

New solution – attractive lighting with fluorescent algae in aquariums, situated in multi-storey transparent elevators and in floor gardens inside skyscraperers

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Abstract

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The use of natural phenomena (fluorescent algae) represents a specific way to improve the shape-forming when designing the interior of new buildings. The unexpected combinations of well-known technical indicators (elevators, aquariums) and new indicators (fluorescent algae in multi-storey transparent elevators) lead to a positive technical effect (the attractive interior lighting of the multi-storey transparent elevators and the floor gardens), as well as to an increased level of originality. The above-mentioned combinations form the patent claims of patent application “Multi-storied panoramic elevator” – BG111889 of 17.12.2014 (Aleksandrov, 2014). The new solution has made a significant contribution to the sustainable development of cities by providing the inhabitants of the tallest buildings with access to the plant and animal world.

Keywords: new solution; attractive light; fluorescent algae; aquariums; multi-storey; transparent elevators; floor gardens; skyscraper

Introduction

The projects presented in this publication represent innovative solutions for high-rise buildings designed for an international design competition – “Superskyscrapers Elevator Annual 2014” (Aleksandrov et al., 2014), whereas the integration of various inventive steps has increased the competitiveness of the project. The elevators designed for the project are, among other, equipped with aquariums for cultivation of fluorescent algae. These aquariums can be situated inside panoramic elevators and on every floor of a high-rise building. From all existing explored aquacultures, especially suitable for these purpose are the fluorescent algae. As a result of their integration, both a significant reduction in electricity consumption for lighting and an improved aesthetic effect are achieved.

“As a natural factor, water in nature can be used both as a natural and an artificial source (processed under given parameters) for achieving the life functions of aquacultures” (Vlasarev, 2013). If a skyscraper is situated in direct proximity to a source of water (sea, ocean, etc.), this water can be used to fill up the aquariums placed in the panoramic elevators which are situated inside the skyscraper.

In the case of another situation of the skyscraper, e.g. in central urban areas, the salting of fresh water, being a prerequisite for the cultivation of fluorescent algae, is realised under pre-described specific requirements in two ways. *First way:* The algae are cultivated only in aquariums situated in panoramic elevators; *Second way:* The algae are cultivated only in aquariums situated between a central panoramic multi-storey elevator and the floors for inhabitation, whereas each aquarium is placed on the respective floor; *Third way:*

The algae are cultivated simultaneously on the floors as well as inside the multi-storey elevators. In this case the positive lighting effect is most considerable. The above-mentioned solution has occurred as a result of the implementation of unexpected combinations of well-known and new technical indicators, which have been explained by the Theory of inventive steps, developed by the author and reviewed in detail in his works (Aleksandrov, 2017b), (Aleksandrov, 2018a) as well as in a part of his dissertation (Aleksandrov, 2014).

An original aesthetic effect with or without inventive step can be achieved by implementing unexpected combinations of objective properties of shape and the means of its organisation (Aleksandrov, 2017). A good example for this are the specific conditions of single-plane shapes of urban structures (Aleksandrova, 2010), the symmetry of crystal structures (Aleksandrova, 2014a) as well as the crystal-like architecture shapes, used in worldwide practice (Aleksandrova, 2014b). The proportion of building materials is as well of high importance for shape-forming (Ching, 2014). The use of fluorescent algae represents only one of many essential elements of the reviewed solution (Abstract of patent BG111889).

„A panoramic elevator (A) consisting of floors with a high degree of mobility when it is necessary to reach a higher or lower floor in the lift's interior range through an internal lift connection, escalators and stairs. The elevator has an autonomous power supply with its own wind turbines located above and below the elevator cubicle with a water

