A FUTURE PLAN FOR THE UNIVERSITY OF BAGHDAD

by

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Bachelor in Architecture
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Dear Dean Belluschi:

In accordance with the requirement for the Degree of Bachelor in Architecture at the Massachusetts Institute of Technology, I hereby submit the following thesis entitled, "A Future Plan for the University of Baghdad".

Respectfully submitted,

Signature redacted

Denis A. Blackett

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ABSTRACT

Background data on the general environmental conditions, both human and geographical is presented. Basic design principles are developed from this data and from general concepts which underly all university design. Implementation of these principles is discussed briefly and a zoning scheme is proposed. The program for the University is presented and graphic and photgraphic site data is given in the appendix.

I. INTRODUCTION

Iraq has 14 institutions of higher learning, all of which are government operated. These institutions, which include such faculties as Arts and Science, Agriculture, Industrial Engineering and Law, had a total enrollment for the year 1956-1957 of 5,500. At present five separate government ministries control these 14 institutions. The government proposes to organize a single administrative unit, comprised of a majority of these institutions, and to be known as the University of Baghdad. It further proposes to construct, in three stages, a complete physical plant for this new university. The three stages will accomodate 5,000, 8,000 and 12,000 students respectively. A 600 acre plot, lying five miles south of the center of Baghdad, and bounded on two sides by the Tigris River, has been chosen as the site of the university.

II. BACKGROUND MATERIAL

2.1 Introduction

General background information on Iraq, its people, present educational policies, climatic conditions, materials and techniques of construction, and site characteristics are presented here. This information forms the factual basis for the development of design criteria.

2.2 Iraq - The Land and The People

Iraq is primarily Moslem and Arab, 96 per cent Moslem and 86 per cent Arab. Sixty-seven per cent of the total population make their living from the land. Ten per cent are nomads. Ninety per cent of the population is illiterate. Large numbers of these people are diseased and ill-fed. Their future depends, to a large extent, upon development of Iraq's great agricultural potential. This can be done through the careful use of her three major natural resources, the Tigris and the Euphrates Rivers, and the large oil reserves. Development must be based upon use of the oil

revenues for the following major purposes:

1. The construction of an extensive irrigation system using the waters of the two rivers.
2. The education of the people in scientific agricultural methods which will enable them to maintain the irrigation system and use it to its fullest advantage.

(Item 1 has been in operation for the last ten years. Item 2, however, has been neglected, to the detriment of a number of promising irrigation projects.)

Iraq was once the "Fertile Crescent" of the Middle East, containing a well-kept irrigation system and cities fabled for their fountains and gardens. These were destroyed by wars and fell into disrepair many centuries ago. It is the aim of the present Iraqi government to reestablish the ancient fertile abundance and to once again become a veritable earthly paradise to the Arabs of the Middle East.

Under the great caliphs of the 8th and 9th centuries, A.D., Baghdad was a center of learning and culture. This tradition has not been completely forgotten today and education is highly valued among Iraq's middle and upper classes. It is unfortunate, considering the country's need for technically

trained people, that Iraqi society values training in the liberal arts more than training in the engineering or agricultural sciences. According to one Iraqi informant this phenomenon is a result of two things: a traditional Arab preference for literary pursuits which is accompanied by a distaste for manual labor, and a government policy which requires higher grades for entrance into technical institutions that for entrance into liberal arts colleges. Traditional preferences and government policy are subject to change as the need for technically trained people increases, therefore one cannot say whether the present ratio of law to agricultural students, for instance, will be preserved twenty-five years hence.

The same uncertain situation concerning future enrollment applies to the ratio of men to women students. Traditionally, Moslem women like their Christian counterparts were not given any extensive formal education. Since the latter part of the nineteenth century this tradition has steadily been broken down in Iraq. Today it is proposed that one-third of the student body for the new university will be female. The majority of instruction will be coeducational.

How far, and how fast this tradition will continue to disappear and how its disappearance will affect future enrollments cannot be foretold.

