

THE PRINCIPLES OF ARCHITECTURAL AND PLANNING ORGANIZATION OF MULTI-STOREY PARKING GARAGES (EXEMPLIFIED BY THE LARGEST CITIES)

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Abstract

The growing population and level automobilization of the largest cities has created many problems one of the challenging ones being car parking which we confront almost every day. Besides the problem of space for cars moving on the road, greater is the problem of space for a parked vehicle considering that private vehicles remain parked for most of their time. Whereas, a solution of this problem leads to the consideration of reserve territories for the construction of multi-storey parking garages for the storage of vehicles in the largest cities, and also is a search for the modern architectural and planning organization for these buildings. Thereby in this paper we examine the principles of architectural and planning organization of multi-storey parking garages in the largest cities: city planning; ecological; economic efficiency; accessibility, aesthetic and describe modern methods of architectural designing buildings for saving vehicles in the largest cities.

Keywords: multi-storey parking garage, principles of architectural and planning organization, a parked vehicle, the largest city

ПРИНЦИПЫ АРХИТЕКТУРНО-ПЛАНИРОВОЧНОЙ ОРГАНИЗАЦИИ МНОГОЭТАЖНЫХ АВТОСТОЯНОК (НА ПРИМЕРЕ НАИКРУПНЕЙШИХ ГОРОДОВ)

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Аннотация

Рост уровня населения и автомобилизации в крупнейших городах создает много проблем, с одной из которых мы соприкасаемся каждый день – хранением (паркованием) легковых автомобилей. В свою очередь, одним из выходов из сложившейся ситуации стает поиск современных архитектурно-планировочных решений многоэтажных автостоянок для хранения автомобилей и резервных территорий для их строительства. В связи с этим, в статье рассматриваются принципы архитектурно-планировочной организации многоэтажных автостоянок в крупнейших городах: градостроительные, экологические, экономической эффективности, доступности, эстетичности и описываются современные подходы к их проектированию.

Ключевые слова: многоэтажная автостоянка, принципы архитектурно-планировочной организации, хранение легковых автомобилей, крупнейший город

In the context of increasing the density of buildings in the largest of cities, more often there is a need for the erection of multi-storey parking garages for car storage. However, the importance of the multistory parking garage as one of the most visible and often controversial elements infrastructure is often underestimated. Designing the parking facility requires an integrated

design approach of many professionals. The multistory parking garage facilities are a basic part of the modern community's transportation system.

Multi-storey parking garages, especially applies to automated parking have provided with a number of advantages: optimal use of space, lower maintenance and operational cost, lower construction cost, secure and environment-friendly nature, comfortable for the drivers and etc. [1].

The objective of the design criteria focuses on the evaluation of the multistory parking garage projects based on the quality, compatibility and contribution to the architectural and urban fabric of the city. Whereas, the site plans and architectural design for projects of multi-storey parking garages should be based on the following five principles (Fig. 1): city planning; ecological; economic efficiency; accessibility and aesthetic. These principles allow targeted approach to issues of ecology, function, comfort and aesthetics in the construction of these buildings.

The purpose of this paper is analysis importance principles of architectural and planning organization modern the multi-storey parking garages in the largest cities using landscape, ecological, economical, visual and aesthetical means.

The city planning principle provides for pedestrian and transport connections to the multi-storey parking garages, the harmonious integration of the building to an overall transport network of a microdistrict and the city as a whole. Pedestrian and Transportation connection to the multi-storey parking garages are important for their exploitation. The multi-storey parking garages should be an integral part of the city. These facilities should be located and designed to minimize walking distances to final destinations and circulation on local or congested streets. The locations of the multi-storey parking garages in relation to transport infrastructure significantly affects for their specialization and possible level of comfort.

An individual multi-storey parking garage project must be compatible with overall transportation system plans of the largest cities. It should be viewed as part of a total transportation system relating to pedestrian circulation and transit operation, as well as automobile movement. Convenient location in the transport infrastructure of the city; proximity to the airport, railway stations, bus stations and other; the possibility of organizing convenient entrances - an important condition for the functioning of the multi-storey parking garages of a high level of service.

The multi-storey parking garages should be planned and developed as part of an overall parking program to meet the needs of the downtown area and other major activity centers, such as airports and hospitals. The proximity of the placement of the multi-storey parking garages to airports, train stations, water ports, provides for the organization of specialized parking garages long-term storage of vehicles [2, 3].

The planning of the multi-storey parking garages, as well as location and design, involves balancing economic, engineering, environmental, and land-use considerations. While site selection is a planning function, it is so closely related to parking facility design that it is discussed in this chapter.

