NATIONAL DATA-BANK CENTRE ABUJA

(INTEGRATING SERVICES INTO BUILDING FABRIC)

BY

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DEPARTMENT OF ARCHITECTURE FACULTY OF ENVIRONMENTAL DESIGN
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1992

DECLARATION

I, OJO OLAYIWOLA O., hereby declare that this dessertation is the product of a honest research undertaken by me. It has not been accepted in any previous application for a higher degree.

All quotations are distinguished by quotation marks and all sources of information have been duely acknowledged by way of references.

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Student's signature Date

DEDICATION

To the memory of my father.

Baba you taught me that to fall is of no consequence rather it is worthy to rise after each fall.

I have come to know that it is more worthy to tread firmly and carefully that one may not fall, for there is always a time lapse between falling and rising.

CERTIFICATION

This thesis entitled "NATIONAL DATA BANK CENTRE, (ABUJA)" by OJO OLAYIWOLA OLANREWAJU meets the regulations governing the award of the degree of Master of Science in Architecture of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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Chairman supervisor committee	Date
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ABSTRACT

One of the most obvious failures in the proper functioning of a building unit or complex, presents itself in the form of failed services. A closer look informs us that these problems usually arise from an improper or total lack of integration of services into Building Fabric. Attempts to investigate this tendency and offer solutions is met with stiff impedance represented in a lack of basic data and literature. This problem, it would prove, is not a prerogative of the Architectural profession alone, rather it is a cankerworm that lives within the fabric of the Nigerian Statistical System (NSS). This basic lack of relevant, reliable and timely data in the Nigerian Statistical System (NSS) and the concern generated informed the "Federal Government" establishment of a "National Data-Bank" in 1988.

This thesis, first investigates the different standard forms of Integrating services into Building fabric then progresses to look into the circumstances of the "National Data Bank Project" and finally applies the results of the first investigation specifically, together with other design parameters to produce a design proposal for the "physical facility" to house the "National Data-bank Centre" within an environment that shall enhance the performance of its stipulated functions and continue to maintain such an environment.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

During the life of a building, one of the most obvious problems presents itself in the form of ugly scenerios of failed services such as ill conceived "unit air conditioning" outlets punching building facades, mazes of cables hanging listlessly in the most impossible locations, failed water supply and waste water disposal systems flooding entire floors, electrical and other ducts that are inaccessible for maintenance work and a host of other faults that contribute to the failure of the building.

As a young man prior to my undergraduate days, this scenes disturbed my feelings, and questions such as why harassed my intelligence. Now that I am afforded the opportunity to appreciate these problems more realistically, I am convinced that they arise mainly from an improper or a complete lack of integra tion of services into building fabric, with the aspect of poor workmanship, resulting from poor supervision. This situation arises from the services engineer not being in tune with the workings of the Architects mind concerning his building.

The success of a building, usually depends among other things, on a functional plan of its architectural spaces as well as

a services scheme that is well integrated into the building fabric. While structural integrity and financial viability is safely assumed thus for the Architect whose first concern and responsibility is the success of his buildings, he must not only familiarise himself with the various "services planning concepts", he must also become acutely aware of the various options and methods of integrating services into his building fabric.

To succeed in this plight and generally that of maintaining his leadership role, the Architect must avail himself of data concerning the various arms of the building industry. These data appear to be unavailable or very difficult to locate, especially for the young Architect. The time lapse between sending for manufacturers catalogues and receiving them might mean all the difference. This basic lack of timely relevant and reliable data in the various sectors of the Nigerian Statistical System (NSS) and the high level concern thus generated has led to the establishment of a "National Data Bank" [NDB] and consequently the "National Data Bank Centre" by the Federal Government.

For now, the centre is going through its teething stages trying to establish for itself a place within the "Nigerian Statistical System" (NSS) and other associated problems. One of such problems is the physical facility within which to house itself. It is ultimately to this end that this research is

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applied.

1.2 AIMS AND OBJECTIVES

This research has as its ultimate goal, the production of a design proposal for the physical facilities within which to house the "National Data Bank Centre" in an environment that will enhance the successful functioning of this organisation and continue to maintain such an environment. To achieve this goal, the research aims to:

a. Investigate various services planning concepts, and study the various methods open to the Architect in integrating services into building fabric.

b. Investigate the circumstances of the "National Data Bank Centre" to determine its organisational structure and spatial requirements.

c. Apply the results of my investigations in (a) and (b) above together with other design determinants to produce a design proposal for a place to house the "National Data Bank Centre" within an appropriate environment.

d. Contribute to the debates presently going on concerning the "National Data Bank" (a computerised Data bank).

e. A long range goal of contributing towards making the lack of relevant timely and reliable data a thing of the past.

1.3 SCOPE AND LIMITATIONS

The research topic is concerned with the integration of

services into building fabric and the "National Data Bank Centre" specifically. In this thesis, shall be found a foundation approach to under standing building services generally but I have not included gas supply and distribution services so also have I not included space heating services as these two services do not constitute regular services for this part of the globe at full development of Nigeria's "Liquefied Natural Gas" project, it may become normal practise, but I believe that time and need will take care of the reeducation that shall then become necessary.

Concerning the "National Data Bank Centre", (its eventual location), whether it remains housed in the Federal Office of Statistics or becomes an extra ministerial department directly under the office of the President is not possible for me to safely forecast and my opinion concerning its location remain exactly that (my own opinion) nevertheless, wherever it may be located, it must enjoy some level of autonomy to function properly, so a separate centre is still justified. I have attempted to understand the meaning and scope of a National Data Bank based on information gathered from various sources as acknowledged and any error in interpretation either of terms or concepts in this very abstract field or in the position or standing of government on policy issues must remain mine.

A data bank, such as this shall without doubt depend on computer technology to handle its work load so the thesis has

researched into computer systems in order to understand the basic working of computer centres, its organisational structure and information flow patterns installation standards and environmental requirements, but this thesis does not go into Programming, Systems Analyses or Data Base Management systems, specialists in the various disciplines are better placed for this.

Basically, the National Data Bank will have two distinctive functions viz Administrative and Commercial Bureau. A comprehensive planning of the facilities to be provided at the centre remains a continuous process. However these facilities could be classified under the following headings viz:

1. Headquarters: this includes
   a) the Central facilities,
   b) housing, - staff/trainees
   c) support facilities.
2. Satellite Sites
   a) ministerial Data banks
   b) sectoral Data banks.

This project is limited to designing a proposal for the Central facilities of the headquarters alone.

1.4 ARCHITECTURAL SIGNIFICANCE

In Nigeria today, there is a wave of resentment towards the

Architect emanating from various sources, questioning the competence of Architects to lead the building team (And young Architects more so). This, I believe arises from the Architect delegating some of his professional responsibilities and thus powers to associated consultants. This constitutes my humble submission in the face of this onslaught.

The young Architect shall find within it a foundation approach to understanding building services and if he uses it coupled with further investigations of his own, he shall be in a position to properly co- ordinate allied professionals, at least as far as building services engineers are concern and thus help to maintain his lead.

This thesis should also contribute to existing local literature in Architectural education. The thesis also presents the profession to a choice group of potential patrons represented by the likely greatest users of the "National Data Bank Centre". The financial institutions industry and greatest as of now, the Federal Government.

1.4.2 **GENERAL SIGNIFICANCE**

1 - A National Data Centre is of high priority to technological development.

1.5 RESEARCH METHODOLOGY

This thesis can be appreciated in three group ings. The first part begins with the introduction and goes on to discuss building services. The second part studies the "National Data Bank Centre" specifically, while the third part applies the findings of the two earlier parts in producing a design proposal for the "National Data Bank Centre".

Information used in this thesis shall be obtained from the following sources:

- Books on Building Services, structure and fabric and materials.
- Manufacturers Catalogues.
- Books on Database Management Systems.
- Papers presented at Workshops, Seminars and Conferences on the establishment and operation of the National Data Bank.
- Government Gazettes and other such publications to familiarise oneself with government policy on the National Data Bank project.
- Personal interviews with staffs of the National Data Bank Centre, the Federal Office of Statistics, sectoral and Ministerial Data Banks.

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- Interviews with specialists in computer sciences and associated discipline.
- Case studies of computer centres and existing buildings and
- Discussions with professionals of the building industry both in and out of the University.

CHAPTER TWO

2.0 INTRODUCTION TO BUILDING SERVICES

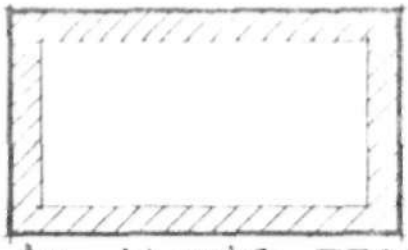
2.1 CONCEPTS IN SERVICES PLANNING

The conception of a building services scheme usually follows one of three options as it relates to the routing of the services around the building. These options include:

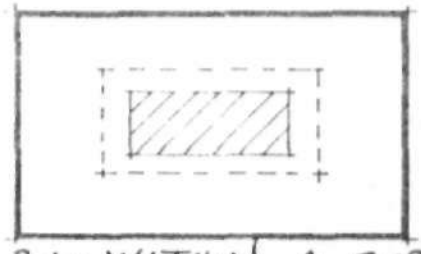
a: routing of services around the perimeter of the building structure. This have the advantage of leaving the architectural spaces undisturbed and also making for relatively easy access for maintenance work but not easily practicable in large scale architectural complexes where deep interiors exists that cannot be readily serviced from the building perimeter. Also large complexes make for greater perimeter dimensions thus making this approach impracticable, but this perimeter routing is most suitable for relatively small projects.

b. SERVICE CORE SOLUTION

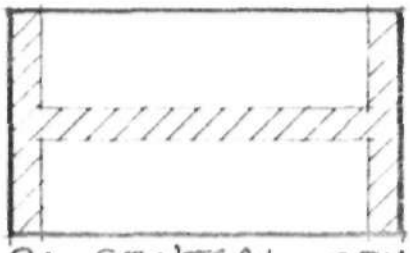
In this case an appropriate zoning is applied in design such that the services are concentrated in a core zone thus reducing considerably the overhead costs in maintenance. This also has the advantage of reducing unfavourable sights to a specific zone in the building where it can thus be appropriately handled. This approach is most suitable for large scale simple



