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JUBA
INSTITUTE
OF
TECHNOLOGY.

by
Buni
Philip
Khamis
class of 83

EPsn
319

A.U.B.
FACULTY OF ENGINEERING & ARCHITECTURE.
DEPARTMENT OF ARCHITECTURE.

Course A 130
Final Project Programming

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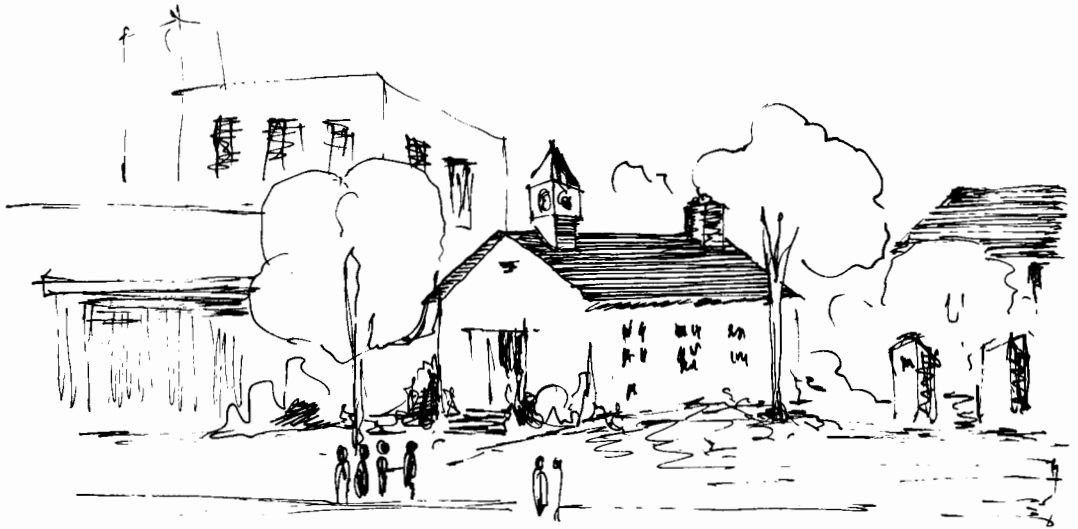
Professor in charge SEROF

15-2-1983.



..... Our heritage is not a style of Architecture - our African, Southern Sudanese heritage is a Spirit of going ahead.

Buni Philip.



.....We are not building a Factory to produce
Machines - We are dealing with Human Souls.

.....

..... I mean that our new School should be an
object of Pride, a Building of beauty and
Distinction.

Mrs. Owen.

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1

INTRODUCTION

HISTORICAL BACK GROUND OF SOUTHERN SUDAN.

Little is known of what was taking place in the Southern Sudan prior to the Turko-Egyptian occupation in the early nineteenth century. In the North there was a weak Christian Kingdoms of Meroe and Sennar which were over thrown by hosts of Arabs from Arabia and Egypt, who poured into the Sudan in the twelfth and thirteenth centuries. Racially the Arabs were assimilated by the indigenous people, but they imposed their language, Religion and tribal structures throughout the area, not in the Southern Region.

In 1820, Mohammed Ali Conquered the Sudan and made it a province of the Turko-Egyptian Ottoman Empire - known as Turkiya until 1884. Then the Mahdiya from 1881-1898.

In 1898, the Anglo-Egyptian came into Sudan and put an end to Slavery. They brought the Southern Sudanese into close contact with the Northern Sudanese. In 1902, the Government of that day decided to administer the two parts North and South separately, which was not a new idea by then, it was first brought by General Gordon when he was made the governor of Equatoria. The idea of this decision was necessitated by many differences between the North and the South - Geographical, racial, religious and cultural. Another aspect of the difference was in administration, that the North had opportunities to advance and develop economically and educationally where as in the South emphasis was laid on maintaining law and order.

In 1946, an administrative conference set up by the Governor General to endorse the idea of the Union, and demanded that the South should be immediately unified to the North. The members of the North were made up exclusively of Northern Sudanese Political Parties while the Southern were having no Political Party of its own, and could consequently forward no members (which was a game) and it failed. Another conference was tried 12 June 1947 (Juba Conference) this also failed due to many reasons.

In April 1952, a self-Government Statute laid the constitutional foundation for eventual independence. A Senate and House of Representative was provided for and it was stated that, "The Sudanese should decide freely for themselves the time and method of exercising the right for self-determination." The parliament unanimously voted to the withdrawal of both co-dominions (Britain and Egypt). Less auspiciously 1955, saw the beginning of what developed into a civil war between the North and the South, as the latter felt, with many reasons, that their opportunities were being circumscribed by

a structure which placed effective control of the Sudanese state in the North, Arab's Muslim hands.

The decisive distinguishing factor between North and South seems, then to be a sense of belonging which has its roots in History and in conferred by birth. The South was completely isolated from the North, until more than a century ago, embittered by decades of subsequent hostility and administration seperately until the threshold of independence, the Southerner feels himself to be an African, while the ruling Northerner is proud of his Arab connexions. The Southerners are therefore fighting for racial equality, which the Anglo-Egyptian government failed to solve and they also failed to joint North and South fully on the bases of equality. They assumed that they have enough time.

In January 1st, 1956, Sudan became independent, nothing was done to solve the problem of the "Civil War", instead, it was made worse, until the major achievement of the "May-government". However, was the solution to the problem of the South; a solution which ended the 17th years of "Civil War" and enabled the Sudan, for the first time in its Modern History, to overcome its racial and religious prejudices and to assert its progressive Afro-Arab identity was a durable base for national unity. On the 3rd February 1972, in Adisababa an agreement was reached and the South Sudan was given a local autonomy and Regional-Self Government. The Southern Region then have the full opportunities to advance and develop economically and educationally alone by themselves.

EDUCATION BEFORE 1820.

Education before the Missionaries, during the time of the tribble Kingdomship, there was education. It was not a

class type of education like today but it was a physical education - running, wrestleing and javaling throwing - to make the young man physically fit to defend their territories from other invaders, until the arrival of the Missionaries. Education was first given in the mother tongue, then to a limited number, in English as a key to Western Technology and leaving.

EDUCATION BEFORE THE CIVIL WAR.

Up to 1926, education in the Southern Sudan was in the hands of four groups of Missionary bodies (later increased to six) each worked within its allotted sphere of influence with little or no government control or assistances. From 1926 to 1936, a government inspectorate was set-up which was limited by lack of central direction and co-ordination of trained Missionary educationists and, to a certain extent of fund. After 1937, the local standard of living was raised by better - trained native teachers and improved of preparation for entry to intermediate schools and teaching in village schools.

The type of schools during the time were as follows:

	<u>1927</u>	<u>1944</u>
Intermediate Schools	3	3
Central Schools	0	7
Elementary Schools	17	37
Trades Schools	1	3
Village Schools	100	270

The number of students in 1944 was 9,578 in all the schools, since they southerners were not accepted to the North the Missionaires decided to help some students to go to Uganda, Kenya, Zaire and Italy for further studies.

EDUCATION DURING THE CIVIL WAR.

During the 17th years of the civil war, the Southerners were still the victims of the independence. By then there were only two higher secondary school "Rumbek Senior and Juba Commercial School." In 1961, all the Missionaries bodies were given an ultimatum to leave the Country within 72 hours by the Central ruling government. They were collected from their various places under the escort of the National army. The Government then opened a lot of public schools in Arabic, built many Mosques, Changed all the Missionaries English schools into Arabic patterns and Koran was a must to be one of the most important subject in all their school followed by Arabic. Not to forget there were many intermediate and technical schools by then. (These pressure was not warmly well covered by the Southerners whose basis of education was in English and by the Missionaries). After primary school the students ere forced to go to Islamic institutions which were built all over the towns, instead of the intermediate schools. The young school boys left their schools and went to study in the neighbouring countries and some joint the civil war. These increased the problem in the South and all the other functioning schools were closed down and a few were taken to the North from 1966 to 1970.

EDUCATION AFTER THE CIVIL WAR.

On the 3rd March, 1972, The Southern Sudan came into an agreement with the Sudanese Government and they were given a Self Refional Government. The first thing which was done was the reperteration, rehabilitation and reconstruction of houses and schools, roads and hospitals. All the schools were reconstructed and were reopened and schools which were taken to the North were sent back to the South. More new schools were opened too. The Official language in the schools was changed as before "English". All the students

who took refuge, returned and a compromise was reached between the central and Regional Government to accept, 25% of the students in all the departments in higher colleges and universities to be from the Southern Sudan.

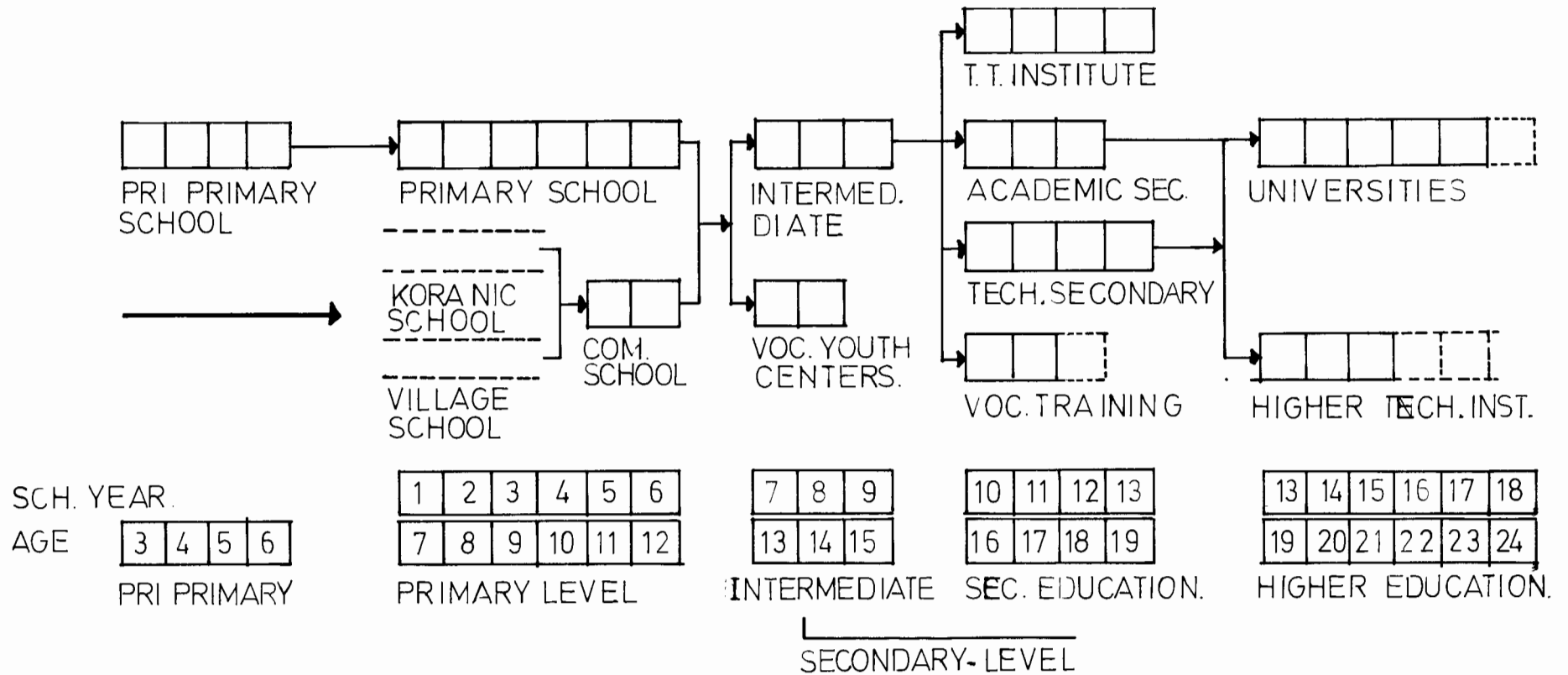
1975, a University was open in Juba, for the following Colleges; National Resources, Economic and Social Studies and Education. Two years later more Colleges were introduced such as Agriculture and Medicine every year 100 students are sent for further studies in Egyptian Universities.

At the end of 1970 the agreement of 25% students from South was not followed, in all the higher educational colleges, institutions and University. One can hardly find 2% or none of the Southern student in any departments of the above institutions. For example, 1982 intake to Khartoum University is a clear example. One student from South was taken for Medicine, one for Pharmacology and four were taken to Faculty of Law.

These can show us that there is still differences between the Northerner and the Southerner. The game here is cold war. The tendency is not to develop the Southern Sudan educationally or if possible give them as less little education as possible, although the North and Southern Sudan has both the same education system as shown in Figure 1 and 2, which shows educational structure in the Country.

EDUCATIONAL SYSTEM - DEMOCRATIC REPUBLIC OF THE SUDAN

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- FIGURE 1 -

EDUCATIONAL SYSTEM IN THE SOUTHERN REGION.

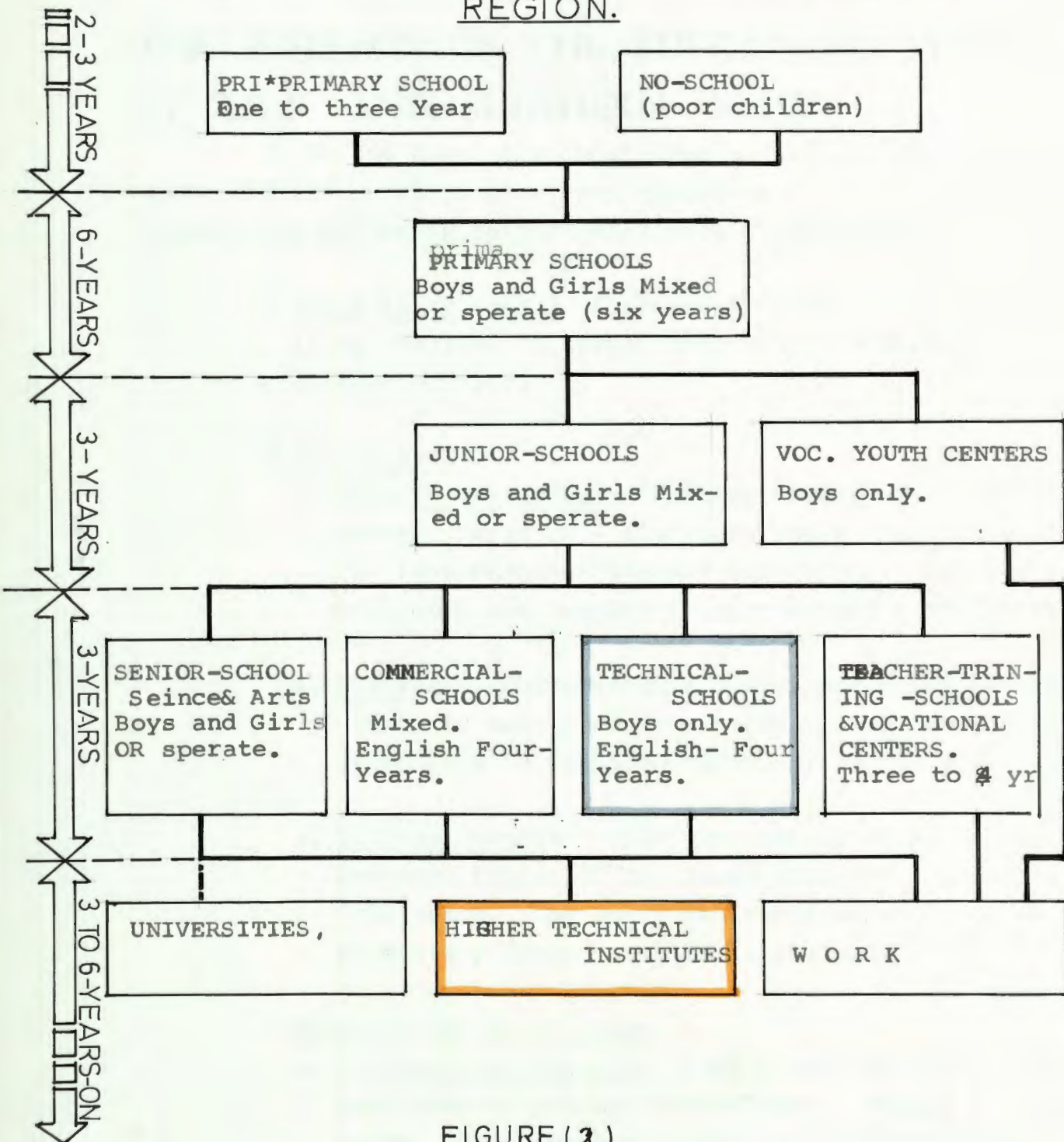


FIGURE (2)

Tables (1,2,3,4 and 5) below will give us a clear picture of Academic and Technical curriculum differences in the Sudan and particularly in the Southern Sudan as well as general intake in the higher Educations.

THE SKELETON OF THE EDUCATION SYSTEM IN D.R.S. AND SOUTHERN SUDAN.

It is the same as in most Arab countries, with only minor difference which have been necessiated by local conditions. The following is the out line o f the system.

A Pre Primary School (Nurseries and Kindergardens)

It is confined in large Towns only for children age of four or five.

B First Level

a, Primary Education:- Children admitted at age of seven. Duration - six years and at they have sit for intermediate Entrance Education. Only succes-
successful ones are awarded Primary School Certificate.

b, Khalwas:- Children of all ages are accepted the Course is mainly religion (memorizing the Kora'ñ) Introduced in Southern Sudan during the civil war.

c, Village School:- This type mainly found in the Southern Region of the Sudan villages. Duration - four years. The pupil can continue in the Com-
plementary School same as in Khalwas.

C Second Level First Stage

a, Intermediate School:- Pupils are admitted after good pass of primary certificate. Duration - three years. Then the pupils sit for the intermediate examination and secondary school certificate.

b, Youth Vacation Centres & National Industries

It is attended by those who have completed primary school and passed an admission examination Duration- two years.

D Secondary Level (Second Stage)

a, Secondary Education:- The pupils admitted who are awarded the intermediate school certificate. The course at this level is of two types:

I- Academic Secondary:- Duration - three years. and the students sits for the Sudan School certificate - which is the basic requirement for admission to University - (Arts and Sciences)

b,II- TECHNICAL SECONDARY SCHOOLS DURATION IS FOUR YEARS. IT IS DIVIDED INTO COMMERCIAL, INDUSTRIAL AGRICULTURAL AND HOME-ECONOMICS. THE STUDENTS HAS TO PASS TECHNICAL CERTIFICATE. THE BERT CANDIDATES CAN JOIN TECHNICAL COLLEGES AND POLYTECHNICS.

III- Teacher's Training Institutes:- Duration four years after passing intermediate certificate. The student qualified as primary teacher.

IV- Vocational Training Centres and National Industries:- Students are admitted after passing both intermediate certificate and quantitative examination. Duration (two to three years) and they qualified as skill workers of technicians.

E HIGH LEVEL

Only outstanding students who pass Sudan School Certificate will stand qualification and then admitted to higher Institution. The requirement varies from faculties to another with great compotition.

TABLE (1) SUMMARY OF GENERAL EDUCATION 1979/1981

L E V E L S		SCHOOLS	PUPILS	TEACHERS	
PRIMARY EDUCATION		5 7 2 9	14 35127	4 1 576	
INTERMEDIATE EDUCATION		1 3 8 8	258 606	1 1 584	
SECONDARY E D U C A T I O N .	ACA D E M I C	3 1 3	1 30 395	3906	
	T E C H N I C A L	INDUSTRIAL	1 5	4 950	6 80
		AGRICULTURAL	3	1 500	
		COMMERCIAL	21	6 000	
		GIRLS	1	2 52	
	TEACHER TRAINING INST.	2 1	4 388	6 65	
G R A N D T O T A L		7 4 9 1	1841 218	58411	

12


 This has Change Greadly During the Pass Two Years. More Technical Schools were Opened.

TABLE (2) RESULT OF SEC. SCHOOL CRETIFICATE 1980

No. STUDENTS SECTION	S A T	P A S S E D	PERCENTAGE
ACADEMIC	56848	31430	55.3%
TECHNICAL	3200	2038	63.9%
T O T A L	60048	33469	55.7%

TABLE (3) (A) ACADEMIC SCHOOL RESULT.

No. OF STUDENTS TYPE	S A T	P A S S E D	PERCENTAGE
GOV. SCHOOL	22981	16318	71.0
AIDED SCHOOLS	8120	2829	34.8
UNION "	18208	7384	40.6
PRIVATE CANDEDIATE	7278	4784	65.7
PRIVATE SCHOOLS	261	106	40.6
T O T A L	56848	31430	55.3

TABLE (4) (B) TECHNICAL SCHOOL RESULT

BRANCH. No OF STU.	AGRIC.	COMM.	INDUST.	GIRLS	TOTAL
SAT	429	1641	1050	79	3200
PASSED	382	882	707	62	2038
PERCENTAGE	89.0	54.0	67.3	78.5	63.9

TABLE (5)

INTAKE IN HIGHER EDUCATION 1979/80

INSTITUTIONS	NUMBER
UNIVERSITY OF KHARTOUM	1 6 5 9
ISLAMIC UNIVERSITY	3 5 9
CAIRO UNIVERSITY OF KHART.	2 9 9 5
JUBA UNIVERSITY	8 1
GEZIRA UNIVERSITY	1 7 8
TECHNICAL INSTITUTES	5 6 7
TECHNICAL DEPT. INSTITUTES	3 2 1
T O T A L	6 1 9 6

The number of Technical School is 40 (fourty), where as the number of academic schools is 306 by 1979/80. The ratio is 1:7, also, the ratio of Students is 1:7 . There are 30,000 candidates who pass the Sudan School Certificate Examination and compete for 7,000 places offered by the University.

One of the objectives of the present Educational plan is the expansion of Technical Education to offer equal opportunities to that of the academic education or of not more. That will mean more higher Institutions has to be open to be able to take the increasing number of those technical students.

Therefore, my personal objective is to stop all the Technical educational problems in the country. I then propose "AN INSTITUTE OF TECHNOLOGY"

(Reasons are explained below)

PERSONAL OBJECTIVES.

Sudan is really in need of skilled labour in all fields. Therefore the government has to expand Technical Education as it has already been planned, not only for the seek of opening more technical schools to balance with the academic schools and to solved the problem of students, but the technical education is one of the major back bone of development in the Sudan and it's regions. These will mean that higher Technical school or Institution has to be expanded too. To balance the development in the country, according to the Addis Ababa agreement, there should also be a balance in education in the Southern Region to that of the North. Since there is already one University, the chance is now for a Technical Institute.

The Institute will be able to absorbed 2/3 to 3/4 of the Southern Students who completed Technical Secondary School Education and the other balance will be from the Northern Sudan and the neighbouring Countries.

At the moment there are four technical secondary schools in the Southern Sudan, and there are three more under construction. This will rise the number of technical schools to seven, and will also rise the number of students from 1635 to 3270. twic as many. One-fourth of this will be sitting for the Sudan Technical School Certificate yearly.

With the present central government policy, in the Northern, Sudan only 20 student from Southern Sudan may be accepted to the higher Institution in the North. The rest of the students are left out without further education, as a result, there should also be one technical Institution in the Southern Region to give an equal opportunities to the Southern Sudan for development and education for the seek of equality with the Northern Sudan. The Institute will have to be centrally located, in the city of Juba which is a Regional capital and it will be a point of increasing the density of urbanization of Juba at the same-time solved the problem of the students (technical students) who come from all parts of the Southern Region to Juba looking for jobs and education.

The Institute will also be a major solution specially to the problem of many strikes by the technical school students because of "the structure system of technical education in the Sudan and the Southern Region".

Why do I proposed a new technical Institute? Why not only open more faculty or faculties of Engineering in Juba University?

First, it is more economical to start with small project like an institute. It may start to give diplomas and courses and later it will be develop to issue degrees. The instatation of the laboratories will take place step by step.

Secondly, it is easier to get donas for small new projects, to a bigger one. Juba University will be use as a typical sucessful development example.

Lastly, it will give more variaty of jobs in the city and encarrage more Variaty of Urban buildings.

The Objectives of the Juba Institute of Technology.

To reflect the changeng needs of the Southern Region of the Sudan and the whole country, will provid:-

- a- Educational opportunities at the diploma and degree level, Bachelor of Technology (B. Tech.).
- b- Research Center to keep abreast of Technological developments and application to the needs of the Region.
- c- A focus for the development of engineering education to meet the unique need of the Region.
- d- The Library of the institute will served the Student and the public.
- e- The institute will acts as a Regional focal point and catalyst for the development of professional activities, including conferences and seminars and center for the publication of Technical information for the Region.

The General Aims.

These can be seen in quotation given by Johnes A. the president of the "University of Transilir" Pekins as follows;

....."Every civilized country tend to developed institutions which will enable it to aquire, digest and advances knowledge relevants to the tasks which it is thought will confront it in the future.".....

Educational Aims.

- a- To develop the students' talents.
- b- To increase the students' technical knowledge and cultural awareness.
- c- To improve the students' attitude as a human being and a citizens, all these to create an adequate basis for their future tasks as professional who should have the possibility and right attitude for continuous studing and learning.

Research Aims.

To give services to community - supplies of manpower - both in terms of quantity and quality to meets the requirement of the Region and the Nation.

ACADEIC POLICY.

In its declared aims of providing educational opportunities. It has also some other policies such as:-
GROWTH: which can be assess within the immediate future but which is ultimately difficult to for see, will constantly be subject to change and through a **pattern** of academic courses that will prediecte within an establish engineering disciplines, it is unlikely

for a rigidly constituted departments, that will best serve the interest of the institute in the long run.

- * The Site is quite fit for future development.
- * Provision should be made for extension of the other departments of engineering, other faculties like Agriculture and commerce on the same Site or as a branch of same institute some where in the city.
- * The intention of the Library should perform a comprehensive services within the Region and Northern Sudan.

The Institute and The Community.

It brings new sources of employments and trade to the city and add a lively new element to the community.

It brings many opportunities for co-operation in education and culture activity and various practical ways in which the Institute and city will help each other.

Shear facilities eg. shops, cinemas etc.

It increase the intensity of it's own community life, student and staff.

The city has many qualities which makes it an excellent place for the new Institute Housing and transportation and it increases the population of the city.

Institute and Industrial Society.

The Institute will inevitably identify itself solved it's needs and problems of contemporary society.

Housing Units depends considerable on the programme philosophy that will be pursued.

2

SCOPE OF PROJECT

SCOPE OF THE PROJECT.

At the present stage, the Southern Region of the Sudan and Sudan as a whole, needs a lot of Technician and Engineers. For these reason it is more economical for both regions to have more technical schools and institutions, and it will be more economical too to starts with most emmediate needs of services that will contribute alot to these under development country. A great care has to be taken so as not to hinder later development or expansion of the Institute.

The Institute of Technology will acts as the main source of the great demand for the following fields:- Automobile, General Mechanics, Electrical, Electronic, Refrigeration, Civil Engineering, and Architecture and Building Technology and Services Engineering. The general over all size of the Institute will depend on the maximum number of the Students enrollment.

Table (6) NORMINAL PROPOSE INTAKE FOR THE FIRST YEAR PER DEPARTMENT.

No.	DEPARTMENT	INTAKE/YEAR
1	DEPARTMENT OF CIVIL ENGINEERING	130
2	" " MECHANICAL ENG.	90
3	" " ELECTRICAL ENG.	110
4	" " ARCH. & BUILDING.	60
5	" " SURVEYING.	30
5	T O T A L YEARLY INTAKE	420

THE MAIN COMPONENTS OF THE PROJECT.

It is a tentative approach to the question of how to reconcile on optimum interpretation of the Institute programme with the potentialities and exigencies of the Site which will be divided into six main parts:

- A - Central Facilities Area.
- B - The Teaching and it's immediate elements.
- C - The Students' Housing and it's relative elements.
- D - The Staff Housing and related elements.

Other programme element, which are unique, are with each of the complex nature, like :

- E - Sport Fields (open air sports facilities).
- F - Parking, Surface parking spaces.

The Tentative size of the Institute is propostional to the Full Total Enrollment of the Student (F.T.E.) which is equal to 1710 Students. AS obtained from table (7) which gives the Total Full Capacity of the Institute after the first five years.

TABLE (7)

PRO POST ENROLLEMENT IN DEPARTMENTS AND TOTAL FULL CAPACITY
OF INSTITUTE

No.			1st Year	2nd Year	3rd Year	4th Year	5th Year
	Departments	Section					
1.	Mechanical	Automobile	30	60	90	120	360
		General Mechanics	60	120	160	240	
2.	Electrical	Electronic	30	60	90	120	440
		Electrical G.	40	80	120	160	
		Refrigeration	40	80	120	160	
3.	Civil Engineering	Structure	60	120	180	240	520
		Construction	40	80	120	160	
		High Way	30	60	90	120	
4.	Architecture and Building Tech.	Architecture	30	60	90	120	270
		Building	30	60	90	120	
5.	Surveying	Surveying	30	60	90	120	120
	TOTAL NO. OF STUDENTS		420	840	1260	1680	1710



TOTAL NUMBER OF STUDENTS ENROLLED IN DEPARTMENT.



TOTAL ENROLLE NUMBER OF STUDENT IN INSTITUTE.

TABLE (8)

TENTATIVE AREA FOR CENTRAL FACILITIES USING FTE (1710)

No.	Central Facilities	Total Students Enrollment 1710	Multiply- ing Factor	Net Usable Area M ²	Add for Circulation %	Total Net Area M ²
1	Central Administration	1710	0.65	1112	55%	1723.6
2	Conference Centre	"	0.10	171.0	45	248.0
3	Central Storage	"	0.20	342.0	55	530.7
4	Library	"	1.25	2137.5	35	2885.0
5	Computer Centre	"	0.10	171.0	40	248.0
6	Auditorium (500 seat)	"	0.15	256.5	65	423.0
7	Out Door Theater	"	0.04	68.4	55	106.0
8	Health Centre	"	-	120	30	156.0
9	Cafeterial and Post Office	"	-	350	30	450.0
10	Book Store	"	-	150	30	195.0
11	Shope	"	-	100	30	133.3
TOTAL SPACE				4878.4		7,098.6

SIZE AND LIMITS

A. Central Facilities:

Using the U.F. (Utilization Factor)and the balance space percentage (For circulation and Utilities). The Tentative area for the central Administration and Central Facilities will be as in table (8). Plus we need to add more for the thickness of walls and toilets.

Therefore the total will be $7,098.6 + 40 \% = \text{Approx. } 10,092 \text{ M}^2$.

B. Teaching Area and Immediate Dependence.

This Consists of four main parts:

- a- Faculty Offices (Dean's office and Administration.
- b- Departments.
- c- Class rooms and Lecture Halls.
- d- Laboratories and Workshope.

To find the tentative size of the institute , a contact hours are to be determined first as shown in table (9).

TABLE (9) CONTACT HOURS OF STUDENT PER WEEK.

SCIENCE AND TECHNICAL SCHOOL		TOTAL CONTACT	LECTURES	WORKSHOP, LABS DROWING OFFICES	TUTORIAL	SEMINARS.	INDIVIDUAL STUDIES	TOTAL	RECREATION	SATURDAY AND WEDNESDAYS.
PER*DEGREE	1 st	21	9	9	3	-	16	37	8	45
PER*DEGREE	2 nd	21	9	9	3	-	16	37	8	45
DEGREE	3 rd	30	15	12	3	-	7	37	8	45
DEGREE	4 th	25	10	12	2	1	12	37	8	45
DEGREE	5 th	25	10	12	-	1	12	37	8	45

TABLE (10) TOTAL ENROLLMENT / YEAR (STAFF: STUDENT RATIO 1:10)

25

DEPARTMENTS	First Year Total Enrollment 100%	Total Senior Academic Staff for first year 10% Total St.	Total Senior Teaching Staff 2% of Students	Total Senior Administration 3.3%	Total Intermediate Staff 7%	Total Staff
Department of Mechanical Engineering	90	9	2	3	6	20
Department of Electrical Engineering	110	11	2	4	7	24
Department of Civil Engineering	130	13	3	4	9	29
Department of Arch. and Building	60	6	1	2	4	13
Department of Surveying	30	3	-	1	2	6
TOTAL	420	42	8	14	28	92



TOTAL STUDENTS ENROLLMENT FOR FIRST YEAR



TOTAL STAFF EMPLOYEED FOR FIRST YEAR

FIVE YEARS FULL TOTAL CAPACITY - STUDENT
 ENROLLMENT PER DEPARTMENT AND TOTAL EXPECTED
 NUMBER OF STAFF

TABLE (11)

26

Departments	Total Enrollment Per - Five Year 100%	Total Senior Academic Staff 10% of Student	Total Senior Teaching Staff 2.% of Student	Total Senior Administrators 3.3%	Total Intermediate Staff 7%	Total Staff Number
Department of Mechanical Engineering	360	36	7	12	25	80
Department of Electrical Engineering	440	44	9	15	31	99
Department of Civil Engineering	520	52	10	17	36	115
Department of Arch. and Building	270	27	5	9	19	60
Department of Surveying	120	12	2	4	8	26
TOTAL	1710	171	33	57	119	380



FULL ENROLLMENT CAPACITY



EXPECTED STAFF NUMBER

TABLE (12) YEARLY INCREMENT OF STUDENTS TO STAFF NUMBERS.

Y E A R S	FIRST YEAR	SECOND YEAR	THIRD YEAR	FOURTH YEAR	FIFTH YEAR
TOTAL NO. OF STUDENTS ENROLLED	4 2 0	8 4 0	1 2 6 0	1 6 8 0	1 7 1 0
NUMBER OF ACADEMIC STAFF	4 2	8 4	1 2 6	1 6 5	1 7 1
NO. OF SUB-ACADEMIC STAFF	8	1 6	2 4	3 2	3 3
SENIOR ADMINISTRATIVE STAFF	1 4	2 8	4 2	5 5	5 7
INTERMEDIATE STAFFS	2 8	5 6	8 4	1 1 5	1 1 9
T O T A L	9 2	1 8 4	2 7 6	3 6 7	3 8 0

For Calculation purposes it is assumed that a Department contains 200 Students (Full Total Enrollement.) and That the Staff/Student ratio is 1:10, using the formula below for teaching spaces, including Class rooms, Lecture theatres, Seminar rooms, Laboratories and Departments areas.

$$\text{Usable area per student} = \frac{\text{User place} \times \text{Contact hours} \times \text{I}}{\text{Working week} \times \text{U.F.}}$$

FOR ACADEMIC OFFICES.

Assume Department of 200

Assume staff/student ratio of 1:10.

2 Professors at 18.5 M ²	37.0 M ²
18 Tutorial Teachers at 13.5 M ²	243.0 M ²
Total	280.0 M ²

Divide 280 M² by number of student (200)

Sub-Total 1.4 M²/student.

Add Research space at 7 M² for every 5 members of staff

Total 18.5 + 14.0 M² 28.0 M²

Divide 28.0 M² by number of student (200)

Sub-Total 0.15 M²/student.

U.F. = Utilization Factor - for room Frequency factor and the occupancy factor.

Area per Student (First and second years only).

$$\frac{\text{User Place} \times \text{Contact Hours} + \text{I}}{\text{Working week} \times \text{U.F.*}}$$

$$\frac{7.4 \times 8 \times 100}{37 \times 50} = 6.5 \text{ M}^2 \text{ (for first and second year).}$$

Third Year students.

Assume one place per student 8.5 M²

Total for 1st, 2nd, 3rd year. 15.0 M²

Divide by Number of years i.e. 3

Sub-Total 5.0 M²/student.

Drawing Office Space.
 Assume user place.
 First and second year (AI Board) 3.7 M²
 Third year (AO Board) 4.6 M²
 Assume Contact hours 1 hrs.
 Working week 37 hrs.
 Assume Utilization Factor 50.0 %.

Area per Student
 First and second year onl.

User place x Contact hours x I

$$\frac{3.7 \times 3 \times 100}{37 \times 50} = 1.2 \text{ M}^2$$

Assume one place per student 4.6 M²
 Total for 1st, 2nd, 3rd, year 5.8 M²
 Divide by number of year i.e. 3 1.93 M²
 Sub-total 1.93 M²/student.

The Total Number of Student in the Institute is 1710 Students., and we have only five Departments. Therefore to have a tentative area for teaching spaces We can divide the total number of student in the Institute by the assume number of student in the department

$$\frac{1710}{200} = 7.5 \text{ Departments.}$$

now we can use the Formula.

Taking U.F. of 1.4 M²/student. $1.4 \times 200 \times 7.5 = 2100 \text{ M}^2$

Add 40 % for circulation utilities and thickness of the walls 630 M²

Sub-Total 2730 M².

