EXPLORING THE POTENTIAL OF MAT-BUILDING FOR THE CREATION OF UNIVERSALLY DESIGNED ENVIRONMENTS

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YASEMİN EREN

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Prof. Dr. Canan Özgen
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Architecture.

Assoc. Prof. Dr. Selahattin Önür
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Architecture.

Assoc. Prof. Dr. Halime Demirkan
Co-Supervisor

Assoc. Prof. Dr. Emel Aközer
Supervisor

Examining Committee Members

Prof. Dr. Vacit İmamoğlu	(METU, ARCH)	
Assoc. Prof. Dr. Emel Aközer	(METU, ARCH)	
Assoc. Prof. Dr. Halime Demirkan	(BİLKENT UNI.)	
Assoc. Prof. Dr. Mualla Erkılıç	(METU, ARCH)	
Assoc. Prof. Dr. Selahattin Önür	(METU, ARCH)	

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Name, Last name : Yasemin Eren

Signature :

ABSTRACT

EXPLORING THE POTENTIAL OF MAT-BUILDING FOR THE CREATION OF UNIVERSALLY DESIGNED ENVIRONMENTS

Eren, Yasemin

M. Arch., Department of Architecture

Supervisor: Assoc. Prof. Dr. Emel Aközer

Co-Supervisor: Assoc. Prof. Dr. Halime Demirkan

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The goal of this study is to reread the strategies of formal organization in architecture, which are called "mat-building" and "mat-urbanism", exploring their potential to contribute to the creation of universally designed built environments in the 21st century. The idea of mat-building was first delineated by Alison Smithson in 1974, in her article "How to Recognize and Read Mat-Building," by means of its traditional and modern examples. The concept of universal design was first used in 1970's and reinterpreted by the American architect Ronald Mace in 1985. Since then, it has become a widely accepted design approach that is also known as 'inclusive design' and 'design for all'. Mat-building can be considered as a viable design

approach that can respond to the crucial need for equally accessible, adjustable and adaptable built environments for all people all over the world. The study aims not only to evaluate the exemplary mat like configurations in light of the universal design principles. It also tries to point to the new ways for developing creative ideas and design theories, and emphasizes the significance of implementing the universal design approach in contemporary architecture and urbanism.

Keywords: mat-building, mat-urbanism, design strategies, universal design, inclusive design.

ÖZ

BİR TASARIM STRATEJİSİOLARAK YAPI DOKUSU OLUŞTURMA YAKLAŞIMININ EVRENSEL OLARAK TASARLANMIŞ ÇEVRELERİN YARATILMASINDAKİ POTANSİYELİNİN ARAŞTIRILMASI

Eren, Yasemin

Yüksek Lisans, Mimarlık Bölümü

Tez Yöneticisi: Doç. Dr. Emel Aközer

Ortak Tez Yöneticisi: Doç. Dr. Halime Demirkan

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Bu çalışmanın amacı, biçimsel organizasyon stratejileri olan yapı dokusu, kentsel doku oluşturma yaklaşımını ve doku-yapı, doku-kenti yeniden okumak ve bu stratejilerin 21. yüzyılda evrensel olarak tasarlanmış yapılı çevrelerin yaratılmasındaki potensiyelini araştırmaktır. Doku yapılar ilk olarak 1974'de Alison Smithson tarafından "Doku Yapı Nasıl Ayırt Edilir ve Okunur" adlı makalesinde tanımlanmıştır. Evrensel tasarım kavramı ilk olarak 1970 yılında kullanılmış ve Amerikalı mimar Ron Mace tarafından 1985 yılında yorumlanmıştır. O zamandan beri yaygın olarak kabul edilen evrensel tasarım aynı zamanda 'herkes için tasarım' ve 'kapsayıcı tasarım' olarak da bilinmektedir. Yapı/ kent dokusu oluşturma

günümüzde yeniden canlanması ve evrensel tasarım ilkelerini yerine getirme potansiyeli bütün insanların ulaşılabilir yapılı çevrelere olan çok önemli gereksinimlerine yanıt veren bir mimari tasarım yaklaşımı olarak düşünülebilinir. Bu çalışmanın katkısı yalnızca örnek doku yapıları ve doku kentleri incelemek değildir. Aksine günümüz mimarlık ve kentsel tasarımında evrensel tasarımı uygulama bilincini artırmak için yaratıcı fikirlerin ve tasarım kuramlarının gelişmesini sağlamaktır.

Anahtar kelimeler: yapı dokusu, kentsel doku oluşturma yaklaşımı, tasarım stratejileri, evrensel tasarım, kapsayıcı tasarım.

To My Mother

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CHAPTER I

INTRODUCTION

The aim of this study is to examine and interpret the principles of formal organization that might facilitate achieving the goals of the universal design approach. The main concern is to reread the organizational strategies in architecture and urbanism, which are called "mat-building" and "mat-urbanism", pointing to their pertinence for the universal design approach. The idea of mat-building was first delineated by Alison Smithson in 1974, in her article "How to Recognize and Read Mat-Building," by means of its traditional and modern examples. The investigation will be based on a literature review in order to understand the current states of mat-building and universal design approaches. New connections and methodological implications of these two approaches will be searched in a context that is formed by the new theoretical stances in architecture and urbanism.

1.1 Problem Definition

Universal design at the urban scale is a new concept. The principles of universal design have been applied to the field of urban design only recently. Therefore, it is important to search new ways, creative ideas and to develop design strategies in order to achieve the goals of universal design. This critical study aims to increase the awareness of the significance of the universal design approach in the contemporary architecture and urbanism, by proposing 1960s' and late mat-building approach as a design strategy. The revival of mat-building in the contemporary architecture and urbanism renders it important to reconsider this humanistic design approach in light of the universal design principles.

Today both in Turkey and in other countries, there is a crucial need for the equally accessible, adjustable and adaptable built environments for all people. Usability by all is important while designing the built environments. Providing equal access for everyone and responding to diverse needs related to the built environment become significant. Design solutions that take everybody into consideration and avoid any kind of segregation of groups within the population should be considered and developed by designers, architects, planners and social scientists in the 21st century. In the International Conference in Kristiansand, Norway, September 2003, the importance of universal design in the built environments is emphasized: 'There is a need for user participation, accessibility initiatives in transport and built environment,

and for the Design for All principle".[1] The necessity of the universal design approach is mentioned also in *Universal Design Handbook* by Leslie C. Young and Rex J. Pace, two designers at the Center for Universal Design in North Carolina University. It is stated in this compilation that:

> *A growing community of designers, researchers and educators worldwide is recognizing that the built environment cannot be designed for one specific population, but for a dynamic range of people and abilities . . . The future must possess, in addition to being environmentally sensitive and sustainable, an ability to adapt to the differing needs and requirements of the users no matter their age or strength or agility. This design approach, known as universal design, strives to make the practical day-to-day tasks involved in living possible and safer for everyone.*[2]

The users' needs and their involvement into the design process have been dealt in a number of Ph. D and Master Theses in Turkey focusing on the specific needs of people with disabilities or people in certain age groups, like children and elderly, or people with limited physical abilities. Oya Demirbilek has presented in her Ph. D. thesis, "Involving the elderly in the design process: a participatory design model for usability, safety and attractiveness" (1999), supervised by Halime Demirkan, a conceptual model, where the expertise of

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[1] Rudolph Brynn, "Easy Access - a city for all," International Conference: International Conference: Presentation of EuCAN by Maarten van Ditmarsch, Kristiansand, Norway, 24-26 September 2003 4. Retrieved December 1, 2003 from http://www.eca.lu/frame.html.

[2] Leslie C. Young, Rex J. Pace, "The Next-Generation Universal Home," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 34.5.

designers and the real requirements and opinions of elderly end-users, related to the concept of ageing in place are collected.[3]

Özlem Özer in her master thesis, "Housing for the Elderly" (1990), supervised by Vacit İmamoğlu, has explored the needs of elderly people and their inabilities due to the aging process and offered an alternative design model responding their preferences and diverse needs.[4] Naz Evyapan, now a lecturer in the Industrial Design Department at METU, in her master thesis, "Exploring Space Without Vision" (1997), supervised by Halime Demirkan, "presented an experiment conducted among blind and visually impaired children from the Göreneller Primary School in Ankara through testing a game played with an educative toy and its effects on the tactual learning performance of the children".[5] In her Ph. D. thesis, supervised by Dr. Tevfik Balcıoğlu in Kent Institute of Art and Design at University of Kent at Canterbury (2003), she presented the design process of a toy with educational objectives for blind and visually impaired pre-school children.

The attitudes and responses to the buildings and the environment, the needs of people and their requirements concerning the organization of spaces in Turkey are investigated by a number of authors. Olcay İmamoğu and Vacit İmamoğlu in their article of 1992 titled "Housing and Living Environments of

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[3] Oya Demirbilek is now a lecturer in the Industrial Design Program, UNSW in Sydney; [previously she was assistant professor at METU (2000)]
Oya Demirbilek, "Involving the elderly in the design process: a participatory design model for usability, safety and attractiveness," Diss, Bilkent University, 1999 iii- iv.
[4] Özlem Özer, "Housing for the Elderly," Diss, Middle East Technical University, 1990 1-2.
[5] Naz Evyapan, "Exploring Space Without Vision," Diss, Bilkent University, 1997 1-3.

the Turkish Elderly" stated that, "in Turkey, examination of current living environments and special housing needs of the elderly has been neglected by social scientists, as well as, designers, planners and decision makers. In contrast to developed countries, in Turkey, old age is not yet regarded as a problem; however it is already becoming difficult to continue existing patterns…" [6]

There are also other efforts in Europe, United States and in other countries in the world for the removal of barriers and the accommodation of the special users' needs. Barrier-free design, which has begun in late 1950s, and accessible design, which was more widely known in the 1970s in the United States, are terms used to describe these efforts.[7] In these approaches the main emphasis was on the specific design solutions for the disability problems. Rather than developing a specialized design approach for a limited number of people, universal design, on the other hand points to the significance of addressing the needs of all people regardless of their age, ability and size.

In many of the books and articles on universal design, it is described and brought into the discussion with its built or proposed examples. However, the study considers that the examples can be insufficient alone to achieve the goals of universal design and to respond to its seven principles. For universal design's further development, it is essential to develop appropriate design strategies and theories. For this purpose, the study searches the potential of a

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[6] E. O. İmamoğlu and V. İmamoğlu, "Housing and Living Environments of the Turkish Elderly," *Journal of Environmental Psychology* 12 (1992): 35.
[7] Elaine Ostroff, "Universal Design: The new Paradigm," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 1.4- 1.5.

design strategy for accommodating everyone's physical and social needs in relation to the built environment beginning from the initial stages of the architectural design process. It assumes that the mat-building approach can provide an architectural basis for the successful implementation of universal design. It should be noted that this study doesn't claim that mat-like configurations are the best design solutions that fulfill the principles of universal design. Rather, it tries to reveal the correspondence between the two concepts and to decipher the potential of mat-building to satisfy the principles of universal design.

Architectural solutions of mat type organizational strategies informed by ethical concerns and universal design principles are expected to augment the possibility of the production of the universally designed built environments. Thus, the thesis aims at inquiring into the possibility of a built environment liberated from physical, social and attitudinal barriers by means of the integration of universal design with the mat-building approach. Mat-building has the potential of creating urban environments that promise to accommodate human diversity and social equality. Mat-building and mat-urbanism with its five characteristics can render possible to fulfill the requirements of the universal design approach. The important thing is the capability of the mat-like spatial organizations to change, to be modified and to grow. Thus, the spatial structure can be arranged in such a way that it allows built environments habitable and accessible for all people as long as possible. Therefore, in this study these organizational strategies and structuring principles of mat-building

are proposed as a viable design solution to create universally designed environments beginning from the initial stages of the architectural design process.

1.2 Structure of the Thesis

In this introductory chapter, the necessity of the universal design approach in the built environments is described briefly. In the second chapter, the study will focus on the principles of formal organization that create mat or carpet like configurations in reference to Alison Smithson's 1974 essay "How to Recognize and Read Mat-Building" and Stan Allen's 2001 essay "Mat - Urbanism: The Thick 2D". First, mat-building and its carpet like configurations are defined. Then, the historical context within which mat-building emerged is elucidated in reference to the Team 10 architects and their debates within CIAM. In the following section, the organization of Dutch casbah is brought into discussion in order to provide a conceptual framework for the definition of mat-building as an organization strategy. The next section deals with the revival of 1960s' mat-building in the contemporary architecture and urbanism. In the final section, the main characteristics of mat-like organizations are reinterpreted and analyzed referring to their traditional and modern built examples.

In the third chapter, universal design's different formulations and definitions are introduced. Terms like everyone, built environment, accessibility, etc. are defined in light of the universal design approach. With reference to their definitions, it is emphasized that what is intended with the

universal design approach is not only the accessibility of the built environment but also its potential to eliminate social, physical and attitudinal barriers. Then, the historical context of universal design is discussed and the development of its seven principles are related. In the following section, the significance of universal design and its prospects in the contemporary world are brought into the discussion. In the final section, the universally designed built environments are introduced referring to the book *Universal Design New York* by Mayor's Office for People with Disabilities and Department of Design and Communication.

In the fourth chapter, the question how the seven principles of the universal design approach can be brought together with the five characteristics of mat-building is examined. The characteristics of mat-building are discussed in relation to the universal design principles. The images of the built and proposed projects of both mat building and universal design are introduced. Analytical diagrams are formulated by the author in order to bring clarity to the mat-building's capability of ensuring the creation of universally designed built environments. The juxtaposition of mat-building characteristics with the principles of universal design is essential to understand why mat-building as a design strategy can be proposed and integrated with universal design. This chapter provides the basis that supports the arguments developed in the second and third chapter.

In the concluding chapter, the importance of suggesting design strategies and techniques which can help to achieve the goals of universal

design is reemphasized. The correspondence between mat-building and universal design is highlighted. The necessity of further research on integrating universal design with the mat-building strategies is pointed out referring to the development of the universal design approach in the future. We need further research on the basis of creative ideas, theories and design strategies for the successful implementation of universal design in the built environment.

CHAPTER II

MAT-BUILDING AND MAT-URBANISM AS ORGANIZATIONAL STRATEGIES

2.1 Definitions of Mat-building and Mat-urbanism

The concept of mat-building was first defined by Alison Smithson in her 1974 essay "How to Recognize and Read Mat-Building: Mainstream Architecture as It Has Developed". The characteristics of mat-building are outlined in this essay in reference to the constructed and proposed mat-buildings. Smithson described the mat process and defined the mat-building as follows:

> *Mat-building can be said to epitomize the anonymous collective; where the functions come to enrich the fabric and the individual gains new freedoms of action through a new shuffled order, based on interconnection, close knit pattern of association and possibilities for growth, diminution and change.* [8]

[8] Alison Smithson, "How to Recognize and Read Mat Building," *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 91.

This definition by Smithson is reformulated by Hashim Sarkis in his introduction to *Case: Le Corbusier' s Venice Hospital and the mat building revival* published in 2001.[9] Sarkis highlights mat-building's low-rise nature, and its dense character. For Sarkis, a repeating element plays an important role in the mat-like organizations. Both the conceptual and spatial framework for different uses is achieved by the repetitive structure of mat-building. The contemporary associations of mat-building and its definitions are also developed within the context for the environmental claims. In their essay "Mat Building and The Environment" Michelle Addington, Nico Kienzl and Singh Inrachooto, described mat-building as follows:

> *Mat-buildings can thus be seen as providing flexible 'shells' to support different activities, in contrast to buildings with function-specific enclosures designed to accommodate predetermined activities. This characteristic, overlaid on compartmentalized spaces connected by clear networks of circulation, presumably allows for a 'plug-in' capability-allowing new functions as well as new spaces to be readily inserted into the plan. This feature purportedly increases the possibility of reallocation of spaces for uses that may change over time extending the useful life of the building and minimizing the need to demolish and replace facilities.* [10]

Therefore, it is possible to approach the concept of mat-building from the point of view of urbanism, environmental systems, architectural programming and planning. Looking mat-building from different angles addresses the fact that the concept of mat-building and its organizations are

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[9] Hashim Sarkis, "Introduction," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 14.

[10] Michelle Addington, Nico Kienzl, and Singh Intrachooto, "Mat Buildings and the Environment: Examination of a Typology," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 71.

capable to be reformulated and applied to different contexts in architecture and urbanism. Mat-buildings provide a high-degree of flexibility in its spatial organization. It allows also the future growth for accommodating changing functions over time.

Addington, Kienzl and Inrachooto, defined mat-buildings in terms of their flexibility and their importance in the environmental context. [11] They stated that mat-buildings with their courtyards can be scattered over the large urban fabrics. This characteristic of mat-building provides to respond to the changes and the growth systematically. Courtyards and modular system within the mat-buildings allow a network connection between the inside and outside. Thus, the high dense nature of mat-building with its capability of extension and division can be achieved. In this respect, mat-buildings and its carpet like configurations differ from the other type of formal organizations. The spatial organization of mat-building, as Smithson discussed in her article, allows it to be applied at any scale, either as individual buildings or an urban layout.

Timothy Hyde, who has updated Alison Smithson's genealogy of mat-building, emphasizes that "a mat-building . . . can be positioned between the two scales, at a point where architecture becomes urbanism". [12] In this article, Hyde discusses how the term "mat-building" should be used, whether it is a noun or a gerund. He searches an answer to the question: "what is it exactly that

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[11] Ibid, p. 71.

[12] Timothy Hyde, "How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 106.

we are recognizing and reading- an operation or an object?"[13] "Instead of defining a distinct object," he says, "mat -building weaves itself into the surrounding context, creating a building that performs like a city, or transforming part of the city into a building".[14]

My contribution with this critical study is to develop a new definition of mat-building in light of universal design and its seven principles. In this proposed definition, mat-building's capability of responding to diverse needs at any time and at any scale is brought into discussion. Within this new definition of mat-building, its possibility for ensuring a universally designed built environment is emphasized. The following section deals with the historical context within which the idea of mat-building first emerged.

2.2 The Historical Context within which the Mat-building Approach Emerged

2.2.1 CIAM Congresses and Their Consequences for the Built Environment

> *Mat-building emerges in architectural consciousness around the late 1950's and early 1960's through the Team 10 debates within CIAM as a challenge to segregation between architecture and urbanism and a way to generate more social interaction across segregated uses. As its origin in architectural discourse, the mat was clearly a response to and a sign of dissatisfaction with the CIAM separation between uses and between architecture and urbanism.*[15]

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[13] Ibid, p. 105.
[14] Ibid, p. 106.
[15] Sarkis, "Introduction,"2001, p. 15.

Modern town planning ideas were discussed in CIAM (Congrés Internationaux d'el Architecture Moderne) held between the years of 1928-1954. Certain principles related with the organizations of town planning and production of the urban environments were introduced. The declarations and discussions made in the congresses are important because they point to the new relationships between architecture and urban planning.

William Curtis relates that, the first meeting took place at La Saraz in 1928.[16] The fourth congress took place in 1933 and became the most comprehensive meeting. Principles related to the modern city and town planning were set at this congress. Architects turned again to the urban problems and tried to solve them by means of functional zoning. Curtis explains functional zoning in his book *Modern Architecture since 1900* and states that 'the key points in town planning lies in four functions: living, working, recreation (in free time), circulation…" [17] Alexander Tzonis and Liane Lefaivre too dwell on the consequences of functional zoning: 'This functional zoning required an urban plan or building programme to be analyzed in terms of elementary functions and then visualized in terms of spatial 'zones', to produce a zoning plan". [18]

However, there were reactions to this new solution to urban problems within CIAM itself. As Eric Mumford stated in his essay 'Emergence of Mat or

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[16] William Curtis, *Modern Architecture since 1900*, third revised edition, (London: Phaidon Press Limited, 1996) 254.
[17] Ibid, p. 255.
[18] Alexander Tzonis and Liane Lefaivre, 'Beyond Monuments, Beyond Zip-a-tone, Into Space/Time," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 125.

Field Building", "within CIAM, early signs of dissatisfaction with the rationalism enshrined by Le Corbusier in the Athens Charter were articulated in 1947 at the first postwar CIAM Congress".[19] In relation to these dissatisfactions, in the ninth congress, terms like "association", "neighborhood", "cluster", "organic analogies for growth and change" were introduced against the idea of functional zoning. With these terms it was intended to express a more complex image of the city and its social context.

After this congress at Aix, a group of younger architects within CIAM, called Team 10, came together to develop this new language of architecture and urbanism. This new language yielded the mat-building approach. Mumford defines the development of the mat concept in reference to the Smithson's article as follows,

> *In contrast to the earlier CIAM emphasis on improving quantitatively measured living standards- things such as light, air, and individual room for each family member – Smithson advocated the type, mat-building, because for her it epitomized the "anonymous collective". She argued that the individual using such buildings "gains new freedoms of action through a new shuffled order, based on the interconnections, close-knit patterns of association and possibilities for growth, diminution and change". This shift of emphasis from architecture as a means of physical improvement for the less advantaged to architecture as a means of generating greater individual freedom(within an assumed pedestrian urban context) was part of the postwar European effort to find a new basis for architects interventions.*[20]

Team 10's thoughts and their affiliation were explained also in *Team 10 Meetings 1953-1984* edited by Smithson: "Team 10 did not repudiate the

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[19] Eric Mumford, "The Emergence of Mat or Field Buildings," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 49.
[20] Ibid, p. 49.

functions; we wanted a more delicate, responsive, net. We shared a belief in the basic rightness of the original aims and in the worthwhile continuance of trying to make an architecture with a 'spirit of hope' . . ." [21] These reactions, Team 10 debates and the principles that they elucidated within CIAM led to the tenth congress of CIAM, the last congress in 1956 at Dubrovnik. Then, Team 10 meetings started in order to search for an environmentally responsive architecture, which later directly led to the emergence of a mat-building approach. In this context, it should be pointed out that the evolutionary history of mat-building is important in the study to inquire into the potential of mat-building for universal design and its seven principles. The study offers to develop the idea of mat-building in order to create universally designed built environments.

2.2.2 Team 10 Meetings and the Search for an Environmentally Responsive Architecture

> *As early as 1933, the participants at CIAM 4 replaced the urban environment with a conceptual utopian city that would allow its inhabitants to reconnect with the natural environment through building configurations that left ample space for light, air and transportation. A later reframing of the ideal city through the work of Team 10 maintained a similar focus on the problems of urban environment as undesirable. As a challenge to the iconic tall housing block of the modern movement, but with the same characteristic of countering the existing urban environment, the concept of buildings with interstitial outside space was developed to create cities that controlled both exterior and interior environments. Mat buildings emerged from this concept, and resulting typology has recently been revisited in the design approach of a younger generation of architects searching environmentally responsive architecture.* [22]

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[21] Alison Smithson, eds., *Team 10 Meetings 1953-1984*, (New York: Rizzoli, 1991) 9.

For Addington, Team 10 members, Aldo van Eyck, the Smithons', George Candilis, Shadrach Woods, Swiss architects Rolf Gutmann and Theo Manz and other Dutch architects, wanted to introduce new themes with the main emphasis on the human association in order to create an environmentally responsive architecture and urbanism. These themes are defined by Mumford as 'the Smithsons' emphasis on street decks, clustering, and local culture; Gutmann and Manz's idea of the 'space-in-between'; van Eyck and Blom's concept of the 'organized casbah' and Candilis-Josic-Woods's principles of stems and webs".[23]

With this new language of architecture, Team 10 members developed a new kind of urban organization that diverges from 'the strict rationalism of CIAM". Woods has summarized their ideas of structuring under four points:

> *We can already deduce from what goes beyond that, if we are to accept the concept of 'organization of the environment', then we must consider that organization in these terms:*
>
> 1. *The only viable organization is one which is potentially dynamic.*
> 2. *The dynamic organization is concerned with the evolution of the human habitat.*
> 3. *The organizations with which we must deal are global in scope and discipline. They are conditioned by everything that happens in the world.*
> 4. *In urbanism there are not three but at least four dimensions, of which the time dimension is perhaps the most important. (This obliges us to restrain irresponsible graphic gestures.)* [24]

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[22] Addington, Kienzl and Inrachooto, "Mat Buildings and the Environment: Examination of a Typology," 2001, p. 67.
[23] Mumford, "The Emergence of Mat or Field Buildings," 2001, p. 58.
[24] George Wagner, "Looking Back Towards the Free University, Berlin," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 21.

For Mumford, "Team 10 wanted to introduce consideration of more intangible social and cultural factors into CIAM, and attempted to create a new vocabulary and set of formal strategies toward this end".[25] These new approaches were presented in the first meeting of Team 10 by Peter and Alison Smithson by means of diagrams. Dirk Van den Heuvel in his essay "Team 10 Diagrams" has explained the works and diagrams of the Smithsons during these periods. For Heuvel, Smithsons introduced the concepts of layering. He states that "the Smithsons perceive urban field as made up of various layers. Each layer is its own domain governed by its own laws. The layers need to be arranged and combined into a new coherence in such a way as to allow them to develop independently and unhindered by the other layers".[26] Smithsons' diagrams, such as Valley Section and Association Diagram are important in terms of indicating the layering (Figure 2.1, Figure 2.2 and Figure 2.3).

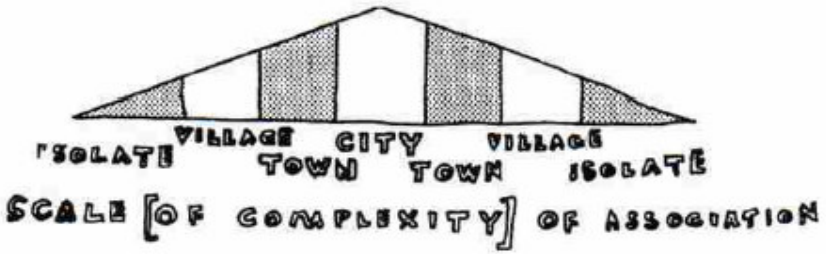

Figure 2.1. "Valley Section by Alison and Peter Smithson". In Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74, (2000): 43.

[25] Mumford, "The Emergence of Mat or Field Buildings," 2001, p. 53.
[26] Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74 (2000): 42.

Figure 2.2. "The dwelling and groupings at the various points on the valley section". In Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74 (2000): 43.

