A COMPARATIVE STUDY FOR UNIVERSITY CAMPUS PLANNING

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by

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M.Sc THESIS EXAMINATION RESULT FORM

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

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ABSTRACT

University Campus Planning is designing a physical environment which contains various functions and elements. University is a place where the young orients for future and also cultural, scientific and sportive activities take place. In the 20th century, the higher education has become the common acculturation. The characterization of the environment is closely related with the success of the campus design. Some examples of university campus site plans are evaluated here with a goal of formatting living campus planning. Main criteria are obtained after the evaluation of the successful samples.

In this thesis, İzmir Institute of Technology campus is considered as "a case study" to investigate. This campus planning is compared with the main ideas of campus design. This thesis in the Department of Architecture contains seven chapters.

The first chapter is the Introduction chapter which involves the "Definition of the Problem", "Purpose of the Study" and "Methods of the Study".It contains the definition of campus design and the problems which expose the necessity to design each university as a campus.

In the second chapter the development of campus design in the world and in Turkey throughout the 20th century are examined. And the examples of campus design site plans from Turkey and the other countries are investigated and their success according to criteria of campus design are determined.

In the third chapter, human basic needs in a university physical environment are examined. These needs include human and behavioral needs, physiological, sociological and psychological needs, and requirements for education, research, health, recreation, food service and sports.

In the fourth chapter, physical structure for a university campus is discussed. The main criterias are determined such as campus landuses, infrastructure, building locations, functional arrangements, circulation networks.

In the fifth chapter, the visual (architectural) criteria for campus design such as image, style, aesthetical values, landmarks, materials, landscapes are investigated.

Some approaches for campus design are studied in the sixth chapter. These are linear, centralized, non-linear and decentralized, molecular and grouping-zoning organizations.

In the seventh chapter, İzmir Institute of Technology campus is investigated as "a case study" comparing with the main criteria of university campus planning and finally two proposals are developed for the site plan of İzmir Institute of Technology.

Finally, the elements to pay attention while creating more quantified university environment in design are defined and determined.

ÖZET

Üniversite kampüsü planlaması, birçok eylem ve unsuru bir arada barındıran bir fiziki yerleşimin tasarlanmasıdır. Üniversite gencin geleceğinin yönlendirildiği, şehir için de kültürel, bilimsel ve sportif faaliyetlerin yapıldığı bir yerdir. 20. yüzyılda, yüksek öğrenim, kültürlerin birbirinden etklendiği ortak bir zemin oluşturmuştur. Üniversite eğitim çevresinin belirli bir kimlik kazanması, üniversitenin bir kampüs planlaması olarak tasarımındaki başarıyla yakından ilgilidir. Üniversite kampüsleri tasarımı için bir katkıyı amaç edinen bu çalışmada; "Üniversite Kampüslerine ait yerleşim planları" incelenerek elde edilen başarı kriterleri doğrultusunda, yol gösterici olabilecek ana ilkeler elde edilmiştir.

Bu tez kapsamında, İzmir Yüksek Teknoloji Enstitüsü Kampüs Planlaması bir "case study" (Olgu değerlendirilmesi) olarak ele alınmış, kampüs tasarımı ana ilkeleriyle karşılaştırılarak incelenmiştir. Çalışma yedi bölümden oluşmaktadır.

Birinci bölüm "Sorunun Belirlenmesi", "Çalışmanın amacı" ve "Çalışma Yöntemleri" alt bölümlerini içeren "Giriş" bölümüdür. Üniversite ve Kampüs çevresinin bir tanımı ve Üniversitelerin Kampüs olarak tasarlanmasını gerektiren sorunlar ortaya konmuştur.

İkinci bölümde 20. Yüzyıl boyunca, dünyada ve ülkemizde kampüs tasarımının gelişiminin kısa bir geçmişi araştırılmış ve yine dünyadan ve ülkemizden bazı kampüs tasarım örnekleri incelenip başarı kriterleri saptanmaya çalışılmıştır.

Üçüncü bölümde; üniversite fiziki çevresinde insan gereksinimleri incelenmiştir. Bu gereksinimler insan davranışları gereksinimleri, eğitim, araştırma, sağlık, eğlence, yemek ve spor ihtiyaçları olarak ele alınmıştır.

Dördüncü bölümde; üniversite kampüsünün fiziki yapılanması ana ilkeleri araştırılmıştır. Kampüs arazi kullanımı, altyapı, bina yerleşimleri, işlevsel düzenlemeler, dolaşım ağı ana belirleyicileri incelenmiştir.

Beşinci bölümde; görsel kampüs tasarım ilkeleri olarak, imaj, stil, estetik değerler, simgeler (landmarks), malzeme, peyzaj (landscape) kavramları irdelenmiştir.

Altıncı bölümde; üniversite kampüslerinde bazı tasarım şemaları üzerinde durulmuştur. İncelenen tasarım şemaları doğrusal, merkezi, doğrusal ve merkezi olmayan, moleküler, gruplama ve bölgeleme (zoning) düzenlemeleridir.

Yedinci bölümde, İzmir Yüksek Teknoloji Enstitüsü Kampüsü, üniversite kampüs planlamasının ana ilkeleriyle karşılaştırılarak irdelenmiş ve İzmir Yüksek Teknoloji Yerleşim planı üzerinde geliştirilen iki öneri ile tartışmalar son bulmuştur.

Sonuç olarak, daha nitelikli üniversite çevreleri yaratılması için tasarımda dikkat edilecek unsurlar belirlenmiştir.

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INTRODUCTION

1.1 Definition Of The Problem

University campus planning is, like a small town, a creation of physical structure where various disciplines and activities take place. Higher education is accommodated in the universities where young people who have different backgrounds, abilities and educational interest, live in close contact with each other. The higher education in any country is an important factor which contributes to the development of that country. Universities, as educational institutions equip the students professionally, socially and psychologically. The education given at the university is a strong determinant of the young adult's identity.

In the world and in our country, the importance of science, information and communication is increasing. 20th century is the time of transition from industrial to the information society. This transition emphasizes the importance of universities in the world, as well as in our nation and society. At these circumstances, the quality of education and physical planning on a university campus support its importance. Furthermore, the quality of its structure has an influence in increasing the quality of information given there.

In the late 20th century each culture effect each other in higher education. In our country, there are 60 universities. So many people have been involved with these institutions directly, at one time or another as students enrolled in programs. In an university, there exists social, economic, intellectual and cultural activities affecting so many people. Therefore, the physical forms of universities are very important.

But each institution differs from each other in its own purpose, contents, organization, mission, size, location, environs, teaching, research and service. These differences help design a campus in its physical environments, as useful as possible. Here, the most important thing, to combine the vision and the practice and to express the suitable ideas

with strong designs.(DOBER, 1992). The visual effects, aesthetic satisfaction, well-designed campus plan increase the quality in education. In the beginning of 20th century, the university campus was developed as a self sufficient town away from the city. Such campuses were prototypes of campus design.

Campus design is the art of campus planning said Dober in his book.(DOBER,1992,p.3) This act reaches the end point in some processes that give form, content, meaning and delight to the physical environment serving higher education. Designs created can celebrate a sense of place. Designs also communicate an institution's purpose, presence and domain. Designs generate an image with symbolism or graced by history. University includes all the human activities and habitation. Each institution deserves to be shaped by a plan. These plans must be a response to reality, distinctions, concepts of its own for each institution. (DOBER, 1992)

Some campus designs in Turkey are; ODTÜ Campus, Hacettepe Beytepe Campus and Bilkent Campus in Ankara, İTÜ Ayazağa Campus in İstanbul, Anadolu University Campus in Eskişehir, ODTÜ Campus in Gaziantep and etc. These campuses appeared to be efficient and functional for campus life. But while comparing the student population involving with universities and the number of universities in Turkey, the quantity of campuses built is not enough. Even the other examples exist in Turkey called as campus which have no any criteria as a campus.

The universities can be classified as city universities and campus universities depending upon their location and physical structure. City Universities are located in the cities. The buildings may be organized in a same area or may be scattered throughout the city. Dormitories are at different locations of the city in the latter situation. The city universities of Ankara is the best examples for this second type city university. The Essex University, in England, is a best example of city university where the residence is a part of it.

Campus Universities includes all the human needs in its area such as educational buildings, social centers, cafeterias, sport area complexes and residences. City campus

students profit from the socio-cultural activities offered within the city but out-of-city campus students can not. The subject of this thesis is the campus university.

In the case of university buildings are scattered throughout the city, as well as the student and the staff profit the possibilities and opportunities of city but interrelations between faculties, scientific interrelations between different disciplines, the profit from a central library, the social and sportive activities, the student profits from different disciplines, the efficiently use of cafeteria and sportive areas by students who live in dormitories, may be neglect. When a university is designed as a campus planning these activities will take place efficiently.

In reality the communication between university, city and people is a requirement such as community activities, concerts, courses offered to the public etc... Each university must be shaped by a campus plan for the ease of work and creating a good place to search.

The campuses which have some disorder in planning will have no wholeness in design. The neglect of designing the green areas as livable social areas and the absence of some social, intellectual and sportive places occur.

But one can repeat that each institution deserves to be shaped by a plan as a campus. Then to institute in a well-planned campus, creates desirable atmosphere for creative research and desirable teaching activities.

1.2 Purpose Of The Study

A well- formulated and designed campus will define the institutions' place in the community. The importance of the visual effects can not be denied. It will achieve aesthetic satisfaction, by arrangement of campus plan, by responding to variations in topography and tree cover, by organizing some approaches, enters, passes, vistas.

It is important also to preserve existing buildings and landscapes. An architectural style, modern or traditional or a mosaic of style serve to institutional area.

The purpose of the study is to indicate and examine the most important criteria for university campus planning, also to compare İzmir Institute of Technology campus design with the main criteria of university campus planning, and to define the elements to pay attention to the subject in design process with the guidance of these criteria, to evaluate the design criteria of İzmir Institute of Technology.

1.3 Methods Of The Study

An analytic method from general to specific is followed. Subject is evaluated starting from the general topic, "University Campus Planning", and details are approached step by step. İzmir Institute of Technology campus is considered as a case study.

At the beginning, the definition of campus design is examined. Secondly, the development of campus design in USA, Europe and in the world, throughout the 20th century is searched with some examples. The campus design planning in Turkey is also investigated.

Human requirements in a campus, physical structure for a university campus, architectural and conceptual elements, the organization schemes are examined. The information is obtained from books in Bilkent, ODTÜ, İYTE, DEÜ, Chamber of Architects Libraries, from Technical Offices of Bilkent, Ege, ODTÜ, DEÜ and from personal interviews.

CHAPTER TWO

DEVELOPMENT OF CAMPUS DESIGN THROUGHOUT THE 20 TH. CENTURY

2.1 In USA, In Continental EUROPE, Great BRITAIN and In Russia

First appearence of an University is in Medieval Era, in the 12 th century AC. These Universities were under the title of '**Universitas Magistrorum et Scholarium**' and were dependent on the churches. An University was a place composed of a union about students and teachers where were occupied with scientific research. Nowadays, a University is a union of science and this called '**Universtas Literarum**'.

In Medieval Era, University was about a single building in city. In 19th century, new needs required new places in big cities, and these buildings became insufficient, and then new campuses occurred far from the city center. For example; Faculties of Rome and London Universities were situated in different places of the city, this was an undesirable situation. Rome and London Universities are redesigned as campus Universities in 1930s' as unifying all the functions in these cities. University of Rome is designed by Marcello Piacentini between 1933-1936 and University of London is designed by Charles Holden between 1930-1965. University of Rome campus appeared as neo-classic faculty buildings around a large square.

As campus planning, United States situation was different. New York University (1813) in Chenectady designed by J.James Ramee and Virginia University in Charlotteville (1817-

1826) designed by Thomas Jefferson were the first examples of campus design in USA, these were inspired from "Castrum" of Rome age. "While designing the University of Virginia, Thomas Jefferson described his goal as the creation of an 'academic village'". (TURNER, 1990, p.3). There was a rectangular garden, the buildings placed around this garden as a compositionel tendency. United States campuses were designed as a "University city", placed outside of city. For all the American campuses main idea is the same; to design a central square and around this square library, auditorium, cafeteria, student union and the other common functions were placed and outside this center the educational functions occurred. "Throughout its history, American higher education has largely adhered to the 'collegiate' ideal rooted in the medieval English universities, where students and teachers lived and studied together in small, tightly regulated colleges."(TURNER, 1990, p.3)

In the 20th century , when it becomes a problem to find suitable place for University campus in the city, campus find its place outside the city, different from traditional city University.

> *"... Another innovation, the placing of colleges in the countryside or even in the wilderness, an unprecedented break with European tradition. The romantic notion of a college in nature, removed from the corrupting forces of the city, became an American ideal. But in the process, the college had to become even more fully a kind of miniature city. And its design became an experiment in urbanism."* (TURNER, 1990, p.4)

Jeffersonian pattern was the most popular pattern for the USA. University of Virginia by Stanford White (in 1890) and American University in Washington by Henry Ives Cobb were the examples for Jeffersonian pattern.

In 1900's the use of industrial materials began to create multistoried and light-filled interior. In the Hearst Mining Building of the University of California at Berkeley, John Galen Howard created a vestibule, inspired from Labrouste's Reading Room for the

Bibliotheque National. The arches suggest coal mines which open onto a sky light. Steel appeared as structural material in the Hearst Mining Building. During the same period, "Open air schoolhouses" appeared on scene and were adopted. Educators advocated the close contact with nature and a homelike atmosphere. These spaces were accepted as the best space for the moral, physical and intellectual development of young people. (SELZ, 1981)

In 1902, Frank Lloyd Wright demonstrated his ability of command in materials and in scale, at Hillside Home School. This was a domestic ambiance rather than an institutional ambiance. The building is related to nature with its materials such as stone, natural wood etc... In 1907-8, Charles Rennie Mackintosh added a north part to School of Art in Glasgow. The addition has a verticality, the narrow bay windows extending the height of the building. The building's form is like an abstract form rather than Mackintosh's Art Nouveau designs. In the library's interior a wooden framework, hanging lamps and tall, thin furniture is designed to show the space. (SELZ, 1981)

Rectilinear Art Nouveau became the end of the movement in Europe. The style continued in Glasgow and Vienna. In the war decade, few innovation appeared in University and school architecture. In 1910, Graduate College at Princeton, New Jersey by Ralph Adams Gram and Frank W.Ferguson built as a national fashion for Neo Gothic academic buildings. In 1910's Collegiate Gothic in Oxford and Cambridge and Neo-Georgian were very popular. In Chicago, some institution were reflecting the ahistorical Prairie Style of Frank Lloyd Wright as traditional domestic Architecture. In California, a regional style effectively used. In institutional structures, in San Diego, Pruning Gill created a style of geometric simplicity and abstraction inspired by the adobe buildings of the Spanish Colonial period. Pruning Gill built an institution in California, Bishop's School in La Jolla. (SELZ, 1981)

In 1920's Bauhaus was an innovative style in school Architecture. The Bauhaus constituted not only a school but a philosophy. The aim of the Bauhaus was to unify the arts and crafts. In earlier, William Morris in England recommended this unify. This

synthesis gave birth to industrial design. Walter Gropius formulated first the Bauhaus philosophy to prevent both the alienation of the artist from the public and the alienation of the worker from his product. In 1925 Bauhaus moved from Wiener to Dessau because of local political oppositions. Gropius designed new school buildings there, according to his philosophy of functional design. Gropius created a complex of clarity and cohesion. "Using a pinwheel plan, whose three arms consisted of a workshop, a dormitory, and a design school connected by suspended bridges containing offices, Gropius created a complex of exemplary clarity and cohesion." (SELZ, 1981, pp.232) Then International Style effected the University buildings as proportioned reinforced-concrete walls and long ribbon windows. Gropius and his team of designers built their buildings according to functional economy. (SELZ, 1981)

In 1940, the war, greatly restricted building for civilian use during the first half of the decade. In this period, the architects succeeded in achieving an according interaction between the large modern building and its ancient neighbor. In Postwar period, the Moscow State University was the most massive building complex, a group of thirty-light buildings arranged symmetrically in military order around a thirty-two story skyscraper topped by a tall spire. This tower dominates the university's main exits. At the entrance of the structure, a waste, marble portico is installed and this portico was appointed with the usual bronze and marble status and fountains proclaiming socialist virtues. "It has almost as little stylistic relationship to modern architectural problems as it does to historical styles. This mode, repeated in many succeeding buildings throughout Moscow as well as elsewhere in Eastern Europe during this period, is usually known simile as Stalinist architecture, bearing the heavy and reactionary imprint of its namesake." (SELZ, 1981,pp.351) Famous modern architects commissioned in the Massachusetts Institute of Technology and in Harvard, in America, 1940's. They built new dormitories for the man returning war. Walter Gropius, as chairman of the architecture department since 1938, helped to design the Harvard Graduate Center. The buildings were designed modest and simple. The horizontality is seen in these buildings. (SELZ, 1981)

At the same time Alvar Aalto was commissioned to build a dormitory for Massachusetts Institute of Technology. He created a curved structure, giving its inhabitants a view of the Charles River. He used red brick as material such as the University of Virginia designed by Thomas Jefferson. "But like Gropius's work at Harvard, Aalto's building did not attain the high quality of his earlier or later work in his native land." (SELZ, 1981, pp.351)

In 1939, Mies van der Rohe was commissioned to design a new campus for the Illinois Institute of Technology. Overall effect of the structure is formality, clarity and control. Crown Hall building of Illinois Institute by Mies is the best example of the campus. The building has a breath-taking open main floor and a vast volume of free-flowing space. "The overall plan of I.I.T. belonged essentially to a classical tradition of planning, which soon came to be considered too rigid and inflexible by most campus planners." (TURNER, 1990, pp.251)

In 1947, Joseph Hudnut outlined a new approach for campus planning. He said;

"Every attempt to bind (Universities) to a pattern laid out in advance has failed-aned ought to have failed. . . . We must set them free to develop their environment in whatever way may best suit their existing needs. . . . The task to be performed in university buildings and the methods by which they are built constantly change. Their nature tomorrow can not be predicted. No program is possible which extends beyond a dozen years. . . . Let's imagine the university, as the city planners imagine the city, as a growing organism whose form lies partly in the past, partly in the future. Our university will never be completed. . . . If we make a master plan then, it must be in such general terms as will admit of new interpretations and unexpected development. We can take nothing for granted. Those facilities which have endured the longest may be the first to dissappear."(TURNER, 1990, pp.280)

In 1950s', Louis Kahn's Richards Medical Research Building at the University of Pennsylvania in Philadelphia is the most influential American University Building. The building has a glazed concrete-framed block surrounded by a cluster of brick-faced towers. The building is differentiated by various functions. The University library in the

University City in Mexico City, designed by Juan O'Gorman, Gustavo Saavedra and Juan Martinez de Velasco. It is a simple block and has a brilliantly colored mosaic pattern designed by O'Gorman himself. The Art Gallery for Yale University in New Haven completed in 1954 by Louis Kahn. The building is pure, calm and orderly. It is a tetrahedral concrete space frame. (SELZ, 1981).

''The phenomenal growth of colleges and universities in the 1960s began in the immediate wake of World War Two, but it was not until the products of the postwar baby boom came of age that a dramatic rise in campus populations and construction budgets occurred on a global scale.'' (SELZ., 1981, pp.510) A New campus plan for the Polytechnic Institute in Otaniemi, Finland in 1949 prepared by Alvar Aalto. The main building of the plan was an auditorium and office building. The auditorium building is marked a high point in Aaltos' career. In England, a New History Faculty in Cambridge University built. It is a L shaped building which has glass roof, totally glazed on its interior side.

The Campus of Yale University, in Connecticut, after the war decades, became a showcase. Most important building of the Yale University is the Art and Architecture Building designed by Paul Rudolph. It is a symbolic building. The functions of building is more suitable scenically than practically. The concrete was poured into corrugated forms. The Beinecke Rare Book Library at Yale is designed by Gordon Bunsaft of Skidmore, Owings and Merrill and its Zen-like sculpture court is designed by Isamic Noguchi. This building is composed of an exterior grid of translucent marble panels.

In British Columbia, Simon Fraser University is designed by Arthur C.Erickson and Geoffrey Massey. The University has a spectacular site near Vancouver. The terrain is organized by terracing and heavy planting. The plan consists of departments, disciplines and other university functions into a tightly knit unit with interior courts and esplanades. University population is considered 18.000 persons. It is designed as a single building, in order to make a compact solution. It is also a matrix-system. The length of complex is

central' which has transparent material at the top(30m x 70m), takes place. (Fig.2.1, pp.12)

Louis Kahn's Salk Institute for Biological Studies, in La Jolla, California is one of the best example of twentieth century institutional architecture. An open formal court existed between two research wings, with offices angled out to face the ocean. A perfectly straight stream of water crossed the open formal court. Kahn designed a grand order and a profound silence, on the beautiful landscape above the Pacific Ocean with inspiration of the great monuments of Greece and Rome. (SELZ, 1981) So, it seems that USA is the first country where campus design were realized in addition to work done in the nineteenth century.

> *"...College planning in America has an independent history, evolving its own forms and producing its own innovations, less subject to European fashion than other fields of architecture and design. The educational institutions of Europe simply were not appropriate models for American schools, which developed their own original character, requiring new forms of physical planning. The American campus, from the beginning, has been shaped less by European precedents than by the social, economic, and cultural forces around it. As a result, it has been the laboratory for perhaps the most distinctively American experiments in architectural planning."* (TURNER, 1990, p.6)

Some campus planning examples from all over the world, will resume with the campus planning approaches. Their differences from each other and their entrances, service approaches, pedestrian roads, circulation networks, open squares, clusters will investigate in this chapter.

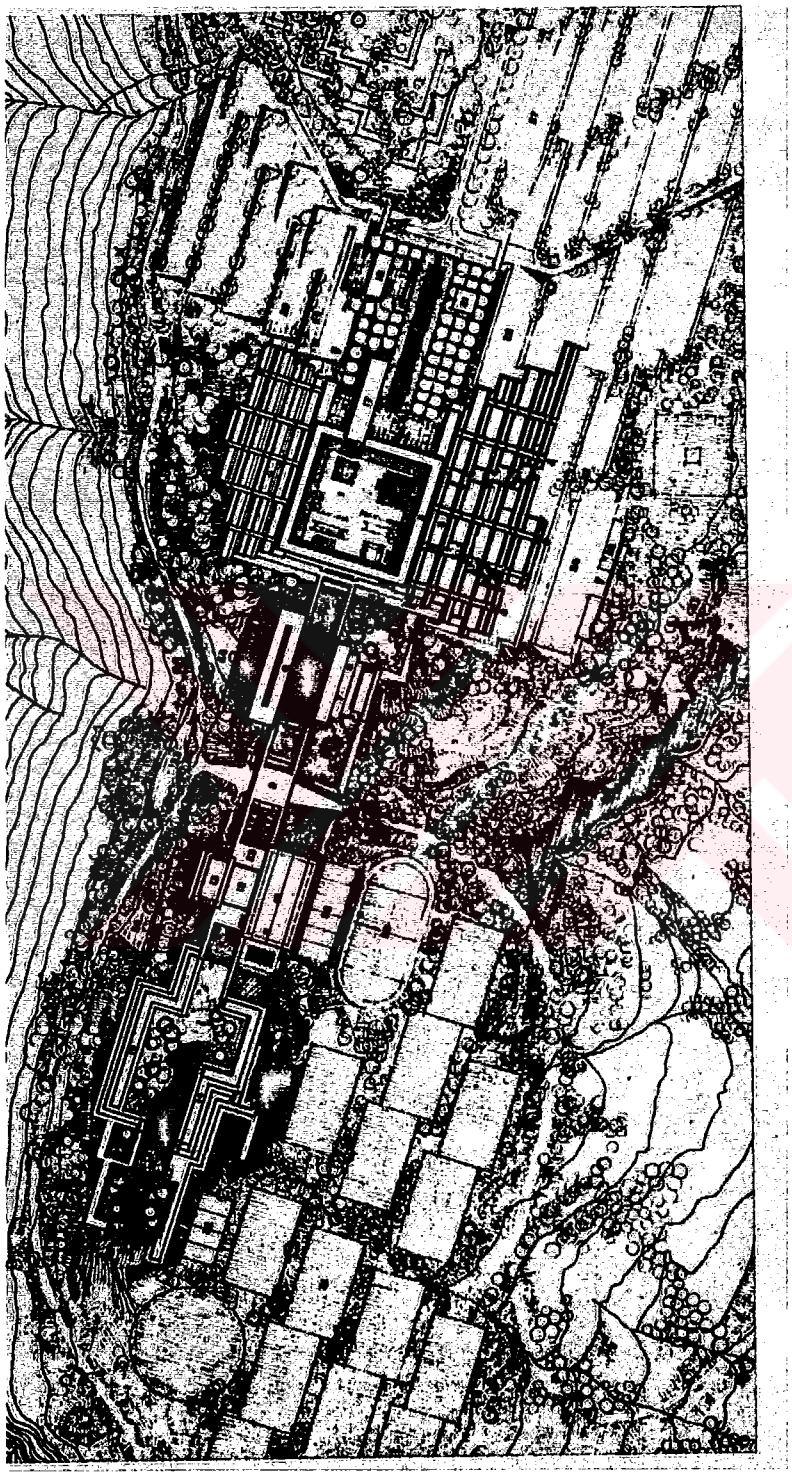


Figure 2.1 Simon Fraser University, Canada, 1963

Example for Zoning, Free Design, Building Landmarks

FLORIDA SOUTHERN COLLEGE, Lakeland, 1938

Frank Lloyd Wright

"Another departure from campus-planning tradition occurred in Frank Lloyd Wright's designs for Florida Southern College, also begun in 1938. This project, which was Wright's first commission for an entire college, was brought to him by the school's president, Ludd M. Spivey, who was an admirer of the architect's work and who gave him full freedom of design as well as an agreeable site in a citrus grove next to a lake."(TURNER, 1990, pp.252)

Design, Building Forms

Design has non-rectilinear geometry, irregular spaces and casual movement from building to building, along paths forming thirty-, sixty-, and ninety-degree angles. "The flexibility of this scheme allowed Wright to give the individual buildings a wide range of shapes-hexagonal in the chapel and theater, circular in the library, rectangular in some of the other buildings, and a combination of hexagonal and rectangular in the music building."(TURNER, 1990, pp.254)

Entrance, Service Entrance, Pedestrian Roads

Entrance of the campus is from the administration buildings area. Service entrances are around the campus outside roads. Pedestrian roads formed as non- rectilinear geometry and as casual movement among buildings but architect created different paths along the trees, near the citrus grove.

Open Spaces, Building Types

Open squares formed as surprising social areas near buildings or at the intersection of paths. They designed as freely but it seems like they are functionally useful for campus social and cultural life. The buildings are designed as free forms, as hexagonal, circular, rectangular or combination of hexagonal and rectangular. No similar forms in buildings can be seen. This campus life may be attractive for students because of its differences in design and its natural environment. (Fig.2.2, pp.14)

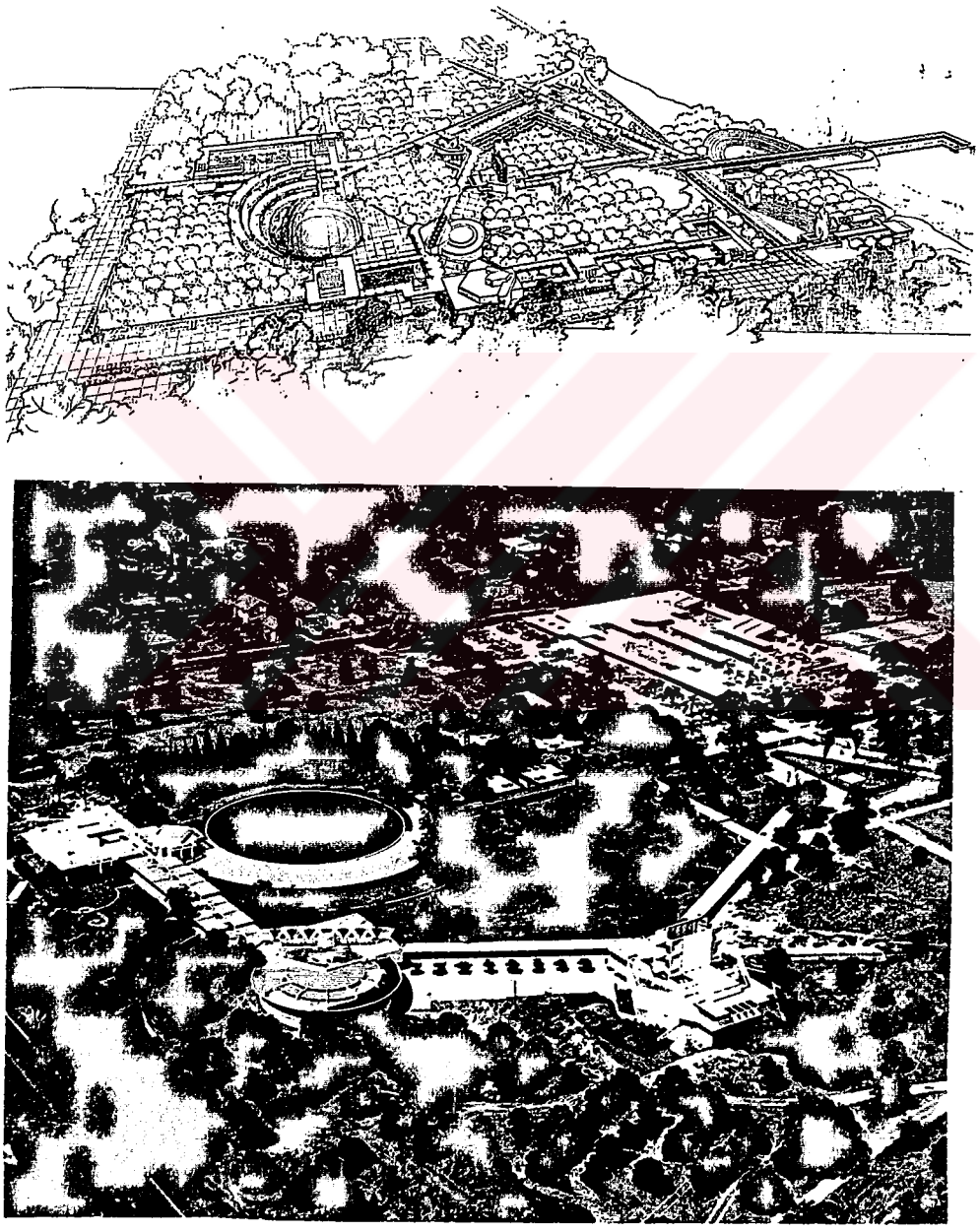


Figure 2.2 Florida Southern College, Lakeland, USA, 1938

Example for Natural Environment, Harmony with Topography, Zoning
OTANİEMİ UNIVERSITY, Helsinki, 1949

Alvar Aalto

Design, Walking Distances, Nature

Site is 7 km far from the city center of Helsinki. It is a competition project. Campus area is about 1.400m x 500m. Student population is expected as 5.000 students. Zoning system is used in planning scheme. In the north of the site housing units and dormitories are designed. Sport facilities and navigation clubs take place in the east part of the campus. The road system is organized according to topography. Natural environment is the basic design idea of Aalto in this campus. He respected the nature and the natural characteristics of environment and he arranged the buildings according to it. (KORTAN, 1981)

Zones

Academic buildings were designed traditionally as one by one. Some buildings were organized around a center. Student activity zone becomes a joint zone of academic and residential zones. Like the traditional campus planning idea, there is no separation of vehicle and pedestrian traffic.