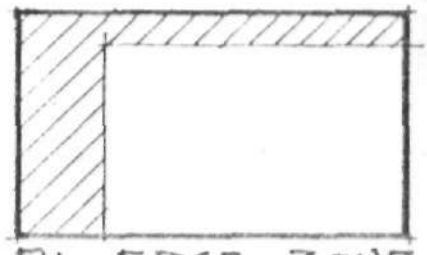
A:- ALONG PERIMETER WALL



B:- WITHIN A CORE ZONE

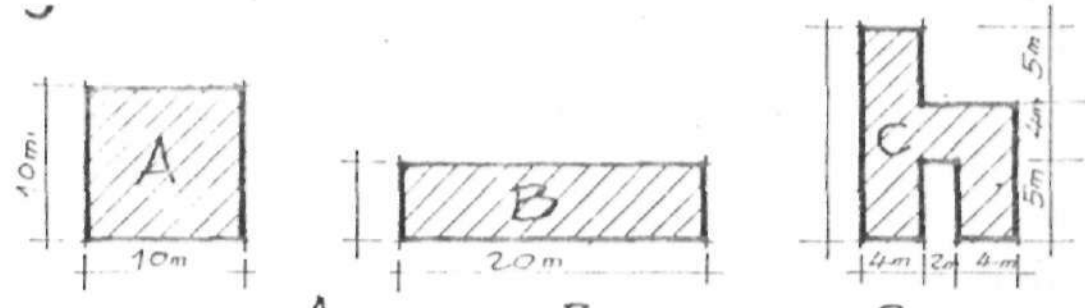


C:- CENTRAL SPINE. CONNECT TO SIDE PERIMETERS



D:- EDGE ZONE AND ONE PERIMETER WALL.

FIG 2.1.[a]



	A	B	C
AREA	$100\,m^2$	$100\,m^2$	$100\,m^2$
PERIMETER	40 m	50 m	58 m
IF 4m HIGH	160	$200\,m^2$	$232\,m^2$
WALL/FLOOR	1.6	2.0	2-2.32
EXPOSED AREA	160	$300\,m^2$	$332\,m^2$

FIG 2.1.[b]

shaped projects as initial installation costs can be relatively high, and all services from the different parts of the building must be routed to this services core. For large scale buildings with considerable horizontal spread, this approach may not always be applicable, as such high rise buildings are most amenable to this conceptual approach.

Lastly we have the composite situation where the above two conceptual approaches may be combined in various measures to solve a specific projects services scheme.

The choice of which conceptual approach is used shall depend on:

1) size and type of project
2) geometry of building
3) competence and bias of consultants.

2.2. COLD WATER SUPPLY AND DISTRIBUTION

2.2.1 Preamble

The provision of cold water supply to a building may be classified into three vis

- water for drinking
- water for general usage
- water for fire fighting

Cold water supply may best be considered in relation to the geometry of the building served. Since large and tall buildings

present numerous installation and design problems which are not found in smaller low rise buildings, we will tackle each separately.

2.2.2 SUPPLY TO LOW RISE DWELLINGS

Domestic low rise dwellings are generally of single, two or three storey construction. Individual premises are connected to the water board mains by a service pipe branch as shown in figure 2.2.1a. The features of the services pipe include: -

The facility for the water authority to disconnect supply by use of a stop cork located outside the property boundary, with a meter to read off units of water supplied

- Laying of the pipe at a depth which will prevent accidental disruption.
- The provision of a duct to carry the supply into the building through the wall and floor.

Once the service pipe emerges from the floor of the building it is called the rising main and it is generally at this point of entry that a stop cork is provided, which allows the resident to close down incoming supply to allow for maintenance. Figure 2.2.1(b) shows a typical cold water installation for a one storey dwelling.

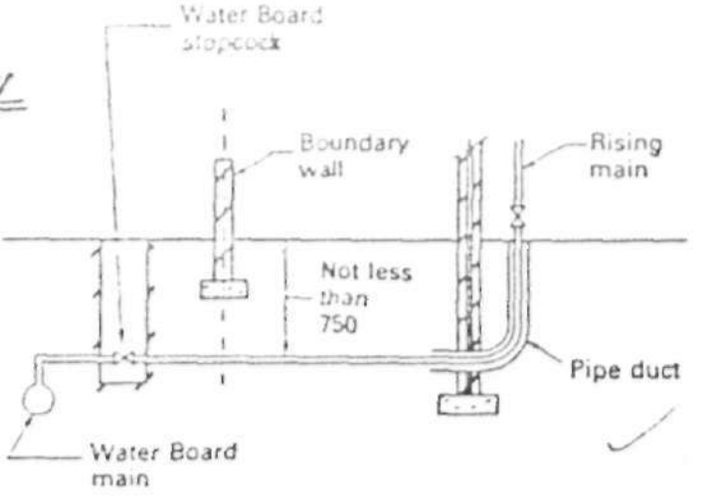
Mains pressure water is carried by the rising main to the

cold water storage tank where water is stored for general purpose use. Drinking water is taken in a branch from the rising main to the kitchen sink. A mains pressure branch may also be taken from the rising main to a ground level water closet (W.C.), in that case a high-pressure ball valve assembly shall be incorporated into the WC cistern. A ball valve [fig. 2.2.1c] is also used to maintain water level in the cold water storage tank.

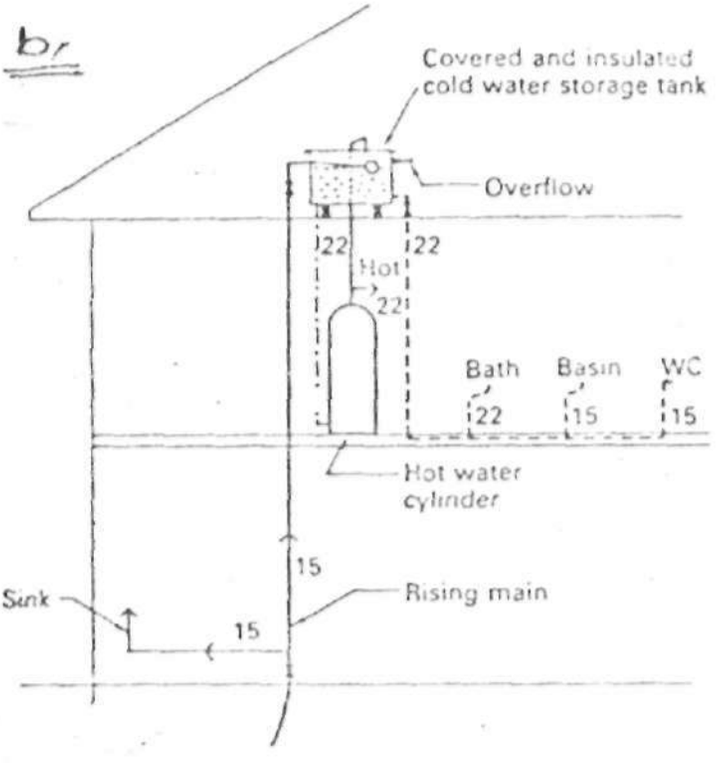
General purpose water is supplied from the cold water storage tank to the hot water cylinder and bathroom sanitary appliances, this water is now at gravita-tional (tank) pressure. (Note the provision for stop corks). An alternative to the stop cork for the restriction of flow is the gate value fig.2.2.1(d).

2.2.3 SUPPLIES TO HIGH-RISE BUILDINGS

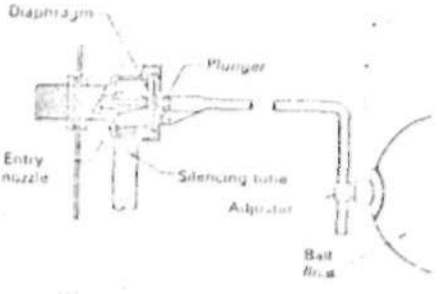
Since the supply pressure from the water board mains is unlikely to allow direct delivery to the upper floors of tall buildings, assistance has to be given to the mains to enable it reach these levels. The design of cold water installations to high-rise buildings is influenced by the fluctuations in the mains pressure caused by peak demand and by structural problems imposed by the storage of water (1 litre = 1kg). The dead weight of water may necessitate the zoning of stored supplies, if loads are not to be concentrated at one floor or in one section of the structure thus loading it eccentrically.



a.



b.



c.



Stopcock



Gate valve

d.

FIG 2.2.7.

Buildings in a multiple occupancy may require large volumes of water for general-purpose use and as this is supplied at gravitational (tank) pressure, storage has to be above the point of delivery. With multi-storey blocks of flats, individual cold-water storage tanks may be provided to each residence or communal storage at roof level may be provided. In tall buildings, the mains will be allowed to service the floors within its capacity while pumps will directly or indirectly assist in conveying the water to the upper levels, but to have pumps in continual operation would be inefficient, consequently, techniques are employed to prevent continual pump operation. Such techniques include:

-- The Pneumatic Systems

-- The Header Storage Systems

-- Enclosed Tank Systems

The pneumatic system of cold water delivery uses compressed air within a pressure vessel to assist the mains. The pump forces the water into the pressure vessel which contains a volume of air. On reaching the desired air pressure level, the pumping stops and the compressed air now provides the driving force behind the mains water. As water is used up, the air in the pressure vessel expands and the pressure falls until at a predetermined low level of pressure the pump is again automatically brought into action.

The header storage system involves the enlargement of the

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rising main just before connection to the roof-level cold water storage tanks. By enlarging the rising main into a cylinder above the last outlet, a storage is formed which could supply the upper levels of the premises with water if the mains supply were to be interrupted. The capacity of the header storage is generally from about five to seven litres per dwelling served. In this system the pump is activated by a float switch located in the cold water storage tank or by a similar switch inside the header storage.

