

THE USE OF GLASS IN LANDSCAPING A GREEN SPACE IN FRONT OF A. I. CUZA UNIVERSITY

UTILIZAREA STICLEI ÎN AMENAJAREA SPAȚIULUI VERDE DIN FAȚA UNIVERSITĂȚII A. I. CUZA

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Abstract. *The paper highlights the different uses of glass through its decorative qualities and finding a landscaping solution to meet the needs of the green space proposed for landscaping in a bachelor's project in Landscape specialization at the Faculty of Horticulture of the U.S.A.M.V. Iasi. In the proposed solution, the functions and position of the analyzed space within the university urban ensemble were taken into account, for its harmonious integration; respectively were brought in the area arranged for socializing as well as for relaxation and rest, introducing pieces of urban furniture adapted to the current requirements, through the endowments of connectivity to the online environment and to renewable energy sources (photovoltaic panels) in their composition, being thus suitable for a modern outdoor space dedicated to students and all passers-by. Geometric style proposed is in accordance with the architectural style of nearby buildings.*

Key words: landscaping with glass, landscape design, urban furniture, university square arranging

Rezumat. *Lucrarea evidențiază diferitele întrebuișări ale sticlei prin calitățile sale decorative și găsirea unei soluții de amenajare pentru îndeplinirea necesităților spațiului verde propus spre amenajare în cadrul unui proiect de licență de la specializarea Peisagistică din cadrul Facultății de Horticultură a U.S.A.M.V. Iași. În soluția propusă s-a ținut cont de funcțiunile și poziția spațiului analizat în cadrul ansamblului urban universitar, pentru integrarea armonioasă a acestuia; respectiv s-au adus în zona amenajată funcția de socializare precum și cea de relaxare și odihnă, introducându-se piese de mobilier urban adaptate cerințelor actuale, prin dotările de conectivitate la mediul online și la sursele de energie regenerabile (panouri fotovoltaice) din componența acestora, fiind astfel adecvate unui spațiu exterior modern dedicat studenților și tuturor trecătorilor. Stilul geometric propus este în concordanță cu stilul arhitectural a clădirilor din apropiere.*

Cuvinte cheie: amenajare cu sticlă, proiectare peisageră, mobilier urban, amenajare piațetă universitară

INTRODUCTION

Glass has been used in various forms since ancient times. Over time, glass has gained more value being used in various shapes and sizes, through the evolution of various techniques.

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The ancient Roman historian Pliny mentioned Phoenician merchants as the first users of natural glass in the Syrian region around 5000 BC. But according to archaeological evidence, the first people who used glass were in eastern Mesopotamia and Egypt around 3500 BC, and the first glass vessels were made around 1500 BC in Egypt and Mesopotamia (<http://www.historyofglass.com/>).

The manufacture of glass had a slow and difficult beginning, because the furnaces for melting glass were small and the temperature for melting glass was difficult to reach. But in the first century B.C., Syrian craftsmen invented the blowing pipe. This revolutionary discovery has greatly improved glass production, making it easier, faster and cheaper. Glass production flourished in the Roman Empire and spread from Italy to all countries under his rule. In the year 1000 AC. the city of Alexandria was the most important center for the manufacture of glass. In Europe, the miraculous art of stained glass in churches and cathedrals reached its peak when they were used in the cathedral of Chartres and Canterbury in the thirteenth and fourteenth centuries (<https://casoteca.ro/18707-2/>).

During the Crusades, glassmaking was developed in Venice, which in time, became the center of glass manufacturing for the western world. In 1291, the island of Murano gathered all the equipments of glassmaking. (<http://www.historyofglass.com/>).

After 1890, the use, development and manufacture of glass began to grow rapidly. In 1902, Irving W. Colburn invented the glass drawing machine, which made it possible the mass production of window glass panes in 1904, the American engineer Michael Owens patented the automatic bottle blowing machine.

Today, glass is used in various fields, in various forms, ranging from decorative objects to entire buildings made of glass.