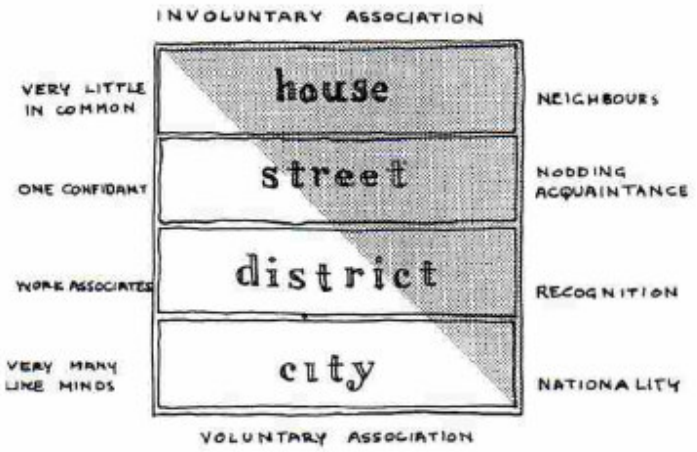

Figure 2.3. "The Association diagram by Alison and Peter Smithson". In Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74 (2000): 43.

Heuvel explains Smithsons' thought in these diagrams as follows: "The issue is not to establish some sort of social unit that could be realized in built forms, or counter-forms. What the Smithsons seek to point out is the fact that the patterns of association of individuals transcend the boundaries of a neighborhood unit or self-contained urban district".[27] Their 'Golden Lane Overlay' diagram shows the layering approach of some complexity. In the

[27] Ibid, p. 43.

diagram, there are three layers distinguished by program (Figure 2.4). Their ideas on modern town planning based on the organizations accommodating the future growth and the programmatic change of the whole while respecting to the identity of each. Clusters, patterns of growth and change, layering of the functions, city and its networks are the key terms defined by the Smithsons in order to decipher the principles and techniques of mat-building (Figure 2.5 and Figure 2.6). For Heuvel Smithsons' strategy is represented using various diagrams as 'Patterns of growth' and 'Patterns of change', with the 'Cluster City' model serving as a summary: a large scale framework which ties together the heterogeneous collection of buildings . . .[28]

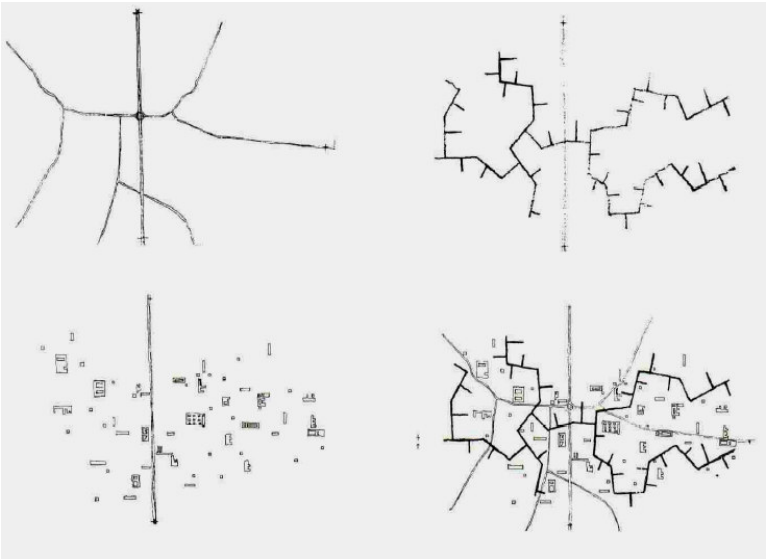

Figure 2.4. "Alison and Peter Smithson, The Golden Overlay: roads on the ground (top left), space elements (top right), ground elements (left), complete (right)". In Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74 (2000): 44.

[28] Ibid, p. 45.

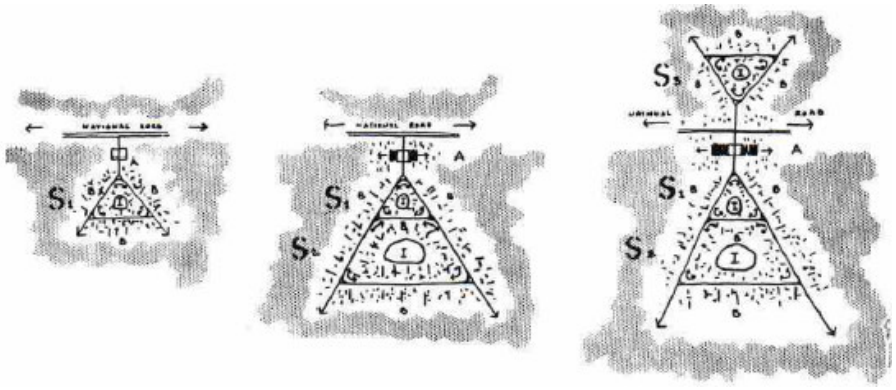

Figure 2.5. 'Patterns of growth on the left, a system of roads and green spaces in the middle and Patterns of growth, phasing on the right". In Dirk Van den Heuvel, "Diagrams of Team 10," *Daidalos- Berlin Architectural Journal* 74 (2000): 45.

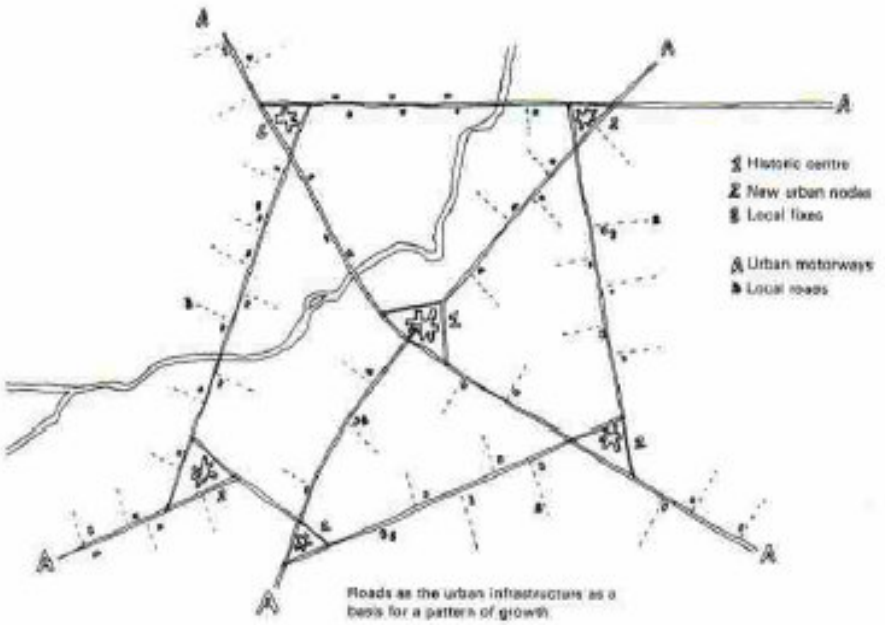

Figure 2.6. 'Patterns of growth by Alison and Peter Smithson, 1958-59". In Alison Smithson, "How to Recognize and Read Mat Building," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 97.

In this historical context, another important concept that can help to understand the mat language is the concept of "casbah". While the Smithsons

were working on the above-mentioned terms, Aldo van Eyck, the Dutch member of Team 10, introduced an architecture and urbanism of configurative patterns called "casbah".

2.2.3 The Configurative Patterns of Dutch Casbah

> *…van Eyck who first created a new direction in Dutch architecture based on Team 10 concepts through his teaching at the Amsterdam Academy of Architecture. His Amsterdam Municipal Orphanage (1955-60) was the first large building to demonstrate his idea of architecture as a "configurative discipline," and it arguably led directly to a number of other mat-buildings including the Venice Hospital and Candilis-Josic-Woods' Berlin Free University.*[29]

In late 1950's, Team 10's intended social content in architecture was achieved through the spatial medium of configurative patterns by a group of younger Dutch architects, called Forum, including John Apon, van Eyck, Jacob Bakema, Herman Hertzberger and other Dutch architects. Their journal, called also *Forum* in the period between 1959 and 1963, was a glorious example of this configurative knowledge. The Forum group offered an architecture and urbanism based on configurative patterns, which were defined by Robert Oxman, Hadas Shadar and Ehud Belferman as "one of the foundations of architectural design and the key to design human settlements".[30] Oxman, Shadar and Belferman stated that "a low dense, contiguous, multi-functional building

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[29] Mumford, "The Emergence of Mat or Field Buildings," 2001, p. 53.
[30] Robert Oxman, Hadas Shadar and Ehud Belferman, "Casbah: a brief history of a design concept," *Urbanism* 6 no.4 (2002): 323.

form was seen as the preferred medium for urban design".[31] The casbah theme provides an organization based on a repetitive process of spatial diversity (Figure 2.7).

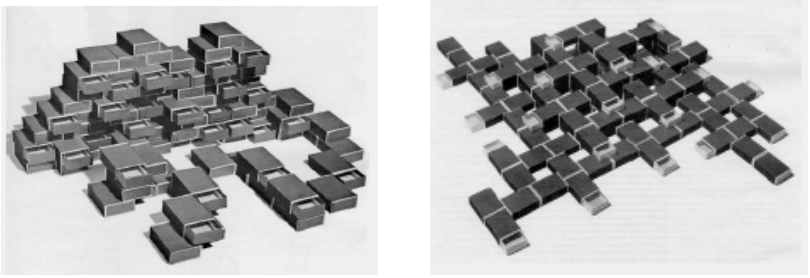

Figure 2.7. Clustering took the form of systematic repetition of a set of elements (on the left) and collective form as continous system (on the right). Robert Oxman, Hadas Shadar and Ehud Belferman, 'Casbah: a brief history of a design concept," *Urbanism* 6 no.4 (2002): 323.

Amsterdam Municipal Orphanage by van Eyck is an important example for the new language of form (Figure 2.8). Flexibility and variability of the architectural form were achieved within the building's repetitive structure. The different elements scaled according to children, the low density layout, the internal courtyards and the possibility for future growth were concepts applied in the design of the Orphanage and shared by Team 10. These concepts led to the creation of new urban fabrics. The configurative knowledge of casbah and its language contributed to the definition of mat-building in Alison Smithson's 1974 essay. 'She presented the ideology of casbah and its more generic form, 'mat-building', on the basis of its attributes rather than its forms".[32]

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[31] Ibid, p. 323.
[32] Ibid, p. 330.

Figure 2.8. Amsterdam Municipal Orphanage by Aldo van Eyck, 1955-60. In Alison Smithson, "How to Recognize and Read Mat Building," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 97.

2.2.4 The Emergence of the Mat-building Approach

> *The way towards mat-building started blindly enough; the first Team 10 review of the field of its thought became collectively covered in the Primer. The thought gradually got further bodied-out in projects, and these in the early seventies began to appear in built-form. At this point mat-building as an idea becomes recognizable.*[33]

As it was emphasized in the previous sections, mat-buildings appeared in Team 10 meetings with an emphasis on interconnectivity, a certain degree of unpredictability and the linkage between built form and use. In this sense, "mat-building took the form of continuous, extensible low-dense urban structure".[34] The emerging mat-building approach was evoked also in Le Corbusier's unbuilt Venice Hospital project in 1964. This prime example of mat-building organizes space according to its functional aspects and its program requirements with an emphasis on the relationship between man and city. Pablo

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[33] Smithson, "How to Recognize and Read Mat Building," 2001, p. 91.
[34] Oxman, Shadar and Belferman, "Casbah: a brief history of a design concept," 2002, p. 330.

Allard states that "the proposed project, starting from the early sketches, takes into account this relation of man and city"[35] (Figure 2.9). Le Corbusier approached to the program of the project and to its urban context as a whole so that for Allard "the Venice project was a special concern for the city and its scales of insertion-the 'osmosis' ". [36]

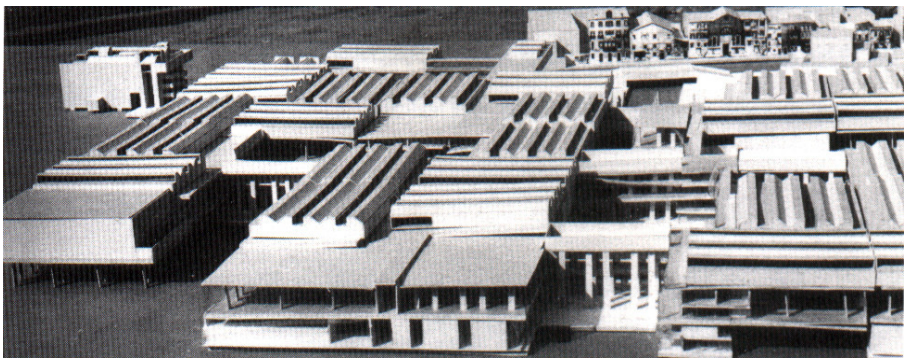

Figure 2.9. Venice Hospital project in 1964 by Le Corbusier. In Pablo Allard, "Bridge over Venice: Speculations on Cross-fertilization of Ideas between Team 10 and Le Corbusier," *Case: Le Corbusier's Venice Hospital and the mat building revival* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 29.

At this point; Sarkis discusses Hospital's programmatic aspect and its flexibility in terms of its relation to the surrounding environment. He explains the project's mat pattern by taking into account the attitudes of Team 10 toward the environment as follows,

> *By virtue of its location and its scale, the building turned in on itself and created its own interior sub environments in the form of wards centered around courtyards that repeated in a security endless manner. These*

[35] Pablo Allard, "Bridge over Venice: Speculations on Cross-fertilization of Ideas between Team 10 and Le Corbusier," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 25.
[36] Ibid, p. 29.

courtyards were supposed to extend the residential areas of the city into the water, but also create an abstract, clear logic that reciprocated back onto the labyrinthine context of Venice.[37]

Thus, with the open courtyards connecting the programmatic areas, a new urban pattern was achieved. The approach to the program and to the context is more readable in the sections of the project. For Allard, "each area was defined and distributed in plan according to the specific program or unit it housed, but the most significant distribution of activities was determined in the section"[38]. The hospital structure provides the equitable care to all patients and the treatment of the nursing facilities (Figure 2.10 and Figure 2.11).

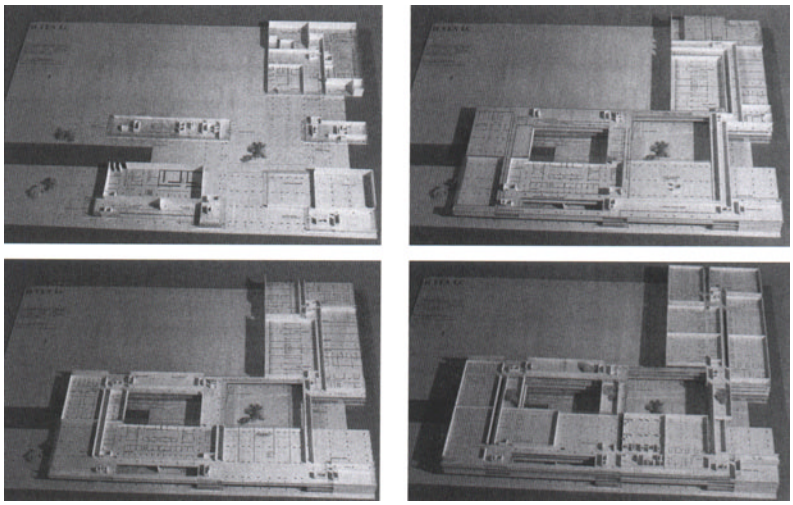

Figure 2.10. "Julian, Sequence of models depicting spatial relationships in Patios, Final Version, 1970". In Pablo Allard, "Bridge over Venice: Speculations on Cross-fertilization of Ideas between Team 10 and Le Corbusier," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 34.

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[37] Sarkis, "Introduction," 2001, p. 15.
[38] Allard, "Bridge over Venice: Speculations on Cross-fertilization of Ideas between Team 10 and Le Corbusier,"2001, p. 24.

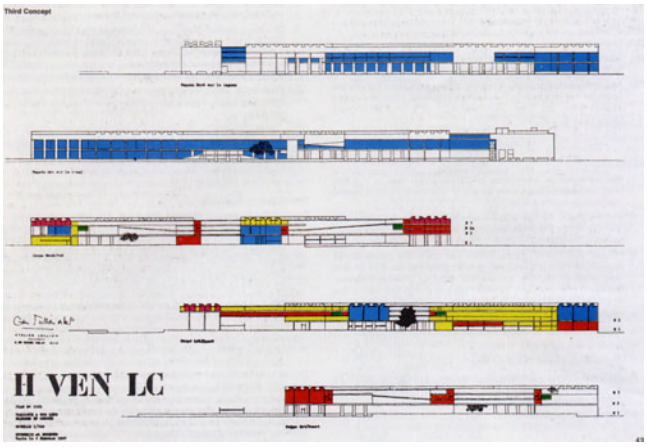

Figure 2.11. Sections and Facades of Venice Hospital. In Le Corbusier, "Rapport Technique," trans. by Lucia Allais, *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 46.

The proposed project was also capable of reintegrating itself within the city. Allard explains the projects' relationship to the environment as follows: 'the essential thing was that the shape of the building as a whole should not be closed in or in any way tied down to a definitive formula: that it should remain an open embellishment to the water side"[39] (Figure 2.12).

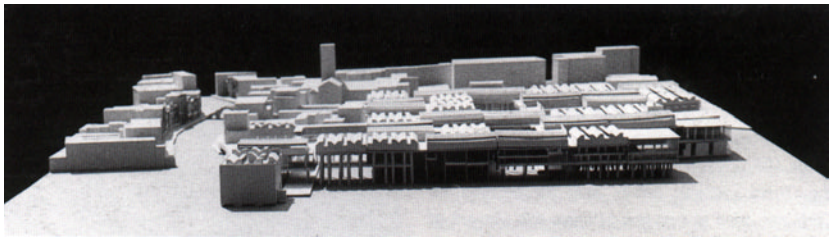

Figure 2.12. 'The open embellishment of the hospital to the waterside". In Pablo Allard, 'Bridge over Venice: Speculations on Cross-fertilization of Ideas between Team 10 and Le Corbusier," *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 30.

[39] Ibid, p. 24.

With Berlin Free University in Berlin (1963-74), Candilis-Josic-Woods and Manfred Schieldhelm attempted to show the environmental responsiveness of mat-building in a university context (Figure 2.13 and Figure 2.14). It is stated by Addington, Kienzl and Inrachooto that "it embodied most of the attributes associated with the mat-buildings, such as the one-to-two story distributed configuration, the use of a highly flexible and remanufactured construction system, and the allocation of functions along internal pedestrian streets and courts".[40]

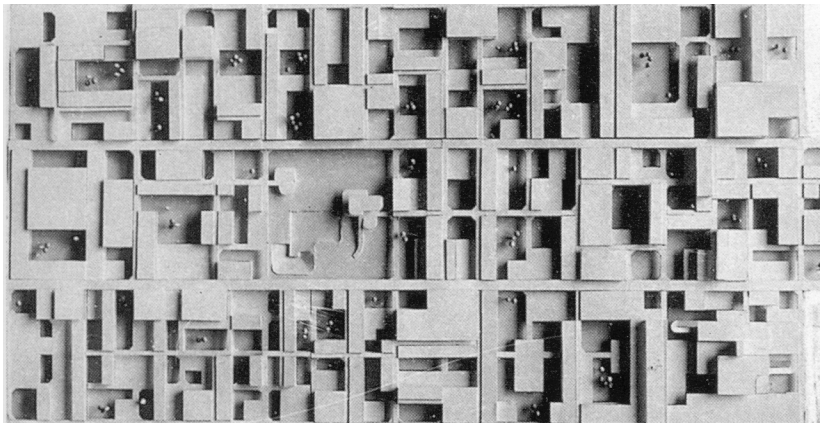

Figure 2.13. Model of Berlin Free University. In M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 75.

[40] Addington, Kienzl and Inrachooto, "Mat Buildings and the Environment: Examination of a Typology," 2001, p. 75.

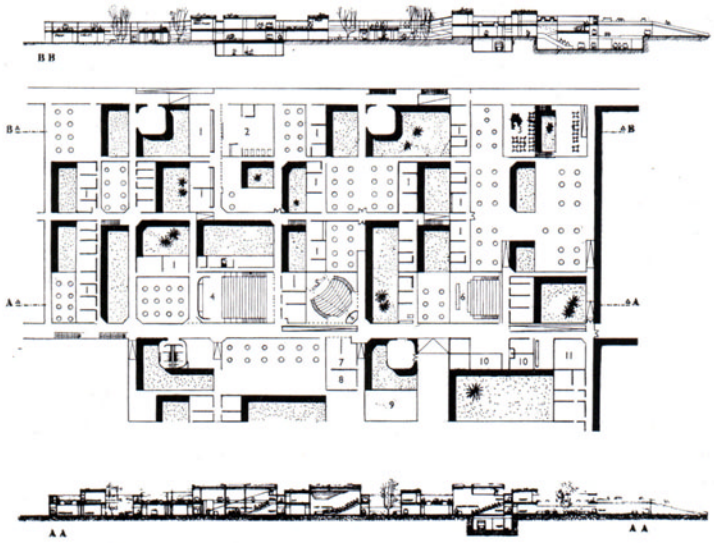

Figure 2.14. "Berlin Free University's plan in the middle and its sections at top and bottom". In M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 71.

The proposed flexibility of the university provides its users the possibility of changing it. The spatial flexibility in the building allows the university to respond to the changing user needs over time. The mat-building approach was explained in Architects' Statement as "an attempt to discover structuring principles which might be applicable to the organization of physical environment"[41] (Figure 2.15).

[41] Architects' Statement, "Competition Project, 1963 -64," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 75.

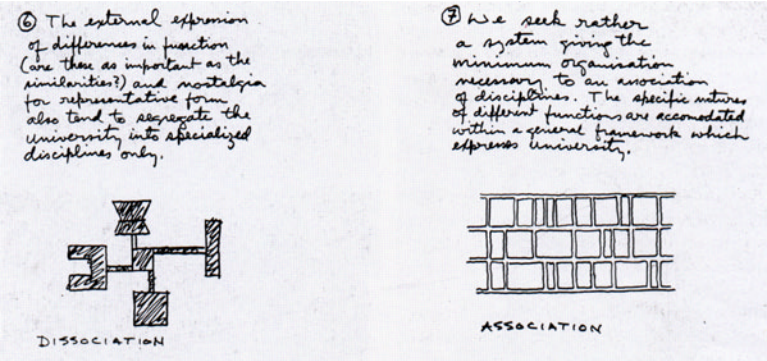

Figure 2.15. 'Ca ndilis-Josic-Woods, sketches illustrating design approach at Berlin Free University, 1964'. In Eric Mumford, "The Emergence of Mat or Field Buildings," *Case: Le Corbusier' s Venice Hospital and the mat building revival* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 58.

In this context, also the 'non-plan' and 'open-plan' approaches are important. Sarkis in his essay "The Paradoxical Promise of Flexibility" has explained that Cedric Price and Reyner Banham's works are important in the Non-plan movement in England.[42] In the same essay, other related attempts are cited as follows:

> *Christopher Alexander tried to identify flexible lattices and patterns that could displace the rigid hierarchical structures of high modernism. Archigram developed literally nomadic structures to catch up with the speed of modern life and relish its agitation. Other searches would also lead to explorations in cybernetics and their impact on design and to the debates around the notions of Non-Plan and indeterminacy in England of the late 1950s and early 1960s.*[43]

[42] Hashim Sarkis, "The Paradoxical Premise of Flexibility," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 84.
[43] Ibid, p. 87.

The next section deals with the contemporary examples of mat-building and the relevance of the carpet like organizations for the recent architecture and urbanism are emphasized.

2.3 The Revival of Mat-Building in Contemporary Architecture and Urbanism

2.3.1 The Significance of Mat-building

The relationship between form, program and organizations in the recent architecture and urbanism brings forth the mat-building approach. Sarkis explains the relevance of mat-building as follows;

> *Today mats are appearing everywhere. We call them fields, grounds, carpets, matrices. Whether seen as counterpoint to the preoccupation with sculptural form or as what happens to architecture when it has to cover really large areas, no building type, it could be stated without exaggeration, captures the predicaments but also the imagination of contemporary architecture more fully. The mat answers to the recurring calls for efficiency in land use, indeterminacy in size and shape, flexibility in building use, and mixture in program. It expresses architecture's increasing encroachment on both city and landscape and the open exchange between structure (building) and infrastructure (context) that this encroachments signals. In the face of these challenges, and in every other design published in every other magazine, the mat claims to address a wide range of problems preoccupying contemporary architecture.*[44]

It is possible to paraphrase Sarkis's statement that fields, grounds, carpets, matrices and mats are synonymous words. He points out that mat-building can be well-suited for both specific building design projects and urban

[44] Sarkis, "Introduction," 2001, p. 13.

design projects in contemporary architecture. Mat-building is capable to respond to the issues related with land-use efficiency, uncertain conditions of size and shape, spatial flexibility and different program demands. It reveals also the recent architectural tendencies that relate buildings with their contexts. Thus, today mat-building is a much wider concept dealing with various urban and architectural issues. Mat-building provides flexible frameworks rather than rigid containers to the programmatic changes both in building and in context. In this respect, the guiding ideas of Venice Hospital and Berlin Free University, explained in the previous section, reappear in today's organizations of structure and infrastructure.

The importance of the further exploration for the ongoing dialogue of mat-building is what links today's architecture and urbanism to the 1960s mat-building approach. Stan Allen explains this continuity as follows:

> *So although some of the issues raised in the text may seem dated, there is much in this 1974 article that still resonates today. This is partly due to the tone, to the openness and generosity of the language, but also to the ebb and flow of issues in architecture and urbanism. Mat-building seems newly relevant, in part because of developments in the urban field that the Smithsons could not have anticipated.* [45]

For Allen the return of the idea of mat-building can also be related with the developments in the urban field. He stated that "certain effects tentatively

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[45] Stan Allen, "Mat Urbanism: The Thick 2-D," *Case: Le Corbusier's Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 121.

described in the 1974 text have become more evident, some have dead-ended, while others have veered off in strange new directions".[46]

The environmental claims of mat-building have been developed in the contemporary discussions of architecture. Its environmental responsiveness has been emphasized and related to the organization of the physical environment, because mat-building provides "a conceptual framework and a model for creating relationship between user and its surrounding environment".[47] The environmental performance of mat-building reveals the fact that mat-building allows its conceptualization for different contexts. As it is capable to respond to the relationship between building and its context, it can be also offered for other contemporary issues in architecture and urbanism. This flexibility of mat-building plays a key role in this study. In this sense, the study explores the possibility of mat-building for creating urban environments that can fulfill the requirements of universal design. The study proposes the integration of mat-building with the universal design approach in order to design built environments suitable for people of all ages, sizes and abilities. The environmental context of mat phenomenon is explained in the essay "Mat Building and The Environment" by Addington, Kienzl and Inrachooto. The following claims introduced by the authors can constitute a basis for the new interpretations of mat-building.