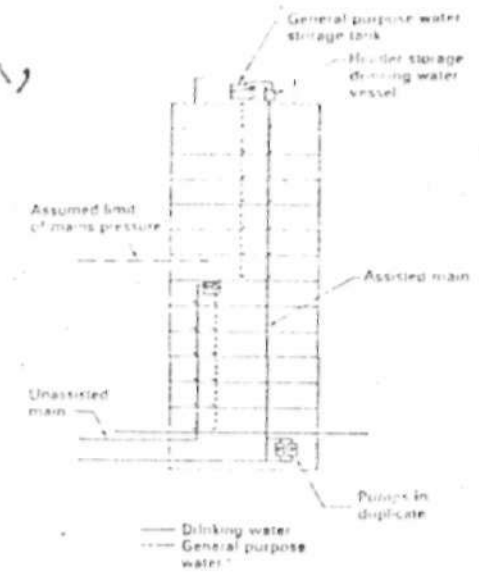
Traditionally, cold water for drinking is taken directly from the mains at mains pressure, since storage could lead to possible contamination. However, provided an enclosed, insulated and ventilat ed tank is used, storage of drinking water is permissible. There are three common arrangement, which provide for the storage of drinking water. Figure 2.2b illustrates one system which employs enclosed tanks for the storage of drinking water.

- One large water tank to serve all outlets from roof level
- A smaller tank provided to service a number of floors in a zoning arrangement or
- Individual tanks provided for each user.

2.2.4 PIPE SIZING

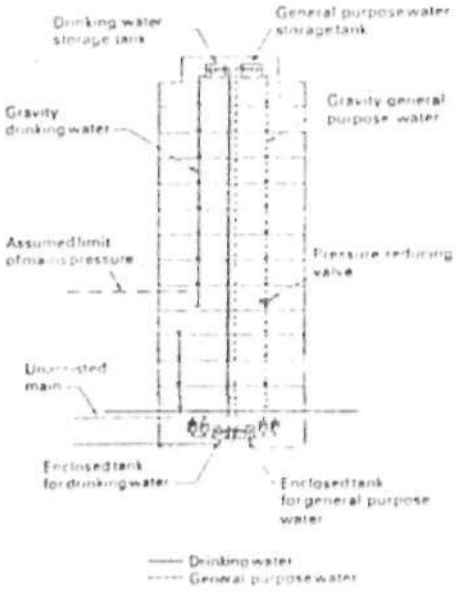
The size of a cold water rising main will depend on the

a)



THE HEADER STORAGE SYSTEM

b)



AN ENCLOSED TANK SYSTEM

FIG 2.2.3.

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following:

Number of connections made to it

Frequency with which those connections draw water

The mains pressure available to the premises.

In Domestic installations, a 15mm rising main will do for individual low rise buildings, but for multistorey building, considerably larger diameters will be required. The diameters of gravity pressure water supplies will also depend on the number of outlets served, their capacity, the frequency with which they are used and the pressure of delivery.

Gravity supplies of general purpose water in domestic plumbing will be taken to the hot water cylinder and bathroom appliances. It should be noted that the diameter of the supply to the bath is gener ally 22mm, while the wash basin and water closet (WC) take a 15mm supply.

2.3.0 HOT WATER GENERATION AND DISTRIBUTION

The methods of hot water generation are influenced by the type of premises served and the nature of the fuel. Generally these may be grouped under the following headings:-

- By using electric immersion heaters this being the simplest form available and very popular in this country.
- By using gas heaters. This is beyond the scope of this work.

- By using solar heaters - an innovative approach which may become more popular in the future.

2.3.1 HOT WATER GENERATION BY ELECTRIC IMMERSION HEATERS

The generation of hot water by electric immersion heaters is considered to be about the simplest form of generation. This involves the use of heating elements which are attached to the top of the hot water cylinder which is well insulated to improve the efficiency of this method see fig.2.3.1a. Thermostats are used to control the temperature of the stored water, and time switches may be employed for pre-set activation of the heater. Since electricity is generally regarded as an expensive method of hot water generation, a variable demand immersion heater would be a less expensive alternative in the long run. This system is achieved by the use of two heating elements in the hot water cylinder. A small one (say 0.5kw) at the top which will supply a limited amount of hot water for things like washing up and the like, and a larger element (say 2kw) towards the bottom which can heat the whole cylinder and cater for the demands of bathing. Fig.2.3.1.b shows a typical variable demand electric immersiobn cylinder.

2.3.3 SOLAR GENERATION OF HOT WATER

Solar collectors for hot water generation are generally of the same basic construction, relying on the "green house effect" of short-wave which is less easily released through the glass

cover and resulting in a temperature rise inside the collector, and water pumped through the collector is heated. When pre-determined temperature difference between the stored heated water and the solar collector is reached, the pump is activated to allow circulation. In this arrangemnt, the "solar collected" replaces the boiler of the conventional hot water systems Fig.2.3.1c.

2.4.0 DRAINAGE AND DISPOSAL INSTALLATION

For efficient working of a disposal installation pipe work system, a number of design criteria should be fulfilled. This applies to the smallest domestic systems and becomes particularly important when related to large communal installations. The capacity of appliances served by the installation and the frequency with which they are used are of paramount importance. Certain appliances cause a large but momentary discharge and this tends to be reflected in the diameter of disposal pipe to which they are con nected. Assumed flow rates are:

WC - In excess of 2 litres per second

Bath - about 1 litre per second

Wash basin - 0.5 litre per second.

In reference to pipes conveying discharges from sanitary appliances, two pipe classifications are usually made, these include:

- Waste pipes - conveying water-bound discharges from

sinks, baths, showers, wash basins and bidets

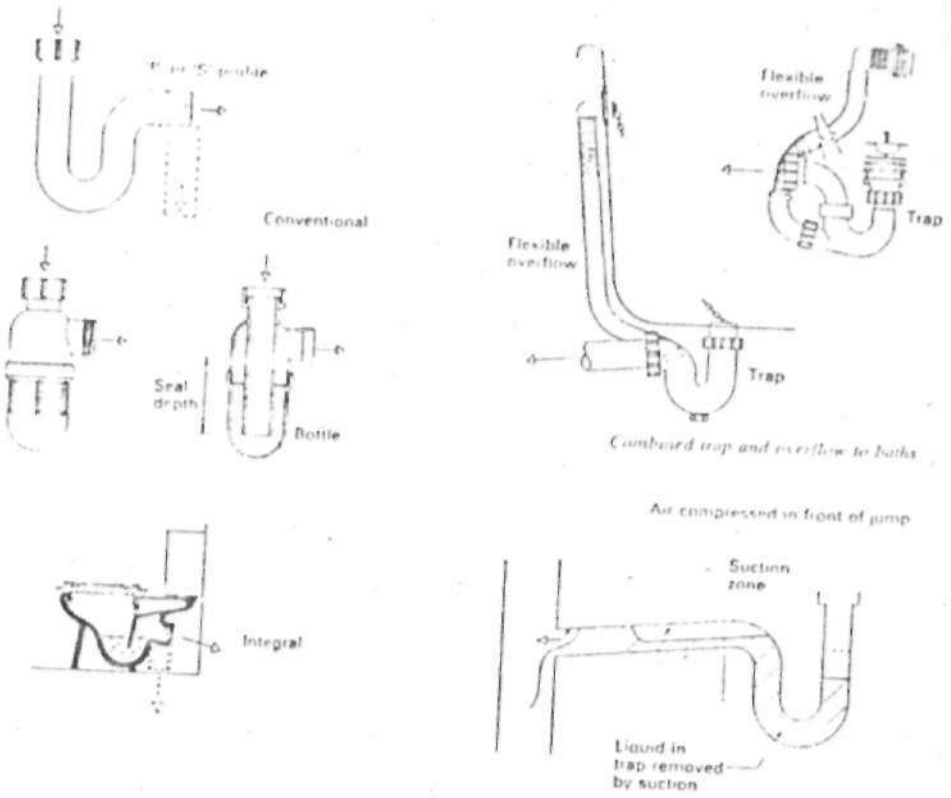
- Soil pipes - Conveying human discharges from WCs or urinals.

The primary function of a trap is to effect a seal against foul air in the pipe work system entering the buildings environment. For a successful seal, 75mm of liquid seal depth for 50mm diameter pipes and 50mm for larger pipes. This range of traps include:

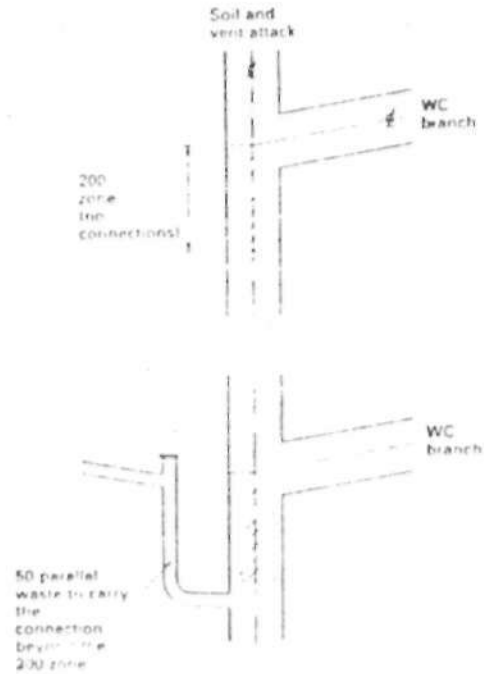
- conventional
- bottle
- integral
- special

Conventional traps are formed from a series of bends in the pipe and allows a full bore flow through the trap. This type of trap requires relatively more space to accommodate the bends. In contrast, the bottle trap is a more compact detail which provides excellent access for the clearance of debris.