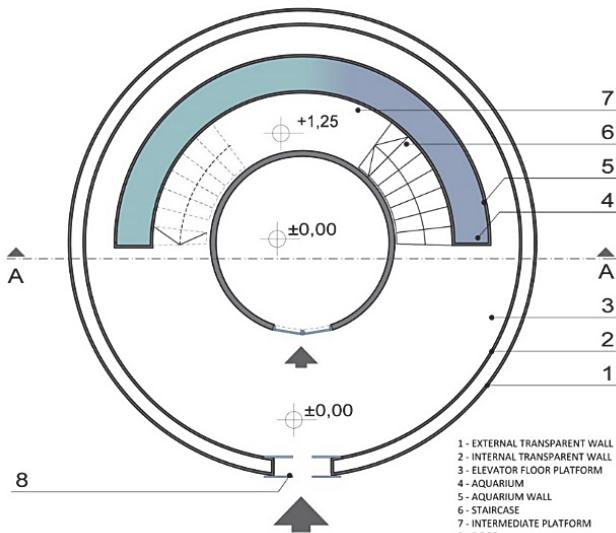


Fig. 1. A panoramic vertical elevator with one central internal elevator; curved escalators or staircases, transparent double external walls, vending machines and tables; with dimensions 6.00 x 6.00 m

fireproof array in two separate water vessels, which represents an energy collector for hot water supply to the building“ (Aleksandrov et al., 2014).

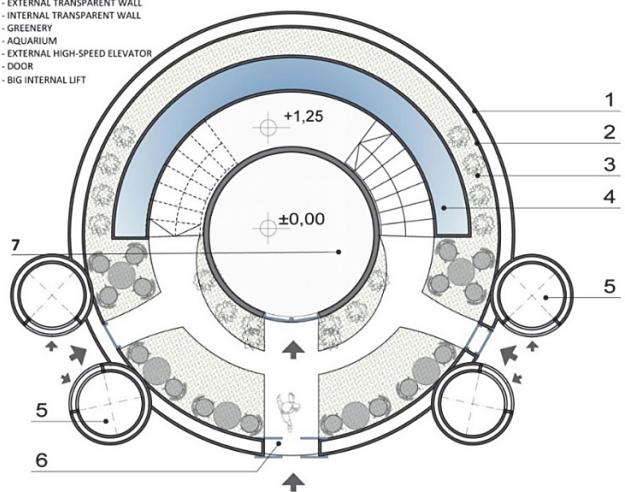


Fig. 2. A panoramic vertical elevator with one central internal lift; two curved escalators or two staircases, transparent double external walls, vending machines and tables; with aquarium and four external high-speed elevator; dimensions 6.00 x 6.00 meters

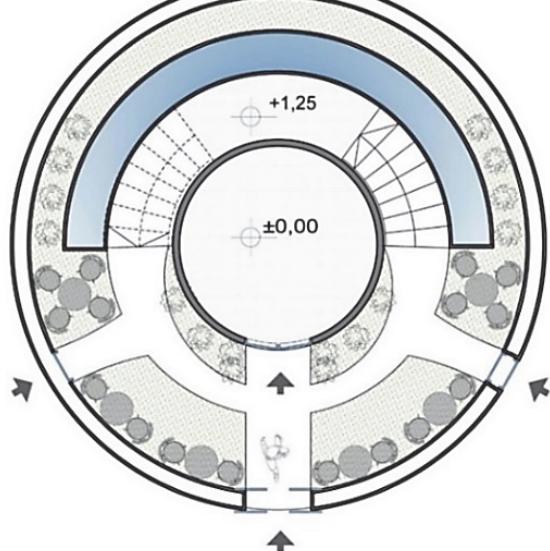


Fig. 3. A panoramic vertical elevator with one central internal lift; two curved escalators or two staircases, transparent double external walls, vending machines and tables; dimensions 6.00 x 6.00 meters

Table 1. A panoramic vertical elevator with internal aquariums and external aquariums