2.3 Higher Education in Iraq

All education in Iraq is free. Students are admitted to the colleges on the basis of examinations taken at the end of their secondary education. If they are accepted, their tuition, room and board are paid by the government. At present dormitories for men consist of large barracks, 50 men to a room. These conditions should not be repeated in the new university.

The learning process consists primarily of memorizing facts. Large lecture halls rather than small seminar rooms are the rule. This situation is not desirable and new teaching methods will probably be substituted for the present ones.

The phenomenon of empire building as practiced by college and department heads within universities is something familiar to institutions in all countries. It involves the acquisition of space, teachers and courses all in excess of what may actually be required, thus making for an inefficient use of the human and physical resources available. This situation is aggravated here, since the various colleges

have grown up under the political protection of various government ministries and may therefore be reluctant to relinquish authority to a central administration. This problem could be solved by eliminating separate buildings devoted to a single faculty, like an architecture building or a physics building, and substituting some other type of functional arrangement.

2.4 Climate and Climate Control

The climate of Baghdad is hot and dry. The skies are cloudless and the sun intense. Wide variations in daily and seasonal temperatures exist, but there is little variation in either precipitation or vapor pressure. In August the average daily maximum temperature is 110°, the daily minimum 76°. In January the maximum is 60°, and the minimum 39°. It does not rain during the summer. During the winter precipitation does not exceed 1.5 inches per month. Vapor pressure does not exceed 14 millibars. Areas having vapor pressures below 20 millibars are normally considered dry. The prevailing winds are from north-west to south-east and during the day they are quite hot since they have blown over the Syrian desert. During parts of the summer they remain uncomfortably hot at night. For the remainder of

the year these night winds may be used to advantage as a cooling agent.

Insulation which can store large amounts of heat while transmitting very little, is quite useful in the Baghdad area. Wood, brick and stone, are, in the order given, the best building materials for this purpose. Used in thicknesses of 4 or more inches they can effectively reduce indoor temperatures during the day. During the cooler nights they emit some of their stored hear and thus serve another useful purpose. Due to the low vapor pressures, all cooling devices using the principle of water evaporation are also especially useful. Other important climate control devices, such as mechanical air-conditioning, overhangs and correct sun orientation, are as important here as they are in other warm climates. For purposes of site planning sun orientation is the most important of these and will be considered in some detail later. Because of the high temperature of the ambient air, ventilation control of individual buildings and wind orientation of groups of buildings is also extremely important.

2.5 Building Materials and Techniques

Brick and ceramic tiles have traditionally been the chief materials for the construction of permanent buildings in Iraq. Today, these materials are abundant in the Baghdad area and mechanics skilled in using them are relatively easy to find. Steel and all other metals must be imported. Stone and wood are also imported, although some is brought from the mountains north of Baghdad. Although there are two cement plants in the Baghdad area, the need for cement in the irrigation projects along the two rivers makes this material scarce at times. The few skilled workers in reinforced concrete are also primarily employed in the irrigation projects along the two rivers.

2.6 Site Characteristics

The site has an area of approximately 600 acres, and is situated five miles south of the center of the city of Baghdad. Although the site and all of the land surrounding it, is flat, it does possess three distinctive physical features: the Tigris River, groves of tall palm trees, and a system of large dikes, eight feet high and twenty feet wide. The groves of palm trees are part of the truck farms which now cover the majority of the site and on which are

grown tomatoes, dates and other fruit. The dikes were built some time ago to protect these farms and their fertile, alluvial soil during the flood time of the Tigris. Dams and barrages have since been built on the Tigris above the city, and now there is little danger of flooding.

North of the site, in the middle of the river, is the island on which the city planned to erect a theatre and cultural center. Although this plan has apparently been abandoned, a connection to the island and thence to the opposite shore, would give the site a more direct route to the center of the city.

The site, of course, is part of the alluvial plain of the Tigris. Since no borings have been taken, nothing is known specifically about sub-surface conditions. It is reasonable to assume, however, that the soil is a highly compressible, organic silt, and that bedrock is probably on the order of hundreds of feet below the surface. It is general practice in the area to put buildings over two stories in height on piles. The normal river elevation is 18 feet below that of the land.

