

## METHODS FOR INCREASING URBAN SUSTAINABILITY BY PLANNING GREEN AREAS IN INDUSTRIAL DISTRICTS

### METODE DE CREȘTERE A SUSTENABILITĂȚII URBANE PRIN AMENAJAREA DE SPAȚII VERZI ÎN ZONE INDUSTRIALE

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**Abstract:** *The idea of the present work started from the concept of urban sustainability, which aims at the correct use of all spaces by increasing the areas planted rationally and thus aligning them with the objectives of sustainable development established by Law no. 24 of 2007 and republished on November 10, 2009 (law on the regulation and administration of urban spaces). Starting from the desire to create a relaxing space for the employees of the BMT Aerospace factory which specializes in the development and production of precision gears for the aerospace industry, this work proposes the arrangement of a special green area in the immediate vicinity of the production hall, visible as much from the offices as well as from the work benches. The paper aims to propose the creation of a relaxing space that can easily fall into the category of "industrial green spaces" or "industrial landscape architecture". When removed from the industrial context of the factory, the proposed landscaping falls in the category of park gardens. The plant massifs, the lawn, the water, the wood, the natural stones, were the essential elements for creating the relaxation space, all the more necessary in the short working breaks. As a result, the landscaping presented in this work radically transformed the "green area" inside the factory into a modern, pleasant, comforting space for those to whom it was intended.*

**Key words:** industrial green areas, sustainability, landscape design

**Rezumat:** *Ideea prezentei lucrări a pornit de la conceptul de sustenabilitate urbană, care vizează utilizarea corectă a tuturor spațiilor prin creșterea suprafețelor plantate rațional și astfel alinierea acestora la obiectivele de dezvoltare durabilă stabilite prin Legea nr. 24 din 2007 și republicată pe 10 noiembrie 2009 (lege privind reglementarea și administrarea spațiilor urbane). Pornită de la dorința de a crea un spațiu de relaxare pentru angajații fabricii BMT Aerospace care este specializată în dezvoltarea și producerea de angrenaje de precizie pentru industria aerospațială, aceasta lucrare propune amenajarea unei zone verzi aparte în imediata vecinătate a halei de producție, vizibilă atât de la birouri cât și de la bancurile de lucru. Lucrarea dorește să propună crearea unui spațiu de relaxare ce se poate încadra cu ușurință în categoria de "spatii verzi industriale" sau "arhitectura peisagera industrială". Scoasă din contextul industrial al fabricii, propunerea de amenajare se încadrează în categoria grădinilor parc. Masivele de plante, gazonul, apa,*

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*lemnul, pietrele naturale, au constituit elementele esențiale pentru crearea spațiului de relaxare, cu atât mai necesar în scurtele pauze de lucru. Drept urmare, amenajarea peisageră prezentată în cadrul acestei lucrări a transformat radical "zona verde" din interiorul fabricii într-un spațiu modern, plăcut, reconfortant pentru cei cărora le-a fost destinat.*

**Cuvinte cheie:** spații verzi industriale, sustenabilitate, design peisager

## INTRODUCTION

The environment can be viewed as a system consisting of three elements, the natural environment, the urban environment and the urban living environment, between them there is a close interdependence and interaction that ensures the balance within the environment, necessary for human survival and evolution (Dascălu, 2006). Therefore, the balance of the environment is vital for mankind, the good functioning of each element being essential.

Currently, the sustainability of the landscape is being pursued, the focus is on creating an unpolluted urban environment, with facilities and facilities for collective forms of contact and rest. These environments aim to create an efficient solution for the four basic requirements of people (Sonea *et al.*, 1979), namely healthy living, balanced work, recreation and communication because the accelerated pace of work and excess work have changed the structure of humanity's leisure time, the landscape being forced to adapt to this phenomenon through increasingly diverse and original multifunctional offers (Clement, 2004). As a result, the idea of the present work started from the desire to create a relaxing space for the employees of the BMT Aerospace factory, which specializes in the development and production of precision gears for the aerospace industry, this paper proposes the arrangement of a special green area in the immediate vicinity of production hall, visible from both offices and work desks. The paper intends to propose the creation of a relaxing space that can easily fall into the category of "industrial green spaces" or "industrial landscape architecture".