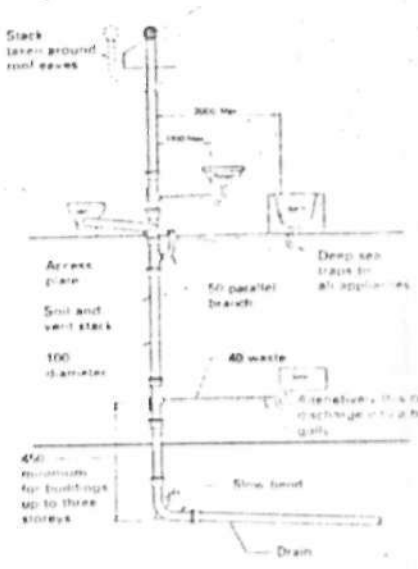
Special traps may include those intended to resist siphonage or dilution traps used in laboratories. The dilution trap may be used to dilute a chemical dis charge and/or to help in the collection of suspended debris. Fig. 2.4.1a shows sketches of the conven tional bottle and integral traps.



a. TYPES OF TRAPS



b.



c. *Single stack disposal installations*

FIG 2.4.1

A stack usually takes in a number of appliances on the same floor, as water services are usually grouped together. If a waste connection is made to a stack directly opposite a WC connection, the long capacity discharge from the WC will inevitably cause induced siphonage and loss of seal in the trap served by the waste. Figure (2.4.1b) shows this effect can be prevented by making connections outside the immedi ate zone of the WC discharge.

Disposal systems pipe work may be grouped into three major classifications:

- Single stack systems
- One pipe systems
- 2 pipe systems

Single stack arrangements are most commonly applied in domestic premises, see figure (2.4.1c). The main features of the single stack are:

- a minimum trap seal of 75mm (deep seal)
- restrictions on the length of branch connections to the stack.
- If the recommended branch lengths are to be exceeded, ventilation will have to be provided.

A typical one pipe system of collection is shown in figure (2.4.1d). This system differs from the single stack in the provision for full ventilation by anti-siphonage pipe work.

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When choosing one of the disposal pipe work arrangements, the proposed layout of the appliances in the building to be served would be the major influencing factor. Provided that careful planning in design is employed, the single stack system, which is an economic solution in terms of pipe length, and may be used on both multi-storey construction as well as low rise structures. This however implies zoning in service planning at design stage such that appliances are grouped around the stack, where such grouping is not possible, the one pipe or two pipe system may be more appropriate.

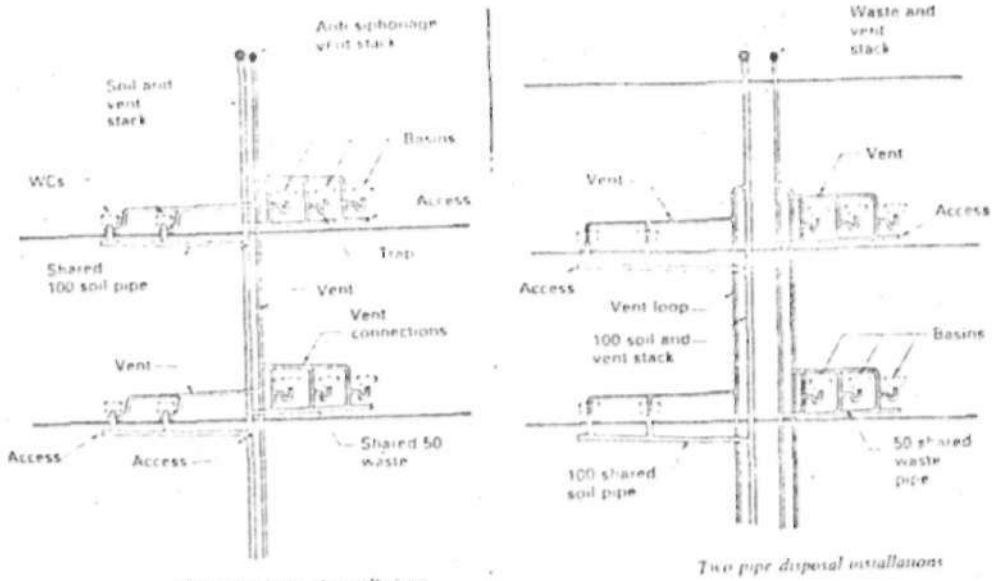
2.5.0 DRAINAGE BELLOW GROUND

Bellow ground drainage installations may be classified into two vis:

- surface water or rain water drains and foul water drains.

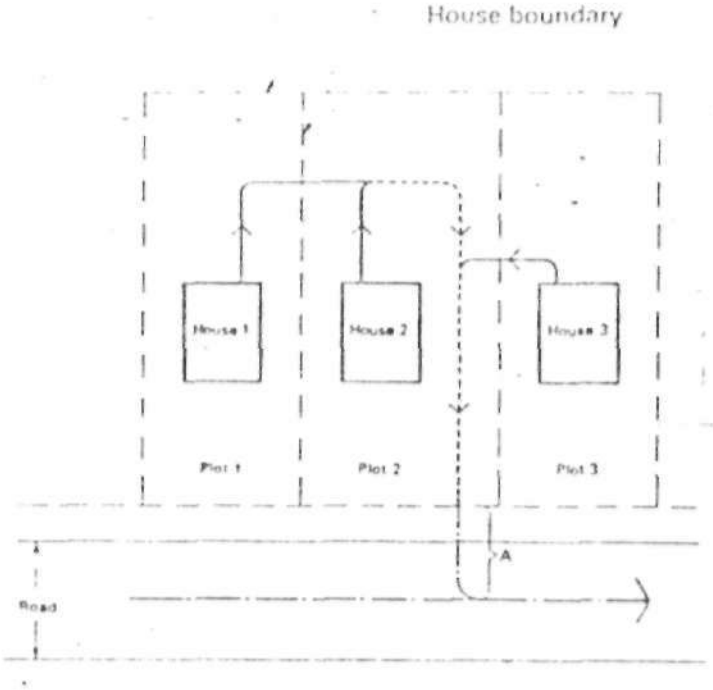
Surface water drains carry only rain water while foul water drains carry wastes and soil discharges. Three systems of collection are employed and by their nature present different amount of materials to the sewage treatment works for processing. These are:

1. The combined system
2. The separate system
3. The partially separate system



One pipe disposal installations *Two pipe disposal installations*

FIG 2.41.d



Drains, private sewers and public sewers

FIG 2.5.1a

In the combined system, rain water and foul water discharges are mixed together and this means that the sewage treatment works is unnecessarily burdened as all discharges are taken through the complete treat ment process but this is unnecessary thus the applica tion of a one system for foul water and a separate system for rain water is to be preferred.

A variation on the combined and separate systems is the partially separate system. In this, the main water from public roads and other paved areas is carried by the surface water drain, while rain water from private roofs and paved areas is discharged into the foul drain. A division is thus made into public and private drains.

The following terms which apply to drainage must be clearly understood. They are 'drain', 'private sewer' and "public sewer". The definitions help clarify the responsibilities associated with ownership of bellow ground drainage runs.

From a design point of view, a number of features may be incorporated in drainage design which will ensure efficiency in operation.

- Pipes layouts should be simple, with as few changes in direction or gradient as possible and pipe runs should be in straight lines
- The system should be ventilated (one of the functions provided by the above - ground drainage stack pipe)
- Pipes should be laid at sufficient depth to avoid damage,

and pipe gradient should suit the material being conveyed - flows containing solid and liquids should be capable of attaining a self cleaning velocity.

- Pipe capacity should be designed to suit peak flow.
- Pipe joint should be water tight - flexible joints generally allow a 5% distortion of one pipe relative to the other without breaking the joint seal.
- Suitable bedding and back filling should be used and sufficient points of access should be provided for testing and the clearing of blockages.
- Inlets to the drain should be trapped (except for the entry at the foot of the soil and vent stack), and junctions to the main flow should be minimised and should be made in the direction of the main flow.

When sizing the pipe diameters for a system, an estimate may be made of the flows emanating from the sanitary appliances, but the extent of rainwater to be accommodated is not easily predictable. Individual surface water drains will be sized in relations to:

- The catchment area of the ground that they receive discharge from
- The intensity of rain fall over this area
- Considerations of the permeability or impermeability of the ground within this area.
- The gradient and diameter of the pipe proposed which will determine the flow velocity and capacity

The factors considered when sizing foul water drains include:

- the quantity of discharge from the sanitary appliances served by the drain (their capacity and frequency of use)
- allowance for periods of peak usage
- the gradient and diameter of pipe proposed, which will determine the flow velocity.

2.6.0 SPECIALIST SERVICES

2.0.1 MECHANICAL VENTILATION AND AIR CONDITIONING

Buildings are ventilated in order to provide conditions in which the occupants may operate with comfort, safety and efficiency. By the provision of adequate ventilation we ensure that

- sufficient fresh air is available for respiration.
- Provision is made for the extraction of pollutants which may accumulate the level of internal relative humidity can be controlled a suitable environment is created with respect to air temperature a suitable environment is created with respect to air temperature air is available to support the process of combustion within the building fumes and smoke arising from fires (both accidental and purpose) can be controlled.

The geometry of large buildings particularly their plan shape may prevent complete ventilation of the enclosed space

through perimeter fenestrations. The distance between central areas and the windows will mean that air stagnation is most likely to occur in the central areas of the building, to relieve this situation, mechanical ventilation is employed.

When considering the deployment of natural or mechanical ventilation to a paprticular premises, the criteria considered in respect to the air are generally quality, quantity and controllability. If natural ventilation is contemplated, the following limitations must be appreciated:

- Precise control of air supplied by natural ventilation is not possible, and
- the occupant of a building can introduce a variable into the provision of fresh air supplied by opening and closing windows in an unpredictable way.

Mechanical ventilation will be necessary:

- where spaces within the building cannot be naturally ventilated;
- in premises where it is necessary to remove polutants (such as fumes and dust);
- in special premises such as hospitals where a sterile environment is required.