Electric power is available at the site from city power lines. A sewerage plant is located across the river and it is hoped

that the university can connect to this plant for sewerage disposal. If not, a plant site must be provided on the university property. City water mains are not presently available and it may be necessary to obtain water from driven wells. The university must provide its own boiler plant for heating and cooling.

III. DESIGN APPROACH

3.1 Introduction

The basic principles underlying the design of the University are discussed here. The implementation of many of these principles is, of course, in the hands of the University administration and subject to existing customs and traditions. Nevertheless the architect must assume certain desiderata and provide the physical plant in which they can be realized.

3.2 Symbolic Significance of The University

The University of Baghdad is not merely another educational institution but a symbol of a nation's and an entire area's hopes for the future. The University's symbolic significance would be enhanced if it reflected, in its physical appearance, the future development of the nation. A heavily landscaped campus, abundant in trees, pools and fountains, and watered by irrigation ditches from the Tigris, would graphically demonstrate the potential fertility of the land. It would help to recreate in the mind of the people the image of Iraq as the fertile crescent of the Middle East. It would establish the University as a source of national pride

and unity.

Due to its significance as one of the Middle East's largest educational plants, the University will receive many Iraqi and foreign visitors. These visitors should have the possibility of experiencing most of the major spaces of the University complex and should be aware of the full symbolic significance of the campus, ranging from the pools and fountains which announce the entrance to the University, to the broad Tigris which forms a final visual termination to most of the major spaces.

The above desiderata imply that:

a. Landscaping is of the utmost importance in the realization of the plan. It should be considered concurrently with all other aspects of the design.
b. Clearly defined sequences of spaces must be provided for the visitor which will allow him to experience the significant areas of the University. Special emphasis should be placed on the approach to the University and the spaces near the river.
c. The design should possess a monumental character befitting the unique position in Iraqi culture which the University holds.

3.3 Diversity in the University Environment

Each member of the University community should be aware of the work of the various departments of which the University is composed. Neither freshman, graduate student nor instructor receives the full benefits of university life if he becomes a departmentalized individual. The design of the physical plant can aid in preventing this departmentalization by creating large instructional buildings containing many departments. Substantial exhibition spaces would be provided where each faculty could, periodically, exhibit examples of current student and staff work unlike the unchanging material which goes unnoticed in the glass cases of M. I. T. These exhibition spaces would serve as visual reliefs to the corridors of the instructional buildings and would bring any interested student or instructor in daily contact with the work of his colleagues.

Student, staff, and faculty should have the opportunity to establish personal relationships with each other during the leisure hours they spend on campus. These contacts are broadening for all concerned and would lead to an establishment of a real educational community rather than an educational factory. Since most leisure time during the day is centered around dining activities, din-

ing facilities will be provided adjacent to both residential and academic areas for use of the entire University community. These dinig or commons areas would contain auxilliary lounges and recreation facilities where faculty, staff and student body could meet with one another.

The University should contain the normal diversified service facilities which attach themselves to educational institutions, such as book shops, restaurants, art supply stores, barber shops etc. The richness of the atmosphere at Harvard and the the comparative dullness at M. I. T. is partly due to the presence of the urbane Harvard Square facilities in one case and of hash house, soda joint facilities in the other. Concession spaces will therefore be provided in the commons areas. These would give the University facilities similar to those found in downtown Baghdad.

Further student-faculty relationships could develop if a plan similar to the tutorial systems of Harvard and Yale were adopted. At present Iraq does not possess sufficient personnel to implement a tutorial system and is probably not particularly disirous to have one. Nevertheless, I believe that this represents a desirable educational ob-

jective for this type of residential university. Therefore the possibility of conversion to this type of system is provided for in the design of the dormitory areas.

3.4 Unity in the University Environment

For various psychological and functional reasons the association of a particular department or particular groups of students with physical areas which are uniquely their own is a desirable feature of university planning.

