

Ergonomics of Contemporary Urban Necropolises

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Abstract. The contemporary ergonomics can accurately describe psychophysical capabilities of the human body, thus greatly contributing to the process of improving the living quality and parameters. Many everyday activities, relating to the man's work, leisure, communication, or social relations, are subject to ergonomic rules and principles, and the same is true of urban and architectural space of urbanized centres as a material space of such activities. It is here that man actively satisfies his needs to engineer his space and facilities necessary for him as an individual – e.g. dwelling houses, and as community – e.g. necropolises. Modern forms of spatial arrangement of necropolises search for solutions which will not only provide a rational - ergonomic material shape of the burial place, but also satisfy mental needs of the man connected with the burial, funeral, cult of the dead, visits to the cemetery, irrespective of the man's age and ability. Among important problems to be solved we should pay special attention to the question of accessibility of the cemetery space to the elderly and the disabled. Therefore all elements constituting the structure of necropolis must allow for ergonomic designing factors.

Keywords: ergonomics of space of contemporary memory places, design for all, the disabled, design of necropolises, new burial form.

1 Introduction

From the ancient times until today, science has perceived man as a combination of the spirit (psyche) and body (soma-physis). Specialist sciences separately and specifically study each aspect of man's **mental** (psychology, sociology, anthropology, culture science, and other) and **somatic** activities (medicine, anatomy, engineering, and other) and create a picture of such activities characteristic of the given specialisation field.

Urban planning (on macro scale), architecture, and ergonomics (on human scale) define the frames and shape the processes of man's spatial and material existence, with a special focus on man's psychophysical needs and capabilities.

2 Urban Planning, Architecture, and Ergonomics in the Context of Spatial Organisation of Urban Necropolises

Urban planning, as a science of programming and planning cities (urban structures) creates formal and legal frames for architecture in the form of urban planning concepts. It satisfies the diversified functional needs of all urbanised space - city users. Specifically, it focuses on the public space and the architectural objects that form it. It creates, implements, and oversees public spaces and facilities, including remembrance places – necropolises.

Urban planning pursues to build a logical, finite, and functional city structure, taking into account the following criteria: economics, sustainability, ergonomics, security, and accessibility to all users. With regard to city space, the overarching objective is to create „spatial order”, i.e. a consistent and logical, adequately scaled neighbourhood of the diverse functionalities of city structures and each of their components.

Architecture, the art of forming (creating) space to satisfy man’s material and spiritual needs relating to designing and erecting buildings, consistently follows the urban planning regulations it is subject to. Architectural design combines into a cohesive whole a facility’s function (intended use), form (aesthetics), structure (materials and structural solutions), and economic assumptions of the investment project. It needs to apply the achievements of many sciences: construction, construction statistics and physics, urban planning, economics, and sociology, psychology, culture, and other. The area of design activities relates to both public and private spaces. **A well designed architecture and urban plan evokes the assumed psychophysical feelings, which distinguishes it from the other objects in that space.**

If architecture is the art of shaping (creating) space in order to satisfy man’s material and spiritual needs, then **ergonomics** is a science that adjusts the whole material environment to man’s psychophysical capabilities. Many domains of man’s everyday activities related to work, relaxation, dwelling, communication, and relationships with other people are subject to ergonomic laws and principles. Ergonomics significantly affects the processes of improving and human life quality and parameters.

Ergonomics is further categorised into the following domains of specialisation¹:

- **conceptual ergonomics** – introduces ergonomic principles at the development stage of concept proposals or designs
- **corrective ergonomics** – corrects work conditions by modernising the existing work stations
- **physical ergonomics** – relates to human physical capabilities
- **cognitive ergonomics** – related to man’s mental capabilities
- **organisational ergonomics** – optimises sociotechnical processes
- ...?

¹ <http://www.iea.cc/>

The contemporary ergonomics deals with the following aspects:

- Newborn man
- Living and working man
- Elderly man with limited psychophysical fitness – disableds
- Dead man – in relation to living man, a phenomenon strongly affecting the human psyche – this is a new research area

Demise ergonomics – is a genuine proposal for the name of a new ergonomic domain of specialisation to deal with the dead man in relation to the living man.

It will help to show a full picture of man's activities in ergonomic studies and complement them with to date undescribed research areas as part of the comprehensive approach to human life from birth to death.

Remembrance places - necropolises are important structural elements of cities that strongly affect the human psyche. Within the city structure, necropolises primarily play an important practical role as places where to bury human remains, and a symbolic one – as remembrance places. The multifaceted aspect of the material shape of remembrance places – necropolises, applies to every man in the world, whatever their culture and religion, irrespective of any age limits or physical fitness levels.