By using a total U.F. of 10.6 M²/student we can now find the total Teaching Area.

$$10.6 \times 200 \times 7.5 = 15900 \text{ M}^2.$$

*=====

C. STUDENT HOUSING & R.DEPENDENCE.

This can be divided in to two main parts:

I- Student Housing (sleeping area)

II- Communal Social and Services area. Which consists of:

- 1- Common room.
- 2- Dining area.
- 3- Kitchen area.
- 4- Central residential laundry.
- 5- Telephone area.

I. The Student Housing.

Assuming that there will be a bout 75% of the Total Students enrolled who will be housed on the Site and 25 % of the rest will be off compus. Number of that can be housed is:

$$1710 \times .75 = 1283 \text{ students.}$$

25 % of them will be housed in the single rooms.

75 % of them will be in double rooms.

Number of single rooms is = $1283 \times .25 = 320$ single rooms.

Number of double rooms is = $1283 \times .75 = 963 / 2$

$$= 482 \text{ double rooms.}$$

Table (13) AREA OF STUDENT HOUSING (SLEEPING AREA).

TYPE OF ROOMS	No. OF ROOMS	AREA/ROOM M ²	TOTAL AREA M ²
SINGLE ROOMS	320	11.2	3584
DOUBLE ROOMS	482	18.5	8917
T O T A L	802	X	12501

For the Administration of the Hostel it is assumed that there will be an office for supervision, student Union, consulting rooms and archive for filling and storage of student record of information. Which in total is assumed to be 200 M².

Giving about 40 % of the total for circulation, Utilities and wall thickness.

$$12701 + 40 \% = \underline{\underline{17553 \text{ M}^2}}$$

II. Communal Social and Services Area.

It is assumed that 100 % take-up of meals at peak hour - Lunch time that have to be considered in design; For two (2) sitting s . The user place figure, used being 1.10M²

Table (14) COMMUNAL SOCIAL SPACE REQUIRED.

SPACE	FTE M ²	BALANCE AREA %	TOTAL AREA M ²
COMMON ROOMS	0.57	50	1462
DINING HALLS	0.55	50	1410
KITCHEN	0.45	50	1154
RESIDENT'S LAUNDRY	0.03	50	77
TELEPHONE AREA.	0.01	50	26
T O T A L			4,129 M ²

(FTE= Full Total Enrollement = 1710 students.)

D. STAFF HOUSING & R. ELEMENTS

The total number of senior staff is 380 only 75 % of these can be accommodated on the compus site, due to the assumSION that some of the academic staff will be part-timer and some senior academic and administrative staff will be off compus.

The number of staff to care for is

$$380 \times .75 = 285 \text{ acommodations.}$$

Thses has to be housed in three (3) main type of housing if possible:

I- Villas

II- Apartments which will consists of Four, Three, Two. and one bedrooms.

III- Town House type of houses

IV- Staff Club.

The next table will sumed up the area, and the type of house that will possible be the most adequate type.

TABLE (15) TO FIND THE TOTAL NET AND COVERED GROUND AREA.

TYPE OF BUILDING	NO. OF ACOM.	AREA OF EACH.	NET AREA M ²	TOTAL NET C.G. AREA M ²
VILLA TYPE V ₁	1	500	500	250
" " V ₂	1	350	350	175
" " V ₃	1	300	300	150
" " V ₄	25	250	6250	3125
APARTMENTS A ₁	60	200	12000	6000
A ₂	100	160	16000	8000
A ₃	60	120	7200	2600
T O T A L A R E A			42,600	20,150

E. SPORTS.

Sports Facilities : Include open sport fields, out doors. Stadium, which will take up to 30,000,- 50,000 expectators in the future. Football field, Baskets, tennis, Volley ball Base ball, and Track fields.

The space has to be provided for 1710 students and 380 staffs, an allowance has to be given to the outsiders also. Therefore the total area will be 41,673 M²

F. PARKING.

The expected number of tracks are Four School Buses and 610 Car parking spaces. With area per car is 25 M².

Total parking spaces is 15,400 M².

TOTAL GRAND COVERED GROUND AREA.

SPECE No.	NAME OF SPACE	NET BUILT UP AREA M ² .	NET COVERED GROUND AREA M ² .
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CENTRAL FACILITIES

1* Central Administration

I- Central Administration and storage	3,308	1,103
2- Library	3,857	964
3- Computer Centre	315	158
4- Central Facilities:		
I- Theater	798	798
II- Cafeteria	315	315
III- Post Office	201	201
IV- Shopping Center	308	154
V- Health Center	246	246
VI- Central main Laundry	389	389
VII- Out-Door Theater	148	148
VIII- Guards room	<u>104</u>	<u>104</u>
Sub-Total	10,092	4,580

TEACHING AREA.

Dean's office, Departments and Laboratories.	13,405	4,468
General Central Workshops	<u>2,062</u>	<u>2,062</u>
Sub-Total	15,467	6,530

STUDENTS HOUSING AREA.

I* Student Housing	17,553	5,851
II- Common Servises	<u>3,299</u>	<u>1,650</u>
Sub-Total	20,852	7,501

STAFF HOUSING AREA.

I- Villas	7,400	3,700
II- Apartments	<u>35,200</u>	<u>17,600</u>
Sub-Total	42,600	21,300

SPORTS FACILITIES AREA.

Sport area	Sub-Total	41,320	41,320
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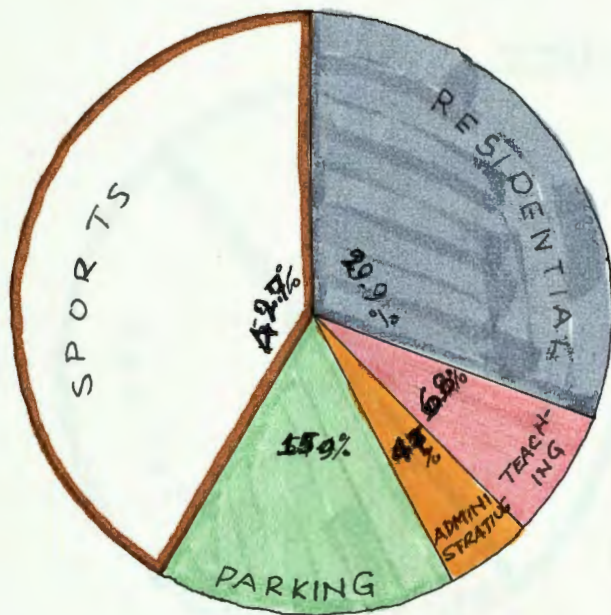
PARKING AREA FACILITIES.

Parking area	Sub-Total	15,400	15,400
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GRAND TOTAL NET BUIL*UP AREA+ 145,731 M²
=====

GRANT TOTAL COVERED GROUND AREA = 96,631 M²
=====

TOTAL COVERED GROUND AREA. IN PERCENTAGE



RESIDENTIAL

22.05% STAFF RESIDENTIAL.
 7.75% STUDENTS RESIDENCE
29.9% TOTAL.

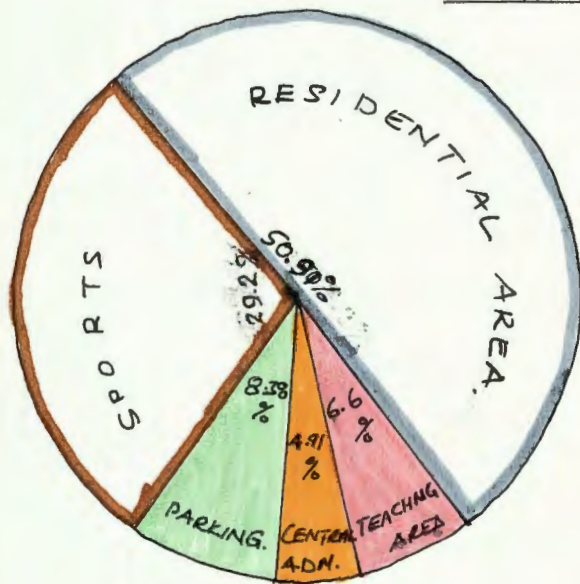
TOTAL TENTATIVE LAND APROPIATE.

To intergrate the building with the beautifull enviroment, the building has to be very carefully distributed and well spaced in the site so as to regained its natural beauty and also for the case of the extreme Climate. To achive that each total covered ground area h has to be multiplied by the Balance Area Factors which is for external circulation and Landscaping.

TABLE (16) COVERED GROUND PERCENTAGE.

SPACE NO.	SPACE NAME	COVERED GRD. AREA M ²	COVERED GRD. % AREANEED	GROUND AREA N NEEDED
A	CENTRAL FACILITIES	4,580	33	13,878
B	TEACHING AREA	16,530	35	47,229
C	STUDENT HOUSING	7,501	20	37,505
D	STAFF HOUSING	21,300	20	106,500
E	SPORT AREA	41,320	50	82,640
F	PARKING AREA	15,400	65	23,692
TOTAL AREA NEEDED		96,631		282,872

TOTAL COVERED GROUND AREA.



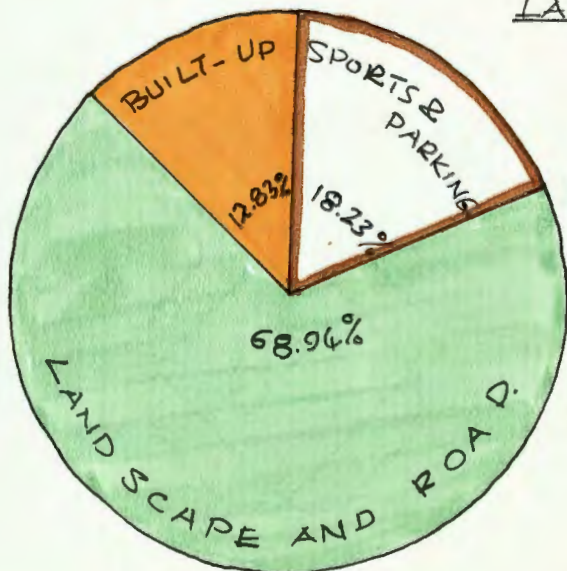
RESIDENTIAL
 13.26% STUDENT HOSTEL
 37.65% STAFF HOUSING.
 50.91% TOTAL

TO have a total Land needed, we should add 10% of the total covered ground needed, for roads and pedestrian path as to get GRAND TOTAL LAND NEEDED. $282831 + 28328 = 311159 M^2$

TABLE (17) LAND USE.

NO:	LAND USES	AREA NEEDED M ²	PERCENTAGE %
A	BUILT-UP AREA	39,914	12.83
B	SPORTS AND PARKING	56,720	18.23
C	LANDSCAPE & ROADS	214,525	68.94
TOTAL		311,159	100.00

LAND USE CHART.



B, SPORTS AND PARKING
 13.28% SPORTS
 4.95% PARKING.
 C, LANDSCAPE AND ROAD
 59.85% LANDSCAPE
 9.09% ROAD.
 68.94% TOTAL.

3

THE PURPOSE AND SALIENT FACTORS AFFECTING THE PROJECT

PURPOSE OF PROJECT.

Architectural Goals.

The general atmosphere of the Institute would be a combination of Institutional and Residential. The Institute complex is to be almost Urban in density and Regional in character, as determined by the simplicity of the Technology and use of materials. The complex is to have an identifiable character viewed from the nearby town.

A simple complex in a simple natural environment, giving the expression of what the building complex is for, and embodying in the architecture, a realistic picture of its educational qualities and tendencies.

Social Goals

To give maximum cultural interchange, both academically and socially.

To achieve a sense of community in the Institute. It is essential that the Institute elements to which various members belong should be of a size with which they could be identify.

The plan shall provide for social and residential structures which should in no-way imposed or encouraged segregation. This may be one solution to the problem of many tribes interacting in one small environment.

The Institute is far enough from the town to create an educational environment which is sense of community identity.

Still the site is conveniently near the city connected by lines of public transports.

Economic Goals

Although it will be a major expense to build and equip the Institute, it will be of great help to the Southern Region.

a- One can expect a rise in the standard of living of many citizens which will eventually change the social and economic structure of the whole Southern Region. An improvement in the living environment can be expected and more demand for better houses with the use of local materials. The transportation network will also change. The Region will be producing their own skilled labour which will give rise to many improvements.

b- As the other branches of the Institute, e.g. Agriculture and commerce, are started, one can expect better economic and increases in production of raw materials. Cash crops will greatly improve in quality and quantity. The consequence of these changes should be a significant increase in the Southern Region and Sudan as a whole.

SALIENT FACTORS.

- (I) HUMAN FACTORS.
- (II) PHYSICAL AND TECHNICAL FACTORS.
- (III) ECONOMICAL FACTORS.

Human Factors.

It is mainly academic and social factors;

- a- Relationship with community - town.
- b- Relationship with existing institute - the new Juba University.
- c- Accessibility; infrastructure - communication - public transport.
- d- Residential possibilities.
- e- Recreation possibilities.
- f- Catchment area (staff - student) sports etc.
- g- Community interests.
- h- Impact on community.
- i- Availability of services and manpower.

Physical and Technical Factors.

- a- The site; location, area, shape, size and extension possibility.
- b- Acquisition possibilities.
- c- Existing town development plans.
- d- Topography, soil qualities, water table and drainage.
- e- Aesthetic qualities - natural site.
- f- Flooding, smoke, pollution - noise, air. etc.
- g- Attitude of authorities; legislation regulation.
- h- Climate - micro-climate, wind, rain and humidity etc.
- i- Vegetation.
- j- Technological method used.

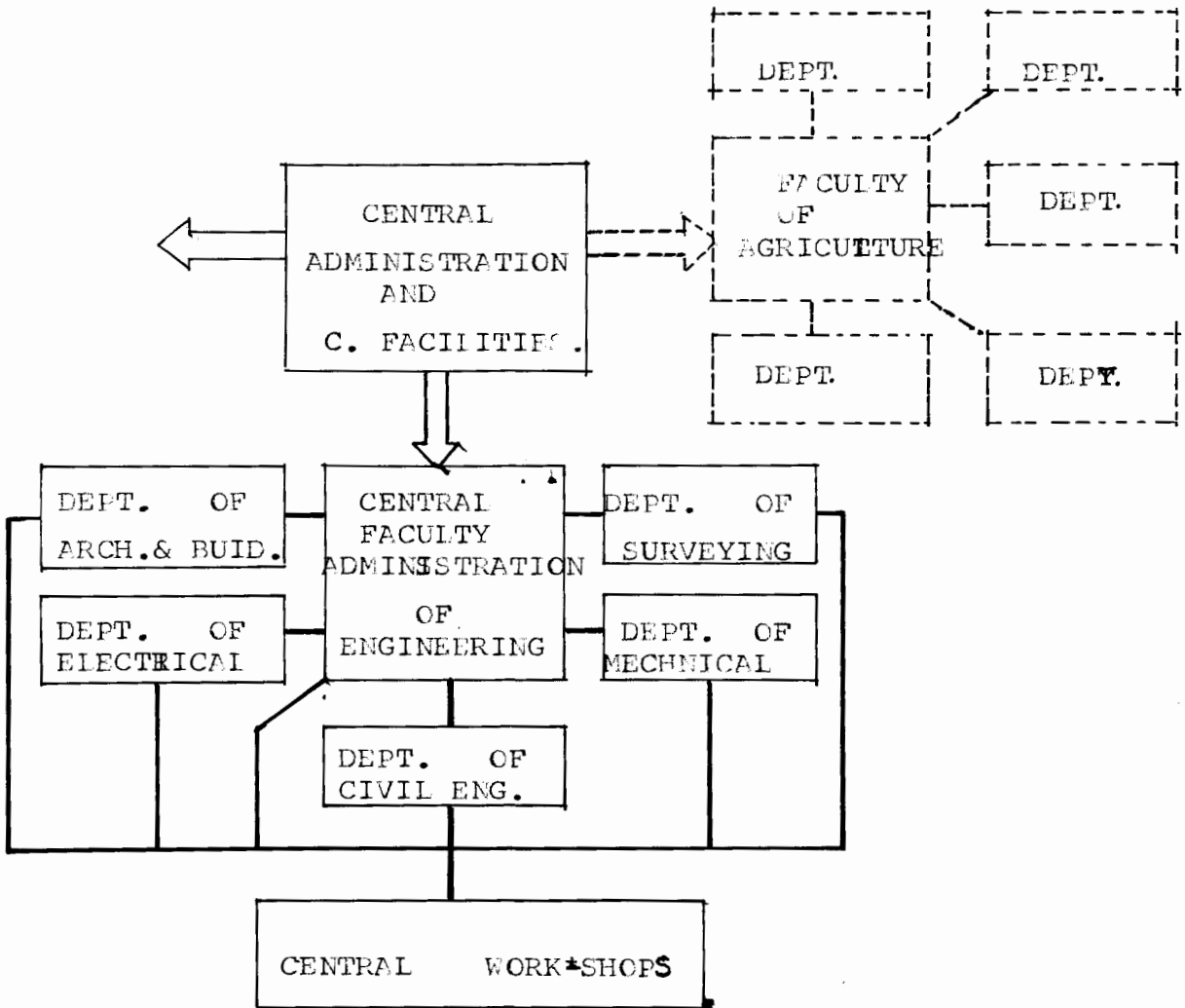
Economical Factors.

- a- Cost of the site development, and material availability and cost of transportation.
- b- Type of school, and availability of fun.
- c- Land uses.

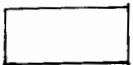
4

SPACE ANALYSIS AND STANDARDS

THE MAIN ORGANIZATION OF ADMINISTRATION



K E Y.



The first Program.

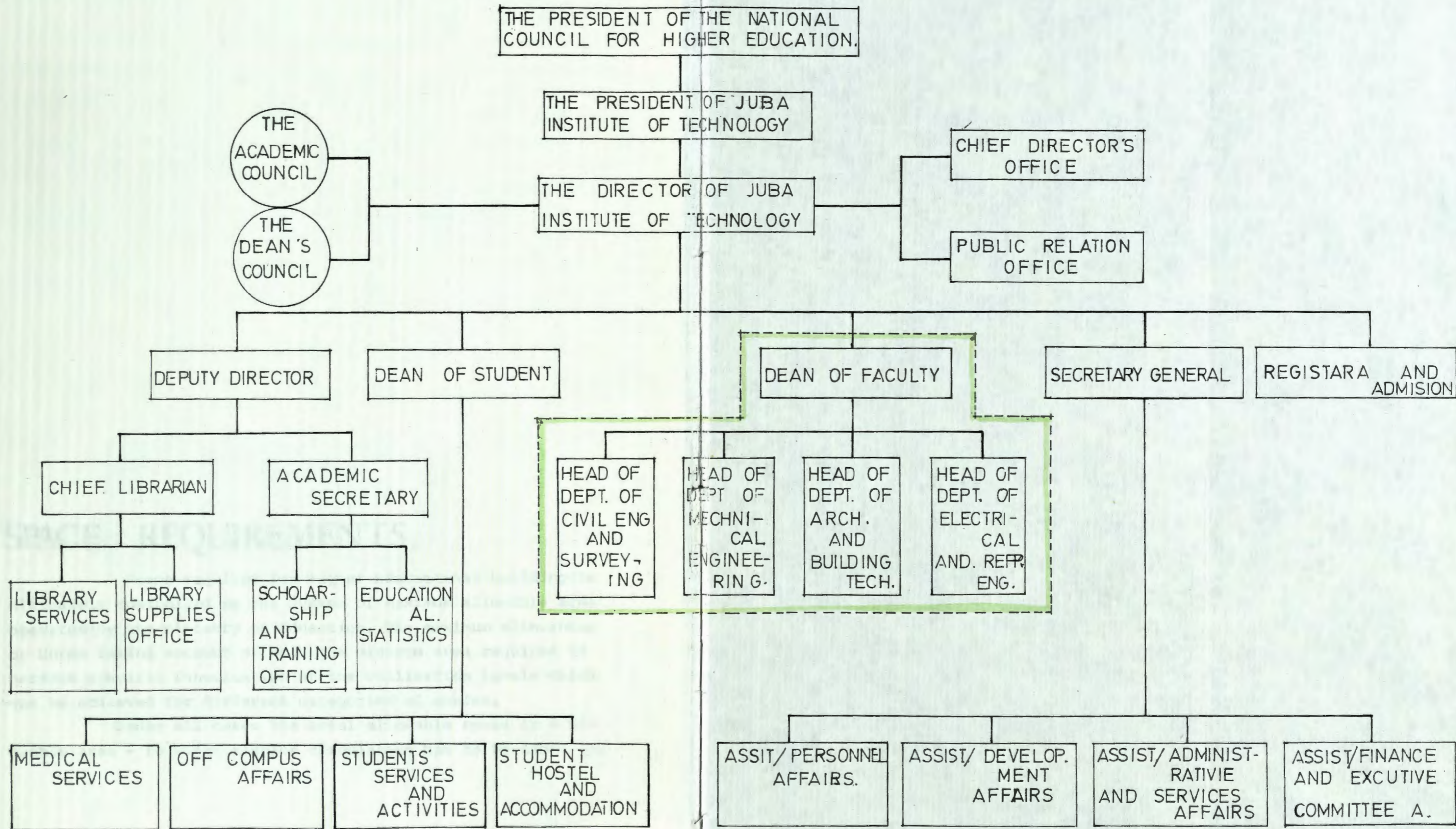


Possibility of Extensions.

FIGURE (3)

It will be possible to extend the Institute when there is need of. For example, Faculty of Agriculture will be the first. Other Departments could also be easy to open. The most urgent Departments to Engineering will be Petroleum Chemical Engineering, Forestry etc.

THE ORGANIZATIONAL CHART
OF
JUBA INSTITUTE OF TECHNOLOGY.



 Will change : Dean of Faculty to DEAN OF FACULTIES and Head of Department to DEAN OF FACULTY When Institute is at its maximum CAPACITY.

SPACE REQUIREMENTS.

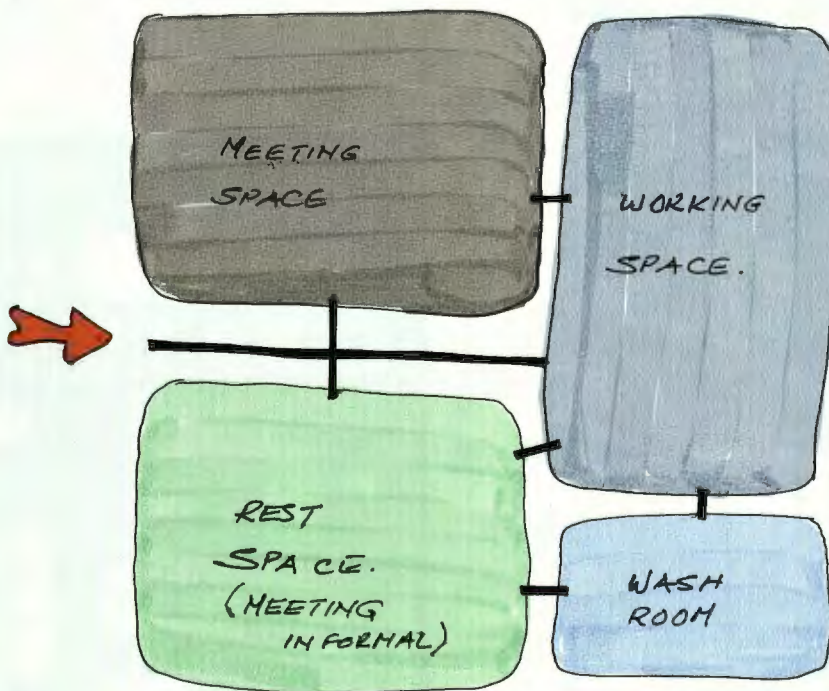
Space required for Higher Educational Buildings is ultimately controlled by the System of maximum allowable area operated by the Ministry of Education. The maximum allowances or Norms taking account of both the minimum area required to perform Specific function and of the Utilisation levels which can be achieved for different categories of spaces.

Under all cases the total allowable space is a net Usable area - to which a space circulation has to be added to.

ADMINISTRATIVE OFFICE SPACES.

Administration: Although the requirement for the administrative Area will vary by project, - Certain rooms will always be needed, such as offices for Principal (President, Dean, Head of Department, Secretary, Registrar, etc. and related secretarial staff as well as appropriate cloak-rooms, and lavatories, storage spaces for records, archives, stationary etc. - meeting rooms, medical facilities, female staff rest-rooms , General offices with desk near entrance, sales counter, bookshops etc.

Administrative Facilities should be of aflexiable nature for changes in organization or expansion so as to be without major alteration. Some administrative facilities also includes confrence-rooms such as Senate House and Committee-rooms.



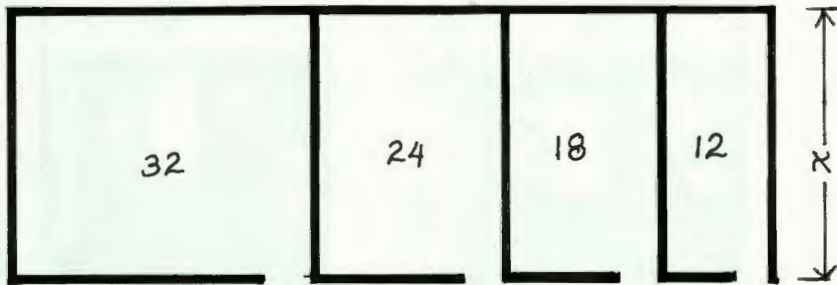
TYPICAL DIAGRAMATIC OFFICE SPACE USES.
IMPORTANT OFFICES

Office Spaces for Teaching Staffs.

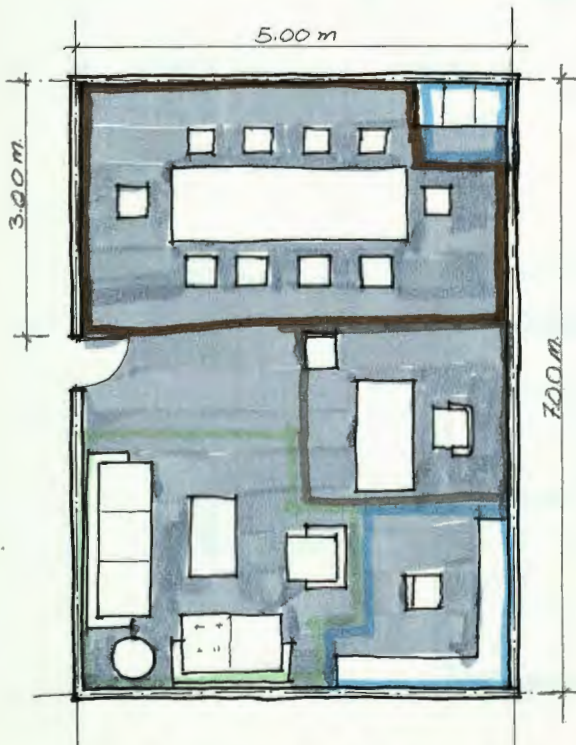
Room for Professor and Head of Department has to be provided with some sofa spaces and small meeting area. But for Tutorial teaching staff it is smaller than the Professor's offices.

Staff offices should be located next to Staff research facilities but it should not take up available laboratory spaces.

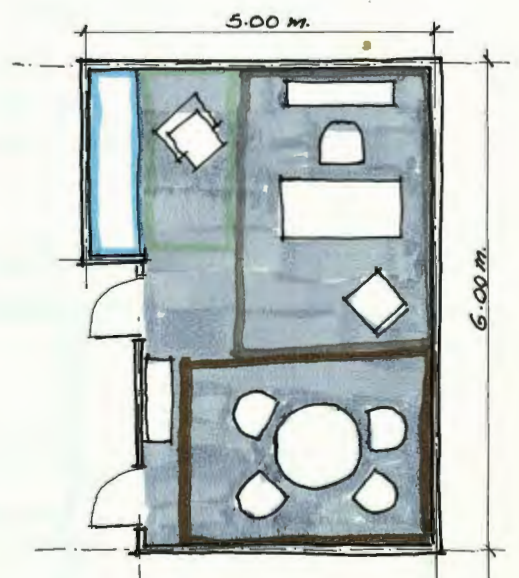
The Most important is the arrangement of the offices. The importances has also to go with the proportion of the room size.



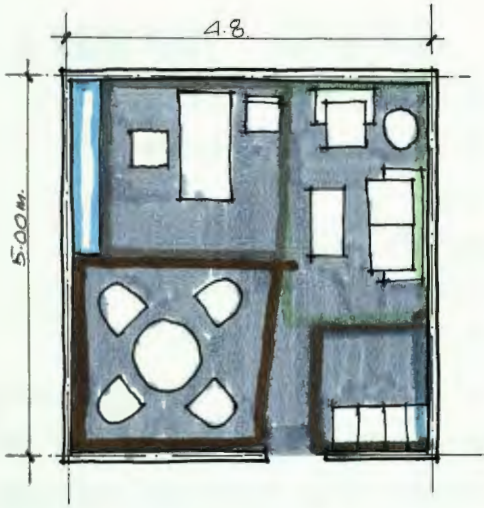
RANGE OF ROOMS SIZE AT CONSTANT DEPTH.



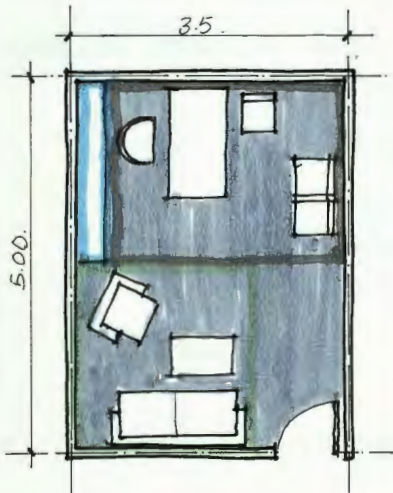
a, OFFICE FOR SENIOR ACADEMIC STAFF. LIKE DEAN.



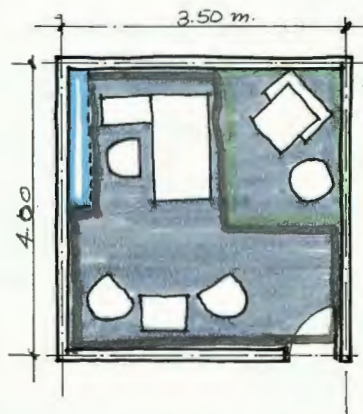
b, ALTERNATIVE SMALLER SIZE OF OFFICE WITHOUT MEETING SPACE.



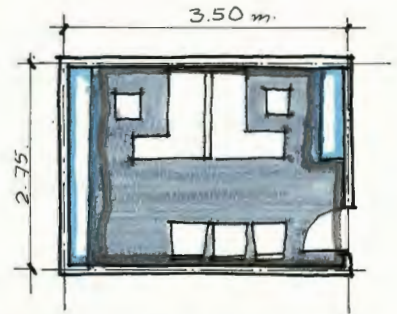
c, OFFICES FOR HEAD OF DEPARTMENTS AND DIVISIONS. WITH SMALL AREA FOR MEETING.



d, PROFESSOR'S OFFICE WITH REST SOFA AND BOOK SHELVES.

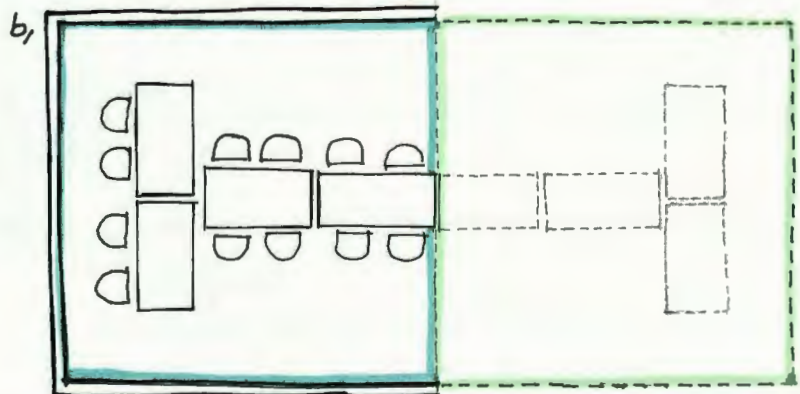
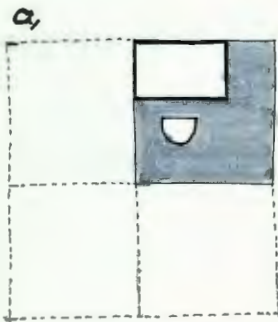


e, ANOTHER ALTERNATIVE OFFICE SPACE FOR A PROFESSOR. OR FOR SECRETARIES.



f, OFFICE FOR TWO SECRETARIES WITH WAITING AREA.

WORKABLE SPACES IN THE OFFICES. a) and b,



LIBRARY SPACES.

The Library will store bibliographic and audio-visual material and make them available swiftly to a student. It will be a tool to assist learning teaching and research and to offer hospitality in varying degrees to visiting students, local-industry and to a limited extent to the general public.

The average capacity is 600 - 1500 students in the future. It has to occupy a key site accessible from the main thoroughfare and with all-weather approaches and if possible associated with Book-shops -- closed to cafeteria.

LIBRARY SPACES: This can be divided into areas;

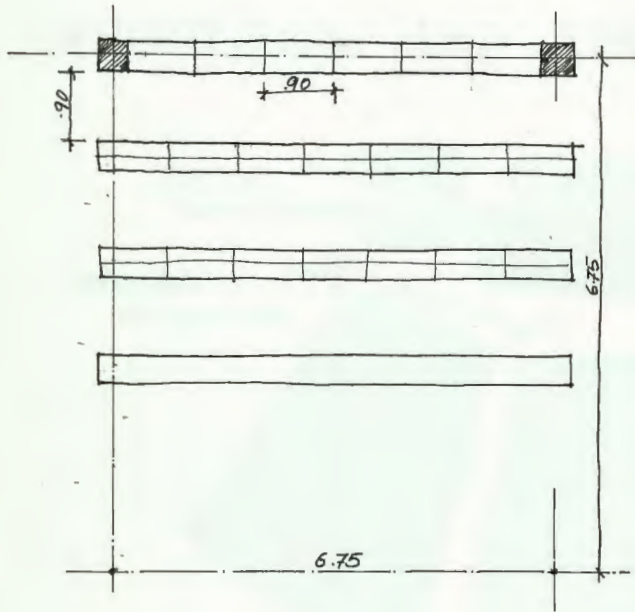
- a- Entrance; cart-catalogue, and hall.
- b- Administration spaces - for Library management and administration-workshop for binding and - storage.
- c- Stacks spaces - close stacks,
- open stacks - Reference books.
- d- Reading-- non- smoking reading area.
smoking reading area.
individual reading area.
Group reading area.

STACK SPACES: 1.00 M^2 housing 110 volumes.

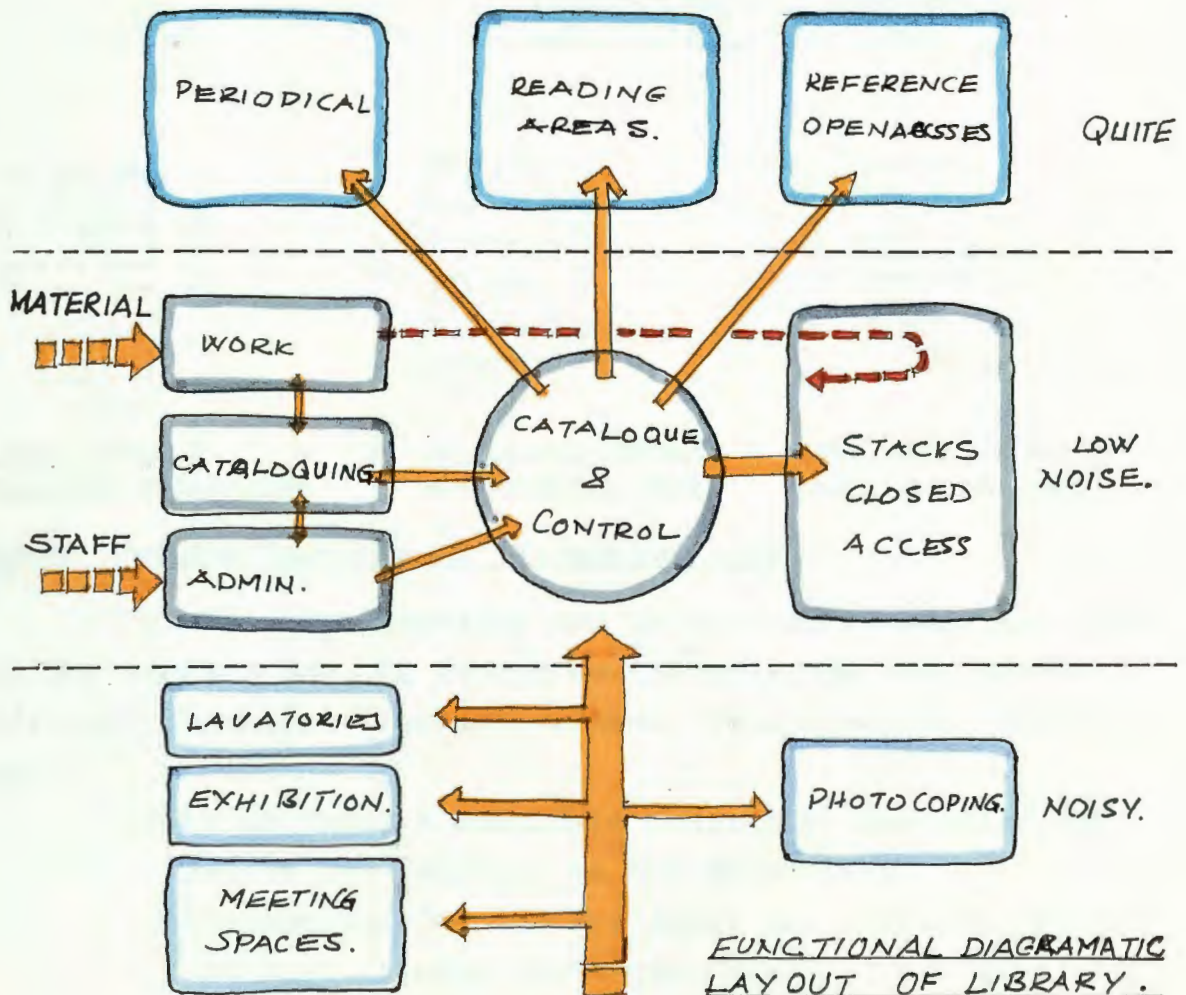
1.00 M^2 is required sufficient for circulation and 430 volumes increases per one year.

$$\text{STACK SPACE} * \frac{\text{No. of volumes}}{110} + (\text{seats} \times 3.7) + (\text{circulation}/430)$$

FURNITURE & EQUIPMENTS: a- Fixed or built-in multifier book stacks.
b- Loose or movable - chair, table, desks of some kinds, carrels, and audio and micro- film equipment.
c- Equipment which has limited life and must be replaced.