It is proposed that in the instructional buildings each department have associated with it the following interconnected spaces:

a. classrooms
b. laboratories (research and didactic)
c. small reference and periodical library
d. faculty offices
e. lounge
f. exhibition space

Such an arrangement has obvious functional advantages for the professor and researcher and it provides the student with a psychological focus in the large instructional complex.

The social structure of the student community, and the manner of its architectural implementation can have a significant affect upon the individual student's psychological well-being. At one extreme, the student should be able to withdraw to the privacy of his own thoughts and at the other feel that he is affective in forming the policies of the large student group. It is therefore proposed that the following social units with their respective architectural implementations be adopted:

1 man unit - individual cubicles in living suites

4 man unit - maximum number of men per suite

20 man unit - each grouping of twenty men would have its own lounge space and form the nucleus of student government

200 man unit - maximum number of men in an individual dormitory building or house... house could support intramural teams, clubs, music groups etc.

4000 man unit - consists of twenty houses... supervises intramural activities... may publish newspapers, magazines, organize large scale social activities etc.

3.5 Flexibility

The uncertainty of the nature of future enrollments make flexibility an important factor in the planning of the University. In small scale applications flexibility implies the ability to convert or expand individual spaces to meet new functional requirements. For site planning it means providing sufficient space within each area so that facilities can grow unhindered. In the academic area the instructional space will expand by extension of the existing instructional buildings while the dormitory areas will expand by the addition of new houses. Cultural, athletic and commons areas have similar needs for expansion and flexibility. Finally, the University is planned in such a way that future growth of the city of Baghdad can take place without encroaching upon the University proper, while allowing the University, at the same time, to become an integral and organic part of the enlarged city.

3.6 Climate Control

Orientation is the main site planning problem in relation to climate control. The position of the sun at various times of the day and year, and the direction of the prevailing winds, determine the direction and spacing of

buildings.

East and west are the undesirable sun exposures. Since the summer sun is quite high in the sky at this latitude southern exposures can easily be protected from the rays of the sun by large overhangs.

The academic buildings, which are primarily used during the morning and mid-afternoon should be oriented with their long axis northeast - southwest to protect against the early morning sun in the summer. This places the academic buildings perpendicular to the hot daytime breezes from the northwest. Narrow courts, oriented in the northeast - southwest direction and placed between building wings, will force the air over the roofs of the buildings rather than into the court areas. Trees and fountains aan also act as barriers to and cooling agents of the wind. Such device are especially important for the large public areas.

The dormitory buildings should be oriented with their long axes running northwest - southeast to protect against the late afternoon summer sun. Some compromise in this orientation is necessary since it would be desirable to use the cool night breezes from the northwest during the fall and spring. Courts should be made deep enough to allow the

breezes to penetrate, approximately twice as wide as the height of the buildings enclosing them.

Buildings should be multistory thus reducing the roof area and the total heat load per square foot of floor area enclosed. Tall buildings are also affective in shading open spaces and adjacent buildings. It is therefore proposed that all major campus buildings be 3 or more stories in height, wherever feasible. It should be noted that tall buildings will undoubtedly require expensive piling operations and therefore building heights should probably not exceed five or six stories.

Wherever it is feasible buildings are placed upon stilts. This provides additional shaded outdoor spaces. These outdoor, ground floor areas are enlivened by the presence of courts between the wings of buildings admitting light and containing landscaped areas.

In addition to air conditioning which is planned for all instructional buildings, evaporative cooling devices or capacitance type insulation may be used for climate control of individual buildings. It is presently felt that neither well water nor river water can be sufficiently filtered of dirt to make it usable as a spray for the walls and roofs

of buildings. Therefore buildings should be designed to take care of their heat load without the use of evaporative cooling devices. It is however recommended that evaporative type box coolers be used in dormitory buildings in lieu of air conditioning. These coolers are individual units whose use does not require the spraying of exposed building surfaces.

3.7 Size of Campus

The maximum expanded size of the academic area is limited to the distance which can be liesurely walked in ten minutes. It is assumed that this distance is approximately 1500 feet, and a circle having this diameter defines the desirable extent of the academic area. This area is to be used for instructional purposes only.