Buildings of different use will demand different quantities of fresh air for occupants. This may be expressed in terms of litres/second or in terms of room air changes per hour. The CIBS guide suggest that the quantity of fresh air needed can vary from eight litres per person per second in fairly smoke

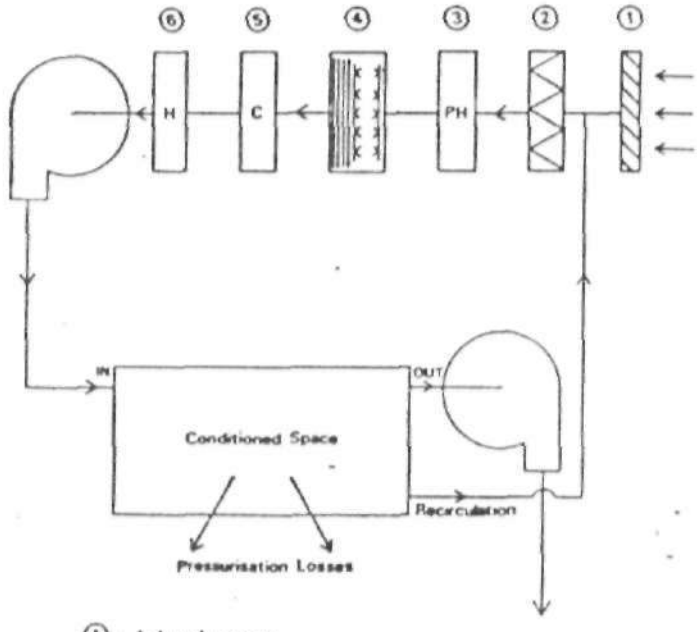
free environment, to as much as twenty five litres per person per second where heavy smoke is anticipated.

The method by which air is brought into a build ing gives rise to a classification of the type of system which may be provided. These include:

- Natural inlet - natural outlet;
- Natural inlet - mechanical outlet;
- Mechanical inlet - natural outlet and
- Mechanical inlet - mechanical outlet

Figure 2.6.1a illustrates this classification with natural entry of air and mechanical extraction. The movements of the air within the building may be influenced by cross ventilation or chimney (stack) effect. Mechanical exhaust systems may give rise to uncomfortable conditions caused by draughts, if the rate of expulsion results in suction of air into rooms spaces. In contrast mechanical inlet and natural outlet systems can cause small positive pressures within rooms which will discourage air ingress and thereby prevent draughts. Mechanical inlet and out let, provide the greatest degree of control.

The building regulations 1985 made specific stipulations with regard to the rate of air change in certain room areas. These areas include habitable rooms, kitchens and bathrooms of dwellings and sanitary accommodation in any building. The air changes range from one per hour for habitable rooms to three per



① - Inlet damper
② - Filter
③ - Pre-heater
④ - Washer/humidifier with eliminator screen
⑤ - Cooler
⑥ - Heater

The component parts of an air conditioning system

FIG. 2.6.2/a

hour for kitchens bathrooms and sanitary accommodation spaces.

FANS

To ensure the current rate of delivery of air to or from different spaces within a building, electric fans are employed. There are many arrangements of fan possible but few are adequately efficient for the movement of air in service installations. Propeller fans, for example are less than 40 percent efficient.

Those suited to air movement includes:

- Centrifugal types
- Axial flow
- Tangential flow

Centrifugal fans are the most widely used, with efficiencies of around 85 percent.

DUCTS FOR AIR

In designing ducts for the conveyance of air, a number of features should be considered:-

- The duct should be smooth - this enhances the uniformity of air movement and reduces the possibility of noise generation by turbulence.
- Changes in directions should be minimised - for circular ducts, the formation of bends should be achieved gradually with the greatest radius possible.

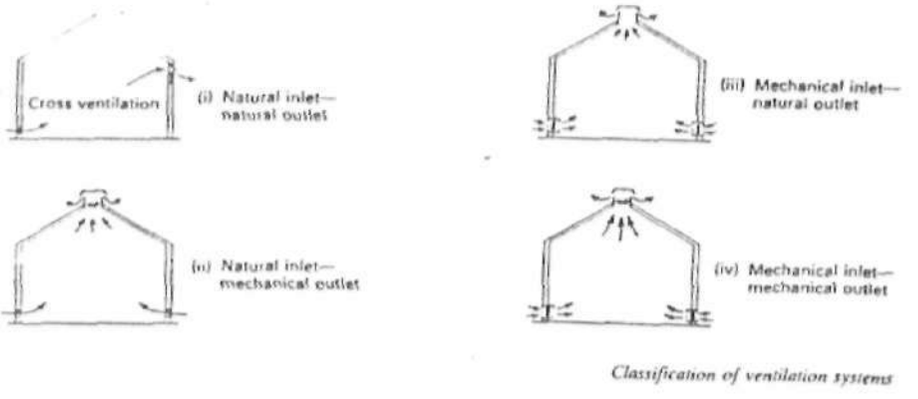
- For rectangular ducts, 90° changes of direction may be "smoothed" by the incorporation of duct vanes (see figure 2.6.1b).
- Branches off the main ducts should be made with a gradual curve and not with a sharp 90° connection.

GRILLES DIFFUSERS AND DAMPS

At the point of delivery or extraction, the duct is fitted with a grille or diffuser. The type of fitting used will have considerzble influence on the spread of the distributionof air in the space. Conical diffusers are the best for efficient "throw" of air into the spae and can handle delivery veloci ties of up to three times those discharged through simple slots diffusers without excessive noise (see figure 2.6c).

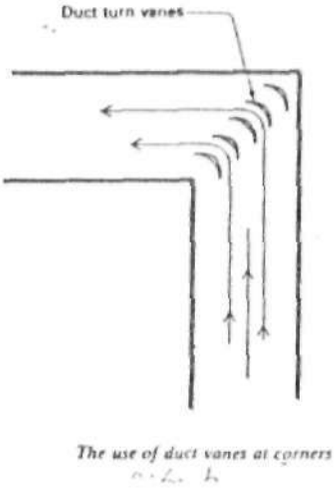
2.6.2 AIR CONDITIONING

True air conditioning involves the purification and control of temperature and relative humidity. Air holds varying amount of water vapour according to its temperature. The quantity of water vapour in a given quantity of air may be expressed as a percentage of the total quantity of vapour capable of being held by the air at a given tempeprature, this is the definition of the term relative humidity and levels of between 40 to 60 percent will create a reasonable internal environment. Provision of an air condition ing system should ensure a regulated supply of air for breathing, the removal of the



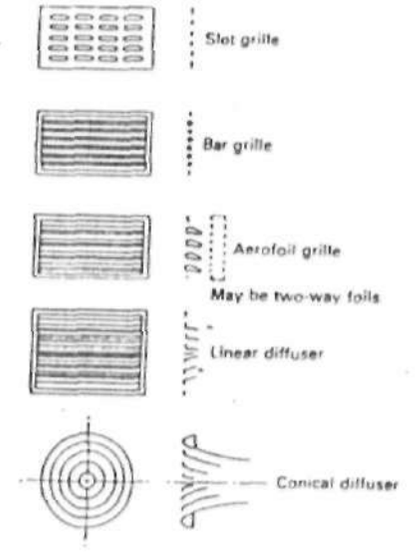
Classification of ventilation systems

a. classification of ventilation systems



The use of duct vanes at corners

b. use of duct vanes at corners



Air delivery grilles and diffusers

c. Air dilivary grilles and diffusers.

FIG. 2.6.1.

products of respiration, and removal of the by-products of occupancy. Approxi mately 1 litre per second per person of fresh air is required if the level of carbon dioxide generated by breathing is not to cause discomfort.

In buildings where air conditioning is to be used, the Architect and services engineer should liaise closely for the successful integration of the system. Correct location of air inlets and exhaust outlets will help prevent nuisance in operation and increase the efficiency of air delivery.

There are many different Air-conditioning systems. Some systems have the facility for reclamation of air from the room space, others simply have an exhaust extractor without recirculation fig. 2.6.2a shows the typical component parts of a system. Air is usually heated by passing it across a hot water pipe coil exhanger which is also the same basic apparatus used for cooling the air. When cooling the flow, chilled water enters the coils from a refri- gerator (chilled brine which is a salt water solution is a common coolant used in cooling coils).

AIRCONDITIONING UNITS

Air conditioning may be provided by a central air conditioning plants with conditioned air ducted to the room spaces or alternatively, individual air conditioning units may be provided to each room. These contain the basic components of the air conditioning plant in miniture. This type of small units come in

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various sizes, shapes and capacity and are popular with smaller or multi occupancy buildings, as maintenance in individual but for large corporate build ings, its efficiency is certainly below standard.

2.6.3 LIFTS AND ESCALATORS

The incorporation of lift installations into a building like all specialist services will necessitate liaison between the Architect, Services Engineer and Manufacturer. The installation will follow the inte gration of design criteria generated by these parties. The designer determines the numbers of floors to be served and through the design the types and quantity of users. It should be remembered that quality as a design parameter will not only relate to overall prestige of the buildings but also to practical considerations such as accuracy of levelling at each floor landing. From the manufacturers point of view, there will be the need to accommodate basic components of the type of lift chosen, together with the need to ensure safety in operation. Traditionally, lifts require machine rooms to suit the sophistication and extent of the lift installation. This is located either at the top or bottom of the lift shaft, depend ing on the roping arrangement employed for the lift car. Figure 2.6.3a shows some of the typical parts of the lift shaft, including the machine room. Note the provisions for ventillation.

The location of the lift shaft will depend on the location of the entrance to the building and the design of the circulation spaces as attempts should always be made to optimise the efficiency of pedestrian flow. In larger buildings, a conflict may arise in design, between the benefits of grouping lift shafts together and the degreee of efficiency of pedestrian flow that this causes. The speed of the lift is a design feature which again will relate to the function of the building. In shops and stores, speed of circulation may be of particular importance, while in residential buildings. reliablity may be a more important criterion than speed. High speeds are usually reflected by high cost and may be justified only in very tall buildings. In summary, when it is intended to incorporate a lift installation into a building, a number of basic factors must first be considered in the choice of the system to use. These include:

- The function of the building
- The number of floors to be served
- The total distance of travel
- The total number of people and/or objects to be conveyed
- Peak concentration of use
- The waiting time for the arrival of the car
- The time delay in loading and unloading.

From these, the capacity of the lift installation is determined.

There is a division into two basic types of lifts vis:

- Electrically operated lifts and
- Hydraulically operated lifts.

ESCALATORS

Typical dimensions allow for up to 10,000 persons per hour at a speed of about 0.5 meters per second. Figure 2.6.3b shows some typical dimensions and indicates the space required to accommodate the component parts. The need for clear headroom space is also a feature. The slope or pitch of the escalator is usually 30° or 35° depending on the space avail able. Reversible direction of motion provides added flexibility. The dimension D marked on the sketch (fig. 2.6.3c) is variable depending on available space safety of passengers is ensured by the following:

- An emergency stop button found at the top and bottom of the escalator
- A governor to regulate the speed
- Automatic controls to bring it smoothly to a stop in the case of a power or mechanical problem.
- A hand rail that moves at exactly the same speed as the steps
- Balustrades, hand rail and side-panels which discourage the catching of clothing or packages.