Entrance, Circulation Systems

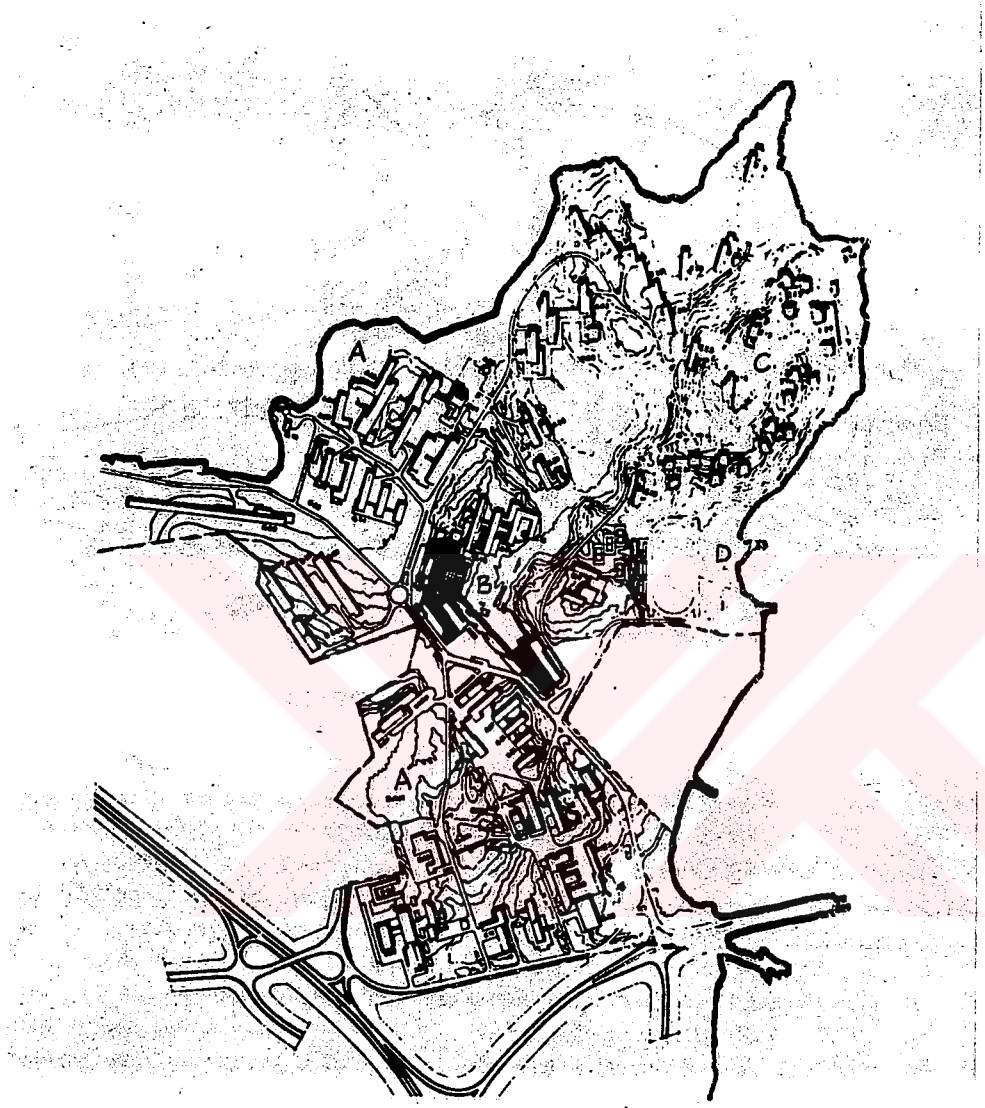
Entrance of campus is near the administrative and academic area. Two service entrance exist, one is on the west, the other is on the east. Pedestrian roads formed according to topography near the buildings. Vehicular traffic separates some faculty buildings from the others.

Open Spaces

Open squares are designed between buildings. Their forms vary according the shape of buildings and according to topography. It is a wide-spread campus plan type then the common center placed at the focus of design. Most important open areas are there.

Building Types, Materials

A repetition in building types are seen. Some clusters occur in housing units. Academic buildings have similarity from one to other in site plan. A hierarchy in building proportions is remarkable. Building materials are brick, metal cladding, glass and sometimes stone. (Fig.2.3, pp.16)



21 Oteniemi Teknik Üniversitesi, Vaziyet Planı

A. Eğitim Binaları
B. Merkez ve Ortak kullanımlar
C. Konutlar
D. Spor tesisleri

Figure 2.3 Otaniemi University, Helsinki, 1949

Example for Natural Environment, Organic Scheme

YALE UNIVERSITY, Morse and Stile Colleges, designed in 1960, constructed in 1962

Eero Saarinen

Design, Organic Plan Type

Yale University, Plan of Morse and Stiles colleges, by Eero Saarinen designed in 1960, constructed 1962. It is an organic scheme in physical pattern. The pedestrian roads and the buildings are curved as an organic plan type. It occurred a sympathy in environment and a warm home like atmosphere. The nearness of the buildings are suitable for the interrelation between different disciplines. The natural materials such as stone constitute the design fabric.

Entrance, Pedestrian roads

Entrance of college is from the central axes of buildings. The administration building takes place at the center of college area. Service entrances are at the some exists of roads. Pedestrian roads are curved as an organic order, like the buildings. It occurred natural environment.

Open Spaces, Materials

A big central open square take place at the entrance of dormitories. This square formed with the paths and buildings around. The other common open areas are as casual gathering places at building entries. In this college pathways forms on the central plazas. Favorite outdoor spaces of the college are greenery areas. Stone pavement in paths and stone walls make a natural atmosphere in college open spaces.

Building Types

All the buildings are designed as some cluster in planning scheme. These clusters have some inner courtyard. Building forms are curved as natural forms of stone pavement. (Fig.2.4, pp.18)

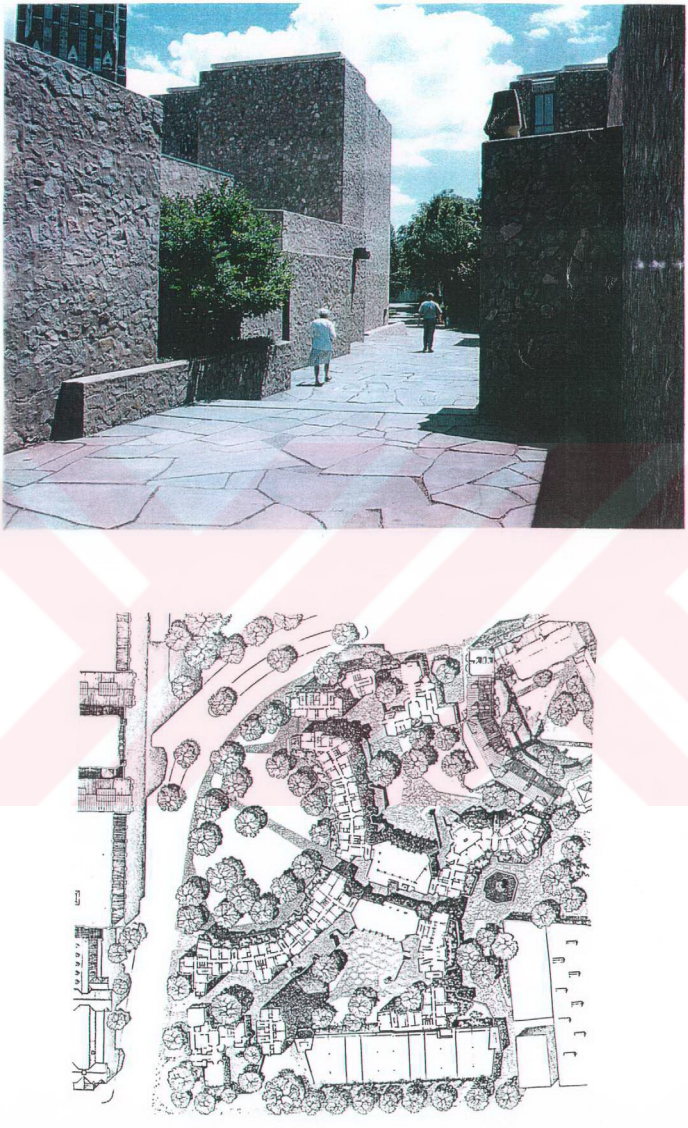


Figure 2.4 Yale University, Morse and Style College, USA, 1960-62

Example for Compact Design, Layer System

UNIVERSITY OF EAST ANGLIA, Norwich, England, 1962

Denys Lasdun

Design, Elevated Walkways

The decision was the university should be compact. Individual would not lose his sense of identity with the whole. Elevated walkways separate students from motor traffic and link the buildings by pedestrian routes.The University was to allow for growth. D.Lasdun intents to create an image of openness and freedom.

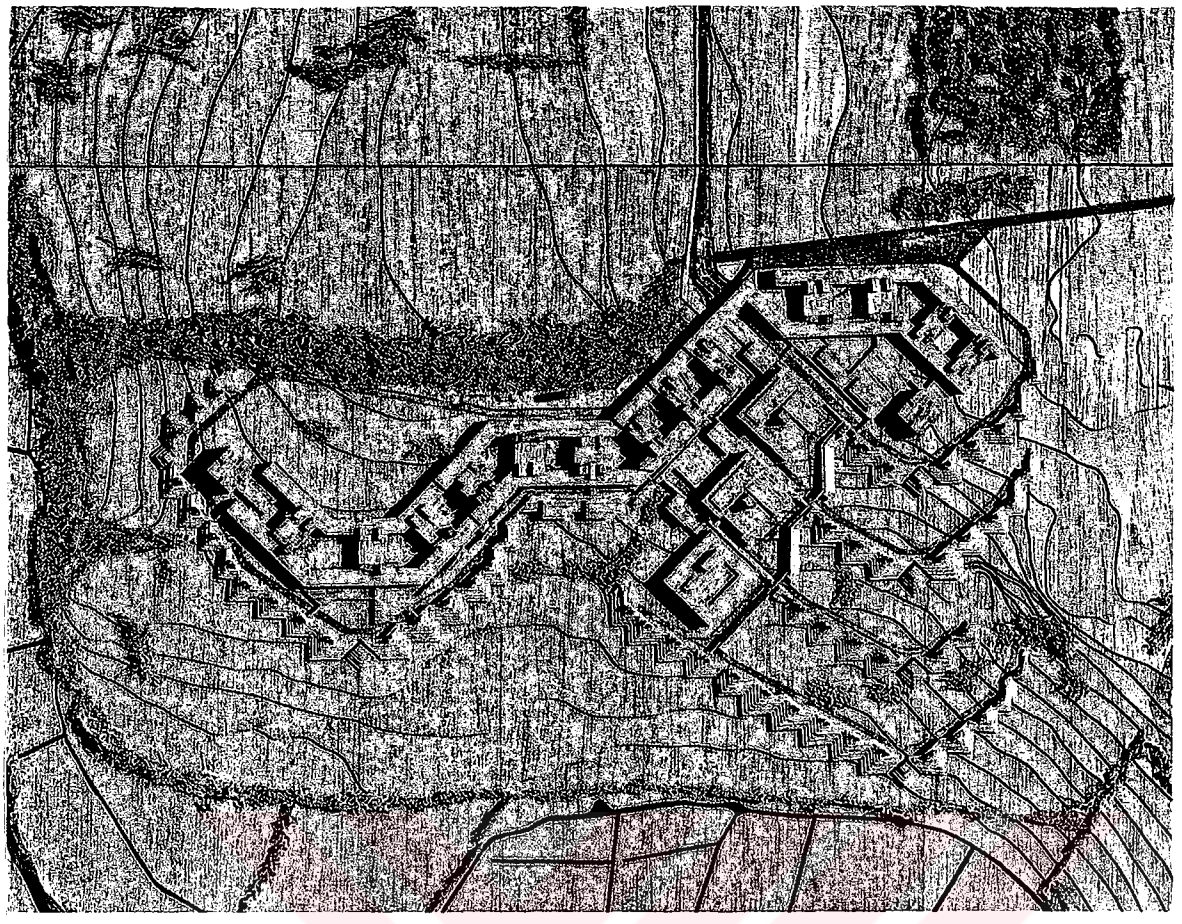
> *"The buildings define a friendly pact between modern technological means-concrete, plate glass, mechanical servicesman and nature. As the architect put it in 1966:'Here we are concerned with making virtually an outcrop of stone on the side of a hill leading down to a river... an assembly of built forms with a diversity of spaces, each one intimately attached to the particular piece of landscape in which it finds itself:* (DENYS LASDUN, 1994, pp.92)

Zones, Functional Facilities, Entrance, Circulation System

The planning scheme of University of East Anglia is a compact design. All academic patterns and all functional facilities are gathered as a whole. Some layers are used for circulation. Zoning and linear organization are used in planning scheme. Entrance of the campus is from the north side. Service entrances are from the west and east side of the complex. Pedestrian roads are elevated and linked the buildings. Vehicular circulation are separated from pedestrian routes.

Open Spaces, Walking Distances, One Building Complex

Open spaces are organized as natural environment. The university has not any open square. Common functions seem to occur inside the complex or on the pedestrian elevated walkways. It is based on the idea of compactness of the activities, and it is designed with the consideration of not more than 5 minutes walking distance in campus. It is a one building complex. All the separated units link to main complex by pedestrian walkways. The linear super-block of academic activities and the social and cultural activity buildings around this block are the main bodies. The academic, housing and student activity zones are planned parallel to each other. (Fig.2.5, pp.20)



University of East Anglia, model of development plan, draft 2, 1963

below: Plan at elevated walkway level

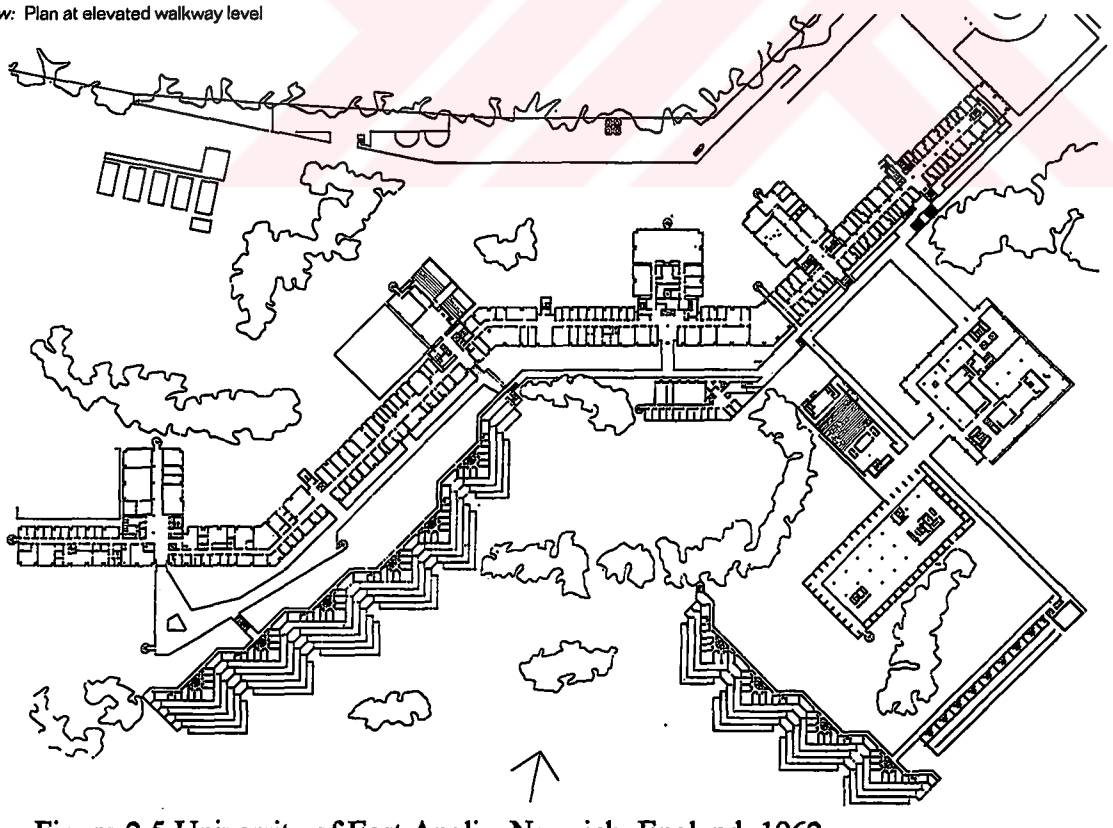


Figure 2.5 University of East Anglia, Norwich, England, 1962

Example for Centralized Plan Scheme, Unified Growth, Over-all Structural Grid
SOUTHEASTERN MASSACHUSETTS TECHNICAL INSTITUTE, North Dartmouth, Massachusetts, 1963

Paul Rudolph

Design, Unified Growth

Rudolph unified here, the entire complex in terms of circulation, topography, sequence of visual experiences, a repetitive structural grid, and mechanical system and strongly modeled elevations designed to maintain good scale relationships within a variety of situations.(SCHMERTZ, 1972) This is a centralized plan scheme for campus design. SMTI has an architectural concept strong enough to control the design of a whole campus. This university planning is not a collection of buildings. It has a unified growth opportunity.

Entrance, Circulation System

Main entrance of the campus are from the north. Service entrances are designed in the south of outer vehicular road loop. Pedestrian circulation is designed at the inner paths of campus. An outer loop is designed for vehicular circulation. Traffic ways linked to the buildings by cul de sac.

Open Spaces

At the southeast of campus, an open space occurred with its steps. This is the only one square of the campus. All the buildings are designed as some clusters which have some front porches and backyards.

Building Types

The building types with their modeled elevations, are designed as a repetitive structural grid. Some administrative or cultural buildings differ from others. It is a well organized campus as a centralized plan but similarity of buildings cause neglect of human psychology. Well designed landscape will solve this similarity problem in the campus. (Fig.2.6, pp.22)

Figure 2.6 Southeastern Massachusetts Technical Institute, Massachusetts, USA, 1963

Example for Centralized Plan Type

STATE UNIVERSITY OF NEW YORK at Postdam 1962-73

Edward Larrabee Barnes

Design, Functional Facilities

It was an assortment of separate buildings around an enormous field. A solution for this campus links buildings to tighten the campus and clearly define outdoor space. High reading room of library, marks the academic center. Monumental gateways provide formal entrances at each corner, with their height as the library roof. (BARNES, 1994) It is a centralized planning type. All academic patterns and all functional facilities are gathered as a whole. The social buildings are united with the academic buildings. At the center of the campus, the library is placed. The expansion in the center of this plan type is impossible, the expansion can be possible by surrounding buildings.

Entrance, Circulation Systems

Main entrance of the campus is on the axes of administration building from the south. Service entrances from the other sides of campus area, from north, east and west. But main service building is located to the south, its entrance also is on the south. An outer loop for vehicular traffic exists but vehicular traffic may use the roads at the center of academic area when it is required. We can say that a separation of pedestrian and vehicular circulation exists in a different manner.

Open Spaces

Open spaces of this campus is well designed. Useful plazas for recreation, cultural and social activities occurred in an hierarchical order. These plazas well paved and landscaped. Landscape prevents the campus from noise and creates a privacy for studies.

Building Types

Buildings are arranged to make an inner courtyard in the center of academic area. Library building is at the center of campus. A linear axes unified library with the student union and dormitories. Buildings have rectangular or square forms and all the buildings have an inner courtyard. (Fig.2.7, pp.24)

1 Library
2 Student union
3 Fine arts building
4 Classroom building
5 Administration building (Giovanni Pasanella)
6 Lecture halls
7 Science building (Giovanni Pasanella and Joseph Merz)
8 Dormitory
9 Dormitory (Joseph Merz)
10 Crane Music Center
11 Service
12 Student union expansion
13 Dormitory

Original buildings
Master plan buildings
Future buildings

Opposite: This aerial photo shows the dormitory clusters around the student union and the academic buildings around the library. The Crane Music Center, under construction, is at left.

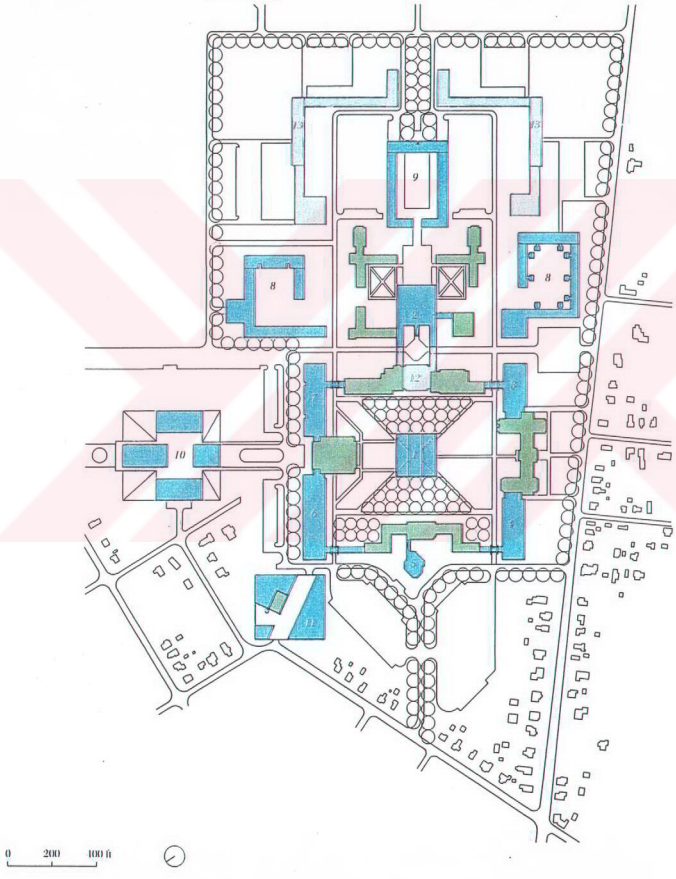


Figure 2.7 State University of New York, Postdam, USA, 1962-73

""Example for Vertical Zoning, Layer Organization

TOUGALOO COLLEGE, Tougaloo, Mississippi, 1965

Gunnar Birketrs & Ass.

Design, Walking Distances, Entrance, Circulation Systems, Building Forms

This campus is planned for 2.500 students and has ability to extend. As it can be seen in cities, it is designed densely. It is opposite to the zoning idea. Different functions are designed together and organized in horizontal. And three layers are planned in vertical. First layer is placed in ground level for the vehicular traffic and autoparcs, second for pedestrian roads. In the second layer academic pattern is installed, this enables best interrelation between different disciplines for students and academic staff in a short way to walk. Third layer is designed for the dormitories with a different structure, looking to the north and south and prepared as two stories, staircases enables the interrelation between academic buildings and dormitories. This is a "matrix-system" in plan scheme. In sections three zonings are occurred, one can say that zoning is not designed in plan schemes but in sections. In this campus the pedestrian movements is the main factor to consider and the walking distance between two points is 1000 m, this is 15 minutes to walk. It is a suitable period to walk, in pedestrian scale. Background buildings are academical buildings and dormitories, at the center, the foreground buildings; auditorium, library, administration building are placed. Gunnar Birkerts created here "an urban environment" and served a sociological education for the students who came from countryside. This planning is a "megastructure" which developed in vertical.(KORTAN, 1981)Main entrance of the campus is from the south. Service entrances are also from the south. Pedestrian ways are designed in three layers and maximum distance is 15 minutes to walk. Vehicular traffic is separated from the pedestrian roads and located on the ground level. At the center of campus a big square occurred for social, cultural activities. Buildings have rectangular forms and they intersect at different levels. It is one single building in other words a complex. At the entrance of campus buildings have diagonal forms as to welcome students, academic staff and visitors. (Fig.2.8, pp.26)

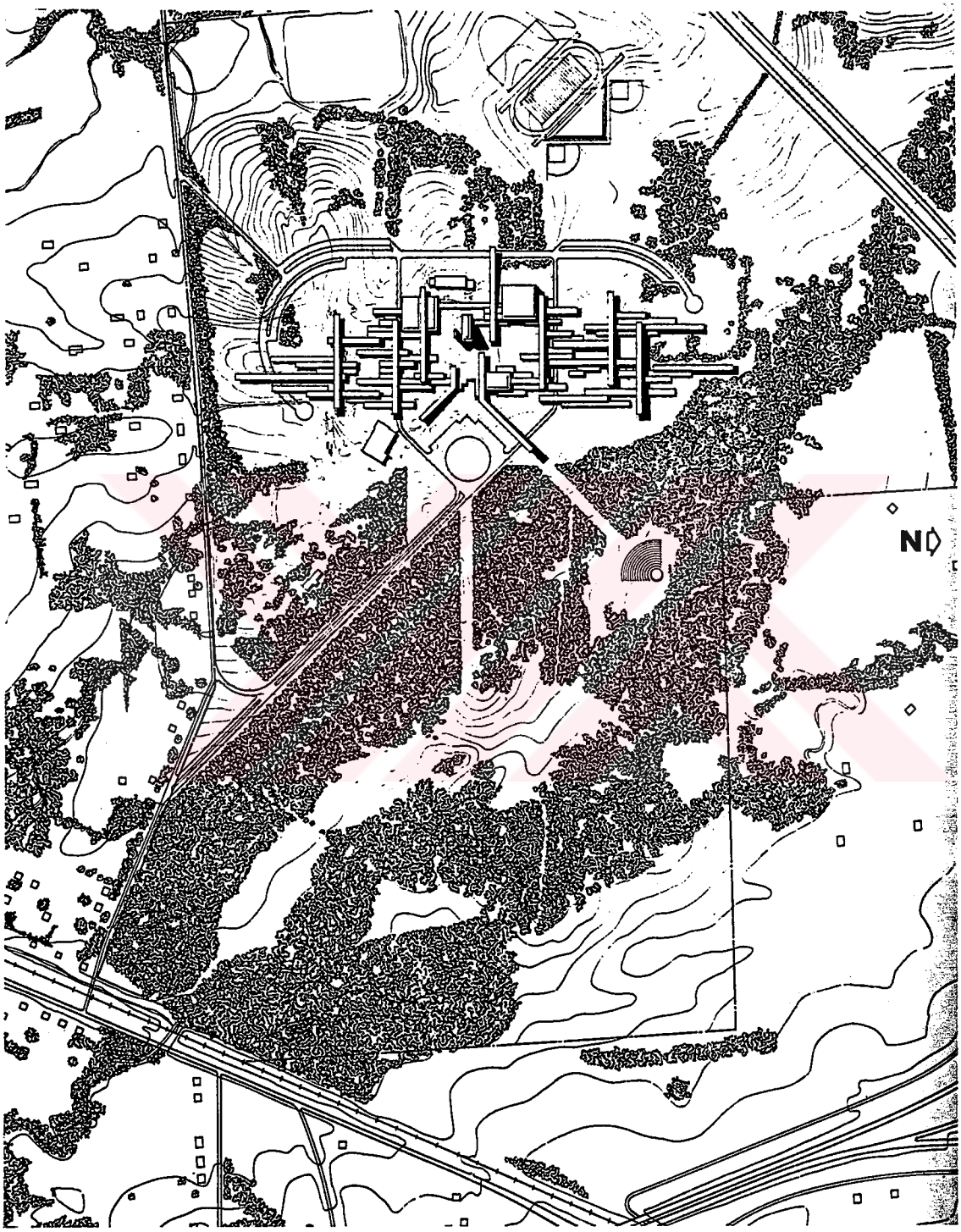


Figure 2.8 Tougaloo College, Mississippi, 1965

Example for Zoning and Wide-Spread Campus

STOCKTON STATE COLLEGE, Romona, New Jersey, 1970

Geddes Brecher

Design, Functional Facilities, Nature

The academic center, the housing and dormitories are installed around the lake. The academic buildings are shaped in a linear order. These patterns linked to each other to occur as a complex. Natural lake separates the facilities from each other and creates academic, housing, dormitories, sports area zones. All the facilities have a scenic view from the lake. Sports areas are near to the academic buildings at the south. Academic staff housing is located at the north of the campus, on the other side of the lake.

Entrance, Circulation Systems

Entrance of the campus is from the west by a pedestrian road. Vehicular traffic have opportunity to use the car parking area near the sports field, from there, one can reach to academic area. Vehicular circulation is separated from the pedestrian roads and a loop occurred for vehicular road around the campus area. This loop connects all the facilities. And vehicular roads connect with "cul de sac" to pedestrian paths to provide car parking places near the buildings. Main traffic road is outer vehicular loop in the hierarchical order. "Cul de sac" roads are the second. A hierarchy also exists in pedestrian paths. An alley, in other words main pedestrian way occurs along the academic buildings. On each side of this alley academic buildings are located. The basic idea of this alley is to make a union, a social place among academic buildings, to strengthen the interrelation among disciplines and to connect the faculties in a short time to walk. The other pedestrian paths are the second or third in this hierarchical order.

Open Spaces, Building Types

Some open spaces occur between buildings and they are useful for cultural, social and recreation activities. Housing zone has many similar units as a typical cluster. In dormitory area also similar clusters are used. In academic area also has similar rectangular buildings. A repetition occurs in building types but the natural environment does not permit for monotony. (Fig.2.9, pp.28)

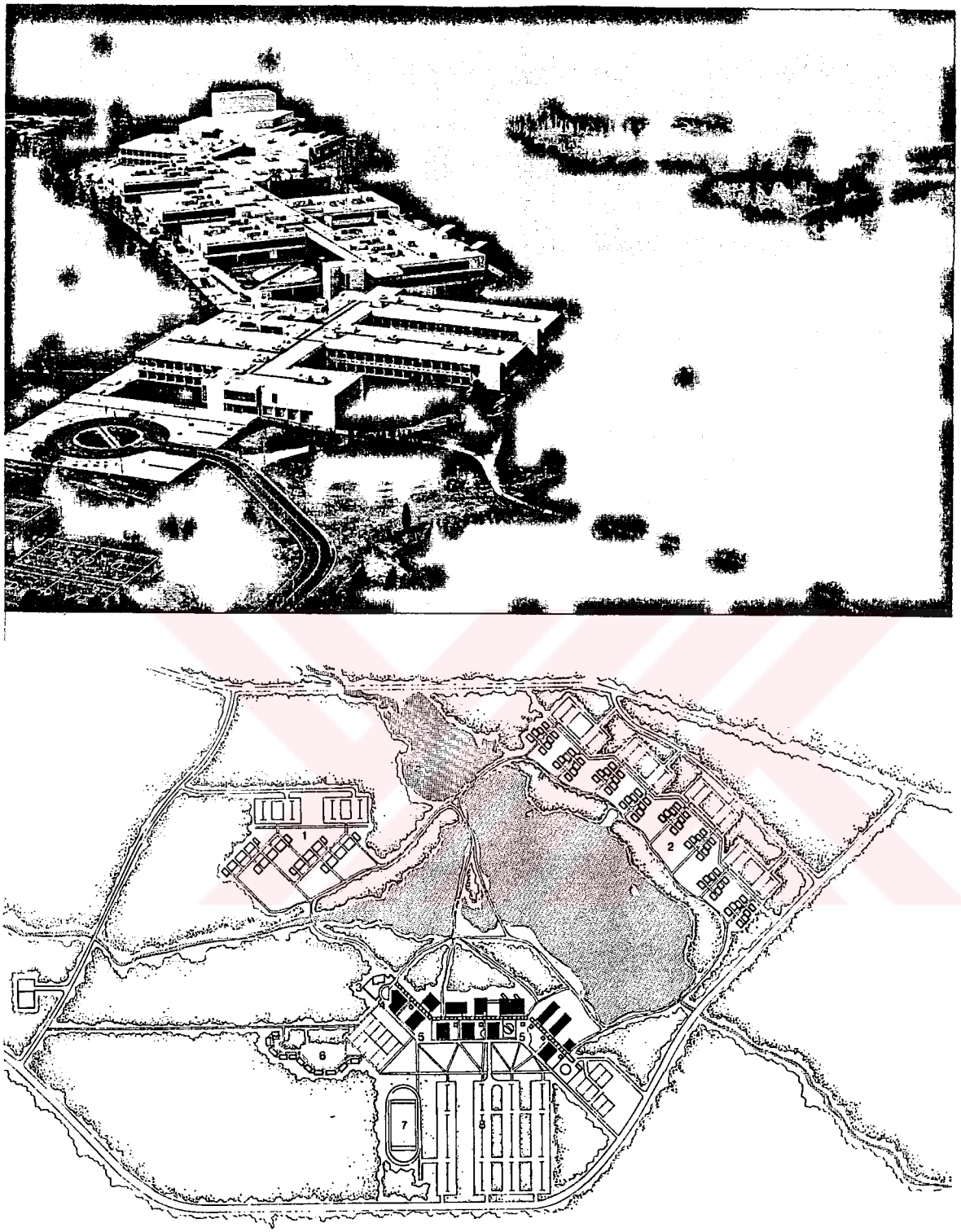


Figure 2..9 Stockton State College, New Jersey, 1970

Example for Compact and Linear Type Campus

EL FATEH UNIVERSITY , Tripoli, Libya 1984

Faculties of Architecture, Geology, Mathematics and Physics

Kisho Kurokawa

Design, Construction System, Building Forms

This university is the largest in Libya, with a student body of 25.000. The roof of each building is distinct from each other and symbolizes the various functions of the structures. Classrooms for the students and research and administration areas are about two different large areas. These two different large areas are two clearly separate volumes. But these volumes intersect in a plaza, this plaza is a place for the exchange of information between students and faculty. In construction, the precast concrete elements used.(KUROKAWA, 1988) It is a linear organization campus planning and a compact design. A circulation is occurred at the inner of the complex. Some plazas are placed to unify the social relations between the disciplines. Similar patterns of buildings are repeated along the inner corridor. A repetition and the monotony in design created a unity but some difference at the plazas gave a visual quality to design.

Entrance, Circulation Systems

Main entrance for the campus is from the east of the complex. Each unity has special entrances from east and west sides. Service entrances for the university are from two sloping accesses on the north. Vehicular traffic is around the university complex. Pedestrian circulation takes place especially inside the complex.

Open Spaces

Two open space exist between buildings for cultural, social and recreation activities. Inside the complex, there exist also some atriums with skylight as gathering places. Multipurpose areas inside the building will serve as social common plazas.