The maximum size of the developed campus should be such that walking distances do not exceed 3000 to 4000 feet.

3.8 Structural Considerations

The major structural material will be reinforced concrete although reinforced brick construction may be applicable in some instances. The principle to be followed for all structures is that curvilinear geometry is to be employed for structural forms in order to reduce the total amount

of material used. Construction is to be standardized. Buildings are to be planned along modular systems thus permitting the repetition of the these curvilinear structural forms in sufficient number to produce economies. This implies the use of shells for roof surfaces and possibly floor systems based upon the iso-moment principles of Nervi. Present concrete construction in Iraq is still rather primitive and shells have not been attempted because of the absence of skilled labor to erect them. However, I believe that a project of this size, containing a large number of identical structural forms, will provide an education for the Baghdad construction industry and eventually result in large savings in construction costs.

Brick and concrete block will certainly be used extensively as wall materials. The intense desert sun makes it desirable to use materials with textured surfaces. The intense sun would also provide interesting patterns of light and shadow on the shell roofs which are contemplated.

3.9 Architectural Style

The architectural style of the University must be determined on the basis of functional and environmental considerations, and by the architect's basic feelings about space

and form. In this case, irrespective of the architectural merit of the solution, its general character and atmosphere will be western. I believe that this result is entirely justifiable and that this stylistic approach is the only one which can produce good architecture.

There are many things to be learned from the architecture of the Middle East, however it would be impossible to absorb these age-old traditions quickly. Attempts to copy their outward forms without comprehending their inner significance would only result in poor architecture. Moreover one of the most interesting and challenging experiences of the young Iraqi might be the confrontation in architectural form of a clear and strong statement of the western view of life. We should export our culture as well as our technology.

3.10 Site Utilization and Zoning

The river forms a very important feature in the design of the University. Its visual, recreational, and symbolic characteristics make of it an element which can be used to enrich the life of the entire University community. Residential and recreational areas are placed adjacent to it and several important spaces open out to it.

The existing trees have similar symbolic and functional significance and have been used to form heavily landscaped portions of the academic and commons areas.

The existing system of dike walls is largely ignored in this design. They may be easily removed if necessary and have neither visual nor functional significance now that flood control dams have been built along the river.

The University complex may be thought of as being divided into several functionally distinct zones or areas having the following characteristics.

Academic: This area contains large instructional buildings enclosing large, heavily landscaped, open spaces. It is the heart or core of the University, the area to which all the other areas relate. As such it occupies a central position of the site, somewhat distant from the river among the existing stand of palm trees.

Residential: The residential area lies between the academic area and the river. It is subdivided into 4000 student units. The outdoor spaces are small except for the recreation space centrally located in each unit. Land is provided around each unit for further expansion.

Commons: The commons areas serve as a link between each individual residential unit and the academic core. They consist of the commons dining halls, areas for student - staff - faculty leisure time activities and rental space for concessionaires. Ample open space is provided.

Culture: The culture area contains the theatre and the faculty club and restaurant building. No museums are presently indicated in the program but some in the Baghdad area may wish to relocate here, and certainly museums will develop as part of the normal enrichment of the academic facilities. These buildings would be placed in the culture area.

This area is adjacent to the academic area but may also be entered from a second direction, for theatre performances open to the public. This second entrance does not encroach upon the University proper.

The field house acts as a link between this area and the academic area thus allowing it to be used as physical education building and an athletic exhibition building.

Research: Areas for future development of special research facilities, which would benefit from the close proximity to the University but whose functions could not be directly

integrated into the University's education structure, are provided at the perimeter of the academic area.

Exhibition Athletics: This area consists of a soccer and track and field stadium seating 15,000. Since it is only used occasionally[1] and has no integral or organic relationship to the rest of the University, it is separated from the other areas. It is served by the same road which brings the public to the culture area. It is surrounded by ample parking space and by varsity playing and practice fields.