## MATERIAL AND METHOD

In order to achieve the proposed objectives, this study used as a research material the system of green spaces of the BMT Aerospace factory, which is made up of different categories of arrangements, with locations and sizes varying and destined to perform certain functions. Thus, the green spaces related to the factory, are private, and fall into the category of recreational landscaping, which must comply with certain norms in force, such as those related to the green space surface of 9-13 sqm, which comes back by law on the head of inhabitant of each city that does not exceed 700,000 inhabitants (Law no. 162/2011; Law no. 221 / 2011; O.U.G. no.195/2005).

In order to help preserve the nature of the site, the bush and tree vegetation has been carefully placed at the level to apply maintenance and eventual remediation where appropriate, so as not to pose a danger to factory employees. This space, through the rehabilitation of the green area, is given functionality and vitality, in order

to restore the connection between man and nature. Thus, by observing the design principles (Iliescu, 2003), the beneficiary will not be aware of the specific forms in the plan, but will be delighted by the countless pleasant relationships produced by the projected environment.

After an elaborate analysis of the existing situation, the following main interventions are proposed at the level of the green space proposed for rehabilitation:

- installation of an automatic irrigation system
- planting trees and shrubs
- land preparation works, in order to mount the lawn formed by turf rolls, through milling and easy leveling.

The proposed lawn for rehabilitation is located in the inner courtyard of the factory and can be admired both from the factory canteen and from the three conference rooms located in the office building, and is part of the green spaces category with a low decorative value from the landscape point of view, as can be easily observed in figure 1.



**Fig. 1** Proposed lawn area for landscaping

For aesthetic purposes, closely linked to one of the basic human needs, it is the need for beauty, namely the aesthetic function. In this context, the aesthetic function within this site we proposed to be harnessed through the vegetal elements that animate green space (Negrea and Zlati, 2011).

## RESULTS AND DISCUSSIONS

In order to create a proposal for the development of the site that corresponds to the needs of those who frequent it, several essential criteria have been taken into account when choosing the plant material:

- not to require very expensive maintenance after the execution of the arrangement;
- for the plantation unit a dominant species was chosen;
- the type of growth of the tree crown to be ordered;

- suitable height at maturity of approx. 3 - 7 m;
- to have the best viability and to ensure sustainability;
- to ensure rapid growth and development;
- there is no need for interventions and annual planting of plant material.

The accomplishment of this desire in the elaboration of the landscaping project was applied the principles of contemporary landscape design, in creating plant compositions, in equal measure, in the design of the park garden, as well as in the choice of species and their location in the general plan. These principles were essential in the elaboration of the color schemes and when taking into account the succession of flowering as can be seen in figure 2.



Fig. 2 Systematization of the green space for BMT Aerospace employees

Bringing in the landscape species of *Betula pendula* (multi-stalk) and *Prunus cerasifera* Nigra aimed to define and accentuate the volumetry of the site, for both winter and summer decoration. The shapes in this arrangement that can be seen in figure 3 are defined by the lines and this is what we see the first time when we look at the remote arrangement.



**Fig. 3** The proposal to arrange the green space inside the BMT Aerospace plant

In order to emphasize the organic forms, different types of wallets were created, highlighted both during daytime and also in the evening with the help of the lighting system, which in order not to load the space was included in the bench areas (fig. 4).



**Fig. 4** The proposed lighting system for the green space

## CONCLUSIONS

1. The entire layout has been designed respecting certain principles of design, landscape design, but also compositional or color association principles to create a harmonious solution to enhance the recreational function of the site.

2. To achieve the proposed rehabilitation it was envisaged that both the positioning of the buildings and the presence of mature vegetation mature creates a shaded space and thus the choice of the proposed shrub species was made according to their ability to withstand shading for a long period. Also, it was desired to maintain a pleasant appearance throughout the year and thus plant compositions with species to provide decoration in all four seasons were used.

3. Rehabilitation aimed at creating a space for recreation and relaxation for employers and for those visiting the factory. The overall image created by the arrangement of the space offers a view full of different colors and textures not only for those who actually spend their breaks in the space, but also for the meeting rooms whose windows are oriented to this space.

4. In order to provide an image as close to our own vision as possible, we used architectural and landscape design programs such as Autocad, SketchUp and Realtime.

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