Modern forms of spatial arrangement of necropolises search for solutions which will not only provide a rational (ergonomic, economic, ecological) material shape of the burial place, but also satisfy man's mental needs connected with the burial, funeral, veneration of the dead, visits to the cemetery, irrespective of man's age and physical fitness level. Among the important problems to be solved we should pay special attention to the question of accessibility of the cemetery space to the elderly and the disabled. Therefore all elements constituting the structure of necropolis must allow for ergonomic design factors.

3 Selected Ergonomic Aspects of Spatial Organisation of Urban Necropolises

The space of “cities of the dead” – necropolises - is shaped analogously to that of “cities of the living” - metropolises, and is subject to the same criteria, standards, rules and space engineering processes as city structures. It boasts the same infrastructural components and spatial organisation, and poses similar engineering problems.

3.1 Seniors and Disableds – Necropolis Accessibility Issue

“Each man is a physical, psychic, and mental entity.(...) We are all deficient in certain periods of life,(...) we get old and become increasingly weaker and mentally less effective. If (...) we want to realistically consider the shape of the environment we

engineer to satisfy human needs, it is imperative that we consider the needs and capabilities of the disabled.”² (Figure 1)

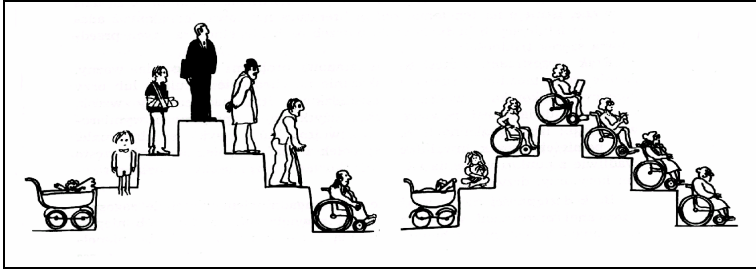


Fig. 1. Life pyramid. “We are all deficient in certain periods of life,”³

Increased numbers of elderly people (seniors), who, as they get older and less healthy are included in the group of disableds, and increased numbers of the disabled in the whole society require that the urban space be adjusted to the needs of these groups of users.

To this end, all necropolis components must take into account the **ergonomic design factors** which help remove **architectural, urban planning, and functional barriers** and **psychological barriers** that arise in relation to disability and the old age. The activities intended to remove tangible constraints (architectural, urban planning, and functional barriers) and intangible constraints (mentality) can be defined as one of the forms of active social rehabilitation and an effort to help the disabled fully return to the society to the extent possible. In practice, this means the need to apply the knowledge composed in the science known as „**ergonomics**”, one that is frequently forgotten by architects, urban planners, cemetery managements, and many other specialists. We often speak of ergonomically designed objects of everyday use, which, set aside the marketing slogan, have nothing to do with ergonomics. At the same time we forget about ergonomics, whose rules, if applied at the design stage of urban configurations, and their later redevelopments, would and could facilitate everyday life by making urbanised spaces accessible to disableds, seniors, and people that are naturally less fit.

Special attention should be paid to the issue of satisfying the psychic and spiritual needs related to the burial:

- the right to participate in funerals
- the right to visit tombs

as well as the tangible needs in the meaning of accessibility to all spaces in the city – including necropolises – by disableds. In effect of the existing barriers these rights are frequently denied or their exercise is largely hindered.

² Syrkus H., Społeczne cele Urbanizacji (Social objectives of urbanisation), PWN, Warsaw (1984) p. 639-640.

³ Syrkus H., Społeczne cele Urbanizacji(Social objectives of urbanisation), PWN, Warsaw (1984) p. 639.

Therefore, we more and more frequently notice the needs of the elderly people and the disabled. Architects and urban planners design urban spaces so that this group can actively and independently play an active role in the life of the society by adjusting the urban spaces and cemeteries with their adjacent areas to the needs of these social groups.



Fig. 2. Old age and partial disability – accessibility issue⁴

Traditionally, seniors are the most frequent visitors to necropolises, they care of the tombs, greenery, meet and farewell the people close to them – relatives and friends. In this way they get ready to “get on the other side” – the symbolic “better side of life”.

3.2 Effect of the Burial Form on the Spatial Arrangement of a Necropolis

An increasingly important problem for most urban centers, both in Europe and world-wide, is **shrinkage of grounds** designed for necropolises, and the related **problem of the burial form**.

