ERGONOMIC STUDY ABOUT SITTING PLACES IN LANDSCAPE DESIGN DOMAIN

STUDIU ERGONOMIC PRIVIND LOCURILE DE ŞEDERE DIN DOMENIUL PROIECTĂRII PEISAGISTICE

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Abstract. *Applying ergonomic principles in landscape design may aim to identify areas of interest on both the organization stages of design and implementation of a design concept. The paper highlights both the principles of organization of specific workplace landscape designers and highlight issues related to design rules of a specific area landscape design.*
Key words: ergonomics, landscape architecture, design

Rezumat. *Aplicarea principiilor ergonomiei în domeniul designului peisager poate avea ca obiectiv identificarea zonelor de interes privind atât organizarea etapelor de proiectare, cât şi realizarea unui concept de design. În acest sens, lucrarea evidenţiază atât principiile de organizare a locului de muncă specific proiectanţilor peisagişti, cât şi evidenţierea problematicilor legate de regulile de proiectare ale unui spaţiu specific designului peisager.*
Cuvinte cheie: ergonomie, arhitectura peisagera, proiectare

INTRODUCTION

Usability implications are found in all activities that occur in landscape architecture. The designers who work in offices, staff working outdoors and those who enjoy the landscape facilities, they all need diferent kind of tools, or furniture that is easy to handle so it could potentiate their creativity and provide psycho-physical comfort (Enache I., 2002).

Design ergonomics aims through its studies each category involved in the landscape architecture, either in concept or as a beneficiary. The basic idea of the project is to create a common product for desk activities, the ergonomic chair, that totals harmoniously ergonomic, aesthetic and anthroposophic standards and whose design follows specific steps to meet the design process. In pursuit of this product should be carried out both theoretical and practical research.

MATERIAL AND METHOD

The main item of furniture that is found in all areas of activity is the chair. Theoretical research undertaken highlighted the fact that an ergonomic chair should meet certain requirements for a comfortable position: feet supported on the floor; thighs completely seated on seat that is parallel with the floor; back rested against a comfortable backrest to allow a slight tilt back and frequent changes of position; the angle between the thighs and back should be between 90^0 and 105^0 (Christopher J.,

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1975; Enache I., 2002). Research conducted for the realization of this project were based on two comparative studies, which concluded in optimal setting size for ergonomic office chairs. The first study summarizes the general ergonomic sizes, as showed in fig. 1. The second study was conducted with people of different genders and different heights. The first subject examined is female and has 1.65 m in height, as showed in fig. 2a. Red arrows, as showed in fig. 2, indicate areas of contact between the back and backrest (for a good analysis milimetric paper was used in the background). The height of the seat used for all subjects (up to the seat) is 45 cm. The second subject examined is male and has 1.70 m in height, as showed in fig. 2b. The third subject considered is male and has 1.75 m in height, as showed in fig. 2c. The fourth subject considered is male and has 1.80 m in height, as showed in fig. 2d.