Example of this principle can be called project of the Park and Ride facilities «Hooggelegen» that a connecting point of the district on a city periphery to the central part of it (Fig. 2 A).

Today, with the deterioration of the environment in urban areas, there is a question of establishing the ecological parking facilities for saving vehicle. **The ecological principle** is characterized by low emissions architectural environment. This principle involves consideration of all environmental factors (noise protection, vibrations, radiation and electromagnetic radiation, fumes, water pollution and soil), sanitary norms regulations and rules when designing the multi-storey parking garages for harmonious functioning of an architectural environment. Creating gardening, both outside the building and inside it ceases indispensable criterion in the design of the multi-storey parking garages.

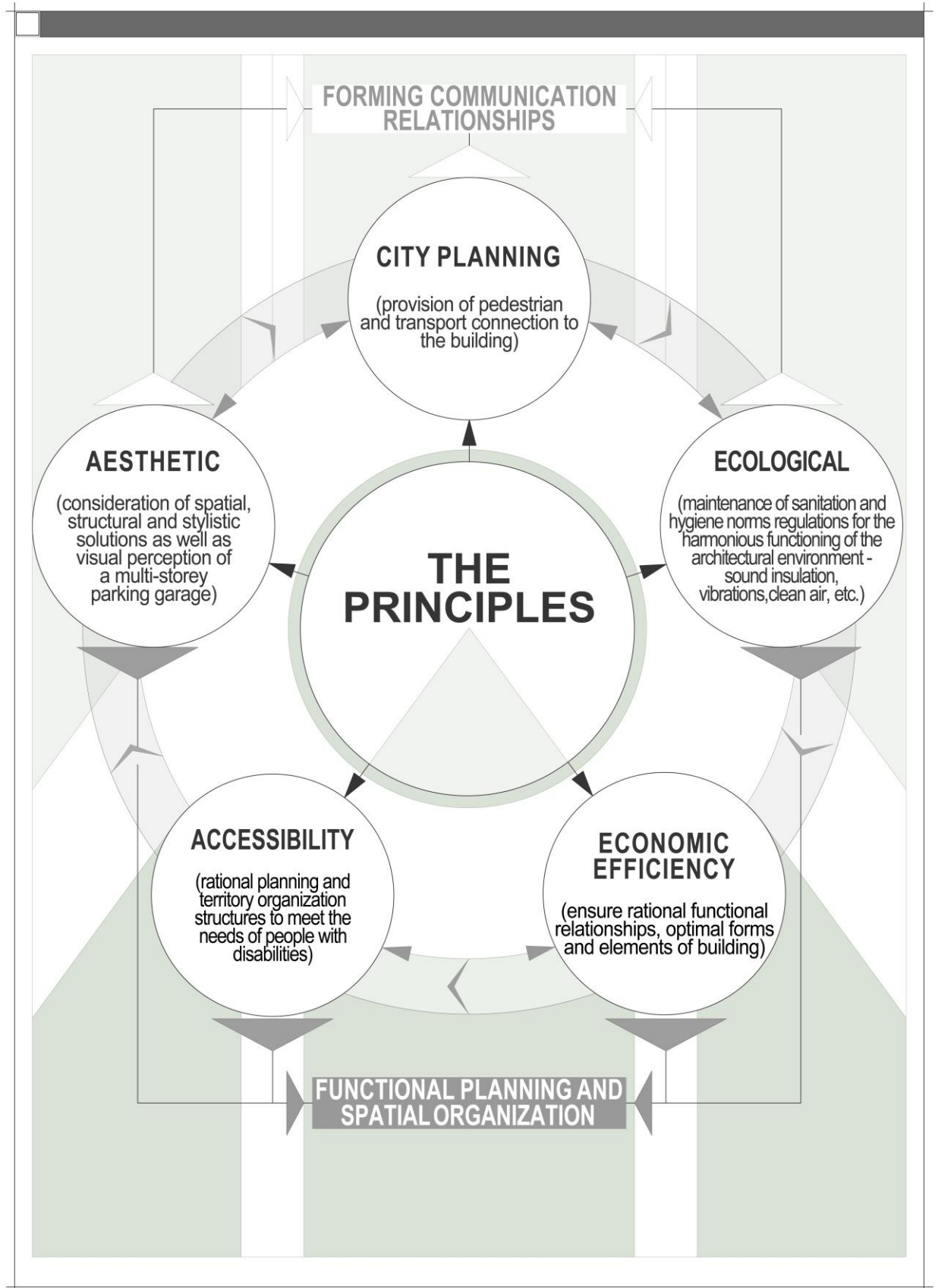


Fig. 1. The principles of architectural and planning organization of multi-storey parking garages (exemplified by the largest cities)

Therefore the multistory parking garage has often been reduced to the construction of the most minimal stand-alone structure or parking lot without human, aesthetic or integrative considerations. This has given the multistory parking garage a poor public perception and has frequently disrupted existing urban fabric.