The burial form and its ergonomics determine the architectural form of the grave, its size, shape, and division of cemetery sections, which together make up the layout of the cemetery that is the spatial organization of the necropolis.

The interrelation is presented in Table 1, e.g. comparison between the traditional pit and the urn burials (See Table 1).

Various burial forms have produced diversified size standards relating to funerary caskets (urn, coffin, funerary bag, etc.), or burial places (single level, multilevel) thus determining the diversity of plots and whole necropolises.

Some important phenomena observed in all contemporary necropolises include **minimised size of the burial casket and burial place, and vertical spatial arrangements** (compacting) aimed at increasing the number of new burial places and lessening (through concentration) possible environmental threats. These highly powerful tendencies are gaining momentum in all newly-developed and generally accessible necropolises in large urban conurbations in the world.

⁴ http://www.plfoto.pl/autor_kaiser_souza

Table 1. The interrelation between traditional pit and urn burials – pictures at a scale of the actual sizes and proportions [2,3]⁵

EFFECT OF THE BURIAL FORM ON THE SPATIAL ARRANGEMENT OF A NECROPOLIS			
	inhumation	urn burial	comments
„packing of the body” coffin / urn			a coffin is 39 times – for its volume 21 times – for the area greater than an urn
grave			the area of a single inhumation is 8 times – net 4 times – gross greater than the area of a single urn grave and more shallow by 41%
section			traditional cemetery sections are characterized by a rigid rectangular design of the rows urn cemetery sections offer the possibility of soft, curvilinear arrangement of the rows
urban design			big-dimensional inhumation occupy the whole area of the cemetery („stone cemeteries”) small-dimensional urn graves allow to diversify the structure of the cemetery by introducing large green areas („green, woodland cemeteries”)

⁵ Drawings by Tomasz Lewandowski, [1], [10].

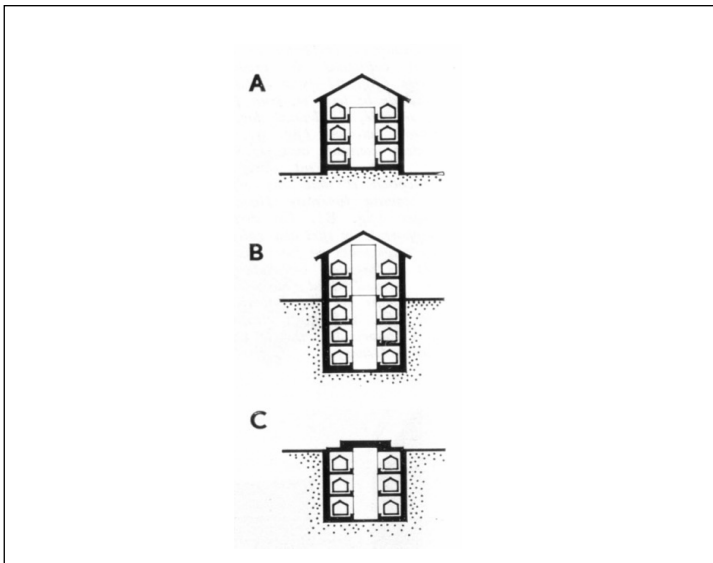


Fig. 3. Verticality of spatial arrangements (compacting) aimed at increasing the number of new burial places - type A,B,C⁶

3.3 Urn and Cybernetic Burial

Cybernecropolis – www.cemetery.com – In the time of development of the information society, and easy access to the Internet, there have appeared cybernecropolises, that is necropolises organized in the fashion of real-world cemeteries. Cyberspace cemeteries are necropolises in a new format. Though virtual, they may be the only place where we can find biographies of the deceased, photographs, memories, or listen to their voice, or watch films about them – everything recorded in an adequate format. Cybernecropolises make use of all advanced multimedia facilities of the commonly known web pages. They are built similarly to real-world cemeteries. Each commemorated deceased person has a virtual grave on which a visitor may put virtual flowers or a stone (Judaism), light a virtual grave lamp, and sign in the guestbook for visitors to the tombstone. Graves are grouped in virtual cemetery sections arranged alphabetically or by selected categories, e.g. by religions, casualties of accidents and disasters, soldiers killed in action, people who died of specific diseases, practising a definite profession, being a celebrity in their lives.

Cybernecropolises allow us – whenever and wherever – to visit persons who have already passed away. The solution's versatility has been highly appreciated by all Internet users, especially by handicapped persons or those who are temporarily not able to visit their relatives' graves. It is evidenced by the numbers of Internet users visiting virtual cemeteries. According to an administrator of one of the web pages, there are about half a billion of them in the world.