The present paper aims is to arrange the Alexandru Ioan Cuza University Square in Iasi and it was proposed to use glass for street furniture, due to the multitude of shapes and ways of use.

The proposed project will be realized in geometric style due to the architectural structures around the arrangement. The space will include 2 functional areas that will serve to relax and rest visitors, but also for walking. The plant species are varied, they ensure the decoration of the space throughout the year, the predominant colors being green, purple and white.

In this project, light-colored glass was used in objects with different roles. Multifunctional modules were thus created, serving as shading and relaxation places. They also have a utilitarian role, with attached spots and sockets for electric charging of mobile phone or tablet batteries, as well as internet access. Electricity for these luminaires will be provided by photovoltaic panels.

Due to the location of space near the University, the main purpose of this area is to provide an ideal place for relaxation and socialization, as well as a pleasant atmosphere.

MATERIAL AND METHOD

Glass is an innovative material with unlimited possibilities, which has many applications in different domains. It is an essential component of the various products we use every day, most often without noticing.

Glass is a solid, amorphous, non-crystalline material, with high hardness and low coefficient of expansion, often transparent, which has various practical, technological and decorative applications. The oldest and most common type of glass is "silicon glass", based on silicon dioxide.

Glass is considered the ideal material for packaging due to its characteristics and the advantages it offers. It is used both for the packaging of liquid products and for the packaging of viscous products in the food field, but also in the pharmaceutical industry (<https://www.glassallianceurope.eu/en/applications>)

Advantages of using glass as a packaging material:

- it is a material impermeable to gases, vapors and liquids;
- it is a hygienic material;
- it is transparent, allowing the visualization of the products;
- can be made in different shapes and colors;
- it is recyclable, it does not pollute the environment;

Initially, glass was used to allow natural light to enter the buildings, even when the window was closed. Transparency was the main reason why the desire to use glass walls in architecture (both interior and exterior) arose. In addition to transparency, properties such as durability, durability in operation are added, which in architecture and exterior design is a clear advantage. In addition, the elegance of the glass structures is a special one, compared to the traditional materials, creating at the same time the illusion of a more spacious and grandiose space. Last but not least, glass offers a certain versatility, being able to be used in many models and colors. These aspects have transformed glass into a basic material used by architects when it comes to putting creativity and aesthetic sense into practice in construction of transparent walls. (<https://www.transparentdesign.ro/>).

Urban furniture is an important element for discovering the personality of a city. Transparency, style, processing and maintenance capacity, as well as the strength of the glass were the basis for its use in urban and garden furniture. Due to these characteristics, it was possible to make different elements of urban furniture: seating benches, lighting objects, bus stations. (<https://www.altuglas.com/en/markets/architecture-and-construction/street-furniture>).

Glass mulch is a unique product, made from recycled glass and is used in landscaping just like decorative gravel. The color of glass mulch does not fade and has a very long lifespan, helps prevent weeds and protect plants.

It can be used in small amounts around plants to create shine and beauty. However, there are people who use it in larger quantities to create landscape designs. (https://garden.lovetoknow.com/wiki/Glass_Mulch).

Stained glass is a work of art made by hand processing the colored pieces of glass and gluing them with melted lead to give life to the characters and compositions embodied in these works. The appearance of stained glass is closely related to the construction of churches and is located around the tenth century. Today, in residences, public buildings and churches, stained glass windows ennoble and offer unique solutions to spaces.

The water pieces are special, not only for their decorative effect, but also for their ecological role. In modern landscaping water pieces are used in conjunction with glass to create spectacular effects and designs, such as:

- Water walls;
- Cascades;
- Artesian wells;
- Water courses.

Glass recycling is one of the many ways we can help reduce pollution and waste.

Glass recycling has many advantages:

- Recycling glass saves energy - various researches have shown that recycling a bottle can produce the energy needed to light a normal light bulb for 4 hours;

- Glass recycling reduces industrial pollution - recycled glass reduces the degree of air pollution by 20% and water pollution by about 40%.

