

## FEATURES OF LANDSCAPE DESIGN FOR 9-FLOOR RESIDENTIAL BUILDINGS

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### ABSTRACT

*The article discusses the peculiarity of planting trees and shrubs in the courtyard space of a 9-storey residential building in the second climatic zone of Uzbekistan. The nature and density of planting of green spaces at which the necessary light regime of the apartments is provided is determined. The possibility of creating interesting landscape compositions and achieving standardized values of the density of green spaces according to SNK - 2.07.01.-03 (3-4 m<sup>2</sup> people), while ensuring the necessary light regime of apartments*

**KEYWORDS:** *9-Storey Building, Light Regime, Insolation, Normalized Area Of Green Spaces, Courtyard Space, Latitudinal House, Meridional House, Calculation Method, Landscape Design, Crown.*

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### INTRODUCTION

If you look at the existing multi-storey residential buildings in Tashkent, especially in those areas where tree plantations have already formed, you will notice that insufficient natural light is observed in the living rooms located behind these trees during the day. People are forced to turn on artificial lighting even at noon. Having measured the area of greening of some courtyards in the Chilanzar region, it was found that the area of landscaping was normal (3-4m<sup>2</sup> / person). However, tree plantation prevailed in the landscaping. Plane trees grew up to 20-22 meters, and residential buildings were 13-14 meters high. At present, in the practice of design and in scientific articles, only a horizontal projection of the crown of trees is included in the greening area, which does not quite correctly reflect the actual area of green spaces. I propose to include the entire outer surface of the crown of trees and shrubs in the landscaping area. Then it will be a more reliable volumetric assessment of the entire landscaping.

Natural illumination was measured at the level of the work surface of the table in the middle of the room. In the apartments on the second floor, in front of the skylights, the crowns of trees were closely adjacent to each other, as a result, the illumination was only 50-60 lux. On the last 4th floor, the sky was clearly visible, so the illumination in the apartments was 80-90 lux. Illumination in the rooms was measured with a luxmeter during the period when the facade of the building was not exposed to direct sunlight. According to European standards, the illumination of the working surface of a table in residential buildings should be within 150-200 lux, and according to KMK 2.01.-02.-18 "Natural and artificial illumination" - 100 lux.

## Main part

Currently, when performing a section of the general plan, in particular, landscaping and landscaping, they show the number of trees, shrubs, flowers, the area of lawns. In orthographic projection, a horizontal projection of the crown of trees and shrubs is performed. The explanatory note indicates only the number of trees, shrubs in tabular form. And to the question: do they meet the urban planning norms according to SHNK 2.07.01.-03. greening area of courtyards of multi-storey residential buildings - no answer. No such analysis has been carried out. In most scientific articles on landscape architecture, an analysis of the nature of landscaping and landscape architecture as a whole in a city, a village or a city district has been carried out in terms of indicators such as the area of greenery per person or the area of greenery as a percentage of the total area of the city

One of the reasons for not performing such an analysis by the head of the project section is that in most cases, the area of greenery plantings in multi-storey buildings (9 floors and above) is 1.5-2 times lower than the norm for the conditions of oases and foothills (2 climatic zone of Uzbekistan according to KMK - 2-01-94). As the analysis of the nature of landscaping in micro-districts shows, with an increase in the number of trees and shrubs, an increase in the density of plantations, regulatory requirements are achieved. However, in this case, the insolation and light regimes of the apartments overlooking this courtyard are violated. The area of parking lots and playgrounds is decreasing in comparison with regulatory requirements. Therefore, an analysis was made of the courtyard space of a 9-storey residential building in Tashkent, where green spaces provide a normal light regime for apartments.

A fragment of residential development includes four 9-storey buildings that form a courtyard space with a long north-south axis. The distance between the facades of the meridional and latitudinal houses meets urban planning requirements. The total area of the yard is 4625 m<sup>2</sup>. Poplars and decorative oaks in front of the eastern (2nd house) and western (3rd house) facades of the houses are planted at a certain interval and at a distance of 7-9 m from the facade. In front of the facade of other houses, trees are planted in a certain rhythm. Each row consists of identical trees with a narrow and elongated crown. This allows the living rooms to be sufficiently illuminated with natural light from the firmament. However, the green area (2510m<sup>2</sup>) of the yard space, taking into account all green spaces, is 1.7 times lower than the standard values and is 2.5m<sup>2</sup> / person with a number of 3-4m<sup>2</sup> / person.