⁶ Robert Auzelle, *Dernieres Demeures. Conception Composition Realization Du Cimetiere Contemporain*, Paris (1965), p.256.

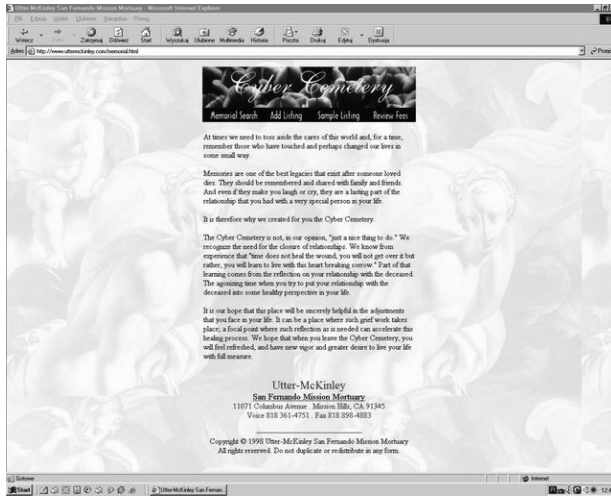


Fig. 4. Website of Cybercropolis in the USA

In the macro-scale, a cybernecropolis is an enormous multimedia encyclopaedia – a database of the buried people, and representation of our contemporary society left for future generations.

Cybernecropolis and burial in the cyberspace – due to its multimedia nature, versatility of solution, high speed of construction and transformation, and unlimited accessibility – seems to be the burial of the future in the virtual space, that would operate in parallel with other forms of the real space.

In authors' opinion, the fullest and generally most accepted form of burial, as well as a compromise solution, will be an urn and cyberspace (UC) burial. A tomb on an urn cemetery will be the best form of commemorating a deceased person within a limited family circle. It will be complemented with a cyberspace grave as a multimedia, unlimited and common form of worshipping the person in a wider social circle.

3.4 Formal and Legal Conditions and Urban Necropolises Management Models

An important role in engineering quality necropolis space is played by formal and legal requirements that sanction the operational and organisational rules of the urban plan.

The legal regulation in force in many countries in the world (e.g. in Poland) are outdated and do not meet the contemporary needs by not applying the ergonomic design and usage rules, common standards of accessibility to the disabled, infrastructure, new forms of burials or tombs, new burial technologies, new forms of ownership, or new necropolis management systems. Outdated legal regulations enhance the pathologies in the necropolis space use and the monopoly of secular and clerical circles on the funerary market.

A contemporary necropolis in the context of free market economy is a modern enterprise that offers a full range of services to the late man's family and manage the

cemetery in a transparent way to the **ISO standards**. An important role is played by the preferred necropolis management model. Two models are predominant: denominational and council model.

In the **denominational model**, cemetery management is entrusted to a denominational commune that each time creates diversified rules and regulations for the necropolis operations. This model gives rise to a series of pathologies which slow down the processes of adjusting such spaces to the existing standards, including the needs of the disabled, as exemplified by denominational cemeteries in Poland.

In the **council model**, cemetery management is entrusted to a specialised public utility that usually manages all municipal cemeteries, and a council-owned funeral company. This model guarantees unified rules and regulations for all necropolises, full data transparency, personal and decision control over the management. It expedites the management procedures, changes to and unification of the accessibility standards for all users. Examples of this model and its effects on the high quality of necropolises in European cities include Prague/Czech Republic, Budapest/Hungary, Vienna/Austria, Warsaw, Częstochowa/Poland.

4 Conclusions

We shape the tangible urban space, but the tangible urban space shapes us, too.⁷ As the demand for high quality of the surrounding space increases, the awareness of these relationships will exert a strong influence on new projects and their implementation.

On the material (somatic) plane, research projects in town planning, architecture and ergonomics should take special regard of satisfaction of mental needs of the man, in order to provide a complete image of the man in the studies.

Demise ergonomics – is a genuine proposal for the name of a new ergonomic domain of specialisation to deal with the dead man in relation to the living man. It will help to show a full picture of man's activities in ergonomic studies and complement them with to date undescribed research areas as part of the comprehensive approach to human life from birth to death.

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⁷ Theodor Heuss – first President of the Federal German Republic between 1949-59 literally said: “first people shape houses, then houses shape people”, Herbert Kuldschun, Erich Rossmann „Budownictwo dla opóźlonych fizycznie”, Arkady (1980) p.110.

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