Nº	Description of the elevator	Plan figures	Radius	Diameter	Area m ²	Number of floors	Elevator height m	Volume m ³
1	2	3	4	5	6	7	8	9
1. Internal aquariums, situated inside the transparent elevator								
1	A panoramic vertical elevator with one central internal lift; two curved escalators or two staircases, transparent double external walls; dimensions 6.00 x 6.00 m ; with fluorescent algae situated inside the elevator.		4.10	8.20	52.78	3	12.50	659.75
2			3.95	7.90	48.99	3	12.50	612.375
3			3.80	7.60	45.39	3	12.50	566.75
4			3.00	6.00	28.26	3	12.50	353.25
5	In this variant, one or more high-speed elevators ensure the faster transportation, while the panoramic elevator is a slower means for transportation, which allows for a more relaxed and enjoyable transportation; with fluorescent algae situated inside the elevator.		4.10	8.20	52.78	3	12.50	659.75
6			3.95	7.90	48.99	3	12.50	612.375
7			3.80	7.60	45.39	3	12.50	566.75
8			3.00	6.00	28.26	3	12.50	353.25
9	A panoramic vertical elevator with one central internal lift; two curved escalators or two staircases, transparent double external walls, vending machines and tables ; dimensions 6.00 x 6.00 m ; with fluorescent algae situated inside the elevator and with mini-garden .		4.10	8.20	52.78	3	12.50	659.75
10			3.95	7.90	48.99	3	12.50	612.375
11			3.80	7.60	45.39	3	12.50	566.75
12			3.00	6.00	28.26	3	12.50	353.25
2. External aquariums, situated on the floors of the skyscraper								
1	A panoramic vertical elevator with three central internal lifts and four escalators or two staircases with intermediate platforms, internal courtyard, transparent double external walls, vending machines and tables; with dimensions 6.90 x 6.90 m and fluorescent algae situated outside the elevator.		3.95	7.90	48.98	4	15	734.70
2			3.45	6.90	37.37	4	15	565.95
3			3.15	6.30	31.16	4	15	467.35

Cultivation of algae on every floor of the multi-storey elevator – first way (Table 1.1; Fig. 1, 2, 3, 4, 9)

The aquarium for cultivation of algae, which is placed inside of a panoramic elevator is covered by patent application “Multi-storey panoramic elevator” – BG111889 of 17.12.2014 (Aleksandrov, 2014)

In this variant, one or more high-speed elevators ensure

the faster transportation, while the panoramic elevator is a slower means for transportation which ensures a more relaxed and enjoyable environment. Aquarium 4 serves as a habitat for various fish and algae, including fluorescent species. (Fig. 1)

Exotic greenery is situated between aquarium 4 and the internal wall 2, and by the left and by the right side of the elevator 7. The external high-speed elevators 5 can be used for

transportation of fruits and vegetables to the floors, where the storehouses are situated. These storehouses are equipped with chambers where positive temperature is maintained. (Fig. 2)

Between the external transparent wall of the elevator and the aquarium and by the left and by the right to the entrance of the central elevator is situated the greenery (Fig. 3). Table 1.1 shows 3 planning solutions of a panoramic transparent elevator with an integrated aquarium for cultivation of fluorescent algae with four dimension variants for each one, and Table 1.2 reveals 2 planning solutions with three dimension variants, with two aquariums situated outside the panoramic elevator but placed in its shaft (Table 1.1 (1-12) and Table 1.2 (1-6)).

