [2]. This solution shows that the innovative technology used with inventive step has a direct influence on the creation of shape.

III. Technical Essence of The Solution

In this project the transportation of the inhabitants of neighboring skyscrapers is realized with the help of transportation rings, inclined under 30^0. These rings are supported by three vertical transparent kernels, equipped with floor elevators. The rings of two neighboring skyscrapers intersect with the vertical transparent kernels of the elevators,

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***Correspondence Author(s)**
Krista Svike, Master of Science in Engineering, Architecture and Design, Aalborg University, Danija
Sandra Laimonovna, Associate Professor, Engineer, Deputy Director, Riga Building College, Latvia.

whereas in the zones of intersection the direction of movement can change, e.g. from the floor elevators through the rings towards a neighboring skyscraper or in the opposite direction [Fig.1.]. The creation of form is realized with the help of the rings used (closed one-dimensional forms with space for the escalators), vertical one-dimensional forms with space for the floor elevators and inclined plains, forming the façade walls of the skyscrapers. Green spaces, i.e. floor gardens are situated in many places within the skyscrapers.

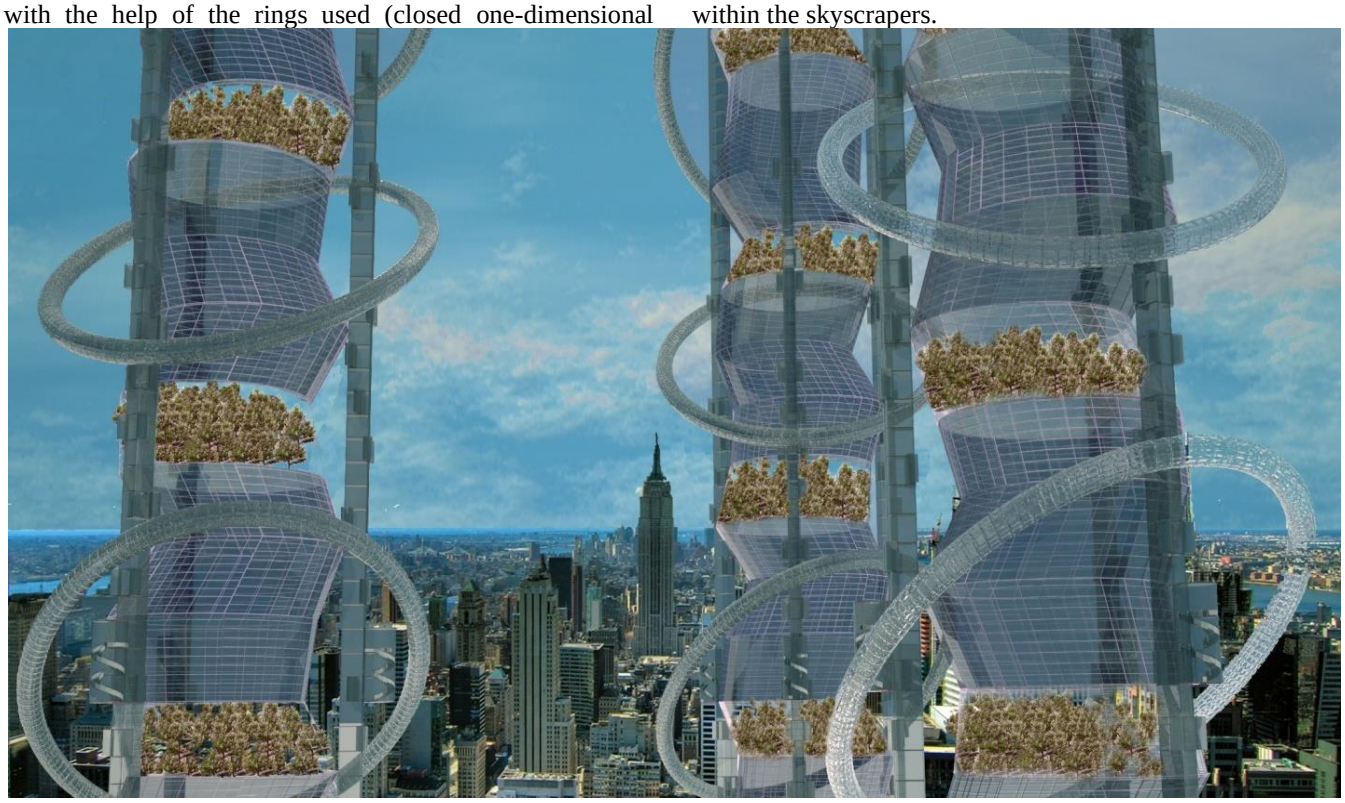

Fig.1. Direct Connection on of Neigh Boring Sky Scrapers with the Help of Connection Rings of the "Bicycle Wheel" Type, Inclined Under 30^0

The rings are supported with the help of spikes, which are connected to the building. Inside the spikes, there is space for evacuation of the inhabitants using the escalators, situated in the rings [Fig.2.].

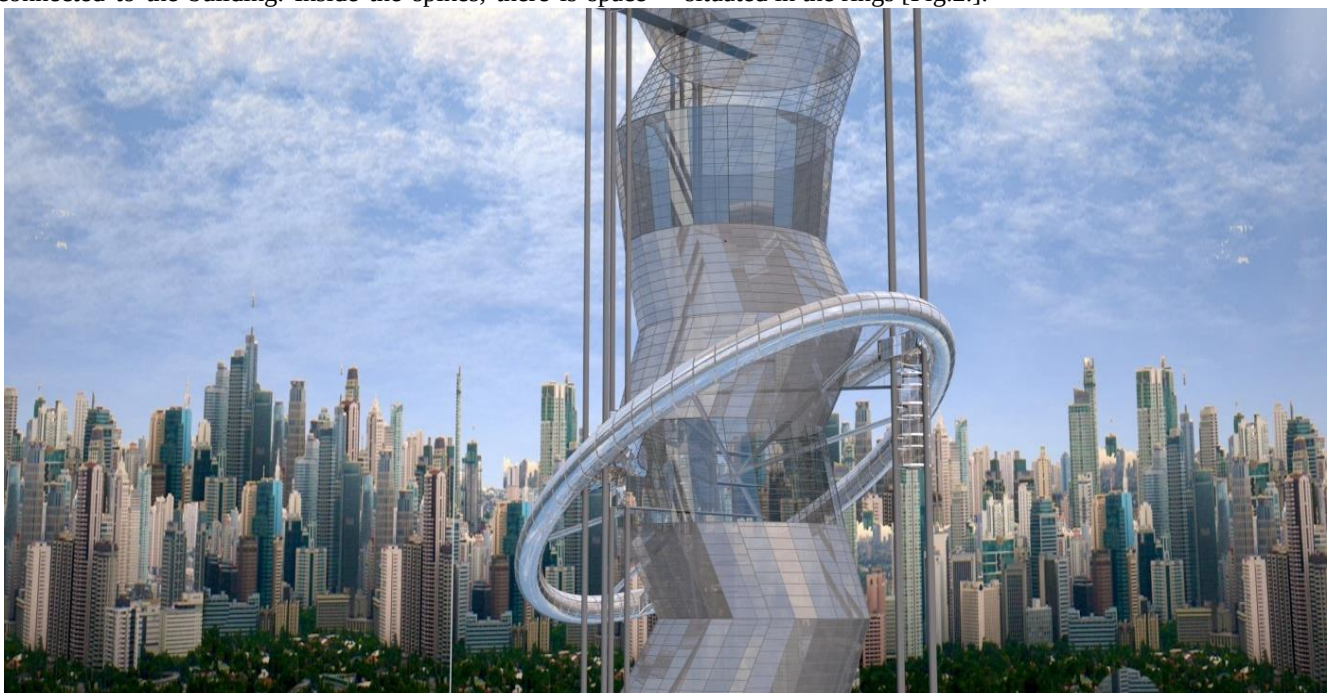

Fig.2. A Ring with Spikes of the "Bicycle Wheel" Type, Encompassing the Structure of the Skyscraper