One Building Form, Zones

This university is one building example based on the idea of compactness of activities. The linear super-block contains academic, social and cultural activities. All the activity zones are planned parallel to each other. (Fig.2.10, pp.30)

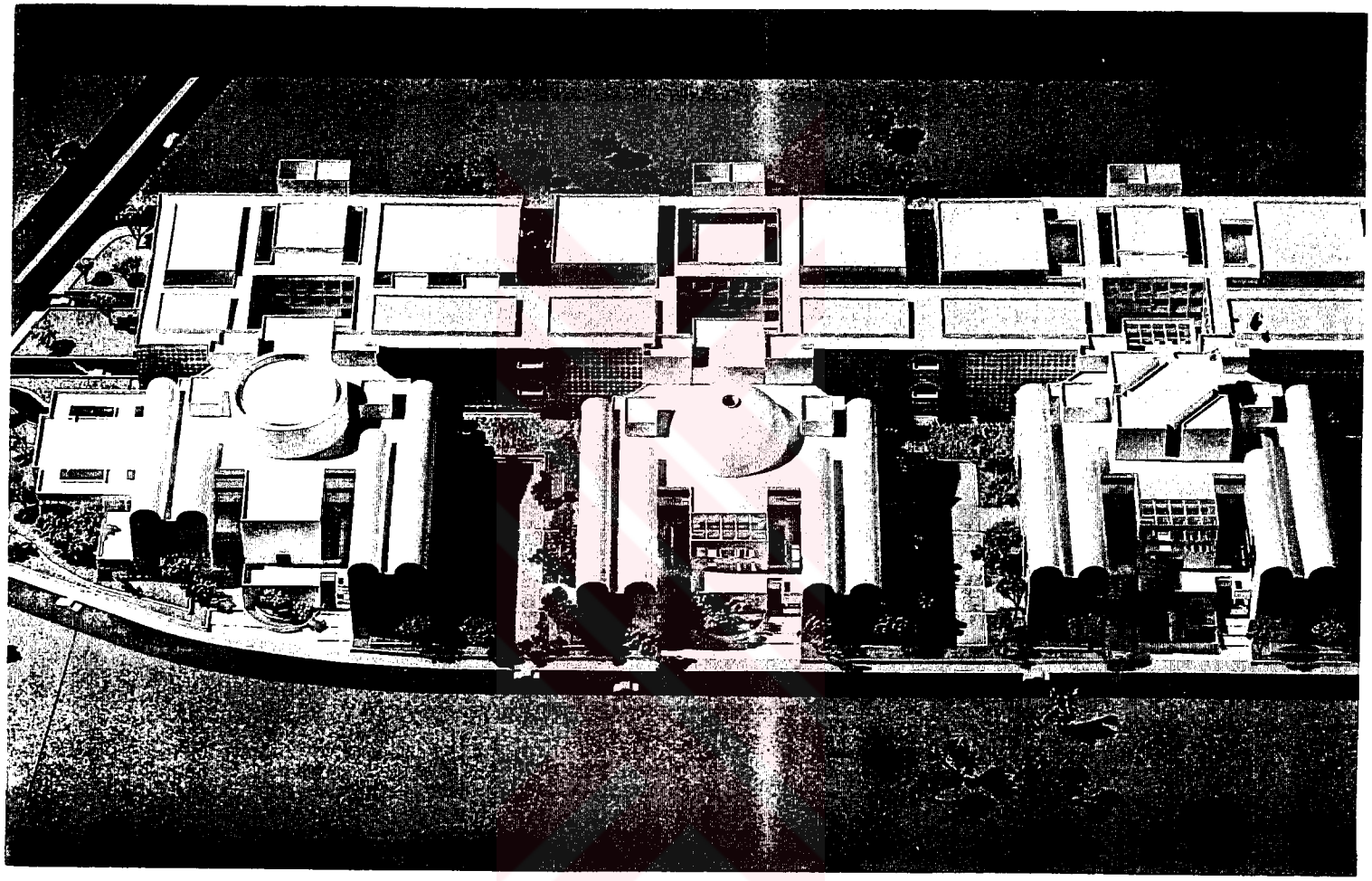


Figure 2.10 El Fateh University, Libya, 1984

Example for Centralized, Hierarchical Units, Compact Design

NATIONAL INSTITUTE OF IMMUNOLOGY, New Delhi, INDIA, (1984-90)

Raj Rewal

Design, Units, Courtyards

The Institute is a complex of academic, laboratory, research buildings, student housing and five clusters of academic staff. These functions grouped as an urban settlement. The gateways and shaded paths exist between buildings around courtyards. Distant vistas and changing views occur and result on shifting axes. The planning type is a centralized organization. The plan is composed of units. This is a compact design. An hierarchy and a growth is provided. The communication and interrelation in a group of units are strengthened contact between people. The communication among different groups is limited.

Entrance, Service, Circulation System

Main entrance of campus is from northeast. Service facilities are located at the back side of campus area on the west. Main traffic roads are separated from the pedestrian roads to permit rapid circulation in campus area. Interrelations between different disciplines strengthened. A loop circulation around the academic buildings is designed to connect all the faculties by vehicular roads which connect with "cul de sac" to pedestrian paths. These cul de sac roads provide car parking places near the buildings. Pedestrian paths occur between academic, social, administrative, sports and residential areas as hierarchical.

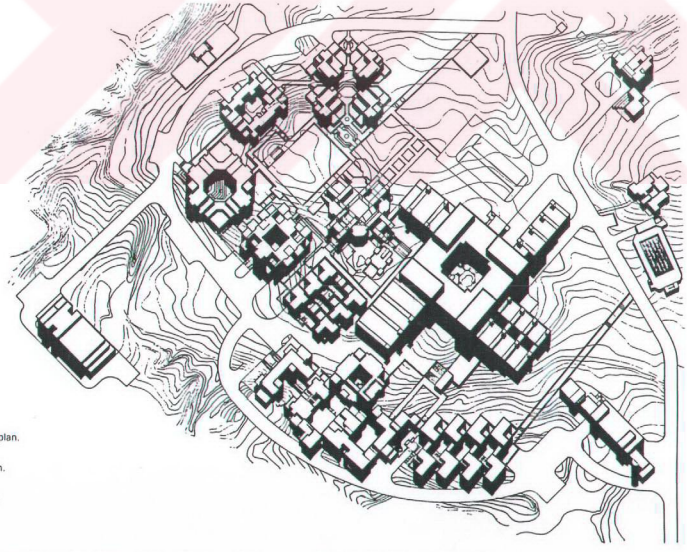
Open Spaces, Building Forms

Open spaces are designed between buildings and on the pedestrian axes. Buildings are gathered for make inner open spaces. Building types are designed as repetition of some patterns and some clusters. In the façades of buildings a simple architecture is seen. (Fig.2.11, pp.32)

View of the students' housing cluster showing the balconies and rendered façades.

Ansicht der Studentenwohnheime mit den Balkonen.

Vue de la résidence universitaire, avec ses balcons et ses façades sobres et rigoureuses.



General layout plan.

Gesamtlageplan.

Plan de masse.

Figure 2.11 National Institute of Immunology, India, 1984-90

Example for Molecular Organization, Grid System

THAMMASAT UNIVERSITY, Rangsit, Thailand, (Phase I, 1986)

Sumet Jumsai

Design, Grid System

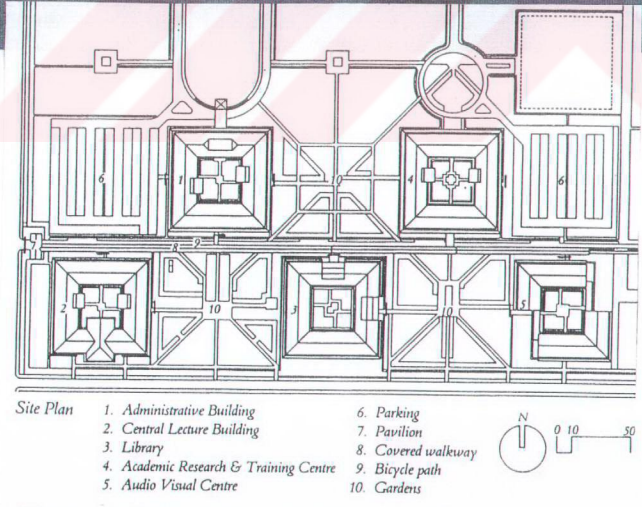
Site is placed to the north of Bangkok. The master plan began to design in 1984 by Jumsai for the first phase. The firm SJA designed first five buildings: the DOM, or central administrative building, the central lecture building, the library, an audio-visual building, an academic and training center. All the buildings placed on a square and a square inner courtyard is occurred. Column grid is about 7.8 meters. The buildings unified by prominent roofs and eaves which give a traditional character to the campus. Thammasat University campus is a molecular organization type. Grid system is considered. Therefore the hierarchy is not a design criteria in Thammasat University planning. The communication among groups is limited but the open places are gathered the building complexes.

Entrance, Circulation System, Open Spaces

Main entrance of the campus is from the west side by the main road of the site. Vehicular circulation and pedestrian are separated from each other. On the main entrance a big car parking area exists, therefore covered walkway and bicycle path are on the most important way of campus. Garden areas as open spaces occurred between buildings and are provided a scenic view.

Service, Building Forms

Service entrances are designed on the north of the campus. Buildings are arranged in modular forms which have some little differences from each other. Molecular organization of the campus did not cause monotony. (Fig.2.12, pp.34)



Site Plan

1. Administrative Building
2. Central Lecture Building
3. Library
4. Academic Research & Training Centre
5. Audio Visual Centre
6. Parking
7. Pavilion
8. Covered walkway
9. Bicycle path
10. Gardens

Figure 2.12 Thammasat University, Thailand, 1986

2.2 In Turkey

"In the book of 'The Modes of Thought', Whitehead said that ;The duty of the university is to create the future."(CANSEVER, 1994/1, pp.112)

In Islamic area, the University was 'Medrese'. It was placed in a 'külliye' which was a complex building composed of a mosque, *medrese, tombs, han*, bath, *bimarhane*(hospital), a *sıbyan mektebi* (a primary school), a *darüzziyafe* (a soup-kitchen), a *tabhane* (a guest-house) and numerous shops. "All these buildings are arranged symmetrically around the mosque which is at the center of the complex." (ÖZÇAY, 1983, pp.10). These *külliyes* are like a starting for a campus planning, in the 14th century.

In Turkey, in the late Ottoman period, we see single buildings for university. These are not campus but the first examples of city universities after the 'külliyes' and 'medreses' of Selçuklu and Ottoman period. The Faculty of Medicine in İstanbul (Mekteb-ı Tıbbıye-ı Şahane/ Haydarpaşa Lisesi, now Marmara University Faculty of Medicine) by Alexandre Vallaury and Raimondo D'Aronco began to institute in 1903. This building is a city university and the influences of Art Nouveau style is seen. It has a inner courtyard, classes are looking to the outside, the corridor is openning to the courtyard. Faculty of Economy (Yüksek Ticaret Mektebi) in Sultanahmet, İstanbul, by Italian architect Raimondo D'Aronco in 1900 was another example of city university. This building became inflamed.

In the first National Architectural Period of the Republic of Turkey we see the first examples of university buildings which were built by architect Kemalettin Bey, in İstanbul. This was a period for return to National inheritance in all the fields in art, literature, economy, rights etc... The city university buildings of Kemalettin Bey are Çarşamba Fethiye Medresesi (1915-1924), in Yavuz Selim, Sultan Abdülhamit-I Evvel Medresesi (1917), Beyazıt Medreset-ül Kuzat (1913) and in Ankara Gazi Quarter, Gazi İlk Muallim Mektebi (now it is a building of Gazi University as a city university (1927-1930). (SÖZEN, 1984)

In the development of After the first National Architectural Period, the basic revolutions and changes began to apply in economy, politics, community, culture. And also the architecture affected and began to reform depending on the above changes. During this period, the foreign architects came to Turkey and worked. Turkish Architects worked without the opportunities offered to foreign architects in Turkey. Some Turkish architects designed their buildings according the style of national architecture. Other Turkish architects adopted to international styles. Some foreign architects worked according to international styles the others designed with formalist neo-classic style based monumental.

Mülkiye Mektebi/Siyasal Bilgiler Fakültesi (Political Science Faculty) (1935-1936) built by German architect Ernst Egli according to functionalism. Ankara Dil , Tarih ve Coğrafya Faculty (Ankara Language, History and Geography Faculty designed by Bruno Taut in 1937. In Ankara some faculty buildings are concentrated in a certain area or scattered throughout the city. Ankara Agricultural Institute in 1928 and Ankara Faculty of Law in 1938-1940 are the examples of the city universities, after the first National Architectural Period. At the same period also, Emin Onat and Sedad Hakkı Eldem designed İstanbul Science and Literature Faculties (1944) and Ankara Science Faculty. Paul Bonatz contributed to these designs

The university campus design in Turkey started in the second half of 1950, many campuses began to built as a small city. In Turkey first university campus planning is Erzurum Atatürk University which built from the result of a competition in 1956. The buildings are according to the rationalist style of this time. This was a design by Enver Tokay, Hayati Tabanlıoğlu, Ayhan Tayman and Behruz Çinici. The campus was criticized with its wide spread site plan and its maladjustement with climate. The buildings are designed according to its time rationalist tendency. (SÖZEN, 1984) This is a wide-spread campus design type. An auto-road crosses the campus site and separates academic buildings from housing and sport areas. Zoning system is used here. A linearity occurred in academic area. (Fig.2.13, pp.37)

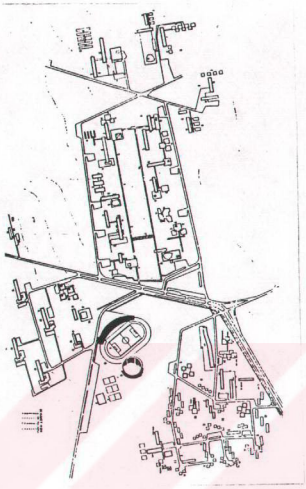


Figure 2.13 Erzurum Atatürk University, Erzurum, 1956

The second University campus planning application is Middle East Technical University in Ankara designed by Altuğ and Behruz Çinici. The third example for campus in Turkey is Karadeniz Technical University built in 1963, designed by Nihat Güner and Mustafa Polatoğlu. This campus situated in Trabzon. The scheme is consisted of separate buildings which are situated in a green area. All functions are distributed on campus area.

The third example for campus in Turkey is Karadeniz Technical University built in 1963, designed by Nihat Güner and Mustafa Polatoğlu. This campus situated in Trabzon. The scheme is consisted of separate buildings which are situated in a green area. All functions are distributed on campus area.

In 1965, a radical change occurred in university campus design. Hacettepe University in Beytepe campus designed by Sabih Kayan and the firm SİSAG. The planning type is composed of units. The buildings are continued to form by the addition of new standard semi-prefabric units. The buildings are formed in an optimum flexibility to organize different functions.

In 1970, İstanbul Technical University (İTÜ) Ayazağa Campus designed by Kemal Ahmet Aru as a molecular design. A partial area of this campus is constructed. It has a social open area at the center of campus as a pedestrian road.

Today, in big cities, new needs require new places and these buildings become insufficient, then new campuses occur far from the city center. Ankara İstanbul and Dokuz Eylül Universities are city universities which have many faculties situated in different places of the city. But Dokuz Eylül University is designed again as campus University in Kaynaklar, İzmir.

Some campus planning examples from Turkey, will resume with the campus planning approaches. Their differences from each other and their entrances, service approaches, pedestrian roads, circulation networks, open squares, clusters will investigate.

Example for Linear Organization and Zoning

MIDDLE EAST TECHNICAL UNIVERSITY (ODTÜ), Ankara, 1961

Altuğ & Behruz Çinici

Design, Alley, Walking Distances

Middle East Technical University campus design was also a competition project designed in 1961. The project was prepared by Altuğ and Behruz Çinici. In this project they unified different ideas. The environment created, has a wide visual assortment.(SÖZEN, 1984) This campus has many qualities comparing to the other campuses built after itself.(CANSEVER, 1994/1) An alley exists between academic area and social area which enables interrelation among different disciplines and social areas. Maximum walking time from one side of academic buildings to the other is about 18 minutes. To walk from dormitories to academic center takes 20 minutes. Zoning system for facilities, is used.

Circulation System, Entrance, Service, Infrastructure

Entrance to campus is from the north vehicular way. Service entrances to faculties, dormitories, sports araes are designed from the outer loop circulation of campus by "cul de sac" roads. Vehicular roads and pedestrian are separated from each other. Main pedestrian roads, in other words an alley gives a social, cultural place for the campus life. Infrastructure.

Open Spaces, Landscape, Buildings, Style, Material

Open spaces are arranged on the front porch of each faculty and related with the alley. Squares have sometimes water elements like administration faculty' square or some sculptures. Landscape design of campus is very successful and the topography is organized well in accordance with buildings. Silhouette of campus is in harmony with nature. Building types are different from each other. Some square and rectangular forms unified in building shapes. It is an organic architecture, as well as architects influenced from brutalism and applied brut beton system successfully. Materials are brick, concrete and this application of brutalism is a pioneer example in Türkiye. (Fig.2.14, pp.38)

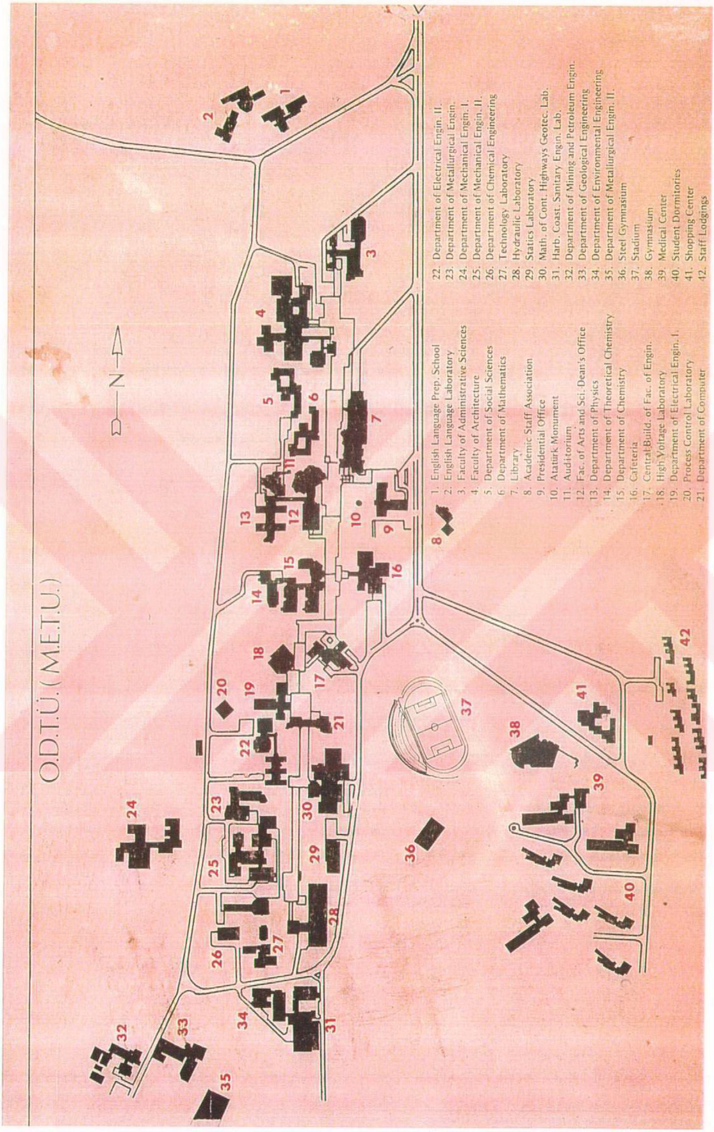


Figure 2.14 Middle East Technical University (ODTÜ), Ankara, 1961

Example for Molecular Organization

ISTANBUL TECHNICAL UNIVERSITY AYAZAĞA CAMPUS, İstanbul, 1970

Kemal Ahmet Aru

Design, Open Space, Inner Courtyards

In 1970, İstanbul Technical University (İTÜ) Ayazağa Campus designed by Kemal Ahmet Aru. İTÜ Ayazağa Campus has 259 hectare land. İTUs' Campus serves 22.496 students and 1803 academic staff. It is a molecular design which composed of repetition of similar elements. It has a social open area at the center of campus as a main pedestrian road where all the social, cultural and administrative buildings take place. This place is a common multifunctional open space at the center of campus. Some flexible inner spaces organized around inner courtyards. Some roads continue at the ground level and buildings take place at the first level. Ground level is reserved for circulation, buildings continue at the upper levels. The plan scheme is suitable for climatic conditions because the space organization is introvert around courtyards.

Entrance, Circulation System, Service

Main entry to the campus is on the south from the main pedestrian road where all the cultural, social, recreational and administrative activities exist. Service entrances are from the outer loop of campus area. Vehicular circulation is not separated from the pedestrian circulation. But some parts of main pedestrian road and some plazas is far from the vehicular traffic.

Buildings, Forms, Organization Scheme

Building types are the repetitions of some clusters. Rectangular and square forms are used in design. Molecular organization of buildings did not created a monotony, design has an hierarchical order and a sympathetic view. (Fig.2.15, pp.43)

Figure 2.15 İstanbul Technical University (İTÜ) Ayazağa Campus, 1970

Example for Molecular Organization

DİYARBAKIR ZİYA GÖKALP UNIVERSITY, Diyarbakır, 1971

Kemal Aru, Yıldırım & Yalçın Sağlıkova, Emre Aru

Design, Inner Courtyards, Circulation System, Molecular Organization

Diyarbakır Ziya Gökalp University was also a competition project designed by Kemal Aru, Yıldırım & Yalçın Sağlıkova and Emre Aru in 1971. The planning scheme is composed of repetition of similar elements which has flexible inner space organized around square inner courtyards. Ziya Gökalp University developed the scheme of vehicular and pedestrian roads by solving the circulation at different layers for prevent the crossing. The plan scheme is suitable for climate because the space organization is introvert around courtyards. It has a molecular organization scheme.

Zones

The campus is divided into three distinctive zones according to activities taking place as; residential, academic and student activity zones. Student activity buildings take place in housing zone as a group and become a joint place of residents and non-residents.

Entrance, Service, Circulation Layers

Campus entrance is from the center of campus area. Service entrances are from the west side of campus area. Vehicular circulation and pedestrian are separated from each other by different layers. So that, this will provide best interrelation among disciplines and careful use of time which can be spend for research activities.

Open Spaces, Buildings

Inner courtyards of modular buildings are open spaces of campus. Molecular organization of buildings is suitable to arrange different squares around buildings. Buildings have octagonal shapes in their molecular order. (Fig.2.16, pp.42)

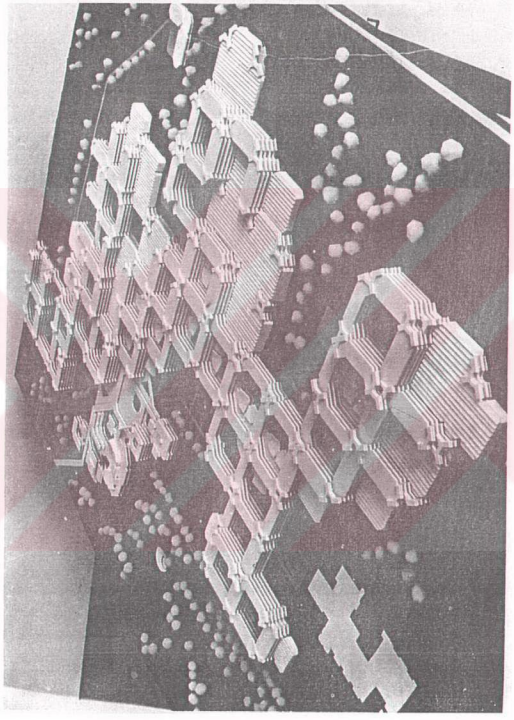


Figure 2.16 Diyarbakır Ziya Gökalp University, Diyarbakır, 1971

Example for Linear, Central and Zoning Organization

ODTÜ GAZİANTEP UNIVERSITY, Gaziantep, 1973

Enis Kortan, Adnan Taşpınar, Teoman Aktüre, Türel Saranlı

Design, Zones

ODTÜ Gaziantep University Campus designed by Enis Kortan in 1973. The site is on the Kilis road and 5 km far from the city center. The campus unified with the residential area of the city. The population is expected for 8.000 persons. The grouping and zoning organization is used in the scheme. The pedestrian and vehicular traffic are separated from each other. Academic zone is designed as a repetition of a linear order from north to south. Main student activity zone is situated in the middle of the academic zone in a linear form from east to west. Housing has been designed separately and located at the west side of the campus with links to academic and student activity zones.

Linear organization, Circulation System

Campus is designed as a compact order and a central organization is planned as well as a linear system is preferred. This campus provides from advantages of central and linear organization. One can reach to university from the central cultural, administrative axes of campus. Service entrances are from the outer loop of campus. Vehicular circulation and pedestrian are separated from each other. All the central academic area is reserved to pedestrian circulation, therefore this prevents the dangers, dusts, noise of vehicular traffic.

Open Spaces, Design Style, Buildings

Open spaces of campus are designed between buildings in this compact order. As design style, a rationalism is seen. The forms of buildings as their rectangular prisms show rationalist ideas of architects. (Fig.2.17, pp.44)

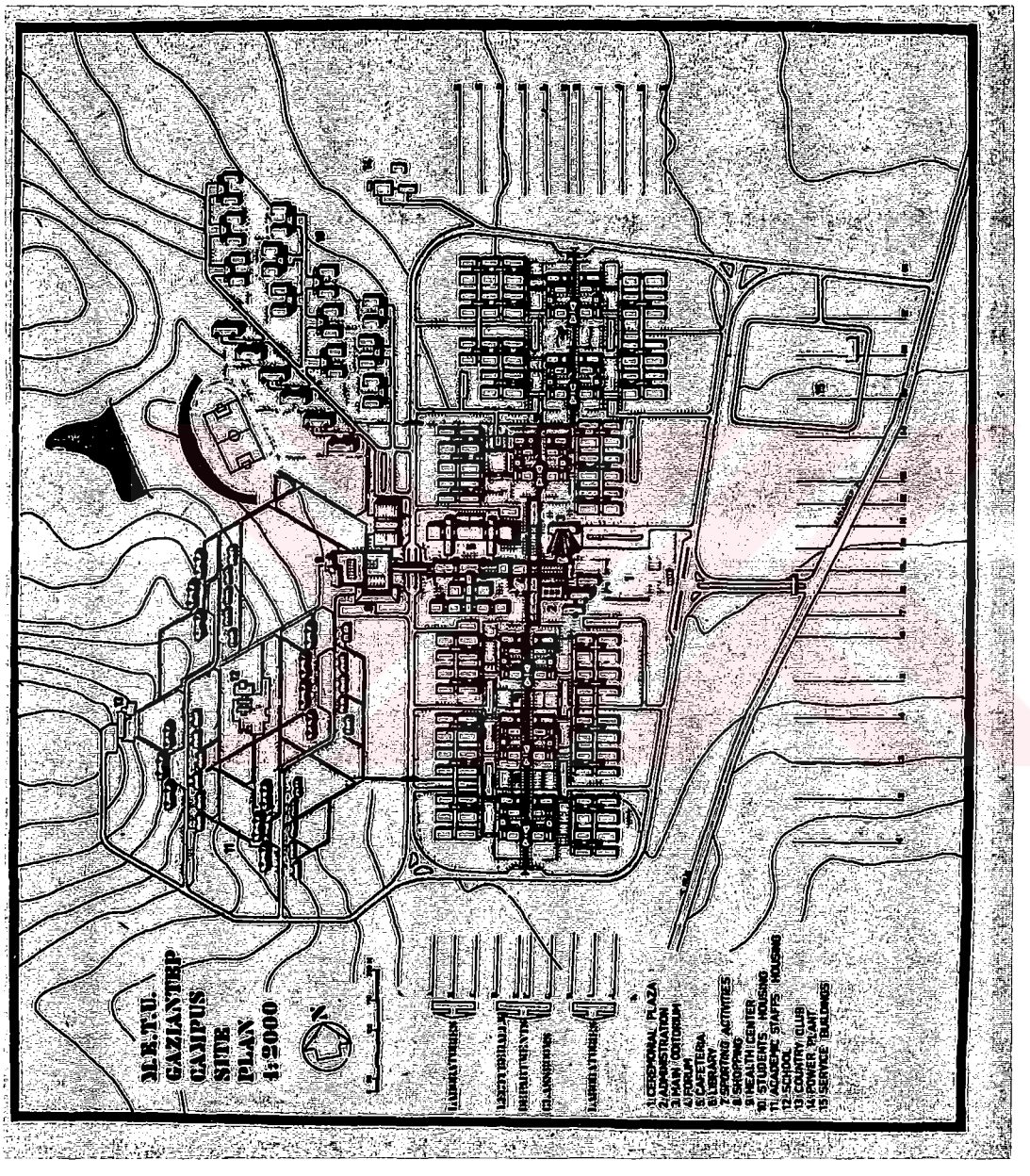


Figure 2.17 ODTÜ Gaziantep University, Gaziantep, 1973

Example for Wide-Spread Plan

BİLKENT UNIVERSITY, Ankara, 1985

Design, Walking Distances

Bilkent University campus is a wide spread campus design. The central campus is planning in linear organization. Expansion of the design is depended on the boundaries of the site. The distribution of functions in campus area, is caused an uneconomic solution and high infrastructure costs. Campus area is not designed according to the standard campus diameter and walking time. To go from a faculty to dormitory or to east campus is impossible by walking. Bilkent enrolls 9.819 students and has 911 academic staff.

Entrance, Circulation System

Campus entrance is from the northeast. The campus is divided in two parts by a grove as east and central campus. Central campus contains faculty buildings, dormitories, cultural, social and administration buildings. Music and scene arts faculty and theater building are located at the center of campus area. East campus contains higher education buildings and some dormitories. Vehicular circulation loop connects two campus areas. Vehicular circulation and pedestrian are separated from each other, at central campus academic zone. A big forest is situated at the middle of central campus and east campus, this forest is offering an abundant beauty year round. Some dormitories and housing for academic staff take place on the entrance road for easy access from city.

Open Spaces, Buildings

A pedestrian way as an alley is designed between faculty buildings for central campus. But this pedestrian way is located on a sloping area then so many staircases exist. Open spaces near this pedestrian way may use for cultural, social, recreational activities. Building types are different from each other but all the buildings has some original modern forms. (Fig.2.18, pp.46)

Figure 2.18 Bilkent University, Ankara, 1985

Example for Semi-centralized Organization

PAMUKKALE UNIVERSITY,Denizli, 1987

Mehmet Türeyen

Design, Radiant Plan Scheme

Campus area is 20.000 meter squared. We see here a radiant plan scheme. All the academic buildings, housing units and dormitories linked with radiant roads to the administration building at the center of campus. A strong main road divides faculty buildings in two parts and links the administration building to big auditorium.

Entrance, Circulation System

Main entrance of the campus is at the south from the central axes of campus. Vehicular traffic and pedestrian are not separated from each other. Open spaces are well organized near faculties, related with pedestrian paths. Some buildings formed as to create inner courtyards. On the south part of faculty area, squares are designed for multipurpose activities, but some large green areas occurred for landscape and to prevent the noise of vehicular traffic on the north of faculty area.

Functions, Building Types

Medical faculty and its housing unit are arranged as a different zone because of its different functions on the west. Housing units of faculties are situated on the east near the sport facilities. Main road of the campus is a cultural alley which links the administration building and the ceremonial square to the auditorium.

Building types have similarities and some clusters are repeated. Squares and rectangles are unified as an organic scheme. Radiant and semi-centralized design of campus is original for the successful application to topography. This is an original design with its basic ideas of forming and order for the site. (Fig.2.19, pp.48)

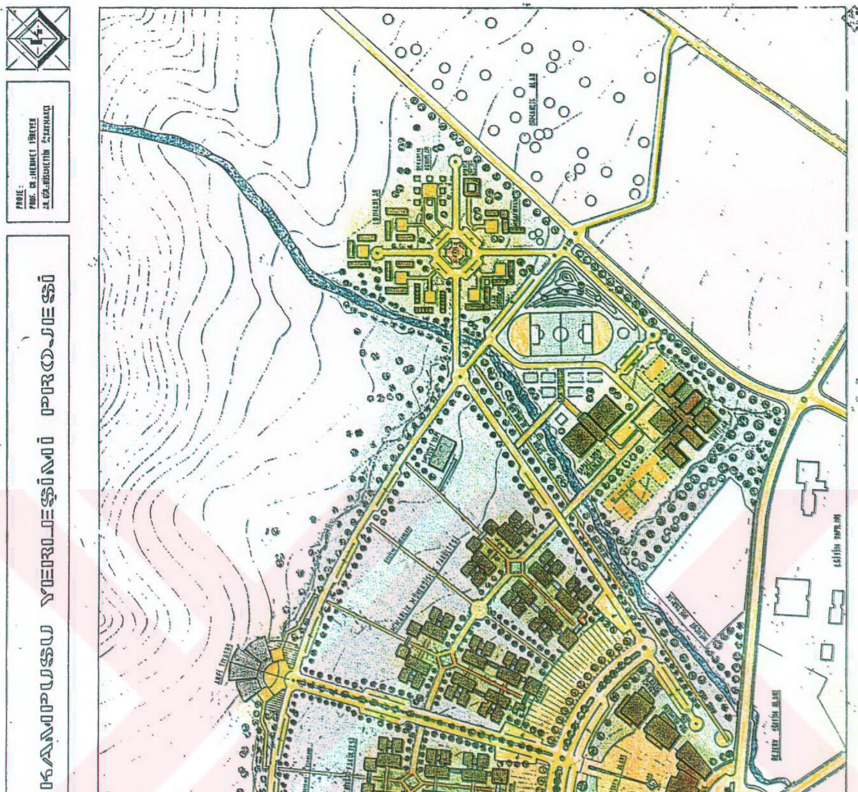


Figure 2.19 Pamukkale University, Denizli, 1987

Example for Semi-centralized Organization

ADNAN MENDERES UNIVERSITY, Aydın, 1988-89

Mehmet Türeyen

Design, Semi-centralized plan scheme

Campus site is placed at the Kepez hill. It is a place 70-80 m high. Aşıklar road links the campus to city (Aydın). At the center of the campus an academic cultural center is located. This center contains library, auditorium and administration building. Sports facilities take place near to this academic cultural center at the other side of the main road. Housing units for academic staff are placed at the back side of administrative building. Dormitories were built before this campus design prepared, they are at one side of the center.