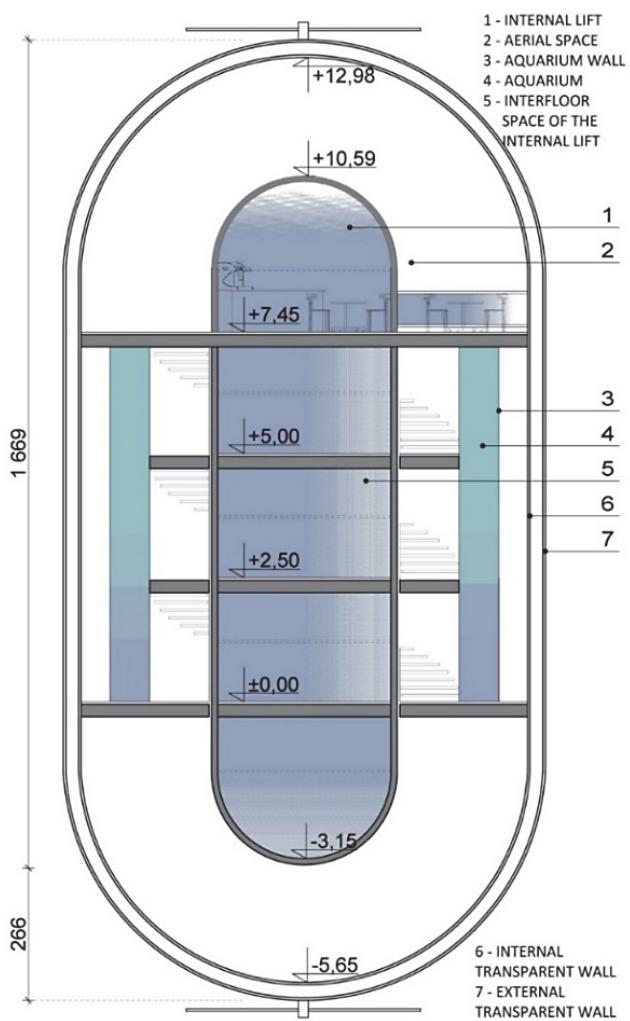


Fig. 4. Section through elevator capsule
(Aleksandrov et al., 2014)

The aquariums where fluorescent algae are cultivated have a height of three floors whereas under the first floor of the elevator capsule is placed a tank rainwater which is used for the irrigation of the floor gardens and as a precautionary measure in case of fire; over and under every capsule is situated horizontal wind generator. (Fig. 4)

Cultivation on fluorescent algae in each floor of the skyscraper – second way (Table 1.2; Fig. 5, 6, 7, 8)

The aquariums are situated in close proximity to the elevator shaft of the panoramic elevator. They are designed to serve as a barrier against the sound made by the movement of the panoramic multi-storey elevator. Soft fruits (blackberries, raspberries, etc.) are cultivated by using a system of wooden rod fences. The greenery from the external transparent wall of the aquarium is also a good sound insulator. The outermost elevators are used for transportation of fruits and vegetables to the floors where the warehouses for their storage are situated. All inhabitants of the building has their own space in the warehouse in order to store their own produce. The middle elevator is used by passengers, whereas the other two elevators are used to transport freight. (Fig. 5)

Inside the space 2 can be situated an aquarium for algae cultivation. Such aquariums can be situated on several floors. (Fig. 6)

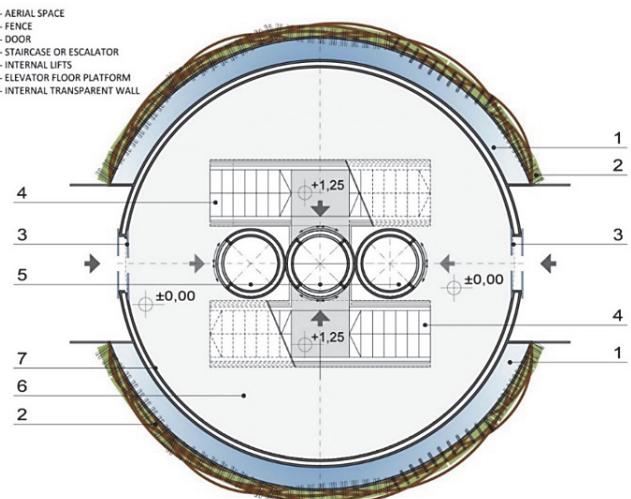


Fig. 5. A panoramic vertical elevator with three central internal lifts and four escalators or two staircases with intermediate platforms, internal courtyard, transparent double external walls, vending machines and tables; dimensions 6.90 x 6.90 meters
(Aleksandrov et al., 2014)

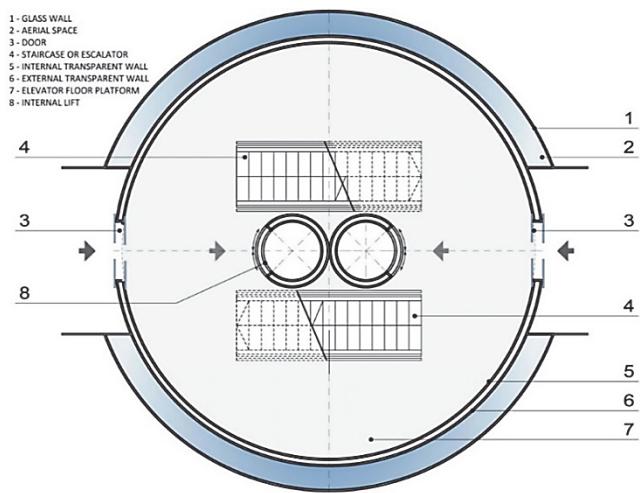


Fig. 6. A panoramic vertical elevator with two central internal lifts and two escalators or two staircases with intermediate platforms, internal courtyard, transparent double external walls, vending machines and tables; dimensions 6.90 x 6.90 meters