To preserve the integrity of fire compartments, the escalator may be fitted with steel roller shutters which will close of the

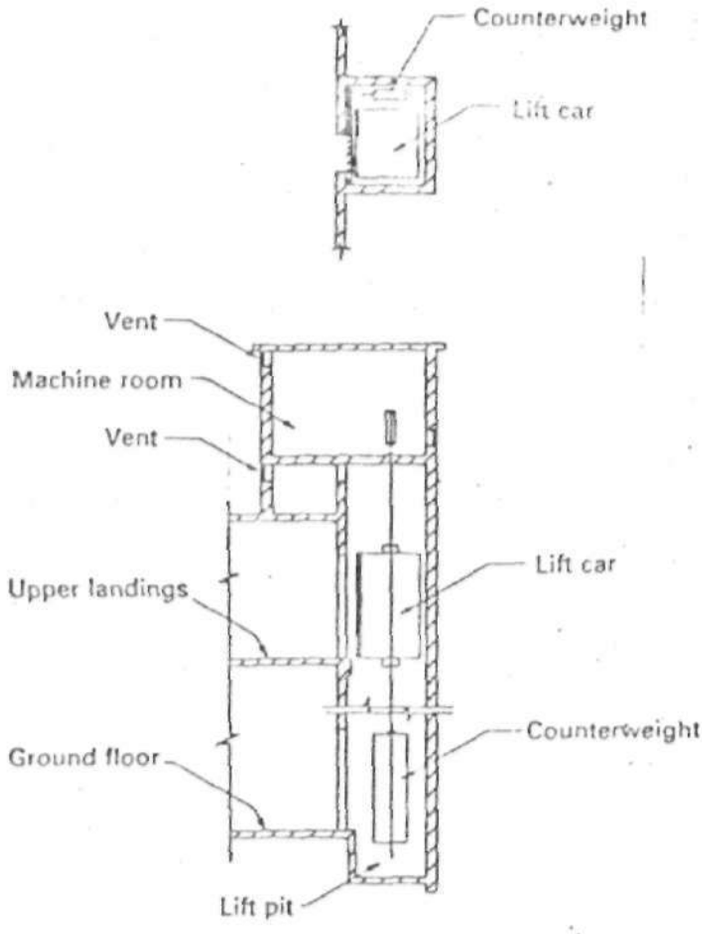


FIG 26.3 a *A typical lift shaft*

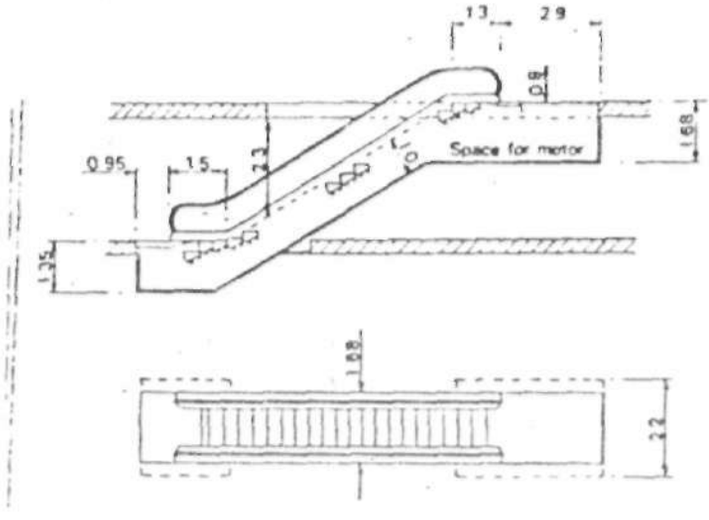


FIG 26.3.b *Escalators — typical installation dimensions*

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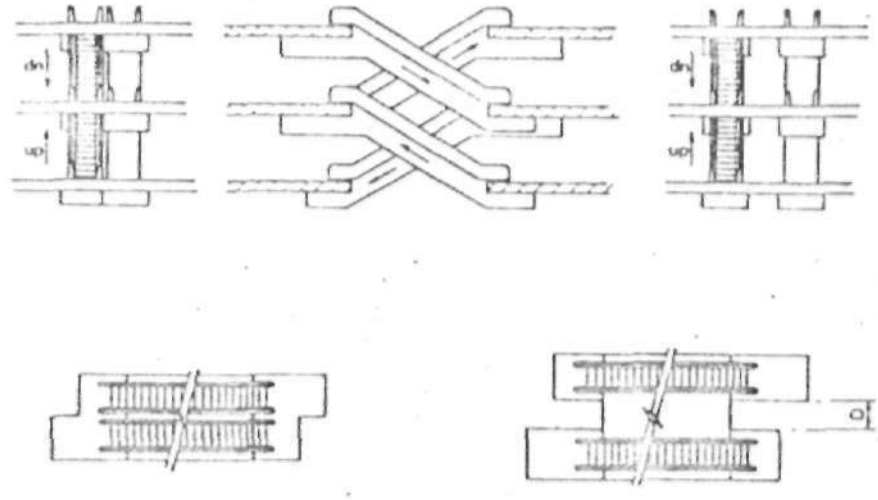


FIG 26·3 c. *Escalators serving successive floors*

stairway on the activation of a smoke detector, heat detector or fusible link. Sprinklers may provide an alternative source of fire control. These may be used in conjunction with fans which can be used to pressurise the stairwell by a system of 'spray nozzle curtaining'. Here, high- pressure water nozzles create a water curtain that discourages flame and smoke movement, these being activated by either a heat or smoke detectors.

In contrast to escalators, passenger conveyors have a very shallow incline, so eliminating the needs for steps. This is a continouous conveyor belt capable of carrying passengers and luggages. With operation speeds of more than double that of escalators, its capacity to carry passengers is very high. It is particularly important for the conveyors to have sufficient space available at the point of termination to allow for free movement for those leaving it.

2.6.4 FIRE FIGHTING INSTALLATIONS

Fire control systems in a building may be classi fied into two viz:

- Passive Control:- This result from the nature of the materials employed in construction. Incombustible and low combustion materials built into the structure will discourage the spread of fire thus exercising a passive control over fire development.

- Active Control:- resulting from the inclusion of equipment specifically for fighting an outbreak of fire.

Passive control will be enhanced by the need to comply with the building regulations. These regulations dictate the extent of fire resistance to be provided by the elements of the building. Large buildings may have to be compartmentalised, with specific fire resistance qualities to be achieved by the enclosure elements. The equipments which are used to provide active control in fire fighting may be grouped under the headings "portable" and "fixed". Examples of portable equipment include extinguishers, fire buckets and tools such as axes for breaking down escape barriers. Extinguishers are generally between 4.5 and 9 litres capacity and of many types such as:

- Carbon dioxide
- Water
- Soda/acid
- Stored pressure
- Dry powder
- Foam
- Vapourizing liquid

It is important for the appropriate extinguisher to be provided to fight the anticipated form of fire. The following table summarises the application of different extinguisher types. It should be noted that although suitability may be indicated by the table, special variations of the selected

extinguisher may be required in particular circumstances.

TABLE SHOWING EXTINGUISHER TYPE TO FORM OF FIRE

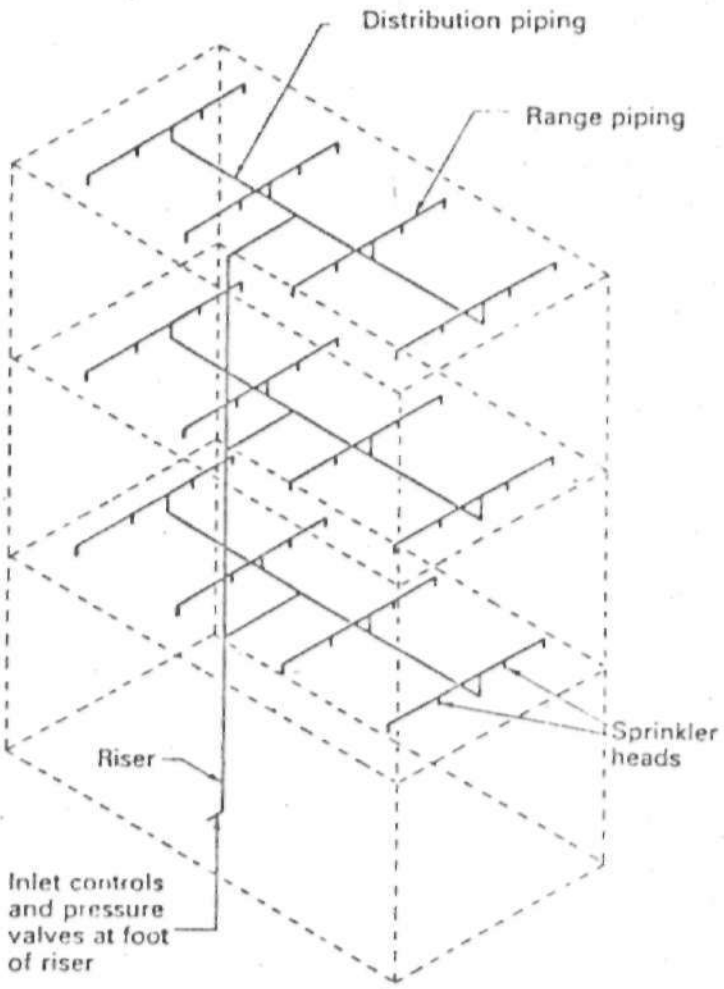
EXTINGUISHER TYPE	ELECTRIC PRESENT	SOLIDS SUCH AS PAPER	LIQUIDS AND WOOD	FLAMMABLE GASES
CABON DIOXIDE	YES	YES	YES	YES
WATER	NO	YES	NO	YES
DRY POWER	YES	YES	YES	NO
FOAM	NO	YES	YES	NO
VAPOURISING LIQUID	YES	YES	YES	NO

Permanent equipment in contrast may include:

- Sprinkler systems
- Permanent hoses
- Riser systems - water or foam

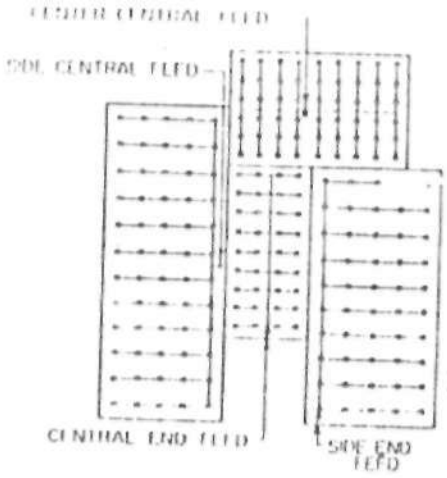
The uses of sprinklers is most popular with commercial and industrial building premises. Within the arrangements of sprinkles available, there are three basic systems:

- **Wet Systems:-** These consists of a pipe "network which is always filled with water see figure 2.6.4.