- Glass recycling preserves natural resources - glass recycling saves the need to obtain more raw materials to make new glass.

- The most important advantage in glass recycling is the fact that it has a wide field of use, especially in art, that uses recycled glass: painting, sculpture, interior furniture and exterior (<https://www.recyclenow.com/recycling-knowledge/how-is-it-recycled/glass>)

The study material is represented by the square space in front of the Faculty of Economics and Business Administration within the Alexandru Ioan Cuza University of Iasi and the use of glass in order to arrange it. Landscaping aims to create new places for socialization and interaction for both students and teachers, but also to improve the appearance of the whole.

The research methods used are:

- Documentation from various specialized fields;
- S.W.O.T analysis of the existing situation;
- On-site documentation through measurements and investigations;
- Choosing the right elements in order to comply with the major principles of landscape design;

- Creating an adequate arrangement proposal, together with the drafting and presentation of the project.

Thus, the main purpose of this paper is to describe the space redevelopment project of the Faculty of Economics and Business Administration at Alexandru Ioan Cuza University of Iasi, introducing urban glass furniture with different functionalities so that students and teachers can spend time outdoors, relaxing in a place dedicated to socializing and recreation.

RESULTS AND DISCUSSIONS

Before presenting the solution of the project itself, the case studies used as sources of inspiration for the proposed arrangement are summarized below, with an emphasis on the characteristic elements of each.

Main Street Park was built in the central business district of Dallas, by demolishing two sets of buildings, so that the resulting space becomes an animated public space.

The park consists of an open space, where shows can be held, around which key elements of the park are arranged with resting places, a central square with

water, with marble slabs, a dog track, green glass shelters specially arranged for study, everything being completed by lush plants. A green roof "hovers" above the park pavilion and over the cafe. The lighting installation animates the roofs of the study spaces and creates a pleasant atmosphere during the evening (fig. 1.a,b) (<https://swabalsley.com/projects/main-street-garden-park/>).



Fig. 1 Main Street Park, overview (left); pavilion detail (right)
(<https://swabalsley.com/projects/main-street-garden-park/>)

Dube Square is a unique example of landscape design - it perfectly combines the design of a public space and a sculptural one where water and visual elements create a memorable space.

Being involved from the beginning of the project, the architect was able to ensure that the spaces were correctly dimensioned for a multitude of functional uses, for adequate pedestrian traffic, or for meeting ecological requirements. It should be noted that the design project were coordinated by the winner landscape architect of award for the steel and glass structures, that define Dube Square. A special type of glass used in this project provides protection against rain, absorbs UV rays, reflects heat and dust, while remaining transparent (<https://worldlandscapearchitect.com/dube-square-durban-south-africa-cndv-africa/#.YCZO7WgzblU>).

The square of the B Body of the "Alexandru Ioan Cuza" University satisfies several characteristics of the green space, such as the social function, the climate protection function, the recreational function and the aesthetic function.

This area proposed for development is positioned in an important point of the city (Carol I Blvd.), being a very busy and easily accessible area. Thanks to the nearby public transport stations, this area can be reached from anywhere in the city. The various buildings and points of public interest offer various services to the population, from the education offered in the cultural and university centers, to the tourism services offered by the historical and art monuments, the museums, the nearby culture and art buildings, cafes, restaurants and accommodation.

The **strengths** of the site are the following:

-The existence of favorable climatic conditions makes the assortments of arboreal and shrubby plants, but also herbaceous plants to be diversified.

-The alignment of "Thuja occidentalis" around the market offers privacy, but also a protection against chemical and noise pollution caused by heavy traffic.

-In the square, the artesian fountain offers a place to relax, being furnished by siting places around it.

-Parking in front of the body of the Faculty of Economics and Business Administration is an advantage for students and teachers.