(Aleksandrov et al., 2014)

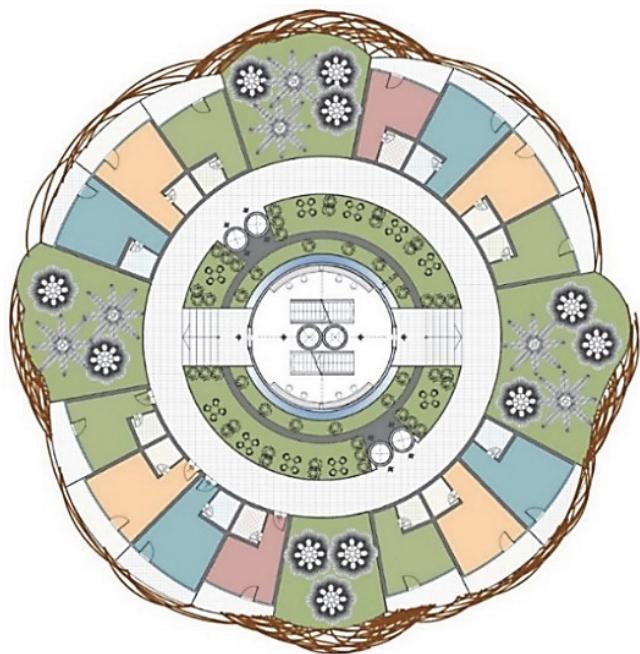


Fig. 8. Plan of the floor with one capsule – there is two internal elevators and four external elevators

(Aleksandrov et al., 2014)

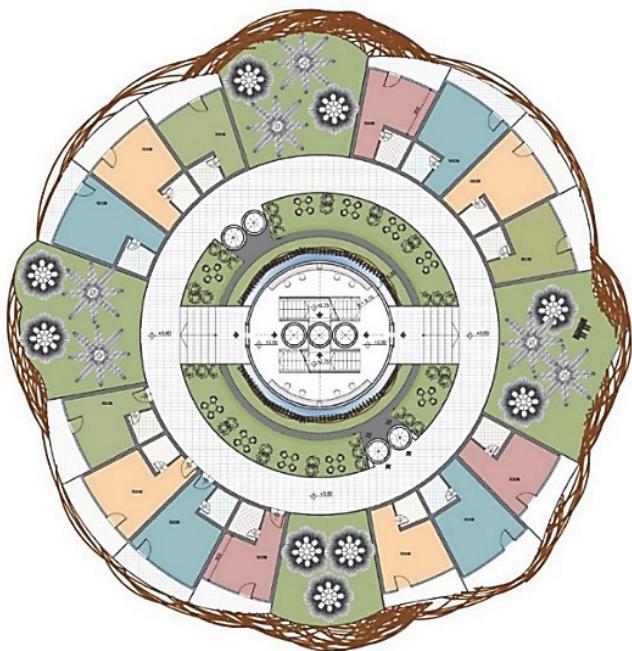


Fig. 7. Plan of the floor with one capsule – there is three internal elevators and four external elevators

(Aleksandrov et al., 2014)

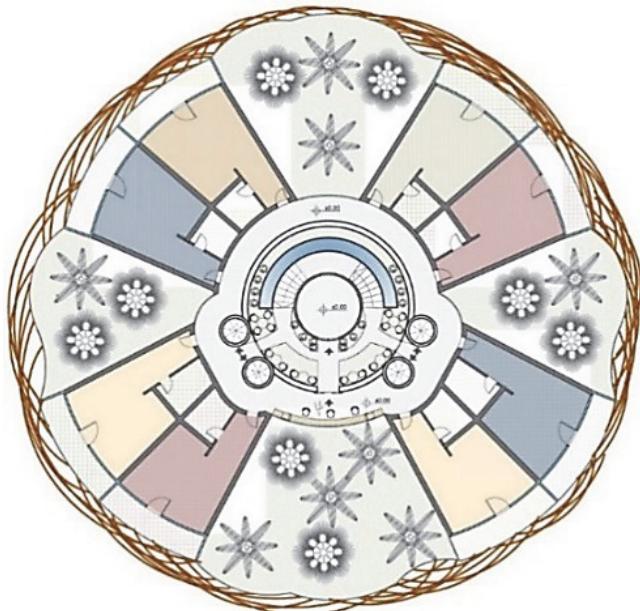


Fig. 9. Plan of the floor with one capsule – there is one central internal elevator and four high-speed external elevators