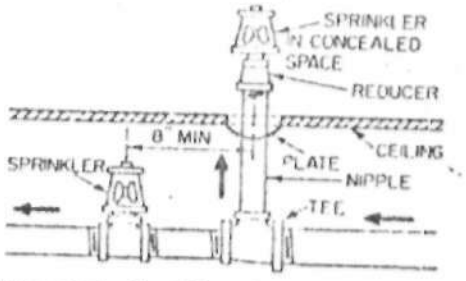


a *The distribution pipe network for a typical sprinkler installation*

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b. Typical layouts of sprinkler piping.



Sprinklers below and above ceiling.

FIGURE 2.6.4.

When the sensor, located at the sprinkler head activates the system, water immediately falls to the area below the outlet. This system has the disadvantages of the pipe freezing in winter seasons, in cold regions where the building does not have throughout heating facility.

- **Dry Systems:-** These overcome the problems of use in unheated buildings since the distribution and range pipes are filled with air until a sprinkler head is activated. On the outbreak of fire, the release of the compressed air in the piping allows water entry via a valve and the pipes rapidly fill up.
- **Wet and Dry Systems:-** These allow for seasonal variations and will be water filled in summer and air filled in winter figure 2.6.4.

Risers are used to carry water to the various levels in multistorey buildings for the connection of fire brigade hoses. In the same way as the sprinkler instalation, risers are either wet or dry to allow for seasonal temperature changes where these are necessary.

2.7.0 ELECTRICAL INSTALLATIONS

Electricity supplies for distribution through the National Grid are high voltage supplies ranging from 130,000 volts to about 450,000 volts and have to be stepped down in stages

through substations and local transformers to the 415/240 volt supplies which have three phases (or line conductors) and a neutral.

A single-phase supply is most common for residential use (one line and one neutral) while industrial and larger consumers may take three-phase supply from which single-phase branch connections can be made.

Lights and other electrical appliances consume varying amounts of energy which is reflected by their power rating and symbolised by wattage items such as light bulbs are thus rated at 25 or 100 watts, while immersion heaters could be rated at say 2500 watts. The current in amps will determine the size of the cable taken to a point of electricity consumption. Cable sizes are reflected in cross-sectional area in square millimetres. For example, a 2 amp current could be conveyed by a 0.5mm^2 area or cross section. Fuses of different rating will be used on the live wire, the size of fuze being related to the current supplied.

SMALL DOMESTIC INSTALLATIONS

Electricity supply have normally entered domestic premises via a pipe duct through the perimeter wall, energing in the electric meter board. Many existing domestic properties shave internally positioned electric meters served in this way but more modern practise is to have the meter visible from the outside by fitting inspection boxes to the outside wall of the

house. This allows the meter to be read without disturbance but this is presently becoming unpopular for security reasons, and presently the inspection board is located in a locked cupboard that allows for visual reading of the meter. Irrespective of the location of the meter, there are a number of other component part of the incoming supply controls which are located at the consumer board. Figure 2.7.1a shows a typical installation consumer board. Distribution into the dwelling is generally through three types of circuit:- lighting, power and equipment power. Lighting is a 5 amp circuit with a line and neutral taken to each ceiling rose, see fig. 2.7.1b.

Electric cabling consists of a conductor (usual ly copper) surrounded by various types of insulation: PVC, Plastic, Rubber or Mineral compounds. Classifi cation of cable is generally by the number of conductors within the cable for example, single, twin, twin and earth, and by the cross sectional area of the conductor (1.0, 1.5, 2.5, 4.0, 6.0, 10.0, 16.0 or 25mm^2). Different diameters of cable are to suit the different current ratings to be carried. Mineral Insulated Copper Covered cables (MICC) are used particularly where resistance to high environmental temperatures or protection from possible fires may be necessary. Single core cables are for use specifically in conduit wiring which will offer some protection to the cables thus preventing damage. The most used conduit material are steel. Galvanised iron pipes although PVC and copper may be used. Metal conduits can also provide the

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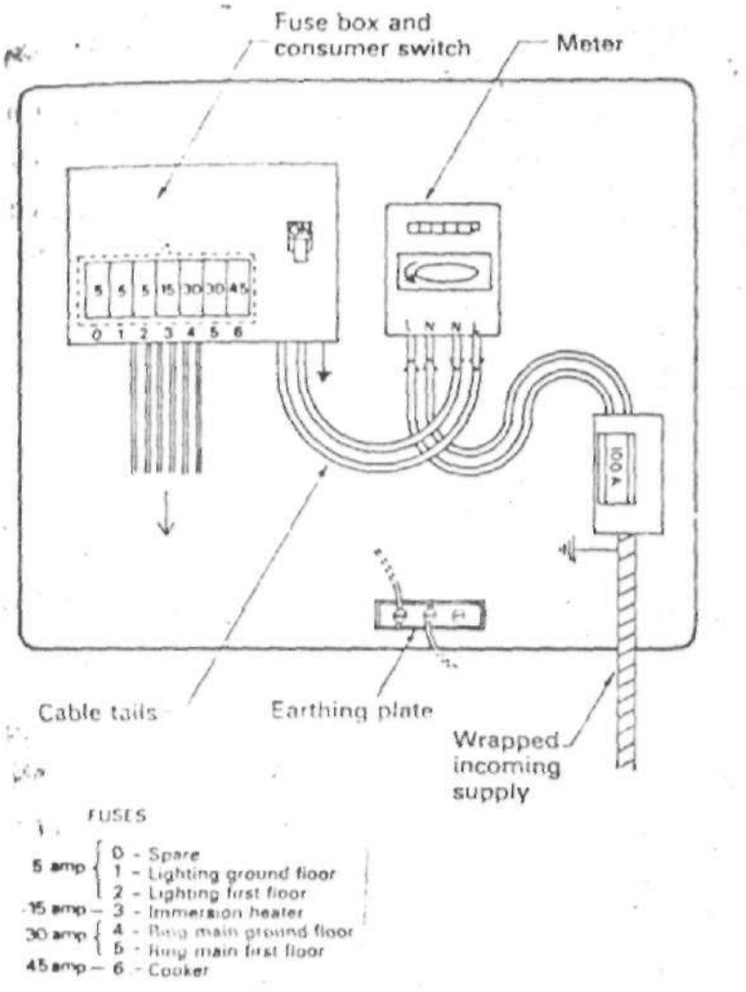


FIG 2.7.1a *Electricity entry into the building — the domestic consumer board*

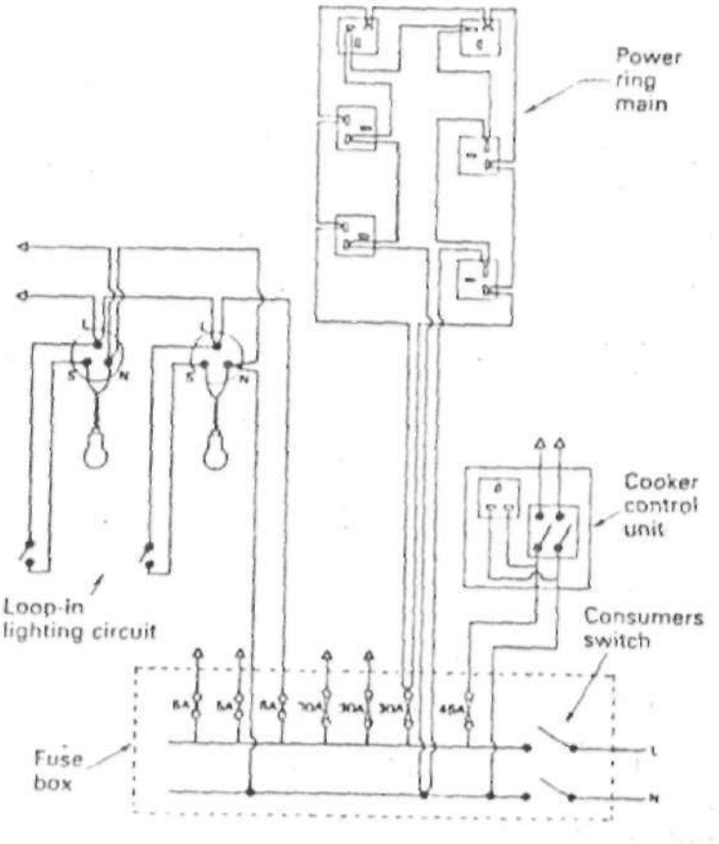


FIG 2.7.1b *A diagrammatic representation of the electrical installation of a dwelling*

useful function of an earth to the system.

Cabling to the lighting circuit is generally 1.0mm^2 cross-sectional area. The power circuits in domestic wiring are for the connection of plug-in appliances at socket outlets. These circuit are installed in a ring around each floor level and are referred to as 'ring main'. In dwellings, there will normally be two ring mains connected to the consumer board by a 30 amp fuse with each outlet taking a 13 amp supply. Certain items of equipment such as immersion heaters and cookers require a higher current than other parts of the installation and are given individual circuits of their own. Immersion heaters may be provided with a 30 amp fuse at the fuse box, while cooker circuits generally have a 45 amp fuse.