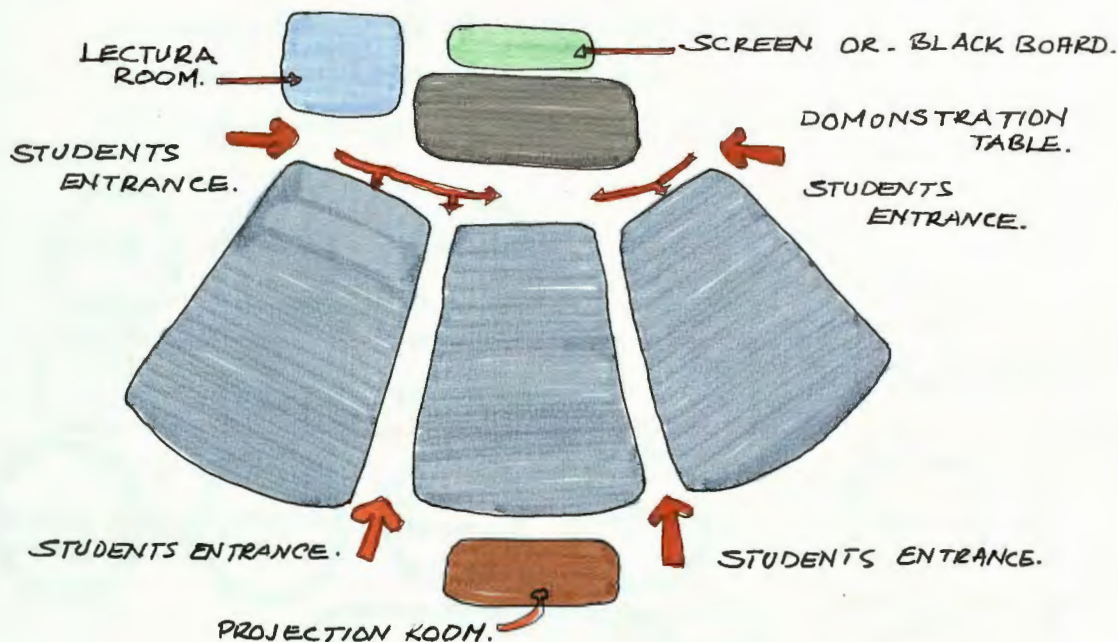


STACKS LAYOUT
WITHIN STANDARD
RECOMENDED GRIDS

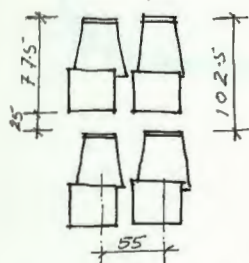


FUNCTIONAL DIAGRAMATIC
LAYOUT OF LIBRARY.

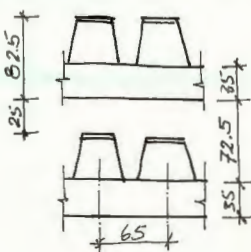
AUDITORIUM AND LECTURE THEATRE SPACES.



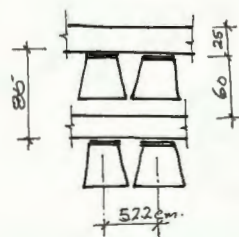
DIAGRAMATIC LAYOUT OF LECTURE THEATRE.



a, FIXED SEAT & MOVABLE TABLET ARM.



b, CONTINUOUS COUNTER AND PIVOTED SEAT



c, SEAT-BACK COUNTER AND FOLDING SEAT.

THREE POSSIBLE FURNISHING. ALTERNATIVES.

It is very expensive and it is usually very low used for few hours a day. It should be flexible and that perform different function - lecture, sinema, demonstration, theatre etc.

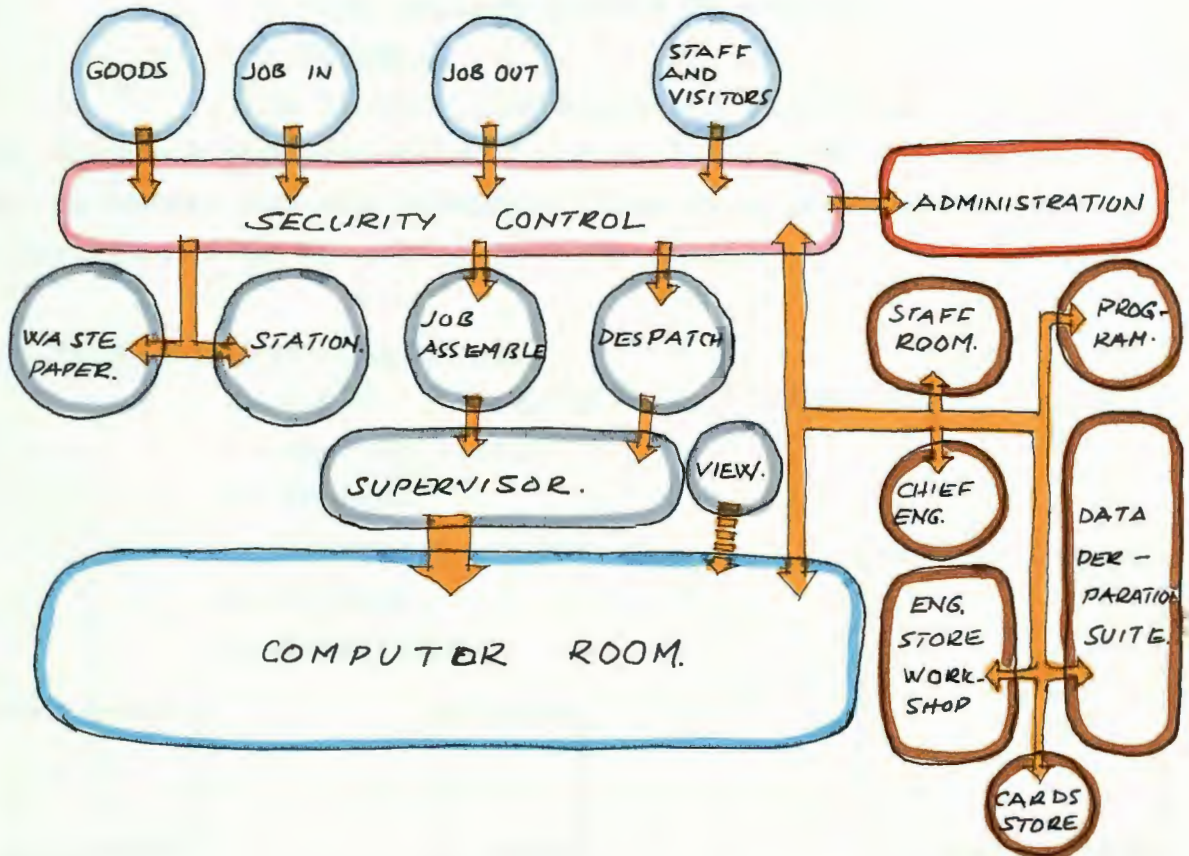
- Longe Theatre should be centrally timetabled and not be the territory of one department.
- Viewing raising the eye level and uniformly sett- ing up a viewing curve-min change of eye level 60 mm

- Medio 2' " " " 125 mm.
- Max " " " " 200 mm.

COMPUTER CENTRE SPACES.

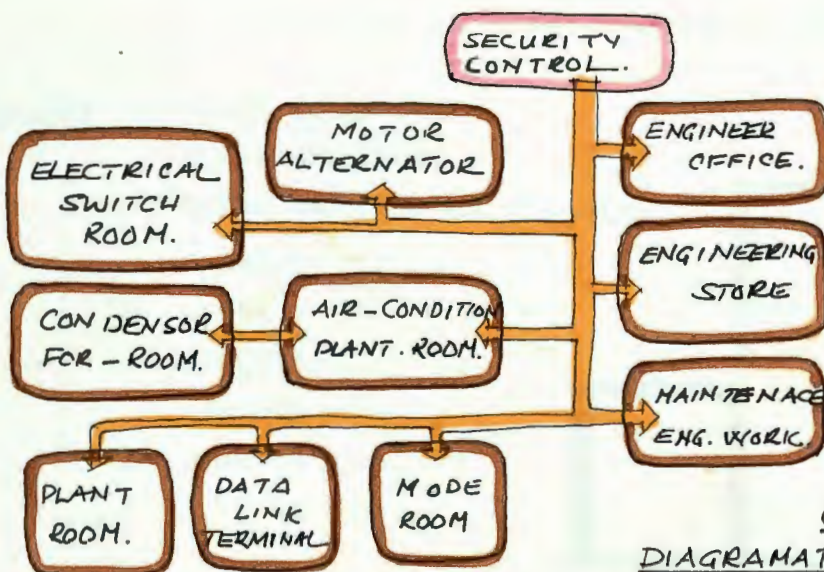
It is to provide a Computing Services. The Computer Centre is divided in to 3 (three) basic division:

- a- Computer Room and Ancillary Spaces.
- b- The Administrative Spaces.
- c- The Plant Spaces.



"A MINI COMPUTER CENTRE"

DIAGRAMATIC LAYOUT.



CIRCULATION. DIAGRAMATIC PLANT-SPACES.

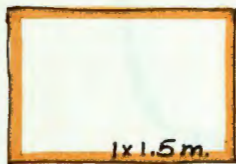
SPACE REQUIRE: For a Mini Computer one large space will be enough.

- The office accommodation will be 50 % of The Computer room.
- Corridor and Welfare accommodation is also 50 % of Computer Room.
- View gallery should be raised 30 - 40 mm. higher.

It is more economical to start with one single Computer and preferable to a collection of several slower machines. The main Computer room is also important show place, it has to be easily seen by public.

The Mini Computer consists of:

- a- C.P.U. (Screen plus key board. (central processing unit.)
- b- Memory.
- c- Secondary Memory.
- b- Printer.
- e- Stabilizer.



HAND DISC DRIVE



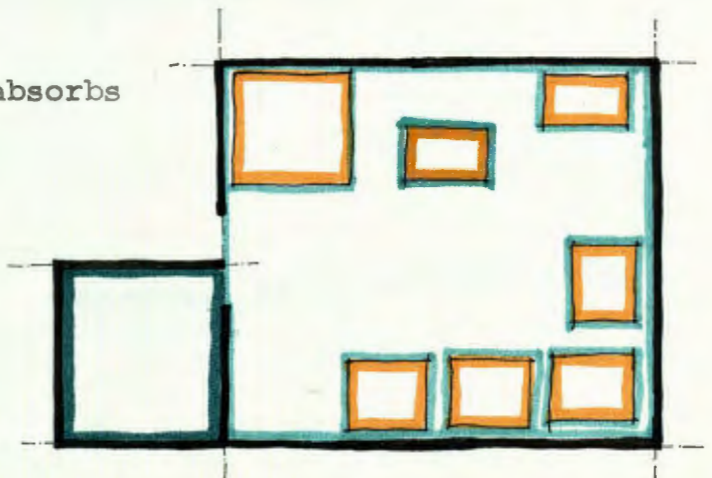
PRINTER.



C.P.U.

IT has to be inter facing peripheraries for C.P.U.

- SPACE:
- a- Sound proove air-tight door.
 - falds ceiling to absorbs sound.
 - b- Light, artifical, natural.
 - c- temperature, 15 C to 10 C.



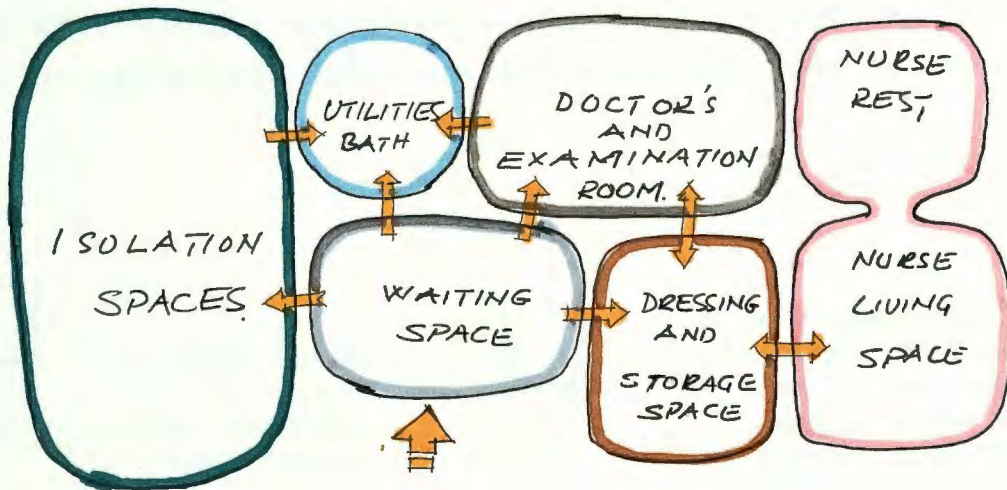
Student's Union Spaces.

The Student Union spaces is best located on the midst of the Student Housing and in fronting the academic area.

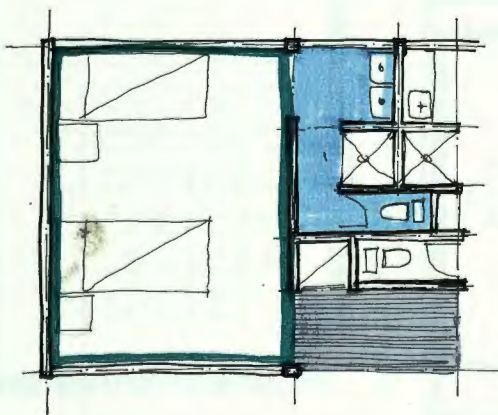
Students' Health Centre Spaces.

The Student Health Centre will be located near the Student Union spaces and it will consists of:-

- a- Doctor's room and examination area.
- b- Two wards for 4 (four) students each.
- c- Dressing and storage spaces plus utilities facilities.



DIAGRAMATIC
CIRCULATION OF HEALTH
CENTRE.



EXAMPLE OF ISOLATION ROOM.

TUTORIAL, SEMINAR, CLASS AND INDIVIDUAL STUDING ROOM SPACES.

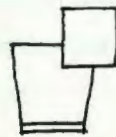
Tutorial Rooms:- are narmally given in staff offices however, sometimes special Tutorial rooms are provided.

Seminar and Class Rooms:- are only common type of classroom can do. It mostly depends on the size of the group. Both furniture and the room should allowed for different arrangements.

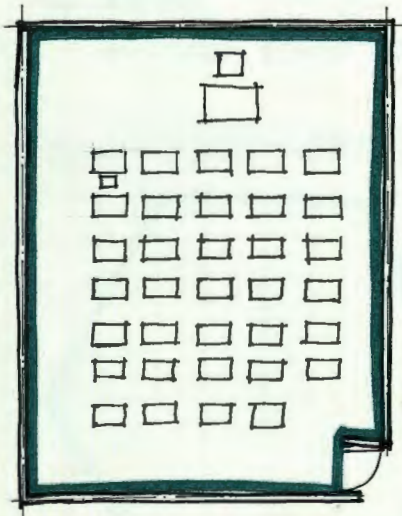
In Morden Education method, less emphassis is layed on chalk and talks. More is layed on discussions of project - work, requiring less formal arrangement of furniture. Increase use of Audio-visual equipment - over head projection, T.V. film and slide projection will required a storage area in each class room.



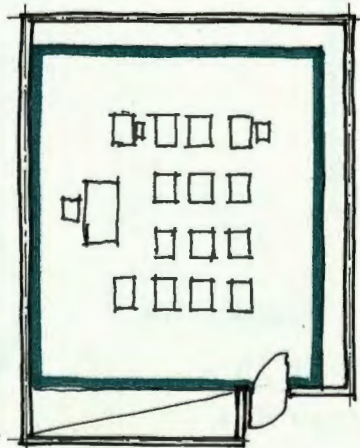
a, LARGE TABLE WITH A CHAIR. FOR FORMAL CLASS ROOM.



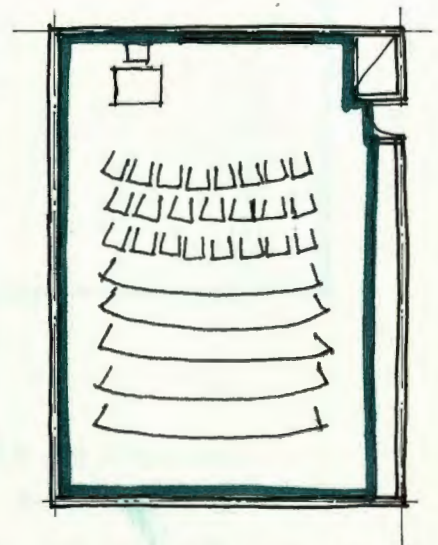
b, A CHAIR WITH FIXED TABLET. ARM. GOOD FOR UNIVERSITY OR INSTITUTIONAL CLASS ROOMS. IN FORMAL. TYPE.



a, FORMAL CLASS ROOM FOR LOWER LEVELS OF EDUCATION. (TAKES LESS).



b, PROFESSIONAL CLASS ROOM.

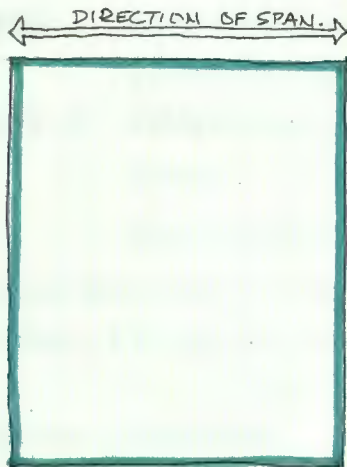


c, INSTITUTIONAL LECTURE CLASS. BEST FOR INSTITUTE. (TAKES MORE)

The arrangement of the classroom will change or affects the usable space area;

- a- It is formal and thus has less and average student number.
- b- Informal arrangement of typical classroom. It is more of tutorial type and more scientific classroom.
- c- Best for lecture classes - It can take more than 64 student in same space as (a)

(Folded partition is best for long large spaces, but it has a lot of disadvantages - noise problem - it is not strong - to improve the structural stabilities is very expensive.)

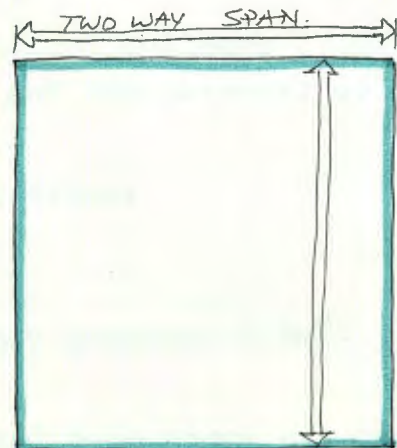
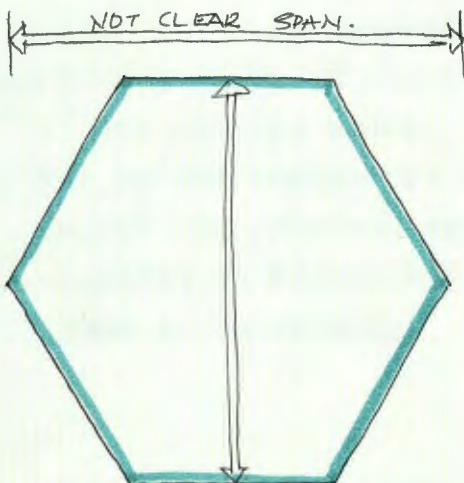


(a) RECTANGULAR

More formal - good - simple structure and easy to construct - clear space.

(b) SQUARE

- large span difficult to cover.



(c) SHAPPED

- difficult to furnish, and very expensive to construct - Not good for foldable partition.

TEACHING LABORATORIES SPACES.

It is considered as an integral part of Educational Structure and it presents architectural planning problems because of its various specific purposes.

Teaching Laboratories are placed in three main categories:-

- a- Those which deal with fundamental principle, (equipment or apparatus are portable and experiment).
- b- Those with fixed apparatus.
- c- Smaller room where individual work is a task. Such as staff research, intensive study and advanced working can be carried out.

TYPE A Electrical Engineering Laboratories and Surveying Laboratories, as well as Architecture Studios.

TYPE B Mechanical, Civil Engineering and Building laboratories.

The sizes of Laboratories depend on the number of Faculties and Students involved - and the complexity of the works. It may be one large space or a number of small rooms.

DESIGN STANDARDS

The major Aspect of Technical Colleges Laboratories is more practical than academic, and the personal working spaces at the upper level includes:-

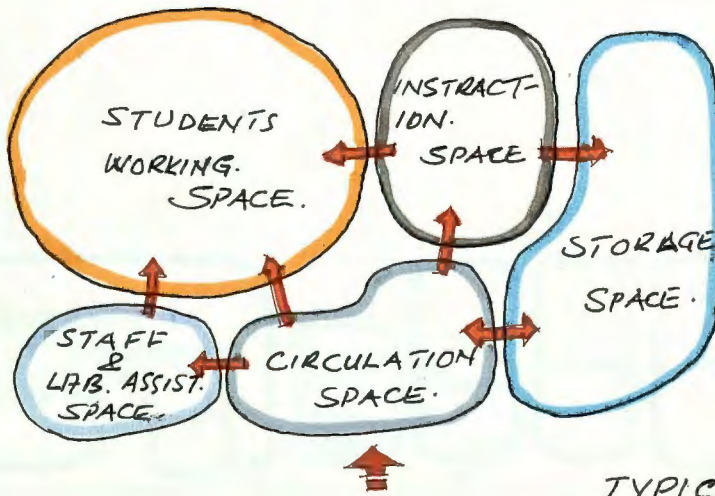
- a- Bench spaces (working table)
- b- Seating spaces.
- c- circulation spaces.

-- Which will be of the order 4.95 M^2 per student- 3.5M^2 - 4.5 M^2 for writing space.

-- For in the individual Laboratories and test rooms are required per personal space $9 - 10.8 \text{ M}^2$, extra space is also required in Electrical and Mechanical test rooms for larger items of equipment.

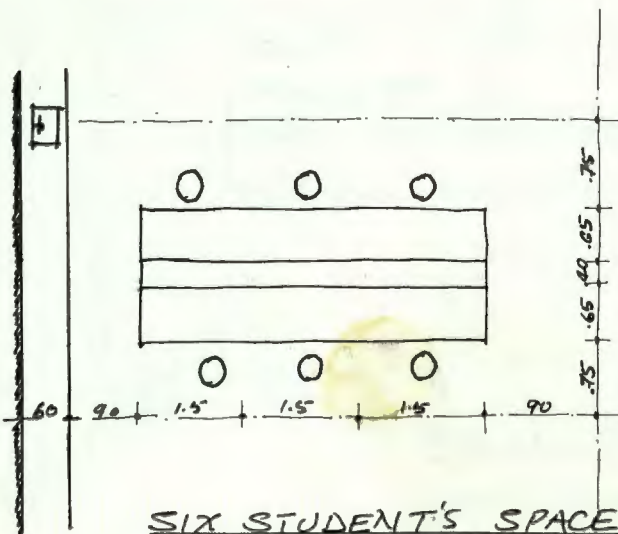
TABLE (I8) LABORATORIES CLEARANCE. (HEIGHT IN METERS)

NO.	ENGINEERING LAB.	AREA M ²	CEILING HEIGHT M
I	LIGHT LABORATORIES.	90	3.0 - 3.60
II	HEAVEY LABORATORIES.	180	4.05 - 6.0



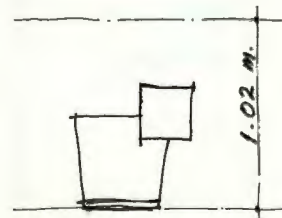
TYPICAL LABORATORY SPACE :

[FUNKTIONAL DIAGRAMATIC RELATIONSHIP.]



SIX STUDENT'S SPACE.

a, BENCH + STOOL b, SIDE STORAGE AND SINK.



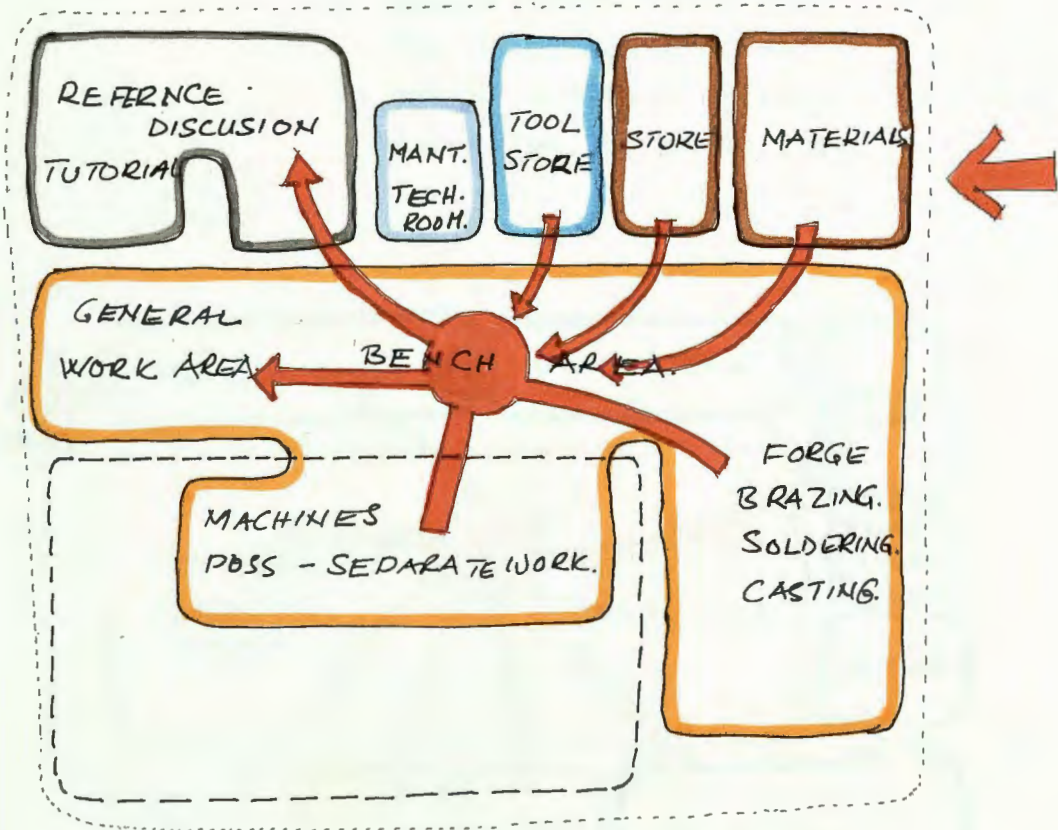
CHAIR WITH FIXED TABLET ARMS.
USED FOR INSTRUCT-
ION - SPACE.

TEACHING WORKSHOPE SPACES.

Work Shops are also an integral part of the Technical Education for pratical purposes; The sizes of the work shops depends on the number of Student who are using it at the time.

These includes all type B laboratories:

- A- Mechincal Machine shop.
- B- Welding Shop.
- C- Sheet Metal shop Complex.
- D- Carpentry shop.
- E- Electrical Work Shop Complex.
- F- Brick Laying Shop.



DIGRAMATIC LAY OUTS SHOWING
FUNCTIONAL REQUIREMENT OF
TYPICAL WORK SHOPS

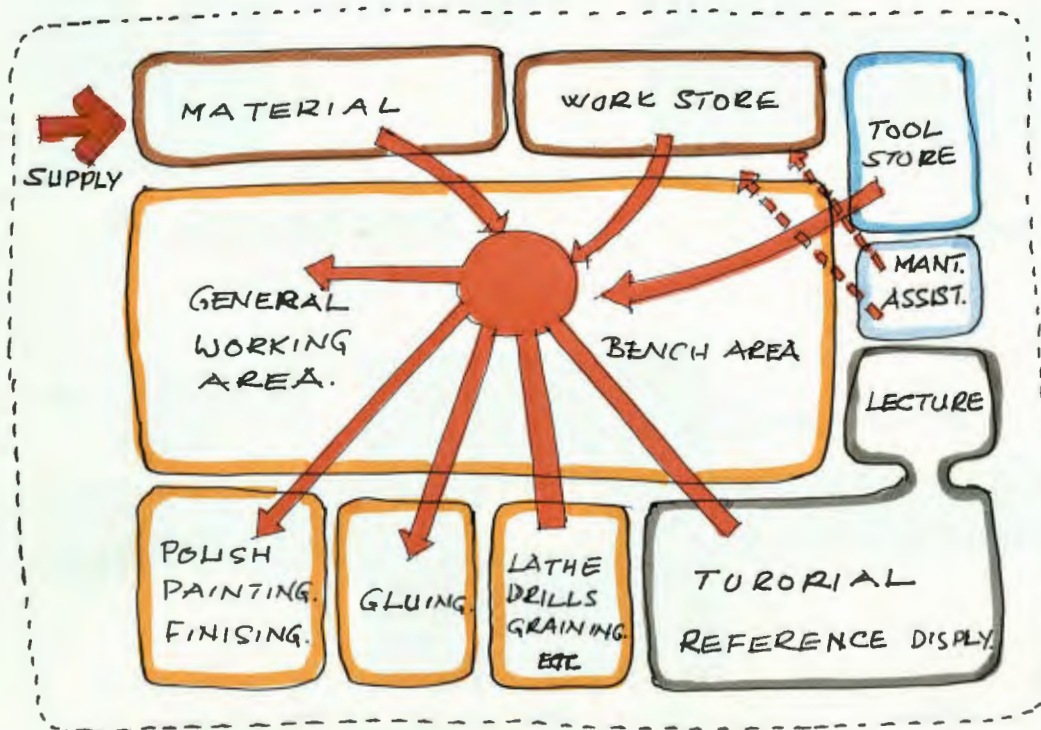
FUNCTIONAL ASPECTS: Proximities either between group of rooms and individual, activities or individual activity background information to be use include Teaching Building character.

Location of the rooms could be decided according to functional criterion only because of constraints created by primary spaces quality.

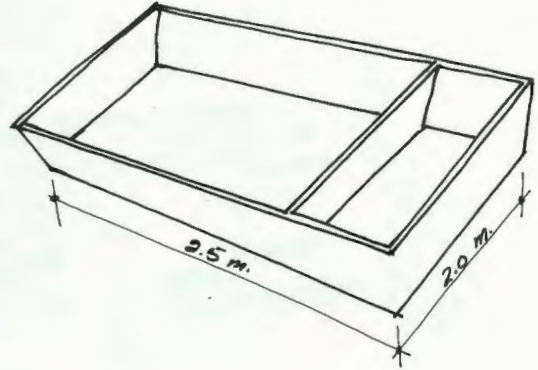
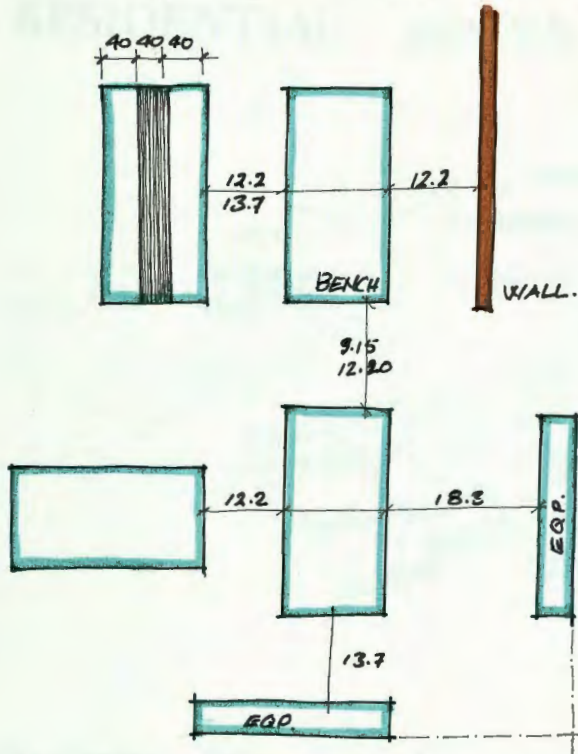
T

TECHINICAL ASPECTS TO BE TAKEN INTO CONSIDERATION WHEN ZONING:-

- 1- Separation of noise and quite actions.
- 2- " " wet and dry action area.
- 3- Isolation of smelly or dirty area.
- 4- " " dangerous action area.
- 5- " " activities producing vibration.
- 6- Special location of room require access for bulky equipments.
- 7- special location of room near windows, core area, or stair case.

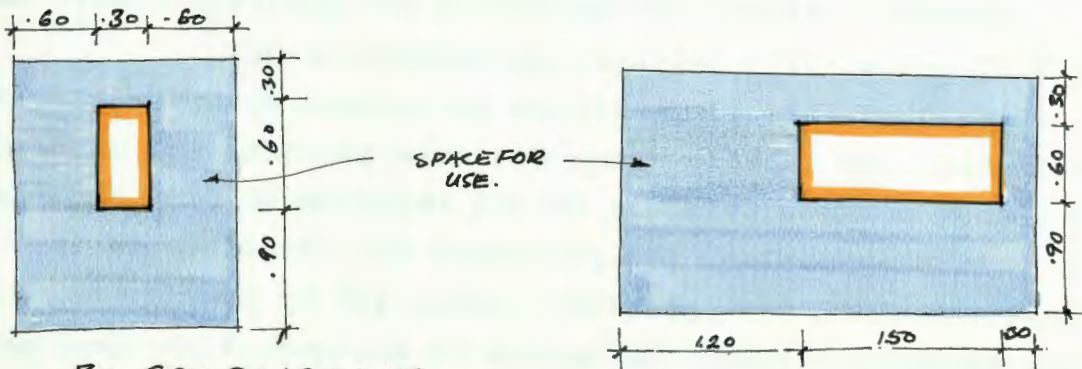


Working Spaces in the Workshope.



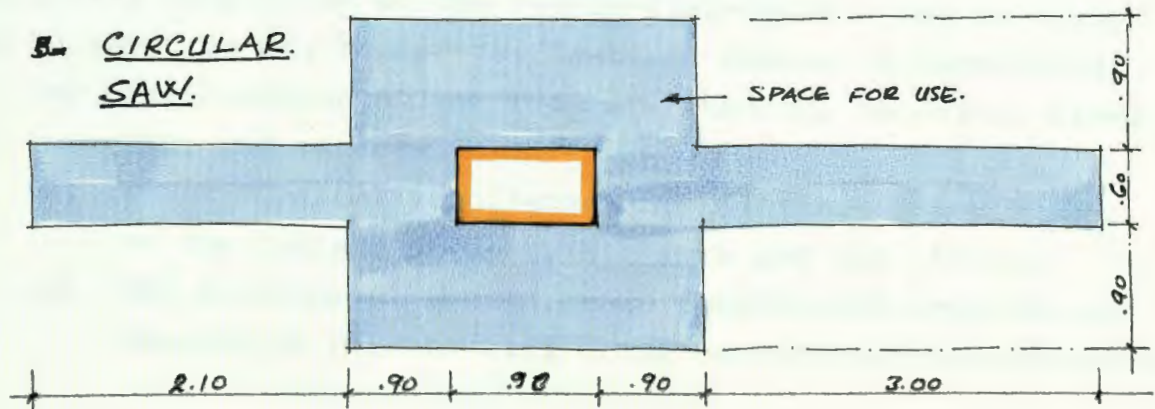
2- "SAND MOULD" FOR
BRICK LAYING
SHOPS.