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[46] Ibid, p. 123.
[47] Mumford, "The Emergence of Mat or Field Buildings," 2001, p . 64.

Claim1: Mat-buildings allow for greater adaptability in use of space.

This claim is reformulated in the essay as follows: "the interstitial spaces of mat-buildings dematerialize the borders of adjacent spaces, rendering the boundaries less distinct and the reconfiguration of spaces more fluid and repetitive".[48] The flexible spatial organizations of mat-building provide the possibility of responding to the future programmatic changes. It is capable to allow the insertion of the new functions.

Claim2: Mat-buildings use land efficiently.

"The claim that mat-buildings use land efficiently is . . . predicated on their potential for densification and growth, rather than on their current use of land."[49] Mat-buildings and its carpet like configurations allow the future growth and their extensions into the urban fabric. The high density of mats, the circulation networks, and the courtyards give the possibility of responding to changes.

Claim3: Mat-buildings are inherently energy conserving.

Spaces around the courtyards are designed to increase the penetration of light, air and solar energy. This characteristic of mat-building can allow the adaptation of the building to any orientation. Mont- Cenis Academy Complex in Germany, completed in 1999, is an important example for its environmental responsiveness (Figure 2.16). It is stated as follows:

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[48] Addington, Kienzl and Inrachooto, "Mat Buildings and the Environment: Examination of a Typology," 2001, p. 71.
[49] Ibid, p. 71.

Designed by Jourda and Perraudin Architectes and completed in 1999, the structure envelops a villagelike cluster of buildings to create a confined microclimate for the occupied spaces . . . The transitional space between envelope and the inner building provides a type of public space where indoor and outdoor activities are protected. More than simply an attempt to respond to the available natural light and solar heat, the building aims to reconfigure the surrounding climate.[50]

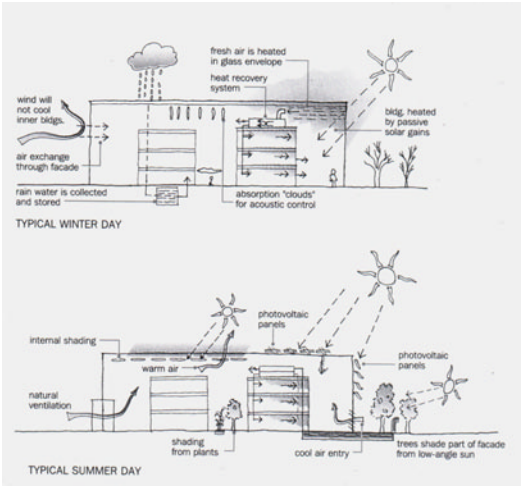

Figure 2.16. Mont- Cenis Academy, Herne; the environmental responsiveness diagram of the building. In M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 77.

Claim4: Mat-buildings reduce the overall need for transportation.

Mat-buildings tend to be associated with the image of pedestrian movement, thus providing the basis for the claim that this building type reduces the need for mechanical modes of transportation. Initial considerations of this building type focused on pedestrian zones as social spaces central to the experience of the city; the elimination of cars and subsequent reduction of energy consumption were not the key concerns.[51]

[50] Ibid, p. 78.
[51] Ibid, p. 72.

The movement pattern and the circulation network of the mat-buildings offer an organization suitable for the pedestrian environments. The changing needs of the users as pedestrians are solved with the potential of mat patterns. In Berlin Free University, the pedestrian movement between faculties and across courtyards indicates a multilevel and directional circulation that responds to the needs of the users (Figure 2.17).

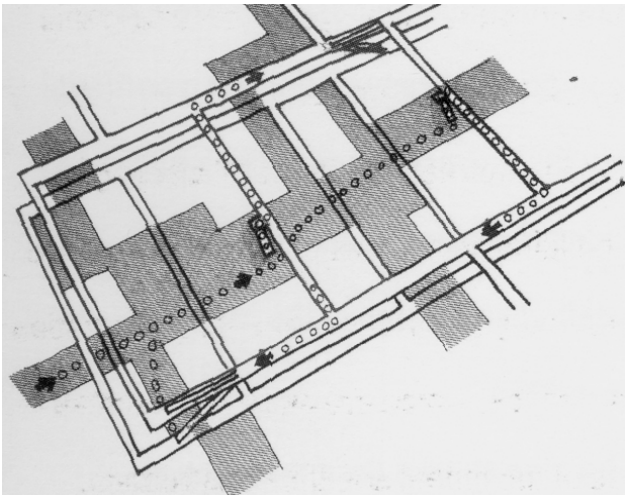

Figure 2.17. "Berlin Free University, competition project. Site layout showing pedestrian flow and possible expansion of complex". In George Wagner, "Looking Back Towards the Free University, Berlin," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 20-21.

Claim5: Mat-buildings create their own microclimates.

Mat-buildings with their courtyards and internal streets create spatial configurations that suggest a different kind of urban structuring compared to the traditional building types and organizations. This peculiarity of mat-building was explained by van Eyck as "a place for rest in a restless city, not a rest house

in a restful region, an oasis within a metropolis".[52] The National School of Decorative Arts in France is an important built example for the environmental performance of mat-building in contemporary architecture (Figure 2.18). It is explained as follows:

> *The National School of Decorative Arts (ENAD-CRAFT), in Limoges, France, designed by the Laboratory for Architecture and completed in 1995, offers many of the characteristics of mat-building in its layout and spatial configuration. In this interpretation of the typology, the impetus to create internalized outdoor environments is rationalized with considerations of reduced energy consumption and an attempt to produce thermal environments responsive to the external climate.*[53]

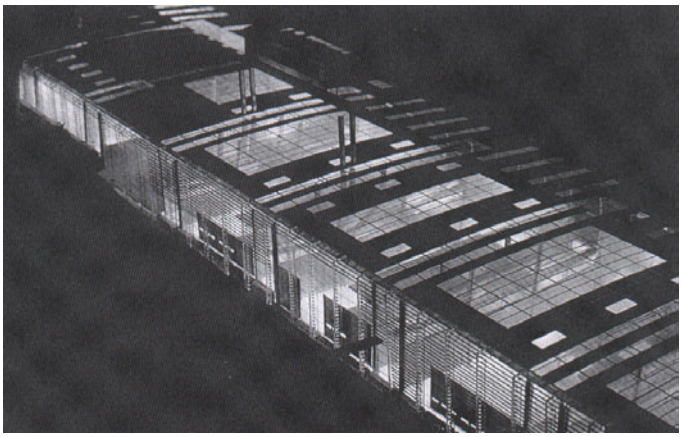

Figure 2.18. Each of the modular unit of the school equipped with its own climate. In M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," *Case: Le Corbusier' s Venice Hospital and the mat building revival*edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 74.

[52] Ibid, p. 73.
[53] Ibid, p. 76.

From contemporary point of view, 'these five claims emerged and were codified during different generations in the development of mat-buildings".[54] Therefore, Smithsons' ideas and proposals about mat-buildings are reframed and reformulated around the 21st century design challenges. It is stated that 'The two early buildings establish the framework and the language for the later development of the claims: The Venice Hospital is an example of a specific adaptation of mat-building, whereas the Berlin Free University is the exemplar of the type".[55] The revival of mat-buildings yields to a close relationship between program and form. In this sense, it is important to discuss Smithsons' architectural order and it commonness in today's architecture in terms of the role of programming.

2.3.2 The Role of Programming in the Smithsons' Thoughts of Architectural Order

For Sarkis, programming can be considered as a process of examining and formulating the user needs and building requirements into the suitable spatial organizations. In this respect, the relationship between programmatic determination and spatial configurations become important. Mat-building's flexibility maintains the possibility of this close relationship. As programmatic determination becomes to change, the spatial configurations in mat-building

[54] Ibid, p. 73.
[55] Ibid, p. 73.

become also to adapt to the changes of the program.[56] The issue of accommodating a number of changing demands and the importance of a flexible framework for this accommodation is discussed by Alex Wall. He defines program as follows:

> *More than aware of the highly changeable and unpredictable characteristics of the contemporary metropolis . . . architects have attempted, in number of ways, to push ideas of program toward more dynamic and productive ends. Program is viewed as the engine of project, driving the logic of form and organization while responding to the changing demands of society.*[57]

Relating program to form, mobility, flexibility and interconnection are the key concepts emphasized both in Smithsons' works and in contemporary architecture. Sophie Trelcat in her 2003 essay "Crossed Thoughts on the Contemporary City" has discussed the contemporariness of these ideas referring to the relationship between the works of Smithsons and Rem Koolhaas.[58] She stated that

> *The polymorphic expression of architectural thought based on the inter-connection of concepts is characteristics of both Smithson and Koolhaas. In their work methods the role of programming has the same complementarity and continuity: rather than an ideal form, the Smithsons prefer to deal with the programme in an attempt to establish dialogue with users, increase possibilities of appropriation, ensure the flexibility of*

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[56] Sarkis, 2001, "The Paradoxical Premise of Flexibility," p. 82.

[57] Alex Wall, "Programming the Urban Surface," *Recovering landscape: essays in contemporary landscape architecture,* edited by James Corner, (New York: Princenton, 1999) 237.

[58] Rem Koolhaas is Professor in Practice of Architecture and Urban Design. He teaches and conducts design research, combining studios, workshops, and seminars into a focused investigation of current urban-architectural conditions in various parts of the world. Retrieved February 10, 2004 from http://www.gsd.harvard.edu/people/faculty/koolhaas/index.html.

mechanisms and services, the independence of functional sets, adaptability to changes, transition between each change of scale: floor, building, town, territory . . . [59]

First she points out that interconnection of concepts are peculiar to both Smithsons and Rem Koolhaas. For Trelcat, the role of programming has continuity in their architectural thoughts. For Smithson, the program is a way of communicating between users and buildings. It provides also the possibility of the future adaptation, the insurance of flexibility and the exchange between building and its context. In this respect, the notions of flexibility, mobility and interconnection which were used in Smithsons' cluster city come to being in contemporary city (Figure 2.19). It is stated that "a concern for improving our understanding of the way cities grow and the way people live in them seems to govern the principles of mobility elaborated by the Smithsons . . ."[60]

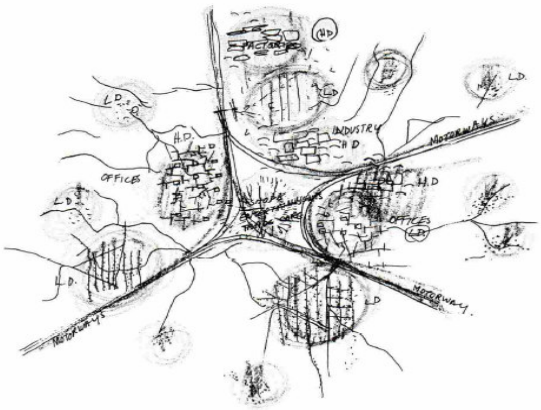

Figure 2.19. Cluster City Diagram by Alison and Peter Smithson. In Dirk Van den Heuvel, "Diagrams of Team 10," *Berlin Architectural Journal* 74 (2000): 46.

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[59] Sophie Trelcat, "Crossed Thoughts on the Contemporary City," *L'Architecture d'Aujourd'Hui* 344 (2003): 52.
[60] Ibid, p. 52.

These architectural thoughts on the mobile, flexible and interconnected organizations of mat-buildings have also been emphasized in Berlin Free University in terms of its linkage between program and form. In this project, Candilid-Josic-Woods defined a humanist architecture by pointing out the user participation while incorporating these three concepts in their new design strategy:

> *Mat bodily combine spaces that act as frameworks for anticipated activities with highly articulated spaces that graphically illustrate the intended programmatic and social interactions. In that sense, the mat embodies different, even contradictory ideological positions vis-à-vis flexibility.*[61]

It should be noted that contemporary architecture and urbanism have learned from the past, from the Smihsons' emphasis on high density, fluidity, speed, space articulation, respect for context and need for change. This continuity of the thoughts is obvious in many built projects of recent architecture:

> *Foreign Office Architects' Yokohama Port Terminal, for example, creates porous mat of movement and waiting spaces by means of warped and folded steel plates. . . MVDRDV's Villa VPRO works on a mat or hivelike model to support an adaptive social ecology in the workplace . . . Kazuyo Sejima's Multi Media Studio in Ogaki presents a very literal mat-like appearance . . . OMA's Nexus World offers a very convincing example of a constructed housing mat.*[62]

Bernard Tschumi's Parc de la Villette competition in 1982 is another important mat-building example showing the role of programming and mat

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[61] Sarkis, "The Paradoxical Premise of Flexibility," 2001, p. 84.
[62] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 120.

revival in contemporary architecture and urbanism. He wrote essays about programming process and its interpretation for a suitable spatial strategy. In his built competition project, "programs, forms, and surfaces are overlaid and overlapped to create a densely textured landscape . . . the parts are simultaneously unique and interchangeable"[63] (Figure 2.20). Thus, the projects and ideas discussed above address the fact that the mat-building strategies develop new approaches to design and planning:

> *Many new typologies emerging in landscape and urban design . . . today deal with densification. This involves designing a compactness that leaves the surrounding landscape intact. The surrounding open space is then developed in various ecological, scenic, and recreational ways as compensation for the lack of public space in the building complex. The compactness of the building development is often realized by reducing gardens to enclosed patios and allowing for multiple ground use. Another important feature of these plans is that they take the cohesion of the landscape as a whole into account. . .*[64]

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[63] Hyde, "How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," 2001, p. 111.

[64] Bart Lootsma, "Synthetic Regionalization: The Dutch Landscape Toward a Second Modernity," *Recovering landscape: essays in contemporary landscape architecture*, edited by James Corner, (New York: Princenton, 1999) 259.

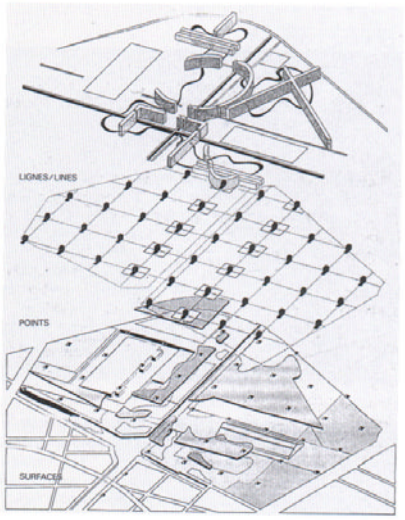

Figure 2.20. Parc de La Vilette Competition, Bernard Tschumi. In Timothy Hyde, "How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," *Case: Le Corbusier' s Venice Hospital and the mat building revival,*edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 111.

Bart Lootsma explains these new landscape typologies of densification strategies with number of its built examples. "A key project in the development of new, denser urban typologies with landscape qualities is the urban plan designed by Geuze and West 8 for Borneo and Sporenurg"[65] (Figure 2.21). He explains this urban design in Amsterdam as follows:

> *The design is, in fact, a variant of the traditional Dutch canal house, though with improved light penetration and privacy. A great deal of what normally would be designed as public space is incorporated into the individual plots, thus creating space within the walls of the buildings. By repeating this type in a great variety of dwelling modes and with maximum architectural variations, an animated street elevation emerges with a fine focus on the individual . . . At the scale of the area as a whole, a balanced relationship exists among the repetition of individual dwellings. The articulated roofscape, and the great scale of the docks, between the intimate containment of the houses and the vast endlessness of the water.*[66]

[65] Ibid, p. 260.
[66] Ibid, p. 260.

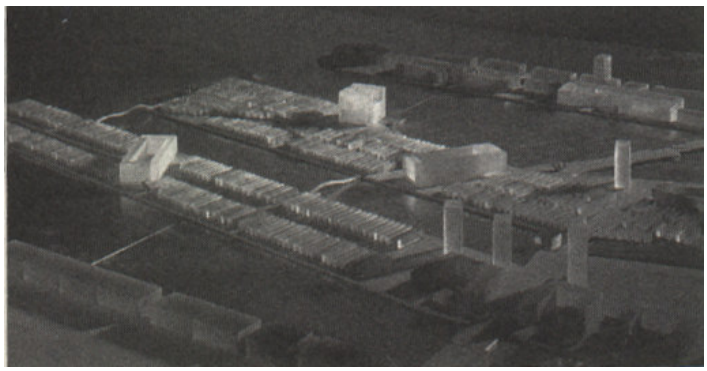

Figure 2.21. Model of Borneo/ Sporenburg, Eastern Docklands, Amsterdam. In Bart Lootsma, 'Synthetic Regionalization: The Dutch Landscape Toward a Second Modernity," *Recovering landscape: essays in contemporary landscape architecture*, edited by James Corner, (New York: Princenton, 1999) 260.

Rem Koolhaas and his office OMA (Office for Metropolitan Architecture) are also fascinated by these new urban approaches. They designed the buildings as the continuous parts of the urban fabrics. Floors are considered as the extension of the landscape. Yokohama Port Terminal is one of the built examples of this attitude. It is designed as an extension of the urban ground (Figure 2.22). This landscape emphasis, the conceptualization of architecture as landscape, is more evident in Allen's 2001 essay.

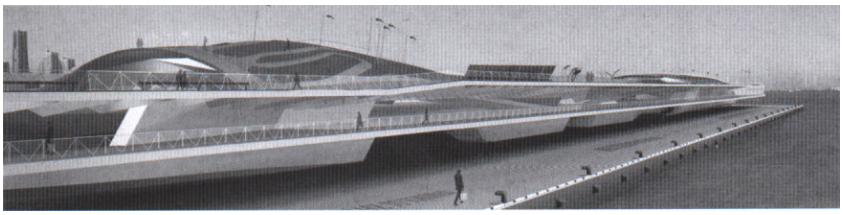

Figure 2.22. Yokohama Port Terminal, the extension of the urban fabric is achieved in the project. In Timothy Hyde, 'How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 114.

2.4 Five Architectural Characteristics of Mat-like Organizations

Stan Allen in his 2001 essay "Mat-Urbanism: The Thick 2D" updated mat-building to meet the design challenges of the contemporary world and reinterpreted Smithson's 1974 essay in relation to the ongoing architectural knowledge:

> *Architects learn from the past, not by imitating or repeating, but by extending and developing propositions made by other like-minded practitioners. This ongoing dialogue of proposition and response is what for the Smithsons constituted architectural discourse- not a series of disengaged texts directed at an academic audience, but a personal effort to work through issues collectively apprehended.*[67]

Allen developed Smithson's constructed genealogy of mat-building and proposed a series of architectural characteristics as follows:

> *The Lessons of mat-building in general (and the Venice Hospital in particular) have been internalized as a series of architectural characteristics:*
>
> *1. A shallow but dense section activated by ramps and double-height voids.*
> *2. The unifying capacity of the large open roof*
> *3. A site strategy that lets the city flow through the project*
> *4. A delicate interplay of repetition and variation*
> *5. The incorporation of time element as an active variable in urban architecture.*[68]

Mat-building with its five characteristics can be interpreted as an organizational strategy. For Allen, this organizational emphasis of mat-building gives way to the continuing relevance of Smithson's 1974 article. He explains

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[67] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 119.
[68] Ibid, p. 121.

this as follows: "one reason for the article's continuing relevance is the avoidance of questions of styles of appearance. The emphasis is insistently organizational. That is, buildings that look quite dissimilar are grouped together on the basis of common organizational strategies".[69]

1. A shallow but dense section activated by ramps and double-height voids.

Allen defines the mat section as 'the product of weaving, warping, folding, oozing, interlacing, or knotting together rather than accumulating of discrete layers as in a conventional building section".[70] This dense and differentiated mat section is related with the landscape architecture which extends and organizes the horizontal surfaces. For Allen, the dense section of mat-building can be compared with the 'thick 2d' of the forests, fields where a new sense of connection in different levels is achieved by ramps. This comparison is explained in the article as:

> *The natural ecology of a meadow, field, or forest exhibits horizontal extension in the macro scale, but at the micro scale it forms a dense mat, a compact and highly differentiated mat section, the "thick 2D" of the landscape, is fundamental to the work that the meadow or the forest performs: The processing of sunlight, air, or water; the enrichment and protection of the soil through the process of growth and decay.*[71]

In this sense, Allen relates Smithsons' diagram for urban form to the landscape architecture and states:

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[69] Ibid, p. 121.
[70] Ibid, p. 125.
[71] Ibid, p. 125.

> *One related discipline in which mat like effects proliferate is landscape architecture. Increasingly, landscape is emerging as a model for urbanism. Landscape has traditionally been defined as the art of organizing horizontal surfaces. It bears an obvious relationship to the extended field of the contemporary city, and also to the newly emerging interest in topological surfaces.*[72]

The importance of this mat characteristic, low-rise nature of mat-building is also highlighted in the architects' statement of Berlin Free University: ". . . the fact that the building has only two stories, and unites different kinds of function on two levels only makes for easier communication".[73] This characteristic of mat-building is outlined in contemporary examples of architecture and urbanism as various structural hierarchies and spatial relationships of "front-rear", "internal-external", "upper-lower", and "public-private".

2. The unifying capacity of a large open roof

The densely constructed section of the groups of buildings is organized under a continuous fabric of internally differentiated space. The continuity and spatial wholeness of diverse elements are created under a roof structure while also respecting the identity of each. This open roof of the horizontal space is defined by Allen as "a low enclosure carried lightly above the user . . . with a high degree of connectedness . . ."[74] Mat-building can be defined as a systematic organization of parts which is also capable of reconfiguring diverse

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[72] Ibid, p. 124.
[73] Architects' Statement, "Completion of the First Phase, 1973," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 31.
[74] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 123.

functions of urban. This characteristic of mat-building was invoked by Allen in the Reconstruction of the Souks of Beirut Competition Project of 1994 (Figure 2.23).

> *Unity is achieved by the continuous rhythm of the roof structure, while diversity of city life is cultivated below. It should be noted that while preliminary proposals for the souks and other buildings have been submitted, a major advantage of his scheme is that it anticipates the future incorporation of various styles and various functions within an overall framework. It allows phasing, incremental realization, and broad participation in the reconstruction process. It is an optimistic approach, confident that the will to rebuild is strong enough to accommodate the complexity of the city to come.*[75]

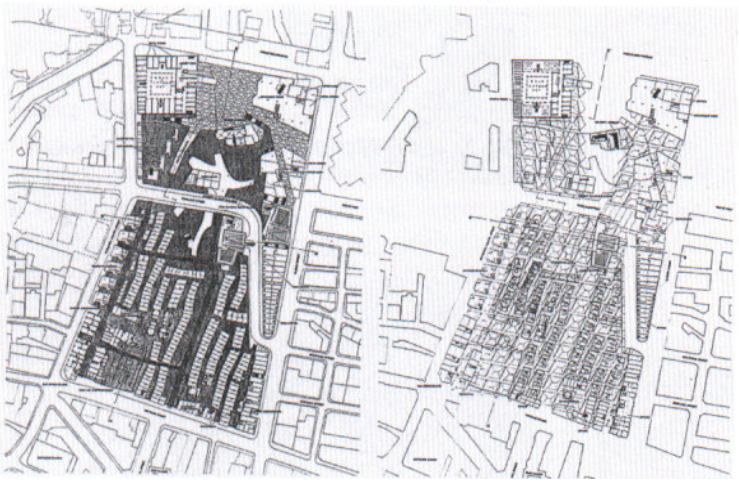

Figure 2.23. Beirut Souks Project by Allen, a unifying roof structure above the city. In Timothy Hyde, "How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 115.

[75] Stan Allen, "Reconstruction of the Souks of Beirut," *Points+ Lines: Diagrams and Projects for the City,* (New York: Princeton, 1999) 59.

3. A site strategy that lets the city flow through the project.

This site strategy is easily observable in the Venice Hospital Project. The mat phenomenon in this project has provided the reintegration of the hospital with the city. The hospital was an attempt to getting close to the city (Figure 2.24).

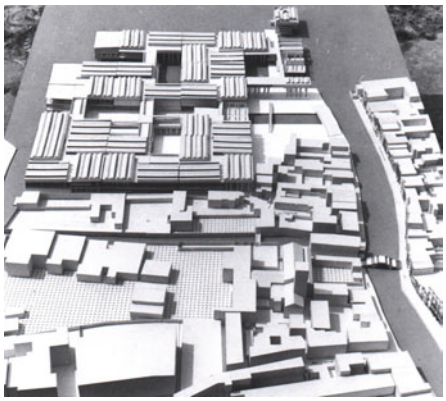

Figure 2.24. 'Model of Venice Hospital Project, by Atelier Julian, 1966'. In Hashim Sarkis, 'Introduction," *Case: Le Corbusier' s Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 10.