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Wind turbines, situated within over the surface of spikes produce the energy necessary to cover the consumption of the inhabitants of the skyscraper. Ifthere is a need to repair or change the turbines, each of them can be easily removed using special covers situated all over the surface of the rings. In fact, the turbines can be mounted on these covers, thus allowing for the operations related to the mounting/dismounting processes to be realized within the rings [Fig.3.].

Fig.3. Wind Turbines, Suspended Over the Spikes of the Ring of the Type "Bicycle Wheel"

The transparent rings as well as the transparent elevators offer the passengers the opportunity to enjoy a panoramic view of the surrounding buildings as well as the internal greenery of the buildings [Fig. 4.].

Fig.4. A panoramic view

Metal and glass are the basic building materials, used to manufacture the panoramic floor elevators [Fig. 5.].

Fig.5. Fragment of a Panoramic Floor Elevator

The Skyscrapers With Their Rings and Transparent Elevator Kernels Represent A Harmonious Part of The Surrounding Environment [Fig.6.].

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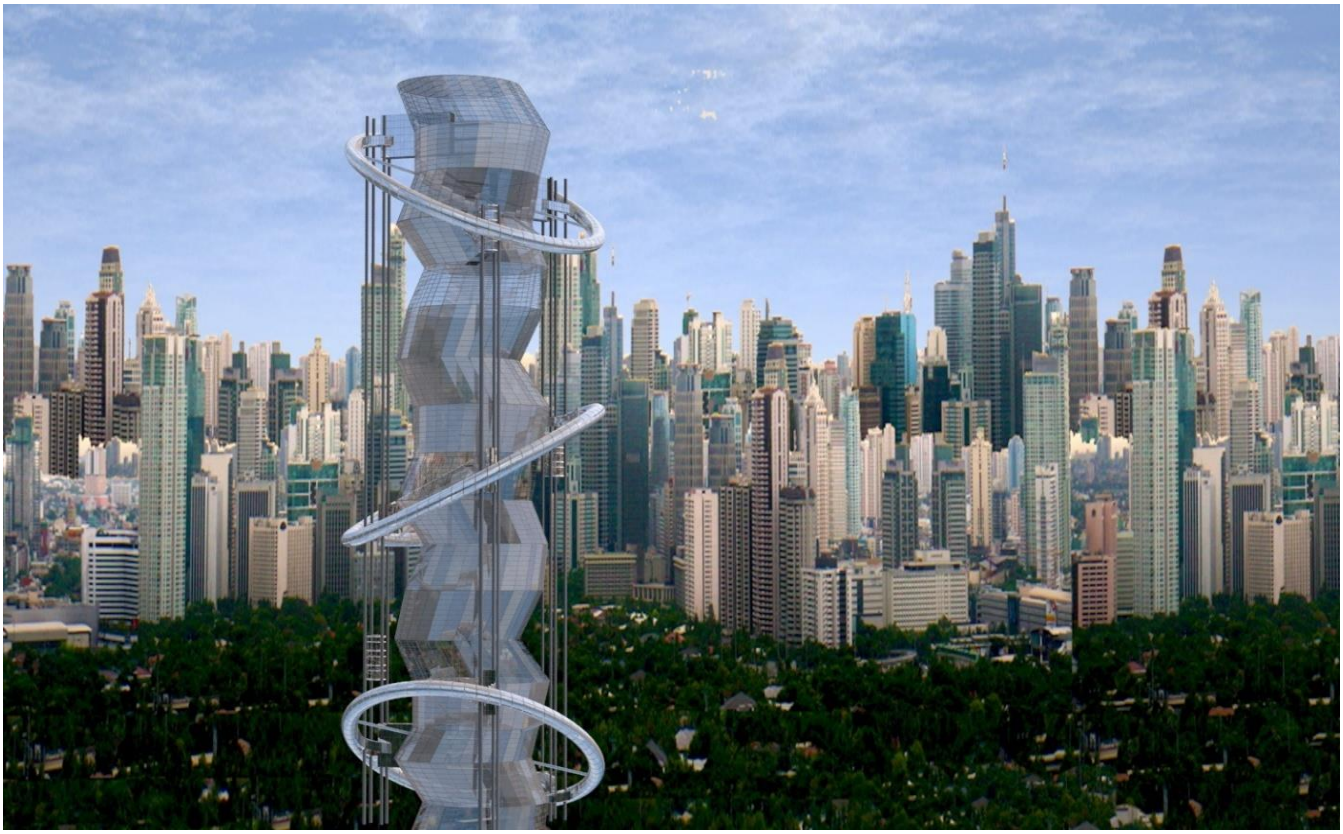