1- CLEARANCES FOR LAYOUT
OF METAL SHOPS



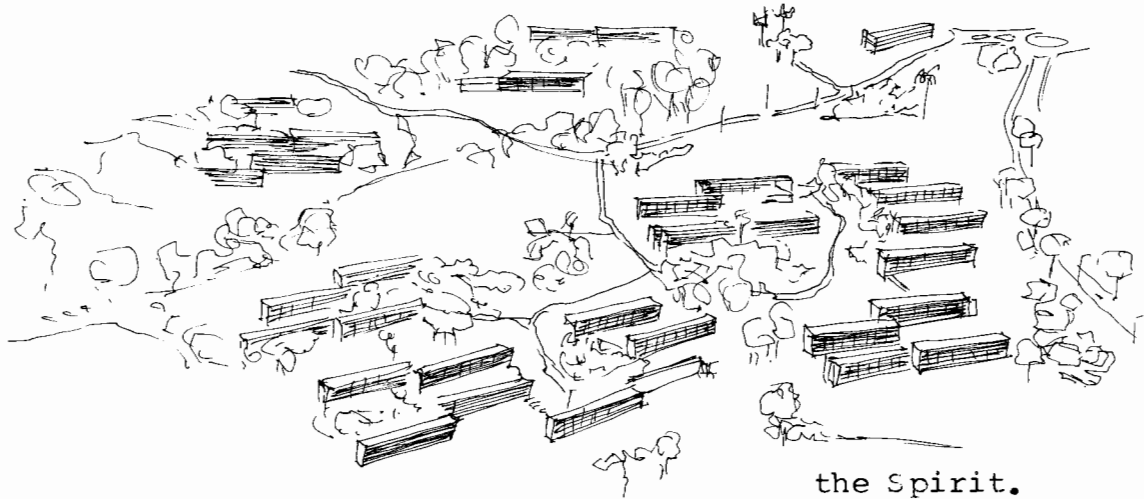
3- GRINDING STONE.

4- LATHE



5- CIRCULAR
SAW.

RESIDENTIAL SPACES.



Students' Housing Spaces.

Student Residence Hall will be the first main type of accommodation require. In the future, more independent living quarters may be needed for married Students.

The accommodation required will be for 75 % of the total Student population enrolled. It will be closely linked to the teaching area and sport fields. The Student's residence will be occupied for 40 (fourty) weeks a year and it will be available for Technological Conference during the Vacation or used it for Summer Training. The Student's Residence Hall will comprise of single and double occupancy and ensured space for studing.

A Student room is very important because a substantial proportion of the twenty-four-hours a day is likely to be spent in it. Therefore, features should be considered;

- (a) The function of the room are studing, relaxing, sleeping, and storage.
- (b) It is Physical requirement are distinctly applicable to the College Student, his work and his living.
- (c) The environment should be so constructed that the accumulative effects will bring confort and satisfaction.

- (d) The room should help to satisfy the individual needs for privacy, security, companionship, shearing and support.

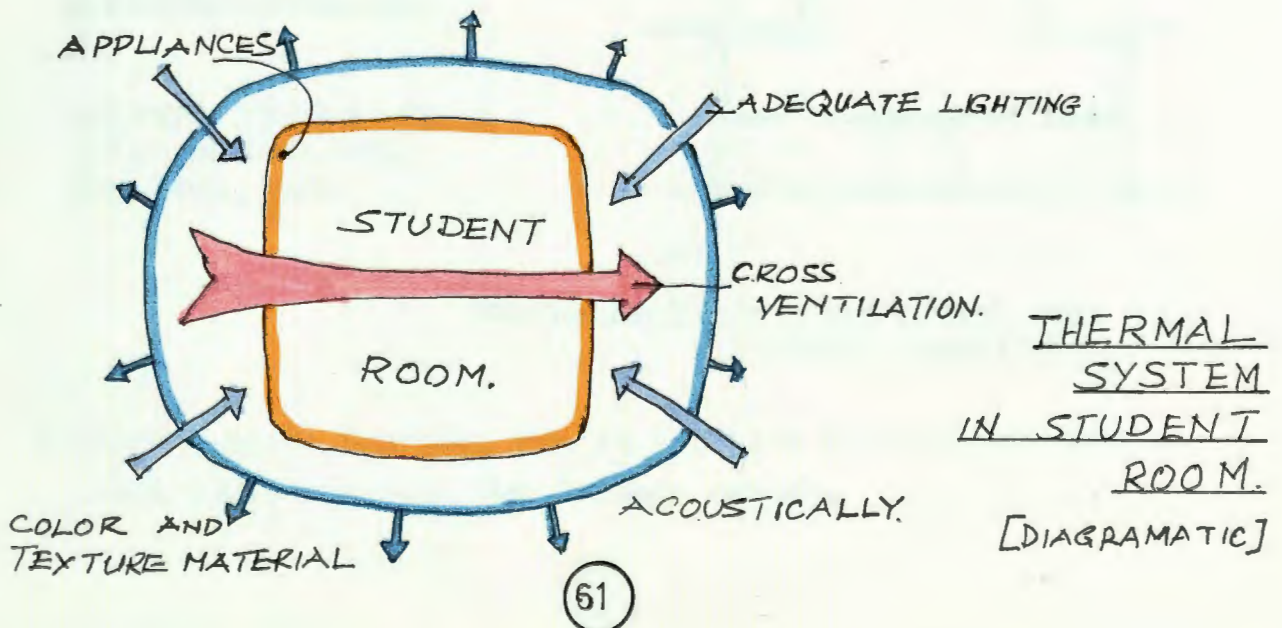
A sense of **privacy** can give a feeling of protection and security that enables the individual to relax, to reflect and gain greater insight into his own conduct and purposes, at the same time privacy may encourage greater concentration in study. The value of privacy, however, it does not necessarily suggest that single rooms are preferable to the double rooms.

Furniture.

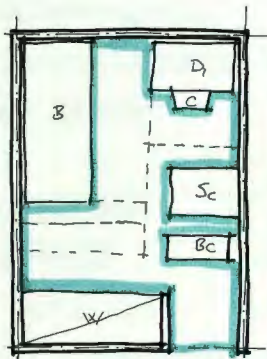
TABLE (19) KIND & NUMBER OF FURNITURE IN STUDENT'S ROOMS

KIND OF ROOM	No. BED	BEDSIDE TABLE	DESK	CHAIR	DRAWER	SELVES WARD.	WARD.	AREA M ²
SINGLE RM.	1	1	1	1	1	1	1	11.2
DOUBLE BED	2	2	2	2	2	2	2	18.5

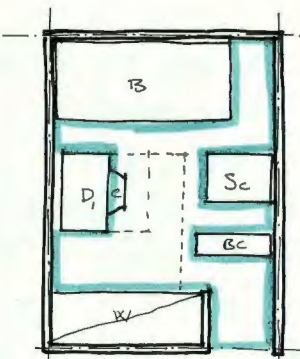
- (a) The Furniture size and use space are the average of existing furnishing.
- (b) Each furniture layout assumes the item placed along a wall, and any item will automatically required additional space.
- (c) Built in furnishing are much more better than movable wardrobe-because the size of the room is only for one possible arrangement.



The Thermal System in the Student Housing allows for individual requirement because of variation in Student Hygiene Air must be kept moving and clean - separate ventilation of individual space must be provided.

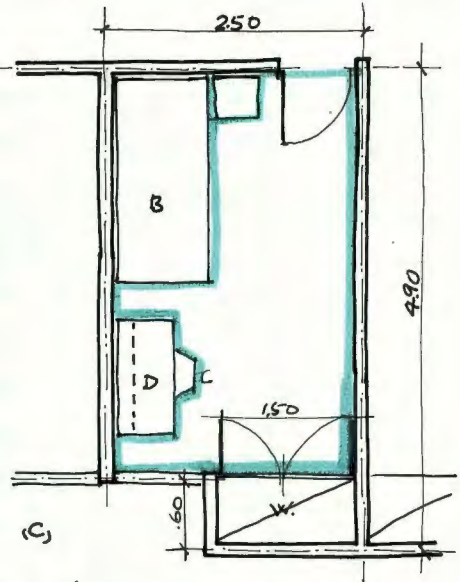


(a)



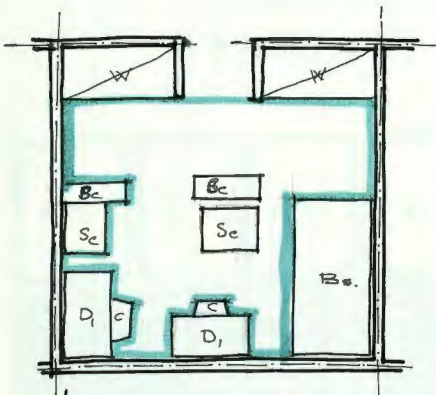
(b)

OPTIMUM SINGLE ROOMS. 9.0M².
AREA (TWO SMALL) (a&b)



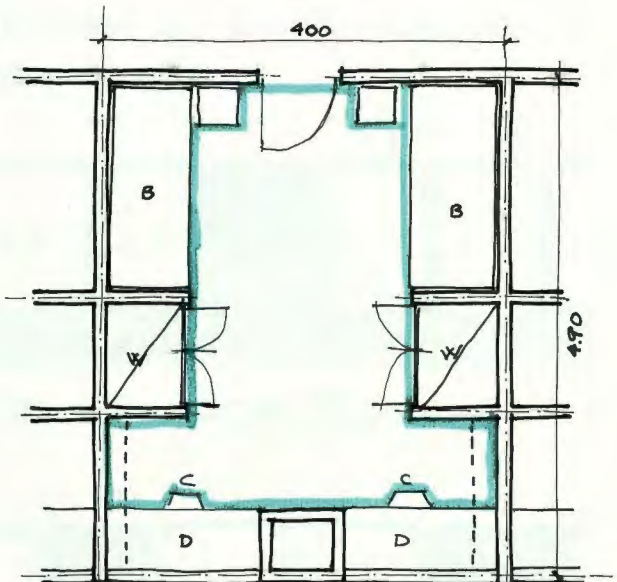
(c)

SINGLE ROOM (GOOD ENOUGH). (c)



(d)

OPTIMUM DOUBLE ROOMS.
(d - BUNKED BEDS)
(NOT BEST USED)



(e)

DOUBLE ROOM - WITH NON-BUNKED BEDS.
(GOOD ENOUGH).

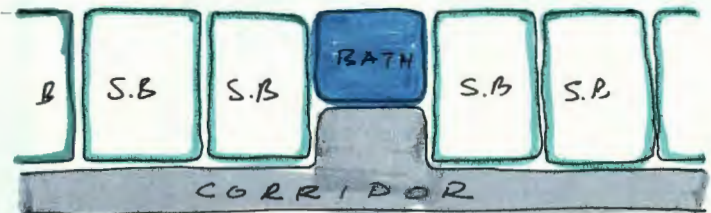
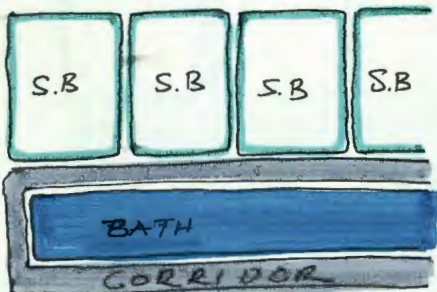
-- Bunked Bed's problem, one is not free or does not get free rest always, single bed is much better,

Facilities: Toilets and Shower Spaces.

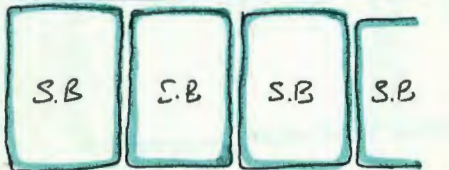
Table (20) MINIMUM NUMBER OF PLUMBING FIXTURES.

TYPE OF BUILDING	WATER CLOSETS	URINALS	LAVATORIES	BATHTUBS OR SHOWER	DRINKING FOUNTAIN.
DORMITORIES INSTITUTIONAL OR LABOR.	1 per 10	1 per 25 over 150 1 // 30	1 per 12 or 1 per 50	1 per 8 over 150 1/20 each	1 per 75
DWELLING	1 per UNIT	1 per U	1 per U		
PUBLIC BUILDING	1*15 1	MANS' T	1-15 1		
OFFICES.	16- 35 2	1/2 T.	16-35 2		
	36-55 3		36-60 3		
	56-80 4		61-90 4		
	81-110 5		91-125 5		
	111-150 6		1/A 45		
	1/ A 40				

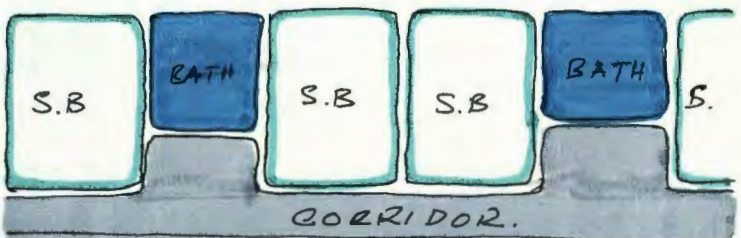
Consideration should be given to their function as related to individual needs for privacy and sociability this can be done by either;



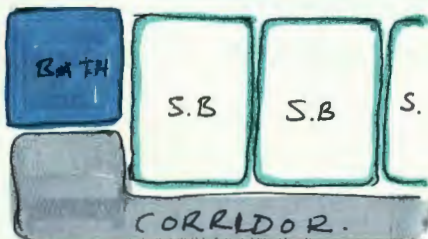
b, MIDDLE-LOCATED



q, CENTRALY LOCATED



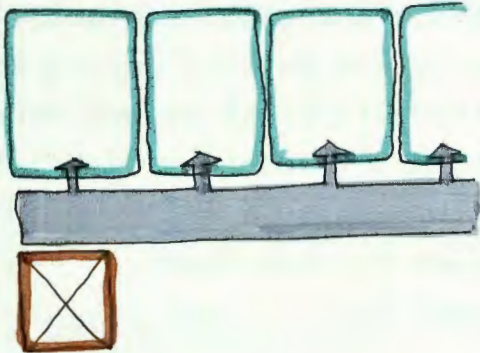
C, DISTRIBUTED IN BETWEEN ROOMS.



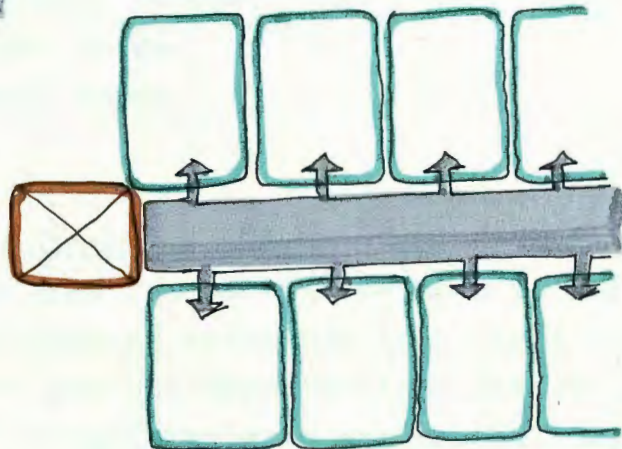
d, END-LOCATED.

- (a) has a lot of problem, light, ventilation, and constant maintenance.
- (b) & (d) has only problem of constant maintenance.
- (c) It doesn't need much maintenance and long term cost - serving but expensive at the initial cost.

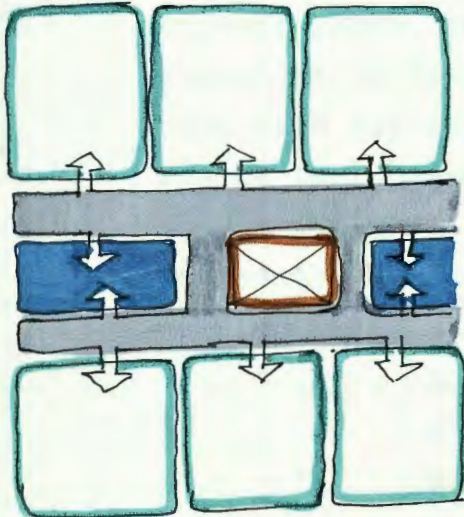
Services to the Rooms.



a SINGLE LOADED CORRIDOR.



b, DOUBLE LOADED CORRIDOR.



c, VERTICAL HOUSING CORES.

The Best for the climate of Juba is single loaded corridor, because of the cross ventilation. No - heating system to be used.

In order to stimulate individual development and facilitate interdisciplinary contacts, the residences will be built in clusters of Halls. Each hall, may consist of single floor or interconnected story building. That will accommodate about 321 student in each block. Each cluster will accommodate 640 - 650 Students, in 160 single rooms and 482 double rooms.

Each building will have a common room for reading, sitting and reception rooms, Also each cluster will have common Dining Hall on the ground level, kitchen and a common hall. Ather common facilities will be centralized in each building or for both cluster, like central laundry, telephones etc.

There will be 4 (four) Blocks,
Each with 80 single rooms,
And 240 double rooms,

Students Residential's Common Hall Spaces.

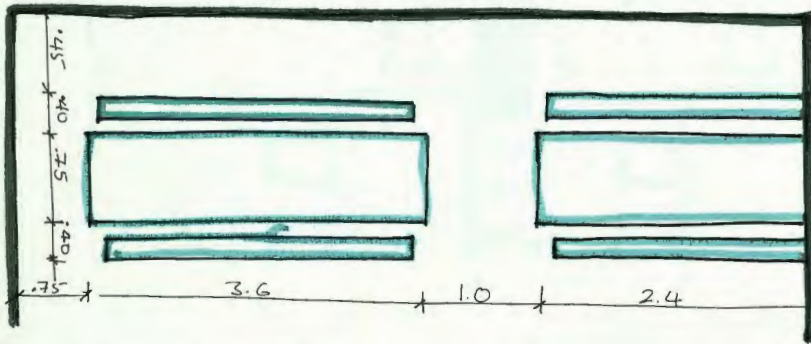
This common- use area can contribute much to social and physical environment favorable to Student growth and learning - provide opportunities for sociability and also to contribute to greater privacy in Student rooms. The atmosphere of it is a partially a product of furnishing, decoration, and illumination with natural light or artificial. The main - lounge is located on the first floor in at least one of the hall. In some other hall it can be placed on the ground floor.

FURNITURES:- a- Lounge Chairs.
b- Semi-Lounge Chairs.
c- Tables - big size and coffee size.
d- Ordinary Chairs.

Dining Spaces.

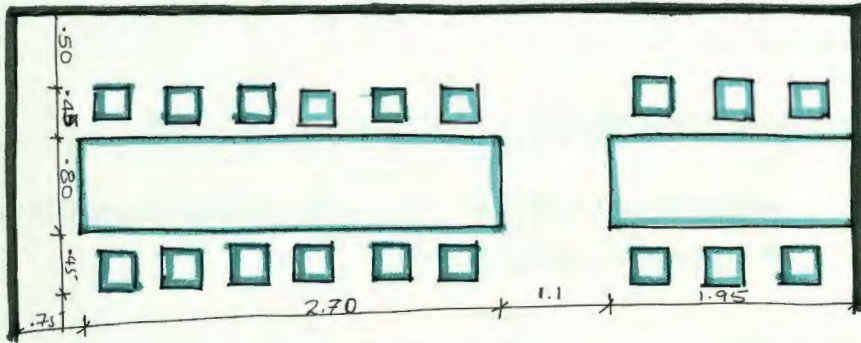
Self - Service Dining Area, It serves as a focal point where students can meet, exchange views and get to know each other better on top of only eating space. Factor to be considered are:-

- a- Number of persons and space at table.
- b- Space of chair and seating arrangement.
- c- Size and type of furniture and storage spaces.



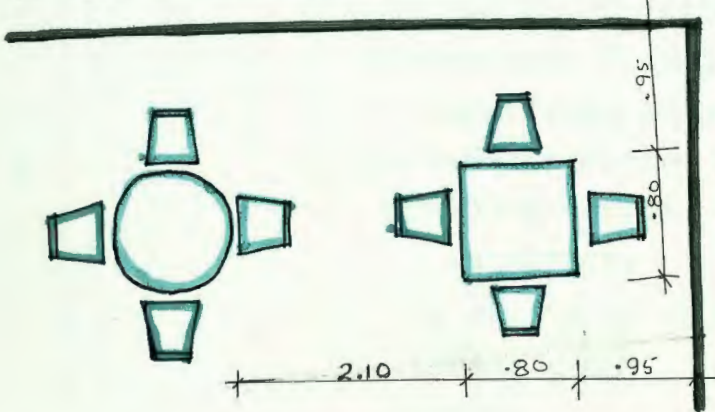
"IT IS AN COMFORTABLE DIFFICULT TO CLEAN,"

a, LONG TABLES WITH FREE STANDING BENCHES.



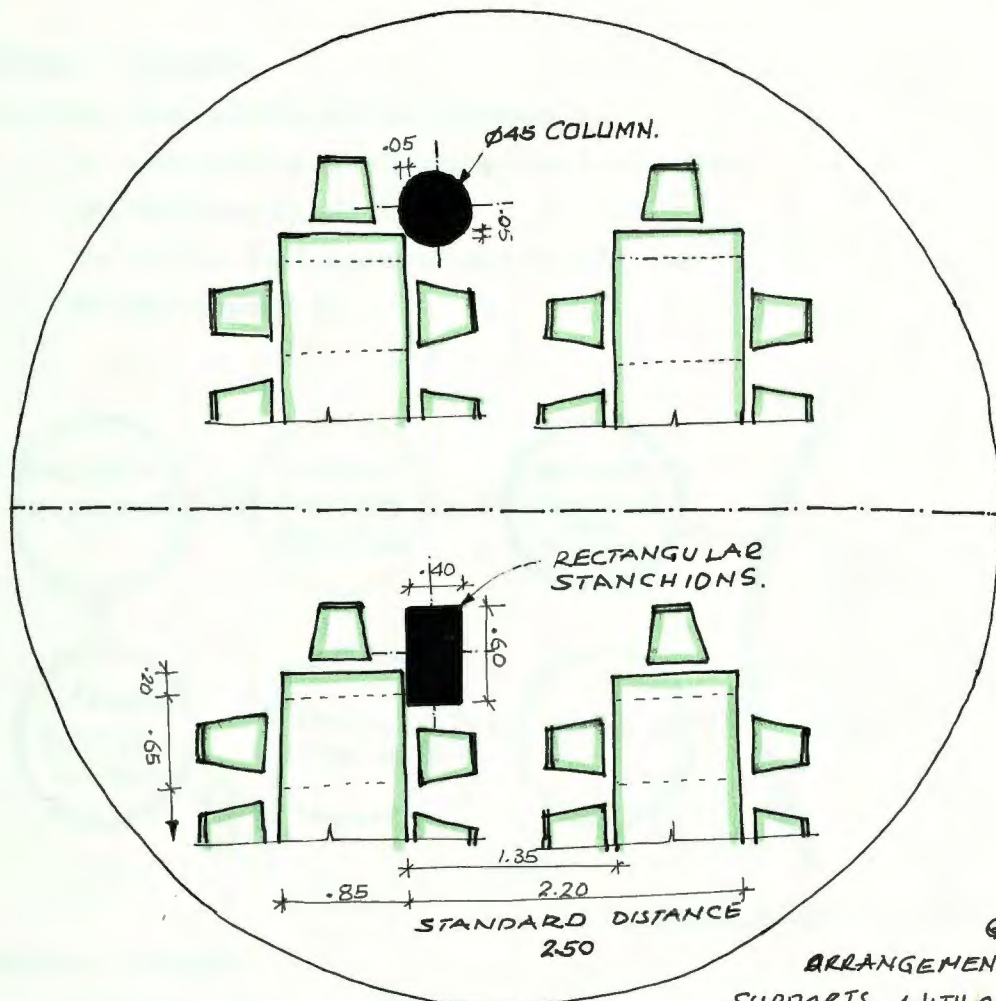
"ARE BEST USED IN STUDENTS DINING HALL. GOOD, EASY TO CLEAN AND (NOT DISTRIBUTING) IT ENCARAGE SOCIABILITY MORE"

b, LONG TABLE WITH CHAIRS.



(GOOD FOR STUDENTS CAFETERIA. IT BEST ENCARAGE SOCIABILITY MUCH BUT. HAVE THE TENTATIVE OF MOVING CHAIRS AROUND.]

c, SMALL SQUAR OR CIRCULA TABLE WITH CHAIRS.



GOOD ARRANGEMENT OF SUPPORTS WITHOUT LOSS OF SPACE FOR DINING HALLS.

SPACE SAVING ARRANGEMENT OF SUPPORTS.

SPACES REQUIREMENTS: a- Cafeteria College 1.08 - 1.35 M²
 b- College Residence 1.08 - 1.35 M²
 per Seat.

RESIDENCIAL DINING : The Dining Space in Apartments and vi Villas is of differant nature;

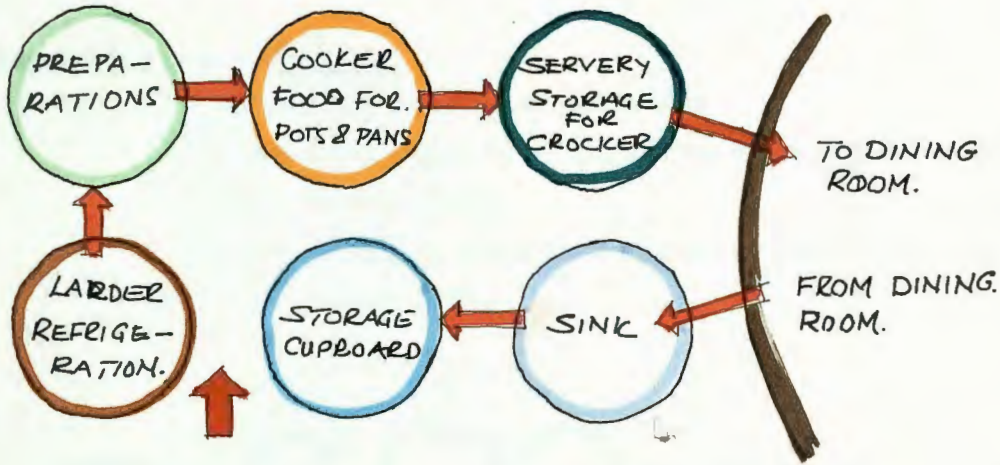
- I- Separate dining room between kitchen and Living room.
- II- Outdoor dining space. should lie on wind protected area with water proof furniture.

It should be in front of dining and Living room , intragrated with house garden.

Kitchen Spaces.

There are four kinds of kitchens:

- a- Student's Residence Hall Kitchen.
- b- Cafeteria Kitchen.
- c- Villa and Appartment's Kitchen.
- d- Kitchenette.

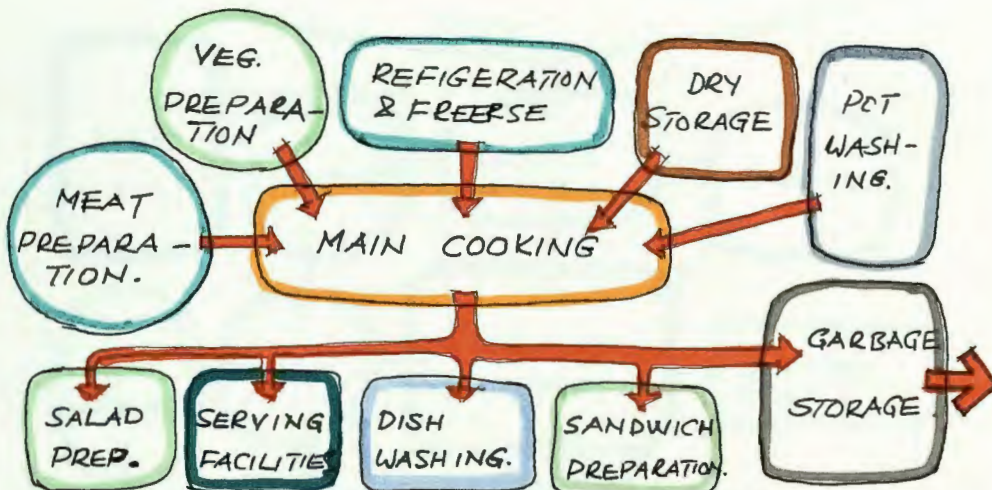


KITCHEN WORK DIAGRAM.

A SERVICE SPACES:

- Kitchen 40 % of Refectory.
- Perparation space occupies approx. 20 % of Kitchen area.
- Storage room approx. 75 % (Fruit, Vegetable etc.).

Kitchen should be sufficiently spacous for work. Some spaces should be provided for Employee Facilities: Dockers & toilets.



DIAGRAMATIC SPACE RELATIONSHIP IN A KITCHEN

Students Warden's Flat Spaces.

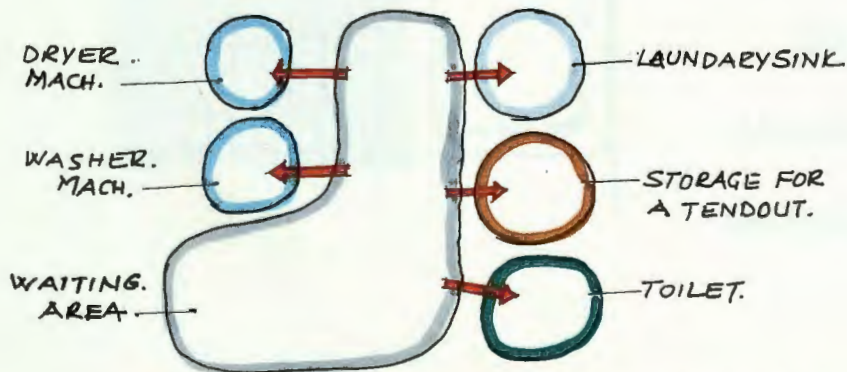
A flat for the Student Warden will be provided in each of the Blocks and should be close proximity to the Student accommodation. It will consists of:-

- a- Bedroom.
- b- Living area and Kitchenette.
- c- Utilities spaces.

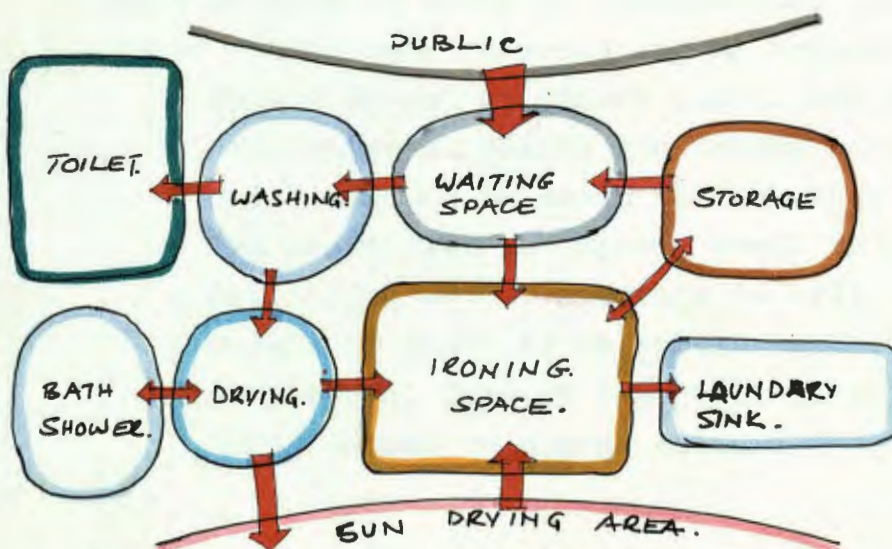
Laundries Spaces.

There will be two type of Laundries:

- a- Self-service Laundry in Student's Residence Hall.
- b- Central Public Laundry for both student and Staff.

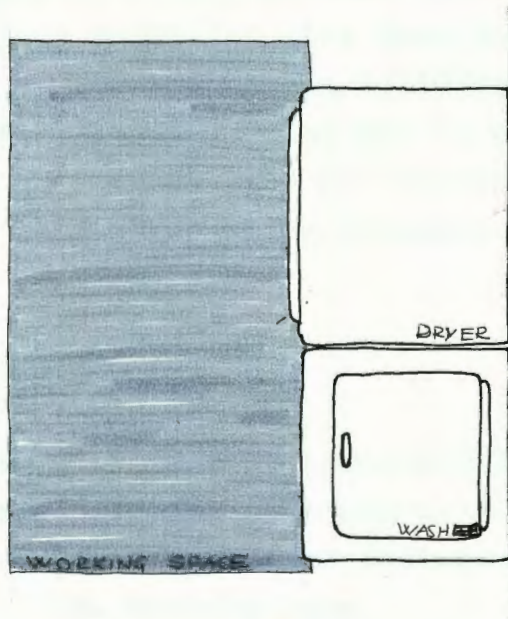


RESIDENCE HALL LAUNDRY



CENTRAL LAUNDRY -
CIRCULATION . DIA.

Arrangement of the washing and drying machine. The best position is to put them in straight line along the wall. It will give less washing space. For Self-service Laundry Coin-system Machines will be used.



STRAIGHT
LINE
ARRANGEMENT
OF
LAUNDRY MACH.

Booths are usually preferred to telephone jacks probably because of costs of installation and of relocation wiring when redecorating or replanning.

- Should be out of direct vision and yet can be convenient to dining and lounge area.
- One booth per 50 seats is the usual ratio or one phone jack per dining booth in school.
- For dining of 650 Students in hall, there should be about 13 telephone booths, four in each hall, five of them will be in common halls closed to dining area.

STAFF HOUSING.

The living quarters for the senior staff are to be spread out in the Natural environment, grouped into some settlements "Garden Village" idea. These settlements can be subdivided into neighbourhoods closed but separated from each other by green wedges to take the advantage of the Natural Vegetation in the area. The type of houses will be of two main types of buildings:

a- Villas. for most senior staff.

b- Apartment building for the other staff.

The small Housing Units can be widely dispersed throughout the campus area but impractical because of costs. It is only given prime consideration in warm areas.

Staffs Club Spaces.

A major part of this accommodation will be in the senior staff club with provision for the following:

a- Common room (lounge and bar).

b- Meeting room.

c- Game room.

d- Dining area and kitchen.

No provision will be given for swimming pool at the moment. The staff can use the common, centrally located facilities.

SPORTS FACILITIES SPACES.

BASIC OBJECTIVES:

a- Physical Education (Skill)

- (i) TO develop useful knowledge and physical skill needed to the students daily work - (mental and physical).

- (ii) To act in socially- usually ways.

(iii) To enjoy whole some physical recreation activity where skills of the many may be need.

b- Needs for Program:

To make changes in Student's mental and physical being.

SPACE STANDARDS: The main outdoor sports facilities will be centrally located between the student halls and access roads to the Institute and staff residences. It will also acts as a buffa-zone between the noisy area and the Institution.

Sports which does not need special equipment and supervision (tennis court, basket and valley ball courts) will be decentralized and placed near the Student's Halls and staff residential area. They will acts as a meeting point between all these dwellings The actual location has to be compatible with its surrounding.

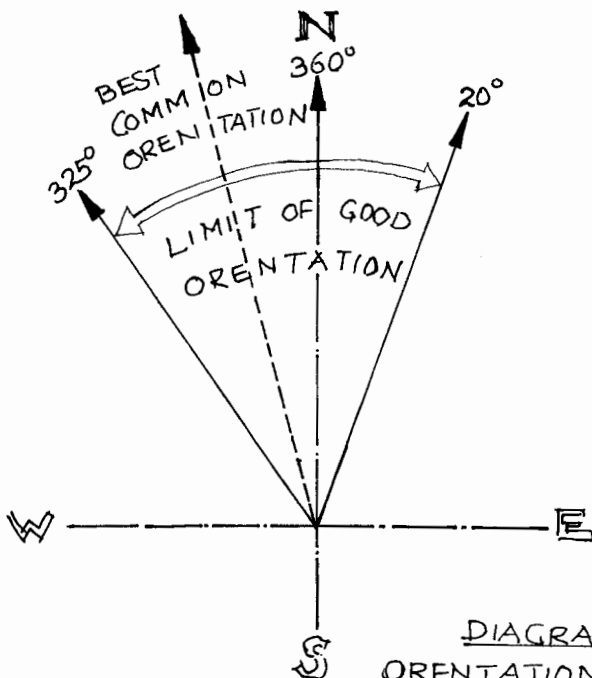


DIAGRAM SHOWING THE BEST ORIENTATION FOR SPORT FACILITIES.