IV. PROGRAM FOR THE UNIVERSITY

4.1 Introduction

The following is a collection of the pertinent quantative information concerning the University. The required areas are obtained primarily from the work of the The Architects Collaborative and Kargman, Mitchell & Sargent. Their work has been modified and supplemented by various sources noted in the Bibliography. Since future enrollment in particular departments may change drastically ~~in the future~~ it was decided to obtain data on the total areas required for particular functions (i.e. classrooms, laboratories) rather than particular departments (i.e. physics or chemistry). These figures reflect orders of magnitude only. As has been mentioned previously the only protection against planning catastrophes resulting from unforseen changes in requirements is the development of a plan which allows for growth and change.

Table 4.1

COLLEGES COMPRISING THE NEW UNIVERSITY
AND THEIR ENROLLMENT FOR THE YEAR-1957

COLLEGE	ENROLLMENT -- 1957
Arts and Sciences	802
Law	562
Education	1068
Commerce	493
Engineering, Planning & Arch.	417
Agriculture	240
Veterinary	71
TOTAL	3653

Table 4.2

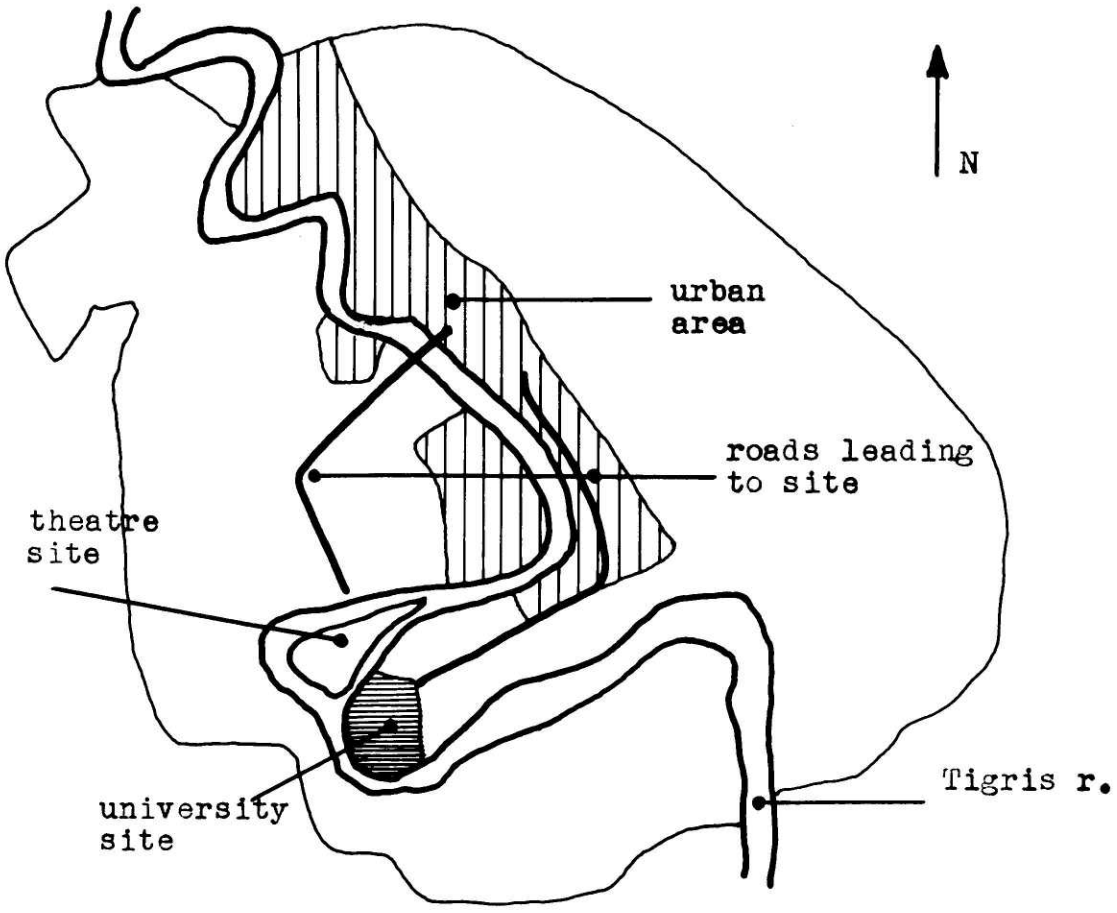
REQUIRED AREAS IN THE NEW UNIVERSITY

Functional Designation or Building	Phase I (5,000)	Phase II (8,000)	Phase III (12,000)
INSTRUCTION			
Classrooms	104,000 sq. ft.	121,000	152,000
Laboratories	36,000	80,000	212,000
Faculty offices	52,000	66,000	90,000
Libraries	9,000	14,000	20,000
Exhibition	8,500	13,000	20,000
Lounge	4,200	6,700	10,000
Halls, toils., stor., etc.	21,000	33,000	50,000
TOTAL	234,700	333,700	554,000

Functional Designation or Building	Phase I (5,000)	Phase II (8,000)	Phase III (12,000)
Dormitory			
Number of students			
Male	3,000	5,000	8,000
Female	2,000	3,000	4,000
TOTAL	5,000	8,000	12,000
Required area (male and female)			
Dormitory rooms	500,000 sq. ft.	800,000	1200,000
Recreation area	100,000	160,000	240,000
Halls, stor., toils., etc.	50,000	80,000	120,000
Administration	16,000	26,000	40,000
TOTAL	666,000	1,066,000	1,600,000
ADMINISTRATION	30,000	30,000	60,000
LIBRARY			
(300,000 vols. in Phase III)	42,000	66,000	100,000