Here landscape weaves the building to the city. Landscape is used to let the city flow and to link scattered functions. Wall remarks that landscape is a much wider concept than its simple definitions as the spaces between the buildings, parking lots, planted areas, green areas or recreational spaces. He points out that landscape is a ground structure and defines it as a wide and inclusive ground-plane of the city rather than limiting its definition only to green spaces. This ground structure plays an important role in organizing the

urban fabric and accommodating the changes of the future.[76] This site strategy also allows the future extension of the mat-like organizations into the urban fabric. These open and adaptive mat organizations are capable of responding to a changing and uncertain future. In reference to the Smithsons' genealogy, Allen points out that "Smithsons were among the first to recognize the potential of infrastructure to influence the future development of the city".[77]

4. A delicate interplay of repetition and variation

The delicate interplay of repetitive and additive elements of mat-building "enabled the creation of urban fabric through serial replications" as mentioned also in *casbah* concept by Forum architects.[78] Hertzberger, a member of Forum group, in his book *Lessons for Students in Architecture,* brings the image of a woven urban fabric in mind:

> *Let us take as the image of a fabric such as that constituted by warp and weft. You could say that the warp establishes the basic ordering of the fabric and in doing so creates the opportunity to achieve the greatest possible variety and colorfulness with the weft.*
>
> *The warp must first and foremost be strong and of the correct tension, but as regards color it needs merely to serve as a base. It is the weft that gives color, pattern, texture to the fabric, depending on the imagination of the weaver. Warp and weft make up an indivisible whole, the one cannot exist without the other, they give each other their purpose.* [79]

It is possible to interpret the warp and weft as landscape and the building, or as city and the building. Like the warp and weft, the city and the

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[76] Alex Wall, "Programming the Urban Surface," *Recovering landscape: essays in contemporary landscape architecture*, edited by James Corner, (New York: Princenton, 1999) 233.
[77] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 124.
[78] Oxman, Shadar and Belferman, "Casbah: a brief history of a design concept," 2002, p. 324.
[79] Herman Hertzberger, *Lessons for Students in Architecture*, fourth revised edition (Rotterdam: 010 Publishers, 2001) 108.

building can be woven within a delicate interplay of repetition. Within the repetitive structures of mat-like configurations, a variety of spatial arrangements are created. Central Beheer Office Building by Hertzberger, built in 1968-1972, demonstrates the mat-building approach. The variation in the project is achieved through the repetition of a certain module (Figure 2.25).

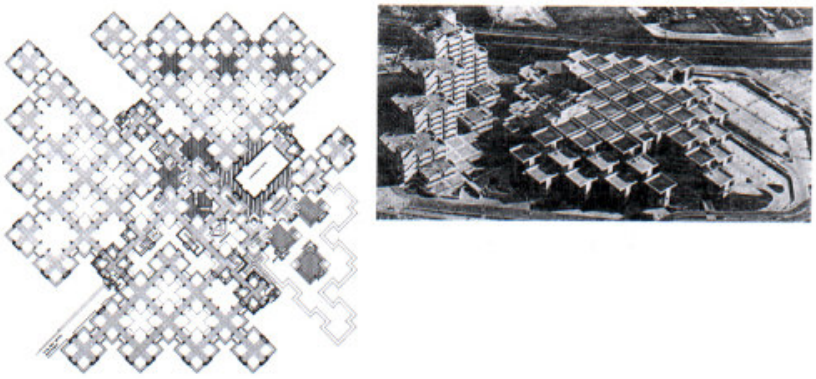

Figure 2.25. Central Beheer Office Building by Hertzberger, built in 1968-1972. In Timothy Hyde, "How to Construct an Architectural Genealogy: Mat-building..Mat-buildings..Matted-Buildings," *Case: Le Corbusier's Venice Hospital and the mat building revival,* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 109.

This repetitive characteristic of mat-building is interpreted by Sarkis as follows: ". . . what is peculiar to the mat phenomenon, as becomes evident in the Smithson/ Hyde timelines, is a high degree of flexibility generated in the overall layout by an equally high degree of specificity found in the repeated element".[80]

[80] Sarkis, "Introduction," 2001, p. 14.

5. The incorporation of time element as an active variable in urban architecture

> *Mat-building is a studied response to a fundamental urbanistic question: How to give space to the active unfolding of urban life without abrogating the architects' responsibility to provide some form of order. ("If there is no order, there is no identity but only the chaos of disparate elements in pointless competition.") Mat -building instead proposes a loose scaffolding based on the systematic organization of parts. (The understanding must come from the perception of the parts, as the whole system can never be seen".) Mat-building is based on an operative realism regarding the extent of the architects' design control.*[81]

Allen highlights mat-building's capability of providing the form of order and of responding to the spatial issues changing in time without eliminating the architects' role. He points out that in such a case mat buildings can provide the systematic organization of the parts. The changing functions can be accommodated in the loose scaffolding of mat-building. It is possible to state that the unconfined frameworks of mat-buildings not only arrange the future demands of spaces but also they are capable to extend the architects' role. Allen points out that like landscape architecture, mat-building takes into account the time factor. Time is considered an important element in architecture and urbanism (Figure 2.26). Woods explained the incorporation of time element in Berlin Free University as follows:

> *We cannot think of planning in static terms, -in three-dimensional space, when we live in a four dimensional world. The realization, for instance, that the scene for action of reality is not a three dimensional Euclidean space*

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[81] Allen, "Mat Urbanism: The Thick 2 -D," 2001, p. 124.

but rather a four-dimensional world, in which space and time are linked together indissolubly, sets our civilization apart from any other.[82]

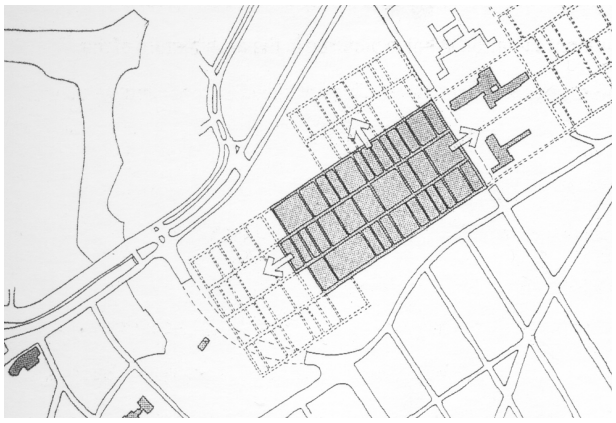

Figure 2.26. "Berlin Free University, its site layout showing the future expansion and the incorporation of the time element". In George Wagner, "Looking Back Towards the Free University, Berlin," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 18-19.

The consideration of the time dimension has created the opportunity of reconfiguring the urban space for new programs and indeterminate futures of urban surfaces. Thus, 'Smithsons' infrastructural ideas about time dimension may be inverted to conceive of systems of movement, service and support that give direction to program without overdetermining the use or meaning of individual spaces". [83]

To sum up these five characteristics of mat-building, for Allen; "mat-building is antifigural, antirepresentational, and antimonumental. Its job is not to articulate or represent specified functions, but rather to create an open field

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[82] Tzonis and Lefaivre, "Beyond Monuments, Beyond Zip-a-tone, Into Space/Time," 1999, p. 119.

[83] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 126.

where the fullest range of possible events might take place".[84] Its urbanistic character is emphasized rather than its consideration as a model for a specific building type in the traditional sense. Thus, "perhaps the synthesis of landscape, architectural, and urbanistic skills into a hybrid form of practice may allow for the invention of newly supple and reflexive built fabrics, new landscapes".[85] In this context, mat-building and mat-urbanism is emphasized in relation to the production of new urban fields. Hence, in the study the synonyms of mat-building, fields, grounds, matrices and mats, are also used for describing the mat-building approach. Therefore, mat-buildings can be defined the outcome of attempts to search an answer to the question of "how can the new patterns of contemporary city be woven into contemporary urbanism".[86]

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[84] Ibid, p. 122.
[85] Wall, "Programming the Urban Surface," 1999, p. 247.
[86] Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 125.

CHAPTER III

UNIVERSAL DESIGN and UNIVERSALLY DESIGNED BUILT ENVIRONMENTS

In this chapter, the universal design approach in architecture and urbanism is elucidated. The implications of adopting universal design in buildings and at the urban scale are brought into discussion. The discussion focuses on the conceptualization of universal design for creating universally built environments for greatest number of people of all ages, abilities and sizes.

First, its various definitions and the common terms used to define the universal design approach are brought into discussion. Then, the history of universal design is summarized beginning from the initial efforts of barrier-free design to the creation of an inclusive built environment. The development of the principles of universal design is explained and its seven principles are defined and interpreted considering their implementations in architecture and urban design. In the next section, the significance of universal design and its worldwide perspective are explored. In the final section, the significance of

universal design's integration with learning environments is discussed and it is expanded to include the issue of a universally designed built environment.

It should be noted that the study deals with the universal design's integration with the architectural and urban design processes to meet the needs of all people with or without disabilities. In this study, what is aimed at evaluating universal design in the built environments is to introduce a theoretical framework before analyzing the correspondence between mat-building and universal design.

3.1 Definitions of Universal Design

There are various definitions of the universal design approach. The common point of these definitions is their emphasis on an inclusive design process for creating products and built environments for all people regarding their age, ability and size. Ron Mace's 1988 definition is quoted by Ostroff, the founding director of Adaptive Environment Center in Boston, as follows:

> *Ron Mace noted that minimum standards are an important part, but not the definition of universal design. His 1988 definition of universal design is quoted in several chapters: 'Universal design is an approach to design that incorporates products as well as building features which to the greatest extent possible, can be used by everyone.*[87]

Rob Imrie, professor of Human Geography at University of London, and Peter Hall who focuses on 'architects and disabling design in the built

[87]Ostroff, "Universal Design: The new Paradigm," 2001, p. 1.5.

environment' at University of London, in their book *Inclusive design: designing and developing accessible environments* define universal design as a social movement which deals with the usability of products, environments and communication systems for all people.[88] The Council of Europe Committee of Ministers at 15 February 2001's meeting defined the universal design approach as follows:

> *Universal design is a strategy, which aims to make the design and composition of different environments and products accessible and understandable to, as well as usable by everyone, to greatest extent in the most independent and natural manner possible, without the need for adaptation or specialized design solutions.*
>
> *The intent of universal design concept is to simplify life for everyone by making built environment, products, and communications equally accessible, usable and understandable at little or no extra cost. The universal design concept promotes a shift to more emphasis on user- centered design by following a holistic approach and aiming to accommodate the needs of people of all ages, sizes and abilities, including the changes that experience over their lifespan. Consequently, universal design is a concept that extends beyond the issues of mere accessibility of buildings for people with disabilities and should become an integrated part of architecture, design, and planning of the environment.* [89]

This definition is a summary of different formulations of universal design and inclusive design. With reference to this definition, what is intended with the universal design concept is not only the accessibility of the built environment but also its understandability and usability for everyone. The Council of Europe Committee of Ministers brings clarity also to the terms of

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[88] Rob Imrie and Peter Hall, *Inclusive design: designing and developing accessible environments*, (New York: Spon Press, 2001) 14.
[89] Resolution ResAP (2001)1 adopted by the Council of Europe Comiteee of Ministers, (2001).Retrieved September 10, 2003 from (http://cm.coe.int/ta/res/resAP/2001/2001xp1.htm)

'everyone', 'independent', 'natural' and 'built environment'. These terms are defined as follows:

> *The term "everyone" means that no difference will be imposed by the environment upon individuals regardless of their age, size or other physical features, abilities or disabilities.*
>
> *The term "independent" means the ability to act without having to rely on outside help, thus avoiding dependency.*
>
> *The term "natural" stresses the integral aspect of the definition. It implies that provisions for access and usability are perceived as normal.*
>
> *The term "built environment" means all buildings, traffic provisions and places or spaces open to the public.*[90]

A universally built environment accommodates the full scope of abilities and age groups. With the universal design approach, the whole spatial structure can be easily used and responds to the users' diverse needs. Universal design is a worldwide design approach, although its definitions and related terms differ from one country to another. Ostroff explains the different perspectives of universal design as follows:

> *Universal design is assuming growing importance as a new paradigm that aims a holistic approach and integrated approach to design, ranging from in scale from product design to architecture, and urban design on one hand, and systems controlling the ambient environment and information technology on the other. The terminology differs from one country to another: there are significant cultural differences in how the movement has evolved in each country, but the similarities are more apparent than the differences as they transcend national laws, policies and practices.*[91]

For the majority of the world, designing an environment that is accessible, adjustable and more inclusive is an important concern. It aims to

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[90] Ibid.
[91] Ostroff, "Universal Design: The new Paradigm," 2001, p. 1.1.

unify all people with or without disabilities and to integrate their needs and demands in the design process. Singanapalli Baleram discusses in his article "Universal Design and the Majority World" that

> *Universal Design for majority –world countries can then be defined as a concept that extends not only beyond the issues of accessibility of the built environment, but that also covers the social, cultural, and economic issues, which are major influences in uniting normal or average people and people with different physical, mental, or psychological abilities.*[92]

Rather than special design solutions for people with disabilities, elderly people, children or pregnant women, a holistic design approach has been developed in order to accommodate all ages, abilities and sizes.

3.2 A Brief History of Universal Design

Universal design's beginnings can also be related to the efforts for the non-discriminatory accommodation of people with disabilities. The prohibition of discrimination against disabled people and providing equal access to education, transportation, recreation and other facilities began in the 1950's with the barrier-free design. Patricia Moore, president in Moore Design in Arizona, explains the first attempts for barrier-free design with the demands of the injured veterans with the end of World War II for the removal of barriers in the environment. Their needs for accessible homes, workplaces, transportation,

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[92] Singanapalli Balaram, "Universal Design and The Majority World," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 5.3.

education settings and other recreation facilities brought forth the accessibility standards and barrier-free design in architecture. Ostroff describes Barrier-free design as follows:

> *Initial term used around the world was barrier-free design and related to the efforts that began in the late 1950's to remove barriers for disabled people from the built environment. An international conference held in Sweden in 1961 cited extensive efforts throughout Europe, Japan, and the United States, primarily by rehabilitation organizations to reduce 'the barriers to the disabled.* [93]

The right of everyone's full participation in the society has an important role in the outcome of universal design. Ostroff mentions the significance of the U.S. Supreme Court Decision in 1954 in establishing the precedent of 'Separate is not equal," which is placed later as a first principle 'Equitable use' in the principles' list. [94] Starting in the late 1950's design standards and accessibility guidelines have been developed for the removal of physical and social barriers for people with disabilities. The first building standards were introduced in 1961 (ANSI). Then, for Ostroff "in the United States accessible design became more widely used in the 1970 as a more positive term than barrier-free design ..."[95] The significant federal legislation are mentioned in the book *The Universal Design File: Designing for People of All Ages and Abilities* by North Carolina State University as follow:

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[93] Ostroff, "Universal Design: The new Paradigm," 2001, p. 1.5.
[94] Elaine Ostroff, "Universal Design Practice in the United States," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 43.2.
[95] Ostroff, "Universal Design: The new Paradigm," 2001 , p. 1.5.

- *The Architectural Barriers Act of 1968*
- *Section 504 of the Rehabilitation Act of 1973*
- *The Education for Handicapped Children Act of 1975*
- *The Fair Housing Amendments Act of 1988*
- *The Americans with Disabilities Act of 1990 (ADA)*
- *The Telecommunications Act of 1996* [96]

There are many legislative acts dealing with the accessibility and adaptability issues. However universal design differs from those with its capability of addressing everyone's need. The American Barriers Act of 1968 is related with the removal of barriers in the physical environment. The Education for Handicapped Children Act of 1975 provides physical accessibility guidelines for children with disabilities. The Fair Housing Amendments Act of 1988 is concerned with the non-discrimination efforts while renting and selling the dwellings.[97]

These acts and other efforts before the emergence of the universal design approach deal only with specific accessibility problems. With these efforts a minimum part of the disability problems and accessibility issues can be achieved. Since they offer specialized design solutions, they can lead to a sense of separation. On the other hand, as mentioned before, in universal design 'separate is not equal'. Furthermore, these legislative acts do not refer to aesthetic aspects of products and the built environments. Architects and designers then avoid including disabled people's needs into the design processes. Universal design, on the other hand, combines aesthetic and

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[96] Molly Follete Story, James L. Mueller and Ronald L. Mace, *The Universal Design File: Designing for People of All Ages and Abilities*, (North Carolina: North Carolina State University Press, 1998) 8-9. Retrivied January 2, 2004 from (www.ncsu.edu/cud)

[97] The legislative acts are mentioned in detail in Sami Muhammad Al-Tal, Integrated Universal Design: A solution for Everyone, Diss, The Union Institute, UMI, 2001. AAT 3048027 4-6.

functional requirements together. For James Muller, "successful design for human use is a creative compromise between utility and aesthetic, between engineering and art".[98]

In this context, Patricia A. Moore explains the emergence of universal design as follows: "when architect Ronald Mace, himself a wheelchair user as a result of having contracted polio as a child, first highlighted the need for universal design, a new movement in architecture was born".[99] Since then it has become a widely accepted design approach that is also known as 'inclusive design' and 'design for all'. The movement from barrier -free design and other legislations to universal design is explained also by the Center for Universal Design:

> *As architects began to wrestle with the implementation of standards it became apparent that segregated accessible features were 'special', more expensive and usually ugly. It also became apparent that many of the changes needed to accommodate people with disabilities actually benefited everyone. Recognition that many features could be commonly provided and thus less expensive, unlabeled, attractive, and even marketable, laid the foundation for the universal design movement.*[100]

As it becomes difficult for architects to struggle with accessibility standards to accommodate people with special needs, there is an awareness of the need for a more inclusive design approach. The Center explains:

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[98] James Muller, "The Case of Universal Design: If you can't use it, it is just art," *Ageing International*, March 1995, 19 cited in Sami Muhammad Al-Tal, Integrated Universal Design: A solution for Everyone, Diss, The Union Institute, UMI, 2001. AAT 3048027 13.
[99] Patricia A. Moore, "Experiencing Universal Design," edited b y Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 2.4.
[100] Story, Mueller and Mace, *The Universal Design File: Designing for People of All Ages and Abilities*, 1998, p. 10.

At the end of the 20th century, the world is very different than 100 years ago. People are living longer and surviving better. Potential consumers of design who may be functionally limited by age or disability are increasing at a dramatic rate. These populations are no longer an insignificant or silent minority.[101]

In the 21st century, all over the world, there is an increase of aging population and people with disabilities. Therefore, rather than providing separate design solution for people with disabilities and special needs, universal design aims to meet the diverse needs of all people. If the built environment is usable for people with disabilities, then it is expected to be usable for everyone. It is important to meet conflicting needs of different disability types. Universal design with its principles and guidelines aims to expand the meaning of adaptable and accessible design solutions for a wider spectrum of users.

3.2.1 The Development of the Universal Design Principles

In May 22, 1995, architects, planners, designers, environmental researchers in the Center developed 10 guidelines of universal design. Molly Follette Story, one of the advocates of universal design, explains the development of the principles as follows:

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[101] *The Center for Universal Design*, "Background and History," NC State University, Retrieved, September 23, 2003 from (www.design.ncsu.edu./cud/univ_design/ udhistory.htm)

From 1994 to 1997, the Center for Universal Design conducted a research and demonstration project funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR). The project was titled Studies to further Development of Universal Design. One of the activities of the project was to develop a set of universal design guidelines.[102]

What is intended with the first version of the guidelines is only related with the usability issues for variety of users. These 10 guidelines are described in the *Universal Design Handbook* as follows:

- *Simple Operation*
- *Intuitive Operation*
- *Redundant Feedback*
- *Gradual Level Changes*
- *Space for Approach and Movement*
- *Low Physical Demand*
- *Comfortable Reach Range*
- *Minimization and Tolerance for Error*
- *Alternate Methods of Use*
- *Perceptible Information*[103]

Later, this list of 10 guidelines was changed into the 6 principles of universal design. For Story, "the tone of the document had changed from a list of attributes to commands".[104] These 6 principles are:

- *Make it easy to understand*
- *Make it easy to operate*
- *Communicate with the user*

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[102] Molly Follette Story, "Principles of Universal Design," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 10.4.
The project team on universal design composed of Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, and Greg Vanderheiden.
[103] Ibid, p. 10.5.
[104] Ibid, p. 10.5.

-Design for user error
- Accommodate a range of methods of use
- Allow space for access[105]

The project team on universal design in the third draft of the principles dealt with the inclusion of the equality concept. As the initial definition of universal design gives importance to the non-discrimination of any type of users, the concept of equitable use was defined as the first principle of universal design in the third draft. Later, the principles of universal design took their final form, called 2.0 versions, and were published as a set of seven principles with their guidelines. The Center stated that 'the principles reflect the authors' belief that the basic universal design principles apply to all design disciplines, including environments, products and communications".[106]

3.2.2 The Seven Principles of Universal Design and Their Architectural Interpretations

In April 1997, the Center for Universal Design introduced the seven principles of universal design in order to articulate the universal design concept in a comprehensive way. For Story, 'The principles are intended to guide the design process, allow the systematic evaluation of designs, and assist in educating both designers, *architects, urban planners* and consumers about the

[105] Ibid, pp. 10.5-10.6.
[106] Ibid, p. 10.6.

characteristic of more usable design solutions".[107] The Center introduced each of the seven principles with a brief description and with its guidelines describing the key elements of the principle. The seven principles are as follows:

Principle 1: Equitable Use.
Principle 2: Flexibility in Use.
Principle 3: Simple and Intuitive Use.
Principle 4: Perceptible Information.
Principle 5: Tolerance for Error.
Principle 6: Low Physical Effort.
Principle 7: Size and space for approach and use.[108]

Principle 1: Equitable Use.

The design is useful and marketable to people with diverse abilities.
Guidelines:
1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.
1b. Avoid segregating or stigmatizing any users.
1c. Provisions for privacy, security, and safety should be equally available to all users.
1d. Make the design appealing to all users.[109]

Universal Design provides usability for everyone (Figure 3.1). It eliminates discrimination by design. Universal design features are capable to accommodate all types of users, with or without disability. People of all ages, abilities and sizes have equal access to the buildings and urban places. Both the architectural features and urban elements are usable, accessible, visitable and attractive for everyone. It is important to ensure equal safety and privacy for all

[107] Ibid, p. 10.6.
[108] Ibid, pp. 10.1-10.10.
[109] *The Center for Universal Design*, "Principles of Universal Design," NC State University, Retrieved, September 23, 2003 from (www.design.ncsu.edu./cud/univ_design/udprinciples.htm)

people. For Mayor's Office for People with Disabilities and Department of Design and Communication, 'ideally, the means by which people use the buildings should be the same (e.g., works well for everyone)".[110] Universal design in all indoor and outdoor spaces provides equal accessibility in circulation patterns and pedestrian flow rather than specialized solutions for only disabled people.

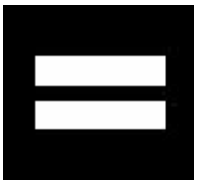

Figure 3.1. The symbol of 'Equitable Use'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 21. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 2: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities

Guidelines:

2a. Provide choice in methods of use.

2b. Accommodate right- or left-handed access and use.

2c. Facilitate the user' s accuracy and precision.

2d. Provide adaptability to the user' s pace.[111]

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[110] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 21. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

[111] *The Center for Universal Design*, 'Principles of Universal Design," Retrieved, September 23, 2003 from (www.design.ncsu.edu./cud/univ_design/udprinciples.htm)

Universal design provides the possibility of responding to the diverse needs of all users (Figure 3.2). Architectural design features, which are universally designed, allow users to choose the appropriate feature. Safety, stability and accuracy can be achieved through the universally designed urban environments. It allows adaptability for the unexpected spatial conditions and for the changing requirements of the users over time. With the universal design approach, the movement patterns and circulation networks within the buildings are flexible enough to accommodate all type of users.

Figure 3.2. The symbol of 'Flexibility in Use'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 22. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 3: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user' s experience, knowledge, language skills, or current concentration level.
Guidelines:
3.a Eliminate unnecessary complexity.
3.b Be consistent with user expectations and intuition.
3.c Accommodate a wide range of literacy and language skills.
3.d Arrange information consistent with its importance.
3.e Provide effective prompting and feedback during and after task completion. [112]

[112] Ibid.

Simplicity is an important concern while creating the built environments (Figure 3.3). Universal design is capable to define the functions clearly. The spatial layout of a building or circulation patterns in buildings should be simple enough so that all types of users can easily access to all spaces. While designing the built environments, the simple and intuitive design solutions become essential at any scale.

Figure 3.3. The symbol of 'Simple and Intuitive Use'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 22. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 4: Perceptible Information

> *The design communicates necessary information effectively to the user, regardless of ambient conditions or the user' s sensory abilities.*
>
> *Guidelines:*
>
> *4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.*
>
> *4b. Provide adequate contrast between essential information and its surroundings.*
>
> *4c. Maximize "legibility" of essential information.*
>
> *4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).*
>
> *4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.* [113]

Universal design demands that a design work should provide the necessary information for all type of users (Figure 3.4). With universal design, it

[113] Ibid.

is possible to design the built environments which are capable to guide the users to the intended directions. Universally designed mobility patterns and circulation networks can also communicate with the users and provide essential information to locate them easily in the built environments. Furthermore, such as color differences, tactile elements, visual and sensory equipments can be also considered as important architectural elements while designing spaces for all people with different abilities.

Figure 3.4. The symbol of 'Perceptible Information'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 23. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 5: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:
5a Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
5b Provide warnings of hazards and errors.
5c Provide fail safe features.
5d Discourage unconscious action in tasks that require vigilance. [114]

[114] Ibid.

Universally designed architectural elements can reduce the risk of unintended actions (Figure 3.5). With the universal design approach, it is possible to create spatial arrangements that can minimize hazards. Universal design can also help to create safety in the built environments and ensure that all spaces are designed in a safe way. Universally designed architectural features can direct all pedestrians into the safe circulation networks. Hazardous design elements can be avoided by providing tolerance of error.

Figure 3.5. The symbol of 'Tolerance for Error'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 23. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 6: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.
Guidelines:
6.a Allow user to maintain a neutral body position.
6.b Use reasonable operating forces.
6.c Minimize repetitive actions.
6.d Minimize sustained physical effort. [115]

Universal design can meet the changing needs of all users varying with age, disability, the environment and circumstances, by employing architectural

[115] Ibid.

design features which require low physical effort (Figure 3.6). Universal design is capable to answer the requirements of all ages. It can provide the possibility for responding to the requirements and disabilities both of the childhood and of the elderly. The resting platforms, the ramps in level changes can provide the users access to the desired space with low physical effort.