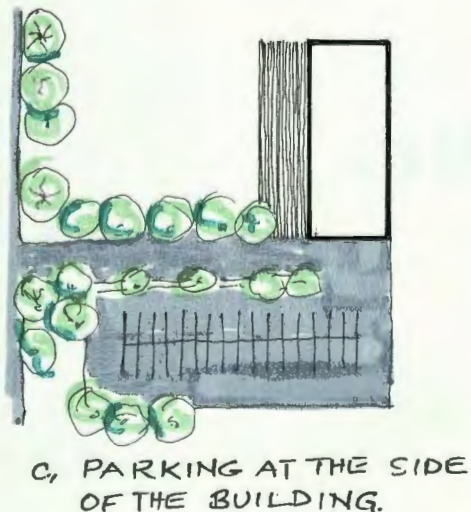
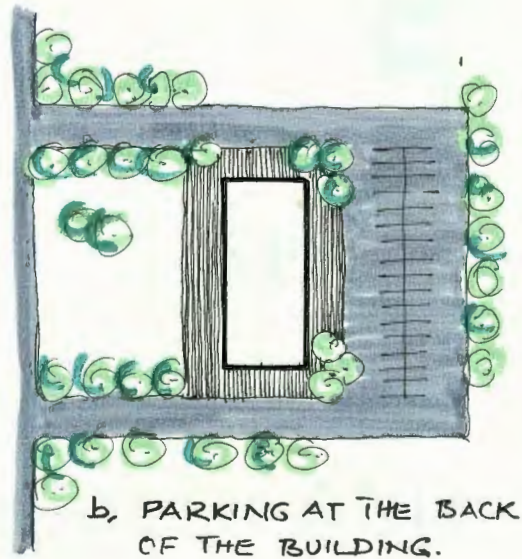
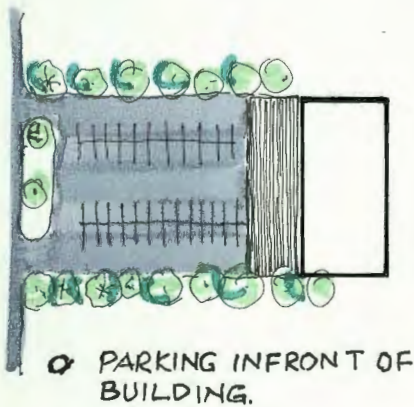
PARKING SPACES.

A minimum of Vehicular traffic should be permitted in the living area, such road should be considered services roads, only, and should not be open to the general public.

Parking facilities should be developed adjacent to the main administration building with some provision for overflow parking to accommodate larger group for special occasions.

75 % of the Staff is assumed to be driving and 25 % of the off campus student is also assumed to be driving, That the parking provision is provided for. Parking provision is solved in variety of ways, using techniques of:

- a- Parking structures - for staff housing.
- b- Parking lots around the apartments and administration and student's hostels.



PARKING SPACE 25 m².
ROAD SIZE 4 - 6 - 8 - 10 meter WIDE
AND 2.00 M SIDE WALK.

THE BEST PARKING IS NOT TO BLOCK THE BUILDING FRONT. COMBINATION OF THE ABOVE WILL BE THE SOLUTION.

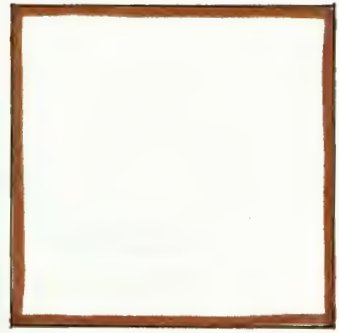
5

SPACE
RELATIONSHIPS
AND
COMMUNICATION
PATTERNS

AREA SPACE
PROPOSTIONS.
1:1500.



CENTRAL ADMINISTRATIVE.



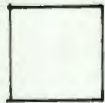
WORKSHOPS.



LIBRARY.



AUDITORIUM.



OUTDOOR
THEATER.



COMPUTER
CENTRE.



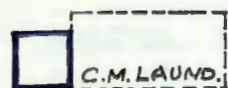
CAFETERIA.



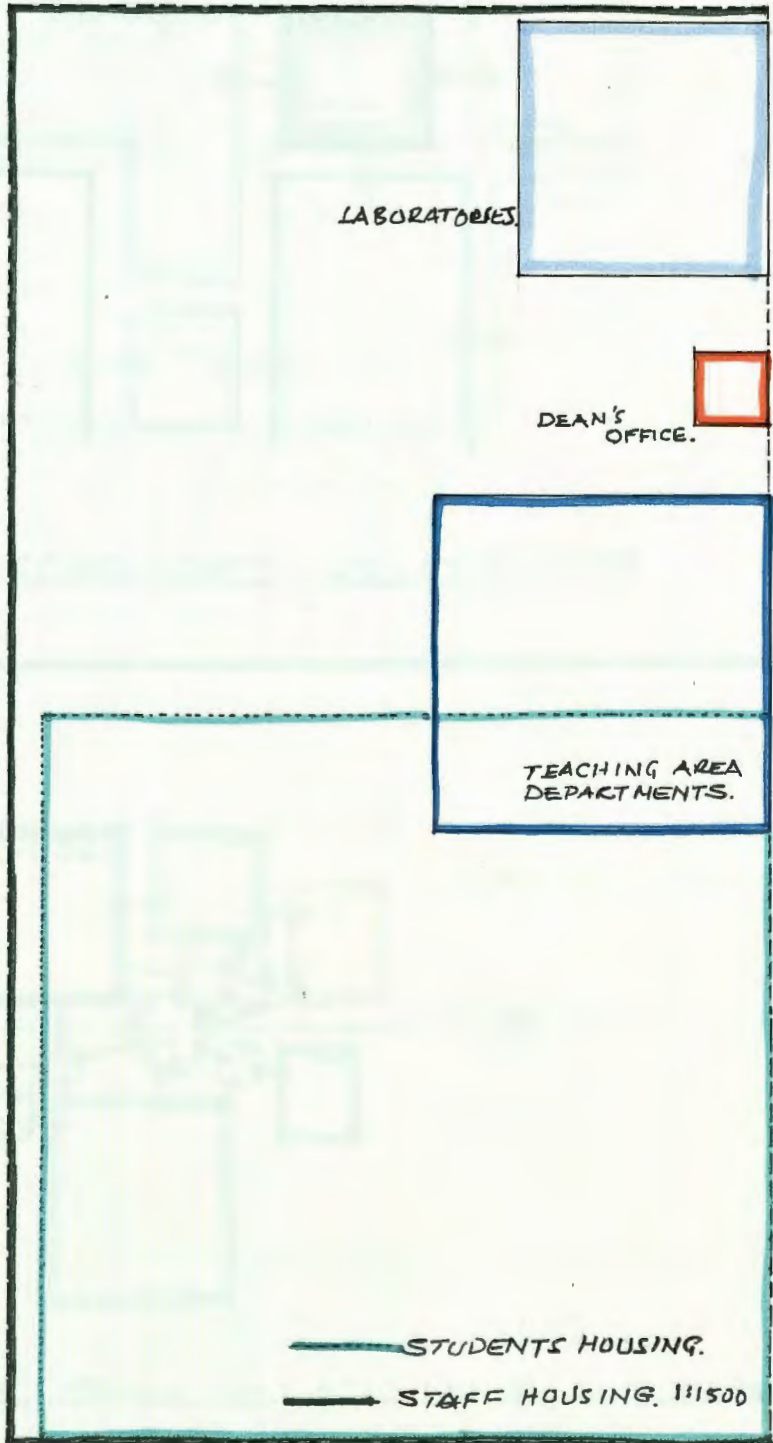
SHOPPING
CENTER.



HEALTH
CENTER.



C.M. LAUND.



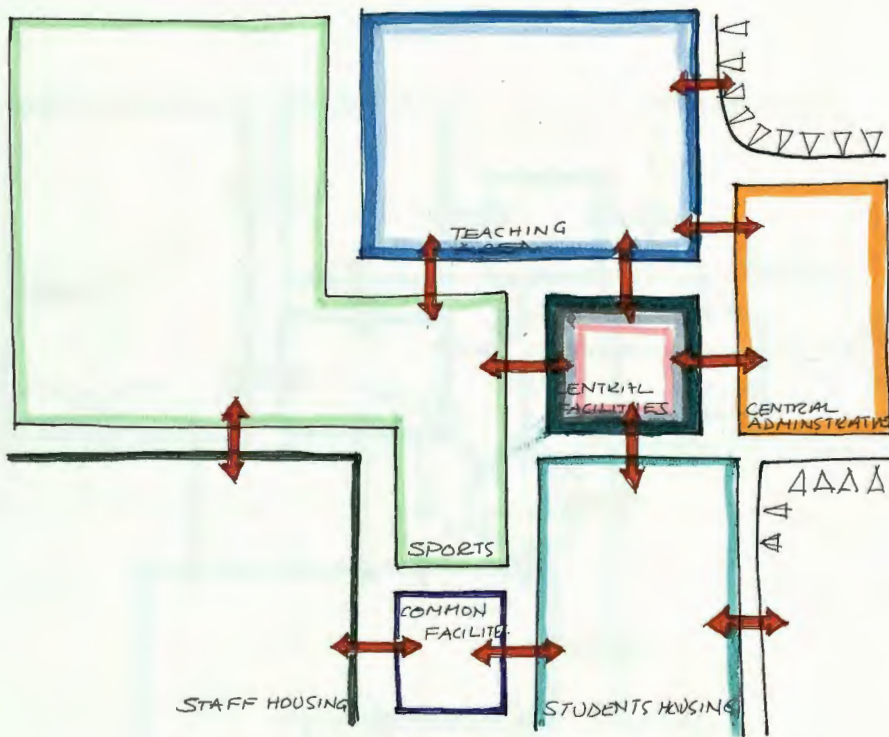
LABORATORIES.

DEAN'S
OFFICE.

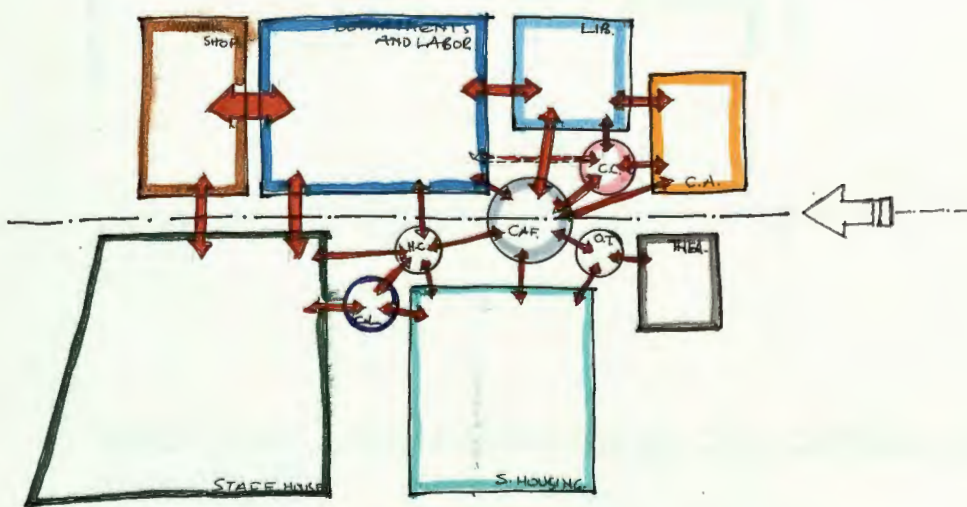
TEACHING AREA
DEPARTMENTS.

STUDENTS HOUSING.

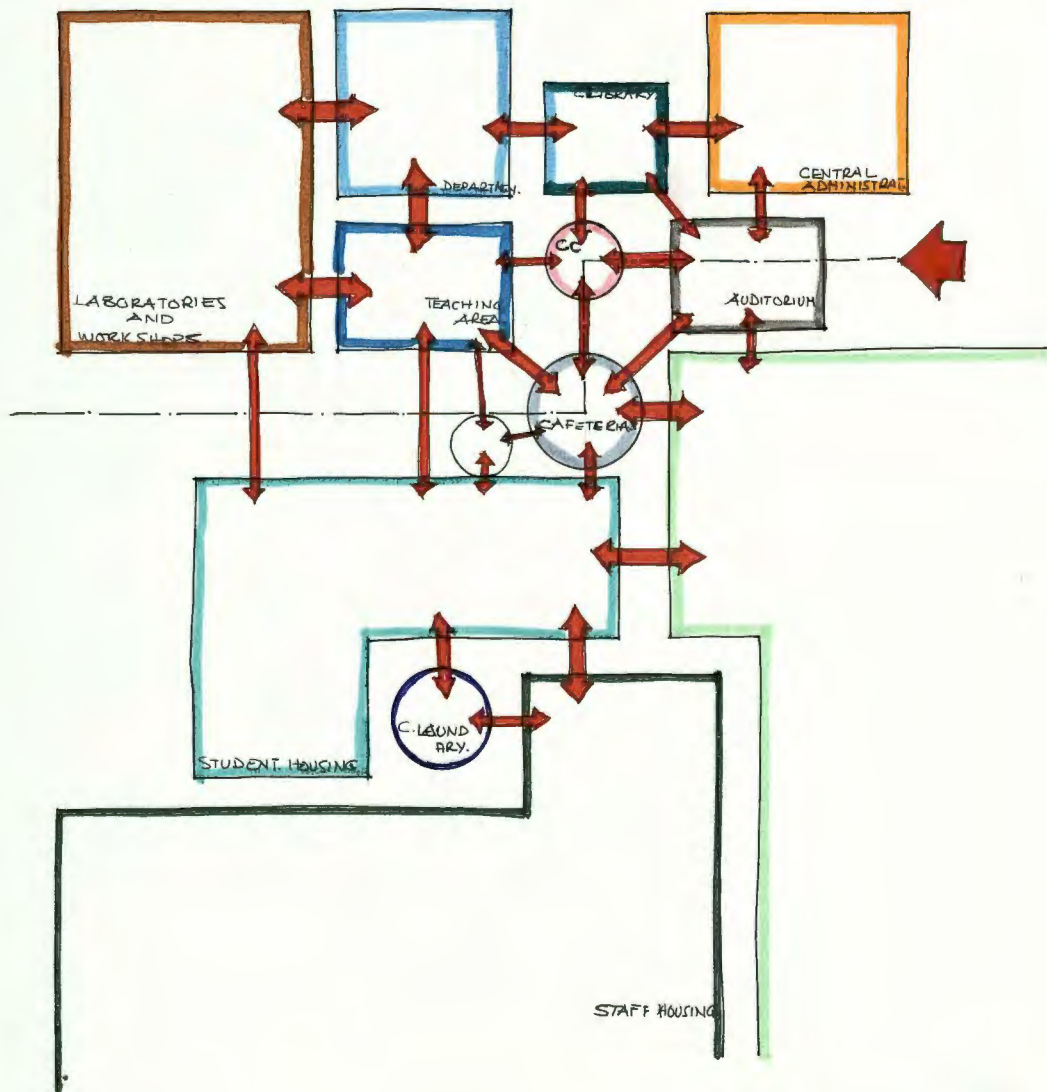
STAFF HOUSING. 1:1500



THE MAIN COMPONENTS RELATIONSHIP.



A MORE DETAILED SPACE RELATIONSHIP WITH CENTRAL AXES.



ANOTHER ALTERNATIVE TO SPACE RELATIONSHIP.

[CARE HAS TO BE TAKEN FOR EXTENSION OF THE INSTITUTE.]

6

SPACE

REQUIREMENTS

THE MAIN COMPONENTS AREA.

Space Code No.	Space Name _____	Total Gross Area _____ M ² _____
A	Central Administration) Central Facilities)	10,092
B	Teaching Area	15,467
C	Student Housing	20,852
D	Staff Housing	42,600
E	Sports	41,320
F	Parking	<u>15,400</u>
	GROSS GRAND AREA	145,731

=====

A. CENTRAL FACILITIES.

<u>Code No.</u>	<u>Space Name</u>	<u>Net Area M²</u>	<u>Total Net Area M²</u>
1. Central Administrative Area.			
I	President's Office		322
II	Board of Trustee's Office		194
III	Department of Administration		
	a) Administration	96	
	b) Division of Personal Services	110	
	c) Division of Administration Services	96	
	d) Division of Development	<u>128</u>	
		430	430
IV	Department of Academic & Scholarship		118
V	Department of Supplies and General Services		
	a) Administration Offices	96	
	b) Purchasing Division	162	
	c) Division of General Services	226	
	d, Student Services	<u>48</u>	
		532	532
VI	Department of Admission and Registration		333
VIII	Department of Finances Administration		<u>434</u>
		Sub Total	2,363
	40% Utilities and Circulation and Wall Thickness		<u>945</u>
	GRAND TOTAL (Net-Built up Area)		3,308 M ²

<u>Code No.</u>	<u>Space Name</u>	<u>Net Area M²</u>	<u>Total Net Area M²</u>
2.	Library.		3,857
3.	Computor Centre.		315
4.	General Central Facilities.		
	I Theater	570	
	II Cafeteria	225	
	III Post Office	145	
	VI Shopping Center	220	
	V Health Center	176	
	VI Central Main Laundry	278	
	VII Out door Theater	106	
	VIII Guide Room	<u>74</u>	
	Sub Total (1)	1,794	
	40% Utilities and Circulation	<u>718</u>	
	Sub Total (2)	2,512	<u>2,512</u>
	TOTAL GROSS NET AREA		10,092
			=====

1 CENTRAL ADMINISTRATIVE.

Space Code No.	Space Name	No. of Persons/ Room	No. of Rooms	M ² Per Room	Total Net Area M ²
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I. President's Office.

1-	President's Office	1	1	50	50
2-	Washroom*		1	10	10
3-	Secretary/Reception/Waiting	10	1	35	35
4-	Director of President's Office	1	1	30	30
5-	Director's Secretary	4	1	24	24
6-	Conference room	25	1	50	50
7-	Vice President's Office	1	1	35	35
8-	Secretary/Reception/Waiting	4	1	24	24
9-	Typing Complex	2	1	16	16
10-	Filing room (Archives)		1	24	24
11-	Office of Legal Advisor	1	1	24	24
12-	Utilities/Bathroom				
				Sub total	322

II. Board of Trustee's Office.

13-	Charimen's Office	1	1	40	40
14-	Secretary/Reception/Waiting	6	1	24	24
15-	Board Room/Kitchenette	20	1	70	70
16-	Typing	2	1	24	24
17-	Filling (Archives)		1	12	12
18-	Waiting Room	10	1	24	24
19-	Utilities				
				Sub total	194

Space Code No.	Space Name	No. of Persons/ Room	No. of Rooms	M ² Per Room	Total Net Area M ²
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III. Department of Administration and Services.

a) ADMINISTRATION

20-	Director (Secretary General)	1	1	30	30
21-	Secretary/Reception/Waiting	4	1	24	24
22-	Meeting Room	10	1	30	30
23-	Filing		1	12	12
24-	Utilities				
				Sub Total	96

b) DIVISION OF PERSONNEL SERVICES

25-	Assistant/Secretary of Personnel	1	1	24	24
26-	Secretary/Waiting/Reception	3	1	16	16
27-	Clerks Staff & Assistances	6	2	25	50
28-	Filies		1	20	20
29-	Utilities				
				Sub Total	110

c) DIVISION OF ADMINISTRATIVE SERVICES AFFAIRS

30-	Assist./Secretary for Adm.Affairs	1	1	24	24
31-	Secretary/Reception/Waiting	4	1	24	24
32-	Clerks Staffs	4	1	32	32
33-	Filing		1	16	16
34-	Utilities				
				Sub Total	96

Space Code No.	Space Name	No. of Persons/ Room	No. of Rooms	M ² Per Room	Total Net Area M ²
d) <u>DIVISION OF DEVELOPMENT AND PLANNING</u>					
35-	Assist./Secretary of Development and Planning	1	1	24	24
36-	Secretary/Reception/Waiting	4	1	24	24
37-	Filing		1	16	16
38-	Clerks for Development	3	1	32	32
39-	Clerks for Planning	3	1	32	32
40-	Utilities				
				Sub Total	128

IV. Department of Academic and Scholaship.

41-	Dean of Student	1	1	30	30
42-	Secretary/Reception	4	1	24	24
43-	Student Services & Activities	3	1	32	32
44-	Off Campus Affiars	1	1	16	16
45-	Filing		1	16	16
46-	Utilities				
				Sub Total	118

V. Department of Supplies and General Services.

a) <u>ADMINISTRATION</u>					
47-	Director's Office	1	1	30	30
48-	Secretary/Reception/Waiting	4	1	20	20
49-	Filing		1	16	16
50-	Clerks	1	1	16	16
51-	Typing Room	2	1	16	16
52-	Utilities				
				Sub Total	96

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of persons/ Room</u>	<u>No. of Rooms</u>	<u>M² Per Room</u>	<u>Total Net Area M²</u>
b) <u>PURCHASING DIVISION</u>					
53-	Buyer, Local Purchasing Office and Local Purchasing Clerks and one Clearance Office	5	1	50	50
54-	Supplier Clerks	2	1	24	24
	<u>Ware House Clerks</u>				
55-	Heat-Clerks Office	1	1	16	16
56-	Clerks Office	2	1	24	24
57-	Typing Room	2	1	16	16
58-	Store Keeper	2	1	16	16
59-	Utilities		1	16	<u>16</u>
			Sub Total		162
c) <u>DIVISION OF GENERAL SERVICES</u>					
60-	Maintenance Officers Office	1	1	20	20
61-	Secretary/Reception/Waiting	3	1	16	16
62-	Clerks	3	1	32	32
63-	Store		1	24	24
64-	Technicant	3	1	24	24
65-	General Store		1	150	<u>150</u>
			Sub Total		266
66-	Food, Housing, Services Transport, etc Officer	1	1	16	16
67-	Clerks	4	1	32	32
68-	Utilities				<u> </u>
			Sub Total		48

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of persons/ Room</u>	<u>No. of Rooms</u>	<u>M² Per Room</u>	<u>Total Net Area M²</u>
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VI. Department of Admission and Registration.

69-	Registrar Office	1	1	30	30
70-	Wash room		1	10	10
71-	Secretary/Reception/Waiting	4	1	24	24
72-	Kitchenette		1	9	9
73-	Assistant Admission and Registration	1	1	24	24
74-	Secretaries for Admission and Registration	1	1	16	16
75-	Meeting Room	25	1	50	50
76-	Filing Room		1	12	12
77-	Transcript Evaluation	2	1	24	24
78-	Enrollement Statistics	2	1	24	24
79-	Registration Counter	4	1	40	40
80-	General Storage Filing Transcripts, Cards, Forms		1	70	70
81-	Utilities				
				Sub Total	333

VII Department of Finance Administration.

82-	Director's Office	1	1	30	30
83-	Secretary/Reception/Waiting	4	1	24	24
84-	Meeting Room	10	1	32	32
85-	Clerks	2	1	24	24
86-	Typing Room	3	1	24	24
87-	Budget Clerks	2	1	24	24

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of persons/ Room</u>	<u>No. of Rooms</u>	<u>M² Per Room</u>	<u>Total Net Area M²</u>
<u>CASHIER'S DIVISION</u>					
88-	Head Division	1	1	16	16
89-	Accountants	2	1	24	24
90-	Student's Cashiers	60	1	60	60
91-	Cash	1	1	12	12
92-	Payroll Director	1	1	12	12
93-	Payroll Clerks	2	1	16	16
94-	Head of Division of Expenses	1	1	16	16
95-	Supply Accountant	2	1	16	16
96-	Credit Accountant	2	1	16	16
97-	Revenue Clerks	2	1	16	16
98-	Internal Auditor	2	1	16	16
99-	External Auditor	2	1	16	16
100-	Head Division of Loans	1	1	16	16
101-	Loan Accountants	2	1	24	24
102-	Utilities				
				Sub Total	434
	GRAND TOTAL (Net built up Area)				2363 M ²
	40% Utilities, Circulation and Wall Thickness				945 M ²
				NET GRAND TOTAL	3,308 M ²
					=====

2. LIBRARY.

Space Code No.	Space Name	Seat/ Reader	Books	Staff	Area M ²
1-	Entrance and Exit Control				
2-	Lobby			1	
3-	Inquiry Desk			1	
4-	Circulation/Desk/Counter + Storage.			3	
					80
	<u>READING ROOMS</u>				
5-	Reading Area non Smoken	225			1290
6-	Informal-Reading Area for Smoker	75			300
7-	Service Points			4	
8-	Periodicals		250		
9-	Carrels Reading Area	35			100
	<u>BOOK STACKS</u>				
10-	References Shelves		10,000		90
11-	Closed Stacks		37,000		340
12-	Micro Forms and Lab. Work			1	50
13-	Audivisual Collection			1	50
14-	Micro Form Reading Space	10			50
15-	Projection Room	50			75
16-	Meeting Room	20			30
17-	Utilities				
				Sub Total	2535

<u>Space Code No.</u>	<u>Space Name</u>	<u>Seat/ Reader</u>	<u>Books</u>	<u>Staff</u>	<u>Area M²</u>
<u>OFFICES</u>					
18-	Librarian			1	24
19-	Assistant Librarian			1	16
20-	Cataloguing			2	24
21-	Acquisition			2	20
22-	Book Binding				30
23-	Work Shop				40
24-	Offices			2	16
25-	Storage				50
26-	Utilities				
Sub Total					220

GRAND TOTAL (Net built up area) 2755 M²

40% Utilities and Circulation + Wall
Thickness 1102

NET GRAND TOTAL 3857 M²

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3. COMPUTER CENTER.

Space Code No.	Space Name	No. of Staff	No. of Room	Net Area M ²
I. <u>ACCOMODATION</u>				
1-	Computer Room	2	1	42
2-	Magnetic Tape Store		1	16
3-	Job Assembly/Ddispatch		1	20
4-	Supervisor's Office	1	1	12
5-	Stationary Store		1	12
6-	Waste Paper Store		1	12
7-	Engineers Stores and Work		1	12
II. <u>ADMINISTRATION</u>				
8-	Entrance Hall Central Point		1	25
9-	Data Preparation Room		1	16
10-	Offices		1	16
III. <u>PLANT SPACE</u>				
11-	Electrical Switch Room)		
12-	Transformer Chamber)		
13-	Air-Condition)	Mechanical 1	42
14-	Condenser Fan Room)		
15-	Utilities Room			
GRAND TOTAL				225
40% Utilites and Circulation + Wall Thickness				90
NET GRAND TOTAL				315

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4. COMMON CENTRAL FACILITIES.

This complex consists of the following facilities:-

- I. Theater for 500 Seats
- II. Cafeteria
- III. Post Office
- IV. Shopping Center
- V. Health Center
- VI. Central Laundry
- VII. Guards Rooms

Space Code No.	Space Name	No. of Person	No. of Room	M ² Room	Net Area M ²
I. Theater.					
1-	Theater	500	1	300	300
2-	Stage and Back Stage		1	200	200
3-	Projection Room		1	20	20
4-	Storage		1	50	50
5-	Utilities				
			Sub Total		570
II. Cafeteria.					
6-	Cafeteria Area		1	150	150
7-	Kitchen Area		1	50	50
8-	Loading and Storage		1	25	25
9-	Utilities				
			Sub Total		225

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Person</u>	<u>No. of Room</u>	<u>M² Room</u>	<u>Net Area M²</u>
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III. Post Office.

10-	Office.		1	50	50
11-	Box Area.		1	80	80
12-	Storage.		1	15	15
13-	Utilities.				
				Sub Total	145

IV. Shopping Center.

14-	Book Shop.		1	80	80
15-	Institute Stirts and Costom. Shop		1	80	80
16-	Common Store.		1	60	60
17-	Utilities.				
				Sub Total	220

V. Health Center.

18-	Doctor's and Examination Room.	1	1	24	24
19-	Nurses-Dressing Room.	6	1	24	24
20-	Nurse Rest-Room.	1	2	40	40
21-	Isolation Room.	4	2	36	72
22-	Store.			16	16
23-	Utilities.				
				Sub Total	176

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Person</u>	<u>No. of Room</u>	<u>M² Room</u>	<u>Net Area M²</u>
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VI. Central Laundry.

24-	Ironing Room		1	12	12
25-	Store		1	12	12
26-	Washing Machines		1	24	24
27-	Ordinary Washing Space		1	16	16
28-	Outside Drying (Sun) 16 x 20		1	200	200
29-	Collection and Waiting Area		1	30	30
30-	Utilities				
				Sub Total	278

VII. Guard Rooms.

31-	Office and Counter	8	2	50	50
32-	Rest-Rooms	2	2	24	24
33-	Utilities				
				Sub Total	74
				GRAND TOTAL	1688

40% Utilities and Circulation +
Thickness of Wall

	675
NET GRAND TOTAL	2363

Space Code No.	Space Name	Total Net Area M ²
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B. TEACHING AREA.

I	Faculty Office	314
II	Department of Civil Engineering	3,452
III	Department of Mechanical Engineering	1,996
VI	Department of Arch. and Building	3,161
V	Department of Electrical Engineering	4,482
VI	Central Engineering Workshopes	<u>2,062</u>
Sub Total (1)		15,467

C. STUDENTS RESIDENTIAL AREA.

I	Student Housing	17,553
II	Student Residence's Common Facilities	<u>3,299</u>
Sub Total (2)		20,852

D. STAFFS RESIDENTIAL AREA.

I	Villas	7,400
II	Appartments	<u>35,200</u>
Sub Total (3)		42,600

E. SPORTS AREA.

Open Air Sports	41,320
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F. PARKING AREA.

Surface Parking	<u>15,400</u>
-----------------	---------------

114,787

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B. TEACHING AREA.

Space Code No.	Space Name	No. of Persons/ Room	No. of Room	M ² Per Room	Net Area M ²
I. Faculty Office.					
1-	Dean's Office	1	1	40	40
2-	Secretary/Reception/Waiting	10	1	30	30
3-	Conference Room	20	1	50	50
4-	Administrative Assistances	1	1	24	24
5-	Typing Complex	2	1	24	24
6-	Associate Dean's Office	1	1	24	24
7-	Secretary/Reception	5	1	16	16
8-	Filing		1	16	16
9-	Castodian Utilities				
			Sub Total		224
	40% Circulation & Utilities and Wall Thickness				90
		NET	GRAND	TOTAL	314

II. Department of Civil Engineering and Surveying.

a)	<u>ADMINISTRATION</u>				
1-	Head of Department's Office	1	1	24	24
2-	Secretary/Reception/Waiting	6	1	24	24
3-	Meeting Room	10	1	30	30
4-	Filing Room (Archives)		1	12	12
5-	Administration Assitant	1	1	16	16
6-	C.E. Student Office	2	1	16	16
7-	Utilities and Castodian				
			Sub Total		122

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
b)	<u>DIVISION OF CIVIL</u>				
10-	Head of Division	1	1	24	24
11-	Secretary/Reception/Waiting	4	1	16	16
12-	Filing		1	12	<u>12</u>
			Sub Total		52
c)	<u>DIVISION OF SURVEYING</u>				
13-	Head of Division	1	1	24	24
14-	Secretary/Reception/Waiting	4	1	16	16
15-	Filing		1	12	<u>12</u>
			Sub Total		52
d)	<u>FACULTY OFFICES</u>				
16-	Professor's Office	1	5	16	240
17-	Teaching Assistant Office	1	5	12	<u>60</u>
			Sub Total		300
e)	<u>LECTURE ROOMS</u>				
18-	Classroom	40	5	60	300
19-	Drafting/Graphic Room	40	1	240	240
20-	Lecture Hall		1	370	370
21-	Utilities				<u> </u>
			Sub Total		910

Space Code No.	Space Name	No. of Persons/ Room	No. of Room	M ² Per Room	Net Area M ²
f)	<u>LABORATORIES</u>				
22-	High Way & Bituminous Material Lab.			16 x 14	240
23-	Construction Material Lab.				200
24-	Sanitary Engineering & Environment.Lab.				200
25-	Soil Mechanics Lab.			16 x 12.5	240
26-	Surveying Instrument Store				40
27-	Process Camera and Dark Room				50
28-	Cartography Store, Map Room Office for Teaching Lab. Assistants				60
29-	Utilities				
				Sub Total	1030
				GRAND TOTAL	2466
				40% Utilities, Circulation and Wall Thickness	986
				NET GRAND TOTAL	3,452

III. Department of Mechanical Engineering.

a)	<u>ADMINISTRATION</u>				
1-	Head of Department's Office	1	1	24	24
2-	Secretary/Reception/Waiting	5	1	24	24
3-	Administration Assistant	1	1	16	16
4-	Meeting Room	10	1	30	30
5-	Typing	2	1	16	16
6-	Filing Room		1	12	12
7-	Office M.E. Student Society	2	1	16	16
8-	Utilities				
				Sub Total	138

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
b)	<u>OFFICES</u>				
9-	Professor's Office	1	8	16	120
10-	Teaching Assistants	1	4	12	<u>48</u>
			Sub Total		168
c)	<u>LECTURE ROOMS</u>				
11-	Class Rooms	90	4	60	120
12-	Studio (Drafting)	40	1	240	<u>240</u>
			Sub Total		360
d)	<u>SHEARED FACILITIES</u>				
13-	Castodians				
14-	Students Lockers				
15-	Utilities				
e)	<u>LABORATORIES</u>				
16-	Fluid Dynamic Lab.		1	250	250
17-	Automotive Engineering Lab.		1	260	250
18-	Combustion & Fuels Lab.		1	100	100
19-	Fuel Lubrication Lab.		1	120	120
20-	Instruction/Teaching Office		1	24	24
21-	Store		1	16	<u>16</u>
			Sub Total		760
			GRAND TOTAL		1426
	40% Utilities, Circulation and Wall Thickness				<u>570</u>
		NET GRAND TOTAL			1996

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
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IV. Department of Architecture and Building Tech.

a)	<u>ADMINISTRATION</u>				
1-	Head of Department	1	1	24	24
2-	Secretary/Reception/Waiting	5	1	24	24
3-	Meeting Room	10	1	30	30
4-	Filing		1	12	12
5-	Student Society Office	2	1	16	12
6-	Utilities				
				Sub Total	106
b)	<u>DIVISION OF ARCHITECTURE</u>				
7-	Head of Division's Office	1	1	24	24
8-	Secretary	4	1	16	16
9-	Filing		1	12	12
				Sub Total	52
c)	<u>DIVISION OF BUILDING</u>				
10-	Head of Division's Office	1	1	24	24
11-	Secretary	4	1	16	16
12-	Filing		1	12	12
				Sub Total	52
d)	<u>OFFICES</u>				
13-	Professors	1	10	16	160
14-	Teaching Assistants	1	6	12	72
				Sub Total	232

Space Code No.	Space Name	No. of Persons/ Room	No. of Room	M ² Per Room	Net Area M ²
e)	<u>LECTURE ROOMS AND DRAFTING</u>				
15-	Class Rooms	30	6	60	360
16-	Lecture Hall	250	1	370	370
17-	Studio	30	5	180	900
18-	Blue Printing Photocopy Room		1	30	30
19-	Room	40	1	60	60
				Sub Total	1720
f)	<u>GENERAL SUPPORTS FACILITIES</u>				
20-	Student's Project Display Hall		1	180	80
21-	Student's Socialty Room	2	1	16	16
22-	Utilities				
				Sub Total	96
			GRAND TOTAL		2258
				40% Utilities, Circulation and Wall Thickness	903
			NET GRAND TOTAL		3,161

V. Department of Electrical and Refrigeration Eng.

a)	<u>ADMINISTRATION</u>				
1-	Head of Department's Office	1	1	24	24
2-	Secretary/Reception/Waiting	5	1	24	24
3-	Filing		1	12	12
4-	Student Society Office	2	1	16	16
5-	Meeting Room	1	1	30	30
6-	Utilities				
				Sub Total	106

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
b)	<u>DIVISION OF ELECTRONIC</u>				
7-	Head of Division's Office	1	1	24	24
8-	Secretary	4	1	16	16
9-	Filing		1	12	<u>12</u>
			Sub Total		52
c)	<u>DIVISION OF ELECTRICITY</u>				
10-	Head of Division's Office	1	1	24	24
11-	Secretary	1	1	16	16
12-	Filing		1	12	<u>12</u>
			Sub Total		52
d)	<u>DIVISION OF REFRIGERATION</u>				
13-	Head of Division's Office	1	1	24	24
14-	Secretary	1	1	16	16
15-	Filing		1	12	<u>12</u>
			Sub Total		52
e)	<u>OFFICE</u>				
16-	Professor's Office	1	12	16	192
17-	Teaching Assistant's Office	1	4	12	<u>48</u>
			Sub Total		240
f)	<u>LECTURE ROOMS</u>				
18-	Class Rooms	40	6	60	360
19-	Castodian				
20-	Utilities				<u> </u>
			Sub Total		360

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
g)	<u>LABORATORIES</u>				
21-	Basic Electrical Eng. Lab.				150
22-	Circuits and net Working Lab.				100
23-	Communication & Electronic Circuit Lab.				150
24-	Electrical Measurement Lab.				120
25-	Transmission & Antennas Lab. (On top of floor)				200
26-	Electrical Machinery Lab. Ground floor 6.0 m				200
27-	Power System				200
28-	Telephoning Lab.				120
29-	Installation & Lighting Lab.				120
30-	Electrical Material Lab. Electronic				80
31-	Electrical Material Lab. Power				100
32-	Heating & Air-Conditioning				200
33-	Refrigeration Lab.				200
34-	Storage		20	12	240
35-	Teaching Assistances	1	14	12	160
36-	Utilities				
				Sub Total	2,340
		GRAND	TOTAL		3,202
	40% Utilities, Circulation and Wall Thickness				1,280
		NET	GRAND	TOTAL	4,482
					=====

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
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VI. Central Engineering Workshops.

a) ADMINISTRATION

1-	Head Office	1	1	24	24
2-	Secretary	4	1	16	16
3-	Offices	3	1	16	32
4-	Filings		1	12	12
5-	Meeting	8	1	32	32
6-	Utilities				
				Sub Total	116

b) MACHINE SHOP

7-	Machine Shop Area		1	100	100
8-	Tool Room/Storage		1	50	50
9-	Tool Gridding Zone		1	40	40
10-	Measurement & Meteralny		1	40	40
11-	Office Instruction/Sope Master	1	2	12	24
12-	Free Activity Space		1	50	50
13-	Utilities				
				Sub Total	304

c) WELDING SHOP

14-	Electrical Welding	20	1	100	100
15-	Black Smith Equipment & Working		1	80	80
16-	Store		1	12	24

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
17-	Instructor/Sop Master Office	1	1	12	24
18-	Foreman Offices		1	9	18
19-	Utilities				
			Sub Total		246
d)	<u>SHEET METAL SHOP COMPLEX</u>				
20-	Sheet Metal Shop	20	1	100	100
21-	Storage		1	60	60
22-	Instructor/Shop Master	1	1	12	12
23-	Foreman Office	1	1	9	9
24-	Utilities				
			Sub Total		181
e)	<u>CARPENTARY Shop</u>				
25-	Carpentary Shop		1	300	300
26-	Storage		1	30	30
27-	Instructors/Shop Master	1	1	12	24
28-	Foreman Office	1	1	9	9
29-	Utilities				
			Sub Total		363
f)	<u>ELECTRICAL WORKSHOP COMPLEX</u>				
30-	Electrical Workshop		1	200	200
31-	Store		1	30	30
32-	Instructor/Shop Master	1	1	12	24

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Room</u>	<u>M² Per Room</u>	<u>Net Area M²</u>
33-	Foreman Office	1	1	9	9
34-	Utilities				

Sub Total 263

GRAND TOTAL 1473

40% Utilities, Circulation and Wall Thickness 589

NET GRAND TOTAL 2062

=====

C. STUDENTS' RESIDENTIAL AREA.

Space Code No.	Space Name	No. of Persons/ Room	No. of Rooms	M ² Per Room	Total Area M ²
I	<u>STUDENT HOUSING</u>				
	4 Blocks of 280 students				
1-	Each with 80 single rooms	1	360	11.2	3584.2
2-	Each with 121 double rooms	2	484	18.5	8954.0
3-	Utilities and circulation				
			Sub Total		12538.0
	40% Utilities, Circulation and Wall Thickness				5015.0
	NET GRAND TOTAL (1)				17,553
II	<u>STUDENT RESIDENCE'S COMMON HALL (FACILITIES)</u>				
4-	Television Lounge				
5-	Quite Lounge		2	200	400
6-	General Area				
7-	Game Room		2	150	260
8-	Snack Bar		2	50	100
9-	Kiosk		2	10	20
			Sub Total		780
10-	Dining Area	500	2	550	1100
11-	Kitchen		2	175	350
12-	Central Laundry (Hall's)		2	38.5	77
13-	Telephone Spaces		2	25	50
			Sub Total		1577
			GRAND TOTAL		2357
	30% Circulation and Wall Thickness				942
			NET GRAND TOTAL (2)		3299
			NET GRAND TOTAL (1 + 2)		20852

D. STAFFS' RESIDENTIAL AREA.

Space Code No.	Space Name	No. of Persons/ Room	No. of Rooms	M ² Per Room	Total Area M ²
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I. Villas.