The **weaknesses** stem from the fact that:

- The alleys inside the Square of body B are insufficient as number, being only two access points around the well. They are unsightly and damaged.

-Benches, although in quite a large number, are positioned only around the fountain.

-The lighting objects are insufficient and unsightly, being very old.

-Vegetation is aged, some trees and shrubs are dry and unsightly.

-The lawn is in a great state of degradation, untidy, giving an unpleasant appearance.

The **opportunities** derive from the following:

-Due to the pedo-climatic conditions, it is opportune to use a great variety of plant species in the arrangement of the Square of Body B of the "Alexandru Ioan Cuza" University, thus having the possibility to create special plant compositions.

-The location as an important area of the square, offers the opportunity to be circulated by a large number of people, offering an ideal place for relaxation and recreation, but also the creation of a social space.

-Due to the existence of the artesian well, a cool space for rest and relaxation is created during the summer.

The biggest **threat** is that the aged vegetation is in danger of collapsing or falling of branches during storms.

The adequate systematization of the recreational function can be achieved by the optimal choice and arrangement of the endowments, the accessibility and fluency of the circulation, the dimensioning of the spaces, the creation of the necessary harmony (Dascălu, 2016).

Taking into account the principles of landscaping, two functional areas were provided in the proposed solution. The first area aims to fulfill the functions of socialization, that of recreation and resting. This area is served by planted green spaces and street furniture, represented by the artesian fountain and shelter types glass modules with seating, placed on both sides of the longitudinal axis, which invites people to rest and socialize.

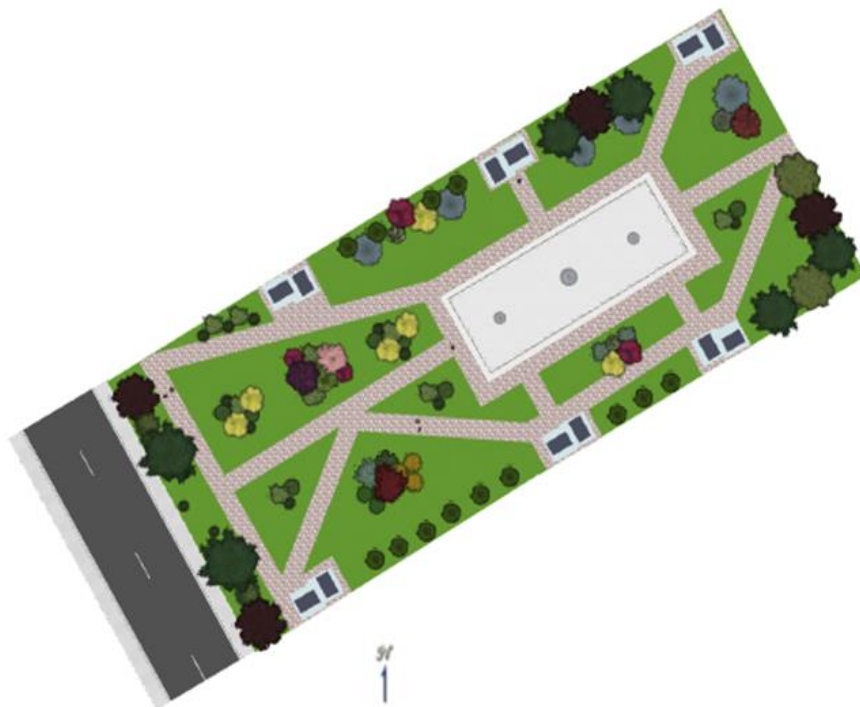


Fig. 2 Proposed development project plan - Square of Alexandru Ioan Cuza University

The second area is intended for pedestrian traffic, which is represented by the surface of the alleys with their dilated access to the rest areas (fig. 2).

The accesses in the green spaces are positioned in points of great interest, being well marked, in order to offer the visitor the certainty that he is going in the right direction (Sandu , 2013).

The access for pedestrians in the University Square can be made through three points, one main access and two secondary accesses.