Entrance, Circulation System, Service

Main entry and service entrances to the campus is from the south way. Vehicular circulation and pedestrian are not separated from each other. Vehicular traffic separates the campus to the partitions.

Open Spaces, Building Types

Open spaces are designed as inner courtyard for each faculty building and also near the academic center building a big plazas linked to three other plazas which occur as ceremonial and multifunctional area. Another open space is at the inner space of faculties. Some gardens, squares are designed for cultural, social, recreational activities and casual gathering. Building types are formed as organic architecture style and situated on a hill with scenic view. (Fig.2.20, pp.52)

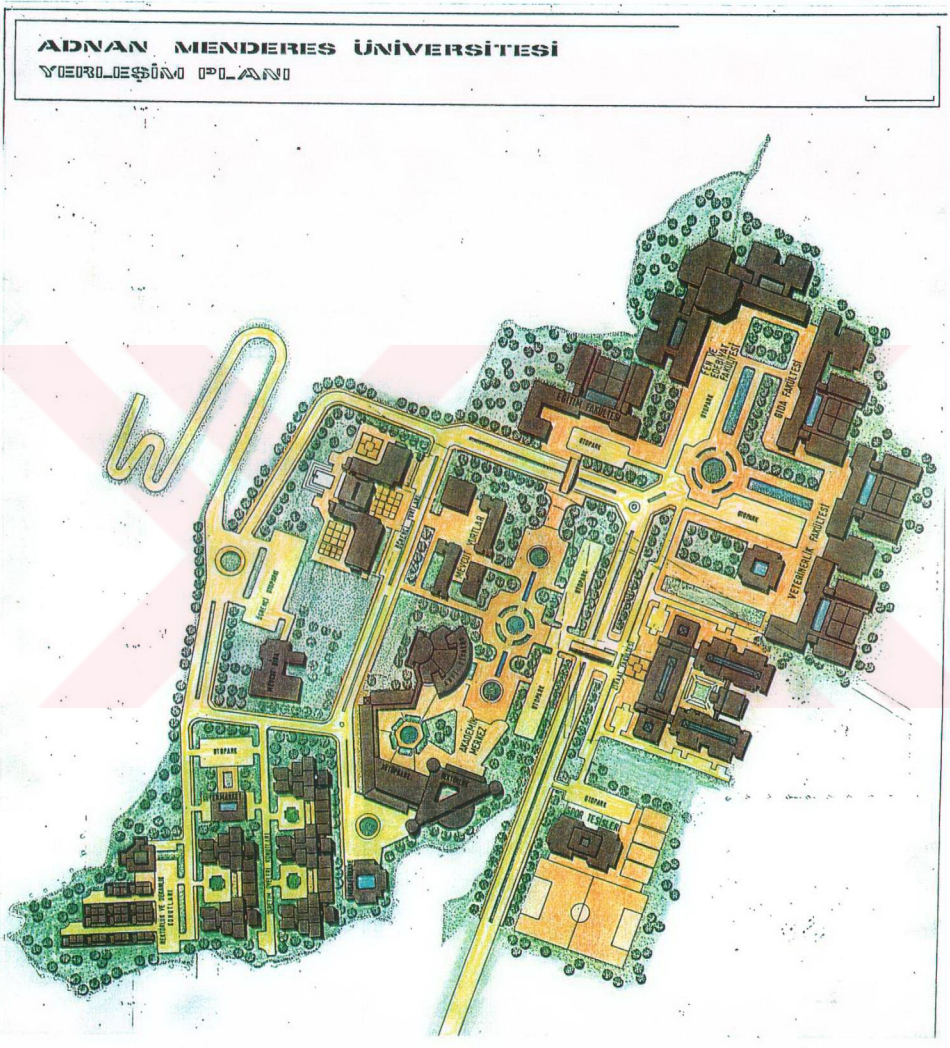


Figure 2.20 Adnan Menderes University, Aydın, 1988-89

Example for Centralized Organization

KOÇ UNIVERSITY, İstanbul, 1991

Arup Associates

Design, L shape Plan

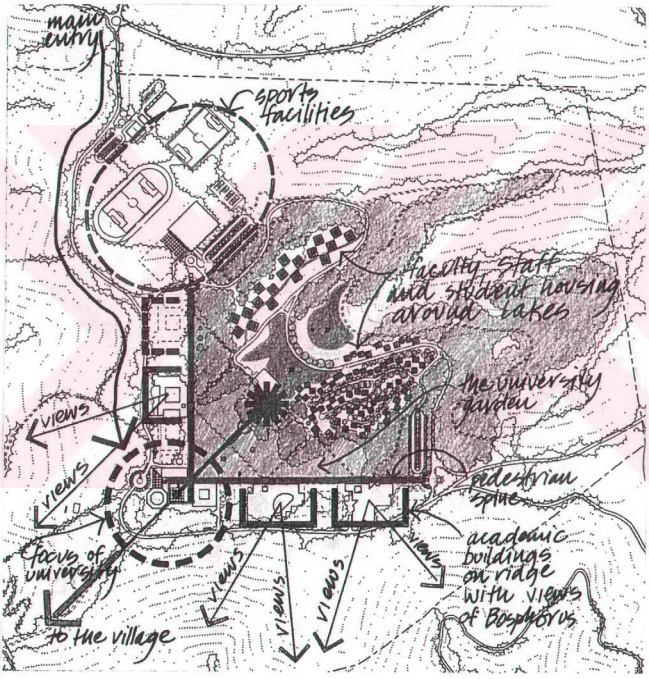
Koç University is designed in 1991 by Arup Associates. It is placed in İstanbul. Koç enrolls 915 students. University has 115 academic staff. Campus is planned to meet the needs of 2.000 students. "The proposed new campus is organized in response to programmatic requirements and fitted to the site to take optimum advantage of views, vistas, microclimate and terrain influences."(DOBER, 1992, pp.236) A linear organization is used in L plan scheme. Faculty, staff and student housing are situated at the inner of L shape. The sport facilities are designed at one corner of this L scheme. Academic buildings are on ridge with views of Bosphorus.

Entrance, Circulation System, Service, Open Areas

Main entry of the campus is placed on focus of L shape. It has a centralized organization. Service entrances are designed from the outer vehicular loop. Vehicular roads are separated from pedestrian roads. L shaped pedestrian way create a social way and connect faculty buildings by a walking path. Open areas occur near this pedestrian way.

Landscape, Building Types

University garden and a lake are designed between academic buildings and housing area. Faculty staff and student housing are located on different side of this lake. A forest takes place around this university garden and this lake is offering an abundant beauty year round. These special places have an important role in campus development. Building types have simple geometric forms. Housing units are formed as square shaped blocks and some clusters are repeated. (Fig.2.21, pp.54)



Master Plan Diagram (1991) Koc University. Istanbul, Turkey. The proposed new campus is organized in response to programmatic requirements and fitted to the site to take optimum advantage of views, vistas, microclimate and terrain influences. (Arup Associates)

Figure 2.23 Koç University, İstanbul, 1991

Example for Linear Organization and Horizontal Grouping

DUMLUPINAR UNIVERSITY, Kütahya, 1995

Enis Kortan

Design, L Shape Linear Organization

Dumlupınar University Campus is a project example for University planning. It is near Kütahya, on the Tavşanlı road. Architects are Enis Kortan and Selahattin Önür. This campus is planned for 20.000 students and 5.000 academic staff. A linear organization exists in the plan scheme. In the middle of academic area, a pedestrian road occurs which has 60 m width. This is a linear green recreation area which surrounded with academic buildings. Recreation area is formed as L shape, on one end, a cultural center exist, on the other end sports area occur. Housing and dormitories will take place on a hill at the south, near to the campus area which has mountain and forest view .

Entrance, Circulation System, Service

Administration building and ceremonial square is a "head" place which located on the top of Taçlı hill with a scenic view of Kütahya. Entrance of the campus area is from the southeast, near the administration building. Service entrances are from the outer traffic loop. Vehicular circulation is separated from pedestrian paths. Car parking areas take place near the outer loop.

Open Spaces, Building Types

Main L shaped pedestrian way serve successfully as open space. Also all the buildings have inner courtyard. Buildings formed different from each other as original design. But all the buildings are designed as certain criteria. On the south of campus a dam will occur and this will enable navigation sports. 'Sun, Spacious and Green' are the basic words of Architect while designing as Le Corbusier thought. (Fig.2.22, pp.56)

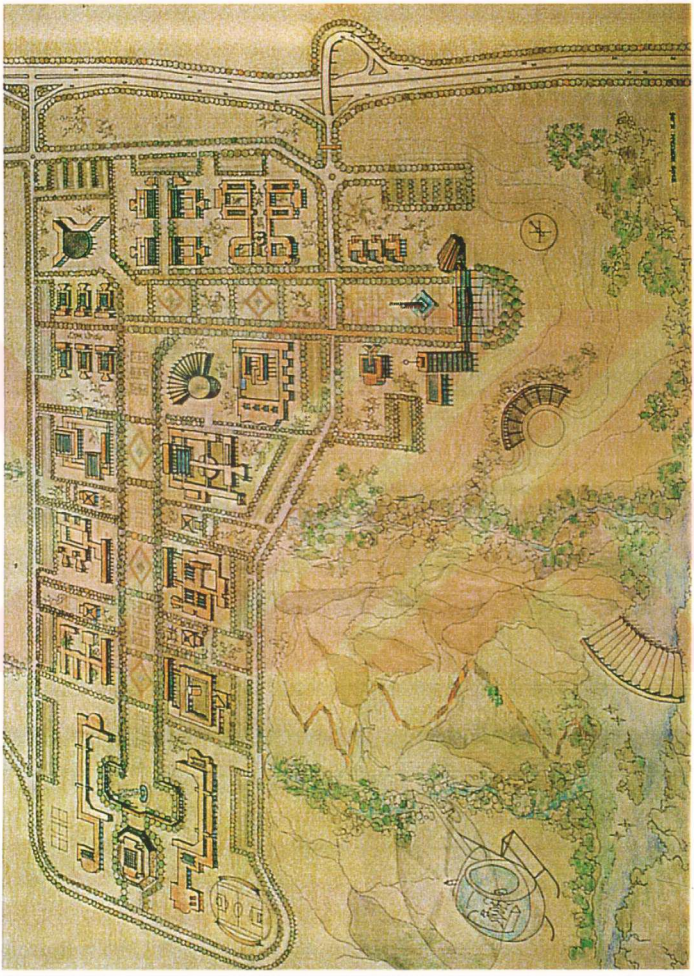


Figure 2.24 Dumlupınar University, Kütahya, 1995

CHAPTER THREE

USER REQUIREMENTS FOR CAMPUS DESIGN

3.1 Human and Behavioral Needs

In modern civilization, the interactions between human beings and their environments have become of great concern. The influence of environment exerts over the social system and the human's experiences and behaviors. All the climatic conditions, the sun, the moon, the winds and the characteristics of the land all affect our lives. Our behaviors depend on our physical and social environments. The elements which define a physical environment, have an immediate and undeniable impact on experience and behavior. The buildings, the structures of cities and towns and these architectural environments where people spend much of their lives in and around, provide a context for behavior. Environment and behavior are intervened to the point of being inseparable. The man can sense, perceive and behave and show variations in front of the environmental acts.

The environment which provides the necessary physical and social conditions for human, it becomes a living environment. But man's control over his environment is not limited. The man's environment can be reshaped and altered. The environment of human being is modifiable to human's needs.

3.2 The Physiological, Sociological and Psychological Needs

Physiological needs of a human being are sleep, rest, eating, drinking, urination, defection, hygiene, sex, light and sunlight.

Safety needs of a human being are basic physical safety, protection against others, avoidance from injury, noise, polluted air, moisture, extreme heat and cold, accident safety, traffic safety and sensory stimulation.

Psychological needs of human are to look at, to listen to, to speak with others, to do things together, to see, to hear. Isolation, experience, contact with others, identifying oneself with something in his environment and aesthetics are also part of these needs.

The needs cause a close relationship between human's environment and his behaviors. The different social-cultural norms of the society, the differences in cultures of different regions, the individual himself, the age cycle of man affect and vary the relationship between man's environment and his behaviors.

Public spaces have sociological importance for common use. Some of these spaces serve for 30-40 students such as lounge, study room etc. Some of them serve for all of the students living at the same building such as a cafeteria. The difference in the squares of these areas shows a hierarchy in themselves. The organization of these spaces should also encourage the young adult to live in a social group with social interactions.

3.3 Needs For Education and Research Activities

The educational activities and the cultural activities help social improvement of the student. The educational activities may be private, group studies, informal and formal discussions. This activities are arranged in classrooms, libraries, study rooms and bedrooms. So these places should be sufficient for these activities. In a study room for individual and group studies, these criteria's should be considered as follows:

- It should provide freedom from noise
- Small separations should exist where one may study alone
- Good lighting

- Temperature and ventilation should be controlled
- Easy access to books and other materials
- Some chance for relaxing should be given

Chiara said in his book like as follows for 'Indoor Teaching Stations':

Space requirements: 8.5 to 9.5 square feet per student (2.59m2 to 2.89m2)

Including: gym floors, mat areas, swimming pools, courts, etc.(adjacent to lockers and showers and within 10-minutes walking distance of academic classrooms.)

Space needs for research and administration considered in relation to student attendance. Space increase factors are equal to the optimal space use figures on the assumption that research space needs will increase in proportion to the increase in the number of graduate students.

The number of graduate students was selected as the unit of measurement for research space needs for these reasons: There is an obligation to provide research facilities for students pursuing graduate work at the University. There is suggestion of a good correlation between the number of graduate students and the number of faculty of the rank of assistant professor or above to teach such students (this is not true in the case of lower-level undergraduate students).(MIDDLEBROOK, 1958,p.33)

General purpose classroom and conference room space needs considered in relation to student station hours of teaching. Space increase factors for general purpose classrooms and conference rooms are all equal to the optimal space use factors because the base area used in the computations has been adjusted to reflect the improved scheduling. It is expected that 50 per cent more hours of use each week can be obtained ultimately from these rooms, and that 25 per cent more seats will be occupied every hour the room is in use.

The optimal space use factor for the Duluth and St. Paul Campuses is chosen to be 0.75 square feet(2.28 m2) per student station hour of teaching instead of

0.50(1.5m2). This means that utilization is expected to be half as effective as for the Minneapolis Campus.(MIDDLEBROOK, 1958, p.31)

The space increase factor for laboratory areas bears the same percentage relationship to the optimal student station hour utilization. This is suitable because of the composite nature of the laboratory groups.(MIDDLEBROOK, 1958) "The optimal utilization of a laboratory is conditioned by both the number of hours one can expect the laboratory to be in use and the proportion of stations or seats expected to be occupied when the room is in use."(MIDDLEBROOK, 1958, pp.30)"Existing utilization must relate to the year to which one is projecting utilization. It varies from one period to another with variations in student attendance and in available space."(MIDDLEBROOK, 1958, pp.30)

The space increase factor for reading room areas is equal to the optimal space use factor. Reading room areas increase in direct proportion to the increase in student station hours of teaching on the particular campus. (MIDDLEBROOK, 1958)

In 1954, the University Library on the Minneapolis Campus had 0.30 square feet(0.914 m2) of reading room space for each student station hour of instruction given on that campus. It has been determined by library officials that this represented the capacity use of such facilities during the morning hours, when the load was heaviest. This figure of 0.30 square feet has therefore been used as the optimal space use factor for reading rooms on all three campuses.(MIDDLEBROOK, 1958, p.32)

Utilization of a laboratory varies from one period to another with variations in student attendance and in available space.

Instructional spaces referred to as "All Other" areas assigned to the colleges are essentially related to laboratory areas, comprising primarily stock rooms, maintenance shops, laboratory preparation rooms, and laboratory service rooms. It can be expected, therefore, that space increase factors for them will relate to those for the laboratory areas they serve. The computations assume a rate of increase

which is half as fast as for the corresponding laboratory areas, since experience indicates that greater use of service areas is achieved as work areas expand.(MIDDLEBROOK, 1958, p.30)

3.4 Health, Recreation and Food Services Needs

In a campus health, recreation and food services are basic needs for human life. Medical centers serve for all of students and academic staff living in the same campus. A medical center contains doctor rooms, waiting rooms, information reception, first aid rooms, surgery, intensive care rooms, radiography unit, cleaning room, policlinics, pharmacy storage, medical analysis laboratories, ambulance garage, technical equipment storage, diagnosis rooms, patient rooms, cafeteria, lounge and kitchen. If the university has a faculty of medicine, the medical facilities will necessarily be more complex and the services for the city habitants will be available to provide their health care.

The recreation facilities contain an open space, a cafeteria, a dining room, a resting room, multipurpose hall etc. Because of their active position and noisy condition the common space must be isolated from study rooms and classrooms in some way but they should have easy accessibility from study room and private rooms. Main lobby and the entrance of the buildings, their outdoor places, front yard and backyards of buildings are also public recreational spaces. These open spaces offer an important physical and psychological transition from the public life of the community to the more private life of a smaller social group. These are the places where the students attended special departmental events and so on. (MARCUS, 1990)

Food service of a campus is the basic physiological need for the students and academic staff. In order to be self sufficient, a campus should contain its gastronomic unit. This will create a social interaction between students and academic staff. The capacity of this unit is determined by the population of the campus. It should mainly contain a dining hall and a kitchen. The size of the dining hall is again determined by the capacity of the utilizing group.

In Minneapolis Campus; Past experience indicates that we will need food service facilities for approximately 30 per cent of the student body... In calculating the space requirements, a turnover factor of two and one half times is used for each space required... In Duluth University; This cafeteria has seating space for approximately 390 customers which means that during a lunch period approximately 975 individuals can be accommodated.(MIDDLEBROOK, 1958, p.82)

As an example in Turkey; METU (ODTÜ) Campus Cafeteria (Ankara) has 5.242 m^2 area. 500 m2 is considered as service units and kitchen area. Then 4.742 m^2 area may be used for lunch and dinner. One person needs 1.5 m^2 area in a cafeteria (NEUFERT, 1955), therefore this cafeteria may serve for 3.161 persons at one time. When turnover factor of two and one half times is used, this cafeteria may serve for 7.905 persons. 19.000 students enrolled in programs and University has 2.000 academic staff and approximately 1.500 personnel and campus population is approximately 22.500 people.(HÜRRİYET Journal, 2.1.1997, pp.11) Therefore, food service facilities in METU Campus Cafeteria is for 35 per cent of campus population. Also, there are sufficient number of canteens in the departments and dormitories. As an other example in Turkey, Dokuz Eylül University Kaynaklar Campus (İzmir) will have a large cafeteria (9.230 m^2), this will be sufficient for campus population about 25.000. The seating place of cafeteria will be for 5400 persons, food service for 13.716 persons and food service facility in Dokuz Eylül Campus will be for 54 per cent of campus population. The other example, Ege University has 30.632 students, 2.500 academic staff and approximately 2.500 personnel. Then campus population is approximately 35.632. Ege University has 8 cafeterias in different places of the campus and total area of these cafeterias is 10.362 m^2. These may serve for approximately 20.000 persons and have 8.000 seating places. Food service facilities in Ege University is for 56 per cent of campus population. (Detailed information about above three universities are found in appendices, pp.147)

3.5 Needs For The Sport Activities and Physical Fitness

Sport activities serve for the physical fitness of man and also it is a hobby facility. While this is a hobby for students and for academic staff and also it is necessary for health. Sport activities protect the body healthy. Campus design may contain a stadium, tennis courts, open basketball fields, volleyball fields, mini-soccer fields, closed sport facilities, swimming pool, soccer fields and others which are necessary. Some city habitants who are not familiar with university life, can participate as watcher in seasonal athletic events.

> *The type and size of gymnasium facilities needed for a given college or university will depend upon many factors, one of the most important of which is the anticipated enrollment of the institution... The physical education building should include one main gymnasium to be used for general physical education classwork, intramurals, and intercollegiate athletic activities in basketball and wrestling.(CHIARA, 1990, pp.276)*

"Our studies have been based on an estimated need for 50 acres (202.350 m^2) of outdoor land for physical education teaching purposes."(CAUDILL, 1959, pp.65) Outdoor spaces for intramurals and recreation are proposed to relate to the present and projected dormitories. This should help promote the identification of students with smaller groups by providing intramural activities adjacent to dormitories. (CAUDILL, 1959)

As an example Middle East Technical University in Ankara, has one grassy-fielded football stadium with a seating capacity of 10.000, a gymnasium (2.478 m^2) with seating capacity, a closed swimming pool and many open sports areas. Ege University also has a closed swimming pool, two gymnasiums (900 m^2 and 4.071 m^2) and open sports areas. Dokuz Eylül University Kaynaklar Campus will have a gymnasium (3.000 m^2) and open sports area when construction is completed.

3.6 Residential Needs

Residential units serve students who are from other cities or countries and academic staff. These units are dormitories, guest houses, housing for academic staff and their small shopping center, nursery -kindergarten, snack and fast food units. The administrative units and services facilities are designed together with the buildings.

> *Student residences are the physical environments which have an important role to prepare the students for life and to orient them. They have common structural characteristics and common problems... University residences are such places where adolescents live with their age mates away from their rather easy family surroundings, learning to life under new special circumstances and thinning themselves forwards an unattached life. So the universities should be living and learning centers with their architectures, administrative programs and student housing complexes."* (BAYAR, 1984, P.4)

Middlebrook said in his book; Land area requirements for single students are based on a continuation of the four-story residence halls such as Centennial and Pioneer. In these buildings the housing density is approximately 200 students per acre(4..047m2). (MIDDLEBROOK, 1958, p.64)

> *Middlebrook said in the book of "How to Estimate The Building Needs Of A College Or University"; It has been estimated for Minneapolis and St. Paul Campuses that in 1960, at least 20 per cent of the students needing housing will be married. In 1965 the proportion will be 25 per cent and in addition present temporary facilities will need replacement. In 1970 the provision for married student housing is based on 30 per cent of the anticipated total student need. Land area requests for married students are based on a housing density of 12 families per acre... Housing density is approximately 200 students per acre. University land is available for housing approximately 1000 single students on the St. Paul Campus, and 500 single students on the Minneapolis Campus. (MIDDLEBROOK, 1958, p.81)*

CHAPTER FOUR

PHYSICAL CRITERIA FOR CAMPUS DESIGN

4.1 Campus Landuse

Location decisions of a new campus or an old one depend on the examination of terrain and locale. Acreage available, site configuration, micro-climate, access, topography, infrastructure, the nature of the surrounds are influential campus design factors. The existing conditions may be discussed by concerning authorities, such as architects, administrative authorities and so on.

Each campus site and situation is different. Institutions vary in their size, organization, missions, resources. These differences and complexity are likely to yield alternative solutions for campus landuse in designing process. By presenting and discussing options and choices, the best solution will be revealed. The discussions evoked by comparing alternatives to create the design necessary for an institutionally acceptable plan. (DOBER, 1992)

Site selection for a campus is important because the life style of the nearby should be in accordance with social life of young and academic staff. The life of the campus people who are far from city should not be isolated. The interrelation among the city and campus must be prepared suitable for social and cultural activities.

The future and today's conditions should be predicted as real as possible, and economical factors, investment possibilities must be considered at the beginning. Design period and preparing knowledge for design should not be limited. The best suitable campus planning and its extensions should be design feasible.

Campus universities, are often installed in a place far from the city. The circulation facilities from the city must be well prepared. And the housing for staff and dormitories for students must be parts of campus. The solutions for transportation and housing should be arranged for success in life of a campus far from the city. "The total assignable area of Minneapolis Campus buildings in use in 1954 was 2.824.692 square feet(8.609.661m2). The net assignable area available through the development of the remaining building sites is 458,500 square feet(1.397.508m2)."(MIDDLEBROOK, 1958, p.61)

4.2 Infrastructure

Infrastructure of a campus should be considered at the beginning of the planning period. The circulation networks and road axes are important to design a suitable infrastructure system.

Central heating solution needs galleries under the main roads or the pedestrian paths. These galleries enable the circulation of the infrastructure system. The electricity system, the heating system, the water system may be collected in these galleries and serve the buildings. In central heating system, each building has an heat exchanger room to distribute the heat water into the buildings.

A drainage canal must be considered under the roads to drain the rain water far away from the buildings. Roof waters collect in these drainage system. The sewage system needs a sloping area to collect in a pool. This pool clears the dirty water to use it for the irrigation of planting.

As examples for usage of domestic water and electrical energy, the findings are as follows; Domestic water usage of Bilkent University in Ankara (Turkey) is 972.787 m^3 for the year 1996. In 1997, domestic water usage of Bilkent is 944.540 m^3. Campus population of Bilkent is 11.730 (9.819 students, 911 academic staff, 1000 personnel). Therefore, the ratio of domestic water usage to one person in a year for 1996 is 82 m^3:1, for 1997 is 80.5 m^3:1.

Domestic water usage of Ege University Campus is 258.466m3 for two months in 1997. The total domestic water usage may be approximately 1.550.799 m^3 in 1997. Campus population of Ege University is 35.632 (30.632 students, 2.500 academic staff, 2.500 personnel). Therefore, the ratio of domestic water usage to one person in a year for 1997 is 44.3 m^3:1.

Electrical energy usage of Ege University is 811.630 watt for a month. The total electrical energy usage may be approximately 9.739.560 watt in 1997. Campus population of Ege University is 35.632 and the ratio of electrical energy usage to one person, in a year, for 1997 is 273 watt:1.

Ege University campus heating system is self heating system for each faculty group (four or five buildings). Dokuz Eylül Kaynaklar Campus heating system will be self heating system for each single building. (Information above is obtained from Technical Offices of Universities)

4.3 Building Locations

In designing period, the building locations constitute a physical pattern for campus planning. The location of the physical components such as buildings, landscapes, infrastructure in order to achieve a physical pattern, positioned to reflect the best aspects of the particular site, locale and environs. This physical pattern may be functional and attractive. The forms of this pattern should be appropriate for the institution's purpose, size, resources and organization. The overall design must be

amendable and adjustable to new conditions. The site arrangements and design inflections are located to encourage contact and communication. Building locations and site arrangements generate an image and sense of place. The institution's presence, domain values are related to its image and sense of place. (DOBER, 1992)

Building locations must be also according to climate, wind, topography, access from the city, roads near to the site, plants and existing trees in site. These factors effect the building locations in a campus planning. At the beginning of design period, existing trees in the site must be identified. Design may start and continue according to the topography, the trees, the climate, the winds of site. The buildings' narrow side must be opposed to the dominate wind. If a warm climate exists, buildings may be arranged wide-spread around the site. If a hard climate exist a compact design is considered in building locations. The topography and natural environment of the campus may be in harmony with the building locations.

Middlebrook said in his book; The ratio of gross building area to land area in the classroom portion of the Minneapolis Campus is approximately 1 to 1. These buildings generally have 4 to 5 usable floors.

> *The student capacity and estimated cost of buildings have been based on a continuation of the present pattern of walk-up buildings, generally not more than four stories above grade. High-rise buildings such as the Mayo Tower are workable when they are essentially self-contained units. However, campus distances are such that any delay occasioned by vertical circulation would make the present time schedule unworkable.*(MIDDLEBROOK, 1958, p.64)

4.4 Functional Arrangements

Functional arrangement depends on an organizational diagram and a concept design. Academic buildings are located at the center of a campus plan. The social buildings must be the main buildings of this center. These social buildings are library,

cafeteria, auditorium. The academic buildings and administrative buildings may be together around these social buildings. Housing units such as dormitories, staff housing may be on one side of this center. The sport facilities may be placed near this center and it is better to be in the axes of the dormitories for the student use. Some research areas may occur at different places of the campus area. These places are for the special users, for the graduate researchers. The parking lots must be considered near these areas.

A campus should be designed in a circle which its diameter is about 800m-1000m. Because a man can walk this distance in 12-15 minutes, it is a suitable time to walk between two points. The pedestrian and vehicular traffic must be separated from each other. This enables a suitable circulation and best interrelation in a walking area, among different facilities. It should be reached from one side to the other side of a campus, by walking maximum in 15 minutes for studies inter-disciplinary and trans-disciplinary.

The populations of different campuses vary in a large spectrum from 5.000 people to 230.000. When a campus is designed for 5.000 people, the diameter will be 500m and area is about 80 ha. (KORTAN, 1981)

Development and elasticity for a campus planning are important factors to consider while design occurs. Campus may need some extension in future. It is a result of knowledge, science, human nature and social life. An extension must be predicted at the beginning of campus design.

Caudill, Rowlett and Scott said as follows in their book for campus planning;

These are the objectives recurring for various campus plan:

The rigid zoning of land in which certain areas are dedicated specially for specific purposes.

The establishment of functional groupings with desirable affinities.

The provision of facilities to meet the social and recreational needs of students.

The development of a unified campus layout, often affecting the location of the library and the student union as unifying elements.

The creation of a physical environment which emphasizes the natural beauty of the campus site.

The separation of pedestrian and vehicular traffic.

The separation of urban and campus traffic.

The development of adequate parking facilities.

The creation of more pedestrian pathways and fewer streets.

The development of density standards of use for various areas.

The reservation of land for inward expansion.

The redevelopment of land for outward expansion. (CAUDILL, 1959, p.4)

4.5 Circulation Networks

Main traffic roads are separated from the pedestrian roads to permit a suitable, rapid circulation in campus design. When pedestrian circulation is separated from vehicular traffic, the faculties interrelations strengthened. Interrelations between different disciplines are available. So that, this will provide careful use of time which can be spend for research activities. In circulation networks, hierarchy is provided. A loop circulation around the academic buildings is necessary to connect all the faculties by vehicular roads which connect with "cul de sac" to pedestrian paths to provide car parking places near the buildings. Outer vehicular loop around the academic buildings is the main traffic road in the hierarchical order. The "cul de sac" roads are the secondary.

Caudill, Rowlett and Scott said as follows, in their book called "Campus Planning Study For The Ohio State University Alternative Basic Schemes".