President Villa Consisting of:

V ₁	a- Reception Hall, Office/Library				
	b- Dining, Bathrooms				
	c- Family Living Room				
	d- Bedrooms for Family				
	e- Two bedroom with Lounge in Ground Floor for Guard		1	500	500

V₂ Vice President Villa consists of:

	a- 4 bedrooms				
	b- 1 Living room				
	c- 1 family room				
	d- Other facilities		1	350	350

V₃ Dean's Villa consists of:

	a- 4 bedrooms				
	b- Other facilities		1	300	300

V₄ Directors and Head of Departments
Villas

	3 Bed room and other facilities		25	250	<u>6250</u>
			Sub Total		7400

<u>Space Code No.</u>	<u>Space Name</u>	<u>No. of Persons/ Room</u>	<u>No. of Rooms</u>	<u>M² Per Room</u>	<u>Total Area M²</u>
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II. Apartments.

1-	3 Bedroom Apartment 1 living room and others		60	200	12000
2-	2 Bedrooms Apartments 1 living room and others		100	160	16000
3-	1 Bedroom Apartment and other facilities		60	120	<u>7200</u>
			Sub Total		35200
			GRAND TOTAL		<u>42600</u> =====

E. SPORTS AREA.

1-	Track and Field (Athletic Area) and two Foot Ball Field. 110 x 75 Space for 30,000 spectators Ground the field				37,000
2-	Basket-Ball (28 x 15) 2 Plus expectators around one.				950
	Tennis 1- Size 23.8 x 8.25 mrs 2- Size 26.60 x 11.00 mrs Allowance of space for expectators				620
3-	Volley Ball (18 x 9) 2 Allowance of expectator space				450
	Hand Ball (40 x 20) with 2 mrs Wind Area. Expectator space				1,000
	Swimming Pool (50.00 x 21.00) Changing room, Showers, Sauna + Expectator Space				<u>1,300</u>
			Sub Total		41,320
			GRAND CROSS TOTAL		41,320
			GRAND TOTAL		41,320 =====

<u>Space Code No.</u>	<u>Space Name</u>	<u>Cars</u>	<u>Total Area M²</u>
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F. PARKING AREA.

1-	School Bus	4 Bus	=	150
2-	Staff Area	200 cars	=	5,000
3-	School Area. Staff + Visitors	400 cars	=	16,250
4-	Student Housing	200 cars	=	1,500
5-	Sport Areas	200 cars	=	<u>2,500</u>
		Sub Total		15,400
		GRAND CROSS TOTAL		15,400
		GRAND TOTAL		<u>15,400</u> =====

THE SITE



GEOGRAPHICAL POSITION

The City of Juba is located at 4 52' North of the Equator and 31 36' East of Greewich, at 460 m above the sea level.

The City of Juba is a capital city of the six regional provinces of the Southern Sudan: Jonglei, Upper Nile, Lakes, Bahr El-Gazal, East and West Equatoria Provinces.

The area of the southern Region of the Sudan is 1/3 (one third) of the total area of the Sudan (664,033.3Km²)

The Site is located about three (3) Km, on the eastern side of Bahr El-jabel (the white Nile), on Torit Nimule road. The area is known as Gumba, just south the new site of Juba University. It is Residential and Institutional site, according to the ten years developing plan of Juba City. South of it is a forest reserved area.

The Site is physically and geographically characterized by some meteorological and geomorphological factors which have considerable influences on the present land used.

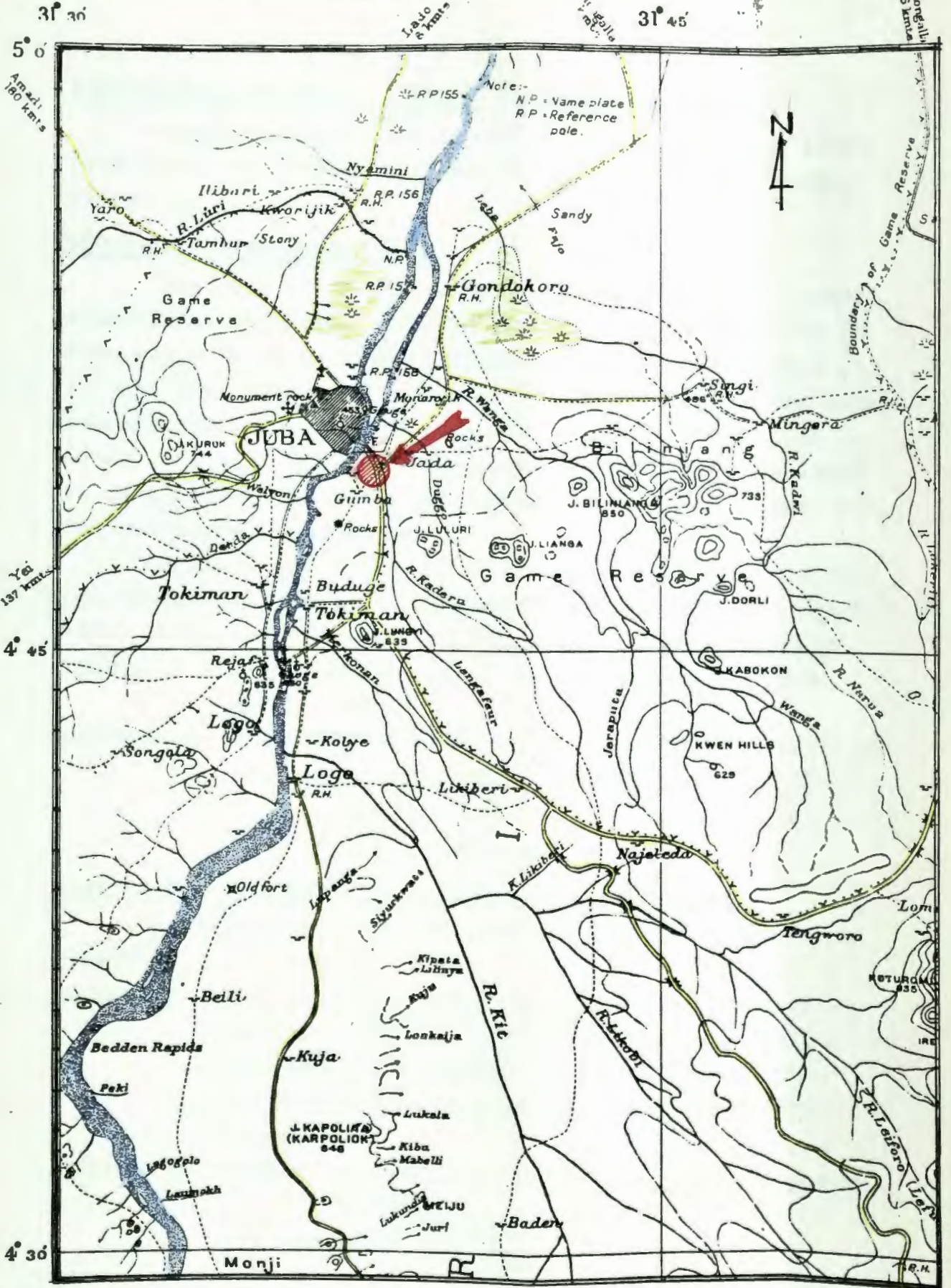
MAP 1 JUBA LOCATION

Scale 1:250,000,000



JUBA (Sudan) SITE LOCATION.

1:250,000



KEY



THE SITE

Juba Town

ROAD (Bridge)

Dry Season Road.

Cleared Tracks

River

Tracts

GEOMORPHOLOGY AND HYDROGRAPHY

The main feature of the Juba area is the large alluvial plain of the Bahr El-Jabel which flows in SSW - NNE direction.

RECENT ALLUVIAL PLAIN (all)

The alluvial plain of the Bahr El-Jabel and its main tributaries is between 1,2 and 2.3 Km. wide to the south of Juba where it is flanked by dissected and hilly country. It is flat area extensively flooded or water-logged in the rainy season, locally terraced with patches and strips of high lands. The main permanent river channel of the Bahr El-Jabel is usually well delimited by a river terrace edge, their width being 300 to 500 metres.

The plain is flooded or water-logged due to poor drainage conditions, and it is crossed by temporary river channel. Fifty percent of the plain is affected by flooding yearly.

LITHOLOGY: Silty clayed to sandy loose alluvial deposits.

(age Holocene)

ENGINEERING GEOLOGY: Predominantly cohesive and compressible ground, locally non-cohesive when sandy permeability; very low to quite-non locally lower-medium.

FLAT TO GENTLE SLOPING HILL WASH*-DEPOSITION AREA:

Usually poorly drained and water logged in the rainy season.

LITHOLOGY: Sandy to silty-sand, loose hill wash (colluvial) deposits, mixed to alluvial in the minor valley silty clays are locally associated to old fluvial lacustrine deposits (age Holocene to pleistocene).

ENGINEERING GEOLOGY: No-cohesive to locally cohesive ground. Permeability low to very low locally upper-medium.

GENTLY UNDUATED TO NEARLY FLAT. (1t)

Lateritic hills, usually with defined and widely spaced drainage pattern.

LITHOLOGY: Mainly sandy lateritic cover, more or less gravelly and silty, generally thin and loose, local occurrence of thick alluvial - colluvial talerized old deposite including sands and gravels with rounded elements occasional occurrence of ironstone horizons (age pleistocene to tertiary).

ENGINEERING GEOLOGY: Usually non-cohesive, sometimes partially indurated ground locally with lithoid horizon (ironstone permeability upper medium to low).

ROLLING TO HILLY AREA: (Bi)

It is with metamorphic rocks or at near the surface usually dissected with defined and closely spaced drainage pattern.

ENGINEERING GEOLOGY: Locally weathered to loose coarse sand fracture.

OUT STANDING ISOLATED RELIEF: (Bc)

Formed by competent rocks of the crystalline basement.

LITHOLOGY: Out crops of more or less foliated rocks igneous to gneiss and granitic types (age precambrian).

ENGINEERING GEOLOGY: Lithoid ground, usually composed of fresh and sound rocks with wide spaced fracture; high quality building material. Permeability upper medium to very low according to fracture.

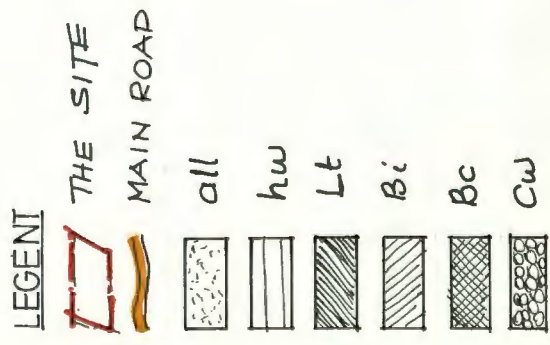
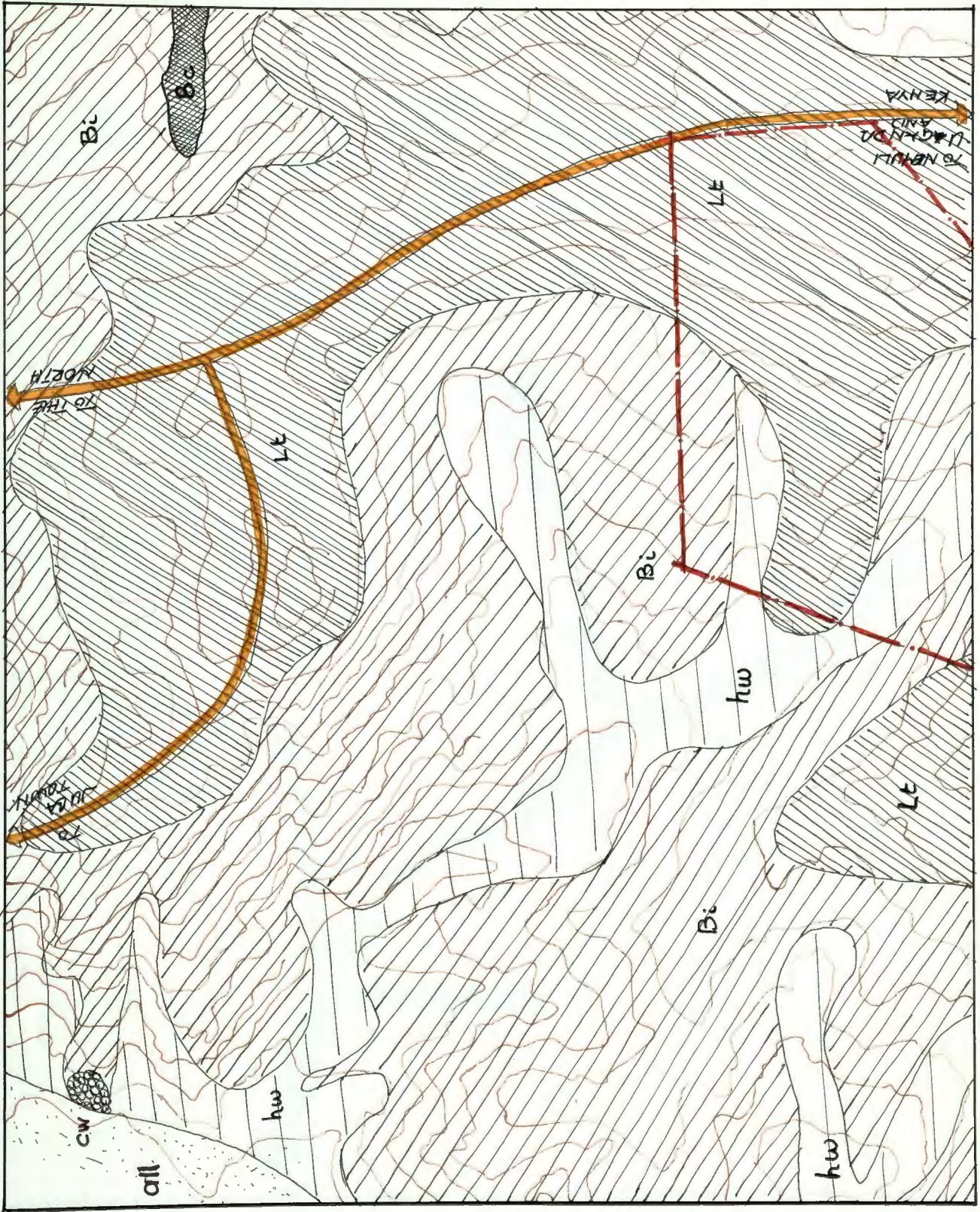
DIORITE DYKES: (cw)

Sub-vertically intruded in the precambrian basement complex.

ENGINEERING GEOLOGY: Usually spaced sometimes loose rock, according to weathering conditions high quality building material when fresh.

GEOMORPHOLOGY
MAP
1:10,000

N
4






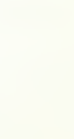
HYDROLOGY
DRAINAGE
PATTERN.

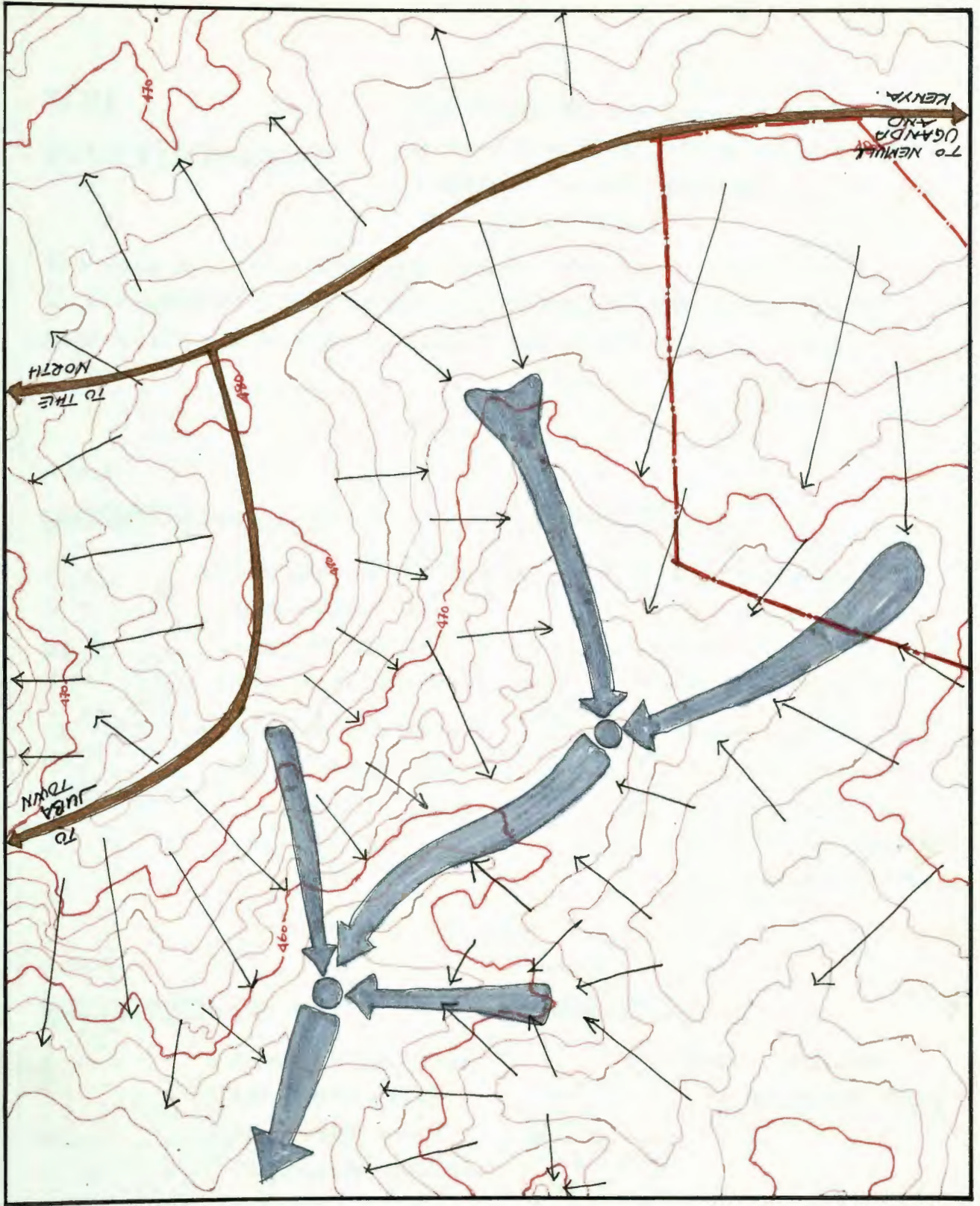
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119

LEGEND

-  THE SITE
-  MAIN ROAD
-  DIRECTION OF WATER.
-  RUN OFF-RAIN WATER.




SOIL INVESTIGATION.


(According to the Test carried out around the Site by The Building - Research Centre- University Of Khartoum -Sudan.)

The work of the report consists of Site investigation, and it includes: Drilling of Ten-boreholes, Soil Mechanical classification and Atterbery Limits and Chemical Test Results.


B.H.1

- 
- Top Soil
 - Dark greyish mica- ceous sandy clay large amount of small size gravel.
 - Dark greyish med- ium micaeous sand.


B.H.3

- 
- Top Soil
 - Darkbrownish to dark greyish san- dy silty clay with traces of mica.
 - Pale brownish to greyish medium- micaceous sand with large amount of crushed quartz.

B.H.4

- 
- Top Soil
 - Brownish to grey- ish sandy silty clay with lumps of crushed quartz.
 - Pale yellowish to greyish medium mi- caceous sand with large amount of small size gravel.

B.H.5

- 
- Top Soil.
 - Dark brownish sandy silty clay.
 - Pale yellowish to brownish clayey silty micaceous with large amount of small size gra- vel.

B.H.6

0.0-0.10 Top Soil.
 • Brownish clayey silty sand
1.0
 • Pale yellowish to greyish medium micaceous sand with large amount of small size gravel.

B.H.7

0.0-0.15 Top Soil.
 • Dark brownish sandy clay with fibrous matter & traces of mica (organic matter)
1.0

B.H.10

0.0-0.15 Top Soil.
 • Raddish brown sandy clay with fibrous matter (organic matter.)
1.0
 • Pale yellowish to brownish medium micaceous sand with large amount of small size gravel and fibrous matter.
2.0

Generally ,fom 0.0 to 0.15 cm. is Top soil(sandy - clay with same organic matter.)and from 0.15 to 1.0 metre is sandy clayish and silty sand .Brownish in color, and Pale yellowish to brownish sand with some small and large gravel with same organic matter.

The bed rock in this area is from 1.0 to 2.0 metre blow and it consists of Basement complex (defination include those regions metamorphic and sedimentary rocks that are over time by haizontal and sub-hoizontal Palaezoic sedimentary organieous rock). The basement complex of the Southern sudan consists of basic- to acid grnisses and quartzites schists.

TABLE (21) ATTERBERG LIMIT TEST

B.H. SAMPLE No.	DEPTH M	LIQUID LIMIT	PLASTIC LIMIT	PLASTISITY INDEX	SIEVE LIMIT	% AGE PASSING IN ϕ .425 m B.S.SIEVE
I	ϕ .0-1.00	28	18	10	17	62
3	0.0-0.50	34	17	17	15	81
4	0.0-0.50	43	18	25	13	35
5	0.0-1.0	45	18	27	13	82
6	0.0-1.0	26	13	13	14	81
7	0.0-1.0	NON	—	PLASTIC	—	—
10	0.0-1.0	38	17	19	12	73
10	1.0-2.0	42	19	23	15	64

TABLE (22) CHEMICAL TEST RESULTS

SERIAL No.	PIT No.	DEPTH	CL PERCENTAGE	SO ₃ PERCENTAGE
I	I	0.0 - 1.0	0.0017	0.441
2	3	0.0 - 0.5	0.0053	0.027
3	4	0.0 - 0.5	0.0053	0.062
4	5	0.0 - 1.0	0.0053	0.115
5	6	0.0 - 1.0	0.0053	0.142
6	7	0.0 - 1.0	0.0071	0.069
7	10	0.0 - 1.0	0.0053	0.012
8	10	1.0 - 2.0	0.0053	0.043

MOISTURE CONTAIN.

Some Area are damp during the Rainy Season but dries rapidly. Risk of soil erosion. Isolated Rock exposed usually well drained and dries up faster. The plain is generally moisted area almost through out the year.

Water Table.

Generally the water table of Juba area is quite low, but there are some faults water levels which accures much shallower then the real water table due to the river and the swamps.

Run Off Volume

The volume of run off-water is much great because of the storm rain of the area. It depends on the surface area of the site, rain falland the time of the year. It can be determined by using the formula: $Q = Aci$

Q = run off (cw'/sec.)

A = drainage area (water sheet in area).

c = rain fall/ run off coef.

i = rain (inches/ hr)

TOPOGRAPHY

LAND FORMATION: It is generally flat at the river bank.

- Genele slope 5 % - 10 % up to the hill side.

-The hill side is 20 % - 50 % slope - not very good for constructions.

CONTOUR : The contour line intervals is 2 (two) metres.

ACCESSIBILITY: The best access is from the intraregional main road.

VIEWS: The valley provides the best channel for view to and from the town , over the green, flat beautifull alluvial plain and the river Nile.

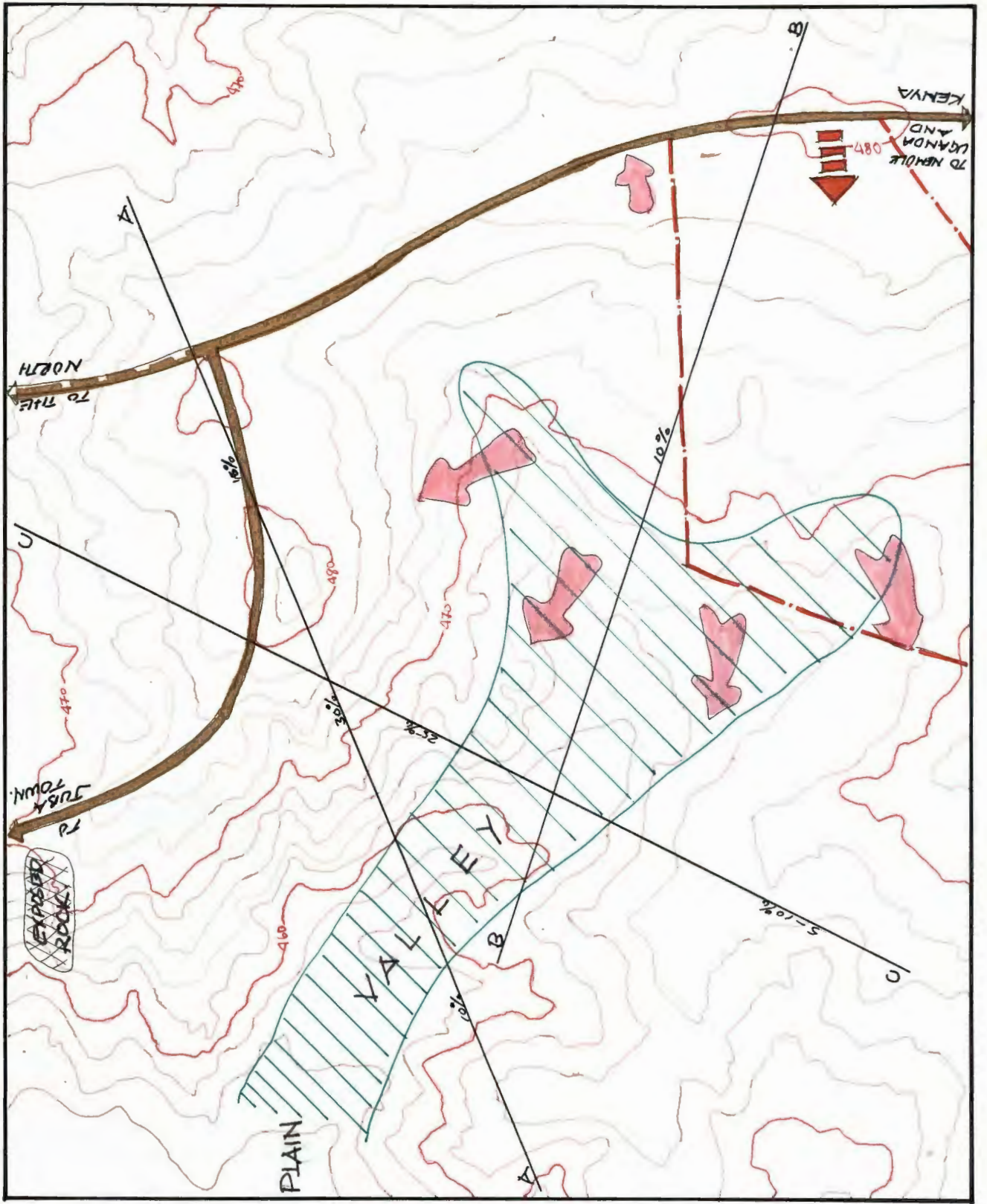
SPECIAL FEATURES: Generally there is no special feature.

In some the slope is very steep, the rocks are exposied which gives a nice land formation (good for land scapes) but needs treatments.

The only man-made feature is the road.

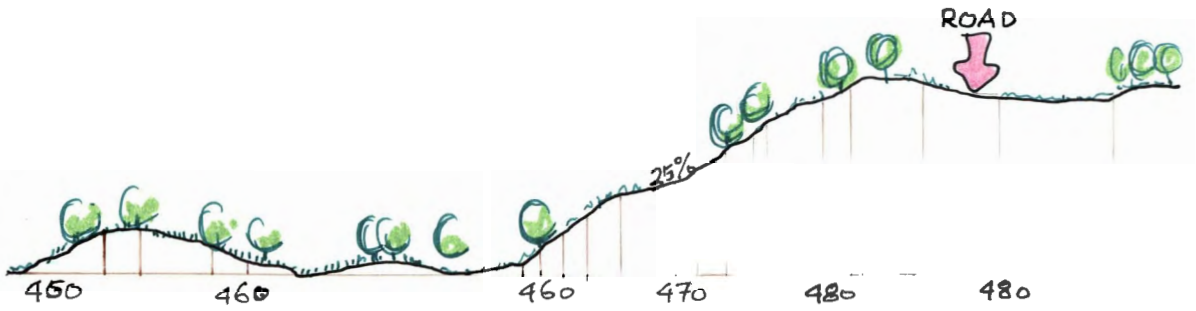
TOPOGRAPHIC
MAP.

1:10000



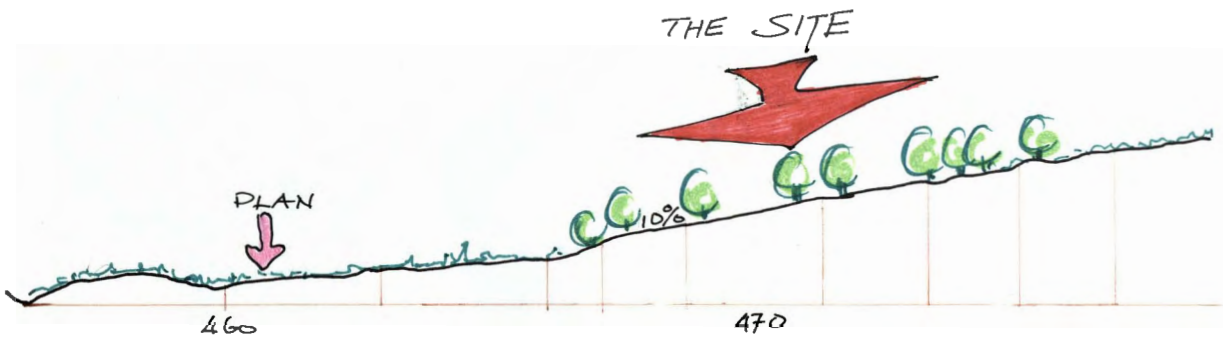
LEGEND

-  THE SITE
-  VIEW
-  SECTION
-  EXPOSED ROCK.
-  VALLEY
-  CONTOUR LINES
-  ROAD



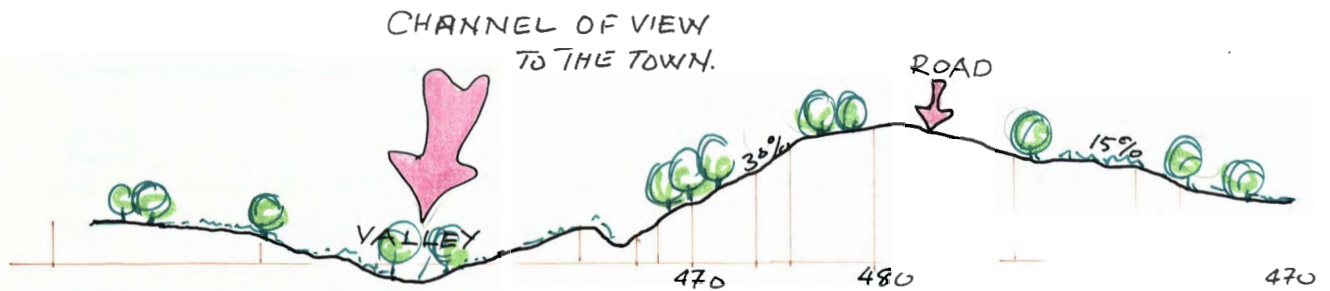
SECTION AA

-25% to 50% Cut and Fill slope.