The main access is made from the B body of the University, positioned in the central axis of the arrangement, and the two secondary entrances are lateral to the space, being accessed through an alley parallel to Carol I Boulevard (fig.2).

The circulations are alleys of 2.50 m wide for the accesses in the space, and 2.00 m for the other circulations inside the arranged area.

The furniture, like the other built elements, must create a pleasant ambiance harmonized with the compositional style. The color, the shape, the finishing details, the materials are the elements that can ensure the harmony of the ensemble or can unbalance the arrangement (Dascălu, 2011; Dascălu and Cojocariu, 2016).



Fig. 3 Details of the proposed furniture module

In the case of this arrangement, the sitting places are benches of parallelepiped shape, straight rectangular, without backrest and modules with cubic shape, but also a module that can be used as a table.

The modules, benches and tables are made of light-colored concrete and fiberglass to ensure thermal comfort, but also to be used in harmony with the space (fig. 3a,b).

It was also proposed to use shelter-type modules constructed of secure translucent glass, consisting of two vertical parallelepiped panels, measuring 3x 3x 0.3 m and 3.5x 3x 0.3 m, respectively, and two horizontal parallelepiped panels with the size of 3x3x0.3 m mounted in the console at the top of the vertical panels (fig 3).

They serve the space arranged as shading and places of rest and relaxation located at the end of the secondary alleys, being equipped with side and ceiling spots at the top, which have both lighting and aesthetic role and are powered by the photovoltaic panel mounted above the module. (fig. 3b)

The proposed artesian well is the result of the renovation of the existing stepped basin, so that it is composed of a basin with a length of 24.5 m, a width of 10.2 m and a depth of 0.50 m, built of polished concrete, with 3 central pieces represented by water jets (fig. 4a).

Fiberglass trash bins were used to maintain the cleanliness, for this arrangement, in harmony with the proposed furniture design (fig. 3b).

The public lighting in the arrangement area is provided by lighting objects, connected to the public electricity supply network.

The lighting system has the functional role of providing the artificial light necessary to create a pleasant environment and security feeling of visitors in the late hours, when natural light is no longer efficient. Artificial lighting manages, through its decorative role, to highlight different natural or constructed compositional elements, by creating shadows or by

illuminating them in a decorative way, in order to highlight certain aesthetic aspects. It was proposed to use light fixtures, 0.80 cm height, light colored, arranged asymmetrically along the alleys and spotlights that are installed on the glass modules (fig. 3a).

The enhancement of a space is achieved by respecting the aesthetic function and the principle of unity in diversity. Vegetation has an important role in highlighting a space through its volumes, colors and textures, having a beneficial impact on people, by inducing peace and harmony.

Trees and shrubs are the central elements of landscaping. The woody vegetation allows directing the perspectives, creating protection screens, highlighting the main entrances, creating games of shadows and contrasts, segmenting the space. Also, through their shape is creating the feeling of dynamism using columnar shapes, and by using pendulum shapes can be achieved the feeling of relaxation. The texture of woody plants also plays an important role in arranging a space, because the use of a fine texture will give the feeling of a larger space, and the use of coarse texture will reduce the space and attract the eye.

In this arrangement, was proposed to keep some specimens of *Thuja occidentalis*, *Picea abies*, *Cornus alba* and *Yucca filamentosa*, the other specimens being eliminated due to advanced age or de-skinned appearance.

To complete the arrangement proposal, it was proposed to use several species of trees and shrubs that are decorative through leaves, flowers, fruits, vines and bark, ensuring the decoration in each season (Sandu, 2009).

For the main accesses it was proposed to use plant compositions composed of species that decorate with leaves, flowers and bark composed of *Picea abies*, *Betula pendula* and *Fagus sylvatica* 'Riversii' to ensure the decoration throughout the year, but also the use flower species such as *Yucca filamentosa* and *Narcissus* 'Cum laude' for extra texture and color (fig. 4a).