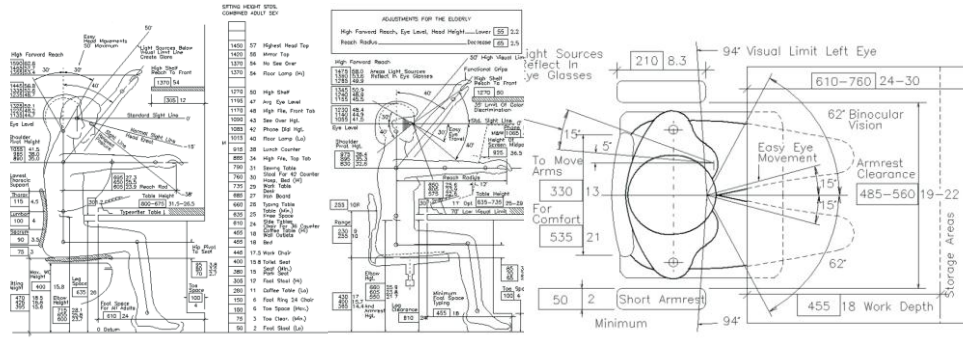

Fig. 1 – Ergonomic dimensions synthesis

Fig. 2a - Female H=1,65m

Fig. 2b - Male H=1,7m

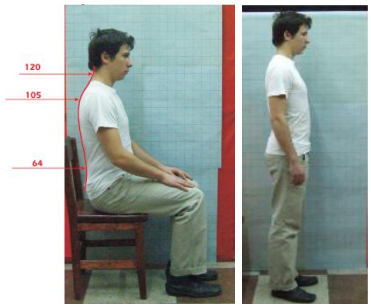

Fig. 2c - Male H=1,75m

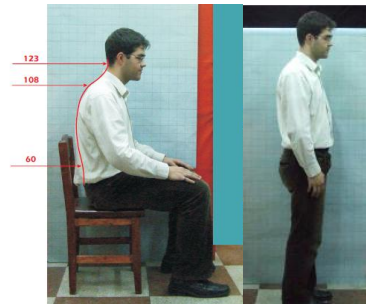

Fig. 2d - Male H=1,80m

As a result of the comparison of both studies it was noticed that minima and maxima of the analyzed dimensions provides similar information as showed in table 1. The unit used is cm.

Table 1

Comparative dimensional analysis

areas	First study			Second study		
	Minim	Maxim	Variation	Minim	Maxim	Variation
cervical	94	118	20	107	123	16
thoracal	85	105	20	100	107	7
lumbar	61	73	12	58	67	11

RESULTS AND DISCUSSIONS

The basic idea is to create an ergonomic furniture (Enache I., 2002), that incorporates in a harmonious way, ergonomic, anthroposophic and aesthetic standards. The main elements taken into account are:

- The backrest: should be folding so as to enable the user to adopt different positions depending on the work performed (eg. keyboard writing, text reading, etc.); to allow vertical sliding to accommodate curvature of the spine depending on the height of the user; to ensure proper sizing of lower back to prevent discomfort and spine deformities.
- The seat: it is possible to adjust the height of the seat position to permit the feet to rest perpendicular to the floor; provide seat angle changes in relation to the floor to allow the takeover of the upper body weight to reduce the weight pressing on inter-vertebral discs; adjusting the depth of the seat to allow both to higher and shorter people to seat comfortable.
- The handles: height adjustment to suit users anatomy and to be lowered when executing a task requiring free movement of arms; changing the distance between the handles is important to prevent the elbows from slipping which would lead the wrist to one side while working at the computer; convenience to avoid pressure side of the elbow and forearm, which is why upholstered handles are recommended.
- The rollers: are important to ensure easy movement of the seat in different positions. For this is recommend to use a minimum number of five wheels.

Following this research were established gauge dimensions for the chair. To check the accuracy of the scale, a virtual model of 1:5 scale (a chair and a model that respects human proportions) was made, as showed in fig. 3. In making of the model the dimensions used were of appropriate size for a 1.90 m person, the manikin used in compliance with the appropriate size for this height. Seat dimensions can be changed using various mechanisms to adapt to smaller stature persons.

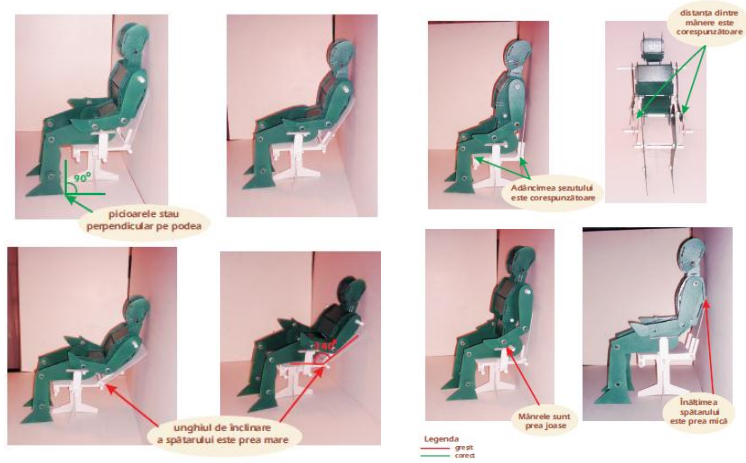

Fig.3 – Analysis of the model

As a result of the analysis of the model some elements were crystallized.