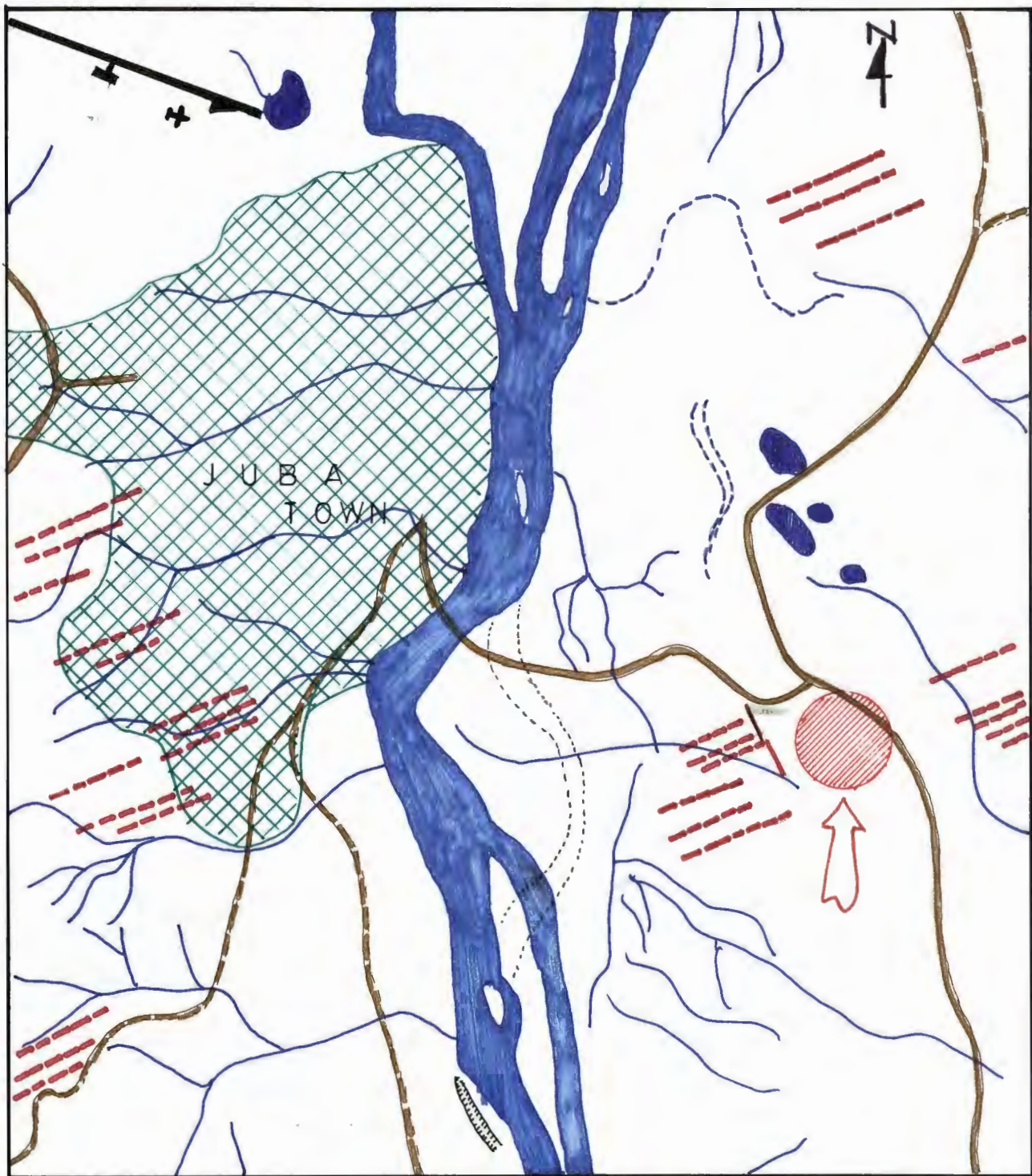
SECTION BB

-10% Slope Good Slops.



SECTION CC

-30% Slope - Road problems.



KEY

 Fault planes (Line)

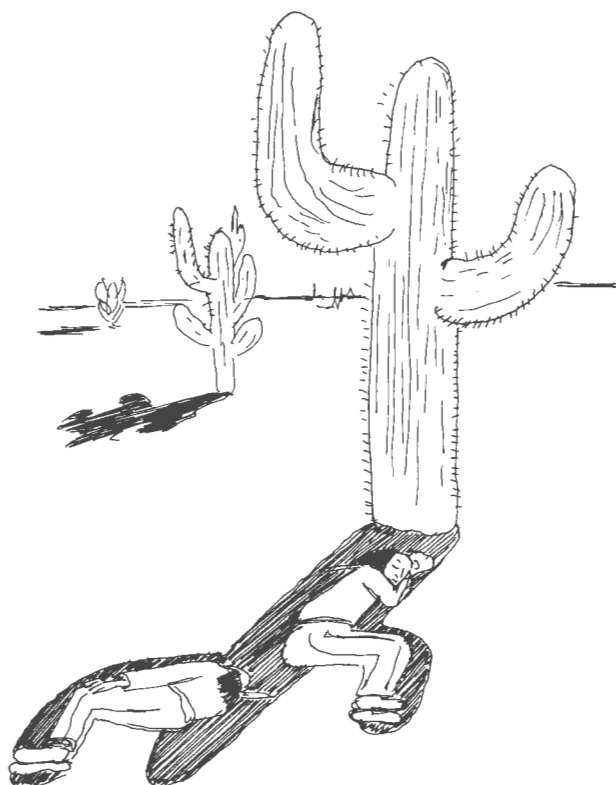
 Flexure Planes

 River Nile

 Air Port.

 Main Road.

 Water Body



CLIMATE. (HOT HUMID TROPICS)

TEMPERATURE: The area of Juba is generally hot. The daily mean minimum temperature is 19.3°C and the daily mean maximum temperature is 37.4°C , with the daily mean temperature is 18.1°C . The maximum temperature is 43.6°C , which accured in Febuary and March. While the minimum temperature recorded was 11.4°C in Jan. 24th. 1957.

ATMOSPHERIC PRESSURE (MB)

The minimum atmospheric pressure is 955.2 MB. in March and maximum is 959.3 MB recorded in July. The yearly mean atmospheric pressure is 957.1 MB.

SUDAN METEOROLOGICAL DEPARTMENT,
CLIMATOLOGICAL NORMALS 1951-1980

JUBA: LAT: 04° 52' N LONG: 31° 36' E ALT: 460

ELEMENT	ATMOSPHERIC PRESSURE M.B. M S L (30 YRS)	AIR TEMPERATURE 0°C						MEAN DAY TEMP MAX+MIN 2	RADIATION (24 YEARS) MJM ² /DAY	BRIGHT SUN-SHINE DURATION (23 YRS)	
		DAILY MAXIMUM			DAILY MINIMUM					HRS	%
M O N T H		MEAN	HIGHEST	DATE	MEAN	LOWEST	DATE				
JANUARY	956.1	36.8	41.3	SEV	19.6	11.4	24-57	28.2	19.39	9.4	79
FEBRUARY	955.5	37.4	43.0	7-73	21.3	12.2	12-57	29.3	19.59	8.3	70
MARCH	955.2	37.0	43.0	30-72	23.1	16.6	12-67	30.0	19.30	7.0	58
APRIL	955.8	34.9	42.2	1-72	22.9	16.5	4-68	28.9	18.93	6.7	55
MAY	957.3	33.2	39.9	2-75	22.2	17.3	31-71	27.7	20.56	7.8	63
JUNE	958.8	33.1	38.5	1-78	21.4	17.5	2-71	26.7	19.22	6.9	55
JULY	959.3	30.9	36.5	16-77	20.7	17.6	9-71	25.8	17.92	6.5	52
AUGUST	958.8	30.8	36.8	29-61	20.6	18.0	16-58	25.7	19.39	6.8	55
SEPTEMBER	957.9	32.4	38.8	31-77	20.7	17.5	7-53 10-56	26.5	21.19	7.7	63
OCTOBER	957.2	33.5	39.0	22-63	20.9	17.3	31-52	27.2	20.35	8.0	66
NOVEMBER	956.8	34.5	39.1	29-73	20.3	14.4	23-55	27.4	19.47	8.5	71
DECEMBER	956.5	35.6	40.2	30-53	19.3	13.9	26-71	27.5	19.18	9.4	79
Y E A R	957.1	34.2	43.0	7-2-73 30-3-72	21.1	11.4	24-1-57	27.6	19.54	7.7	64

(128)

ELEMENT	RELATIVE HUMIDITY (30 YRS)	CLOUD AMOUNT (0-8) (29 YRS)				R A I N F A L L S						EVAPORATION P I C H E (MM) (30 YRS)	WIND (10 YRS)	
						TOTAL	ON. OF DAYS			MAX. IN ONE DAY			PREVAILING DIRECTION	MAIN SPEED M. P. H.
							0.1	1.0	10.0	TOTAL	DATE			
MONTH	MEAN	00.00	06.00	12.00	18.00									
JANUARY	44	3.5	5.2	5.3	4.4	4	1.3	1.1	0.1	18.7	3-1953	11.2	NE	4
FEBRUARY	43	3.8	5.5	5.5	4.8	10	2.4	1.8	0.3	32.7	29-68	11.8	NE	4
MARCH	52	5.1	6.2	6.3	5.6	45	7.9	6.1	1.5	54.3	4-57	10.1	S	4
APRIL	65	5.8	6.6	6.5	6.1	99	11.9	9.9	3.0	107.0	29-79	7.0	S	4
MAY	73	5.9	6.4	6.5	6.0	149	9.4	8.3	4.4	78.2	7-62	4.8	S	4
JUNE	77	5.6	6.4	6.5	5.8	103	11.1	9.3	3.3	83.9	29-76	3.8	S	3
JULY	81	6.0	6.7	6.6	6.1	127	13.4	11.3	3.9	77.0	10-58	3.1	S	3
AUGUST	81	5.7	6.5	6.6	5.8	164	13.6	11.2	5.5	88.3	2-75	2.8	S	3
SEPTEMBER	78	5.5	6.3	6.3	5.6	109	10.2	8.9	3.3	77.8	10-60	3.8	S	3
OCTOBER	75	5.6	6.3	6.4	5.9	108	11.2	10.0	3.3	115.9	25-62	4.4	S	3
NOVEMBER	68	5.1	6.1	6.4	5.5	42	7.4	5.8	1.5	41.5	17-51	5.7	S	3
DECEMBER	54	3.9	5.4	5.4	4.5	9	2.2	1.8	0.2	38.1	3-68	8.6	NNE	3
YEARS	66	5.1	6.1	6.2	5.5	969	1020	85.5	30.3	115.9	25-10-62	6.4	-	-

RELATIVE HUMIDITY :

The minimum mean relative humidity is 43.% in March and maximum is 81 %. The yearly mean is 66 %. This means that it is very Humid during rainy season. The annual Relative Humidity is fairly high and it is at the highest during the highest temperature. The climatic factors affecting the place are those of typical hot humid tropics.

RAIN FALL:

It is seasonal rain fall and there about six to eight month of rains. From March to November. Average rain fall is 500 - 1250 mm of rain - fall. There is little rain during dry season , 100 - 250 mm. Wettest month.

EVAPORATION PICHE:

The maximum evaporation occurs during dry season. 11.3 mm / day in February and the minimum occurs in July 3.1mm / day. Average/year is 6.4 mm/ day.

PRECIPITATION:

There is no proper record of precipitation done.

W I N D :

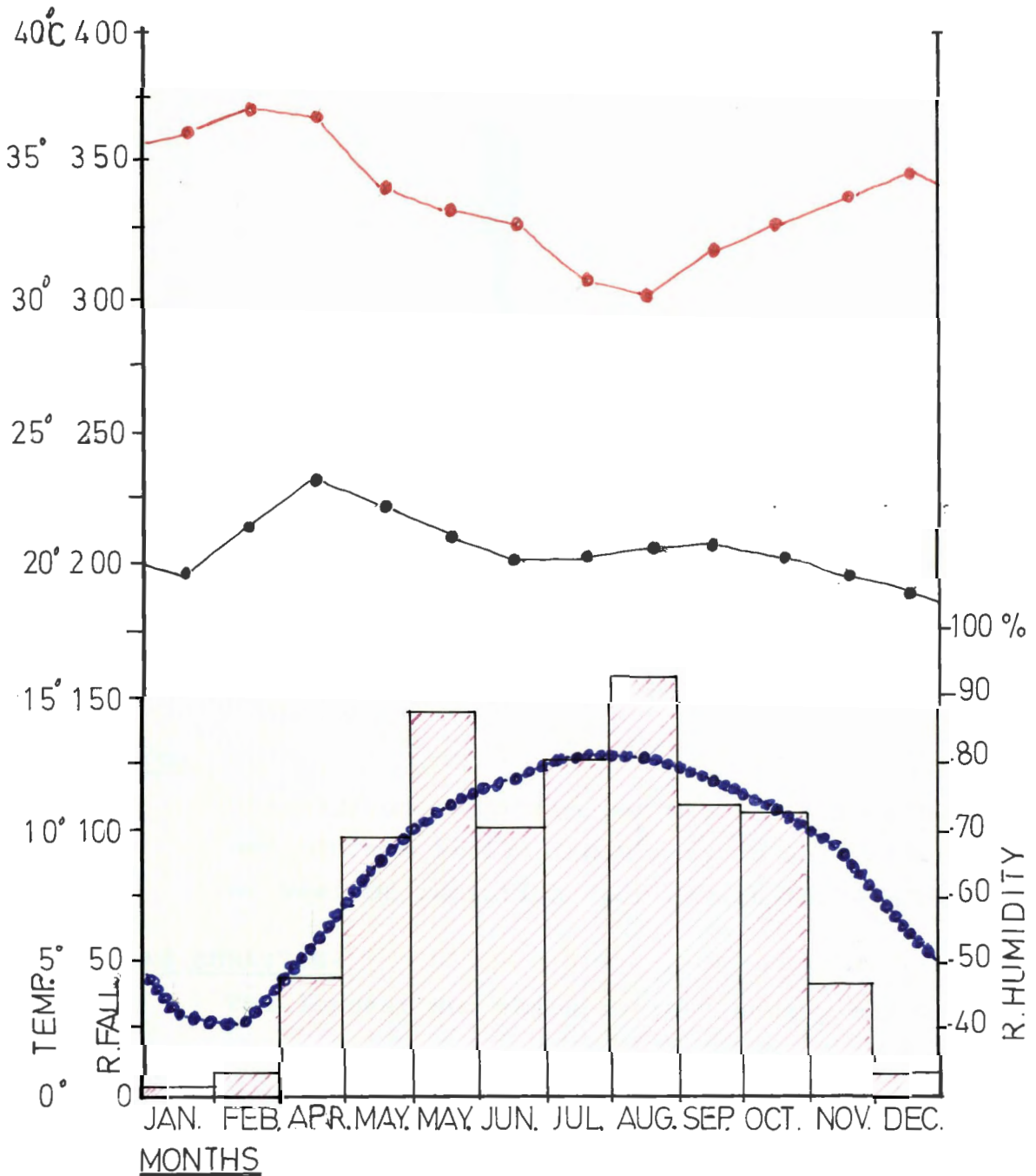
The general direction of the prevailing wind is North East and Mostly South.

It is seasonal, fairly strong and steady during monsoon period or (equivalent) speed, 3 miles (4.83 Km) per hour to 4 miles (6.44 Km) per hour, This affects the orientation of buildings, but can be solved.

(see wind rose on the next page)

J U B A (Altitude 4_6 0 m 4 52 North 3J 36 East

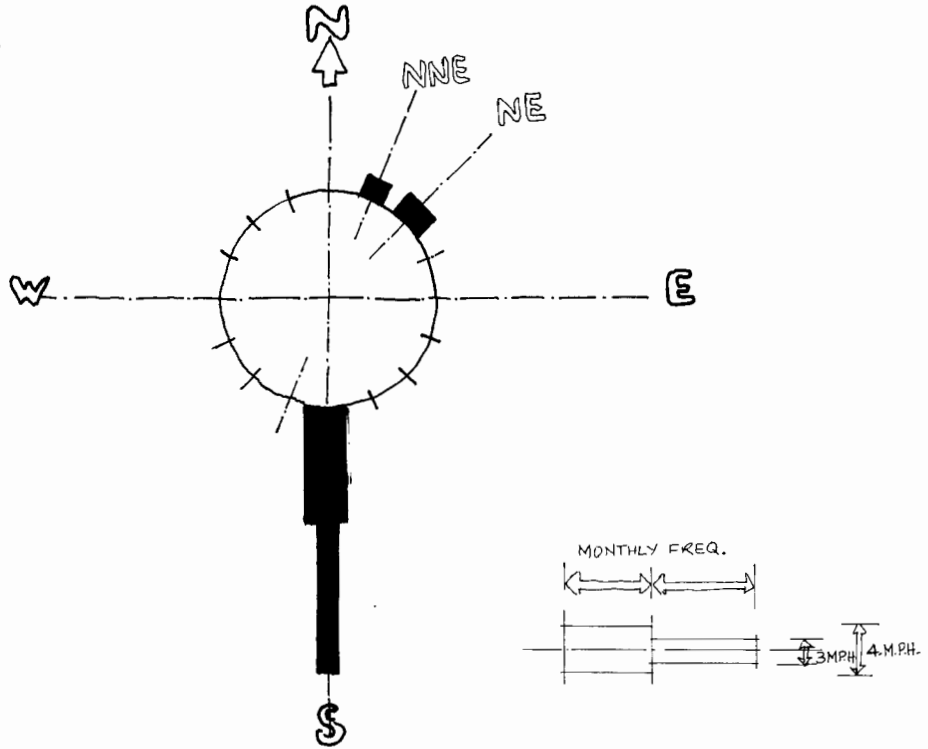
MONTHLY VALUES OF MEAN TEMPERATURE, R. HUMIDITY,



KEY

- Mean Max. daily Temperature °C.
- Mean Min. daily Temperature °C.
- Monthly Relative Humidity.
- ▨ Monthly Precipitation.

WIND ROSE



SKY CONDITION:

The general appearance depends on the seasons, During the rainy season the sky is very humid, immediately after rain the sky gets clear and looks blue, as island sky, later in the day, it brightened the dust increased in the lower part of the sky, as desert sky.

RADIATION:

The maximum radiation per day is $21.19 \text{ MJM}^2/\text{day}$ and minimum is $17.92 \text{ MJM}^2/\text{day}$ in July. Average per year of radiation per day is $19.54 \text{ MJM}^2/\text{day}$.

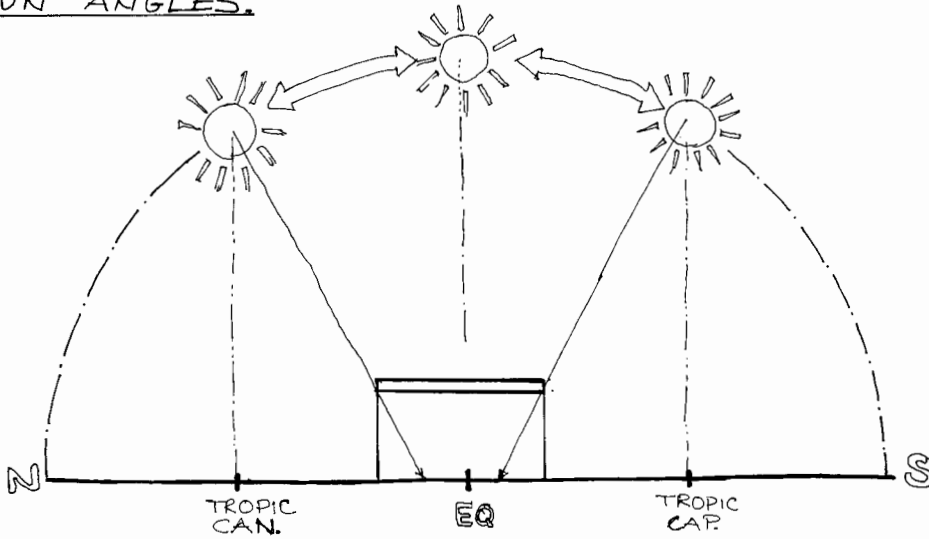
SUN SHINE DURATION:

The longest sun shine is in January and December 9.4 hours per day, 79 %. and July 6.5 to 6.7 hours about 52.55 %. Yearly mean of sun shine is 7.7 hours, and about 64 %.

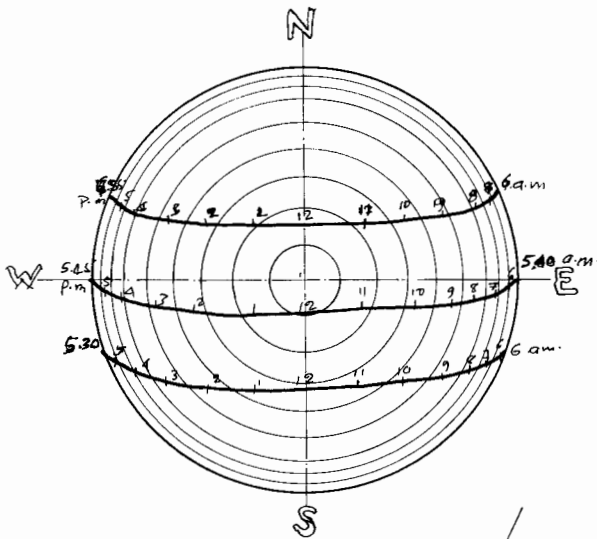
SUN ANGLE:

The site is at $4^{\circ} 52'$ North which is almost at the Equator. The sun angle shows that the North and South facade is almost exposed equally to the sun.

SUN ANGLES.

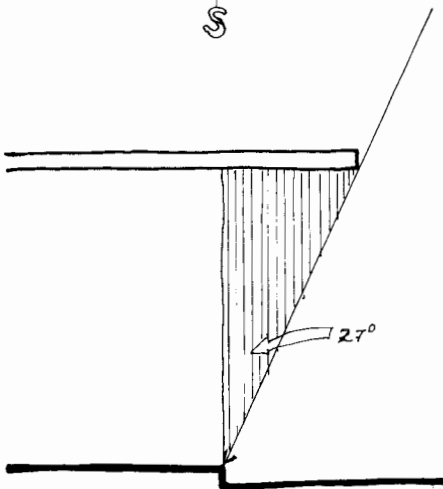


SUN-PATH DIAGRAM.



DIRECTION OF SUN AT MIDDAY.

DATE - MONTH.	LAT. 4° N.
1 st JAN	27
1 st FEB	19.5
1 st MARCH	12
1 st APRIL	2
1 st MAY	18
1 st JUNE	19
1 st JULY	13
1 st AUGUST	14
1 st SEPT.	4
1 st OCT.	8
1 st NOV.	15
1 st DEC.	26



MIDDAY SUN ANGLES. AT LATITUDE 4° NORTH.

SUN RADIATION

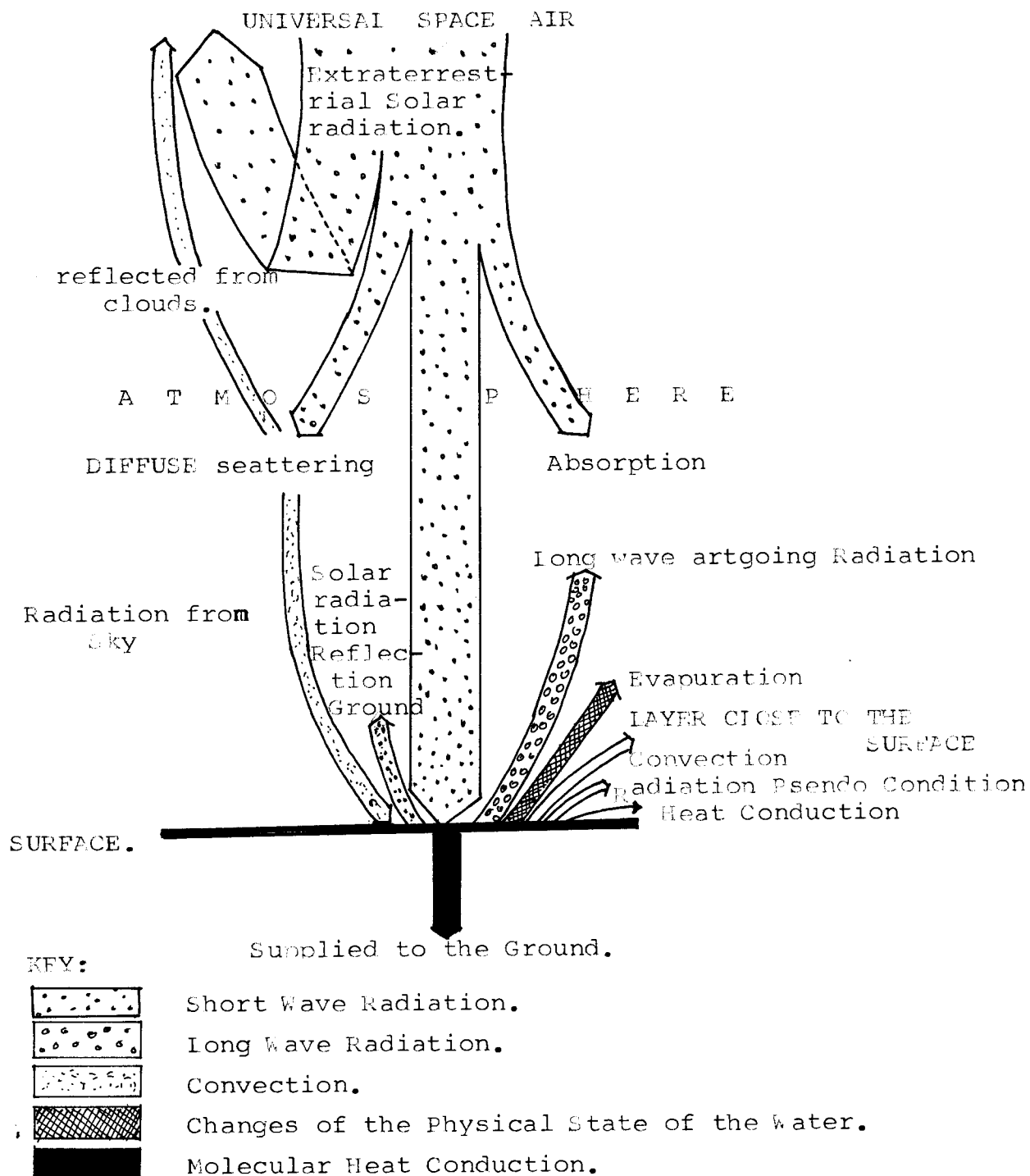
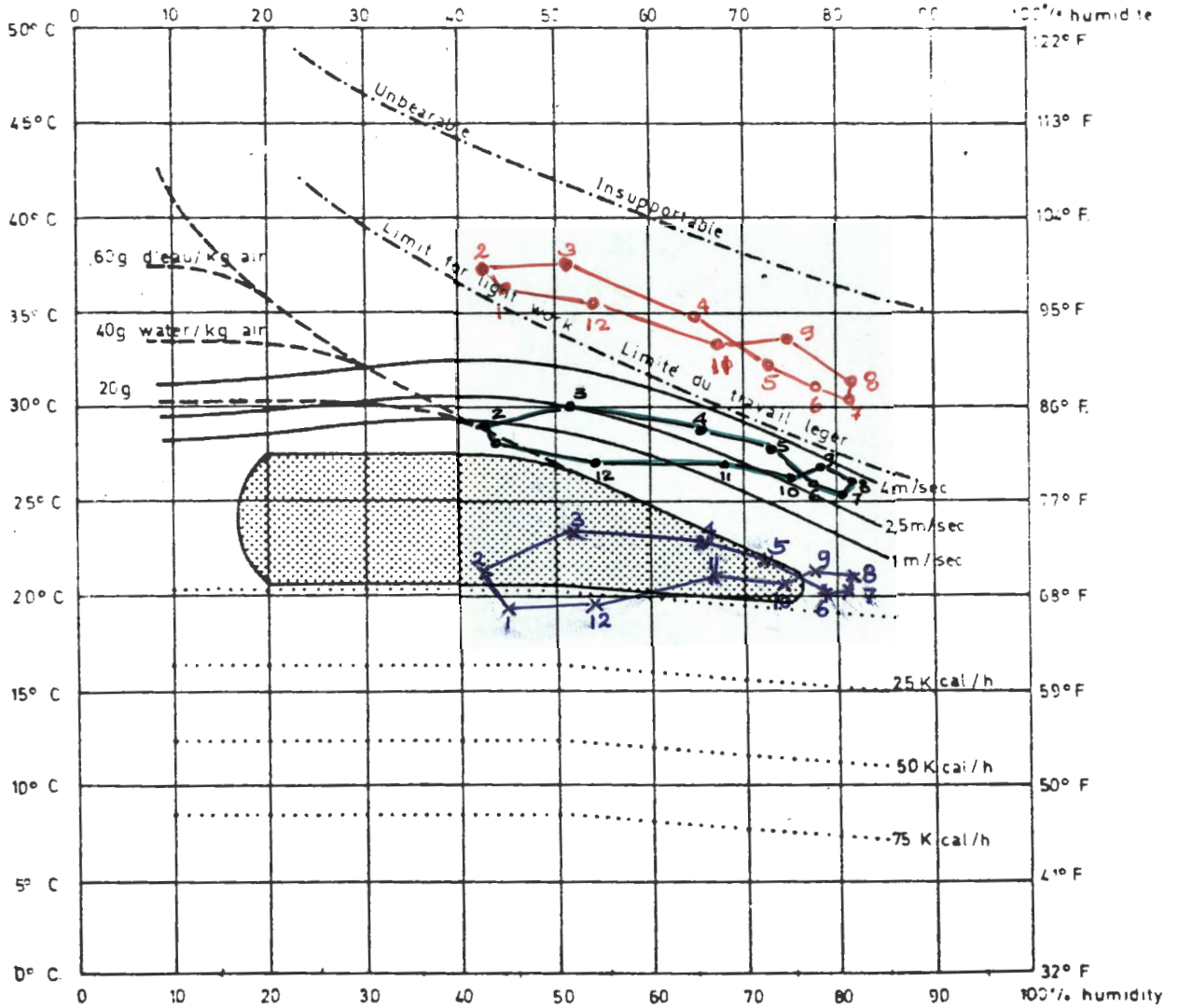






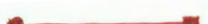


FIGURE (4)

BIOCLIMATIC COMFORT CHART (JUBA)

AIR TIDE 460m Position 4°52' N. 31°36' E.

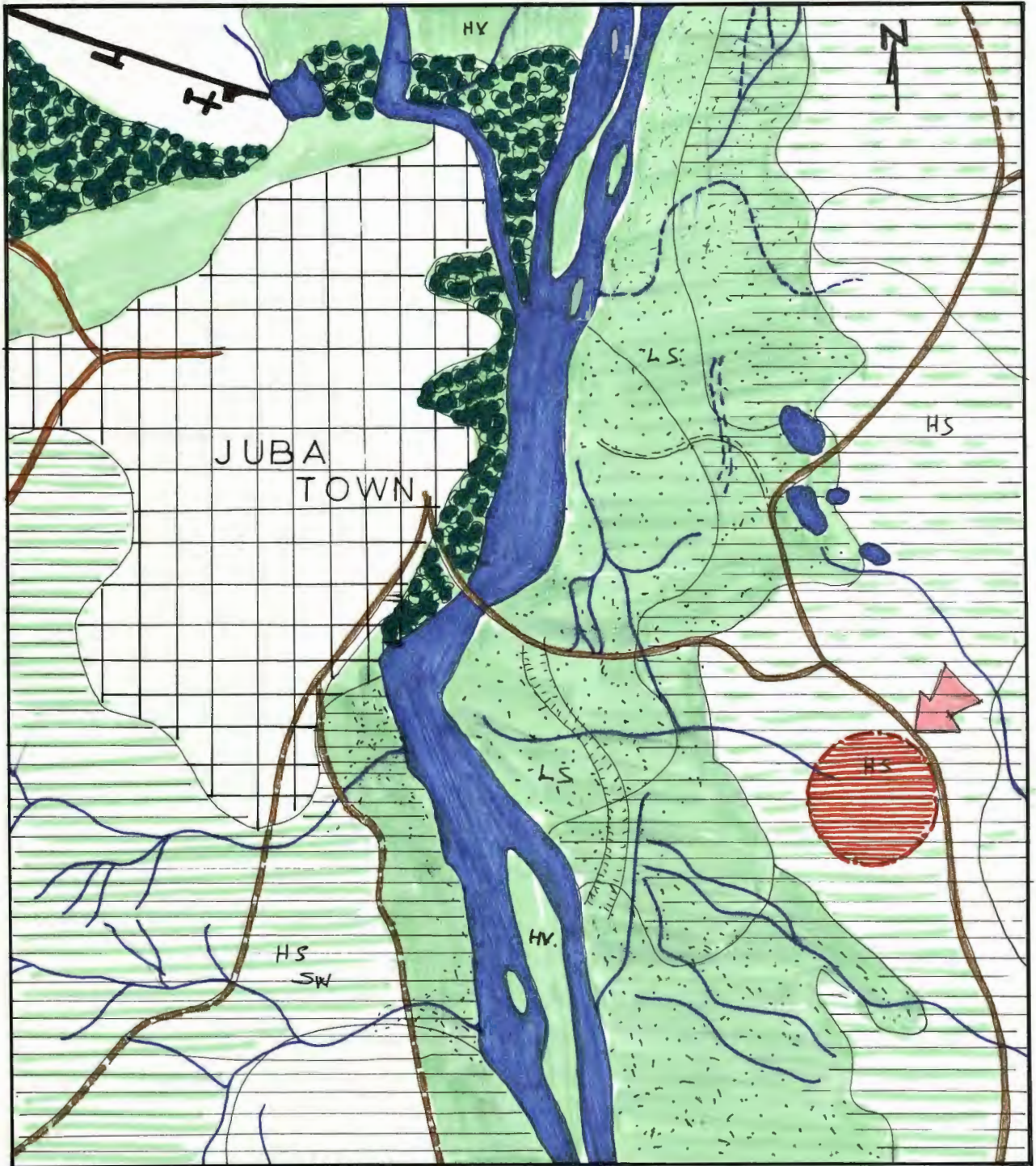


KEY:

-  Comfort Zone
-  Extension of Comfort Zone by Ventilation
-  Extension of Comfort Zone by Humidification
-  Extension of Comfort Zone by Heating
-  Maximum mean Daily Temperature
-  Mean Daily Temperature
-  Minimum mean Daily Temperature

IMPORTANT SOLUTION: Make use of Sun-shading and proper Ventilation But in the afternoon Cooling is very much needed. By air condition - drying the air.

LAND USE AND VEGETATION MAP OF JUBA AREA



LEGENT

CULTIVATED AREA

- DENSE (OVER 75%)
- MEDIUM 50-74%
- SPARSE 25-49%
- ROAD

TREE PLANTATION

- ADVANCE "M" "F" "W"
- INADVANCE
- URBAN AREA AND SERVICES.

VEGETATION UNITS

- HY HYDROPHILOUS V.
- LS LOWLAND SAVANNAH
- HS HIGHLAND "
- RIVER NILE.

ECOLOGY

The main Vegetation that cover the area of Juba are: Hydrophilous vegetation, low and highland savannah-grass land with few trees of umrella shaped. Hydrophilous vegetation is of toich and riverine area with permanent to **semi**-permanent moistured soil.

Low-land savannah grassland accures in flat-area seasonally flooded or water logget drainage condition (alluvial area) and high land savannah is on gently undulated to hilly mountainous area with well defined drainage pattern.

NB. ther is no sources of polution in the area.
only there will be noise polution when the highway is constructed.

The area is still vargine care has to be taken.

INFRASTRUCTURE.

- a- Traffic pattern at the moment is the all-weathered road from Juba to Nimule and Uganda, and to Torit-Kenya is still under construction. It will be the main future vehicular road with pedestrian side walk. The possible access to the site is from this road. This area is only penetrated by poor peasants on foot or cycling, that made up some foot path which can only appear during dry season.
- b- Utilities, since the land is still natural, The land is used only for cultivation. No sewer line, and electric line passes through the land. Only overhead telephone line passes along the main road.
- c- Natural energy sources; the most possible natural energy sources will be the passive energy, (solar-energy). The sun is bright all the year around. Another most important energy source is the wood. It is used more commonly in the area. In the ten years plan of Juba town, there will be an overhead hydroelectric power line from Nimule to Juba.

SOCIO-ECONOMIC ENVIRONMENT AND DEVELOPMENT TENDANCIES

TENDANCY: The area of the site is mainly used for local cultivation by the local peasant for their local consumption, mainly seasonal crops (not in large scale) but for low income rate only. Fire wood is another income source for the poor native of the area.

The development Tendency for the area is ten years plan which has to be urban in character.

According to the ten years structural plan. Educational and urban.

ARCHITECTURAL CHARACTER AND HISTORY OF THE SITE AND SURROUNDING

This area of Juba has no significant Architectural character that can be preserved. It is just a natural site use for local cultivation, with some small huts. care has to be taken when developing the site it has to be not so urban or regional. A new character can be created by the use of local materials, and simplified technology.

LEGAL FACTORS AFFECTING LAND USE

The site has to be developed according to the new long term ten years development program. It has to be residential and institutional in character. The local construction techniques has to be improved to more 'URBAN' character.

8

DESIGN
RECOMMENDATIONS
FOR
THE
SITE

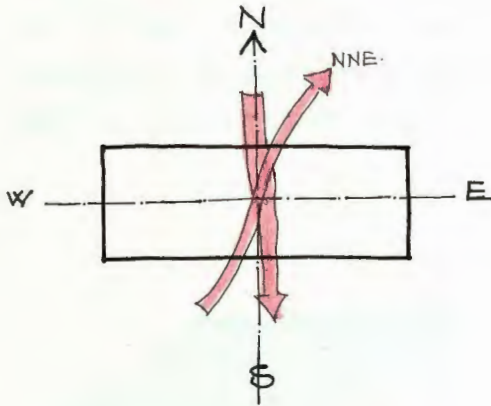
ORIENTATION.