I. Design for the separation of urban and campus vehicular traffic.

1. *All urban traffic should flow around rather than through the campus.*
2. *Bar automobile traffic from certain parts of the campus except for service or emergency use.*

3. *Create a perimeter road around the campus as an outer belt.*

II. *Design for the separation of pedestrian traffic from vehicular traffic.*

1. *Submerge busy streets to unify spaces and to help eliminate conflict of pedestrian and vehicular flow.*
2. *Make parking the transition from vehicular to pedestrian flow.*
3. *Locate parking facilities where they are least likely to be crossed by pedestrian traffic.*

III. *Design for inter-campus and intra-campus movement.*

1. *Establish a transit system (moving sidewalks, elephant trains, trolleys) as a means of exchange between parts of the campus.*
2. *Locate a heliport on campus.*

IV. *Design for pedestrian traffic needs.*

1. *Evaluate walking distance in locating instructional spaces.*
2. *Consider staggered schedules and classbreak "stretch out" to implement decentralized solutions.*
3. *Turn present on-campus streets into pedestrian ways with pleasant paving, trees, benches, pools, and plazas.*

4.Utilize pedestrian ways for emergency and slow moving service vehicles.(CAUDILL, 1959, pp.48)

Several alternative solution can be found to fulfill the circulation needs of centralized or decentralized campus plans but three general types seem to solve more problems effectively. They are (1) the outer loop, (2) the inner loop, and (3) the spine. (CAUDILL, 1959)

Outer loop duplicates the urban loop. The outer loop, in effect, does the best job of separating urban vehicular from campus vehicular traffic. It must be either supplemented with feeder streets which penetrate close to destinations and terminate in parking facilities, or with a transit system which can shuttle within the heart of the campus. The outer loop can preserve the campus as a pedestrian world. (CAUDILL, 1959) (Fig.4.1, pp.74)

Inner loop can be double-loaded to minimize feeder roads to destinations whereas the outer loop is an inner-feeding vehicular system. The inner loop relies more on the urban system to serve peripheral areas of the campus adjacent to the urban vehicular loop. The inner loop might become a barrier to on-campus pedestrian traffic and tends also to divide the campus into smaller sectors. The inner vehicular campus loop is suitable for double use with a transit system. It may be possible to confine its use to transit only, in the case of a centralized plan. Campus vehicular traffic would terminate in parking facilities reached directly by short feeder streets from the urban system. (CAUDILL, 1959) (Fig.4.2, pp.75)

The spine is the most direct system for serving east-west or north-south destinations. It relies on the urban system to provide for other destinations. It does not separate urban and campus vehicular circulation. But it does provide more service with less length of road. Since it has limited points of access, the spines' limitations are proportional to the load put upon it. In other words, the spine might well develop into a six-lane high way if people were allowed on it without control. (CAUDILL, 1959) (Fig.4.3, pp.76)

> *Land needs for parking have been in a different category from land needs for instructional purposes because the former have been financed through earnings. This may not be possible in the future as parking lots are lost to building sites. In any case, the land needs for parking are interrelated with other land needs... The present ratio of campus population to parking spaces is 2.2 to 1...At the North Campus of the University of Michigan, parking is being provided at a ratio of 2 to 1..* (MIDDLEBROOK, 1958, p.65)

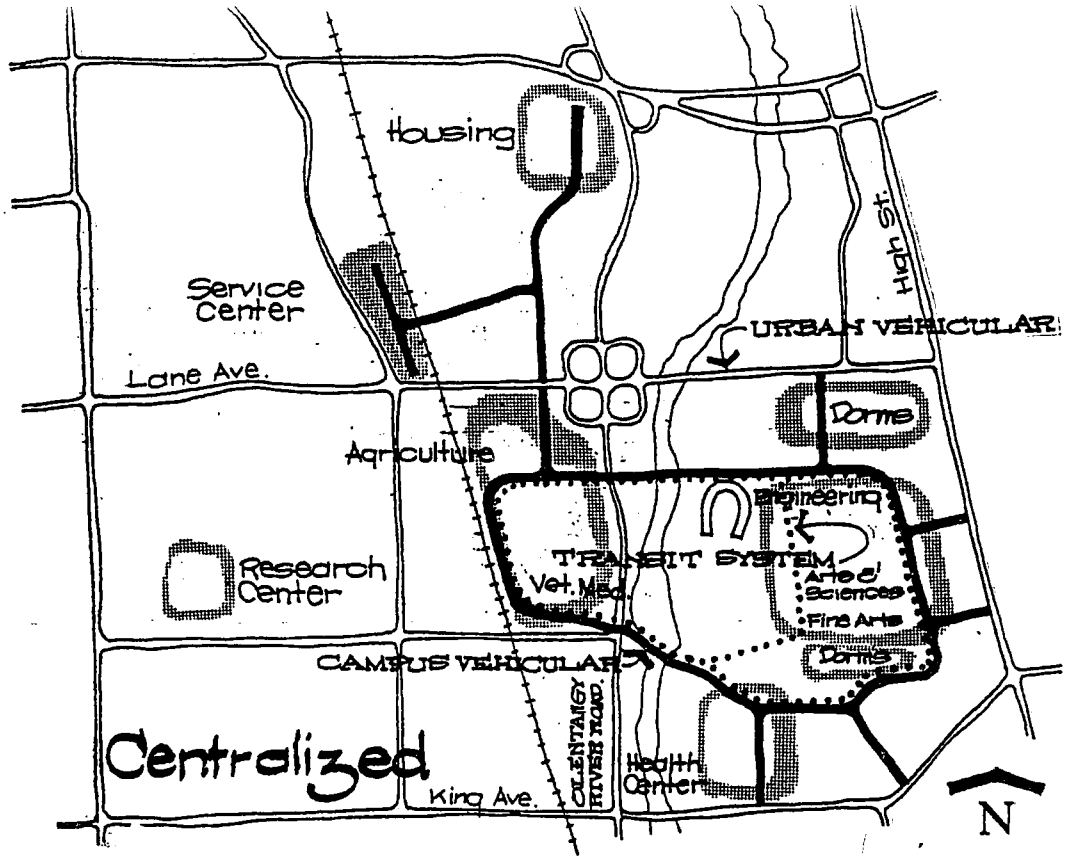
"The present ratio of registered cars on campus to the number of persons eligible to have registered cars is 1: 3.8. This might increase or decrease in the future, depending upon such factors as University policies with respect to allowing student cars on campus, charges for parking, ratio of commuter students to total student

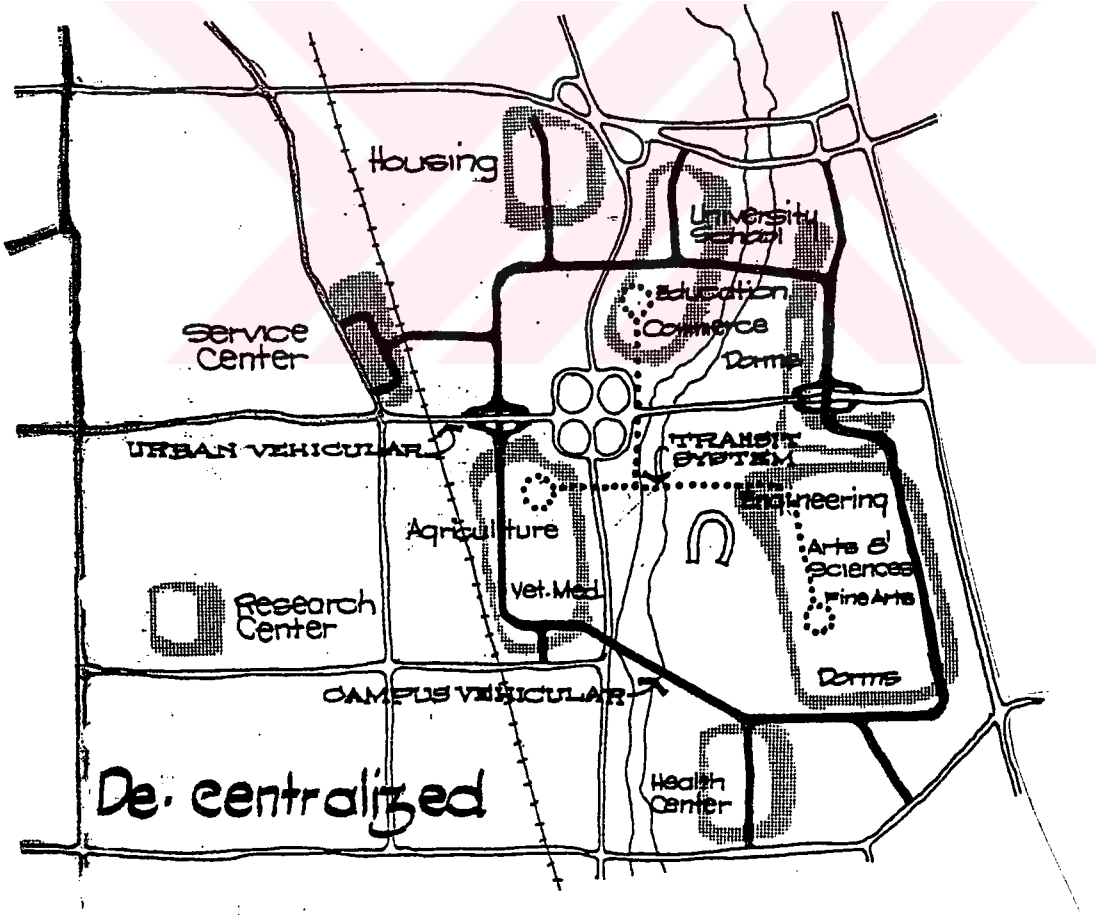
body, availability of public transportation, and general economic conditions. For purposes of this preliminary report, we assumed one car to every three people. This is consistent with general trends and with the increasing percentage of Ohio State students who commute."(CAUDILL, 1959, pp.55)

The ratio of registered cars on campus to the number of persons, might increase or decrease in the future. It is evident that the master plan must be designed to include high density parking facilities because of the impossibility of relying on surface parking alone to solve the future parking needs of the University.

Bilkent University in Ankara, Turkey, has 9.819 students and 911 academic staff. (Hürriyet Journal, 3.1.1997, pp.119) The parking facilities of Bilkent Campus are like this; 1556 parking area for academic area, 283 for housing area and 316 for dormitories. Total parking area serves for 2.055 cars. The population of Bilkent is approximately 11.730 (considering 1.000 personnel). The present ratio of parking spaces to campus population is 1: 5.7. Bilkent campus is a new campus in Turkey. And the number of car owners is not less comparing to the other new universities in our country. The car parking facilities of Ege University Campus and Dokuz Eylül Kaynaklar Campus are not registered.

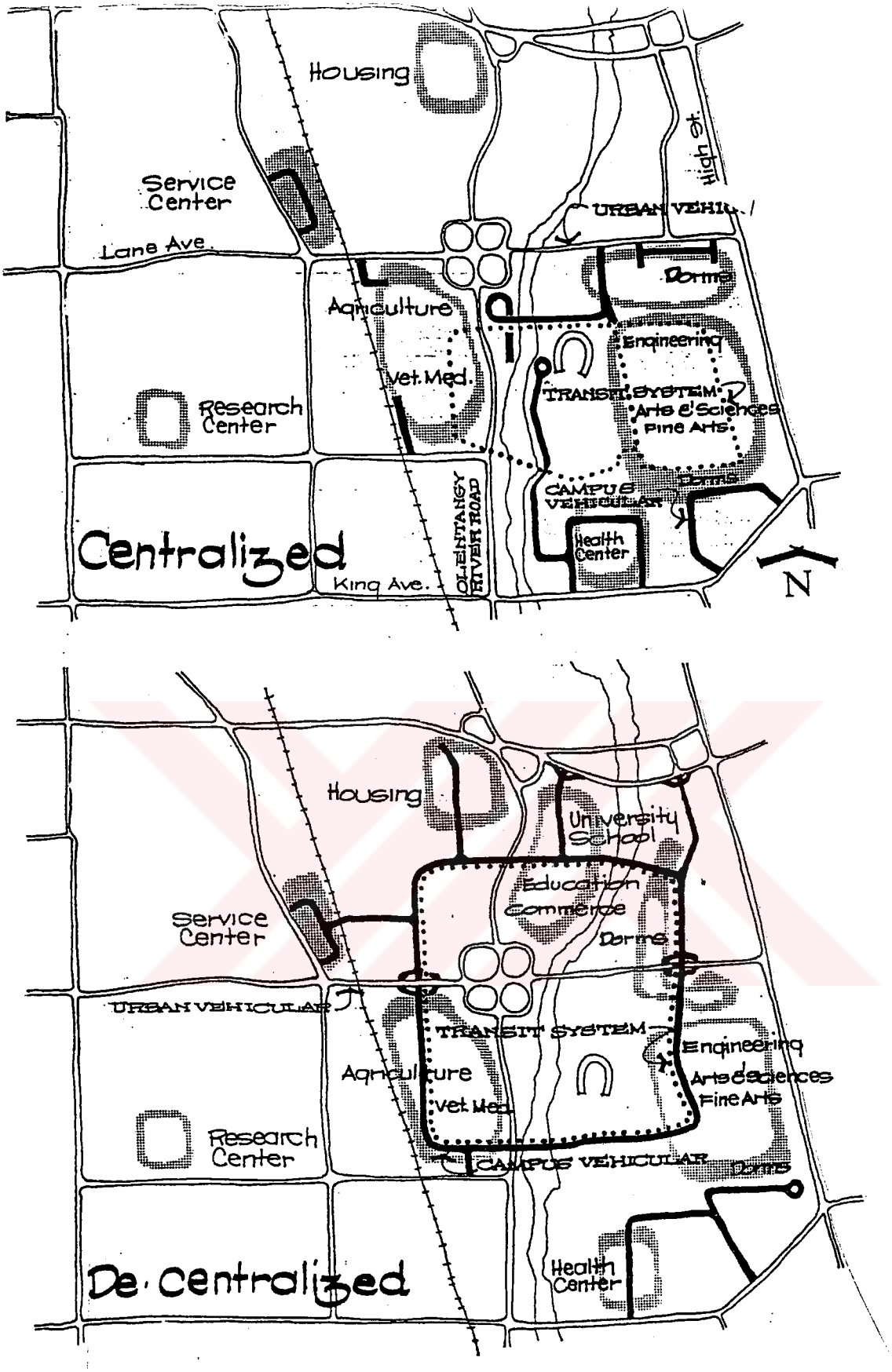
In pedestrian paths, a hierarchy also exists. An alley occurs in some campus planning, as a linear pedestrian way between academic, social, administrative, sports and residential areas. The buildings are situated on each side of this pedestrian way, in other words "alley". This alley is the main pedestrian road which connects all the functional facilities. The basic idea of this alley is to make a union, a social place among the facilities and to strengthen the social relations and to connect the faculties in a short time to walk. The other pedestrian paths are the second or third in this hierarchy of pedestrian circulation. The circulation networks may design at the beginning as the building location pattern starts to occur.





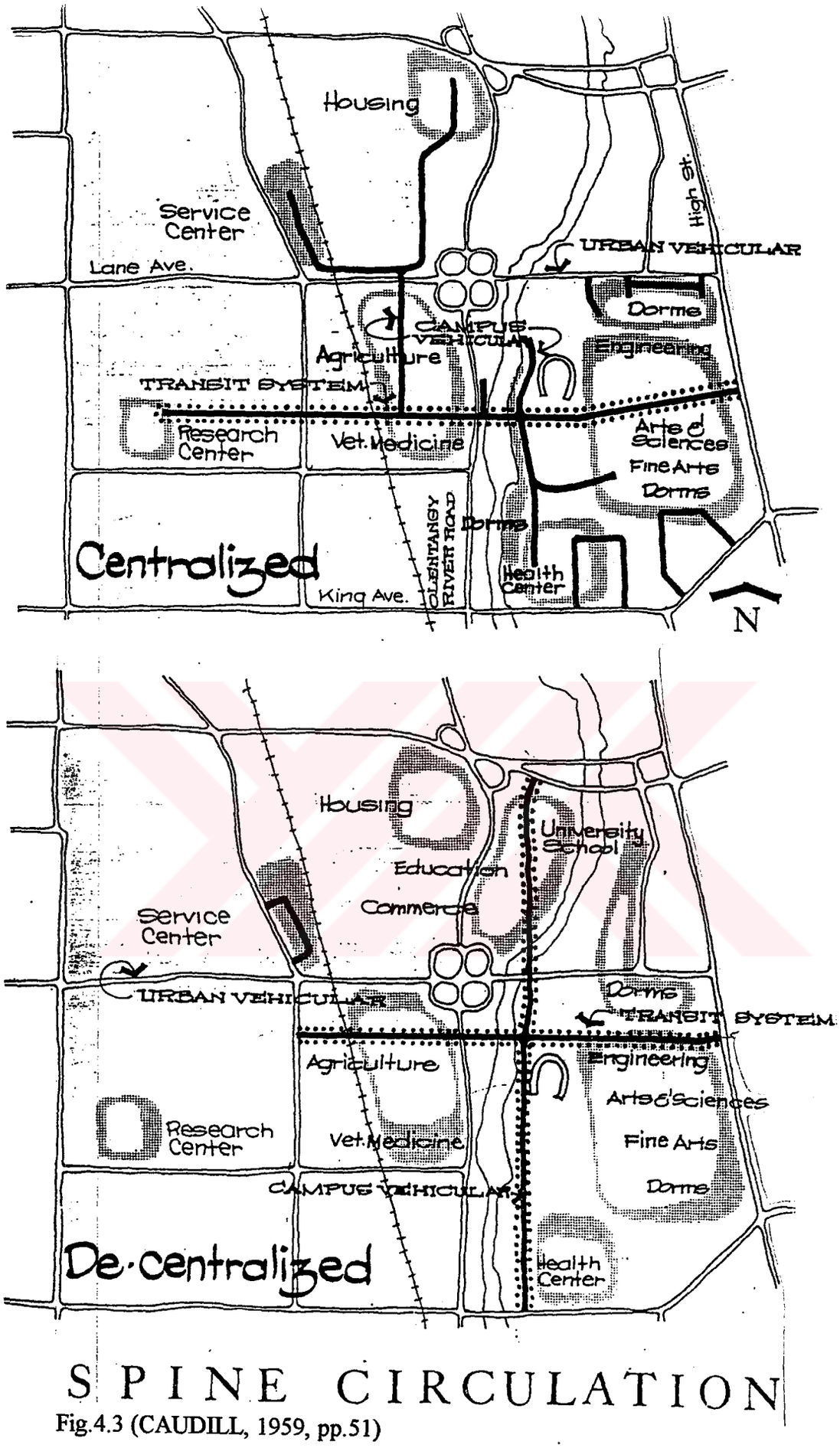
OUTER LOOP CIRCULATION

Fig.4.1 (CAUDILL, 1959, pp.49)



INNER LOOP CIRCULATION

Fig.4.2 (CAUDILL, 1959, pp.50)



SPINE CIRCULATION

Fig.4.3 (CAUDILL, 1959, pp.51)

CHAPTER FIVE

VISUAL CRITERIAS FOR CAMPUS DESIGN

5.1 Image

Image of a campus involved the definition. All the visual materials are included as the definition and these are unified as image. The conceptual criteria such as style, aesthetical values, landmarks, materials, landscape are unified and created the image of a campus. Image is generated with symbolism or history. The differences between institutions, in its own purpose, mission, size, location, environs are helped to occurrence of an image in campus design. (DOBER, 1992)

5.2 Style

Style is accepted as a powerful visual criteria in campus design. In general, style is appeared as a definite type of architecture which is distinguished by special characteristics of structure or ornamentation. As Dober indicated;

> *Purpose, size, location, style and cost are the primary architectural issues which, addressed and resolved, produce feasible college and university buildings. Of this five intertwining factors, style is the least tangible to rationalize, though the most visible part of the architectural undertaking. Stylistic questions involve status, taste, emotion, symbol, philosophy and perception -a full range of cognitive, scientific, and aesthetic matters.* (DOBER., 1992, pp.39)

In campus design, style is accepted as a special definitive way. The buildings and their parts are shaped into a vocabulary of forms. The forms are unified as distinctive and repeatable patterns. The style is appealed visually.

The outer fabric of buildings are appeared with materials. These materials are associated with the forms and patterns. The whole is organized to serve function. As a result a style is occurred to appeal visually. Style of a campus planning also is signified the client attitudes and values. A symbolic import and a visual energy are gathered in style. (DOBER, 1992)

''Style is a signal, an indicator of institutional presence to those who know the language of cultural artifacts, as in the abstracted building that announces a cover story on higher education in a weekly news magazine, or the air view of Oxford, a comparable, if esoteric, shapes and forms.'' (DOBER., 1992, pp.39)

These are Architectural Styles in University Design are as follows:

Colonial, Early Georgian, Late Georgian, Federal, Jeffersonian Classicism, Greek Revival, Early Gothic Revival, Romanesque Revival, Victorian Gothic, Italianate, Richardsonian, Romanesque, Georgian Revival, Industrial, Beaux Arts Classicism, Regionalism, Chicago School, Ornamental Modern, Art Deco, International, Miesian, Fashioned Materials, High-Tech, New Brutalism, Contextural, Post-Modern, Neo-Modern, Deconstruction (DOBER, 1992, pp.40)

Campus designs can be categorized as monoforms, metamorphorics and mosaics in style. A Monoform Style is an overall visual impression, a monoform is a singular style applied to a campus. ODTÜ (Middle East Technical University) is a best example for monoform style as its Brutalist tendence.

Metamorphosis is a change in form. The external pressure or effects are caused a change in structure or substance of campus. On campus, new functions may demand new forms, this causes the metamorphic process. Duke University West Campus and

Stanford University are the best examples of metamorphosis in campus design.(DOBER,1992)

The campuses that have no singular style are mosaics. A variety in visual impression exists. While new functions are needed, each generation is contributed an example of architecture of its own time. When new buildings, new functions require in campus an extension may need. Then some extensions may have some effect on the overall campus image. (DOBER,1992)

Institute of Technical Education in Bisham, Singapore is an example for High-Tech style in University building. This is a design of Tay Kheng Son in 1993. This building complex is an image of technical progress. It is also suitable solution to the region's tropical climate. It is a large span steel and concrete construction. "The roof shape as overhanging roofs protect the building from sun and rain, then this enables a response to the region's tropical climate."(KHAN, 1995, pp.58)(Fig. 5.1, pp.79)

Figure 5.1 Institute of Technical Education (1993), Bisham, Singapore

5.3 Aesthetical Values

Aesthetical values of campus design depend on the basic criteria of the architectural aesthetical values. These are; composition, proportions, color, material, dimension-scale, pattern.

Composition is to unify the separate parts to make a whole. Proportion is the relation between two things comparing to their quantity, greatness, degree. In architecture, the proportion is to divide some design elements to obtain the best influence. The man's scale and needs are the main ideas to create the proportion in architecture. The proportion is also the relation between the whole to its parts. It must be make compare, to create a suitable proportion in design. It must be select the non-equal parts to compare, to obtain the best proportion. If an evident effect required, it is available to gain a good result with minimum simple proportion.

Scale in design is related to;

-Scale between human and building

-Between building and environment

-Building scale in itself (This is the proportion)

In campus design also the human scale is important and all the design criterias depend on the human scale. Human needs and his proportions are main basic criterias to consider in designing the campus.

In architecture and in campus design architecture some contrasts exist between;

-Light and shadow

-Open plan and closed plan

-Horizontal and vertical

-Solid and void

-Curved and straight

A contradiction in solid and void in campus design is required. The contrast in color of campus design architecture may be use in balance, where it is required. The competition of

the equal parts in contrast is not suitable. The materials must be in an hierarchy. More contrast will be create the monotony and will destroy the calm. In Ronchamp Church, a rational contrast exists, designed by Le Corbusier. It is a best example in contrast of light and shadow, and in the form of roof and in contrast of color. The "Falling water house" (1935-1939) by Frank Lloyd Wright created a good contrast like a sculpture, his idea was also destroy the four walls.

To search right in architecture is important. A relation between the aesthetical value and the reality exists. The right depends on the physical environment of architectural design. If an architectural form is in relation with right, the edifice has a value in art. One can see the right in nature.

A design must be contain a reason. This reason may bring the right to design and to campus design. The right in structure, the right in program, the right in scale are the basic values of aesthetic.

Pattern is an aesthetical value in architectural design of a campus. The effects of pattern as visual or as a touch are different. The moveable surfaces are hiding the form and color. These surfaces are warm and interesting. Flat surfaces are cold and boring and reflect the light and give a brightness. Dark colors in pattern give us the feeling of nearness. Light colors in pattern show the distance. Dark, warm, bright and smooth surfaces give the feelings of nearness where as light, cold, matt and hard surfaces give farness.

As an aesthetical value in a campus design, the material reflects us with its effects. Structural material has a plastic value. As statically, material is a carrying element, as visual, material influences us with its color and pattern. All the materials have a quality but if they used in a suitable manner. The material gives us its best effects to the qualified structure. Material and space create a unity together. Material shows itself with its pattern. Material gains its identity with the help of the pattern. In a campus design, designer must know the materials' quality effects and be able to use it in place.

Nelson Fine Art Center of Arizona State University is an example for qualified design in aesthetical values. This complex placed at the focal point for the Arizona State University. It contains Education Building, Lecture Hall, Music Center, Theater and Museum. It is like a desert city. We see here the play of strong light and shadow. This complex has a linearity in its design.

Figure 5.2, Nelson Fine Arts Center (1986-89) Arizona State University, Tempe, Arizona

5.4 Landmarks

Landmarks are important features that identify a locale. Buildings, architectural elements, monuments, color and special spaces are the examples of landmark elements. Some campus landmarks appear at the beginning of design. Landmarks are some definitions of historic, cultural, and natural resources. These resources may be recognized by man as possessing exceptional value or quality. Landmark becomes a legal definition while recognizing an exceptional value by man. These exceptional values of landmarks mark the local, regional, or national heritage. (DOBER, 1992)

Some buildings and places may be considered as landmarks. These are museums, mosques, cathedral, opera house, capitol building, boulevard, open squares. These objects mark a venue, serve as points of geographic orientation. The landmarks celebrate and symbolize the places. İstanbul as a strong image city, could be described as a collage of landmarks: Kız Kulesi, Dikilitaş, Ayasofya, the square of SultanAhmet, Süleymaniye Mosque, Boğaz etc... İzmir's landmarks are Saat Kulesi, Harbour, Kadife Kale etc... These all landmarks together in a city, provide a richer design experience than they would singly. The campus landmarks equivalencies are library, administration building, sports arena and the quad. Some buildings earn status as landmark.

"As cultural institutions, colleges and universities have affirmed society's mandate to conserve and interpret history, among other responsibilities. Landmarks are accepted as history's architectural artifacts."(SELZ., 1992, pp.26)

Since 1980's, campus architecture was energized with forms, materials, colors, and textures. Every new buildings had chance to be a landmark with using the forms, materials, colors and textures.

Site arrangements and landscape are design signifiers as landmarking devices. Landmarks as building or as landscape can be positioned as dominant or subordinate elements in campus planning. Background and foreground buildings can give prominence to referential buildings, as visual reasons as well as symbolic effects. The colors, physical forms and materials of a referential building can be associated with the surrounding physical context. Referential landmark buildings are the design concepts invented or design concepts revived or reinterpreted.

Color may be a landmark for those who recognize its meaning. Ancient China used the color to identify the meaning in architecture.

The hue is used in building panels, signs, canopies, outdoor, furniture, and in flower arrangements displayed in windows that can be viewed from the sidewalk. Particular colors, of course, have long been connected with particular colleges and universities as emblems proudly worn or carried. On ties, hats, banners, and the seemingly bizarre body paint some adults wear at athletic events, color has been used to link people and their institutions. Given these manifestations, the judicious use of symbolic color as a landmark device in campus design merits attention.(DOBER, 1992, p.34)

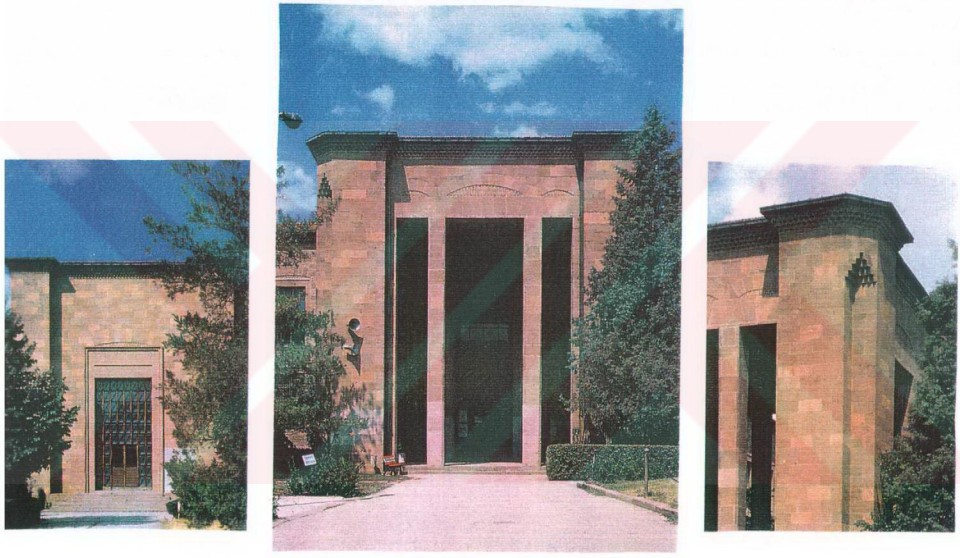


Fig.5.3 Ankara Science Faculty Entrance as a landmark element.

5.5 Materials

In Campus Architecture, materials are elementary stuff. The basic materials of building are wood, stone, brick, concrete, glass, metal-colored, textured, and formed. These materials constitute the design fabric and a perceptible aspect. Materials are determinations of architectural pattern.

Materials can serve referentially to mark a particular place, time, and attitudes. This choice of materials communicate and symbolize institutional continuity and advancement. Building materials also proclaim new purposes and ideals. In terms of style, the change is expressed.

John Onians said "Materials are "bearers of meaning". He has wanted to say some architectural effects, specially classical building columns have been interpreted in Western civilization from ancient Greece to 16th century Rome. Onians writes: "Aware of their own needs, and understanding the desires, anxieties, and uncertainties of others, they (the designers) used (changes in the shape and placement of columns) to develop a shared knowledge and to influence ideas and actions ... to find (one's) way through life."

Stone and baked clay architecture are 6000 years old. Steel and glass may be dated back less than two centuries. Aluminum in architecture is of recent origin. The building construction methods differ for each material so the materials could be used structurally, as a space enclosing fabric, and for decoration.

The identification and selection of exterior materials depend on the designers' ideas to give architecture a particular look. Sometimes, building materials are recognized as institutional emblems. The materials convey a distinctive sense of place and the image. For example the Colonial American colleges' main material was brick. The brick has been used in College of William and Mary for traditional buildings and contemporary complexes. The adobe has been used in University of Mexico, local stone in the University of Colorado, Boulder, and aluminum and glass in the Air Force Academy.

The **teflon-coated textile** has been used, in 1960s in the University of La Verne. In Harvard **red brick** is used, this reminds the colonial beginnings. Aluminum framed large windows suggest modern times in this university.

In Free University of West Berlin (1969), a change and flexibility is occurred in philosophically and physically and a metaphor in materials. The designer and the client

believed that the provision for change was essential for institutional viability. The University s' interior is arranged according modular partitioning, flexible areas, modular structural systems. The architects were wishing to clad their buildings with a material as contemporary in outlook as the university mission, then they chose cor-ten steel for the exterior surfaces. The metal cladding on the outer sheels' surface would slowly rust to give the facade a distinctive patina. The metal became an institutional metaphor. This institutional metaphor indicated the place and time.

Concrete would seem to be the metaphoric material for modern times, in the 20th century. Concrete is used in many way on technology as concrete poured, paneled, fabricated, stressed with steel for structural strength, sometimes bush-hammered. Prior to 1940, in few university concrete buildings exist.

Concrete's remarkable architectural qualities were known since the construction testified to concrete's durability, strength, and dramatic space enclosing capabilities. In the Roman Empire, the concrete was seldom utilized mostly due "to a conviction that ashlar was the only respectable material for better class buildings.". When stone was not available, the brick was the second choice.