It should also be taken into account that the number of tenants was taken into account only for three houses, the fourth house was assigned to another courtyard space (rms. 1). The novelty in this article is that I propose to calculate the area of trees and shrubs landscaping not by the area of the projection of their crown onto the horizontal surface of the earth, but by the outer surface of the crown.

Let's consider several characteristic forms of tree crowns (Fig. 2). The first shape is the cone-shaped crown of a coniferous tree. The area of the horizontal projection of the crown on the ground is:  $S_g = \pi D^2$ , where  $D$  is the diameter of the horizontal projection of the crown. The surface area of the crown, with the height of the lateral surface of the crown equal to  $3D$  (without the area of the lower base), will be  $S = 0.5\pi D \times 3D = 1.5 \pi D^2$ . That is, the area of the crown will be three times the area of its projection onto the ground. With a crown height equal to  $4D$ , the area of its outer surface will be four times the area of its base.

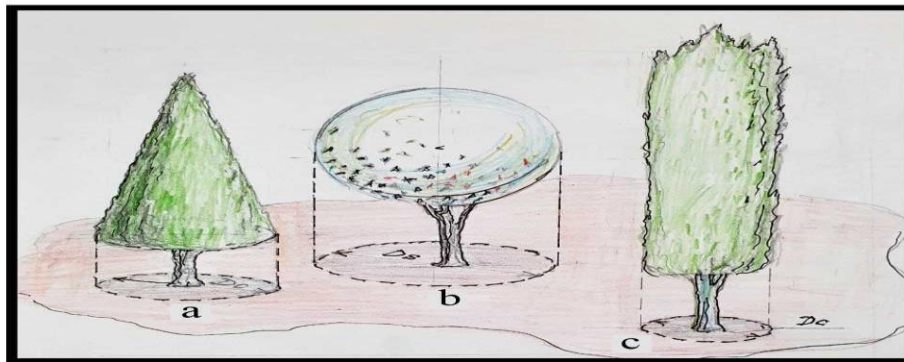


Fig.2. The projection of the crown of trees of various shapes on the surface of the earth  
 a) cone b) ball c) cylinder

**Fig.1. Landscaping of the courtyard space of a 9-storey residential building**

Take the crown of a tree in the form of a ball. The surface area of its horizontal projection is:  $S_g = \pi D^2/4$ . The surface area of the ball is:  $S_{ш} = \pi D^2$ , i.e. it is four times its horizontal projection. Poplars often have a crown shape in the form of a tall cylinder. Then the surface area of the crown of a poplar can be determined from the well-known expression:

$S_T = \pi D \times h_{ц}$ . With a crown height equal to 4 D,  $S_T = 4 \pi D^2$ . That is, the area of its crown is 16 times greater than the area of its horizontal projection.

Now let's return to our nine-storey building and calculate the crown area of poplars and ornamental oaks in front of meridional and latitudinal houses. Their total number is 23 trees. With an average crown height of 15 meters (although poplars in Tashkent grow up to 25-30m), the total area of tree crowns was 2925m<sup>2</sup>. Taking into account the area of lawns, the total area of landscaping was 5435 m<sup>2</sup>. The landscaping area per person was 5.4 m<sup>2</sup>, which is 1.4 m<sup>2</sup> more than the overestimated norm of gardening in the yard. It should be noted that such high rates were even with the construction of two playgrounds, three gazebos and a parking lot for 24 cars. The width of the driveways in the courtyard for the approach of vehicles to the entrances was taken not 3.5 m, but 4-4.5 m. (fig. 1).