Figure 3.6. The symbol of 'Low Physical Effort'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 24. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 7: Size and space for approach and use

> *Appropriate size and space is provided for approach, reach, manipulation, and use, regardless of the user' s body size, posture, or mobility.*
> *Guidelines:*
> *7.a Provide a clear line of sight to important elements for any seated or standing user.*
> *7.b Make reach to all components comfortable for any seated or standing user.*
> *7.c Accommodate variations in hand and grip size.*
> *7.d Provide adequate space for the use of assistive devices or personal assistance .*[116]

This principle is explained that "a building's design f eatures should provide an adequate amount of space that is appropriately arranged to enable anyone to use them".[117] Universal design can accommodate people with

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[116] Ibid.
[117] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, 2001, p. 24.

different body sizes (Figure 3.7). It can accommodate the required dimensions and appropriate sizes both in buildings and urban spaces so that the universally designed spaces can serve for everyone. Before introducing universally designed educational settings and the universal city, it is important to explain the significance of this integrated approach and discuss what separates universal design and its seven principles from the other accessibility terms and attempts.

Figure 3.7. The symbol 'Size and space for approach and use'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 24. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

3.3 The Significance of Universal Design and Its Prospects in the Contemporary World

> *Although there are other terms that are frequently used, such as life span design and transgenerational design, Mullick and Steinfeld (1997) explained that what separates universal design from these terms is universal design's focus on social inclusion. This relates to the 'separate is not equal' precedent of equal opportunity.* [118]

Different from the other accessibility attempts and their related design approaches, the universal design approach takes into account the equality of all users, their changing demands throughout the entire lifespan and their

[118] Ostroff, "Universal Design: The new Paradigm,"2001, p. 1.5.

involvement into the design process. The Center for Universal Design states that "universal design is the best way to integrate access for everyone into any effort to serve people well in any field".[119] In this context, The American Society of Architects (ASLA) explains the distinguishing aspect of universal design as follows:

> *Universal design differs from accessible design in that it is inclusive rather than exclusive and provides for designs that accommodate the full range of physical limitations as well as the able bodied; integrates the accommodation of the disabled within the basic design concept of the facility; and avoids special places based on abilities.*[120]

In recent years, design approaches that address a wide range of people and abilities have become significant. The tendency toward this kind of design approaches attests the importance of the human rights and the inclusion of all ages, cultures and differences in the contemporary world. Universal design is based on the idea of human rights: "the concept that human beings whatever their natural or accidental specificities might be, should be treated, and treat other human beings, in a way that protects human dignity".[121] Leslie Kanes Weisman discusses the universal design approach in the 20th Anniversary Celebration of Adaptive Environments. In her article "Creating Justice,

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[119] Story, Mueller and Mace, *The Universal Design File: Designing for People of All Ages and Abilities,* 1998, p. 127.

[120] *American Society of Landscape Architects*, "Universal Design (1986, R1994, R2000, R2001)", Retrieved, March7, 2004 from (www.asla.org)

[121] Ioanna Kuçuradi, "Human Rights," Public Lecture, Metu Faculty of Architecture in Ankara. 12 December 2003**,** Cited In Ioanna Kuçuradi , "A sine qua non for the effective implementation of Human Right," Retrieved December 5, 2003 from (http://www.unesco.org/opi2/human-rights/Pages/English/KucuradiE.html)

Sustaining Life: The Role of Universal Design in the 21st Century", she mentions universal design's promise of social integration under three issues:

> *First, universal design reminds us that there is no separation between mind and body, and between people and their environments.*
>
> *Second, universal design recognizes that there is no separation between human health, environmental health and social justice.*
>
> *Third, universal design upholds the demographic ideals of social equality and personal empowerment because universal designers strive to create products and spatial environments that are designed to provide the to provide same level of comfort, accessibility and assistance to multiple users and multiple publics.*[122]

In this respect, equality and non-discrimination are key terms. 'The Charter of Fundamental Rights of the European Union" highlights these two terms in the article 21 titled non-discrimination. It is stipulated that "any discrimination based on any ground such as sex, race, color, ethic or social origin generic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, age, or sexual orientation shall be prohibited".[123] Accommodating individual differences and eliminating discrimination in the design processes are the main issues of universal design. The Center for Universal Design explains the inclusive character of universal design by emphasizing that ". . . being human means that there is no one-model individual whose characteristics remain static through their life time. Universal design embodies this inclusive spirit".[124]

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[122] Leslie Kanes Weisman, "Creating Justice, Sustaining Life: The Role of Universal in the 21st Century," Retrieved December 19, 2003 from (www.adaptenv.org/examples/ article2.php)

[123] Charter of Fundamental Rights of the European Union (2000/C 364/01) EN 18.12.2000, "Article21: Non-discrimination," Official Journal of the European Communities, 13. Retrieved October 10, 2003 from (www.europarl.eu.int/charter/pdf/text_en.pdf)

[124] *Affordable and Universal Homes: A Plan Book*, (Raleigh, NC: Center for Universal Design, 2000) vii.

Universal design extends beyond the boundaries of other design approaches by considering the problems of all ages, abilities and sizes. It is stated that "by designing for a diverse population, universal design integrates usability for everyone in their work on a routine basis. This approach leads to greater inclusion for many groups often reflected in the design process (e.g., children, the elderly, people of small stature, frail people, etc.)". [125]

Today, there is an increasing awareness of universal design in many countries around the world. There are exemplary design projects, related proceedings, established centers and associations for universal design and various attempts for the integration of universal design in many countries considering its role in the 21st century.[126] There are numerous studies that aim to improve universal design. In this respect, it is important to relate what is going on today with the universal design approach. Since universal design is a developing concept, it needs to update its definitions. Kenneth J. Parker explains in the proceedings "Inclusion by Design" that "universal design is a concept of the 1990's and it should regularly update its definitions and intentions in order to stay relevant to the present and future needs of society". [127]

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[125] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, 2001, p. 1.

[126] The related links and addresses of Universal Design Research and Development Organizations can be found in detail in the Appendix Resource List of Molly Follete Story, James L. Mueller and Ronald L. Mace, *The Universal Design File: Designing for People of All Ages and Abilities*, (North Carolina: North Carolina State University Press, 1998) A-32-37. Retrivied January 2, 2004 from (www.ncsu.edu/cud)

[127] Kenneth J. Parker, "From Universal to Inclusive Design," Proceedings, June 1-5, 2001: Inclusion by Design, Montreal: Canada, 2001. Retrivied March 7, 2004 from (www.inclusionbydesign.com/worldcongress/proceeding.htm)

The international conference "Easy Access - a city for all" in Kristiansand, Norway in 2003 was held in order to discuss the universal design in the built environment. The accessibility attempts in Nordic countries and creation of a city for all were the main concerns of the conference. In Luxemburg, 2003 experts set up by the European Commission introduced a report "Making Europe Accessible For All by 2010" and mentioned the importance of universal design and they promoted certain accessibility issues in order to make Europe accessible for all. Aaotulis project 2001-2003 is one of these international attempts to introduce universal design with innovative teaching methods in many countries and it is cofounded by the European Union.

In light of these discussions, it deserves to highlight Kennig and Ryhl's statement: "worldwide there is an increasing as well as understanding of universal design, and an increasing number of people actively try to impart constructive and qualitative design solutions, either based on their professional background or their personal experience".[128] Hence, the universal design features in a built environment can reduce physical, social and attitudinal barriers. With universal design, the built environment becomes available and usable for everyone. The diverse and changing human abilities, such as cognition, vision, hearing, mobility and speech etc., at different stages of life can be accommodated through an inclusive design approach.

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[128] B. Kennig and C. Ryhl, "Teaching Universal Design: Global Examples and Models for Teaching in Universal Design at Schools of Design and Architecture," Retrieved September 18, 2003 from (http://anlh.be/aaoutils/)

3.4 Universally Designed Built Environments

This study points to the importance of universal design in the built environments in order to develop an inclusive design approach that helps to create accessible, affordable and adjustable urban environments. Michael Davis highlights this issue in his article "Universal Access in Education and Training- Issues and Strategies in Developing Countries" which is presented in the proceedings *Inclusion by Design* in Montreal, 2001. He mentions, "We cannot achieve the goals of universal access in the physical environment without first gaining universal access to the minds of the community itself". [129]

Universal Design can be applied to all spaces and to any scale. There are examples of universal design implantations in residential environments, in educational settings, in transportation areas, in health environments and in other recreational facilities. For Fred Tepfer, who supports the importance of universal design in educational environments, "schools, colleges, and universities are ideal environments for fostering universal design. Compared to other types of uses, education has the most extensive experience with the broadest range of diverse needs". [130]

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[129] Michael Davis, "Universal Access in Education and Training - Issues and Strategies in Developing Countries," *Proceedings, June 1-5, 2001: İnclusion by Design*, Montreal: Canada, 2001. Retrivied March 7, 2004 from (www.inclusionbydesign.com/worldcongress/proceeding.htm)

[130] Fred Tepfer, "Educational Environments: from Compliance to Inclusion," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 46.2.

In this context, it is essential to discuss the universal design approach in educational settings, because a universally designed educational setting can play a key role in terms of gaining knowledge of universal design and implementing its seven principles into the built environments. Creating a socially inclusive learning environment and its contribution within the boundaries of an accessible urban fabric are important. Both the physical accessibility features of the educational settings and their social inclusiveness can increase the consciousness of universal design and its implementations. As it was mentioned in Berlin Free University, a well-known example of mat-building, there is a close relationship between learning spaces and the urban fabric of a city. Wood stated this relationship as follows:

> *The city itself, which is the natural habitat of western man, is the school, college, university. We see the city as the total school, not the school as a micro-community. Places of teaching and learning, when they can be identified as such, are an integral part of the structure of the city.*[131]

Especially in universities, where there is a wide range of students with different abilities, ages and sizes, universal design becomes more important. Universal design in these educational settings means the removal of physical, social and attitudinal barriers. The spatial organization of the university building should go beyond the minimum requirements and an inclusive structure should be achieved to facilitate access equally for all students. Tepfer mentions the

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[131] Gabriel Feld, 'Shad's Idée Fixé: Berlin Free University and the Search for Principles of Organization," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 113.

significance of the inclusiveness in an educational building organization that "clear, 'imageable' building organization and floor plans are essential. Legible environments are often easier to move around in and much easier for blind people and those with cognitive or psychiatric disabilities to navigate".[132] It should be noted that providing age and ability appropriate materials, learning methods and information technologies are also important as well as the inclusiveness in the built environment. Educational settings should accommodate the needs of all students with a range of abilities. Especially in the 21st century, in which learning via Internet and through information technologies have made education available as many people as possible, universal design becomes more significant. In this context, providing flexibility and adaptability are important design considerations while creating universally designed educational settings. Tepfer states the importance of the flexibility as follows:

> *The most successful design solutions integrate the activities of all elements of the population while also providing choice and flexibility. The redundancy that may result is also an opportunity for a more richly varied design palette. For example, some individuals can not climb stairs. Others have trouble with ramps, but can manage stairs if proper handrails are provided. The best solution integrates both stairs and ramps into the design so that neither appears to be an afterthought.*[133]

Universal design in buildings should be also viewed from the point of universal design at the urban scale. It is important to locate a building type

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[132] Tepfer, "Educational Environments: from Compliance to Inclusion", 2001, p. 46.11.
[133] Ibid, p. 46.10.

successfully within the urban infrastructure. Its neighborhood context, the in-between spaces and its connection to the urban fabric should be universally designed so that it can provide the possibility of responding to the diverse user needs and their changing demands over time. In this respect, it is important to discuss the universally designed built environments and to study the adaptation of universal design at the urban scale.

A worldwide concern about the inaccessibility and social inequality of the cities brings forth the importance of the integration of universal design to design and renovate the urban environments ensuring the full social inclusion of all people. For Sandre Marley, 'if this universal design or inclu sive approach to design at the urban scale were adopted more widely, the effect would be streets that would be more liveable and enjoyable for everyone and more inclusive neighborhood and cities".[134] Universal design can create new urban fabrics and modify present urban areas to make them more socially inclusive, adaptable and affordable.

The definition of the universally designed city is also important to discuss universal design at the urban scale. This study addresses the adaptation of universal design and accessibility issues in cities through a close reading of the Mayor's Office for People with Disabilities and Department of Design and Communication's book *Universal Design New York*, in which the universal city is defined and the elements of the universal city are described as follows:

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[134] Sandre Marley, 'Creating an Accessible Public Realm," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 58.1.

> *A universal city is, by definition, a city of inclusion where everyone is welcome to participate and contribute. Whether addressing a general building issue (e.g., circulation) or a specific building type (e.g., sport facilities), universal design is a process by which inclusion is ensured for all.*[135]

In the book it is stated that there are five building issues (1.using circulation systems, 2.entering and exiting, 3.wayfinding, 4.obtaining product and services and 5.using public amenities) and six building types (1.cultural facilities, 2.public assembly and entertainment facilities, 3.participant spots and recreation facilities, 4.temporary lodging, 5.workplace facilities and 6.human service facilities).[136] If the principles of universal design are adopted in these building issues and types, then the creation of the universal city will be achieved by providing equality and usability for everyone. The important issue is the consistency of the elements of the city with universal design.

Weisman in her article "Creating the Universally Designed City: Prospects for the New Century" emphasizes universal design at the urban scale. She identifies the universally designed city for the future according to three criteria: "(1) establishing housing for all as a human right, (2) supporting environment and human health and (3) achieving safety and mobility in the public realm".[137] For her, human diversity and social equality are important concerns for creating universally designed cities. The implementations of

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[135] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, 2001, p. 25.
[136] Ibid, pp. 25-109.
[137] Leslie Kanes Weisman, "Creating the Universally Designed City: Prospects for the New Century," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 69.13.

universal design in the contemporary architecture and urbanism will be reemphasized and further evaluated while describing its correspondence with mat-building and mat-urbanism.

CHAPTER IV

THE CORRESPONDENCE BETWEEN MAT-BUILDING and UNIVERSAL DESIGN

Having discussed the theoretical frameworks within which the concepts of mat-building and universal design have unfolded, this part of the study questions the characteristics of the mat-building approach which can help to create inclusive built environments. It develops a conceptual framework for exploring the possibility of mat-building's integration with the universal design approach. It highlights the importance of an investigation for appropriate formal organizations or spatial configurations to implement the seven principles of universal design more comprehensively.

It should be noted that this study doesn't aim to evaluate the exemplary mat like configurations as the best design solutions that fulfill the requirements of universal design. Rather, it tries to reveal the correspondence between the two concepts and to decipher the potential of mat-building in implementing the principles of universal design. In this context, this study aims to contribute

to the further elaboration of a design strategy, integrating it with the universal design approach. Rather than addressing the proposed or built examples of universal design, this study depicts a design strategy to improve universal design practice at the urban scale and to guide architects and urban planners.

In the first section, the potential of mat-building for the implementation of universal design are deciphered. The relation between the attempts for humanizing architecture and mat-building is brought into discussion. The discussion focuses on how mat-building responds to the relationship between the social issues and the physical environment. Then, the juxtaposition of the two approaches' principles is introduced. The characteristics of mat-building are related to the principles of universal design. The aim is to demonstrate how mat-building as a design strategy can meet the requirements of universal design. Each of the mat-building's characteristics is discussed in light of the seven principles of universal design. Analytical diagrams are formulated in relation to the elaboration of each characteristic of mat-building together with the appropriate principle of universal design. The final section includes the concluding remarks on this juxtaposition.

4.1 Mat-building As a Humanistic Design Approach

It is possible to perceive an overlap between mat-building and universal design. Although mat-building's characteristics cannot correspond to all of the principles of universal design and they have not yet been developed from the

point of universal design, there exist significant similarities and intersections between their principles (Figure 4.1). 1960's concept of mat-building can be considered and evaluated in light of the principles of universal design. In this context, this part of the study tries to explore and analyze their overlapping aspects in order to integrate universal design principles into practice in the fields of architecture and urbanism.

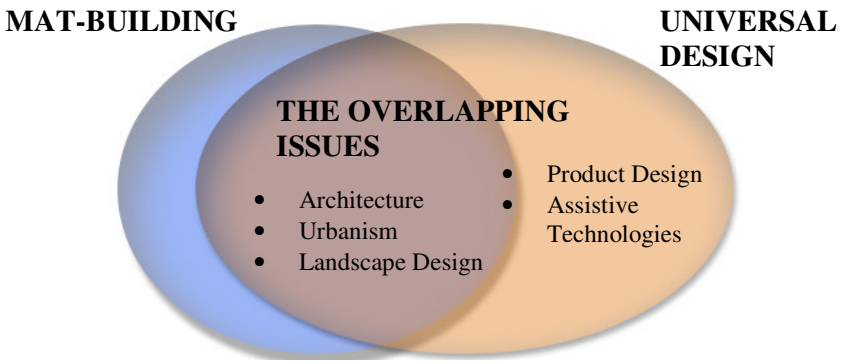

Figure 4.1. The overlapping aspects of the two concepts' principles. Yasemin Eren, 2004.

Beginning from its first formulation by the Smithsons, mat-building gives prominence to a more human architecture. Mat-like configurations are capable of sustaining social interaction and of accommodating human activity. As explained in detail in Chapter II, unlike modern town planning ideas of CIAM, mat-building promised to humanize architecture. Team 10 aimed at generating social interaction in architecture and urbanism by means of mat like organizations.

Berlin Free University by Woods, Candilis, Josic and Schieldhelm is an important built example of mat-building as an attempt to humanize

architecture. Beginning from the planning phase, the university as a whole was designed by giving prominence to social issues. Wood stated that

> *. . . rather than being concerned with the distinct categories of 'architecture' or 'town planning', architects should address the 'creation of environment at every scale' because, irrespective of scale, what mattered was 'human association'- the actions of people- rather than abstract configurations of space.*[138]

The architects tried to achieve a realm of social interaction within the university through the internal streets, courtyards and the overall circulation pattern of the complex (Figure 4.2). Spaces were articulated in a way to allow the building to respond to the changing requirements of its users and to sustain social events over time. The building's spatial structure associated with the social issues is not only historically significant, but can also be highly relevant today for discussing the social inclusion of all people, regardless of age, size and ability within the context of mat-building and mat-urbanism.

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[138] Tzonis and Lefaivre, "Beyond Monuments, Beyond Zip-a-tone, Into Space/Time," 1999, p. 133.

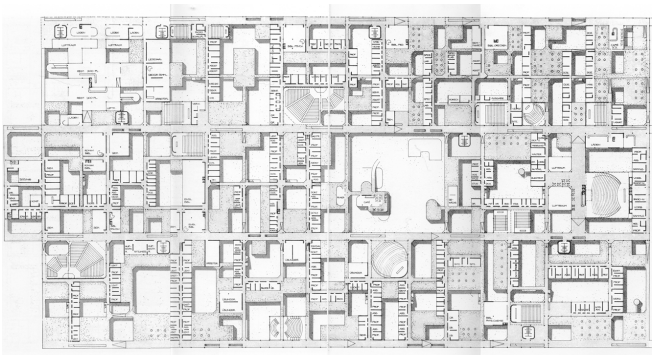

Figure 4.2. 'Berlin Free University, upper level plan showing the relationship between courtyards and internal streets". In George Wagner, "Looking Back Towards the Free University, Berlin," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 29.

In the history of mat-building, the design efforts in England and Netherlands give a particular emphasis also on the relationship between physical form and social interaction. For instance, Hertzberger made important contributions to Dutch architecture and urbanism by developing socially responsive built environments. For Hertzberger, "the spatial organization may serve to stimulate social interaction and cohesion" [139] (Figure 4.3). He tried to design built environments for a more human architecture and urbanism: "the form of the space itself must offer the opportunities . . . for the users to fill in the spaces according to their personal needs and desires". [140] A variety of mat-building examples was developed by Dutch architects who aimed at incorporating social issues into the design processes.

[139] Hertzberger, *Lessons for Students in Architecture*, 2001, p. 63.
[140] Ibid, p. 25.

Figure 4.3. Lima Housing by Hertzberger, 1984-89, pedestrian routes, internal courtyards are important in terms of social interaction. In Herman Hertzberger, *Lessons for Students in Architecture*, fourth revised edition (Rotterdam: 010 Publishers, 2001) 42.

Cedric Price, one of the members of the Archigram group, developed projects for changing physical and social needs in architecture and urbanism. Royston Landau remarks that "Price's view of architecture has a deeply e thical dimensions, at the center of which is the effect an architecture may have upon its occupants or observers. He has often stated that architecture can too easily become constricting and damaging for those who use it (socially, psychologically or even physically)".[141]

It is also possible to refer to Price's design concepts and projects corresponding to the requirements and definitions of the mat-building approach. Considering adaptability, flexibility and changeability in architecture and urbanism, the term 'indeterminacy in design' has a significant place in both mat- building and in the work of Price. Price in his projects aimed to

[141] Cedric Price, *The Square Book*, (London, Wiley Academy: 2003) 11.

develop an indeterminate and socially responsive architecture. His unbuilt project Potteries Thinkbelt in 1966 has a significant place among the projects that reveal his search for a responsive, anticipatory and adaptable architecture. [142] It responds to the varying needs and desires of the individuals and of the society (Figure 4.4). Stanley Mathews in his PhD thesis titled "An architecture for the new Britain: The social vision of Cedric Price' s Fun Palace and Potteries Thinkbelt", relates that:

> *Price proposed utilizing the derelict railway network of the vast Potteries district as the basic infrastructure for a new technical "school." Mobile classroom, laboratory and residential modules would be placed on the disused railway lines and shunted around the region, to be grouped and assembled as required by current needs, and then moved and regrouped as those needs changed. Modular housing and administrative units would be assembled at various fixed points along the rail lines.*[143]

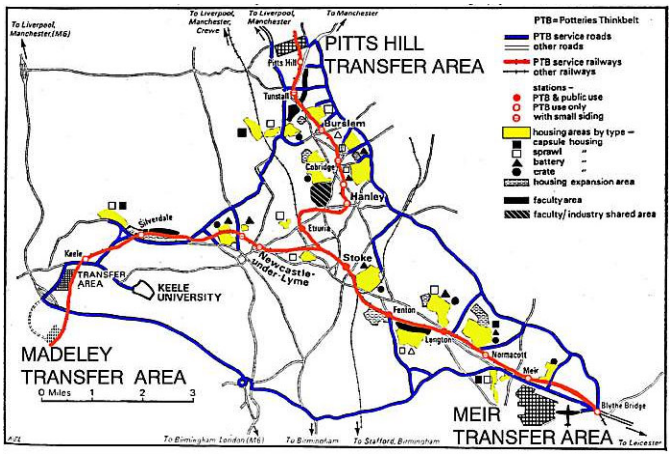

Figure 4.4. Potteries Thinkbelt Plan, 1965. In Retrieved January 29, 2004 from (http://www.thepotteries.org/maps/index.htm)

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[142] Stanley Mathews, "An architecture for the new Britain: The social vision of Cedric Price' s Fun Palace and Potteries Thinkbelt," Diss, Columbia University, UMI, 2003. AAT 3074308 325.

[143] Stanley Mathews, "Potteries Thinkbelt: an architecture of calculated uncertainty," Retrieved January 29, 2004 from www.people.hws.edu/mathews/potteries thinkbelt.htm.

This project by Price renders it possible to understand how the changing needs and uses could be answered within a dispersed architectural field through flexibility, adaptability, fluidity and change of the plug-in features (Figure 4.5). Mathews states that the 'plug-in' features of the Potteries Thinkbelt are motivated by Price' s profound understanding of the impossibility of determined programming within unstable socio-economic conditions, and of the potential of calculated uncertainty in post-industrial society".[144] For Mathews, the non-fixed layout of the Thinkbelt can adapt easily to the rapidly changing needs of education. For Price, 'flexibility in the construction and deconstruction of enclosures is alone insufficient to achieve the degree of immediacy of change required".[145]

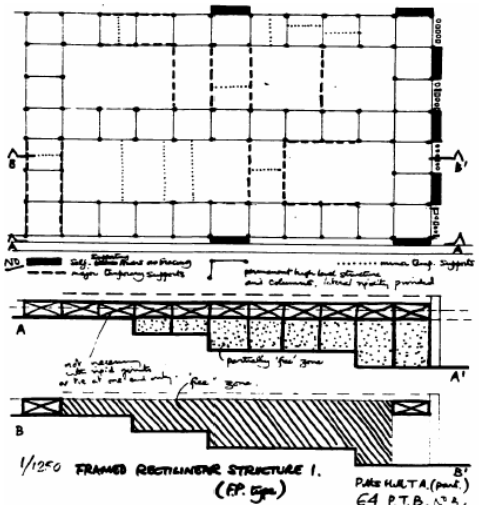

Figure 4.5. Pits Hill Transfer Area, Preliminary Plan and Section, open framework with the plug-in modules. In Stanley Mathews, "An architecture for the new Britain: The social vision of Cedric Price' s Fun Palace and Potteries Thinkbelt," Diss, Columbia University, UMI, 2003. AAT 3074308 390.

[144] Ibid.
[145] Price, *The Square Book*, 2003, p. 56.

Mat-buildings have also important spatial characteristics, through which they allow to create adaptable, flexible and changeable urban environments. Mat patterns in urban environments are capable of responding to the changing needs of users over time and to the future requirements of an architectural program. Mat-buildings' capability for plug-in features is an important characteristic to ensure the implementation of universal design and its principles. Although these features make both structural and infrastructural elements flexible, adaptable or changeable in relation to the unintended actions and unexpected design conditions over time, for universal design flexibility and adaptability alone are not sufficient. From the point of universal design, what is important with these plug-in features is their equitable and easy use for all people. If adaptability, changeability and flexibility of the structures can be achieved by low physical effort regardless of user experience, age, size and ability, then it is possible to ensure equally accessible and usable built environments.

In this context, these discussions are also important in order to reveal the fact that despite the emphasis on social issues and human association in some 1960s' mat-building projects; they cannot fulfill the requirements of universal design and its seven principles. As an example, flexibility in some mat-building projects in 1960s and 1970s provide only a provisional framework that can be changed and adjusted according to the users' demands without considering the equitable use and low physical effort. Hertzberger in

Diagoon Dwellings (8 Experimental Houses in Delft 1967-70) formulated such a design approach. He explains these dwellings as follows:

> *The plan is, to some extent, indefinitive, so that the occupants themselves will be able to decide how to divide their living space- where they want to sleep, where to eat and so on. If the family circumstances change, the dwelling can be adjusted accordingly to meet the needs, and even to some extent enlarged, the actual design should be seen as a provisional framework that must still be filled in.*[146]

On the other hand, flexibility in universal design means everyone's equal access and use of spaces. Regardless of age and ability everyone should be capable of making changes and adaptations easily. To this extent, this study aims to bring clarity to different applications of such notions. Therefore, it aims not only to propose a design strategy, but also tries to analyze and interpret each characteristic of mat-building according to the requirements of universal design. This juxtaposition of mat-building characteristics with the principles of universal design is essential to understand why mat-building as a design strategy can be integrated with universal design.