To speed up construction and to economize on materials gave cause to imitate expensive architecture with mortar-bound stuccoed rubble. After the French revolution, the need for fireproof construction in urban areas and evolving tradition among French engineers for experimentation in technologies and materials caused fostering concrete architecture in 19th century in France. The parish church at Le Vesinet (1864), designed by Louis-Charles Boileau is the first modern concrete institutional structure. The concrete was employed mostly in utilitarian structures at the beginning of the 20th century. The bridges, factories and stadia were built using concrete, the grain silos were made of concrete also. (DOBER, 1992)

In 1903, Harvard University's Soldiers Field Stadium completed as a continuous poured concrete structure. This was a pioneering enterprise, the largest single example at that time

in the world. Harvard University has three buildings in concrete. The others are Cary Cage and gatelodge (1897) and Weld Boathouse (1906) were well proportioned buildings with an outer layer of exposed dark aggregate, accented with brick.The designers were Harvard's professors who used concrete skillfully for its technical and artistic qualities.(DOBER, 1992)

In 1930s, the concept and practice is differed. Concrete buildings became favorable. In 1941, the concrete is accepted as "trademark of the new architecture". The concrete campus buildings are remarkably different as campus histories and picture books now reveal. The concrete architecture is provided much speed in construction period and served the rapid and unparalleled growth and democratization of higher education following World War II. Concrete is became the signal of institutional advancement. Concrete is also became an acceptable material for the traditional forms of institutional architecture and an emblem of its age. Unlike traditional designs, concrete architecture did not breed a complementary landscape.(DOBER,1992)

In the world, from the mid-1950s through the 1970s, concrete was, the main, preferred chosen material for modern campus construction. In concrete construction, ornament-free detailing became a symbolic indicator. In concrete designs a basic tolerance in joining modern materials are existed such as joining glass, concrete, aluminum. Mechanical tools would hammer the concrete surface for texture.(DOBER,1992)

Louis Sert, as a master of concrete, used concrete with primary colors splashed on inset panels, in his designs of Harvard University's facades. A visual continuity is afforded by concrete buildings at the Massachussets Institute of Technology. Institute's planner, O.Robert Simha says "Materials can extend the memory of place, as well as mark it." (DOBER, 1992)

Pomona College has a unity and a remarkable landscape in campus design. Concrete architecture is directed to serve the scenery. But if a building is required an architectural significance, they built without compromise to campus design. The new gymnasium is a

special building in Pomona campus design image. At Trinity College, in Dublin, a surfacial resemblance between the aging concrete facade and the older stone in 18th century Georgian buildings exists. (DOBER,1992)

Concrete is technically and visually appropriate in climates where masonry architecture damages from insects and molds, and where there are extreme variations in temperature and humidity. Concrete may be a trademark material until if prizes and publicity denote current practice, which would influence the next way of campus architecture. (DOBER, 1992)

University of Toledo Art Building is different with its materials. This building is designed by Frank Gehry in 1990-92 in Ohio. One façade of the University is like a fortress, clad in lead-coated copper. The other surfaces are covered with glass. The building is in contrast with the other neoclassical buildings and with their white marble-clad. (JODIDO, 1993)

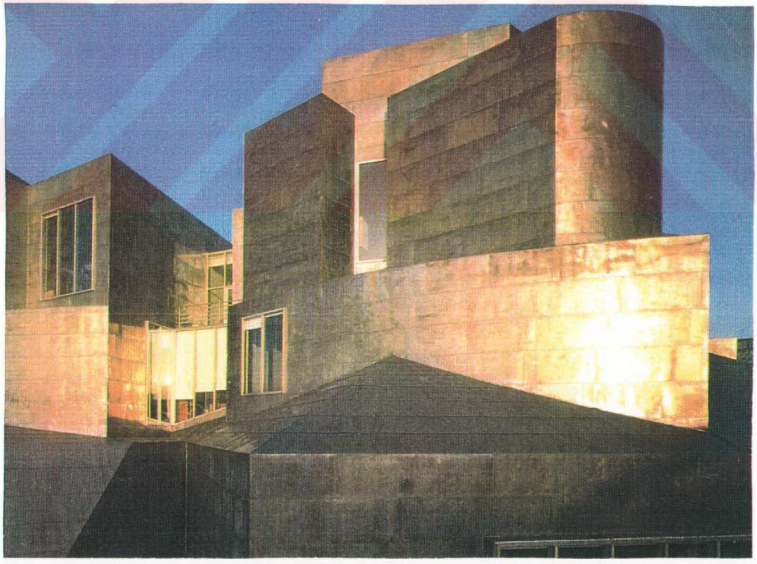


Figure 5.4 University of Toledo Art Building (1990-92), Ohio, USA

Figure 5.5 University of Oregon Science Complex (1990) Eugene, Oregon, USA

University of Oregon Science Complex restored by Charles Moore. The basic material of buildings is brick. The base of this design is to restore architectural unity to a 1914 campus. The common areas between buildings are atriums and courtyards. There exist an external link between the buildings. (Fig.5.5, pp.80)

5.6 Landscape

Landscape is a part of a campus. A campus is livable with a suitable landscape. "A campus without landscape is as likely as a circle without a circumference, an arch without a keystone, an ocean without water." (DOBER., 1992, P.167)

Landscape is concerned with lawns, greens and playfields. Landscape defines aesthetic, functional and symbolic purposes in the areas between buildings. It organizes the overall campus plan, the interior circulation systems such as walks and roads. The green areas include the campus edges, gateways, gardens, arboretums, memorials, bell towers, fountains, outdoor sitting areas, site furniture, signs and natural features on the site, including ponds, woodlands and rock formations.(DOBER,1992)

Landscape elements are **aesthetic, functional** and **climatological factors** for campus planning. Landscape can serve as **aesthetic factor**. Landscape elements for aesthetic factor are used such as sculpture, ceremonial and symbolic articulation, textural and tactile richness. Landscape can serve as **functional factor** also. Functional landscape elements are slopes, embankments as erosion control, as screens and privacy. Landscape can serve as **climatological factor** as protection from the rain, as protection from the sun, as air circulation. (DOBER,1992)

Its elements and plant material can abate noise, control dust, divert traffic, secure boundaries, afford privacy, and be arranged for pleasure. The size, appearance, and quality of the campus greenery differ in climate differences, sun-shadow patterns, soil, moisture, elevation, plant selection and cultivation differences. (DOBER, 1992)

Landscapes are forming the areas like art forms. Plant materials can be used in a fashion, adding color and texture to architectural compositions. It can be used also as aesthetic objects in each campuses' architectural compositions. Certain plants show the nature's changes. The passing seasons can be appeared in changes in color and leafing. In some locales, the changes in colors show the time of day. (DOBER, 1992)

Some **Nature's Imperatives** exist in landscape of a campus. The better landscape effects require years to mature. Certain tree types are used as design components. The trees are used to define axial compositions and en masse as design symbols. (DOBER, 1992)

Nature and nurture must be kept in balance in landscape design, for which a long view is essential. Design reasons must be taken into consideration by suitable methods. Well landscaped campuses are more beautiful than the other campuses. Landscape is an ascendance as a contributor to campus design.(DOBER, 1992)

Campus greens are lawns and trees. First landscape materials were grass, trees and fencing. Greenery is becoming important in recent years. Green woodland areas are provided a green ambiance for buildings. The greenery is serving as an outdoor lounge, and furnish a stage for formal and informal institutional rituals. The green areas are the most enduring and prevalent of campus image. (DOBER, 1992)

Scientific purpose may be serve as landscape. Science as landscape are the special places planned for plant to search and to label. In campus planning, the special places such as arboretums, natural areas and gardens are occurred. These types of greenery for science and art cause some contributions to campus designs. These special places have an important role in campus development. The role of these places are combining as they do instruction and research. At the same time, these places are offering an abundant beauty year round. The campus image is changing according the size, location, characteristics and quality of these special places.(DOBER, 1992)

Some campuses have collected some trees and shrubs for experimenting geological specimens. These plant materials are labeled. Some plant materials are located for the visual effect as well as natural viability and scientific relationship.

Campuses may be edged by forests but so far only few campuses seem to realize it. Many campuses may not have fund and manage expensive gardens. For campus boundaries many variations exist. These are the boundaries with plantings for instructional purposes, the boundaries with the memorials for integration landscape with sculpture and artwork.(DOBER, 1992)

As art in landscape, two trends are used in landscape design. One is the outdoor museum, in which objects created as studio art are placed in the outdoor environment. The second is environmental sculpture in which the setting inspires the artist to use hard forms and soft forms. Stone and cast metal are the examples for hard forms. Shaped earth and plantings are soft forms. Soft forms, in general, are used to create an overall setting for devote some representational meaning, or religious, political, and symbolic connotations.(DOBER, 1992)

Paths are pedestrian and vehicular roads that connect buildings and spaces. The paths are generating the skeleton of campus design which gives shape and scale to design.

In path design;
-paths should be designed in a hierarchy of volume and use.
-paths intended to carry large volumes of pedestrian circuit.
-paths should be designed so that they are accessible.
-minor paths can be down-scaled but not neglected as opportunities.
-pedestrian traffic and vehicular traffic should be separated.
-the intersections of major paths, should be designed to encourage participation in campus life.
-paths should be constructed of materials that are visually sympathetic to the environs.(DOBER, 1992)

The typical campus landscape design elements are paved surfaces, lighting, signs, display boards, bicycle racks, information kiosks, trash receptacles, fencing and billiards, benches and seats. Signs systems are important to help explain environment, to direct traffic, to indicate a destination, to commemorate people and events. (DOBER, 1992)

The principle components of the landscape are as follows:
-Gateways
-Building setting
-Ceremonial open spaces

-Active recreation open spaces
-Passive recreation open spaces
-Gardens and arboretums
-Vehicular circulation routes
-Pedestrian circulation routes
-Campus crossroads
-Sculpture, fountains and memorials
-Outdoor furniture
-Lighting
-Signs
-Plantings
-Accents
-Special effects (DOBER,1992, pp.172)

National Pensions Institute by Alvar Aalto is a best example for campus landscape. The whispering trees of its open space and thick grove gave a design image that attracted students and visitors of university. Aalto explained the main idea of his scheme "The idea was to create open squares making available spacious pedestrian zones at different heights depending on the given terrain, completely sheltered from motor traffic"(WESTON,1995, pp.154) The idea of raising public zones and open spaces from the traffic ways, made obvious sense in terms of enhanced views, but was also vital on Aalto's mind to protect them from noise and fumes of cars. (Fig.5.6 pp.94)

University of Ruhunu is a well example for landscape. It is designed by Geoffrey Bawa. University's place is on a hilly coast overlooking the sea. It is a new university for 5.000 students. There are series of buildings linked by terraces, gardens and covered walkways. This areas create some space for pause, contemplation and meetings. These are modest and elegant buildings but they placed accordingly to the landscape which differs from others. (Fig.5.7 pp.94)

Figure 5.6 National Pension Institute (1948), Helsinki, Finlandia

Figure 5.7 University of Ruhunu (1980-86), Matara, Sri Lanka

CHAPTER SIX

SOME APPROACHES TO CAMPUS DESIGN

6.1 Linear Organization

In Linear Organization, a linear pedestrian way occurs between the facilities as academic, social, administrative, sports and residential areas. The buildings are placed each side of this pedestrian way, in other words each side of this 'alley'. Linear organization can be realized in an unlimited area and an infinite growth. This type of planning is suitable for large and small campuses.

There are two types of linear organizations in campus design. One is an alley and on both sides of this alley the academic buildings are situated. The examples for this solution are Bochum (in Germany), Gaziantep, Sakarya, Malatya Universities.

In the second linear organization type, an alley exists, on one side of this alley the academic buildings are situated, on the other side of this alley social buildings are gathered. This solution is longer than the first type of linear organization.

In linear organization similar patterns of buildings are repeated along the alley. This will cause a repetition, a monotony in design and in fact, this creates a unity. Linear organization enables an unlimited expansion if the land is available. (Fig.6.1, pp.99)

6.2 Centralized Organization

In centralized organization all academic patterns and all functional facilities are gathered as a whole. Centralized scheme is a concentration of functions and facilities. The basic idea is to make union among the facilities and to strengthen the social relations center. This type of planning is not changeable, all the decisions should be taken at the start of the planning. Centralized schemes also have the problems of high concentration of students in a minimum land area. The expansion of the center is impossible, the center is appeared by surrounding buildings. The expansion can take place behind surrounding buildings. Centralized schemes also provide for vertical expansion into high rise buildings. University of East Anglia (in England), Bradford University of Stockholm are planned according to the same scheme.(Fig.6.2, pp.100)

6.3 Non-linear and Decentralized organization

In this planning type, all functions are distributed on campus area. The scheme is consisted of separate buildings which are situated in a green area. Decentralized scheme is also a physical division and distribution of functions and facilities which have been concentrated. Expansion of the design is depended on the boundaries of the urban land. The distribution of functions in campus area, is caused an uneconomic solution and high infrastructure costs. The separation of pedestrian and vehicular traffic is not considered as one of the main idea of design. In fact the pedestrian and vehicular traffic is separated from each other. The most characteristic examples for this pattern are University of California-San Diego, Santa Cruz (in USA), Los Angeles Campuses, University of Mexico and Otaniemi Technical University in Finland.

6.4 Molecular Organization

This planning type is composed of units. The scheme is continued to develop by the addition of new units. This type is planned as a compact design. An hierarchy and a growth is provided in campus design. This hierarchy is identified the groups and a system from the individual to whole. Molecular organization gives a limited flexibility, in fact, an optimum flexibility sometimes occurs. The communication and interrelation in a group of units are provided and encouraged contact between people. Therefore the communication between different groups is limited. (Fig. 6.3, pp.100)

6.5 Grouping and Zoning Organization

Functional group zoning is occurred from the necessity of designing specialized areas and for having variation of activities, relations, structures in campus design facilities. Campus facilities components are combined like:

-Academic facilities
-Administrative facilities
-Social facilities
-Residential facilities
-Sports facilities
-Service facilities

In grouping design, an horizontal planning and a vertical planning are considered. In horizontal grouping, functions are placed in separate buildings, but in vertical grouping the relation between different functions is strengthened.

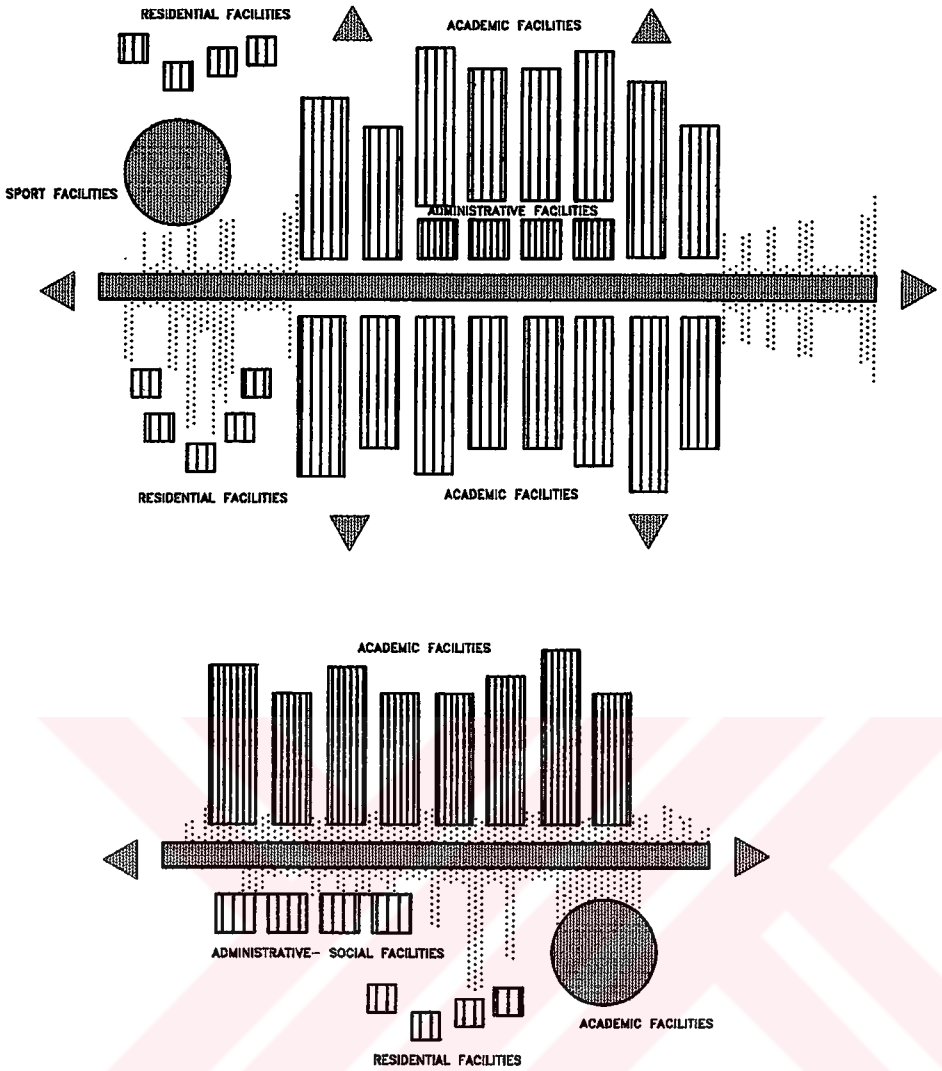
In horizontal grouping, the scheme is expandable, a flexibility is provided by the division of academic facilities according to their functional activities. Interrelation between nature and campus is provided. Standardization in construction can be

considered and it is economically suitable. A handicap is occurred by the existing empty space during day or night because the using time of some facilities. "The limit to this type of lateral expansion is reached when the agricultural lands become so diminished that the teaching and research needs are not met."(CAUDILL, ROWLET, pp.41, 1959)

In Vertical grouping, the scheme is not suitable for expansion. The structure is composed of overlapping of functions. This scheme is economically applicable. Vehicular and pedestrian circulation can be separated from each other easily. The neglect of interrelation between nature and man is occurred. "Vertical expansion into high rise buildings reaches its limit when the density becomes too great for the amount of land available."(CAUDILL, ROWLETT, pp.41, 1959)

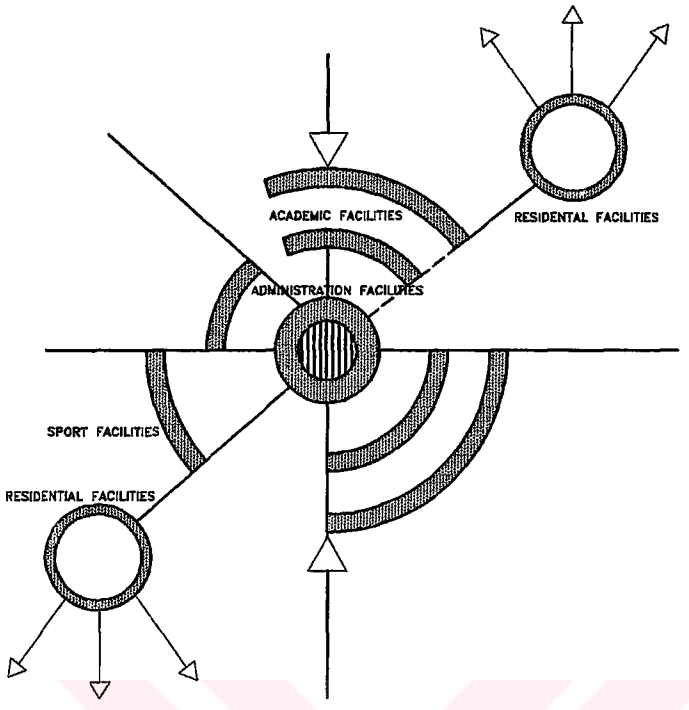
> *Vertical expansion. It may be difficult to justify one and two-story buildings in a congested area. Low buildings may be removed to allow high rise buildings to be constructed to house the displaced functions. In going to high rise buildings, it must be remembered that a reasonable ratio between the total floor area of the building and its surrounding land must be maintained.*(CAUDILL, ROWLETT, pp.42, 1959)

Examples of the horizontal grouping are University of Bath, Bochum (in Germany), Essex, Sussex, Laucester, Surrey (in England), Stirling, Oslo, Toronto, Malatya University and Sakarya University. Examples of the vertical grouping is Free Berlin University (in Germany) and Toulagoo University (in USA). In some University plan types, the grouping is not considered as a design criteria. In this type scheme, the structures are designed as separate functions with harmonizing in physical environment. The interrelation between different functions is neglected. Standardization and economy in some structures are difficult to realize. Example of this scheme in Turkey is Ege University. (Fig.6.4, pp.101)



LINEAR ORGANIZATION

Figure 6.1



CENTRALIZED ORGANIZATION

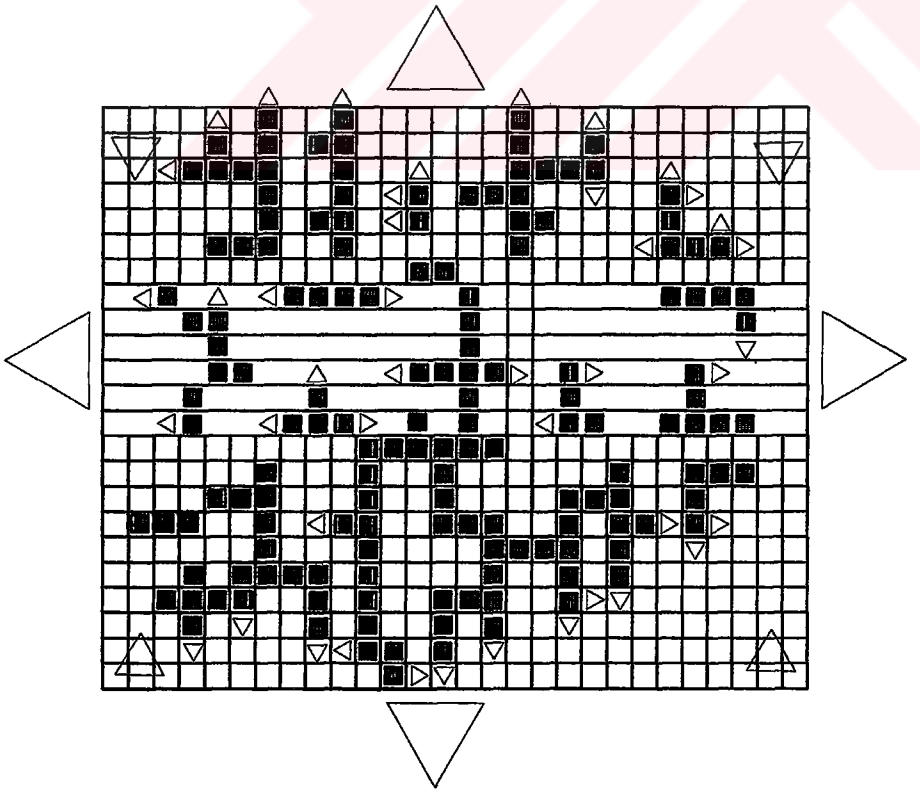
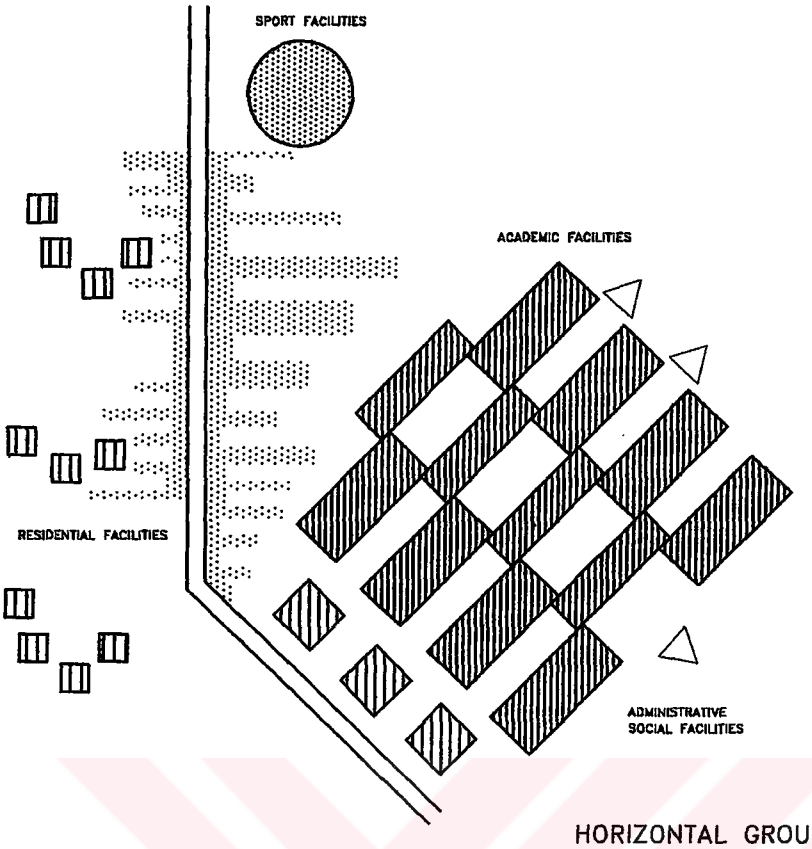
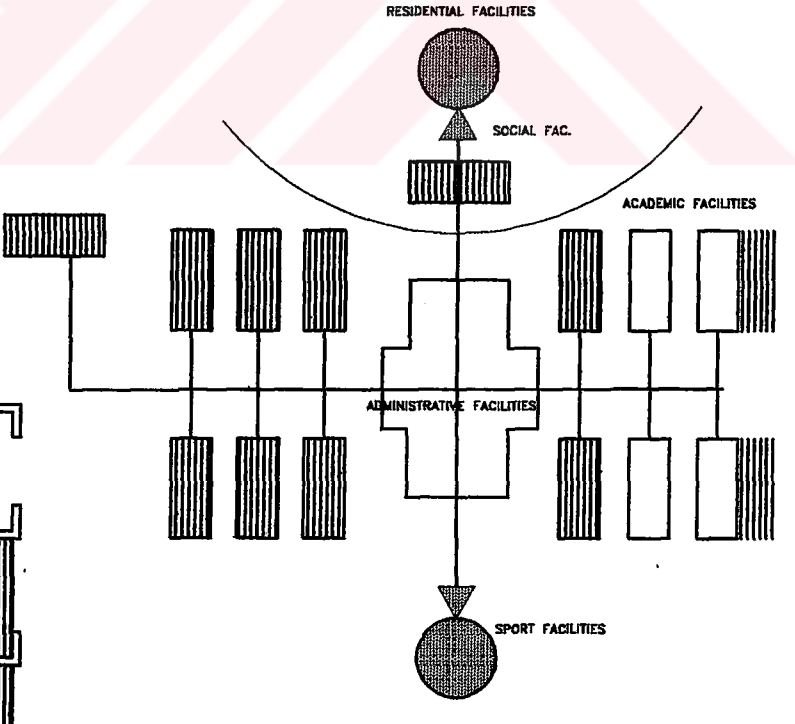


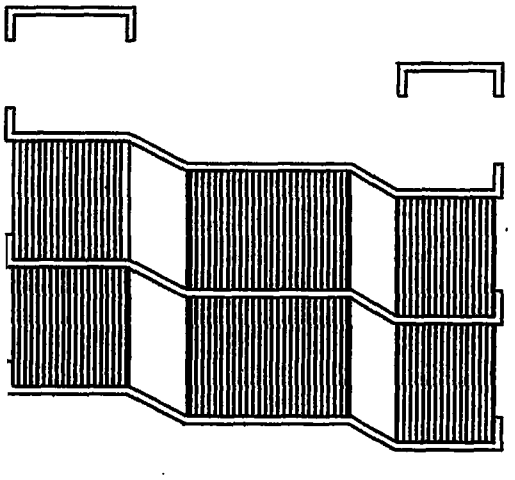
Figure 6.2, 6.3 MOLECULAR ORGANIZATION



HORIZONTAL GROUPING



VERTICAL GROUPING



VERTICAL GROUPING SECTION

Figure 6.4

CHAPTER SEVEN

EVALUATION OF THE DESIGN FOR İZMİR INSTITUTE OF TECHNOLOGY CAMPUS

7.1 Landuse

İzmir Institute of Technology campus area located in Urla, about 40 km away from İzmir city center, on the main highway to Çeşme. This area is 35.000.000 m^2 which is on the Urla-Karaburun road, near the sea, on a sloping area. On the south, Çeşme-İzmir autoroad and old Çeşme-İzmir road, on the west Café Manzara-Barbaros Village-Kocadağ Hill, Radiolink station, on the east future Karaburun-İzmir road itinerary, Gülbahçe Harbour-Urla Municipality-İçmeler are the borders of İzmir Institute of Technology campus. %95 of this area belong to the finance treasure of state and %5 of this area belong to individual possession. The site has a great scenic beauty, with a view of the sea along the entire eastern side. The extreme eastern part of the land reaches the sea and to the road to Çeşme which runs through the land. Campus buildings' total construction area is 497.634 m^2. The construction of Rectorate building and the Faculty of Architecture started on November 1994.

Nowadays, the construction of two buildings of Rectorate, three buildings of Faculty of Science, one building of Electrical Engineering, two buildings of Faculty of Architecture are continuing. Two of the Electrical Engineering's buildings have already been completed.

İYTE Campus first designed by Italian Architects Luigi Pisciotti and Uberto Siola. Luigi Pisciotti said in their feasibility report: this is essential in realizing the necessity and opportunities of such a vast area in designing a university seen not as a complex of buildings, whether large or small, but as an urban settlement, that is, a university city or campus. If designer considers the significance of this concept, the background information - expressed in the maps and geographical reports as far as the area is concerned, and in the layout as far as the campus is concerned - acquire a different meaning and provide the objectives of the project. (PISCIOTTI, 1994)

Pisciotti said that the university campus does not represent a model of construction density or of particular building organization. And also he said that the true matrix of the campus is that of transforming a function - the university function - from the logic of a building or a group of buildings, as has been the case for centuries, to the logic of a true urban organization, a city. (PISCIOTTI, 1994)

To describe the adopted solution, Architects dealt with three orders of questions:

- regarding the area,
- regarding the general arrangement of the university complex,
- regarding the buildings.

As far as the first problem is concerned, the main objective was to protect the beautiful scenery of the area. As a consequence, the choice of which areas should

house the university structures was made, in a certain way, by excluding the areas to be safe-guarded, on the four basic parameters:

- the strictly panoramic parameter, researched using landscaping techniques;
- the geological parameter;
- the archeological parameter;
- the parameter of area accessibility, which translates into improved exploration of the entire region.

As the landscape is concerned, all buildings which would be higher than 140 meters above sea level have been blocked, with the exception of several areas marked for future university extension. All the gorges which connect the mountainous part of the territory with the area along the sea will also be safeguarded and used as fundamental collectors for waste water. (PISCIOTTI, 1994)

In academic area, each faculty planned as three or four separate buildings. One of these for academic staff, one for management and administration offices, another for classes and studios or laboratories. These cause a difficulty to reach a class in open air.

Human factor is neglected in some areas and generally in overall of design. Because all lines are so linear except in some pedestrian circulation routes and in some vehicular circulation routes. The vehicular route to Çeşme separates academic buildings from sport facilities area and dormitories.This separation will create a difficulty to reach to sport fields. Dormitories will be used as a holiday centre in summer period. This may be the reason of this separation. Some open spaces exist for active and passive recreation.

Path design is not according to topography in the design of İYTE. The buildings are not suitable to slope of natural ground. Paths connect buildings and

spaces. The paths are flanked by wide green spaces which divide the various faculties and the other buildings. Dober said that "They generate the placemaking skeleton which gives shape and scale to the campus design." (DOBER,1992,212)

The scheme shows four distinct areas, all located within the single drawing of the system :

- The area of the Rectorate, hierarchically the most important, facing the entrance, like a great door facing the territory
- The faculty area, with the connected faculty centers and departments, located in a central position with respect to the entire university system.
- The sports area close to the Rectorate, and above all, not far from the access road which represents the point of contact with the outside road network.
- The area for technical facilities and general services, located inside the complex, towards the southwest.

The choice is to make the Rectorate as the true "hinge" and the true point reference of the entire composition of the area. (PISCIOTTI, 1994) This area extends from the academic buildings area on the west side to the students' housing on the east side, from the health facilities on the north side to the sports facilities on the south side.