Fig. 4 Details of decorative plant compositions around the decorative pool

To the left of the central alley, three compositions have been proposed: a central plant arrangement composed of *Acer palmatum* 'Atropurpureum',

Cotinus coggygria, *Magnolia grandiflora*, *Cornus alba* 'Sibirica', *Cercis canadensis* which decorates in both hot and cold periods, specimens of "Cotinus coggygria" and *Cornus alba* 'Sibirica' remain decorative through their vines even in the cold season. The other two vegetal compositions are arranged symmetrically to the left and to the right of the central composition being made up of: *Forsythia intermedia*, *Cornus alba* 'Sibirica', *Picea abies* 'Nidiformis' and two flower specimens of *Yucca filamentosa* that will complete the composition.

To the right of the central alley it was proposed to divide the space into three triangular areas, delimited by alleys using three compositions: a centrally positioned composition consisting of *Acer palmatum*, *Juniperus communis* 'Montana', *Juniperus communis* 'Despressa', *Kerria japonica* 'pleniflora', *Taxus baccata* 'Repandens' and the other two are made of *Cornus alba* 'Sibirica', *Picea abies* 'Nidiformis' arranged on either side of it, being symmetrical. Perennial flowering specimens of *Vinca major*, *Tulipa kaufmanniana* are arranged around these two areas for extra color (fig. 4. b).

Along with the existing specimens of *Picea abies*, it was proposed to use other species such as *Betula papyrifera* and *Fagus sylvatica* 'Riversii' to create a contrast of colors and textures and to ensure the decoration for as long as possible (fig. 4.a).

At the site there are also compositions made up of species such as: *Cotinus coggygria*, *Forsythia intermedia*, *Juniperus communis* 'Montana', *Hydrangea quercifolia* or *Syringa vulgaris* 'Michel buchner', *Picea pungens glauca*, *Acer platanoides* 'Royal Red'. (fig. 5.a, b) (Bernardis, 2010, 2011)

In some areas, such as alleys, was proposed the use of perennial flowering species such as: *Gazania splendens*, *Delphinium elatum* and *Phlox divaricata* (Draghia and Chelariu, 2011).



Fig. 5 Details of decorative plant compositions

Following the redevelopment, the Market space in front of Alexandru Ioan Cuza University benefits from a special dynamic, given the balanced arrangement of traffic flows correlated with socialization and relaxation areas, the game of water jets in the redeveloped basin, the arrangement of plant groups, shapes and different colors, but also of modern furniture, together with the facilities given by connectivity to the online environment and to renewable energy sources, which also power the proposed decorative lighting system

CONCLUSIONS

Through the work "The use of glass in the arrangement of the Square of B body of University "Alexandru Ioan Cuza" was highlighted the variety of uses of glass and how it can be used in a public landscaping, in the structural composition of urban furniture, so that their aesthetic value to be enhanced by their resistance and durability, given by new glass processing technologies.

The proposed solution took into account the functions and position of the analyzed space within the university urban ensemble, for its harmonious integration; respectively, the socialization function as well as the relaxation and rest function were brought to the arranged area, introducing pieces of urban furniture adapted to the current requirements, through the endowments of connectivity to the online environment and to the renewable energy sources (photovoltaic panels) from their composition., thus being suitable for a modern outdoor space dedicated to students and all passers-by. The proposed geometric style is in line with the architectural style of the nearby buildings.

The analysis of the natural environment determined the choice of several varieties of plants grouped in the vegetal compositions, so that the decoration is ensured throughout the year. In the case of the existing vegetation, it was proposed to preserve some specimens of trees that were in good health with a pleasant appearance and to eliminate those that were affected by the passage of time.

The study of multiple examples of the use of glass as a building material in various areas of architecture and art, as well as the choice of this material in the composition of furniture proposed in the space of Alexandru Ioan Cuza University Square highlights the versatility of this material and brings a discreet note of modernity - a space full of history and full of young people.

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