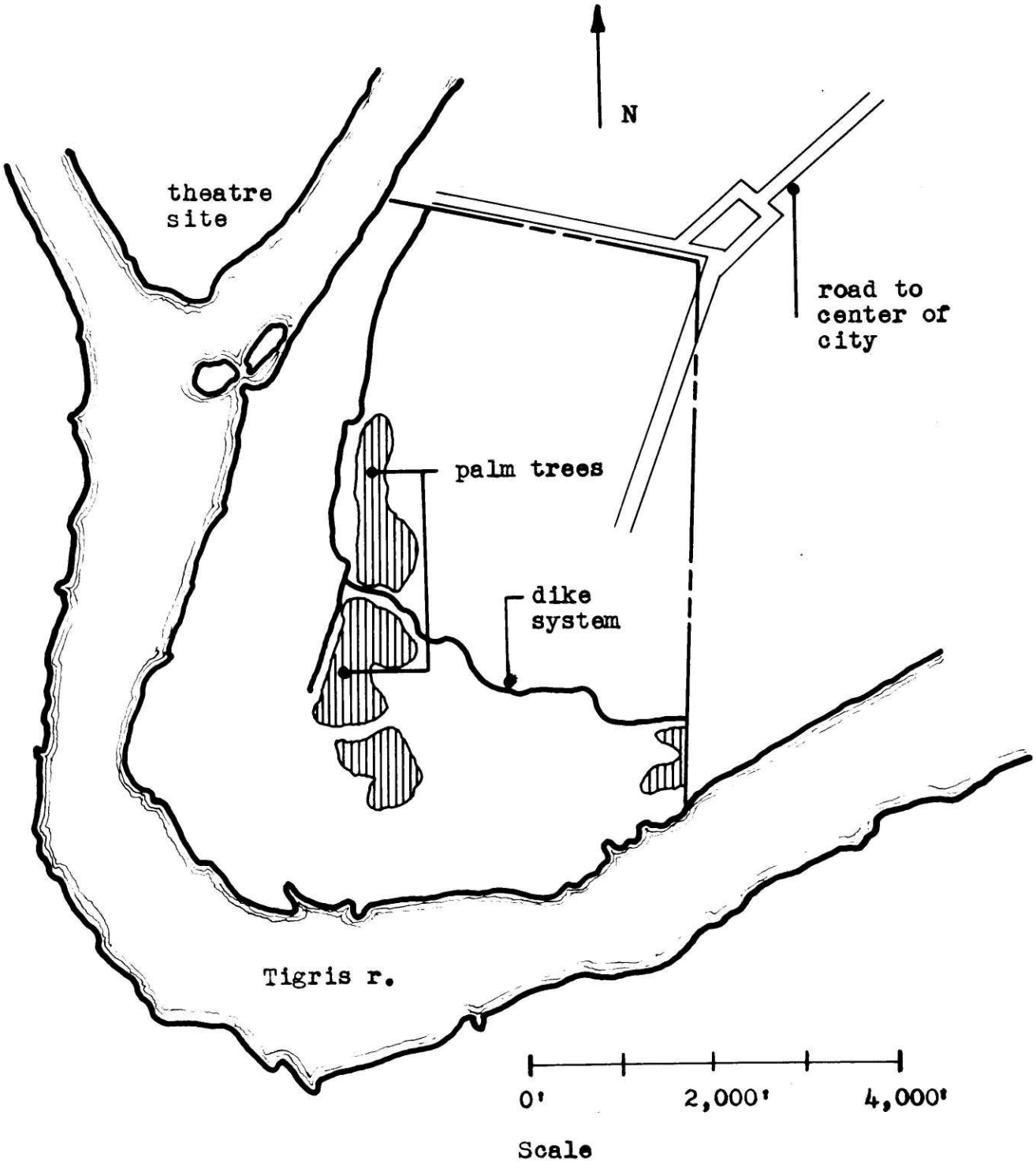
Functional Designation or Building	Phase I (5,000)	Phase II (8,000)	Phase III (12,000)
SPORTS			
Soccer Stadium (15,000 capacity)			220,000
Field House (5,000 capacity)		40,000	40,000
Soccer field	135,000	135,000	135,000
2 Outdoor Swimming Pools	24,000	24,000	24,000
Tennis, handball, volley ball, etc.	100,000	220,000	300,000
TOTAL	259,000	419,000	719,000
MECHANICAL EQUIPMENT PLANT	20,000	20,000	40,000
THEATRE (4,000 capacity)		65,000	65,000
MOSQUE (700 capacity)	15,000	15,000	15,000
COMMONS AREAS	100,000	180,000	240,000
ELEMENTARY SCHOOL		FACULTY CLUB (30,000 sq. ft.)	
OBSERVATORY		INFIRMARY (50,000 sq. ft.)	
FACULTY RESIDENCES			

APPENDIX



CITY OF BAGHDAD

FIG. A-1



UNIVERSITY SITE

FIG. A-2

Photographs of Site

Fig. A-3

Photographs of Site

Fig. A-4

BIBLIOGRAPHY

1. Adams, D. G., Iraq's People and Resources, University of California Press, 1958
2. Adams, Howard and Greely, & Anderson, Beckwith and Haible, University Circle - A Plan for Its Development, 1957
3. Briggs, M. S., Muhummadan Architecture in Egypt and Palestine, Oxford University Press, 1924
4. Climatological Atlas for Iraq, Meteorological Service, Ministry of Comm. & Works, 1945
5. Gibberd, F., Town Design, the Architectural Press, London, 1953
6. Harris, G. L., Iraq - Its People, Its Society, Its Culture, HRAF Press, 1958
7. Housing and Building in Hot Climates, HRAB, National Academy of Sciences, 1953
8. Lee, Dr. D. H. K., Physiological Objectives in Hot Weather Housing, Housing and Home Finance Agency, 1953
9. Report of the Committee on Student Housing, M. I. T., 1956
10. Rivoira, C. T., Moslem Architecture, Oxford University Press, 1918
11. Salter, (Lord Salter), The Development of Iraq, A Plan of Action, Iraq Development Board, 1955

12. Shurcliff, Shurcliff and Merrill, Master Plan for the University of Massachusetts, 1957

13. Yoon, C. S., A Future Plan for Seoul National University, Master in Architecture thesis, M. I. T., 1959