The Site for a new School ought to be a result of intergrated coordination of "Rational" as well as "Irration-na" Aspects:

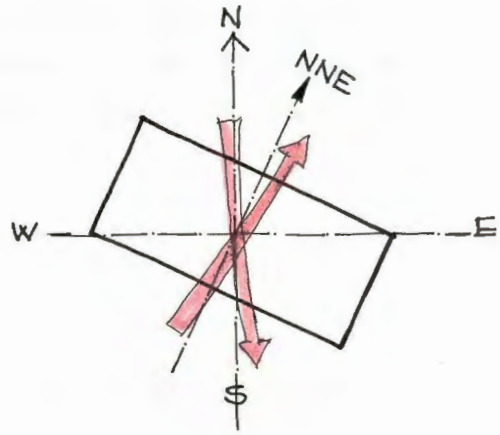
THE ORIENTATION OF SCHOOL BUILDING: (Should be according to the following;

- a- Natural light.
- b- Sun Shading (minmum solar load or face openning.
- c- Natuzal ventilation (prevailing winds direction.
- d- Geophysical precondition (Horizontal or sloping site.)
- e- View.
- f- Urban Relationship.
- g- Functional space uses.

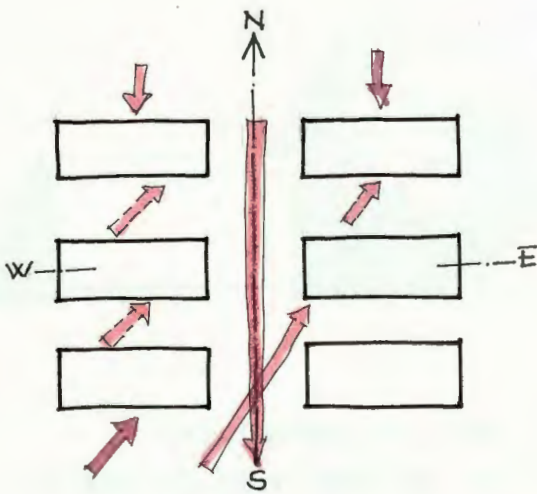
ORIENTATIONS ACORDING TO THE WIND DIRECTION.



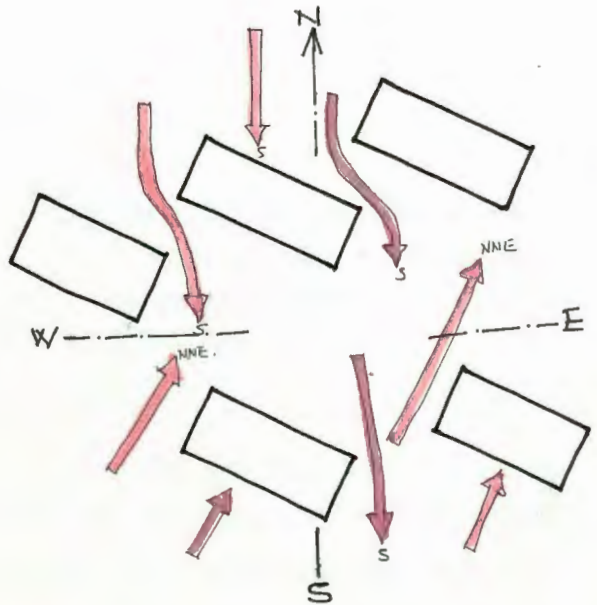
a, THE BEST ORIENTATION FOR VENTILATION (NATURAL) BUT DOES NOT GIVE PROPER VIES TO THE SITE.



b, BEST ORIENTATION WITH MAX. VIEW. STILE HAS CROSS VENTILATION. VIEW IS ACROSS THE GREEN ZONE, RIVER & TOWN.



c, MONOTONOUS SOLUTION (INVOLVING RISK OF BREEZE BLANKET.

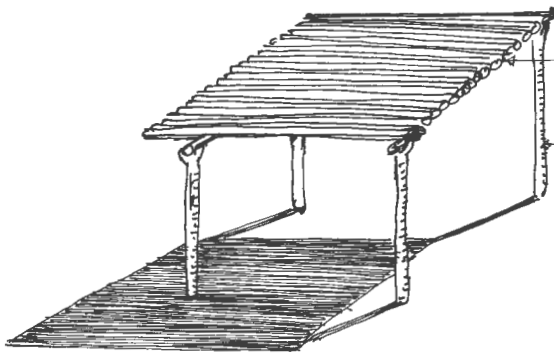


d, BEST SOLUTION BUT PROBLEM OF TOPOGRAPHY MAY NOT ALLOW.

The best solution for building orientation will be the combination of the two orientation according to the topography.

SHADING MEANS.

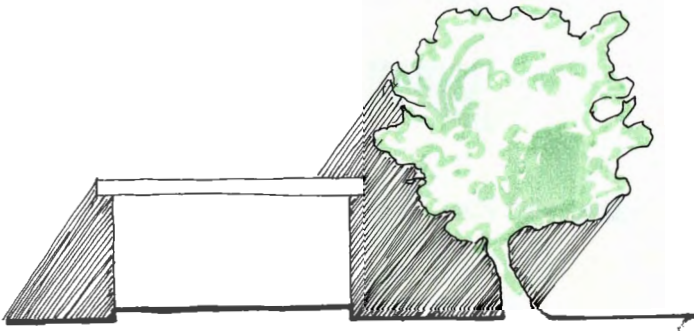
The sun is the first common problem to be solved after the orientation of the building. Because the sun is always so bright that it radiate a lot of heat on the building. Traditionally the common method is only to prevent a direct sun light.



MAT OR LEAVES OF TREES.

POLES.

SINCE THE (SUN) DIRECT SUN GIVES MUCH HEAT THEREFORE THE FIRST STEP IS TO STOP DIRECT SUN RAYS.

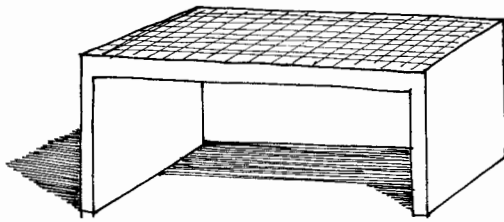


9, NATURAL FORMED IS THE FIRST TRIAL. A PLEASANT MICRO-CLIMATE IS OFFEN CREATED.

Moutains can also create the same effect but at most cases it fare and can only change the direction of the wind. When trees are used, it will depend on a shape, size and distance of the trees from the building in order to give the pleasant effects.

The existing natural trees on the site has to be preserved. More has to be planted .

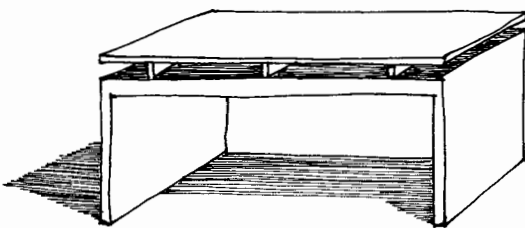
SHADOW PROVIDED BY THE FOLLOWING LOCAL METHODS:



a, MAT VENTILATED BETWEEN THE ROOF AND MAT.

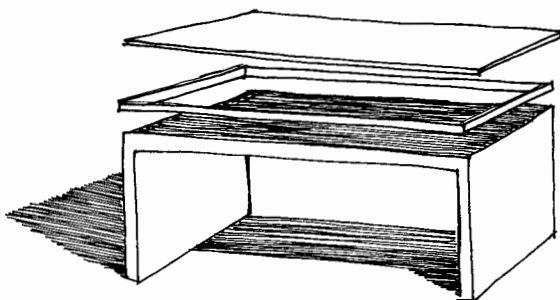
- a- Espalier plantations
- b- Simple mats of grass or bamboo,
- c- Trees
- d- Ventilation of the covered space and the roof.
- e- Using shaded roof terraces.

SHADING STRUCTURES.



a, DOUBLE ROOF VENTILATED.

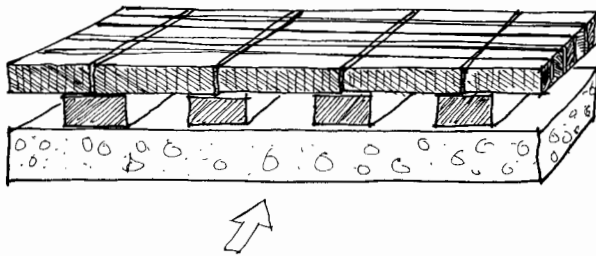
- a- Can be slab suspended over roof - double roof.
- b- Evaporative cooling of a roof by means of water basin.
- c- Using grass or creeping plan on roof.
- d- Ventilated pavement on roof terraces.



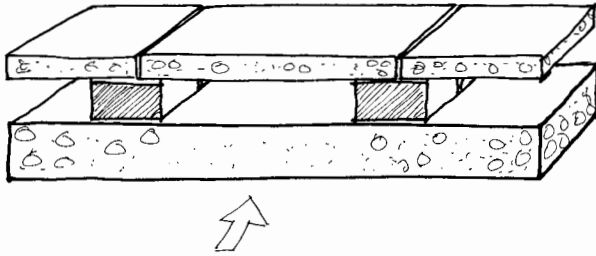
b, SHATED ROOF TERRACE.

- shade roof terrace is the most economical one.

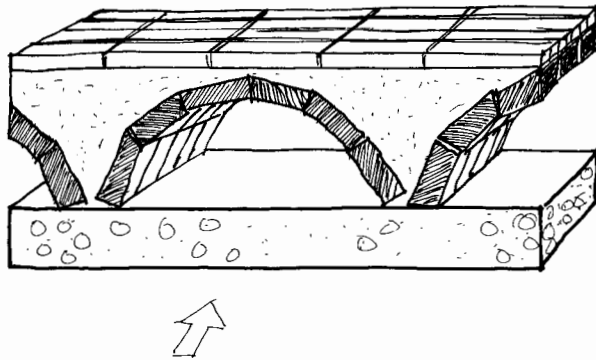
LOCAL METHOD OF VENTILATED PAVEMENT DETAILS.



a, BRICKS LAIED ON BRICKS.



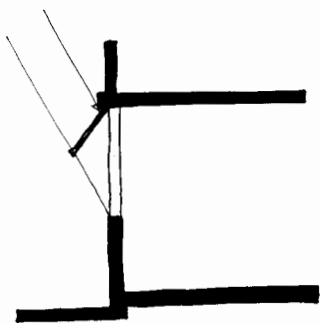
b, CEMENT PLATES ON BRICKS.



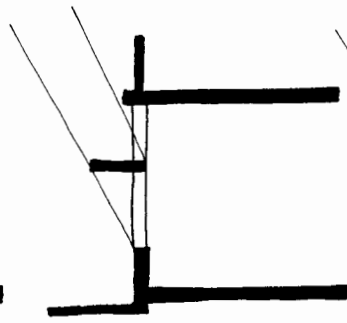
c, TILES ON SAND,
ELEVATED BY BRICK VAULTS.

THE ARROWS SHOWS THE
DIRECTION OF THE "WIND
CHANNEL"

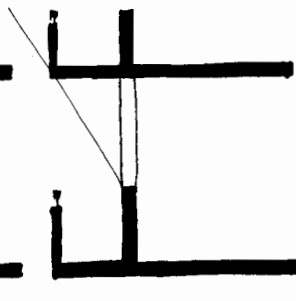
TO THE OPEN FACADES TO PROTECT THE DIRECT SUN
IS BY STRUCTURES.



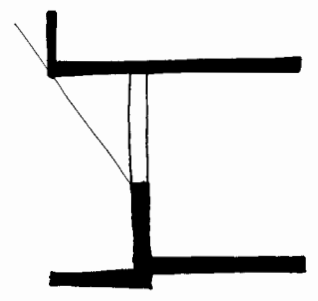
a, SUN SHADE



b, CANOPY

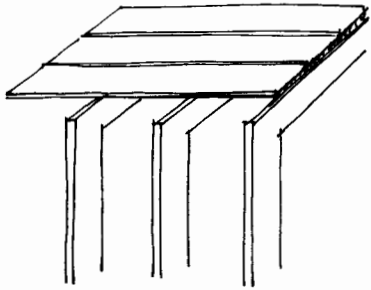


c, BALCONY

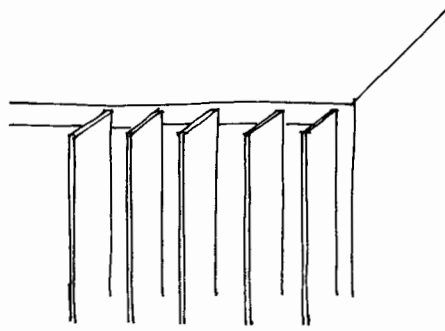


d, CANTILEVER.

OTHER METHOD OF PROTECTING THE FACADE IS BY VERTICAL OR HORIZONTAL LOUVERS OR STRUCTURES.

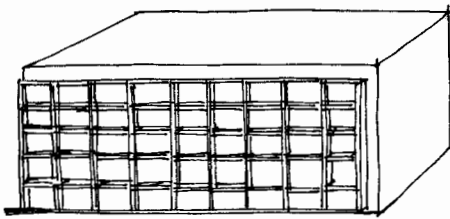


a, VERTICAL BUILDING STRUCTURE.

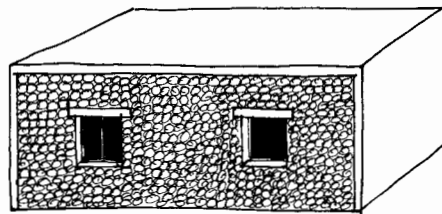


b, VERTICAL LOUVERS IT IS APPLIED ON THE BUILDING FACADE.

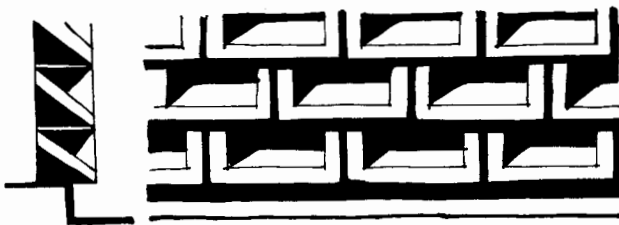
CONCRETE LOUVERS OR BRICKS ARE USED.



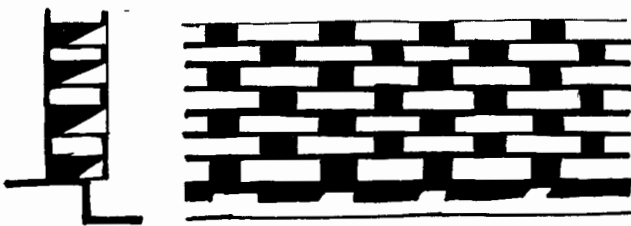
a, CONCRETE BLOCK LOUVER BETTER FOR CLASS ROOMS.



b, BLOCK WALL SUPPLIED WITH VIEWS, GOOD SUN BRAKERS.



c, DETAILED OF CONCRETE BLOCK LOUVERS.



d, BRICK LOUVER DETAILED.

BRICKS ARE SOME TIMES USED. IT IS LESS EXPENSIVE SINCE THEY ARE LOCALLY MADE OR LOCAL BLOCKS OF CONCRETE CAN BE USED. MADE OF CONCRETE OR SOME TIMES CERAMIC TILES ARE ALSO USED.

NATURAL LIGHT.

Sun Shading device integrated part of the building in open facade will change the light- niveau as well as light distribution in room behind. Also the depth size of room is a problem. In school building it depends on the overall dimension of the class-room, laboratory or workshop.

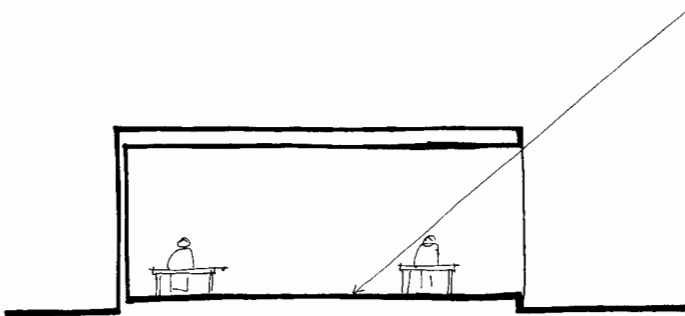
The ideal light in class-room is determined by;

1- The minimum light factor, T mini.

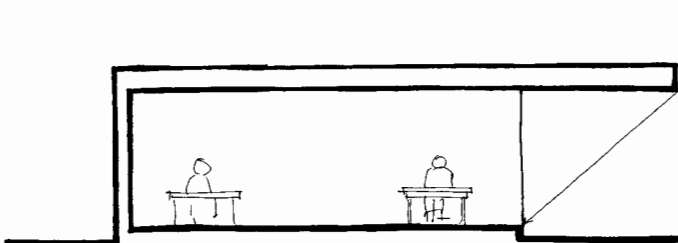
2- The maximum light factor, T max.

$$\frac{T \text{ min.}}{T \text{ max.}} = \frac{1}{3}.$$

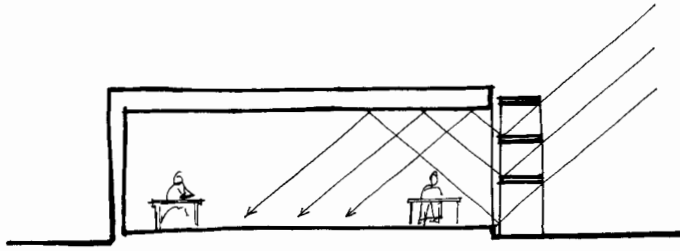
ILLUSTRATIONS OF INFLUENCE ON NATURAL LIGHT OF THE MOST COMMON SHADING STRUCTURES.



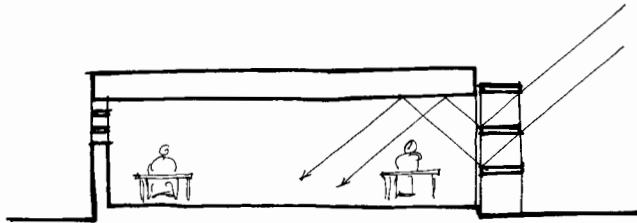
a, DEEP ROOM WITHOUT SUN SHADING FACTOR = $T \text{ mini} / T \text{ max.}$ BETWEEN THE INSOLATED AND SHADOWED PLACES IS INTOLERABLE.



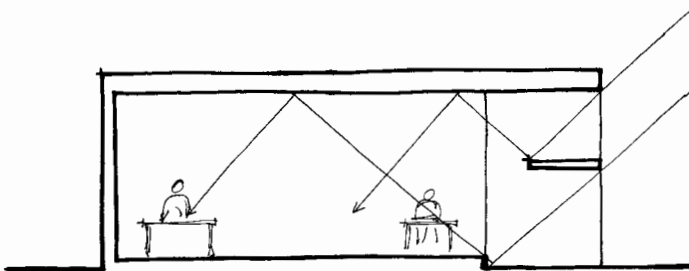
b, LOGGIA TYPE. THE CONTRAST FACTOR IS SMALLER. THE ROOM IS NOW SO DEEP. THE INNER PLACE HAS INSUFFICIENT LIGHT.



c, HORIZONTAL SHADES. BRIGHT PAINTED CEILING BE ABLE TO REFLECT SUFFICIENT LIGHT TO THE INNER PLACES. AT THE SAME TIME REDUCE THE LIGHT FACTOR AT SUFFICIENTLY AT THE WINDOW PLACE.



d, ANOTHER POSSIBILITIES OF REDUCING THE CONTRAST FACTOR IN A DEEP CLASS-ROOM.



e, SOLUTION BY USING THE PROTRUSION OF THE CLASS-ROOM. LOGGIA GIVES AN EXCELLENT ANSWER TO THE NATURAL LIGHTING AND SUN SHADING.

The sun shading devices should not only be used for shading, but be used to the maximum to reflect more light to the inside of the room without glare.

CONTROL OF SOLAR RADIATION.(natural heat.)

It has to be reflected back or absorbed. The energy that reached the earth is absorbed by earth and man-made feature, By the use of convection, conduction, and evaporation radiation can be emitted to the loser layer of the atmosphere.

- a- The absorption of heat into the building material depends on the strength of control, is obtained by shading structure.

b- By using reflected material on the surface of the building. For instance white-wash of roofing.

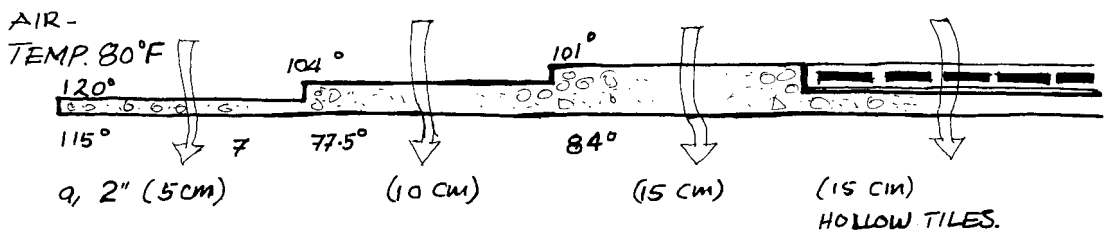
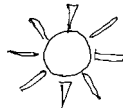
Material	Reflected percent.
i- Earth	6 %
ii- Concrete	6 %
iii- White-sand	9 %
iv- Red Masonary	30 %
v- White eternite	60 %
vi- White wash	80 %
vii- Aluminum sheets	80 %

The higher the reflecting material the better the heat emitted level.

c- Heat storage emission values; the less the heat storage capacity the better the material for heat radiation. (conduction).

d- By using the thick material heat storage capacity is saturated too early which causes heat emission into the classroom before the school day. or insulation material can be used.

EXAMPLE ON ROOF



Another method of reducing heat is by application of double roof. That is by air gaps under the roof.

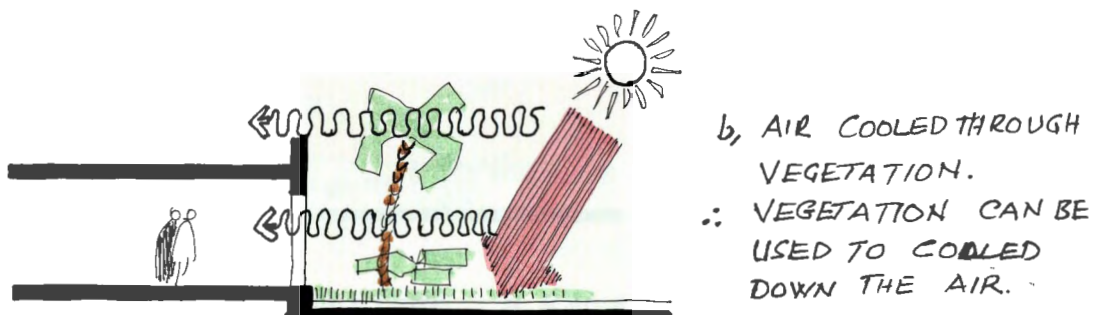
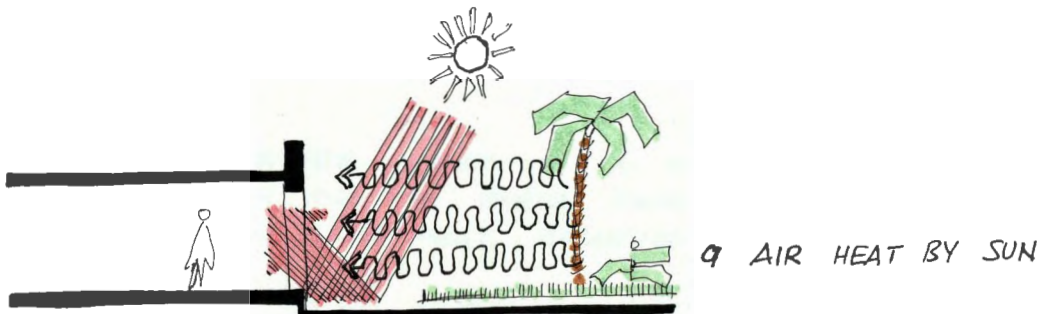
VENTILATION.

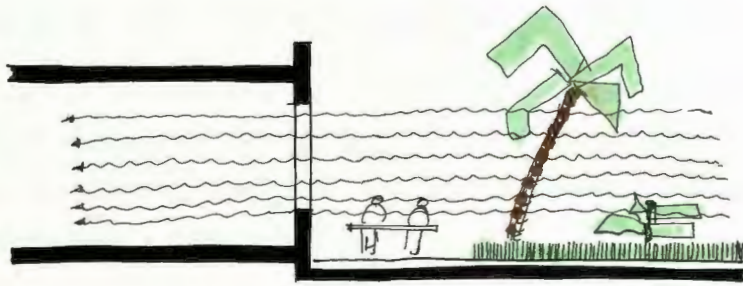
A small amount of air movement gives the feeling of comfort. Specially in hot humid climate, the sensation of comfort is dependant on the amount of air movement.

The air movement inside a building is the result of;

- a- The outside windspeed which causes pressures and vacuum around the building.
- b- The difference in temperature between the insulated and shaded facades.
- c- The thermic effect derived from metabolic heat.

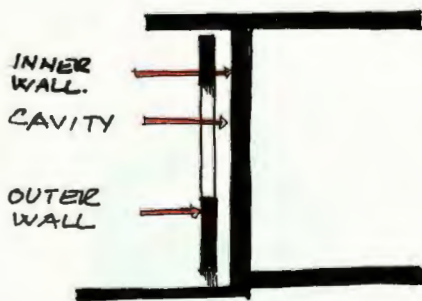
The effect of sketches (a) and (b) is so small, except for places where there is no wind at all. Therefore facade orientation perpendicularly to the wind direction will promote maximum ventilation.



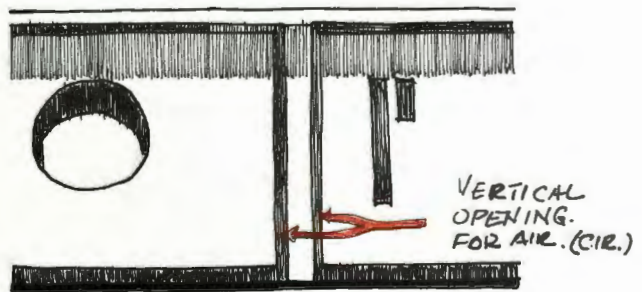


IT IS VERY IMPORTANT IN THE HOT HUMID TROPICS TO ADMIT COOLING BREEZE AT THE BODY HEIGHT.

INSTEAD OF HAVING DOUBLE ROOF WE CAN ALSO HAVE DOUBLE WALL FOR THE EAST AND WEST WALLS,

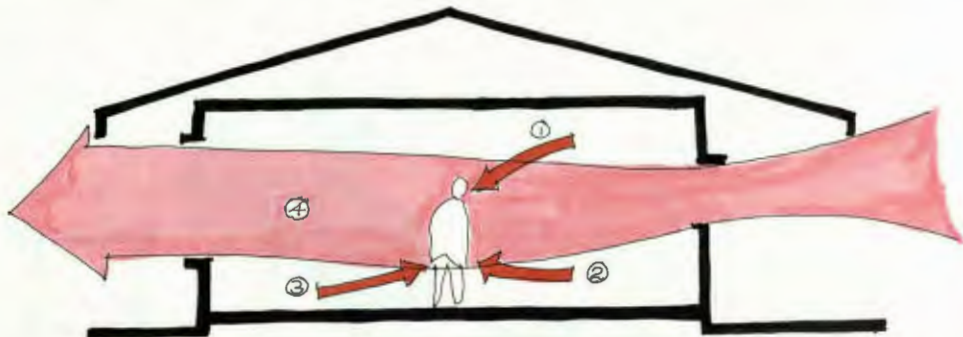


SECTION



ELEVATION OF DOUBLE WALL WITH OPENING FOR VENTILATION.

FOR A BETTER INTERIOR IN HOT HUMID CLIMATE CARE HAS TO BE TAKEN FOR THE THREE MAIN PRINCIPLE WAYS OF WHICH THE BODY LOSES HEAT - RADIATION, CONVECTION AND EVAPORATION.



1, HUMIDITY. 2, TEMPERATURE. 3, RADIATION 4, AIR-MOVEMENTS.

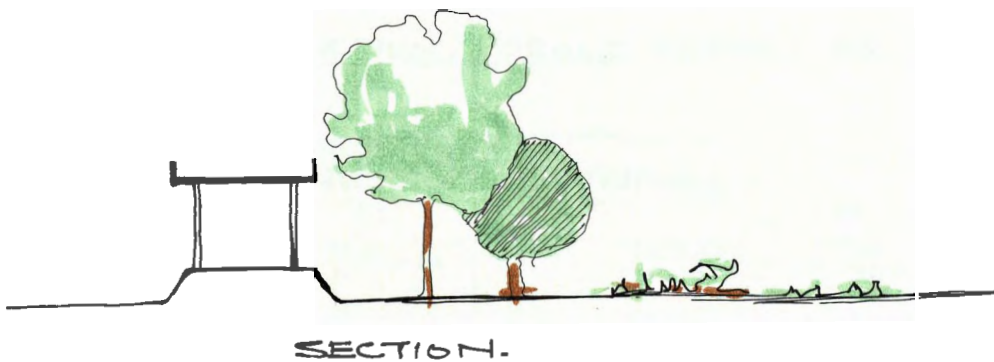
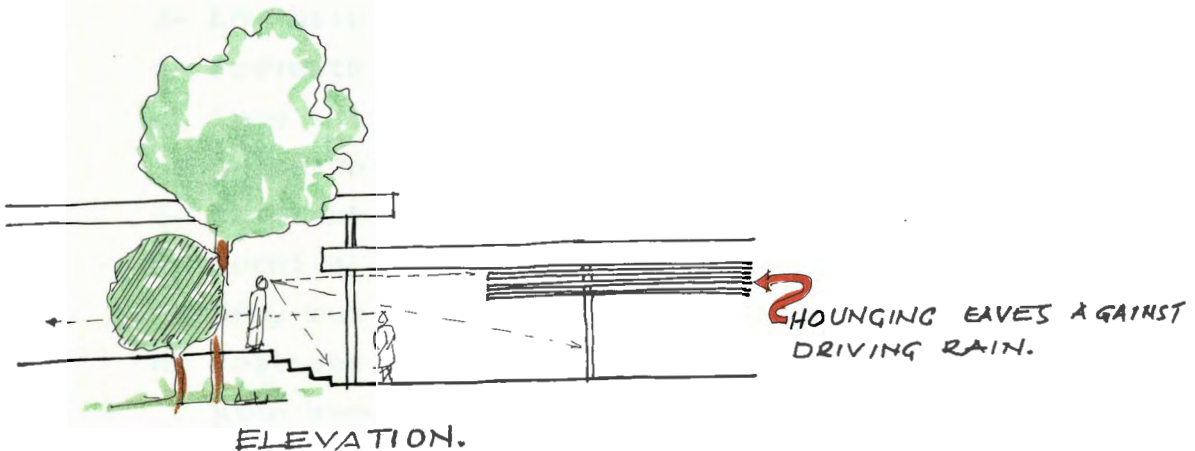
INSECTS SCREENING.

Mosquito Screening keeps mosquitoes, flies, and other flying insects out but it reduces the air-movements and so increases the inside temperature and induce a claustrophobic atmosphere.

RAIN.

Tropical Rain can be sudden, heavy and wind-borne. In some places it may be continuous. On the top of what has been discussed above, (sun }.

All the under pass has to be paved of bricks, concrete tiles, or slabs.

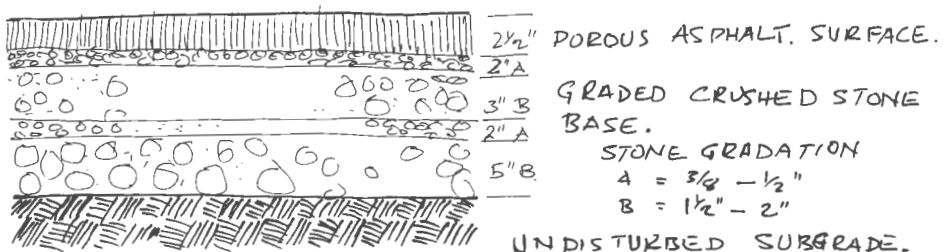


ECOLOGICAL PARKING LOTS A D ROADS.

Providing paving without obstructing the natural Rain water percolation which is so necessary for balace in the Ecology. Also, it has good economic value in that drainage collection system requiring structures, pipes and sewers can be eliminated, as well as curbing and other elements in the parking lots related to the standard drainage system.

- 1- Allows storm water to percolate into the soil rather than increase runoff in storm sewer lines or combined sewer line. (percolation under porous pavement).
- 2- Safety improvement
 - a- Prevents wet skidding or hydroplaning accidents
 - b- Enhances visibility of pavement making no glare.
- 3- Low maintenance cost.
- 4- Prevents flash flooding and preserves local streams from erosion.
- 5- preserves natural drainage pattern.
- 6- Eliminates puddles.
- 7- Permits the use of urban debris to form base reservoir, but risks of land slidding.
- 8- Restores natural moisture to the benefit of roadside vegetation.
- 9- Temperature and storm control - cooling effect from light-colored pavements through the use of different colored aggregates. (natural color of the aggregates)

SECTION / POROUS ASPHALT PAVING.



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DESIGN CONCEPT. (GENERAL YET)

The general atmosphere of the Institute has to be a combination of Institutional and Residential. The Institute Complex is to be almost Urban in density and Regional in character which is identifiable, viewed from the near-by Town. The simple Complex in a simple natural environment, giving the expression of what the building Complex is for and embodying in the Architectural a realistic picture of its Educational qualities and tendencies.

Planning Concept.

Program, site, climate and cost is underlying factor which is considered in during the development of concept. Climate is a strong factor. The planning concept should lean towards a solution to climate control, orientation shading, solar control, ventilation, rain, insects and distances from each other.

Program:- The simple separation of building to be relatively closed with minimum distances for pedestrian circulation both indoor and outdoors. The program has to give maximum cultural interchanges both academically and socially, and achieves a sense of community with social Residential structure.

Site :- The Site is to be utilized to the maximum advantage It should be easier to maintain and is more in keeping with natural surroundings of the Region. It has to be accessible from the main high way.

Circulations.

(CIRCUMFERENTIAL ICCP SYSTEM APPROACH)

The basic object is to create a safe pedestrian courts or campus, free of adverse traffic which is confined to perimeter roads. Including access and parking. It is disadvantage is cost and considerable length of pavement less expensive is central spine.

The best circulation would be a combination of the circumferential and central spine. A major access of pedestrian spine passing through the complex would one of the best solutions.

In total form the Institute is to be composed of courts or precincts loosely organized to allow the maximum Picturesque Landscape, trees, native vegetation and meadows, to interweave with the man-made forms. The Student Residence are assigned semi-mixed with the academic facilities in the same precinct.

Important factor in the circulation system is to discourage the use of the campus drive by through traffic attempting to avoid traffic lights at major street intersections,

Educational Organization.

This is illustrated in the diagrammatically forms, what can cause or affects the grouping of educational organization, according to the functions and importances.

- a- Public, semi- public, semi- private and private.
- b- Academic, teaching, residential and recreation.
- c- Noisy, low-noise, and quiet area.

See diagrams.

Technological Concept.

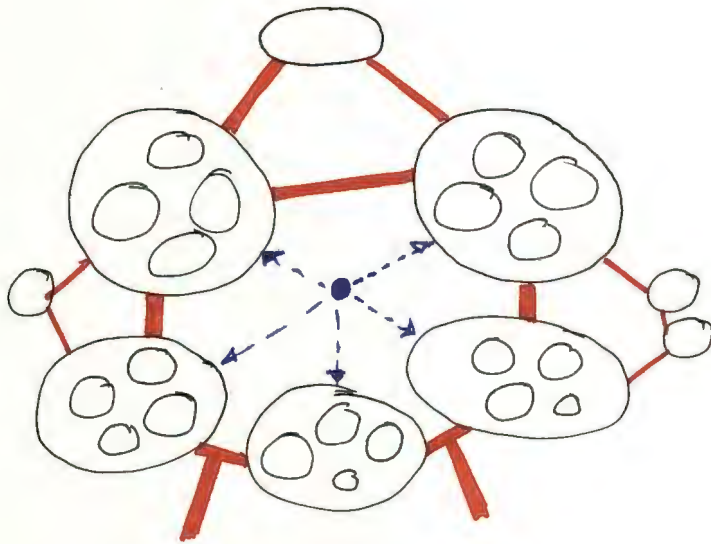
To achieve a Regional and Urban character, Local Traditional Material are to be used.

Red brick- Locally moulded and burn, used as bearing wall or infill partitions.

Because of the earthquake cases reinforced concrete will be the most economical constructional method, for large spans, and for much larger spans of workshops steel trusses will be also economical.

Asbestos cement roofing material which is locally produced is also very economical to use and it has the advantage of being heat insulating material.

No Elevators are to be used for the vertical circulation. Only staircases and ramps, which are the best solution for the area, since the building height is limited and because of the cost of power.



PRECINCT PLANING.