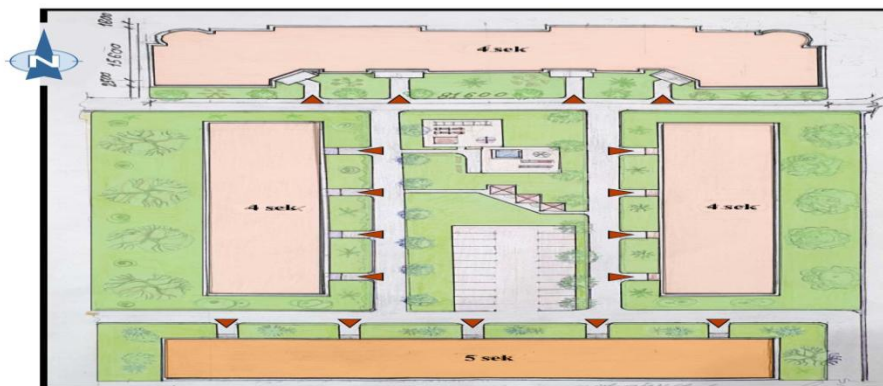


Fig. 1. Landscaping of the courtyard space of a 9 storey residential building

**Fig.2. The projection of the crown of trees of various shapes on the surface of the earth**

a – cone, b – ball , c – cylinder

## METHODOLOGY

Methods of full-scale measurements of the illumination of living rooms using a luxmeter in the absence of direct sunlight were applied, i.e. lack of insolation of living rooms. The rooms were illuminated by the diffused light of the firmament and the light reflected from the leaves of trees, shrubs and the facade of the opposing building. A mathematical analysis of the area of the outer surface of the crowns of trees of various shapes (cone, ball, cylinder) was carried out according to the well-known formula. Leaves inside the crown volume were projected onto free areas of its surface. The author analyzed the normative literature on urban planning and landscape architecture.

Literary review. If for determining the gaps between the facades of houses the main role is played by ensuring the normative insolation of each apartment, then to ensure a sufficient light regime of the apartments during the growing season, the main role is played by the density and nature of planting of green spaces are considered by IS Sukhanov, AASaidov [2, 3]. Much has been said by L.A. Adylova, D.U. Isamukhamedova [4, 5]. The norms of green spaces per person in the courtyard, in the microdistrict, residential area, on the scale of the city or settlement are indicated in the SNK for urban planning. [1]

The methods of creating interesting landscape compositions in garden architecture are described in Rosemari Alexander, Karena Batstoun [6]. In the article: "Landscape architecture: design of private houses" Norman K, Booth gives recommendations and suggestions for the organization of landscaping and landscape design of the courtyard of a low-rise dwelling [7]

In the article: "Recommendations for determining the urban planning maneuverability of residential buildings, taking into account the landscape and climatic features of Central Asia" G.K. Goldstein speaks about the landscape solution of the courtyard space, depending on the planning structure of the courtyard and the direction of the prevailing winds [8]. In open and semi-open courtyards of multi-storey buildings, it is recommended to plant trees with a dense crown opposite the prevailing winds. This solution is especially important in areas with frequent dust storms.

Architect I.A. Merport, in his book "Housing for the South", recommends a landscaping structure for desert and foothill zones that allows horizontal and vertical ventilation of spatial formations, and also notes: "The number and placement of trees must meet the requirements for limiting insolation" [8]. He did not say anything about ensuring the normal light regime of apartments. The principles of organizing protective zones from green spaces for tourist villages and roads are described in the articles of Z. E. Matniyazov [9,10,11].

## CONCLUSIONS AND OFFERS

The analysis and calculations carried out allow us to draw the following conclusions and proposals.

When calculating the area of trees and shrubs landscaping according to the above method, it makes it possible to achieve the normative density of landscaping even in a 9-storey building, while ensuring sufficient light conditions for apartments.

Shrubs growing up to 5-6 meters can be planted in the courtyard area adjacent to the facade, at a distance of 3-4 meters from the facade at a certain interval to ensure ventilation of the apartments. Shrubs should not form a solid windbreak.

Trees gaining a height of 15-20 m should be planted behind the passage for cars at a distance of at least 8-9 meters from the facade, also with a certain interval between their crowns to ensure the normal light conditions of the apartments.

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