4.2 Five Characteristics of Mat-building in light of the Seven Principles of Universal Design

It is intended to reveal mat-building's capability of ensuring spaces that can be used, experienced and adjusted easily and equally by everyone. In this

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[146] Hertzberger, *Lessons for Students in Architecture*, 2001, p. 157.

respect, the integration of mat-building with universal design can increase the possibility of the creation of universally designed built environments. As Edward Steinfeld mentions universal design's capability of "promoting the flexibility, adaptability and interchangeability of fittings and fixtures to ensure an adaptable environment, one that can be easily adjusted to meet the needs of any person", it is also possible to mention mat-buildings' capabilities of creating adaptable, changeable and flexible physical environments.[147]

It should be noted that the juxtaposition of the principles of universal design and the characteristics of mat-building doesn't mean that there is a one to one correspondence between them. Under each characteristic, the more related universal design principles are selected and introduced. The juxtaposition of the principles of universal design and the characteristics of mat-building are interpreted through the images and analytical diagrams done by the author. They can help to clarify the content of the concepts of mat-building and universal design.

What is intended with this superimposition is to establish a comparative context for the argument on the adaptability of mat-building as a design strategy to the universal design approach. Second is to reveal the fact that today's exemplary universal design projects cited in research papers and other publications are insufficient for guiding architects and planners for the implementation of the universal design principles. They are hardly focusing on planning and urban design issues. In this respect, this study also criticizes the

[147] Imrie and Hall, *Inclusive design: designing and developing accessible environments*, 2001, p. 16.

images of the built environments associated with the universal design approach in terms of their potential for achieving universal design practice in the contemporary architecture and urbanism.

4.2.1 Mat-building's shallow but dense section activated by ramps and double- height voids

Principle 1: Equitable Use.

The low-rise character of mat-building enables to accommodate a large number of users. Unlike the high-rise buildings, mat-building's low-rise character takes the advantage of an equally accessible circulation network (Figure 4.6). It can organize activities in one or two stories height so that it minimizes vertical movements. Ramps in the mat-building approach are integrated with the design. When their dimensions and details are reconsidered taking into account the related codes of accessibility and universal design, they become appropriate for all (Figure 4.7). Thus with the integration of the two concepts, it is aimed equitable use of the built environments for all people, regardless of their disabilities. The Norwegian State Council on Disability mentions the importance of designing the built environment with equal possibilities. It states as follows:

> *Specialized solutions for particular user groups should be avoided; the normal solutions should be usable by all. The main access, entrance and the building's internal circulation system should be designed to allow all*

groups to use the ordinary solution. If this is not possible, an alternative without steps should be integrated as an equal part of the normal solutions.[148]

As it can be observed in the diagrams, the use of the universally designed ramps can provide equally access for users (Figure 4.8 and Figure 4.9). Beginning from the first stage of the design process, the integration of a universally designed ramp minimizes the need for specialized design solutions. Thus without segregation of any user, all people can explore and experience the whole space equally. Mat-building with its low-rise character and its ramps can be offered to equitable use.

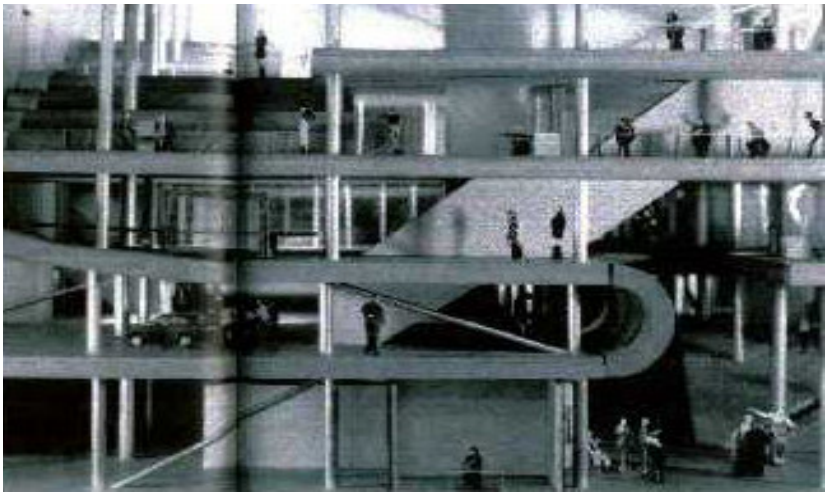

Figure 4.6. Mat-building Example: Villa VPRO by MVDRV, 1993-97. The dense section and the ramp allow access within the building. In Retrieved March 15, 2004 from http://www.fb.ze.tu-muenchen.de/tutzing/villa.jpg

[148] Finn Aslaksen, Steinar Bergh, Olav Rand Bringa and Edel Kristin Heggem, "Universal Design Planning and Design for All," The Norwegian State Council on Disability, Retrieved March 23, 2004 from (http://home.online.no/~bringa/universal.htm)

Figure 4.7. Universal Design Example: 'The ramp system is integrated into the building's circulation system and allows people to view exhibits from above. Everyone uses this ramp to go from one area to another". In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 34. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

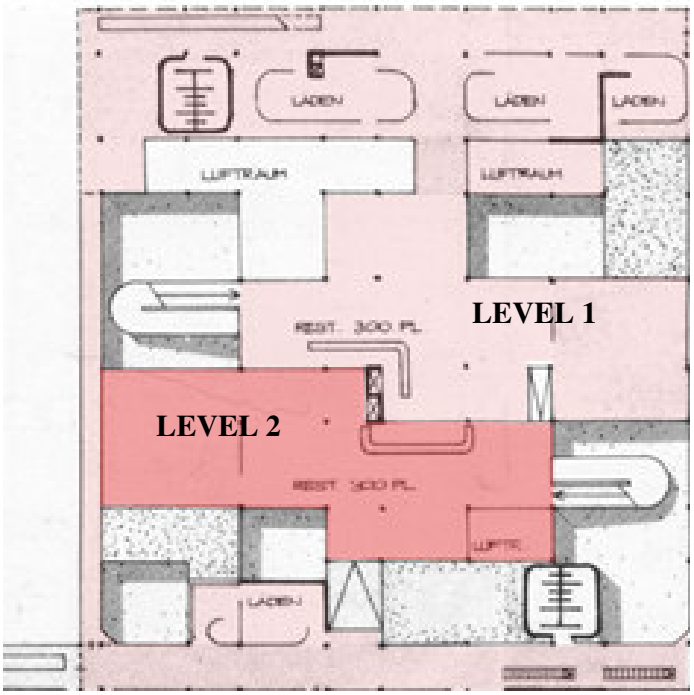

Figure 4.8. Equitable Use in the Mat-building Approach: A close up view of Berlin Free University's upper level plan for showing the integration of the ramps within the structure. Eren, 2004

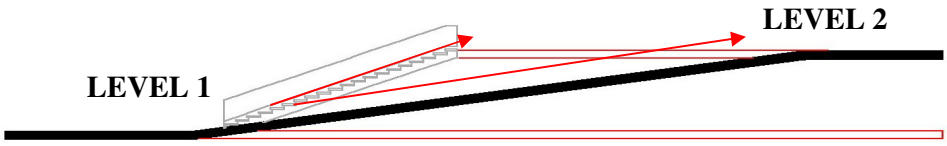

Figure 4.9. Equitable Use in the Mat-building Approach: The use of the ramp near the stairs for providing equal access. Eren, 2004.

Principle 2: Flexibility in Use

Flexible design features have an important place in the universal design approach. Spaces that fulfill universal design criteria can be easily adapted to the differing needs and requirements of the users. The use of the mat-building approach gives the possibility of flexible design features so that the buildings and urban fabrics can be structured in such an inclusive way which can provide different choices of access for its users. The achieved flexibility in a mat-building example, Villa VPRO by MVDRV, is explained by Allen as follows: 'The resultant topological organization creates a series of surfaces that can be appropriated and modified by the office workers. Working within the limits of available structure, the inhabitants deploy a kind of collective intelligence to refigure the space of their own building"[149] (Figure 4.10).

Unlike the high-rise buildings, the low-rise character of mat-buildings can accommodate flexible movement patterns, flexible circulation networks and choices of access which are important in the universal design approach, while responding to the diverse users needs (Figure 4.11). Mat-buildings with one to two-stories height can also allow the use of highly flexible structures.

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[149] Stan Allen, 'Mat Urbanism: The Thick 2-D," 2001, p. 120.

Katsura Villa in Kyoto is an important early mat-building example. Through the use of the sliding doors and movable partitions within its two story height, the spaces in this residential environment have the possibility of accommodating diverse needs of users (Figure 4.12). If these sliding doors and movable partitions are reconsidered in light of the dimensions and standards of universal design, then it is possible to ensure flexibility in use for all. The integration of mat-building with the universal design approach makes it possible to develop flexible design solutions that can accommodate everyone's needs and preferences (Figure 4.13).

Figure 4.10. Mat-building Example: Villa VPRO by MVDRV, 1993-97. In Retrieved February 10, 2004 from (http://www.architectuur.org/images/mvrdv02_1k.jpg)

Figure 4.11. Universal Design Example: "An adjacent ramp and stairs provide choice of access to building". In European Concept for Accessibility, Technical Assistance Manual 2003, EuCAN Members 2003, In Retrieved June 7, 2003 from http://www.eca.lu

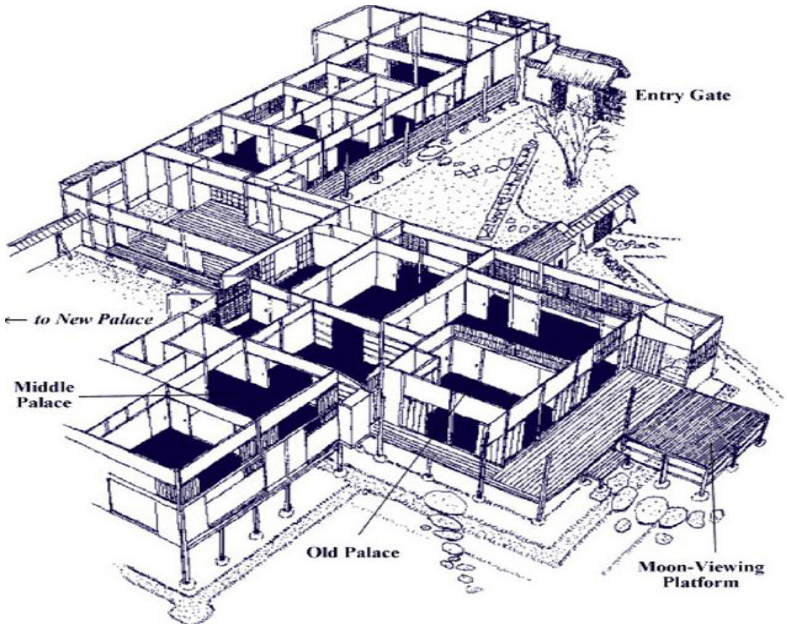

Figure 4.12. Mat-building Example: Katsura Villa in Kyoto, 1615-1653, In Retrieved October 10, 2003 fromhttp://www.getty.edu/artsednet/images/BM/Katsura/cross.html

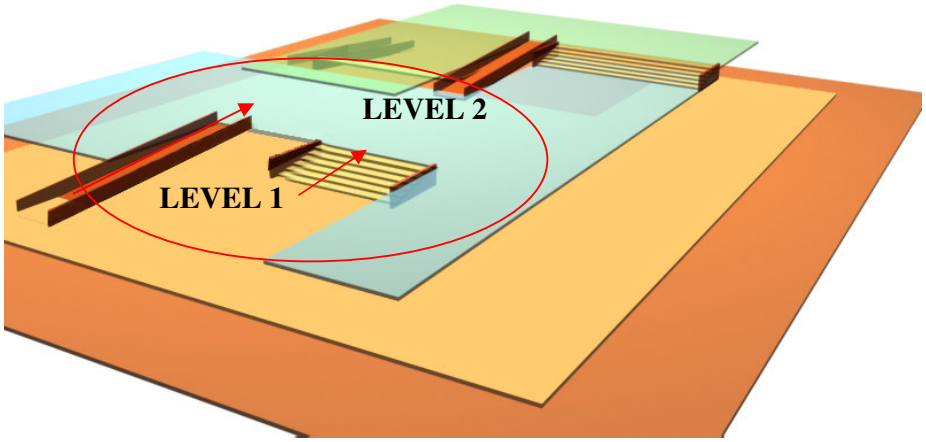

Figure 4.13. Flexibility in Use in the Mat-building Approach: A universally designed ramp adjacent to the stairs can accommodate everyone's need and preference. Eren, 2004

Principle 3: Simple and Intuitive Use

Mat-buildings have also the potential of making use of spatial organizations easy to understand for everyone. The importance of the low-rise nature of mat-building is also highlighted in the statement of architects' of Berlin Free University: ". . . the fact that the building has only two stories, and unites different kinds of function on two levels only makes for easier communication"[150](Figure 4.14). In universal design, the usability and understandability of both interior and exterior spaces are important as design considerations (Figure 4.15). As it can be observed easily in the analytical diagram, a simple designed circulation between the ramps can eliminate the confusion within the structure and enable easy use of the spaces (Figure 4.16). The Norwegian State Council on Disability also emphasizes that 'the possibilities of achieving universal design are greater in densely built-up

[150] Architects' Statement, 'Completion of the First Phase, 1973," 1999, p. 31.

areas, where public transport is established and the walking distance to services is short".[151] Thus, mat-building with its dense sections and ramps can be proposed as a design strategy for simple and intuitive use and can be reconsidered in light of the requirements of universal design to make the built environments consistent with everyone's expectations.

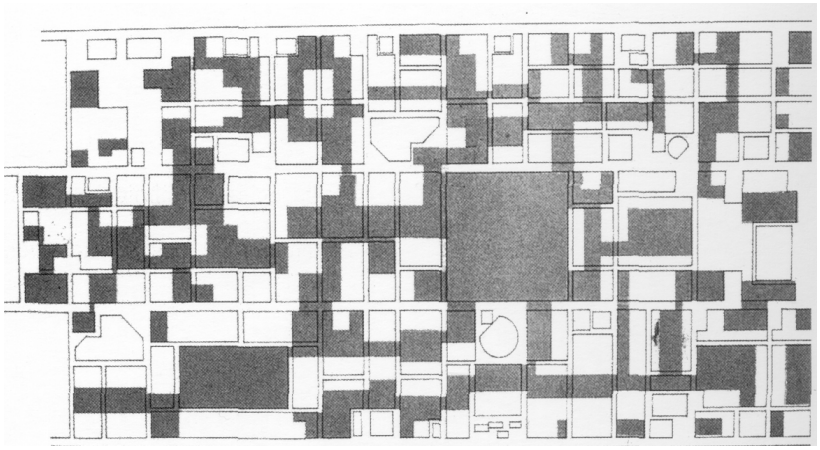

Figure 4.14. Mat-building Example: 'Berlin Free University, overlaying of pedestrian routes designed in low-rise nature of the building". In George Wagner, 'Looking Back Towards the Free University, Berlin," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm*, edited by Gabriele Feld, (London: Architectural Association, 1999) 18.

[151] Aslaksen, Bergh, Bringa and Heggem, "Universal Design Planning and Design for All," Retrieved March 23, 2004 from (http://home.online.no/~bringa/universal.htm)

Figure 4.15. Universal Design Example: 'This large patio is directly accessible from the adjacent dining spaces inside, enabling everyone to move outside easily when the weather is good'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 107. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/publications/udnypdf.htm)

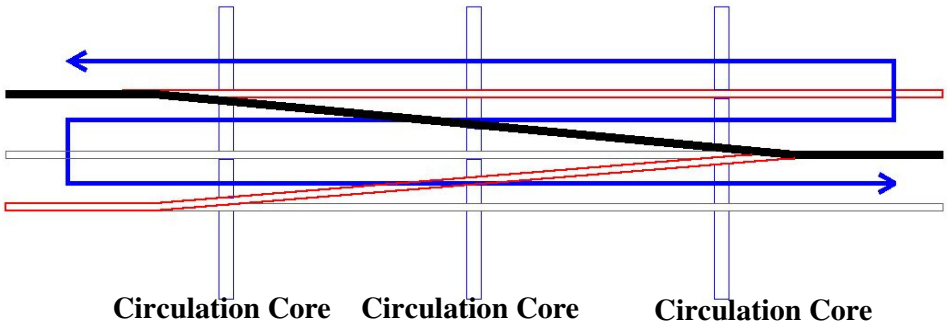

Figure 4.16. Simple and Intuitive Use in the Mat-building Approach: Mat-building is capable of providing a simple designed network between the ramps. Eren, 2004.

Principle 6: Low Physical Effort

The potential of low-rise structures in mat-buildings can reduce physical effort. They can offer the possibility of using the spaces with low physical effort. In mat-buildings 'the allocation of functions along internal pedestrian streets and courtyards" allows the use of spaces with low physical

effort.[152] The dense interconnected structure of mat-buildings has the potential of providing spaces that allow users to use and travel comfortably with the help of the ramps. In this respect, Venice Hospital by Le Corbusier is an important example which can provide ease of access through its low-rise character and use of the ramps (Figure 4.17). The horizontal network of shallow ramps and vertical cores within the hospital can create opportunities for a variety of patients' and medical staffs' activities. It can also be stated that if the hospital had been designed in light of the universal design approach, it could function in a more holistic way and become usable to the greatest extent of patients.

In the universal design approach, the resting places, seating areas, accessible pathways and building circulation become also important for low physical effort (Figure 4.18). The Ed Roberts Campus in Berkeley, California is an important unbuilt example of universal design's full demonstration (Figure 4.19 and Figure 4.20). The site design of the campus, its urban planning, use of spaces and their relation with the urban fabric are designed in light of the universal design principles. Susan Goltsman states that 'the building circulation system is envisioned as the centerpiece of universal design for the building. Without predetermining the elements or form, the circulation system should provide a clear, visible route vertically through the building".[153] The building in the Ed Roberts Campus is two-stories height. Inside the building universally designed ramps are used as pathways. Within the campus

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[152] Addington, Kienzl and Inrachooto, "Mat Building and The Environment," 20 01, p. 75.
[153] Susan Goltsman, "The Ed Roberts Campus: Building A Dream," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 64.8.

building, the amount of available office space is provided considering the future growth of the partner organizations. These characteristics of the universally designed campus are also overlapping with the mat-building's characteristics. In this context, The Ed Roberts Campus is an important example revealing the fact that when a building is designed in light of universal design, then it is possible to observe that this building also displays mat-building's characteristics.

In the low-rise structures of mat-building, the need of vertical movement is minimized. A clear path to travel for all users, resting places and seating areas near the internal courtyards and ramps are also important for people with or without a disability (Figure 4.21). Goltsman states that 'in addition to elevators, the building should have the components of ramps as places for gathering, communicating and showcasing displays".[154] Hence, the reconsideration of mat-building's low-rise character and its ramps in light of the principle of low physical effort can allow the users' full participation in all types of buildings.

[154]Ibid, p. 64.10.

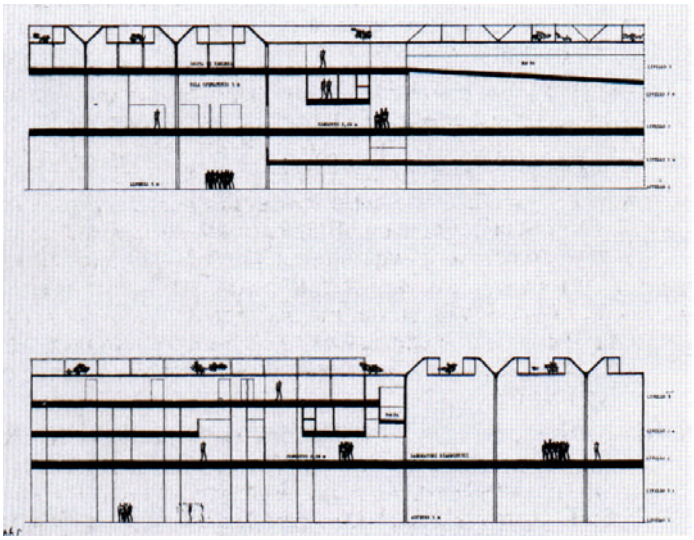

Figure 4.17. Mat-building Example: Sections of Venice Hospital. In Le Corbusier, "Rapport Technique," trans. by Lucia Allais, *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 47.

Figure 4.18. Universal Design Example: 'This ramp has walls that provide a convenient resting place. Because the floor surface slopes, people of different statures can find a comfortable spot'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 75. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Figure 4.19. Universal Design Example: 'The transparent lobby provides a welcoming view of the dramatic, helical ramp and covered courtyard beyond where people can gather and meetings can occur". In 'The Ed Roberts Campus The Design: Photo Library – Colorful drawings from many different views showing the design of the ERC," Retrieved April 23, 2004 from (http://www.edrobertscampus.org/the_design.html)

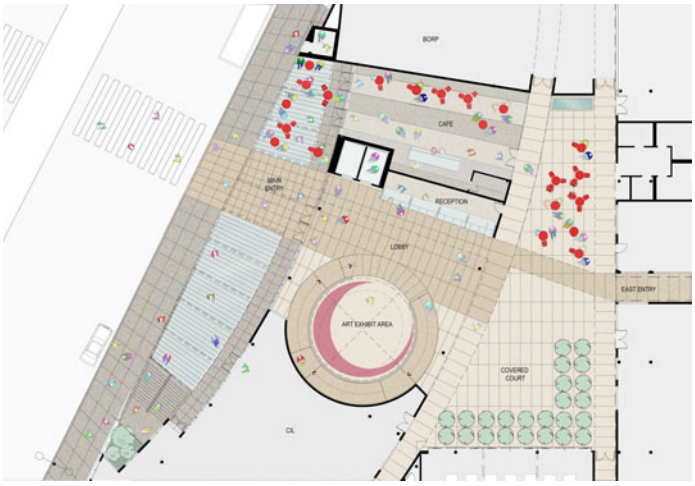

Figure 4.20. Universal Design Example: Ground floor plan of the Ed Roberts showing the helical ramp and covered courtyard. In 'The Ed Roberts Campus The Design: Photo Library – Colorful drawings from many different views showing the design of the ERC," Retrieved April 23, 2004 from (http://www.edrobertscampus.org/the_design.html)

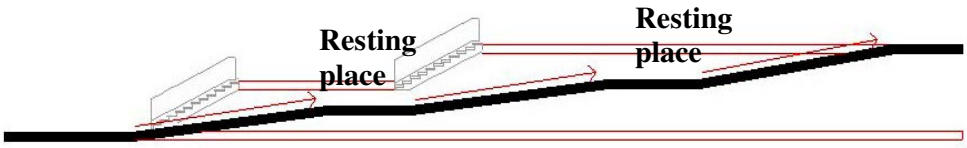

Figure 4.21. Low Physical Effort in the Mat-building Approach: Resting places near the ramps gives the possibility of using spaces with low physical effort in low-rise structures. Eren, 2004.

Principle 7: Size and space for approach and use

Providing appropriate sizes and spaces regardless of the users' body size, age and ability are important design considerations in universal design. Rather than defining an average human being, universal design aims at creating built environments based on the measures and standards appropriate for everyone. However books *Neufert*, *Neuferts' Architects' Data* published in 2000 define an average person according to which most people try to change or adapt their behaviors (Figure 4.22). In light of these discussions, it deserves to highlight the essays of "The Dutch Struggle for Accessibility Awareness" by Maarten Wijk, "The Evolution of Design for All in Public Buildings and Transportation in France" by Louis Pierre Grosbois and "Accessibility Standards and Universal Design Developments in Canada" by Shauna Mallory and Brian Everton. It is stated by Mallory and Everton that "the concept of universal man is based on a high ideal of human form that most people simply

do not fit".[155] In this context, the modular network of mat-buildings in some 1960s built examples and the use of Le Corbusier's measuring device 'Le Modular' in buildings, such as in Berlin Free University, couldn't fulfill the requirements of the universal design principles (Figure 4.23). Human dimensions fitting into the golden section cannot respond to the diverse sizes of people. There exist no standardized man, woman and people with disabilities. While proportioning the spaces to the human beings, a broader scope of human dimensions and measures of human form should be considered. (Figure 4.24) Thus, it can be significant to re-interpret the modular network of the mat-building approach in light of universal design. The universal design principles can have an important place in the today's revival of mat-building.

". . . [T]he idea of blurring of boundaries, varying degrees of enclosure, and the creation of 'self-adapting spaces'. . . " are also important design ideas employed in mat-buildings that help to provide adequate spaces usable for everyone.[156] Mat-buildings can evolve in different phases of the design process so that they can be re-dimensioned related to the temporary and permanent changes of the functional program. In this context, Katsura Villa in Kyoto is significant in terms of its construction in different phases of the design process (Figure 4.25). For Arata Isozaki, "the palace was constructed in three different phases until it reached its present form. Within each phase, it was completely

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[155] Shauna Mallory and Brian Everton, "Accessibility Standards and Universal Design Developments in Canada," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 16.2.
[156] Addington, Kienzl and Inrachooto, "Mat Building and The Environment,"2001, p. 77.

redeveloped".[157] Considering the characteristics of mat-building and the requirements of universal design, it is important for architects, planners and designers to design buildings and urban fabrics which are capable of responding to the needs of a broader scope of human dimensions and of evolving in different stages of the design processes. Providing appropriate sizes and spaces for the use can be achieved within the possibilities of mat-building.