In this area, it is important to consider the position of these structures with respect to contour lines, a position which architects could define cut into the hillside. Along this substantially horizontal line, at approximately 45 meters above sea level, Architects have located a system of pedestrian's walkways at right angles to each other, along which nearly all the buildings important to university life are located. (PISCIOTTI, 1994)

As result this is a well design but human factor seems to be neglected and the topography and design also is not developed enough for realize. (Fig.7.1, pp.106), (Fig.7.2, pp.107)

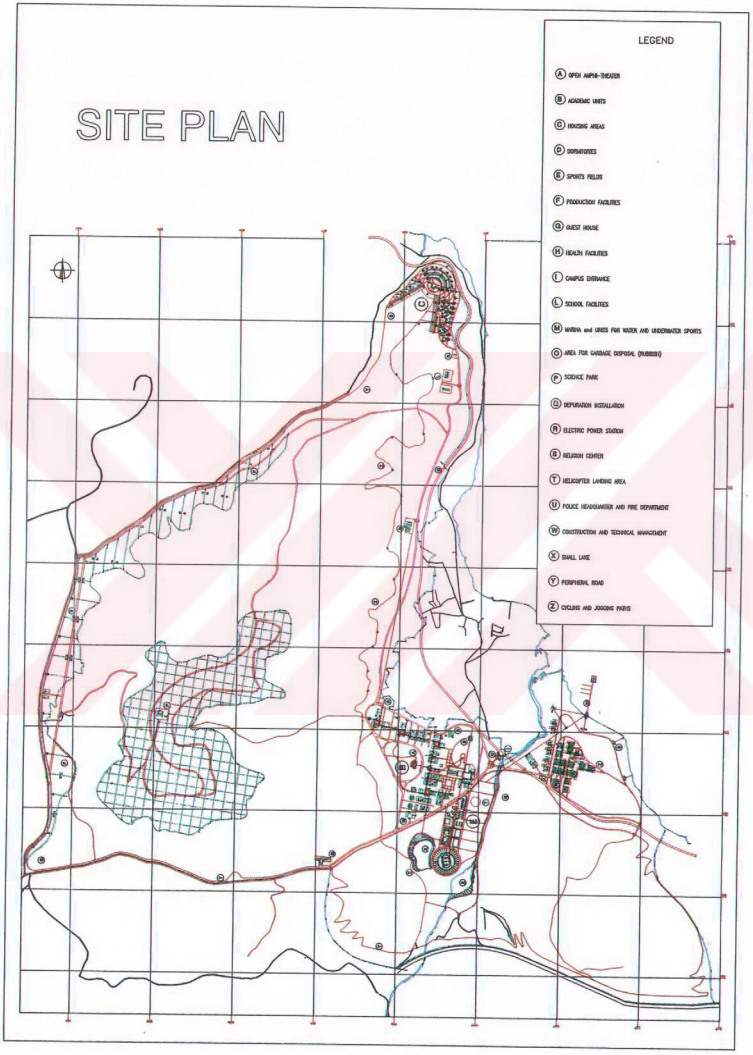


Figure 7.1 İzmir Institute of Technology Site Plan

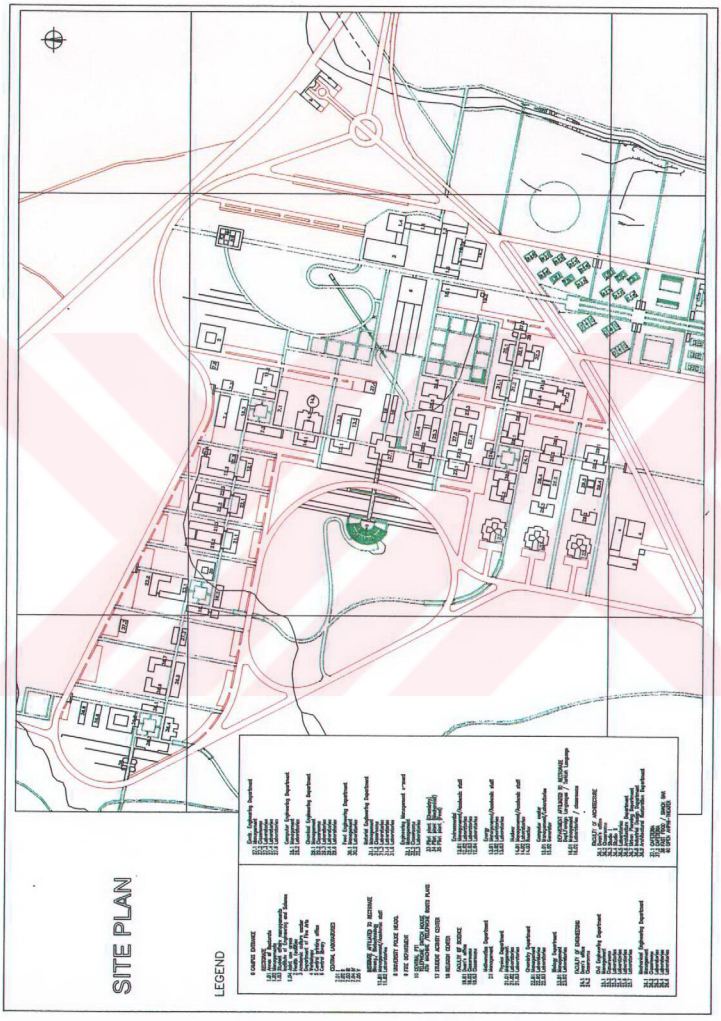


Figure 7.2 İzmir Institute of Technology, Academic Buildings Site Plan

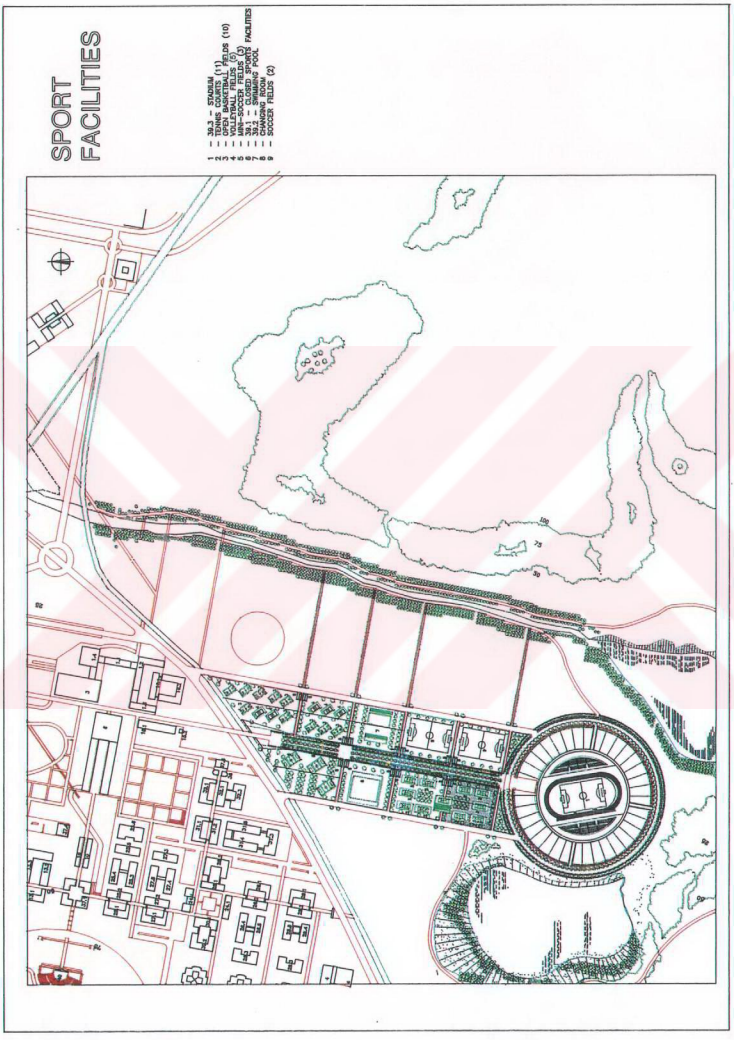


Figure 7.3 İzmir Institute of Technology, Sport Facilities Plan

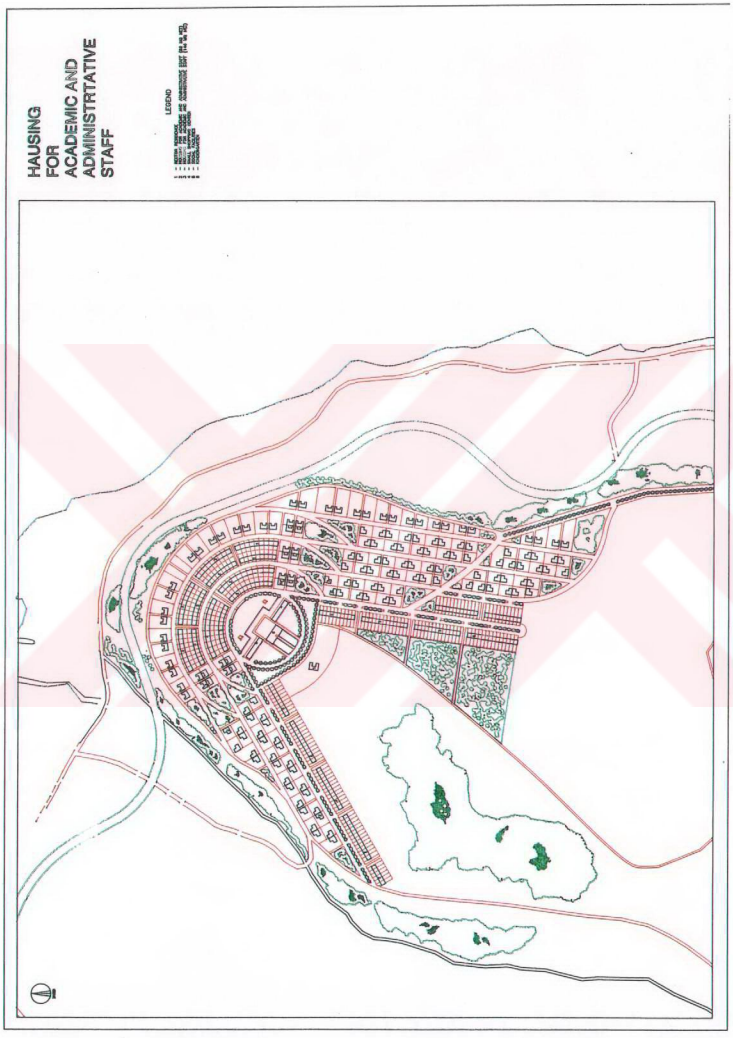


Figure 7.4 İzmir Institute of Technology, Housing Facilities Plan

Figure 7.5 İzmir Institute of Technology, Dormitories Plan

7.2 Geology, Topography, Soil and Foundation and Meteorology

According to Turkey earthquake geographic map, campus area take place in the first critical earthquake region. Landslide risk don't exist in this site.The results of the works of geological engineering for the İzmir Institute of Technology campus and the proposals are summarized below:

a. In the application of soil, local rocks founded.
b. Ground level cover on the earth as alüvium, rising slope rubbish, beach sand and etc...are seen on the river basins, on the rising slopes and near the seaside. Thickness of the ground level cover is not thicker than 5 m.
c. In the natural conditions, there is no negative factors, in the rising slopes stability.
d. The proposal area is suitable for the basement construction. However, in mineral springs place, a fracture is seen. It is a place which has firmly limestone. Therefore when the buildings place were selected it must install away from the fracture and the dormitories place must install to another place.
e. The limestone which appear on the excavation, may be use as rock or crushed aggregate. The other materials which can get on the excavation, are usable as filling anywhere, but not as basement filling.
f. Site is placed in the first critical earthquake region.

2.300 hectar area of the campus are covered with volcanic rocks, andesite and a little basalt. On the south section of Urla- Çeşme road, 1.200 hectar area is covered with top and bottom cretaceous and with limestone rocks. But near the Tatar stream the soil has silt character. In the section there has agregas based volcanic rocks. In this area the sport fields will establish. The other areas are rocky places which Administrative, Engineering, Science and Architectural

Faculties(80.242 m^2) buildings install. But the construction will be difficult because of the existence of the rocky places where the water links pass by.

The average rain in İzmir, according to İzmir Meteorology is 700.2 mm. But the dissociation of rain shows a disorder. More than half of the rain as 414 mm rains in December, January and February. Climate is mild between June and September. According to İzmir Meteorology datum, dominant wind direction is from north to south.

7.3 Infrastructure

a. Purifying System

Campus area will shelter so many people in housing units and in dormitories. Therefore, technical infrastructure is important. The site requires a sufficient purifying system according to its people and density. Purifying pools which situated on the site, will serve for 20.000 persons. This is suitable for sewer system but when requirements will increase, the purifying pool capacity may enlarge. The purifying pools will install at a lower level of the site.

The circulation networks and road axes of İzmir Institute of Technology are suitable for infrastructure system. Infrastructure of the campus was planned to make as central heating system. But the large campus area and the topography prevented this system. Then self heating system began to use for each group of building. A drainage canal will be constructed under the roads. The rain water and roof waters of the buildings will unify in the drainage system. The sewage system will organize according to the sloping area of the site. The purifying pools will be constructed to use the dirty water in irrigation of plants.

Waste waters of campus buildings will collect in some centers and will purify and this purified water will use in irrigation of plants. But waste of chemical

materials will change to materials which are not harmfull and will destroy by special methods.

b.Water sources

There exist Tatar stream on the south, Karapınar stream on the north. On this large river basin from the north, Kavaklı, Ballıkaya, Sinek Kışla, İncirli, Gülbahçe, Cinlipınar and Meryem streams take place. All the streams except Tatar, Kavaklı and Karapınar stream are limited with their river basin and they are not suitable for water storage with their topographic area. Domestic water may be provided from Tatar, Kavaklı and Karapınar stream. These are ground level water sources. Tatar stream on the south, in spite of its large river basin on which collect lime stone, therefore, this stream is not suitable to get a little dam. Kavaklı stream which extends from east to west has suitable physical specialities as topographical basin and geological units for collect a little ground water. But İzmir-Çeşme road aligned the valley and this stream has no ability to collect the ground water.

On the north, Karapınar stream which borders the site, has given an opportunity to collect water. This river basin may control with one or two little dam. One of these dams will collect 7 meter river basin flow.

Under the earth water supply is limited. There exist lime stone under the earth water sources basin but sea water exudation (diseables the water for drinking and using) causes the lost of water specialities for drinking and using. İçmeler water source is a typical example of this type. The rocks which transmit or not transmit the water, do not carry so much water. But in some locations, volcanic levels in some exploratory wells and some alluvion wells may contain 1-21 hour water.

But at the conclusions of research, the drinking and domestic water can't be supply from the campus area, it needs to be obtained the water from Urla Yağcılar village basin. For this purpose, in the basin, 120 m deep, 7 wells will be drilled.

Supply water from the wells by 13.000 m long pipeline will reach to the main central of campus area, under the highway of İzmir-Çeşme road and Urla-Gülbahçe road and from the east of the fault layer of Çarpandağı mount.

As we can see from the site plan of İzmir Institute of Technology three parts are designed for water requirement. In a summer day, daily water consumption for one person is about 250 lt/ day. A student or a staff use up 1/3 of his consumption in office and 2/3 of his consumption at home.

In academic, administrative buildings, classrooms, academic staff rooms, libraries and laboratories, it is suggested that there will be 8.400 students and 1.700 academic staff and personnel. For laboratories, the water requirement will be 2.00 lt/hour (172.8 m^3/day) and for sport buildings, the water requirement will be 1.00 lt/hour (86.4 m^3/day).

Dormitory buildings of İzmir Institute of Technology consist of four types and dormitory managers and personnel live there. 3.712 students may live in dormitory type A. Dormitory type B may serve for 1.152 students. Dormitory type C is for 156 and dormitory type D is for 24 students. The dormitories' water requirement calculated as 13,75 lt/hour.

The residences for İzmir Institute of Technology are designed for academic staff, personnel and for their families. There exist 400 housing unit, it is calculated four persons for each one, then there will be 1.600 persons. It is estimated that 800 persons will remain at home all day long then they will use 2/3 of water requirement. The total water requirement will be 3.86 lt per hour. Water source requirements calculated from the total of water requirement. This will be Q= 16.47 +13.75 + 3.86 = 35.08 lt/hour.

c. Heating System

Buildings of the campus have 497.634 m^2 usable area. Self heating system for each building is not economic for campus. The buildings considered as some groups such as dormitory buildings, housing units, sports buildings, faculties. Each building groups will have a central heating boiler room. This system will be suitable for the sloping area of campus. It will use hot water system central heating because of condensation and sweating problems. The hot water pipeline which will connect to the buildings from the boiler room, will pass inside the galleries under the earth. A suitable isolation may need to prevent heat lost. It may need suitable compensator to receive the expansions from two different ways. Water pass inside the large pipeline and installation will be heavy enough. Then a suitable carrying console is needed. In addition, because of high compression and heat in system, a special security and automatic control system are needed.

d. Electricity

Campus electrical energy will be as 34.5 KV medium tension electricity. This energy will supply and transfer to the centre of electricity on campus and distribution will be realized under the earth by 19 transformer stations. Lower tension electrical energy will get by these transformer stations. When the necessity appears, it will be prepared a room for electrogen units in exit of transformer station and lower tension. Compensation units will install at the transformer stations to decrease the costs. (Information about infrastructure of İYTE is obtained from İYTE Technical Office documents.)

7.4 Building Locations

Buildings were grouped in design as each faculty clusters. A repetition is considered in the planning scheme. This is a physical pattern in the campus planning of Izmir Institute of Technology. Its pattern is designed functionally. Buildings' locations are not according to climate, wind, topography, scene of the

seaside. These are negative factors effecting the building locations in campus. Their locations and site arrangements of Izmir Institute of Technology generate its rational designing image. In İzmir a warm climate exists, buildings of campus are arranged wide-spread around the site.

In academic area, each faculty planned as three or four separate buildings. One of these for academic staff, one four management and for administration offices, another for classes and studios or laboratories. These cause a difficulty to reach a class in open air. (Fig.7.3, pp.108), (Fig.7.4, pp.109), (Fig.7.5, pp.110).

7.5 Functional Arrangements

Interrelation between students and academic staff who study in different disciplines is the main idea while designing this campus. All the academic departments of İzmir Institute of Technology are situated in a constant unity on the campus planning. Natural environment of İzmir Institute of Technology is considered as an important constant.

The organizational diagram and concept design of İzmir Institute of Technology is according to L shaped linear organization. Pedestrian ways occur among the facilities. This is a large campus planning. Similar patterns of building are repeated along the alley. This causes a repetition and a unity. The campus has an expansion ability with its wide-spread campus planning.

A functional group zoning is occurred from the necessity of designing specialized areas as academic, administrative, social, residential, sport and service facilities. The campus scheme is designed according to horizontal grouping. The campus area is large and a warm climate exist then horizontal grouping is suitable. The scheme is flexible to expand, the divisions are according to their functional activities. Interrelation between nature and campus is provided.

Access to İzmir Institute of Technology Campus is by underpass way from Karaburun road. An entrance door building, a reception and waiting places are occurred. Faculties are installed near the main pedestrian road of campus on the each side of academic center. Student dormitories are placed on the northwest of the site. Academic staff housing are installed on the north of the campus area. In the site some sport fields and recreational green areas are planned for the students' spare time. However, İzmir Institute of Technologys' main sport complex is planned on the south of the campus, between İzmir- Çeşme road and Çeşme autoroad.

At the academic center, on the north and south axis, there exist a pedestrian road as an "alley", width 30 m or wider in some places. The circulation and accessibility among faculties, academic center, research center and common functions are provided by this alley. All the buildings are installed near this "alley". And some extensions are considered for faculties then the green areas at the back of buildings is separated as reserve areas for extensions of buildings.

Academic center is placed at the center of academic area. Academic center essentially is on the axis of entrance. And it contains administration, library, central laboratory and auditorium which are planned at the west of academic center. Pedestrian path (30m) becomes larger when it reached to academic center and occurred as a square. The aim of this bigness as a square is to create a ceremonial place and to break the monotony in the pedestrian road.

On the north of academic center there exist faculty of engineering and architecture. These faculties are installed on the opposite side of "alley". Faculty of science, foreign languages, Turkish languages and research center are placed on the south of academic center.

Pedestrian and vehicular circulation is separated from each other. Vehicular traffic around the site is planned at a maximum level, with an outer belt about 25 m which access to the academic area. The car parking facilities from the outer belt provides optimum requirement. Academic center is planned easy accessible from dormitories and housing.

Green areas, open auditorium, manifestation and exhibition areas, mini soccer fields and basketball fields are sportive and recreational common areas. This type of recreational areas spread over the campus area as optimum as possible. And these areas are placed on the north and south end point of the campus area. These recreational areas are accessible for students at break, in planning of campus. On the other hand, some areas are designed for sports activities, TV and theater activities for dense usage by students. On the south side of the site, at the Ballıkaya Hill and near Karaburun road, a cultural center is designed. This area also is planned as a recreational open area for İzmir Institute of Technology campus.

However, main sports fields are planned on the north side of the campus between Çeşme autoroad and Çeşme-İzmir road. This area is a place where all the sport activities and organizations will take place.

Dormitories are installed on the northwest of the campus site and separated from academic zone but in spite of this separation, a unity is appeared cause by the nearness to academic center. Mostly each room in a dormitory is about $25m^2$. Rooms are designed for two persons or four persons. 18 dormitories exist. 9 of them will be for girls, 9 of them for boys. A pedestrian road will provide access from campus area to the dormitories. At the center of this area, a shopping center, a cafeteria and an administration building will take place. Some sport fields and recreational areas are designed in optimum number and dormitories are designed

close with sports areas. Dormitories will shelter 5.044 students if each rooms will be for four students. Dormitory area will be touristic area in summer period.

Housing for staff is far from dormitories and are placed on the north cape of the site. Academic staff housing is located near the seaside far from academic center. It will cause to build different shopping centers and service facilities for these housing places. Housing area contains 100 m^2, 80 m^2 and 70 m^2 units. There will be 400 housing units. Some recreational areas such as nursery, guesthouse and cafeteria exist in the housing area.

The area of this campus is a circle which its diameter is about 1.250 m. This cause minimum 24 minutes walking time from one end of campus to the other. It is bigger than the standard of 800 m diameter and 12-15 minutes for walking period.

7.6 Circulation Networks

Access to İzmir Institute of Technology Campus is by underpass way from Karaburun road. This area is on the Urla-Karaburun road, near the sea. An entrance door building, a reception and waiting places are occurred. Faculties are installed near the main pedestrian road of campus on the each side of academic center.

A loop in vehicular circulation exists around the academic buildings of İzmir Institute of Technology. This vehicular circulation connects all the faculties each other. But in application the administration of İYTE requested two vehicular roads crossing the pedestrian paths of campus, this will be applied. In circulation networks an hierarchy is provided. The vehicular roads connect with "cul de sac" to pedestrian paths. The buildings are situated around pedestrian road. Some pedestrian roads exist in this campus site but the pedestrian way which link

cultural buildings to each other is the main pedestrian road. Second pedestrian way is the academic buildings Lshaped road. The paths are around the buildings for easy access. We see a main pedestrian axes which links the administration building to social and cultural buildings such as library, central PTT(telephone switch house), cafeteria and open auditorium. This is the center of campus. Some paths reach there from all the other academic buildings.

Most of the dense circulation is the inter campus pedestrian circulation, then the circulation becomes easier among functions. Most important criterion of campus planning is not to create any intersection between pedestrian and vehicular circulation.

The length of the outer belt and secondary roads around academic area is 20.375 m. Apart from the roads, open areas and parking lots are 83.200 m^2. The location of buildings which are on the construction are far from each other. In order to built roads on the campus, in some locations cut/fill slopes need to be constructed.

Path design is not according to topography of campus site in the project of İzmir Institute of Technology. The section drawings of buildings are not according to natural ground. Paths are flanked by wide green spaces which divide the various faculties and other buildings. Dober said for paths; "They generate the placemaking skeleton which gives shape and scale to the campus design." (DOBER, 1992, pp.212)

7.7 Campus Open Spaces

"When thinking about campus outdoor space use, it is helpful to start with the notion that each student, employer, and faculty member probably has a work or

home base around which his or her daily campus activities circulate." (MARCUS, 1990, pp. 144)

In a campus, for pleasing, casual gathering places at building entries are needed. Home base was usually the students' major department where they took most of their classes, where they saw their adviser, attended special departmental events. The spaces around campus buildings are campus outdoor spaces. The campus outdoor places are "front porches" and "front and backyards". These places serve for waiting, meeting, casual conversation, and so on. (MARCUS, 1990)

İzmir Institute of Technology has these outdoor open spaces for waiting, meeting and casual conversation. Because all the buildings designed as some cluster in planning schemes, then these clusters have some inner courtyard, "front porches" and "front and backyards". The campus of İzmir Institute of Technology has some plantings, overhangs be coordinating to create a cool and shaded open spaces. Campus entrances are also important open spaces of campus design. It is a place to combine to create a highly used and highly imaginable gateway to the campus. Campus entries should be placed where the majority of students will enter on foot and also they should provide pleasant spaces for waiting, eating, casual studying, reading notices, and picking up news-papers or flyers. İzmir Institute of Technology has a well designed campus entrance as a gateway to the campus at the intersection of Çeşme and Karaburun roads. It has also some kind of central plaza or gathering places for each clusters and two big squares and a pool near administrative and cultural buildings. This campus will have an opportunity to have some green squares and major plaza spaces where friends meet, bands play, displays are placed.

These central plazas are bounded by places that generate a high degree of use throughout the day. These include the student center, library, theater, gymnasium,

cafeteria, administration building, bookstore and post office. These are located where major pedestrian flows pass by. So many people will become familiar with the place, those who will have come to watch people or wait for a friend have plenty to observe. (MARCUS, 1990)

In this campus pathways forms on the central plazas, bringing many people to the plaza as emphasizing the socio-psychological importance and perceptual orienting of it. Favorite outdoor spaces of this campus are greenery areas.

Figure 7.6 İzmir Institute of Technology, Campus Entrance Elevation

7.8 The Program

The total required area of İzmir Institute of Technology is 497.634 m^2. The simplified required program in faculties or facilities of the campus are as follows;

Academic Buildings

Rectorate.....9.396 m^2

Faculty of Science.....34.964 m^2

Faculty of Engineering.....58.576 m^2

Faculty of Architecture.....25.546 m^2

Inter disciplinary programs.....48.633 m^2

Institute of Science and Engineering.....1.168 m^2

The center of Computer Applications and Research.....4.281 m^2

The Central Library.....16.833 m^2

Health Facilities and Cultural Centers.....29.721 m^2

Sports Facilities.....57.928 m^2

Dormitories.....103.814 m^2

Other facilities

Central printing press.....1.378 m^2

Central Laboratories.....2.703 m^2

The Research and Application Center for Bio-Engineering and Bio-Technology .....4.105 m^2

Housing for Academic Staff and Guest houses.....59.033 m^2

The Research and Application Center For Environment.....5.236 m^2

The Research and Application Center for Energy.....4.785 m^2

Nuclear Research Center.....6.409 m^2

Student Activity Center.....10.234 m^2

Religious Center.....510 m^2

The required campus program of the İzmir Institute of Technology were prepared by a commission unified in İYTE with academic and technical office staff.

In İzmir Institute of Technology, there will be 25 under graduate and graduate programs in science, architecture and engineering faculties. Approximately 8.400 students will be enrolled in programs. 5.400 students will be in under graduate programs, 2.200 students will be in graduate programs and 800 students will be in interdisciplinary programs. İzmir Institute of Technology will have 972 academic staff and 1146 administrative personnel. Then the population of İzmir Institute of Technology will be approximately 14.000.

7.9 Planning and Construction Period

The first project of İzmir Institute of Technology was planned by Italian Architect Prof. Luigi Pisciotti as a compact plan type in the same environment. But administration of İzmir Institute of Technology required wide-spread plan type for the site. The second design is prepared as wide-spread plan type by Luigi Pisciotti and his equip. This plans had approved and the preparation of the application projects were drawn in Turkey. The constructions of the Faculties started according to these application projects and is continuing.

The construction fields installed in four different places of the site as the Faculty of Architecture, the Faculty of Science, the Faculty of Electrical Engineering, the Rectorate Building constructions. These are about ten buildings

now. Two of Electrical engineering buildings finished completely. Now, finishing workings of the other buildings are continuing.

7.10 Image

The definition of İzmir Institute of Technology is to be basically research University in Türkiye. The architectural elements such as style, aesthetically values, landmarks, materials, landscape are unified to create the image of İzmir Institute of Technology campus. Image of this campus is appeared with symbolism. History is not a criterion for the image of a new campus. The purpose, mission, size, location, environs of İzmir Institute of Technology are helped to occurrence an image in campus design.

7.11 Style

The style, the powerful conceptual criterion of İzmir Institute of Technology is "Rationalism or Neo-Rationalism" as the tendency of Italian architects Luigi Pisciotti and Uberto Siola.

Rationalism is a powerful doctrine in philosophy since antiquity. It defends that the universality and the necessity can not be the products of experience. The necessity is the base quality in logos of the real information. This information doesn't occur from experience but from the mind. The information occurs from the concepts in mind (intelligence) that appears in birth of a man and from the present concepts in mind. It accepts the influence of experience to gain speed in appearance of the concept. But the absolute universality and the absolute necessity are in evaluation of mind as *'a priori'* or the *'a priori forms'* concepts that occur separately from experience. Rationalism is opposite to Empiricism that defends the

sensitive experience as the source of information. The theory of 'the ideas from the birth' of Descartes defends the base principles of rationalism. Rationalism is a doctrine which has some limitation. Most important limitation is the deny of universality and necessity of the real information is related to experience. In the history of Architecture, in many periods, in many countries, some followers of rationalism is observed who are the followers of rationalism in history are; Choisy, Violet-Le-Duc, A-Baudot, Arata Isozaki, Perret (classical rationalist), Mies. (FROLOV, 1991)

> *Bernard Russel (1872-1970) also, puts the Rationalism and Empiricism side by side. Russel accepts a priori system as Rationalism and finds resembles between a pyramid sets on the top of its hill and Rationalism, between a pyramid sets on its bottom and Empiricism. When a false exists on the priori (Rationalism) system, the pyramid will fall down. But in Empiricism, the pyramid consists of by some flats depending on the experience and observation, if some parts are removed it will conserve its state.* (KORTAN, 1996, pp.54)

Italian Tandenza is Neo-Rationalism, most important architects are Giorgio GRASSI and Aldo ROSSI. They said "from follows function". (FRAMPTON, 1980, pp.290). It is a scientific development and a structure as basis of Architecture. Rationalism has some main ideas as structuralist based on certain rational ideas. These are; geometry (straight lines), simplicity, clarity. They resume object to types. It is a mass production. They accept machine as a rational object.

A definite reason or difference did not exist to pass from Rational Architecture to Neo-Rational Architecture. The main starting point of the mind with rational forms was explained as follows:

> *Marc-Antoine Laugier described (in 1713-1769); The rustic hut which I have just described is the model on which the magnificent achievements of*

> *architecture have been imagined... The pieces of wood set upright gave us the idea of columns. The horizontal pieces surmounting them gave us the idea of entablatures. Lastly, the sloping pieces forming the roof gave us the idea of pediments: this is what all the Masters of the Art have recognized...* (AAM., 1978, pp. 17).

In Egypt, Grec, Rome, Renaissance, Neo Classicism and in Modern Architecture rational forms always exist and are used. Le Corbusier, Louis Kahn and Mies also used the simple geometric forms and had tendency to rationalism. Rationalist architects decide at the beginning to their design and functions adjust to it. They are formalist, deductive, and functionalist. Neo-Rationalism is different from Rationalism as to return to historicism and to connect to tradition. It is a rebellion to Modernism's break out from tradition and history. They don't refuse the Modernism but they possess history and tradition again.

The main forms used by Neo-Rationalist Architects are the main forms such as cubes, prisms, cylinders, pyramids, cones. Then form language based on the main rational geometric forms and the typologies appeared for use in architecture, urban design and industrial design.

Neo-Rationalist ideas of Italian Architects Luigi Pisciotti and Uberto Siola are observed in their campus design of İzmir Institute of Technology. As neo-rationalist architects, they used the basic simple geometric forms, especially the rectangular prisms. A repetition of forms is seen in columns and windows proportions where as the monotonous occurs. The scale of the building is big and monumental. Symmetrical order is observed in plan schemes and in façades of buildings. Similarity between units and cluster occurs. A return to historical elements and traditional materials and forms exist in design of İzmir Institute of Technology campus.

Project for the new University of Cagliari in Sardinia, designed by Luigi Pisciotti, Uberto Siola with D. Rabitti is also an example for Neo-Rationalist style. "In this project the university is being conceived not as a city in its own right. The morphological and typological elements are the elements which constitute the city, the street, the square, the block..." (AAM,1978, pp.179) (Fig. 7.7, pp.128)

LUIGI PISCIOTTI, UBERTO SIOLA (avec D. RABITTI) 1972

Projet pour la nouvelle Université de Cagliari, Sardaigne
Project for the new University of Cagliari, Sardinia

ıns ce projet, l'Université est conçue comme une ville de son ɔpre droit, les éléments morphologiques et typologiques i la constituent sont les éléments qui construisent la ville ıme, la rue, la place, le bloc...

In this project the university is being conceived not as a wide spread campus but as a city in its own right. The morphological and typological elements are the elements which constitute the city, the street, the square, the block...

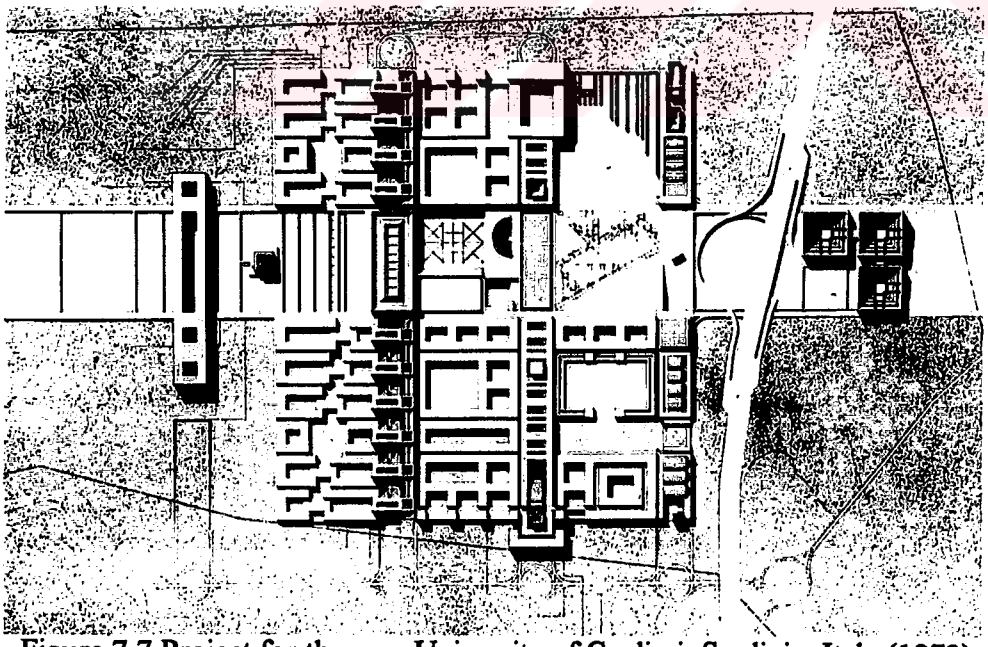


Figure 7.7 Project for the new University of Cagliari, Sardinia, Italy (1972)

Another campus project from Luigi Pisciotti, Uberto Siola

İzmir Institute of Technology. The materials can not recognizable from the first design project of Italian architects. Building material of İzmir Institute of Technology may be recognized as institutional emblems in time.