However, many architects, engineers, and planners have envisioned and constructed far more complex, aesthetic, and integrative structures. This should be the goal of good the multistory parking garage design [4, 5, 6].

Landscaping can add to the multistory parking garage facility attractiveness and is good public relations. Disadvantages are initial cost and maintenance of appearance. Landscaping in the context of the multistory parking garage facilities is generally restricted to trees, shrubs, and grasses. The latter two are minimized in actual use because of their relatively high maintenance requirements.

Finally, landscaping on the periphery of the multistory parking garage facility and within parking areas can be used to soften the appearance of the multistory parking garage facility from the street. More specifically, expanses of the multistory parking garage should be broken up with landscaped islands and planted strips, which include shade trees and shrubs. Such landscaping provides a canopy cover and reduces the urban heat island effect in the summer. Landscaping not only provides shade on hot days, absorbs carbon dioxide, and reduces pollutants emitted by vehicles as they sit in the sun, but also breaks up the visual impact, making the multistory parking garage feel smaller and less overwhelming.

Some developers of the multistory parking garages are beginning to incorporate green roofs on parking structures to retain and naturally filter stormwater runoff, thereby improving water quality. According to «Roofscapes», Inc., green roofs can retain 50-60% of the total annual runoff volume of a roof, reducing the need for costly stormwater management systems. Underground parking structures often have lawns and parks planted on top. Above ground parking structures could also incorporate roof systems of vegetation, soil, drainage, and waterproof membranes to alleviate environmental problems including storm water runoff and the urban heat island effect. Additional benefits of greenroofs include improved livability of the urban environment by buffering noise, reducing glare, and offering an aesthetic alternative to asphalt roofing. Green roofs are more costly than traditional roof systems; however, the associated costs could be offset by the reduced need for stormwater facilities.

An example of implementation of the ecological principle is organization vertical gardening in the multistory parking garage façade's. An example is project of the multistory parking garage «Ballet Valet» in Miami, 1996 (Fig. 2 B).

The principle of economic efficiency of the organization of the multi-storey parking garage built on rational connection, optimal structure and its elements - ramps and etc. Optimal space-planning decisions of the multi-storey parking garages can be designed in such conditions: the maximum use of the construction site; the minimum time required to move the vehicle in the inner space of the structure; ensuring the comfort and safety of storage; minimum operating costs; low cost cars. Necessity is also carrying out a feasibility study project indicators (criteria for the ratio of the total useful area, the cost of parking lots and maintenance costs, etc.).

That economic calculations in the construction of the multi-storey parking garages, as a rule, determine the path of their further exploitation [7, 8, 9].

The multi-storey parking garages should be located and designed to maximize usage, such as permitting daytime business use and evening recreational parking. And multiple-use development is an effective means of blending multi-storey parking garage with its environment. Multiple-use development can both unify and beautify cities areas. And it is proved that the cost-effectiveness of the multi-storey parking garage can be achieved by increasing the number of floors of buildings (Fig. 2 C).

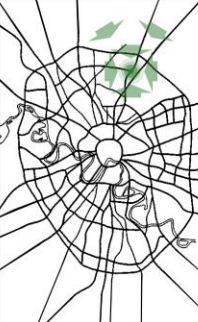

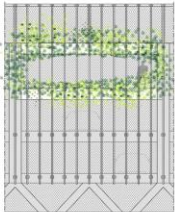


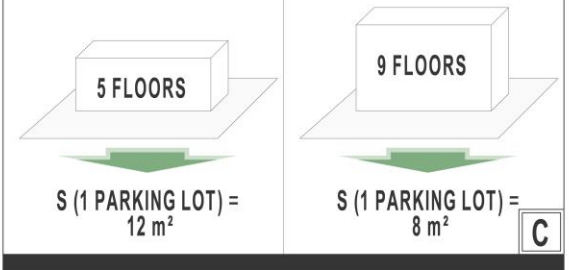

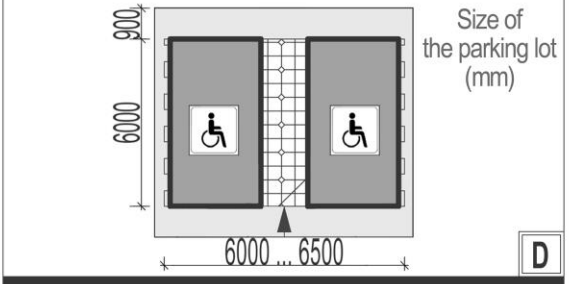
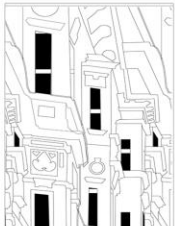