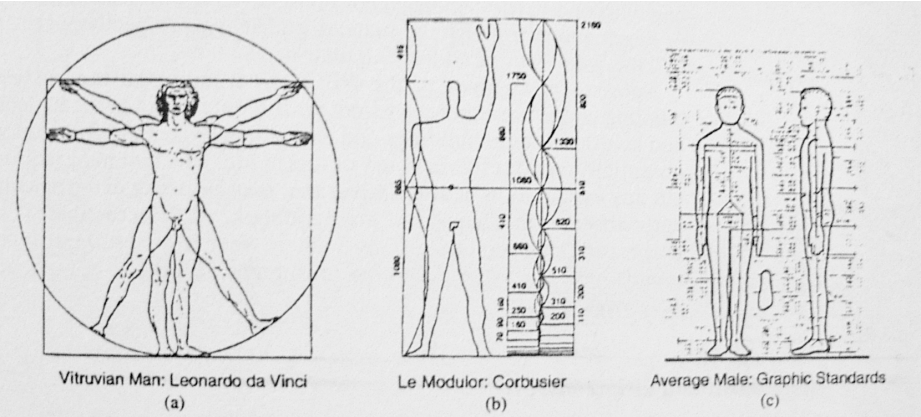

Figure 4.22. Mat-building Example: Vitruvian man: Leonardo da Vinci (at the left), Le Modulor: Le Corbusier, 1961, (in the middle) Average Male: Ramsey and Wittkower, 1994 (at the right). In Shauna Mallory and Brian Everton, "Accessibility Standards and Universal Design Developments in Canada," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 16.2.

[157] Arata Isozakı, *The Katsura Villa: The Ambiguity of Its Space*, (New York: Rizoli, 2001) 3.

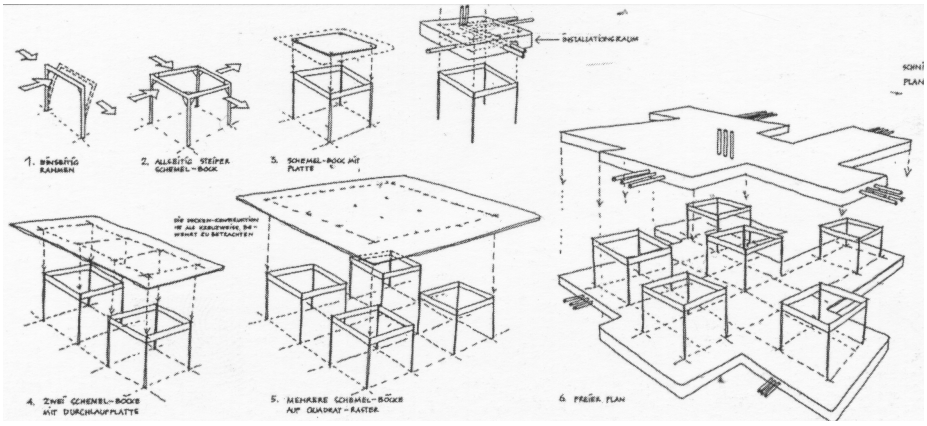

Figure 4.23. Mat-building Example: 'The modular network for the positioning of pillars in the bearing structure is based on a 30-centimeter unit'. In Architects' Statement, 'Completion of the First Phase, 1973," *Free University, Berlin: Candilis, Josic, Woods, Schiedhelm,* edited by Gabriele Feld, (London: Architectural Association, 1999) 31.

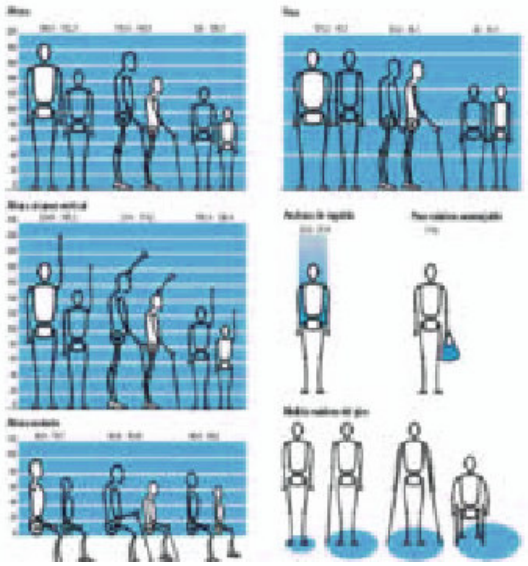

Figure 4.24. Universal Design Example: Anthropometric Table, A broader scope of human dimensions and measures of human form should be considered by designers and architects, planners. In European Concept for Accessibility, Technical Assistance Manual 2003, EuCAN Members 2003, In Retrieved June 7, 2003 from http://www.eca.lu

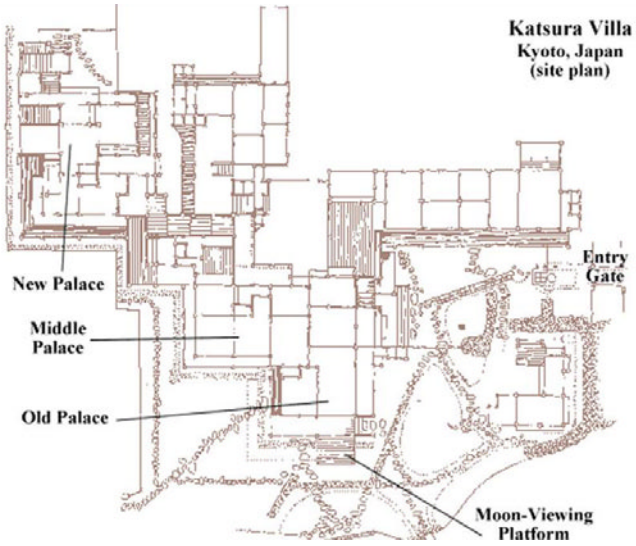

Figure 4.25. Mat-building Example: New Palace, Middle Palace and Old of Katsura Villa were constructed in different phases of its design process. In Retrieved October 10, 2003 from http://www.getty.edu/artsednet/images/BM/Katsura/cross.html

4.2.2 The unifying capacity of large open roof

Principle 1: Equitable Use and Principle 2: Flexibility in Use

"The desire to create a flexible construction system that can accommodate change . . ." can be achieved under a continuous roof structure of mat-building.[158] The unifying capacity of the roof structure can combine diverse demands of users and equally accessible spaces underneath. In the Reconstruction of Beirut project Allen has proposed "to recover the ground of the site with a series of continuous surfaces"[159] (Figure 4.26). This constructed roof can accommodate a series of functions such as housing, business, leisure and dining. With this characteristic of mat-building, it is possible to achieve

[158] M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," 2001, p. 77.
[159] Allen, "Reconstruction of the Souks of Beirut," 1999, p. 59.

both equality and flexibility requirements of universal design. The integration of mat-building's characteristics with the universal design principles is also important in terms of ensuring the creation of universally designed cities and extending universal design at the urban scale (Figure 4.27). The diversity of the urban fabric can be achieved within the mat like structural organizations (Figure 4.28). People with special needs can be accommodated equally with other people in the society under the unifying capacity of the roof structures.

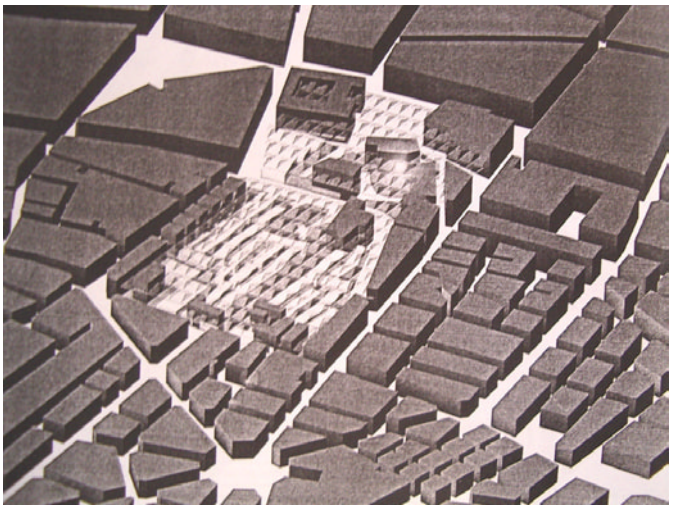

Figure 4.26. Mat-building Example: Beirut Souks Project by Allen, a unifying roof structure above the city can combine diversity of the functions. In Stan Allen, "Reconstruction of the Souks of Beirut," *Points+ Lines: Diagrams and Projects for the City,* (New York: Princeton, 1999) 60.

Figure 4.27. Universal Design Example: 'Ensuring the usability of diverse facilities by everyone helps to create the universal city'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 77. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

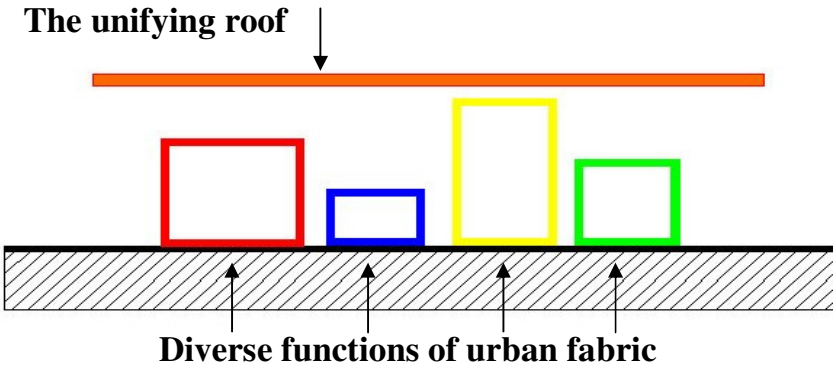

Figure 4.28. Equitable Use and Flexibility in Use in the Mat-building Approach: The unifying capacity of the roof structure for the diverse functions of urban fabric. Eren, 2004.

Principle 4: Perceptible Information

Nodes, specific points, links, main and secondary circulation networks and horizontal dispositions of functions become important within the overall framework of a continuous roof structure. These design features can help to create distinguishable urban environments that can be used and understood by a variety of users. A directed system and a travel pathway allow people to find the

way in the building easily. For Mayor's Office for People with Disabilities and Department of Design and Communication, 'the information provided must be presented with sufficient contrast to surrounding conditions so that it is distinguishable from its context and decipherable in all its various modes of presentation".[160] A variety of modes of information can be achieved under or above roof structures with nodes, points and other design elements specific to the mat-like configurations.

In Logistical Activities Zone in Barcelona Allen proposes a continuous roof structure, under which a network of pathways is created (Figure 4.29). Allen states that ". . . infrastructures organize and manage complex systems of flow, movement and exchange. Not only they provide a network of pathways, they also work through systems of locks, gates and valves- a series of checks that control and regulate flow".[161] As it can be observed in the Allen's project, with the potential of a continuous roof structure it is possible to create conditions that can direct users and lead them easily to the intended spaces. When the dimensions and details of the roof structure and pathways are reconsidered taking into account the related codes of accessibility and universal design, it is then possible to ensure that travel paths are readily perceptible by anyone. By proposing mat-building as a design strategy for the implementation of universal design, it can be possible to provide perceptible information. An organized and universally designed circulation layout of the built environment

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[160] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, 2001, p. 23.
[161] Stan Allen, "Reconstruction of the Souks of Beirut,"1999, p. 81.

can provide essential information. Using an identifiable circulation system is important in terms of perceptible information in universal design (Figure 4.30 and Figure 4.31). As it can be seen in the analytical diagrams, Kazuyo Sejima's Multimedia Studio in Ogaki City provides a roof structure under which the separate functions of the studios are unified by a corridor that encircles the building and guides the users (Figure 4.32).

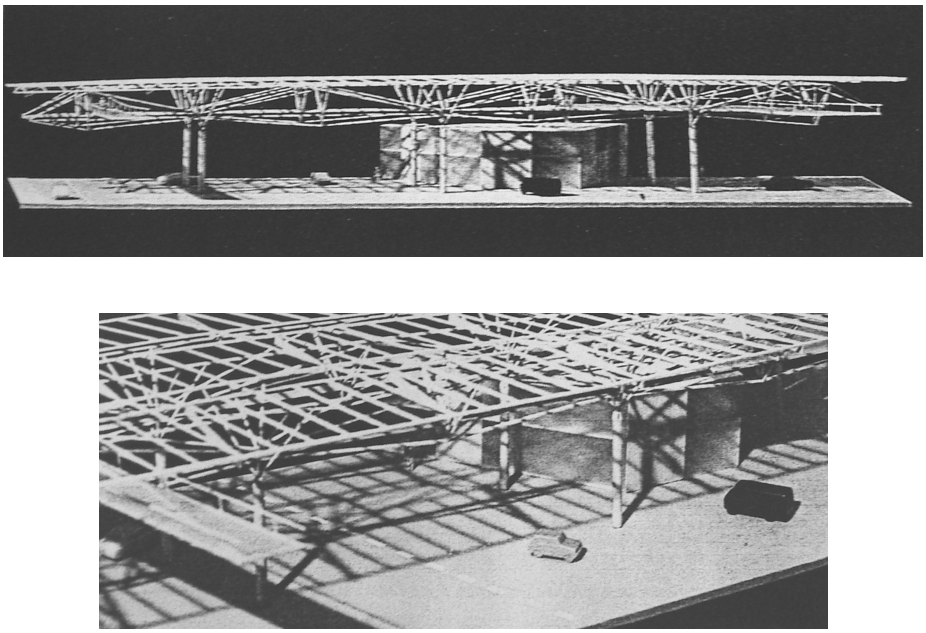

Figure 4.29. Mat-building Example: Model of Logistical Activities Zone in Barcelona by Allen, 1996 at top and a close up view of the model at the bottom. In Stan Allen, "Reconstruction of the Souks of Beirut," *Points+ Lines: Diagrams and Projects for the City,* (New York: Princeton, 1999) 85.

Figure 4.30. Universal Design Example: 'This interior courtyard *under the roof structure* reveals the interior circulation of the building on every floor'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 43. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Figure 4.31. Universal Design Example: Passageways, stairs, ramps and elevators are identifiable from multiple vantage points allowing people to understand where they are going and how get there. In European Concept for Accessibility, Technical Assistance Manual 2003, EuCAN Members 2003, In Retrieved June 7, 2003 from http://www.eca.lu

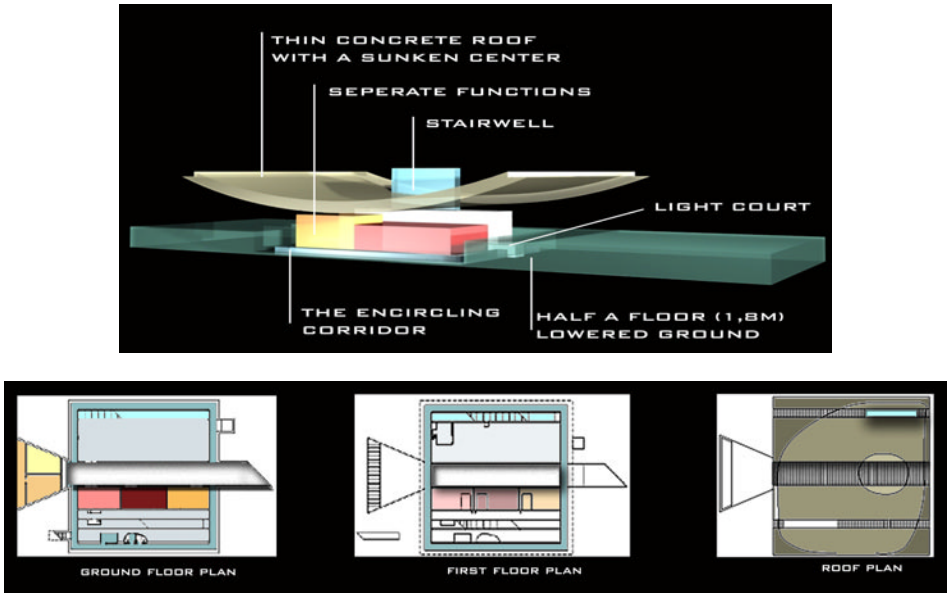

Figure 4.32. Perceptible Information in the Mat-building Approach: The unifying capacity of a roof structure in Multimedia Studio in Ogaki City by Sejima, 3DModel at the top, the plans at the bottom. In ARCH 609 Advanced Themes in Architecture and Urban Design I Fall 2002-2003 given by Assoc. Prof. Emel Aközer, a group work presentation by Yasemin Eren and Ece Kumkale in which the potential of mat-building were deciphered.

Principle 7: Size and space for approach and use

Mat-buildings have the potential of creating the conditions for providing change and growth within the boundaries of the roof structure. Allen considered the future construction under the continuous roof structure in the Logistical Activities Zone in Barcelona (Figure 4.33). He states that: "By creating a structured field condition that is architecturally specific yet programatically indeterminate, the future life of the site is free to unfold beyond the fixed limits of a masterplan". [162]

From the point of universal design, the important issue is to accommodate growth and change and to provide enough clear areas (Figure

[162] Ibid, p. 74.

4.34). It is also possible to state that the roof structure can function as roof gardens and terraces which can provide appropriate spaces for the required facilities. Berlin Free University offers as a mat-building the use of the roof structure. In the "Architects' Statement" (1963-4) for the competition project for Berlin Free University it is noted that:

> *The university, in the present stage of design, has three levels: an underground floor, which contains most of the activities; an upper floor with offices and small classrooms. It is hoped to add a fourth level with some housing if this is desirable. All roofs are accessible as public or private terraces.*[163]

If this potential of mat-building is reconsidered in light of the requirements of universal design, then the appropriate size and space for everyone can be achieved. Under the unifying capacity of the roof structure, it is possible to provide adequate spaces and enough clear areas for the temporary or permanent human activities (Figure 4.35).

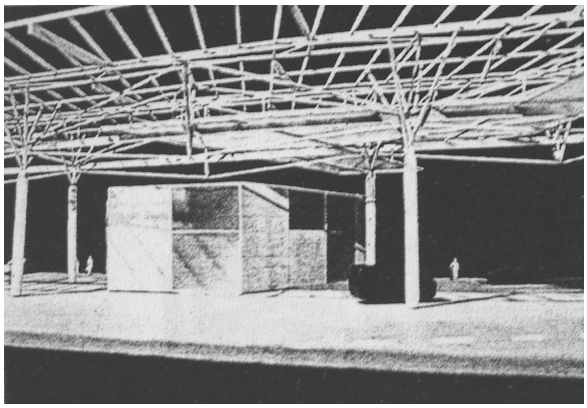

Figure 4.33. Mat-building Example: Model detail of Logistical Activities Zone. In Stan Allen, "Reconstruction of the Souks of Beirut," *Points+ Lines: Diagrams and Projects for the City,* (New York: Princeton, 1999) 85.

[163] Architects' Statement, "Completion of the First Phase, 1973," 1999, p. 25.

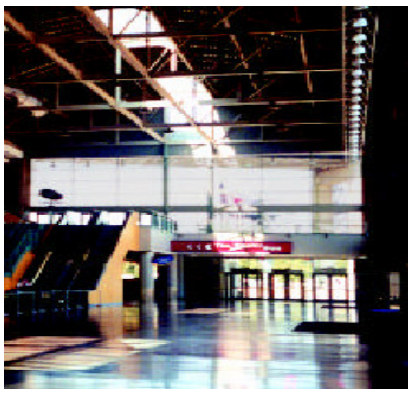

Figure 4.34. Universal Design Example: Providing sufficient clear area and a clear path of travel are important parts of universal design. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 79. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

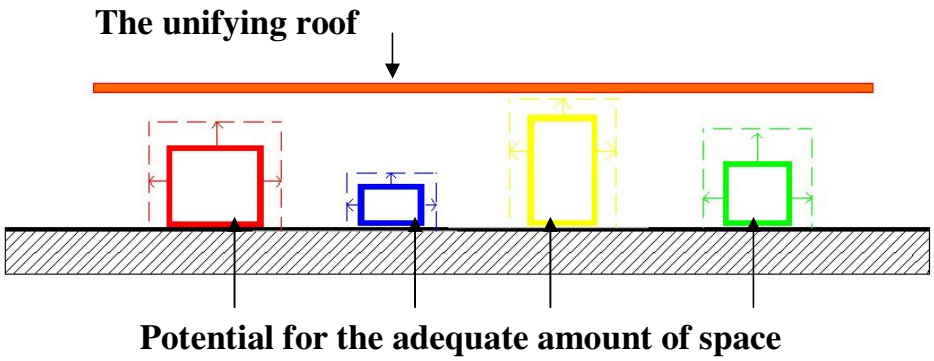

Figure 4.35. Size and space for approach and use in the Mat-building Approach: Mat-building is capable of providing the appropriate sizes and spaces under the unifying capacity of its roof structure. Eren, 2004

4.2.3 A site strategy that lets the city and the landscape flow through the project

Principle 1: Equitable Use and Principle 2: Flexibility in Use

Marley in her article "Creating an accessible public realm" mentions the importance of universal design at the urban scale and emphasizes that ". . . the principles of universal design . . . should be expanded to create a framework for

design at the scale of streets, neighborhoods, and city".[164] Creating equally accessible urban environments becomes important in universal design. A universal urban field can respond to the varying needs of people and provide equal access to the buildings. Creating an inclusive field of urban environment is also an important design concern for mat-buildings. In the mat-building approach, it is possible to create an uninterrupted continuation of the urban fabric into the spatial organizations. The floors, slabs and other building features can be considered as an extension and continuity of the landscape. A continuous flow between the buildings and the site can accommodate an easy access to buildings without the need of any specialized solutions. If this characteristic of the mat-building approach is taken into consideration in light of the universal design principles beginning from the initial stages of the design process, then flexible choices of access and universal design solutions at the urban scale can be achieved.

Allen elucidates the characteristics of mat-building referring to its contemporary built examples. He explains Kazuyo Sejima's Multimedia Studio in Ogaki as follows: "Its gently cupped roof appears to give into the effects of gravity, sloping down on one side to allow access from the lawn. This topographical surface concretizes the flat, artificial terrain of its campus site, slightly lifted up to give light to the workspace below"[165] (Figure 4.36). As seen in the project of Sejima, the site can become part of the interior space so that it gives the possibility of approaching and entering the built environment

[164] Marley, "Creating an Accessible Public Realm," 2001, p. 58.1.
[165] Stan Allen, "Mat Urbanism: The Thick 2-D,"2001, p. 120.

easily from the site (Figure 4.37). In universal design it is also important to provide an equally accessible approach and entrance from the site to the buildings (Figure 4.38). In *UDNY* it is stated that "people who require an accessible entrance should not be exiled to a remote delivery area . . ."[166] The integration of this characteristic of mat-building with universal design can ensure spaces which are equally accessible for all.

Figure 4.36. Mat-building Example: Multimedia Studio in Ogaki City, Japan by Kazuyo Sejima and Ryue Nishizawa, 1995-96, The topographical surfaces allows equality and flexibility in access for all type of users. In Stan Allen, "Mat Urbanism: The Thick 2-D," *Case: Le Corbusier's Venice Hospital and the mat building revival* edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 120.

[166] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, 2001, p. 21.

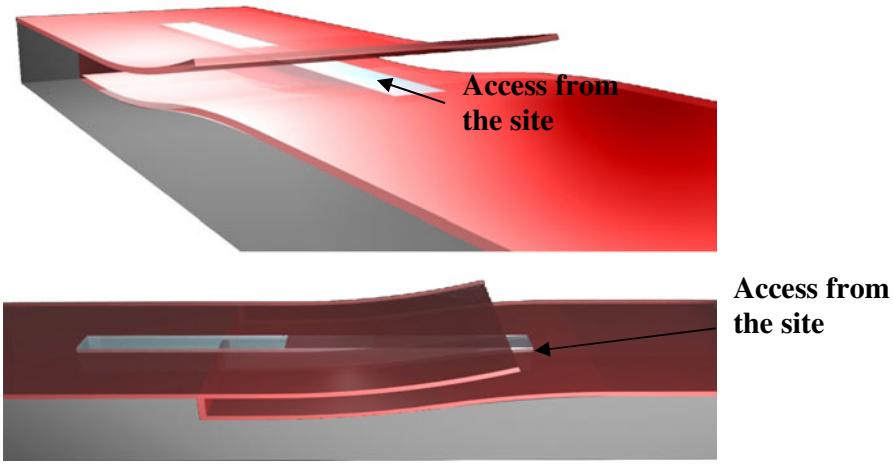

Figure 4.37. Equitable Use and Flexibility in Use in the Mat-building Approach: Flexible accessibility of Multimedia Studio in Ogaki within the urban fabric. In ARCH 609 Advanced Themes in Architecture and Urban Design I Fall 2002-2003 given by Assoc. Prof. Emel Aközer, a group work presentation by Yasemin Eren and Ece Kumkale in which the potential of mat-building were deciphered.

Figure 4.38. Universal Design Example: 'It is important to ensure continuous, flexible and accessible pathways so that all users can use equally'. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 25. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/ publications/udnypdf.htm)

Principle 6: Low Physical Effort

Mat-buildings can organize spaces, the horizontal and vertical layers of a structure as an extension of the landscape. For Allen, 'landscape as a

unifying model is explicitly evoked in the surfaces that link . . . scattered functions".[167] Yokohama International Port Terminal by Foreign Office Architects is an important mat-building example which is designed as a part of the urban fabric (Figure 4.39). The continuity between exterior and interior spaces is explained by the architects as follows:

> *Rather than developing the building as an object or figure on the pier, the project is produced as an extension of the urban ground, constructed as a systematic transformation of the lines of the circulation diagram into a folded and bifurcated surface. These folds produce covered surfaces where the different parts of the program can be hosted.*[168]

The continuation of the landscape allows users to move comfortably and with low physical effort (Figure 4.40). The integration of mat-building with universal design can allow an accessible site design and travel routes to the buildings (Figure 4.41). Everyone can access easily and comfortably by creating universally designed spaces as an extension of the landscape. Fair Housing Act mentions the importance of an accessible site design as follows:

> *An accessible route of travel is the key unifying element that facilitates the safe and independent use of a site and its buildings by all people, especially people who use wheelchairs or walking aids or who walk with difficulty. A successful accessible route connects site arrival points, i.e. parking, bus stops, etc., with all exterior and interior amenities. . .*[169]

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[167] Stan Allen, "Mat Urbanism: The Thick 2-D," 2001, p. 121.
[168] Retrieved January 17, 2004 from http://www.arcspace.com/architects/foreign_office/htm
[169] *The New Fair Multi- Family Housing: A Design Primer to Assist in Understanding the Accessibility Guidelines of the Fair Housing Act*, (North Carolina: North Carolina State University Press, 1997) 13.