Fig.6. Outline of a Modern City with the Skyscraper

The access to the building is realized with the help of short horizontal connection, corresponding to the number of the respective transparent panoramic elevators [Fig.7.].

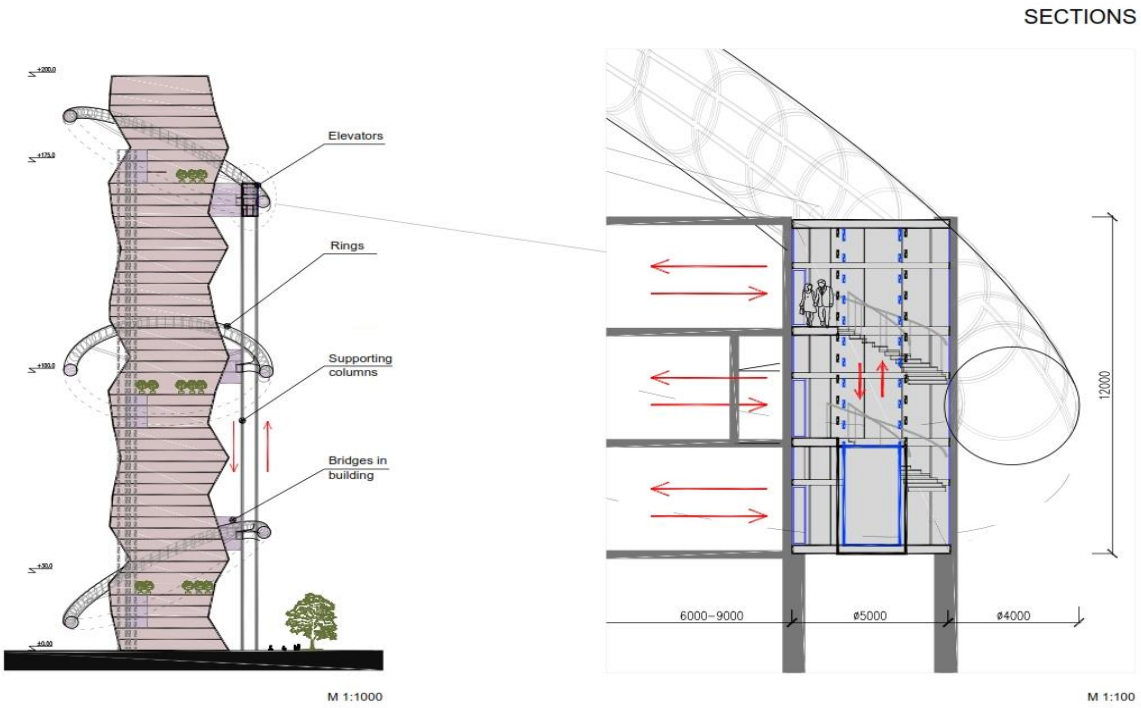

Fig.7. A Vertical Section and a Fragment Representing the Ways for Entering and Exiting a Panoramic Elevator