| | PRINCIPLE | SCHEME | EXAMPLE |
|--|-----------------------------------|---|---|
| | <p>CITY PLANNING</p> |  |  <p>A Park & Ride facility «Hooggelegen», design by «JHK Architecten», Utrecht, 2009</p> |
| | <p>ECOLOGICAL</p> | <p>Vertical gardening on the facade</p>  |  <p>B Multistorey parking garage «Ballet Valet», «Arquitectonica», Miami, 1996</p> |
| | <p>ECONOMIC EFFICIENCY</p> |  |  <p>C</p> |
| | <p>ACCESSIBILITY</p> |  |  <p>D Size of the parking lot (mm)</p> |
| | <p>AESTHETIC</p> | <p>Detail of the facade</p>  |  <p>E Baroque parking garage, «PPAG architects», Скопје, Macedonia, 2013</p> |

Fig. 2. The implementation of architectural and planning principles in design of the multi-storey parking garages

The principle of accessibility of the architectural environment determines the need to create architectural and spatial organization of the territory and construction of the multi-storey parking garages, which would provide for the needs of people with disabilities. This principle ensures the provision of a safe and functional the multi-storey parking garage. Given the global trends in the design and construction of civil buildings and structures, as well as the national program for the organization of a barrier-free architectural environment for all, without exception, populations in the construction of the multi-storey parking garages should be provided: matching horizontal and vertical communication; arrangement specially equipped and marked parking spaces for parking and storage of vehicles; individual toilets and bathrooms [10].

A fundamental planning of the multistory parking garage is provide safe, efficient, economical storage as near as possible to the parker's destination.

The multi-storey parking garage access should be possible from multiple routes. The circulation routes should have simple and clearly defined with markings, signage and potentially variable message signage. This legibility should not end when the car is parked. Clearly defined pedestrian routes seamlessly connect to pedestrian areas at the lift, stair cores and payment points, with defined crossing points in appropriate locations.

The principles of accessibility are realized through the formation of larger parking lots and organization of convenient ways to move it (Fig. 2 D). Designated accessible parking lots, whether external or internal, should be provided within 30 m of the main accessible entrance and / or any other accessible entrances. In the multi-storey parking garage, at least one level of parking should include easy to locate accessible parking spaces. The walkway from designated parking to the accessible entry to the building should be no less than 1100 mm in width and must be firm, level, non-slip material with a texture contrasted with the adjacent surfaces. The multistory parking garage facility entrances should be clearly visible to drivers along approach streets.

The aesthetic principle embody of composition or style architectural elements, natural and social environments that are harmonious and aesthetically linked. This principle implies taking into account the volume, planning, constructive, artistic and stylistic decisions and disclosure of visual perception of the building.

The aesthetic principle is realized in interesting and contemporary types of the multistory parking garages facades (Fig. 2 E).

Shaped characteristics of the multi-storey parking garages affect both the overall composite system existing urban environment and the direct perception of the building and its attractiveness. The architectural and artistic quality the multi-storey parking garages are particularly important, since it is a question of industrial, inexpressive imaginative solutions, along with the inconsistency of their functional structure of discord with the surrounding modern architectural environment [11, 12].

Conclusion. The Parking Facility has become a community building type that the majority of us use every day. Thereby in this paper we were examined the principles of architectural and planning organization of multi-storey parking garages in the largest cities: city planning; ecological; economic efficiency; accessibility, aesthetic and describe modern methods of architectural designing buildings for saving vehicles in the largest cities.

On the basis of these principles, it is advisable to form rational methods of architectural design environment, forms of expression, aesthetic the multi-storey parking garages, avoiding the negative effects on the environment and human health. Therefore, using these principles will help to create a modern architecture of the multi-storey parking garages, taking into account climatic conditions and particularly socio-cultural needs, and will be crucial to improve their planning schemes.

Designing the multistory parking garages facility requires an integrated design approach of many professionals. Parking has often been reduced to the construction of the most minimal stand-alone structure or parking lot without human, aesthetic or integrative considerations. This has given parking a poor public perception and has frequently disrupted existing urban fabric. However, many architects, engineers, and planners have envisioned and constructed far more complex, aesthetic, and integrative structures. This should be the goal of good parking design.

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