(Aleksandrov et al., 2014)

Table 1 presents two planning solutions for the interior space of a transparent panoramic elevator with an integrated aquarium for fluorescent algae with three dimension variants (Table 1.2). The aquariums with fluorescent algae make part of the floor gardens and are situated in close proximity to the shafts of the multi-storey elevators. Four vegetable gardens are integrated into the public space with low-growing vegetation. (Fig. 7)

Fluorescent algae are placed in aquariums, which are situated on the floor plates in close proximity to the panoramic elevator shaft. (Fig. 8)

The fluorescent algae are placed in an aquarium, situated in a multi-storey elevator. The panoramic elevator can be accessed via three doors – two of them also ensure the access to two high-speed elevators. (Fig. 9)

The aquariums with fluorescent algae are situated only inside the multi-storey panoramic elevator. In the uppermost end of the shaft is placed a freight elevator, filled

with rainwater, which is intended for irrigation of the floor gardens where fruits and vegetables are cultivated. The rainwater can also be used for fire extinguishing. On the roof are situated higher tree species. (Fig. 10)

Conclusion

The attractive artificial lighting of the floors and the multi-storey panoramic elevators is achieved by using fluorescent algae which are cultivated inside smaller and bigger semi-cylindrical aquariums (one unit inside the elevator and two units outside of the elevator, next to its shaft). Different planning schemes of the multi-storey elevator have been designed by keeping the dimensions of the elevator shaft the same, which allows the interchangeability of all planning schemes, whereas the fluorescent algae can be cultivated on the balconies of the skyscraper. Skyscraper complexes situated in the central parts of megacities should have connecting modules. Such modules could be multi-storey park gardens served by panoramic elevators. The connections between the skyscrapers can be carried out in the air without reaching the ground level. The fluorescent algae, situated in aquariums placed inside panoramic elevators contribute to the aesthetic effect of the skyscraper design. The combination of chambers with one or two separated spaces allows the cultivation and storage of fruits and vegetables under positive temperatures. The use of rainwater for irrigation of fruit and vegetable gardens as well as its use in case of fire contribute in a positive way to the exploitation capabilities of skyscrapers.

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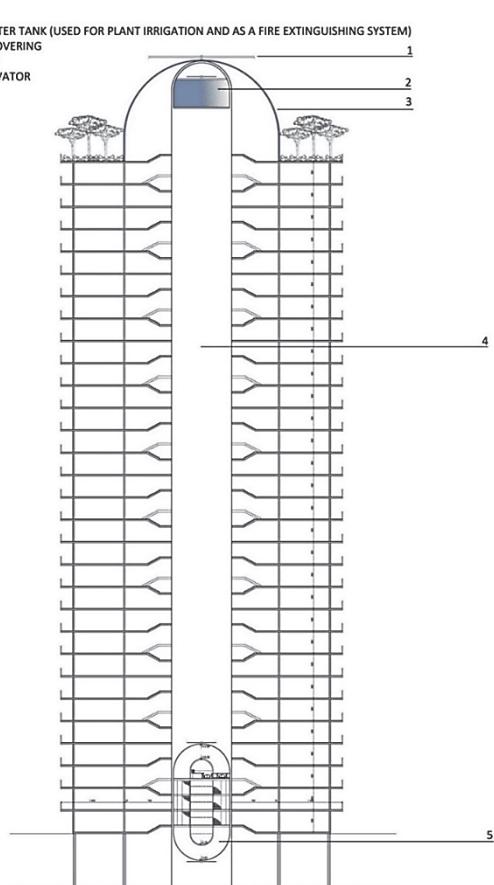


Fig. 10. Section
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