What is correct: the seat height is appropriate because, according to the model, user's feet will sit perpendicular to the floor; distance between handles is appropriate because it will allow the user to support the arms, assuring them the necessary space for movement; depth and seat width are proportional to the corresponding human scale.

What has to be changed: height of the back, being too small does not provide full coverage of the back (this can cause discomfort and deformity of the spine); the maximum angle of inclination of the backrest is too high (being an office chair is not justified to use an angle so large for the backrest); height of handles should be modified to provide the necessary support. An inadequate position of the hands can lead to pain, muscle spasms and cramps. All this leads to reduced yields.

After analyzing the proposals named above, a new model to correct malfunctions was made. Thus a 1:1 scale polystyrene model was made, as showed in fig. 4. At this stage it is proposed a more compact form, to support the entire width of the back. The thoracic cushion was reduced in length, and a curve was added on top to support the shoulder without limiting the free movement of the arms. Adding this curve led to a larger backrest. To balance backrest's size, the pillows will be reduced until a balance is reached. It was noticed that the bulge in the lumbar area should be reduced in order not to hamper the spine, and the cushion supporting the neck should be modified. Its dimensions are too large and limit the natural movement of the head. Seat cushion is provided with an angle of inclination towards the rear to help distribute pressure on the inter-vertebral discs. Also it was noticed that this angle is too sharp at the front, and it's uncomfortable for the legs. The ascended sides of the seat have a supporting role.

Fig.4 – Polyester model, 1:1 scale

The final concept has the following types of adjustments:

- seat height allows lifting or lowering the seat to allow user's feet to sit perpendicular on the floor; the seat depth allows the user to move forward and backward to enlarge or shrink the sitting space; the angle of rotation of the seat allows the inclination of the seat with approx. 10^0. This helps distribute partial upper body weight, easing the weight pressing on the intervertebral discs. This type of control can be used when the backrest is inclined to maintain a constant angle between the spine and legs.
- rotation angle of the backrest permits inclination of the backrest with approx. 20^0 to allow the user to adopt different positions depending on the type of activity.
- the height of the handles can be adjusted depending on the size of user's arms.
- handles angle: the upholstered part of the handles can be rotated so that when the backrest is rotated at a certain angle it allows repositioning the handles.
- Height adjustment will be made by lowering and lifting each pillow individually. This allows each user to match corresponding back cushions to their spine curvature (cervical, thoracic and lumbar curves). The pillow corresponding with the cervical area has an extra possibility to be adjusted also in depth (front-to-back).

Fig. 5 – Final concept

The following materials are recommended for the final ecological version: textile (natural fibers) or natural/ecological leather. Chair legs can be

made of plastic (for economic models) or chrome. Rubber rollers can have different colors matched with seat cushions. The cushions will be attached in the plastic housings of neutral color (gray). Plastic material will be used for the sliding casing of the back cushions. The axis on which the handles are mounted will be made of plastic or chrome. The final concept is presented in fig. 5.

CONCLUSIONS

1. Using non-ergonomic chairs can create both physical and psychological discomfort in the office which may ultimately lead to various diseases.

2. Ergonomic chairs should prevent and diminish health problems especially the ones affecting the spine. The main purpose of this chair is to facilitate work and to maintain proper posture to reduce the risk of muscles and joints pain, deformation of the spine and in particular to reduce stress.

3. The results of the ergonomic study can be extended to landscape designing of seating places in the landscapes and outdoor spaces.

REFERENCES

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