Figure 4.39. Mat-building Example: Yokohama International Port Terminal, 1996. In Retrieved January 5, 2004 from (http://www.arcspace.com/architects/foreign_office/)

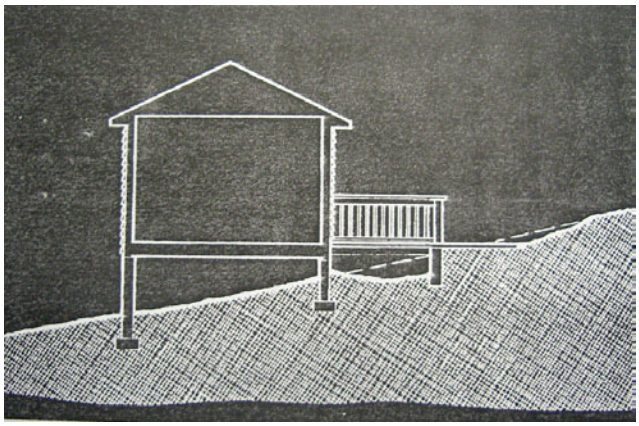


Figure 4.40. Universal Design Example: Creating an accessible entrance from site to the building is important in universal design. In Leslie C. Young, Rex J. Pace, "The Next-Generation Universal Home," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 34. 13.

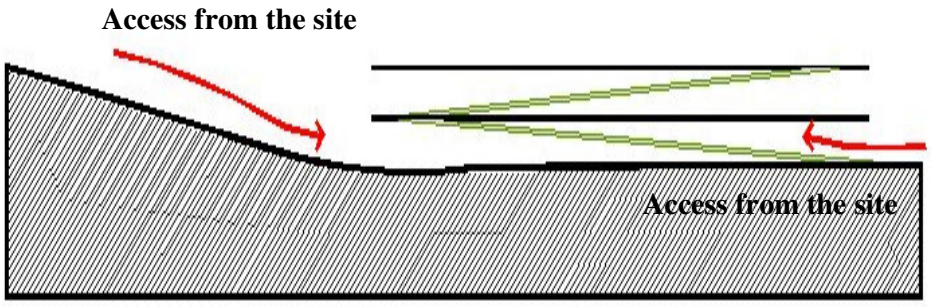


Figure 4.41. Low Physical Effort in the Mat-building Approach: An easy access from the site to the built environment. Eren, 2004.

4.2.4 A delicate interplay of repetition and variation

Principle 1: Equitable Use and Principle 2: Flexibility in Use

Universal design aims to provide design solutions for all ages, sizes and abilities. Mat-buildings, on the other hand, can offer choice for all people through variations so that it can accommodate the demands of everyone equally (Figure 4.42). Mat-buildings also take the advantage of repetitive systems, which can allow spatial structures to expand and change to respond to the changing needs of a variety of users. Sarkis explains the high degree of flexibility in mat-buildings as "what is peculiar to the mat phenomenon . . . is the high degree of flexibility generated in the overall layout by an equally high degree of specificity found in the repeated element".[170]

Using repetitive urban elements in the universal design approach, using repetitive urban elements plays an important role in the built environment (Figure 4.43). An environment designed with the variation and repetition

[170] Hashim Sarkis, "Introduction," 2001, p. 14.

characteristics of mat-building allow more users to participate in and experience in that environment. For Goltsman, "social diversity is very much linked to physical diversity".[171] Contact between different people with different abilities can be achieved with the repetitive and diverse structures and infrastructures.

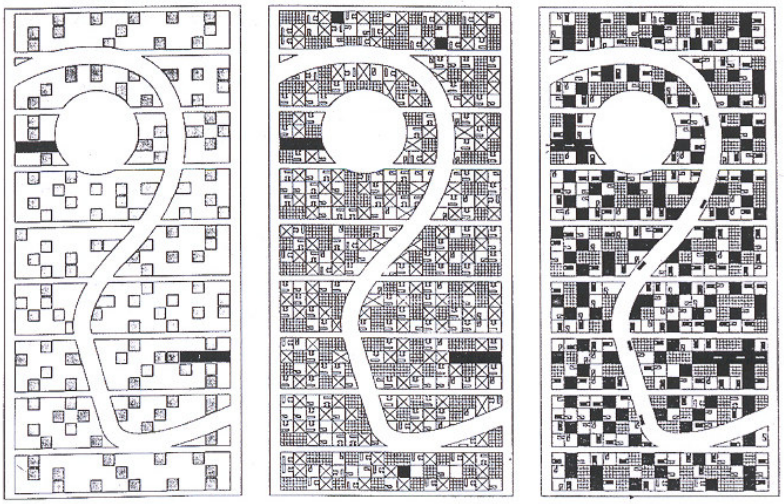


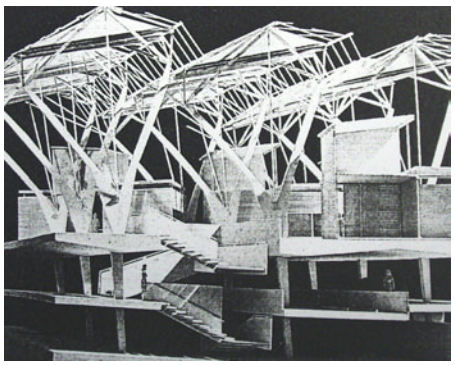
Figure 4.42. Mat-building Example: The plans of Low-Rise Housing by Kazuyo Sejima, 1996. Its repetitive character can offer choices for all people through the variations. In Le Corbusier, "Rapport Technique," trans. by Lucia Allais, *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York : Prestel, 2001) 41.

[171] Susan Goltsman, "Universal Design in Outdoor Play Areas," edited by Wolfgang F. E Preiser and Elaine Ostroff, *Universal design handbook*, (New York: McGraw-Hill, 2001) 19.2.

Figure 4.43. Universal Design Example: In the park using repetitive urban elements can create universally designed spatial organizations usable for all. In Retrieved April 17, 2004 from (http://www.uoregon.edu)

Principle 3: Simple and Intuitive Use

With the repetitive design elements of mat-buildings, it is possible to eliminate the unnecessary complexities for the users. As seen in the Reconstruction of the Souks of Beirut, Allen proposes the repetition of certain roof modules so that the variety of functions within the complexity of the city becomes easy to use (Figure 4.44). Regardless of the user's experience, the built environment can be easily understood by the repetition of certain design elements (Figure 4.45). The integration of this mat-building's characteristic with universal design can allow the repetition of universally designed elements through which simple and intuitive use can be achieved in the built environments (Figure 4.46).



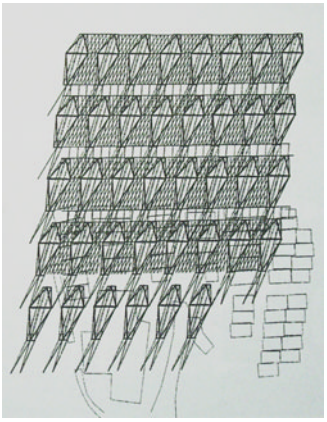


Figure 4.44. Mat-building Example: Section model at the top, Site Plan at the bottom. In Stan Allen, "Reconstruction of the Souks of Beirut," *Points+ Lines: Diagrams and Projects for the City*, (New York: Princeton, 1999) 61-69.

Figure 4.45. Universal Design Example: A repetitive layout of path systems and circulations patterns can accommodate the needs of all people within the structure and infrastructure. In Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York*, (New York: A City of New York Office of the Mayor Publication, 2001) 29. Retrieved January 17, 2004 from (www.ap.buffalo.edu/idea/publications/udnypdf.htm)

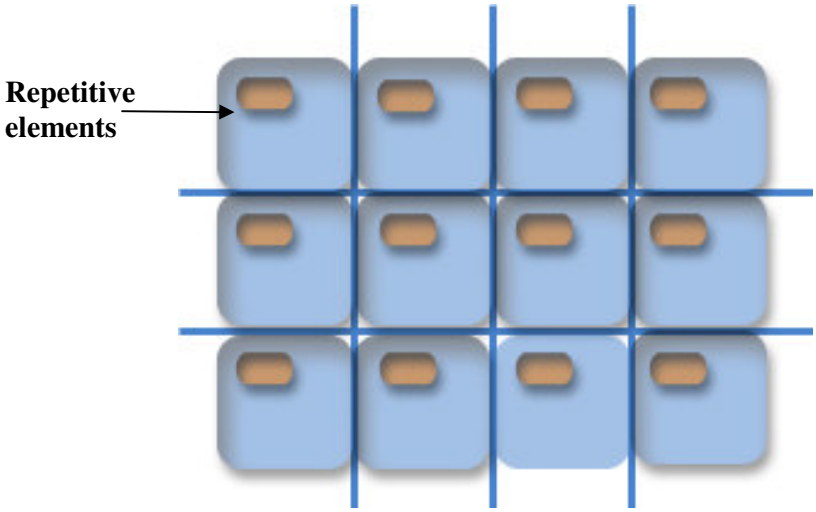


Figure 4.46. Simple and Intuitive Use in the Mat-building Approach: The repetition of universally designed elements in a modular structure. Eren, 2004.

Principle 4: Perceptible Information

For Mayor's Office for People with Disabilities and Department of Design and Communication, "to use the city effectively, we need information about where we are (orientation) and how to get where we want to go (way finding). This information is provided by means: landmarks, sign and information services".[172] In universal design, it is important to make the spaces in the built environment easy to use and easy to find. By the integration of mat-building with the universal design approach, perceptible information can be provided with the help of the repetitive signs, landmarks and nodes. Using the repetitive design elements within the variation characteristic can give necessary information effectively to the users.

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[172] Mayor's Office for People with Disabilities and Department of Design and Communication, *Universal Design New York,* 2001, p. 12.

In this context, Parc de la Vilette is an important example of mat-building, which carried the characteristic of repetition and variation into the urban context. Red follies are designed in various forms and they are repeated within the whole park (Figure 4.47 and Figure 4.48). In the park, the use of these repetitive follies provides perceptible information related with its surroundings. In Saitama Prefectural University, the repetition of nine human figure-shaped signs is offered as the distinguishable design elements in-between the different departments of the university (Figure 4.49). These repeating figures like other elements, which constitute a net of information, can provide the students essential information. They direct users and lead students to the intended departments. Same these built examples of the mat-building approach, in the universal design approach it is also suggested to design parks, in which the essential information can be achieved through the universally designed repetitive elements ensuring perceptible information (Figure 4.50).

Figure 4.47. Mat-building Example: Parc de La Vilette Competition, by Tschumi. In Retrieved April 7, 2004 (http://www.parisdigest.com/takingarest/parcdelavillette.htm)

Figure 4.48. Mat-building Example: Parc de La Vilette Competition, Bernard Tschumi. In Retrieved April 7, 2004 from (http://www.algonet.se/~pwh/lavilette.jpg)

Figure 4.49. Mat-building Example: One of the nine human figure-shaped signs in Saitama Prefectural University by Riken Yamamoto and Field Shop, 1999. In Retrieved April 8, 2004 from (http://www.townart.co.jp/english/projects/saitama_kenritu/zf.htm)

Figure 4.50. Universal Design Example: The use of the repetitive landscape elements which are dispersed throughout the park and readable by all can provide perceptible information. In Center for Universal Design, Exemplary Projects: Landscape Architecture, Retrieved February 7, 2004 from http://www.design.ncsu.edu/cud/nightsky/sensory/features.html

Principle 5: Tolerance for Error

The modular structure of The National School of Decorative Arts (ENAD-CRAFT) by the Laboratory for Architecture provides safety for its users (Figure 4.51). Each of the units has comfortable and safe environmental conditions and with the repetition of these units the whole building becomes responsive and safe. It is possible to create universally designed safe urban environments with the help of the repetitive design elements (Figure 4.52). If these design elements are usable and safe for everyone and can be designed also in variation, then it can be stated that with the universal design approach in mat-buildings hazards and errors are minimized. The integration of mat-building with universal design can provide to design clear and accessible pathways, circulation networks and spaces by marking and identifying them through the use of safe and repetitive structures (Figure 4.53).

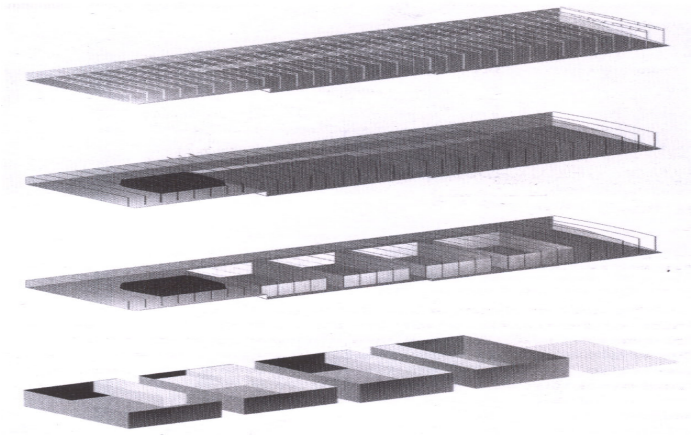

Figure 4.51. Mat-building Example: Modular scheme of The National School of Decorative Arts (ENAD-CRAFT) can provide safety for all users, in Limoges, France,by the Laboratory for Architecture, 1995. In In M. Addington, N. Kienzl and S. Inrachooto, "Mat Building and The Environment," *Case: Le Corbusier' s Venice Hospital and the mat building revival*, edited by Hashim Sarkis with Pablo Allard, and Timothy Hyde, (New York: Prestel, 2001) 75.

Figure 4.52. Universal Design Example: Systematic repetition of various elements helps for the creation of universally built environments. In European Concept for Accessibility, Technical Assistance Manual 2003, EuCAN Members 2003, In Retrieved June 7, 2003 from http://www.eca.lu

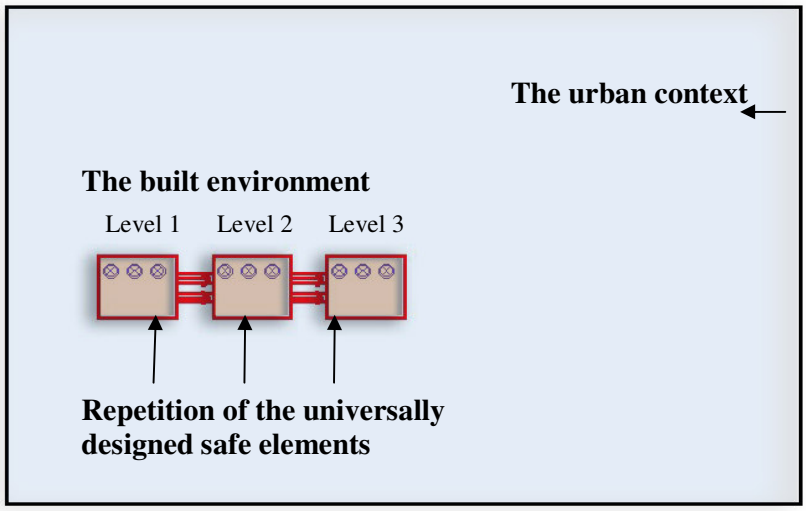

Figure 4.53. Tolerance for Error in the Mat-building Approach: The use of the safe repetitive elements with due variation can identify and mark the spaces so that all people can reach and access safely to them. Eren, 2004.

4.2.5 The incorporation of time element as an active variable in urban architecture

Principle 1: Equitable Use and Principle 2: Flexibility in Use

Considering the changing social and physical changing demands of users over time, mat-buildings can offer spatial organizations that have the possibilities of changing and adapting throughout the lifespan of the users. Mat like organizations can respond to the changing needs of users by establishing a flexible and open framework that can accommodate the change and the growth over time. In this context, Villa VPRO by MVDRV is an important built example (Figure 4.54). For its architects,

> *In the case of the Villa VPRO, MVDRV consulted with the building's future occupants. As they were unable to predict with certainty their needs (giving changing technologies, changing work patterns and corporate hierarchies), architects conceived the project as a series of spaces and surfaces, flexible enough to evolve over time, while specific enough to give a direction to the future growth.* [173]

In Berlin Free University the incorporation of the time element is also highlighted: 'the need for the building to be adaptable to different work programmes has been met with a flexible system 'in four dimensions' ". [174]

Universal design aims also to design built environments which are capable to meet the changing needs of users over their lifespan. In universal design, modifications and adaptations of spaces can be done easily and with low physical effort. Lifespan concept is important in universal design. It is important in the mat-building approach as well. In the article "Universal design: Housing for the Lifespan for All People" by Center for Universal Design, the importance of the lifespan concept is emphasized: ". . . today' s architects address the life cycle of buildings. It is time that they began to address the life cycle of people as well. Universal design is considerate of the human lifespan and the continuum of abilities of all individuals". [175] The Norwegian State Council on Disability defines a lifespan dwelling by emphasizing that 'the lifespan dwel ling is based on directions in line with the principles of universal design. The lifespan dwelling can be adjusted to

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[173] Jean Attali, "Vertical Labyrinths," *Reading MVRDV*, edited by VeroniquePatteeuw, (Rotterdam, NAI Publishers, 2003) 87.
[174] Architects' Statement, 'Completion of the First Phase, 1973," 1999, p. 31.
[175] *The Center for Universal Design*, "Universal design: Housing for the Lifespan for All People," NC State University, Retrieved January 17, 2004 from (http://www.design.ncsu.edu/cud/pubs/center/books/lifespanhous.htm)

different types of architecture and building, and can be combined with other important social aims"[176]. It is stated by Leon A. Pastalan that 'the universal design concept considers those changes that are experienced by everyone as they grow from infancy to old age. Problems related to temporary or permanent disabilities are incorporated into the concept as well". [177]

In this context, mat-building is an important design strategy in terms of providing a flexible and open system which can allow the process of change and modification over time (Figure 4.55). From the point of universal design it can also be possible to reconsider this characteristic of mat-building so that the changes and modifications over time can be easily and equally achieved by everyone regardless of the user's experience, age, size and ability. In light of these discussions, it is possible to state that the integration of mat-building with universal design can offer design solutions in which the time element and changing needs of users over time can be combined into the design processes in order to create the built environments endowed with design features accessible, understandable and usable in all stages of life.

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[176] Aslaksen, Bergh, Bringa and Heggem, "Universal Design Planning and Design for All," Retrieved March 23, 2004 from (http://home.online.no/~bringa/universal.htm)
[177] *Center for Universal Design*, "Universal design: Housing for the Lifespan for All People," Retrieved January 17, 2004 from (http://www.design.ncsu.edu/cud/pubs/center/books/lifespanhous.htm)

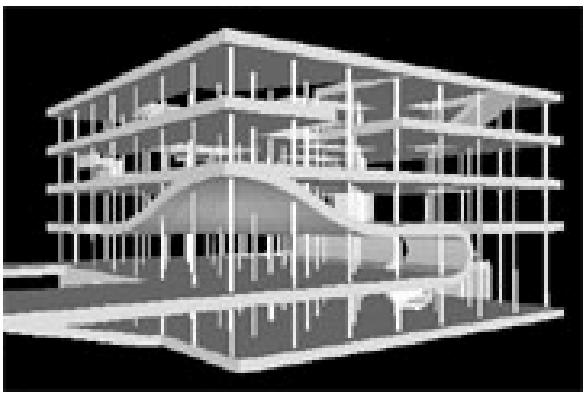

Figure 4.54. Mat-building Example: The flexible system of Villa VPRO which can allow the process of change and modification over time. In Retrieved March 23, 2004 from (http://www.architectuur.org/images/mvrdv02_1k.jpg)

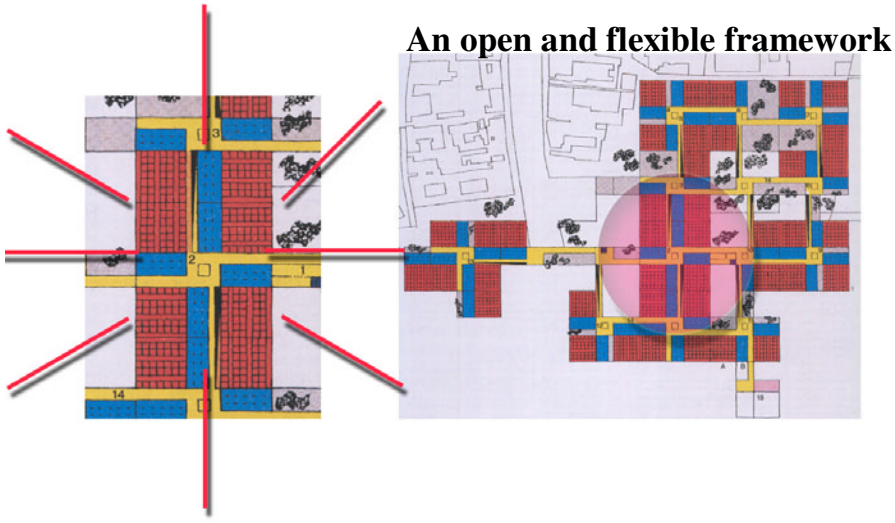

Figure 4.55. Equitable Use and Flexibility in Use in the Mat-building Approach: A flexible and an open system of Venice Hospital can allow the process of change, modification and growth over time. Eren, 2004.

4.3 Concluding Remarks

It is important to remark that universal design requires a design strategy that can allow to put its principles into practice. It cannot be sufficient to refer only to universal design's built or proposed exemplary projects in order to improve existing built environments and to develop new design solutions.

Architects and planners should take a closer look how universal design can be developed systematically and integrated into the contemporary architecture and urbanism.

In this context, this critical study argues that the mat-building approach can provide a means through which the principles of universal design can be implemented. Mat-buildings can create spatial configurations that can respond both physically and socially to the requirements of the seven principles of universal design whereas universal design offers possible solutions for the details and the dimensional requirements of the mat like organizations. Thus, with the integration of the two approaches it can be possible to create inclusively designed built environments beginning from the initial stages of the design process.

Unlike modernist urbanism, mat-buildings with their five characteristics promise a different kind of urban structure which can pave the way for universal design. The low-rise character of mat-building, its ramps, the unifying capacity of its roof structures, its creation of continuity between the building and urban fabric, the differentiation of the parts within the repetitive structures and its capability of change and growth over time allow the structures and infrastructures to address the requirements of universal design. Moreover, the humanistic approach of mat-building can be also improved and developed taking into account the social issues and ethical considerations in universal design.

CHAPTER V

CONCLUSION

Today, designers, architects and planners all around the world struggle to create urban environments that are physically, socially and psychologically accessible for all people. In the 21st century's architecture and urbanism accommodating variation and full participation in the built environment is very important. It becomes significant to design the whole spatial structures and infrastructures in conformity with the concept of universal design. In the last decade, there is an increase in the number of aging population and people with disabilities. Furthermore, there are various needs and demands of children, pregnant women and people with diverse abilities, sizes and ages. As it was presented throughout the study, the universal design approach and its implementation are significant to achieve equality for everyone in the built environment.

For this purpose, the study highlights the importance of working out design strategies and techniques that can contribute to the realization of the

goals of universal design. As the dimensional standards and disability guidelines have an important place in universal design, the overall form, the organization of spaces and the whole movement patterns should also be taken into consideration from the point of universal design. If the initial design decisions are set in light of the universal design approach, then exclusive and stigmatizing design solutions can be avoided.

Throughout the study, it is aimed to reveal the significance of such an integrated universal design approach. The proposed mat-building and mat-urbanism have capabilities of evolving over time and responding to the users' changing needs in time and in different circumstances. By pointing to the correspondence between mat-building and universal design, the thesis aims to provide a design strategy for designers, architects and planners, which helps to create or renovate urban environments according to the principles of universal design. With the mat-building approach, it is possible to design urban environments that allow growth and change, and are adaptable to the users' needs.

The important thing related with the mat-building approach is its capacity to receive new meanings in time. It is noted that in the contemporary architecture and urbanism, the scope of mat-building is enlarged in many of the built examples to include the contemporary issues of landscape and urbanism. As it stated in detail in Chapter II, matrices, fields, carpets and grounds are used as synonyms for mat-buildings. Mat-building can define an organized field where diverse functions of urban life are unified and their internal

relationships become more important than the overall structure. It establishes networks, paths, and matrices for movement, flow and exchange. Hence, this study reconsiders and reassesses also mat-building in light of universal design. In addition, it states that the further research on mat-building incorporating with the seven principles of universal design can contribute to mat-building's future developments. My contribution with this critical study is not only to explore the potential of mat-building for the implementation of universal design, but also to open new ways to import creative ideas and design strategies for further research in universal design. Future studies can include the development of mat-like configurations designed universally and being applicable to specific building facilities, such as educational settings, residential environments or transportation facilities.

Especially in Turkey it is significant to design residential environments universally. If the apartments could be designed in conformity with the universal design principles and mat-building techniques, then the occupants could live as long as possible and afford to age in place. The low-rise character, adjustable and changeable design features of mat-building by incorporating the seven principles of universal design can respond to the changing users' needs in residential environments. A systematic repetition of certain universal design elements in the residential environments can also provide a framework for different possibilities in apartment living. A high degree of flexibility achieved in the integration of mat-building with universal design can give all people the possibility of ageing while using the space efficiently and effectively. This

discussion can be also valid for education, transportation and other urban environments. The repetition of these universally designed building types at the urban scale can also open up the possibility of universally designed cities in Turkey and in the other countries.

Architects and planners are also responsible for taking into account a broader scope of human dimensions rather than defining an average human being. The different dimensions of human form are important to capture diversity of people. Lack of knowledge related to disability types and diverse demands of people for providing accessibility and usability are important problems that architects and planners are facing today while designing the urban environments. They should be aware of the requirements of all ages, abilities and sizes. Rather than addressing the needs of an average human being, they should consider and be conscious of the issue of diversity. Thus, it should be noted that the architects and planners have the responsibility of creating buildings and urban fabrics that can communicate with its users in an inclusive way and can be used equally by all people through their entire life.

In this context, this study also brings clarity to the relationship between the contemporary social issues and the physical environment by suggesting a viable design strategy for universal design's implementation at urban scale. As it is mentioned in many references, universal design at urban scale is a comparatively new concept. Therefore, future research in this emerging new

area can also involve further development of mat-building and other appropriate design strategies as well for the implementation of the universal design principles.

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