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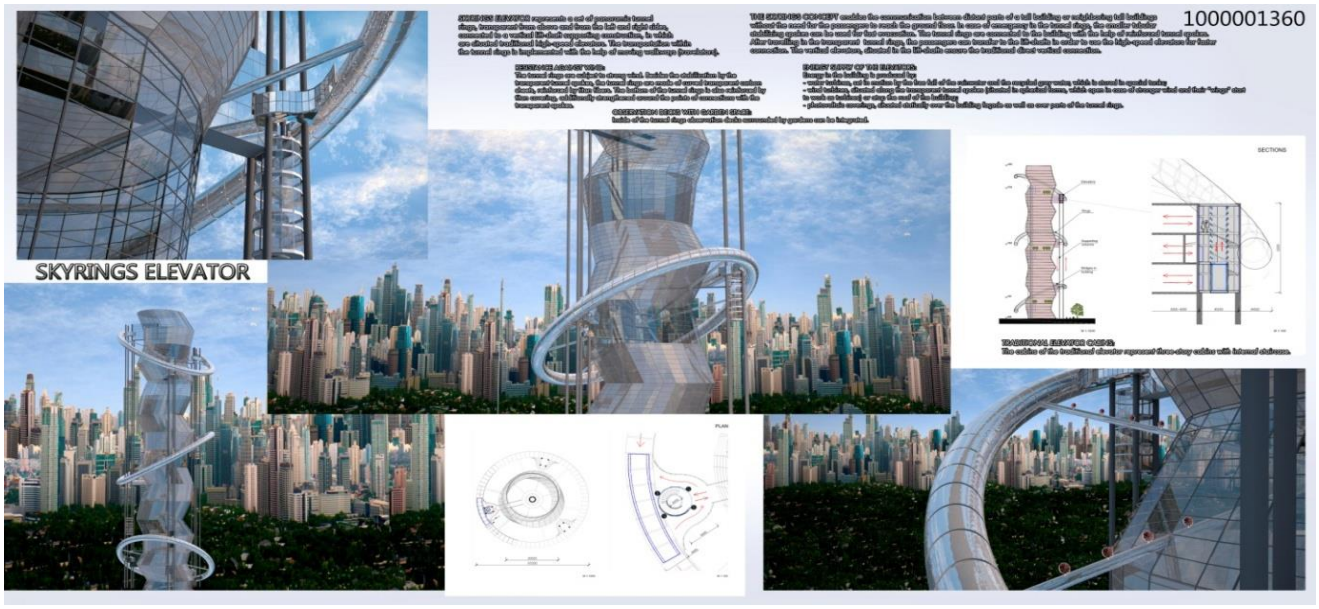

Fig.8. View from a competition boardof project № 1000001360

IV. CONCLUSIONS

1. Innovative solutions can be adapted to different abstract forms, given that they are suitable for use in the respective building solution and implementing the respective building materials. Contemporary building technologies depend on the newest building materials which impact the development of the building industry, machine industry, elvator industry, etc.
2. Innovative building technologies, following the requirement of inventive step have a great impact on the creation of form in general: Superskyscrapers Velodrome Competition – 2015 (a building construction allowing the floors to be mounted in the air by using elevator-lifted pre-fabricated floor constructions), Superskyscrapers Elevartor Annual – 2104 (skyscrapers encompassed by rings with spikes of the “bicycle wheel” type; implementation of floor elevator capsules with dimensions of 6 x 6 meters with integrated internal elevators).
3. The more the innovations in a given solution, the greater its competitiveness which allows for the creation of new market niches.
4. The conceptual innovation design can serve as a springboard for careers in architecture, while this very conceptual design represents the main feature of any given project in space and time.
5. The Erasmus + program gives the opportunity for a meaningful cooperation covering various aspects of the educational process, inluding lectures, course projects and joint participation in international competitions.

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