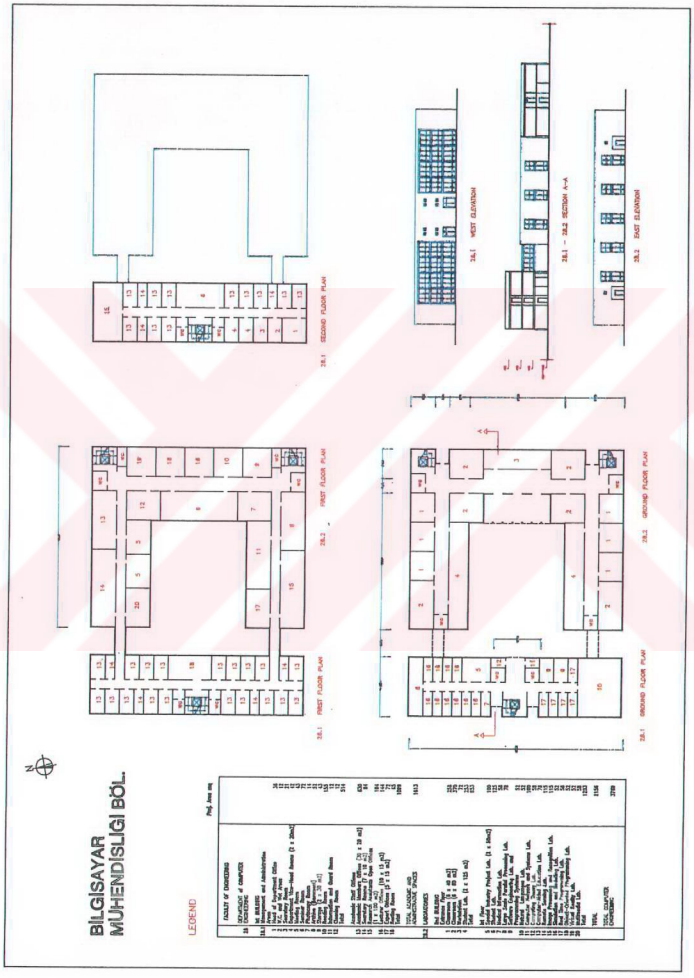


Figure 7.8 İzmir Institute of Technology, Faculty of Engineering

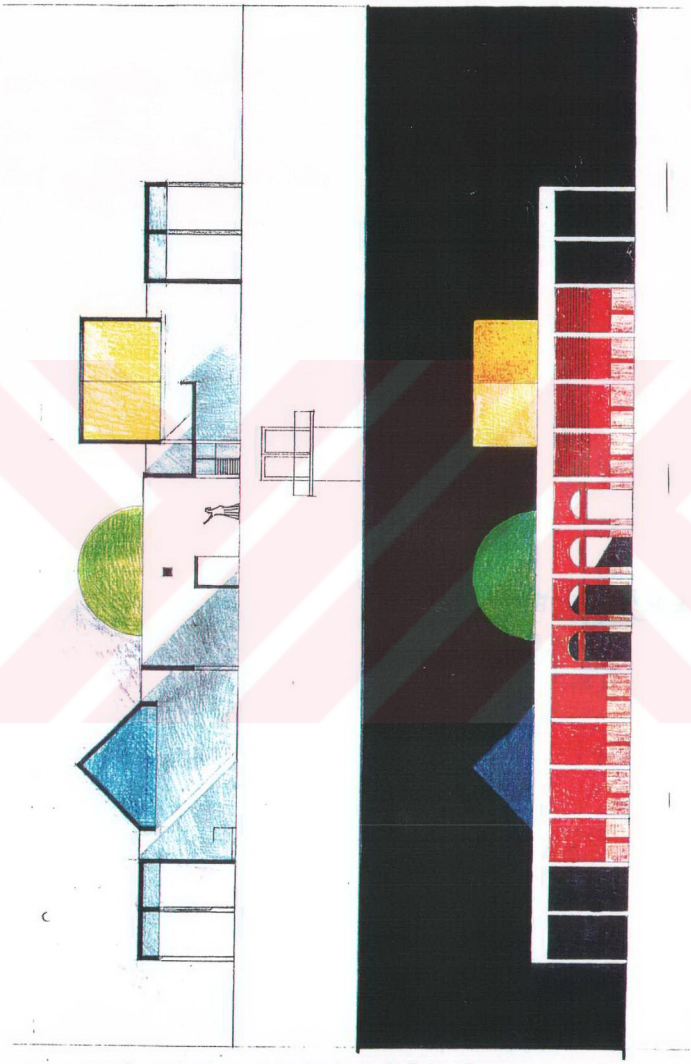


Figure 7.9 İzmir Institute of Technology, Religion Center

7.12 Aesthetical Values

İzmir Institute of Technology depends on the following criteria of the architectural aesthetical values;

As the composition of this campus, some clusters are repeated to unify the separate parts and to make a whole. Human psychology is neglected and man comes into a monotonous order.

A rectangular and a square type of plan are remarkable as far as proportion is concerned. A partition of this proportion in campus plan and in facade exists. This repetition causes the monotony.

White painted walls are used in color and in some buildings "brut-beton" (concrete) used as prefabricated concrete elements. Tile is another traditional material in this campus design as respecting traditional elements, but it was not applied because of its cost. A return to historical elements and traditional materials exist in design of İzmir Institute of Technology.

The scale of the buildings are big and monumental. It is not suitable to the human scale. Human becomes depressed because of this monumentality and size. The repetition of some cluster in plan type is constitute the pattern. The repetitive elements in the structural systems are also the inherent patterns. The main ideas in patterns are; geometry (straight lines) simplicity, clarity. The architects reduce object to types which causes a mass production.

7.13 Landmarks

The landmark objects of İzmir Institute of Technology are open place elements, buildings and some natural resources. These landmarks celebrate and symbolize the places. The **big water element** in the main axes of academic building site is a

good landmark element. **The religion center** at the top level of the site, as a panoramic place will be a landmark element if it realizes. **Open Amphitheater** is a good landmark element at its sloping site. **Open squares** and **campus entrance** are also the landmark of the İzmir Institute of Technology.

7.14 Materials

The basic materials of İzmir Institute of Technology campus are concrete, glass, painted and plastered brick walls. Materials as determinations of architectural pattern serve to campus design. The selection of exterior materials depend on the architect who draw the application plans for buildings and the preference of administration of İzmir Institute of Technology. The materials can not recognizable from the first design project of Italian architects. Building material of İzmir Institute of Technology may be recognized as institutional emblems in time.

7.15 Landscapes

İzmir Institute of Technology campus has a suitable landscape design planned by Italian architects of campus. In this design, landscape serve as an aesthetic factor. Landscape elements are used such as sculpture. The elements has symbolic articulation. Landscape serve as functional landscape elements as dense planting as noise barrier. Near the building the curtain walls exist to protect the building from water and some slopes and embankments used as erosion control. The trees of the site were not established at the beginning of design period, therefore in the site, some trees are lost. The climate is warm here in Izmir, the buildings arranged wide-spread around in the site with harmony with climate.

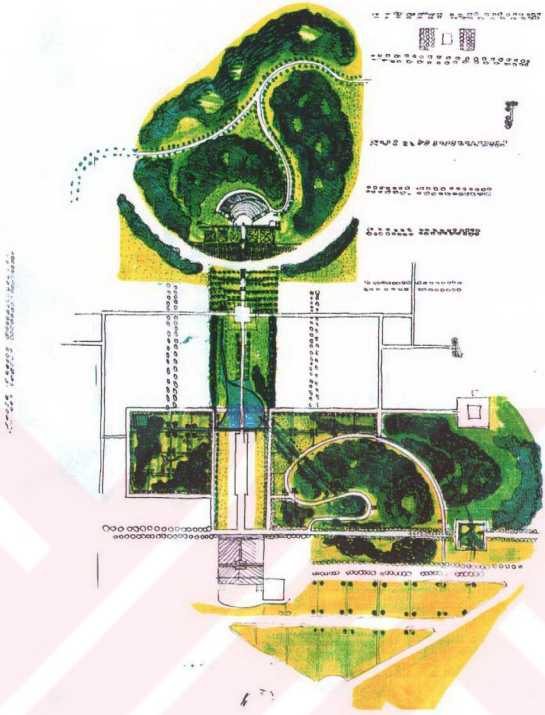


Figure 7.9 İzmir Institute of Technology, Landscape Drawing from Cultural Center

7.16 Proposal for İzmir Institute of Technology Site Plan

A Type Proposal

These are the ideas for A type proposal for İzmir Institute of Technology. This proposal is developed for current campus site plan application. The vehicular roads and building places is not changed but building forms are changed and path designs are developed.

Administrative Units:

In the site plan of İzmir Institute of Technology, the administrative departments were placed separately from faculty buildings. This new arrangement enables a close relationship between administrative buildings and faculties.

Relationship among Social, Cultural Centers and Academic Buildings:

In the site plan of İzmir Institute of Technology, the square arrangements are so bigger comparing to requirements and these squares separate the administrative buildings from the faculty buildings. This new design decrease the size of the main square and it is situated at the center among the engineering, architectural, science faculties and administrative buildings. And the relationship among the square and the pool and the hill which has a panoramic seaside view is strengthened.

Social and Cultural Buildings are Gathered as a Union and Placed at the Center of Academic Area:

In the first site plan of İzmir Institute of Technology, library building was so big that with its long mass it is not suitable for human scale and environment. Library, cafeteria and student union center are redesigned in the same axial system. Librarys' form is changed to a suitable size.

All the faculty buildings' nearness to cafeteria units and the café units places:

In the site plan, cafeteria is placed at the center of academic buildings and little cafeterias are designed suitable to serve faculties.

Buildings sizes are evaluated according to daylight, wind direction, human scale, natural environment silhouette:

In Italian design, buildings sizes, are so bigger for human scale and daylight, wind direction are neglected. This new proposal is designed according to decrease

the buildings forms to suitable size with human scale. Daylight, wind direction and human scale are evaluated sensitively.

Open spaces among Buildings Designed Sensitively As Considering The Path Design Details:

Avant project for the site plan of İzmir Institute of Technology by Italian Architect was not designed as evidently for the pedestrian roads and path designs. In this proposal the path designs and open spaces are arranged.

B Type Proposal

İzmir Institute of Technology B type proposal is developed for a new idea on site plan of academic buildings. This site plan preserves the outer loop as vehicular circulation of academic area. But the spine (vehicular) circulation inside the academic area is accepted unnecessary and as a dividing element for academic area, therefore these roads are changed as "cul de sac"s for parking facilities.

Building forms and locations are designed as looking to the south. Building locations are solved as clusters which have views looking to the sea and scenic view. Administration buildings were scattered buildings near the entrance. Pedestrian and vehicular access to administration buildings were unsolved. Access to administration buildings redesigned according to topography and car access facility.

Building forms are designed to break the monotony in buildings shapes. Forms are repeated to create environmental difference and an aesthetical composition. Buildings are located as to provide maximum sun light.

Parking facilities are increased as much as site becomes enable. In the site plan a cultural axes which composed of cafeteria, library, student cultural center, bank

office and post-office, is created for social activities. This center is placed at the center of the academic area, in the north to south direction. On the each side of this cultural axes, on the west or east part, a pedestrian way occurred.

Pedestrian road which links Faculty of Architecture and Faculty of Science to the cultural axes, is designed as considering sloping area of the site and visual characteristics of the environment. Buildings of Faculty of Engineering are also placed as looking to the south and not to shade to each other. In this area also parking facilities are increased.

The Entrance:

The entrance of the campus is at the vehicle road. There is an entrance door which has a specially controlled space in front, covered from three sides and top. The administration buildings are on the south of the entrance space. Following the administration buildings, the first buildings on the north are academic cultural center and on the south Department of Foreign Languages. Some axes to the main pedestrian road are provided. The plazas in the back of the administration buildings lie low with broad stairs around and it is rimmed by sitting walls. These plazas have stepped extensions like a terrace which has corners to sit on. Cafeteria is on the periphery of the plaza with self service arrangement. The small cafeteria will be a joyful place for all students with its characteristic milieu.

The Service Street

There is a service street at the back of the cafeteria. The service street includes car parking facilities. At the end of the service street, a vehicle road axed to the main vehicle road. The cafeteria kitchen gets the service from this service road.

The Academic Buildings

The faculties are organized as clusters. Concerning the site, the share for each group is not the same because of their different functions.

CONCLUSIONS

University Campus Planning as a creation of a physical structure, is not independent from the contemporary urban design. In our cities, most important negative factors which affect human life are; congestion, noise, vehicular traffic and lack of natural environment. As one can say that campus design also is, like a small town, a place for all the human requirements so that all the negative factors which affect cities should be prevented.

High density in an urban settlement is a negative factor, it affects the human being and separates him from natural environment. A university campus planning should be in balance with solids and voids. This balance will result best in site planning's of campus and in human psychology. At this point, while location decisions and site plan studies of any campus beginning to be discussed, landuse should be examined. Size of campus site, site topography, micro-climate and topography are considered as main factors to pay attention. These should be examined according to get more profit from nature. The natural and climatic data are important in the university campus design. In the hot climatic conditions, buildings are scattered throughout a vast area horizontally and more benefit may be obtained from nature. But in cold and severe climatic conditions, compact and upright designs should be considered, but high structures separate human from nature and create a negative factor psychologically. "The ratio of gross building area to land area in the classroom portion for a campus should be approximately 1 to 1."(MIDDLEBROOK, 1958) The buildings should be generally 2 to 4 usable floors.

Vehicular traffic is also a negative factor in campus design, but it is also necessary. The pedestrian and vehicular traffic in any campus planning should be absolutely separated from each other. Even existence of vehicular traffic should not be perceived from campus. Vehicular traffic axis may be designed in an elliptical or circular loop around the academic area. Vehicular roads must be surrounded with trees to prevent noise and dust. Pedestrian may walk throughout the campus area without crossing any vehicular axis. This separation may permit a suitable, rapid pedestrian circulation as well as strengthen social relations between people and interrelation among disciplines. Vehicular roads may have access to the buildings by 'cul de sac' for parking use. The vehicular roads must be connected only with these 'cul de sac'.

Three types of circulation needs solutions are the general types. The circulation solution of centralized or decentralized campus can solve by the outer loop, the inner loop or the spine solutions. Outer loop solution can preserve the campus as a pedestrian world then create a privacy, a suitable place to work. Campus planning must be designed also for the separation of urban and campus vehicular traffic, for the separation of pedestrian traffic from vehicular traffic, for inter-campus and intra-campus movement and for pedestrian traffic needs.(CAUDILL, 1959)

Noise ensuing from vehicular roads, may be reduced by proper landscaping, and this landscaping may also help to eliminate the effects of noise, dust, traffic and other negative elements. Therefore, landscape can serve as a functional factor to abate noise, control dust, divert traffic, secure boundaries and afford privacy.

A main pedestrian road should be designed to connect buildings and spaces especially among the academic facilities. Paths should be designed in a hierarchy

of volume and use. Main pedestrian road should be a focal axis for campus social life and an instrument to strengthen the social relations and interrelations among different disciplines. This main pedestrian road, in other words, alley, provides an opportunity to arrange open spaces for different social, cultural and scientific activities.

Functional grouping and zoning on a campus, is important and necessary for the location of different areas. By zoning, campus facility components should be arranged according to interrelations among various facilities. Academic facilities should be organized in close and easy access for social facilities (such as cafeteria, library, auditorium, cultural center, administration building, etc...), sport facilities and to service areas. Residential buildings should be designed close to sport areas and to the service areas, such as health and food service and shopping areas. On some campus planning schemes, dormitories are designed in close relations with the academic staff housing, and others, they are located far and separated from it. It is not so important to design these two facilities together or close relation with each other, but it enables us to use some facilities together such as shopping centers, pastry-shop, etc... But to separate social life of young and his recreation activities from academic staff housing, these two facilities may design in different places but this last decision will increase the costs of services, infrastructure etc... Health facilities also should be designed close contact with residence facilities and academic facilities.

Food service needs of campus is calculated as 30 per cent of the student body. A space should be used two and one half times in a cafeteria. Housing facilities density must be approximately 2 students per 40 m2. Land area requests for married students or academic staff housing must be a housing density of 1 family per 330 m2. (MIDDLEBROOK, 1958)

The educational and research facilities should be designed sufficiently for these activities. These places should be isolated from noise. It should be arranged for private or group studies and be, provided with good lighting. "The optimal space use factor for the research facilities is chosen to be between 2.3 m^2 and 1.5 m^2 for a person. During the morning hours when a university librarys' load was heaviest 0.9 m^2 of reading room space for each student is the optimal space use factor."(MIDDLEBROOK, 1958) Caudill said in his book that their studies have been based on an estimated need for 202.350 m^2 of outdoor land for physical education teaching purposes in a University.

Middlebrook said in his book(1958) that the ratio of campus population to parking spaces is 2.2 to 1. Caudill said in his book(1959) that the ratio of registered cars on campus to the number of persons eligible to have registered cars is 1: 3.8. In Turkey, in Bilkent University, parking is being provided at a ratio of 5.7 to 1. The ratio of registered cars on campus to the number of persons, might increase or decrease in the future. The master plan must be designed to include high density parking facility because of the impossibility of relying on surface parking alone to solve the future parking needs.

Human needs change in time, even science and nature of human depend on these changes. The environment on a campus should be designed as a living environment because man can sense, perceive, behave and show variations in front of the environmental acts. The environment which can bring the actual necessities to human life is the living environment. But man's control over his campus environment is not limited, man's environment can be reshaped, altered and modified to changing human needs.

University's visual criteria are also important to identify the place of institution in society and to signify the quality of education. A space which conveys a happiness to man as visual quality, becomes an attractive place. All the

students and the academic staff will desire to come to such an attractive campus and will stay and work there longer.

All the visual elements, the styles which used on campuses; the materials, landscape and other elements used on the campus environment have certain meaning. Materials are determinants of architectural pattern for the campus planning. Campus design styles may generate a symbolic or historical image. Here, the most important things are to interpret, explain and to express a style, landmarks, materials, aesthetical values (pattern, scale, color, proportion, composition) and landscape with strong designs.

University's planning scheme depends on the site conditions, city location and architects' choice whose choice is related with the university's identity and mission in the society. Architect tendency to aesthetical values also can not be denied. Only one approach for campus design is not suitable and creates some difficulties for campus life. This system is the non-linear and decentralized plan with scattered buildings throughout the green areas. The separation of vehicular and pedestrian roads is not achieved in this approach. A unity in campus design can not be accomplished. This type of campus planning is little better compared with the city university. The other plan types, as linear and molecular systems unify the campus as a whole and interrelation among different disciplines are strengthened. Molecular organization plan type is limited in flexibility.

Grouping organization in campus planning is another important approach. A campus may be designed like horizontal grouping or vertical grouping. Horizontal grouping should be preferable because of its close relation between human and nature. Vertical grouping is a solution when the site is not enough, but it seems that this is not suitable for human psychology.

. The negative and positive features of a scattered campus plan are as follows:

The negative features are;

. When campus is scattered throughout a vast area, natural environment becomes an artificial one and agricultural fields are destroyed.

. Scattered plan type for a campus planning causes to break the interruption of interrelation among different disciplines and prevents the provision of suitable and sufficient facilities for contemporary education.

. When zoning is considered in a campus planning, a handicap is occurred by the existing empty space during day or night because the using time of some facilities.

. In a scattered campus plan, when the weather conditions are not suitable a difficulty occurs in walking outside. This type of planning has risks in providing social unity.

The positive features of a scattered plan type are as follows;

. Being in direct relation with nature makes all the people happy.

. Students may quit the educational area where hard studies take place, for to go another place at night in which their dormitories exist. This change in place gives the students a possibility to rest in a different environment. Dormitories as different places from the academic center create a recreation and rest serving space to life style of young.

. In case of the night education, the students who live in dormitories will not be disturbed by negative conditions. In other words, different facilities will not disturb another area.

. If dormitories organized in the same area, the students from different faculties will be all together and in social relations the negative effects of some groups will be prevented.

. When the buildings are separate and independent from each other, the construction has possibility to continue in some process and in some periods. It

is important especially, in developing countries where the economical situation is limited.

From the determination of some campus design criteria, zoning criteria such as to be scattered throughout a vast area became to change as compact designs.

Size of the campus area, its population, development, elasticity, extension, transportation from city, site selection, investment possibilities, design period are important factors for a campus planning.

Site selection is important because the life style of the nearby should be in accordance with the social life of students and academic staff. If the campus site is far from city, campus must be prepared suitable for social and cultural activities and transportation between campus and city must be solved to prevent isolation from city life.

Investment possibilities and design period are important factors for future and today's conditions of a campus. Investment possibilities must be considered at the beginning. Design period and preparing knowledge for design should not be limited for create best solutions on campus designs considering the site and its requirements.

The area of a campus should be in a circle which its diameter is about 800 m and permit to walk from one end to the other optimum in 12 minutes, maximum in 15 minutes. The population of a campus should be 5.000 people to 20.000 because the area and walking time of campus may be suitable with this population.

Extension of a campus must be predicted at the beginning of design period because the development and elasticity for a campus are important factors to

consider. All the campus may need some extensions in future, as a result of knowledge, science, human nature and social life.

Ideas on İzmir Institute of Technology Campus

As a result when İzmir Institute of Technology campus design is looked over, it is obvious that its design is a wide-spread plan type. Campus site is far from city. Investment possibilities are limited. Design period and the construction are continuing at the same time. The area of campus is bigger than the standard circle for a campus. The population will be approxiametely 14.000 people. Campus area and the site plan enable for future extension. Noise will not be a disturbing factor because of its wide-spread campus design for İzmir Institute of Technology.

İzmir Institute of Technology site is 40 km far from city center. While site selection period, the accordance of nearby life style with social life of academic staff and students is not considered cause by economical factors. The campus has a great scenic beauty, with a view of the sea along the entire eastern side but the nearby life style is not suitable for the needs of young people and the academic staff. This campus must be constructed completely to settle down. The social and cultural activities and also transportation between campus and city must be solved to prevent isolation from city life. Gülbahçe village center is 25 minutes far by walking time to the academic center of İzmir Institute of Technology. Gülbahçe village life style is now different from city life.

Some requirements of site and disciplines are considered in application projects. But application projects should be prepared completely before the construction start. In this campus application, some requirement decisions change in construction because the design period was not sufficient.

The area of this campus is a circle which its diameter is about 1.250 m. This cause minimum 24 minutes walking time from one end of campus to the other. It is bigger than the standard of 800 m diameter and 12-15 minutes for walking period. This will create a handicap in interrelation among disciplines and difficulty to reach library, auditorium, cafeteria etc...

Estimation on population of campus is suitable for a standard campus. This will not create any problem but all the facilities must be organized before settlement. Change in human needs will not cause a problem because campus area is large enough for extension of buildings.

Italian Architects designed an outside traffic loop for vehicular circulation which continues around academic buildings. But during the application the administration of İzmir Institute of Technology required two new vehicular roads which divide the site. This division will not be suitable for campus life, interrelation among disciplines and continuation of pedestrian circulation.

İzmir Institute of Technology campus design is a wide-spread plan type. This factor is strengthened human and nature relationship. But when the weather conditions are not suitable, to go from one building to another will be difficult. Because laboratories and classrooms are designed in different buildings for a single faculty. Site conditions have also difficulties because it has a sloping area, strong wind from north to south.

Zoning functions are applied with success. Housing units is far away from the dormitories and academic areas, in a place where a scenic sea view exists. This solution may create a calm place for academic staff, but costs increase in construction and in infrastructure. Research units installed at the north part of campus area near to Barbaros area, and a calm place occurred for studies. Sport

facilities and navigation sports area take place near dormitories, this is a suitable solution.

Main problem of this campus will be pedestrian circulation difficulties. Because site of the campus has a sloping topography and the distance between faculties are far enough. Path design is not according to topography. The buildings are not suitable to sloping site. On the construction period, some buildings needed basement floor for suitable application in site. The old Çeşme road and Karaburun road cross the site. Some layers for traffic circulation must be organize to make a solution for these crossing.

Functional arrangements and circulation networks are designed successfully. Circulation networks of İzmir Institute of Technology are suitable for infrastructure system but the large campus area and topography conditions create handicap for central heating system. Self heating system began to apply in order to central heating system. The purifying pools system is essential for each campus like İzmir Institute of Technology. Purified dirty water will use in irrigation of plantings, it is a positive application example for other campus areas.

Building locations should be according to climate, wind, topography, seaside view. But building locations in İzmir Institute of Technology campus are not according to these factors. The rationalist ideas organized the building locations in a wide-spread campus plan, in a geometric linear order, not considering topography conditions or seaside view as well as wide-spread planning creates best climatic area.

As visual criteria are considered, İzmir Institute of Technology campus is an example of Neo-Rationalism. In this tendency, the campus planned as a town. It is a wide spread campus plan. Geometric lines occur in buildings' plan and in the

façades. Traditional and historical elements effect the design as basic factors. It is a rigid architecture, human factor in some cases neglected.

Visual components occur as landmarks, style, materials and landscape. We can say that a big water element in the main axes of academic building site is a good landmark if it will be realized. The religion center at the top level of the site, as a panoramic place will be a landmark. Open Amphitheater is a good visual element as a landmark at its sloping site.

As material, architect chose the traditional elements such as; tile, stone, etc... Materials serve as a metaphor of institutional presence as traditional and international.

Landscape was designed near the sport facilities and housing area but the site of academic center and dormitories seemed to need to be landscaped. And also there exist so much place in the periphery of site for landscape. The boundaries, gateways, ceremonial open space, gardens and arboretums, fountains, lighting, plantings, signs are designed. The detailed planning of this area should be handled for landscaping.

Open spaces of İzmir Institute of Technology are sufficient. Two big plazas and a water element near administrative and cultural center are well planned. Landscape elements will strengthen the beauty of these places. Each faculty cluster has an inner courtyard and some small squares for passive or active recreation and gathering.

Image for İzmir Institute of Technology is to be basically research University in Türkiye. Image of this campus should be appeared with symbolism but the architectural style of the campus has influences from traditional and historical

elements. But one can consider this as a symbolic tendency because this is a new campus.

Consequently we indicated and examined most important criteria for University campus planning, also compared İzmir Institute of Technology campus design with the main criteria of university campus planning. The elements to pay attention to the subject in design process with the guidance of main criteria of campus design are defined.

Finally the elements to pay attention while creating more quantified university campus planning are defined and determined. The evaluation of İzmir Institute of Technology and searching some campus design examples from all over the world enable to determine campus design main criteria and to define some ideas to propose for new university campus planning. We expect and wish that these determinations of criteria for campus design will be useful for our colleagues for design new university campus planning.

APPENDICES

MIDDLE EAST TECHNICAL UNIVERSITY (ODTÜ), Ankara, 1961

Altuğ & Behruz Çinici

Area

METU Campus is located on the Ankara-Eskişehir highway and has been forested entirely through the efforts of the University employees and students since the early 1960s'. The University includes lake Eymir. With 42.000.000 square meters, METU is the largest campus in Turkey.

Area: 42.000.000 m2

Construction area: 800.000 m2

Distance from city center: 5 km.

Student population: 20.000

METU Faculty of Architecture

Area: 12.675 m2

Cost/ m2 : 846 TL. (9 TL= 1 USD)

Cost/ m3 : 173 TL

Starting date of construction : April 1962

Date of completion : September 1963

METU Faculty of Administrative Sciences

Area : 4.820 m2

Cost/m2 : 806 TL

Cost/m3 : 224 TL

Starting date of construction : June 1966

Date of completion : February 1967

METU Central Library

Area : 6.700 m2

Cost/m2 : 787 TL

Cost/m3 : 218 TL

Starting date of construction : January 1966

Date of completion : June 1967

METU Administration Building

Area : 5.740 m2

Cost/m2 : 719 TL

Cost/m3 : 211 TL

Starting date of construction : September 1966

Date of completion : April 1968

METU Faculty of Arts and Sciences- Auditoriums

Area : 2.200 m2

Cost/m2 : 1157 TL.

Cost/m3 : 263 TL.

Starting date of construction : May 1966

Date of completion : July 1967

METU Cafeteria

Area : 5.242 m2

Cost/m2 : 1074 TL.

Cost/m3 : 240 TL.

Starting date of construction : June 1962

Date of completion : September 1965

METU Faculty Housing

Area : 2.466 m2 (18 adet)

Cost/m2 : 887 TL.

Starting date of construction : July 1968

Date of completion : September 1969

METU Gymnasium

Area : 2.478 m2

Cost/m2 : 1402 TL.

Cost/m3 : 165 TL.

Starting date of construction : August 1966

Date of completion : June 1967

METU Faculty of Engineering- Metallurgy Department

Area : 4.470 m2

Cost/m2 : 735 TL.

Starting date of construction : October 1967

Date of completion : November 1968

Construction, Students' Population

Construction began on the new campus area in 1962. In a year and a half all the basic facilities of the University were completed. The building programs, originally planned to meet the needs of 12 000 students, have continued to progress rapidly. Classes were opened on the new campus in October, 1963. METU's campus, equipped with the most advanced scientific and technical facilities, now serves almost 20 000 students from all parts of the world. METU has 2.000 academic staff. 5.500 students live in dormitories.

Library

The METU Library is located in a central building to support research and education activities, and occupies a total floor space of 12.058 square meters. There are 8 reading halls, 5 demonstration rooms and one display hall. Library has 1310 reader places. The library contains 275.310 books and 119.900 bound periodicals, 1.645 currently received periodicals. Library has, besides the usual library services, an Audio Visual (AV) Center for video and film shows.

Dormitories

There are 11 modern dormitories on the METU Campus, of which four are for female students. The accomodation capacity of all the dormitories is 4962 beds: 1960 for female students and 3002 male students.

Food Service

There is one large central cafeteria on the Campus which offers table d'hote lunch and dinner. Also, there are sufficient number of canteens in the departments and dormitories. Breakfast and snack needs are conveniently met by these canteens.

Museum

METU is probably the only university in the world which has an archaeological museum housing material discovered on its own grounds. The Yalıncak excavation site, which lies about 4 kilometers south of the dormitory buildings, was dug by archaeologists, the years 1962, and 1966.The finds from the Late Phrygian, the Hellenistic, Galatian, Roman, Byzantine and İslamic periods point to a continual inhabitation in this area since the 6 th century B.C.

Sports Areas

One Grassy-fielded football stadium with a seating capacity of 10 000.

(Information above is obtained from Internet and Behruz Çinici Works Book., 1966)

DOKUZ EYLÜL University, Kaynaklar Campus

Population.....25.000
Academic Staff.....1.841
Area : 450 Hectar

Faculty of Science and Literature.....55.000 m2
Faculty of Architecture.....14.000 m2
Faculty of Engineering (1).....20.500 m2
Faculty of Environmental Engineering.....8.000 m2
Faculty of Civil Engineering.....8.000 m2
Faculty of Electric and Electronic Engineering.....6.000 m2
Faculty of Industrial Engineering.....4.000 m2
Faculty of Jeophysics Engineering.....3.000 m2
Faculty of Geology Engineering.....5.000 m2

Central Library 12.000 m2
Workshops and Central Printing..... 4.000 m2
Central Cafeteria..... 9.230 m2

Faculty of Management.....23.000 m2
Proffession College.....20.000 m2
Dormitories.....4.000 m2
Gymnasium.....3.000 m2
Administrative Cafeteria.....16.100 m2
Medico.....30.000 m2

(Information above is obtained from Technical Office of DEÜ.)

EGE University, Bornova Campus

Campus Population.....30.632
Academic Staff 1.841
Area : 450 Hectar

Faculty of Economy and Administration.....776 m2
Tecnoparc Building.....1.505 m2
Faculty of Medicine and Hospital 30.809 m2
Hospital for Children.....38.500 m2
Nurses Housing.....3.758 m2
Hotel Ege Health..... 5.500 m2
High School for Nurses.....4.762 m2
Nursery.....192 m2
Tennis Court Cafee.....256 m2
Cafeteria.....2.177 m2
Cafee Teos.....1.000 m2
Sports Medicine.....950 m2
Çeşme Profession College.....2.500 m2
Çeşme University College Canteen.....120 m2
Computer Center (in construction)..... 5.455 m2

Sarı Kiosk Club.....360 m2
Ödemiş University College..... 308 m2
Yeşil Kiosk Club.....440 m2

Amphitheatre.....760 m2
Gymnasium..... 900 m2

Cafeteria of School of Music.....470 m2
School of Classical Turkish Musics 2.006 m2
Printing Press.....2.038 m2
Turkish Learning Center(TÖMER in construction)..... 6.052 m2
Gas Station.....342 m2
Faculty of Agriculture.....49.357 m2
Cafeteria of Faculty of Literature.....470 m2
Ceremonial Center 4.640 m2
Faculty of Pharmarcy.....7.774 m2
Faculty of Literature.....13.620 m2
Faculty of Water Resources 1.184 m2
Faculty of Communication.....4.497 m2
Faculty of Dental Medicine..... 23.135 m2
Central Library (in construction).....8.900 m2
Foreign Language College..... 4.236 m2
Close Gymnasium.....4.071 m2
Sports Fields (Soccers, Athletics).....21.000 m2
Additional Classrooms..... 5.326 m2
Cafeteria of Food Engineering.....512 m2
Faculty of Food Engineering.....7.643 m2
Ege Profession College.....18.869 m2
Faculty of Texlile Engineering 19.522 m2
Bus Station and Repair Room 856 m2
Faculty of Chemical Engineering.....10.828 m2
Mini Cafeteria of Soccer Fields.....2.556 m2
Olympic Pool Building.....5.163 m2
Cafeteria 1.....2.177 m2
Sevgi Yolu Bazaar 805 m2
Medico.....7.541 m2
Central (Telephone exchange).....200 m2
Faculty of Art and Science.....53.000 m2

Halle.....311 m2
Housing for Staff 18.990 m2
Bank Office.....180 m2
Academic Staff Club.....518 m2
Library of Administration 720 m2
Institute of Sun Energy 3.622 m2
Institute of Nuclear Science.....2.274 m2
Administration Building 6.927 m2
Cafeteria of Administration.....1.000 m2

(Information above is obtained from Technical Office of Ege University.)

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