LARGER INSTALLATIONS

For buildings such as block of flats, offices and factories, the overall power consumption will necessitate the use of a three-phase rather than a single-phase supply. For the larger installation the capacity of the main fuses may exceed that of domestic installation by tenfold, and most likely employing a circuit breaker for this functions. There may be many user outlets to serve, and particularly in multistorey structures thee will be items in common use which will require a power supply viz lifts, heating boilers and air conditioners. In these types of

installation a three-phase busbar panel can present means of easy connection for single rises to the various levels. An alternative to this would be to take a three-phase supply busbar through out the full height of the building and tap off single-phase supplies as required to each floor level.

2.8.0 SOLID WASTE DISPOSAL SYSTEMS

2.8.1 STORAGE AND DIRECT COLLECTION

The depositing of refuse manually by residents into various sizes of container is acceptable for buildings of up to four floors. For taller buildings however, a chute may represent an efficient method of collection. A typical refuse chute is illustrated in figure (2.8a) which shows the main features of refuse chute design. The chute needs to present a smooth, impervious and non-combustible finish to the refuse conveyed. Suitable materials for chutes include:

a. Clay Pipes to BS 65

b. Concrete Pipes to BS 556

c. Steel Sheet to BS1449 Part 1 and galvanised steel to BS 729

d. Stainless Steel to BS 1449 Part 2.

2.8.2 ON SITE TREATMENT OF WASTE

With installations of refuse collection where large volumes of refuse is involved, volume reduction may be by compaction, shredding, balling or incineration. Automatic rotating turn-tables

which incorproate a ram compactor which can achieve volume reductions of the order of 4:1 exist which reduce attendance time. Incineration is even more effective in achieving volume reductions of upto 10:1. Incineration does however mean higher installation costs for machinery and high operation costs in terms of energy usage and the need to comply with environmental legislations.

PIPE COLLECTION SYSTEMS

Appreciation must be shown for the limited capacity of many pipe line systems to deal with most of the refuse generated as many such systems are capable of dealing with only perishable waste and this may be less than a quarter of total refuse generated. However there are some systems which convey all of the generated refuse. One such system isthe pneumatic pipeline. This is a refuse duct of variable bore whcihcollects the refuse from the foot of a series of refuse chutes under the action of air suction (something working like the vacuum cleaner). The suction piping does not normally exceed a bore of 500mm and cast iron is the most widely used material. On arrival at the collection point, the refuse is incinerated or ran packed.

Wet transfer of refuse may be a less expensive method of pipeline collelction but this method cannot deal with the total amount of refuse generated. Two examples of the wet pipeline method are the Garchey system and the sink grinder system. The Garchey system, it is claimed can deal with about 40 - 50 percent

of total refuse, while the sink grinder handles basically perishable materials fig (2.8b).

2.9.0 THE INTEGRATION OF SERVICES INTO BUILDING FABRIC

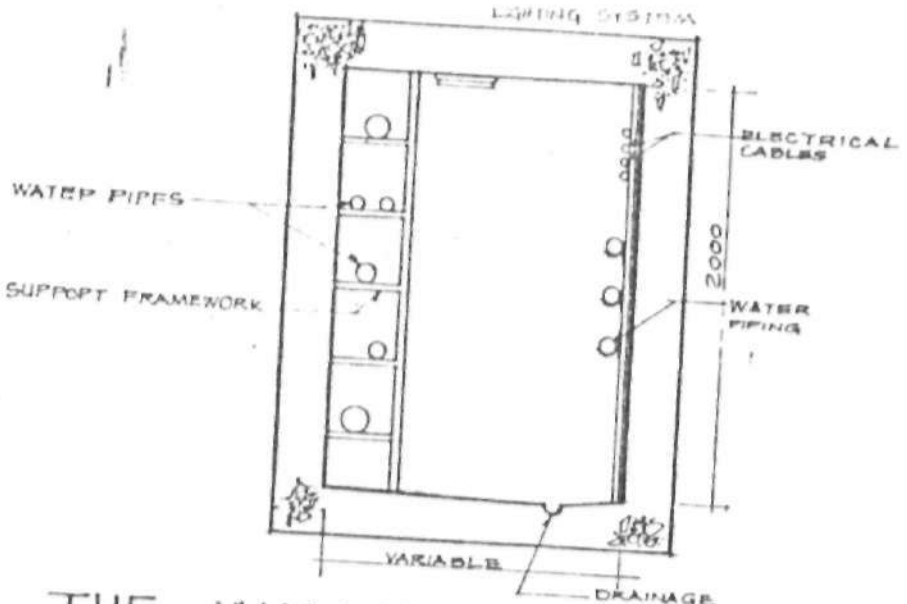
In concluding this chapter, we shall first deal with the integration of services into building fabric and a short discussion of external maintenance equipment.

There are different ways in which pipe, cable and box ducted services may be routed around a building, but a division may be made into structural and non-structural methods of accommodation. Structural accommodation will be very influential in design, as this class represents ducts and recesses built into the fabric of the building. Non-structural accommodation includes method of containment attached to the structural elements of the buildings such as suspended ceilings, raised floors and surface trunking.

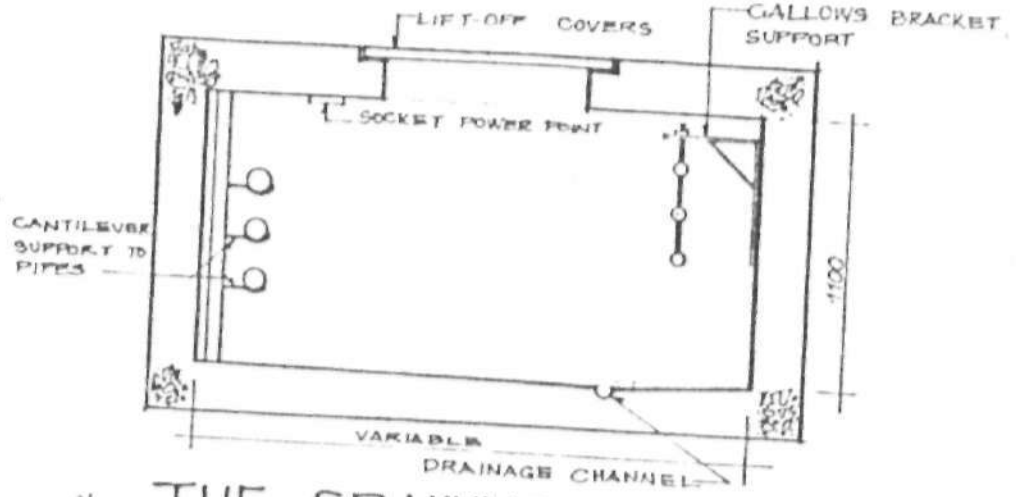
2.9.1 STRUCTURAL ACCOMMODATION OF SERVICES

Ducts built as part of the building fabric can be classed into three types. These are horizontal, vertical and lateral.

The horizontal group includes major service ways such as walkways and crawl ways, these occurring at around or sub-ground levels or on service floors, see figure (2.9.1a). These hori-



a THE WALKWAY DUCT



b THE CRAWLWAY DUCT

Fig 2.9.1

zontal ducts contain the bulk of the pipe and cable services which are routed around the floor of the building and from these, vertical ducts will transfer the services to each floor level. Within these ducts, there shall be a logical arrangement of the items conveyed, for example, hot pipes must be kept away from cold pipes, and water carrying pipes will not be located above electrical cables. Walkways have their own lighting systems and electrical power points should be provided at intervals for the attachment of power tools. Illumination at crawl ways will usually be by plus in portable lighting and access will have to be provided at regular intervals because of the greater restriction of movement. Vertical ducts connecting various floors may be divided into two types vis:-

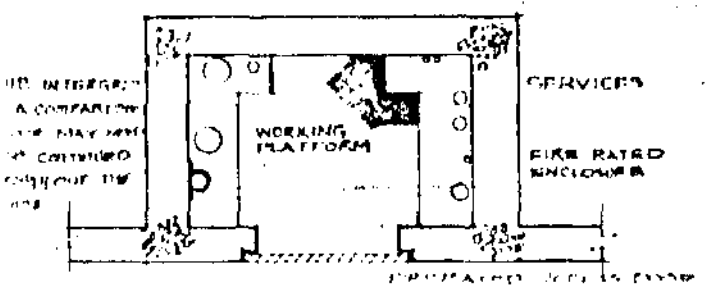
Internal access vertical ducts and the External access vertical ducts is indicated in figure (2.9.1b). Internal access vertical ducts shall be sufficiently large to allow an operative to stand inside while attending the services. External access vertical ducts in contrast normally have a full-width removable access cover, as the operative is expected to stand outside the duct while attending the services. On reaching each floor level, the convey ance may continue in strucutural accommodation in the form of floor trenches. These are lateral means of distribution.

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2.9.2 NON-STRUCTURAL ACCOMMODATION OF SERVICES

Non-structural distribution of services on each floor may often be via suspended ceiling of which there are various types. These can be generally grouped under three classifications: namely joint less, jointed and open (see figure 2.9c). Joint-less, types are not usually employed in the distribution of services, since the continuous monolithic ceiling finish does not readily permit access to the ceiling void. The jointed types in contrast, allow easy access to the ceiling void, since these use tile or panels which are removed from the frame work. Figure (2.9d) shows a typical suspension assembly consisting of a network of inverted 'T' sections usually in light-gauge pressed metal onto which the panel or tile finish is laid. This suspension frame work is often short fixed to the structural ceiling above. The ceiling void provided by this type of access has a large capacity for accommodation as the depth of the void can be increased or reduced by the length of the hangers. The open group of suspended ceiling may be applied in new buildings but is more commonly associated with alteration and refurbish-ment schemes. In the system, slates, boards or grids are used for the ceiling layer, lealving the ceiling void open to view. However as these details are brightly coloured while the void walls and true ceiling are darkly finished. This system provides a means by which the floor-to-ceiling dimension is reduced to improve aesthetics. When suspended ceilings are to be used in multistorey construction as the main route for services distribution on each/all floors, the

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a INTERNAL DUCT

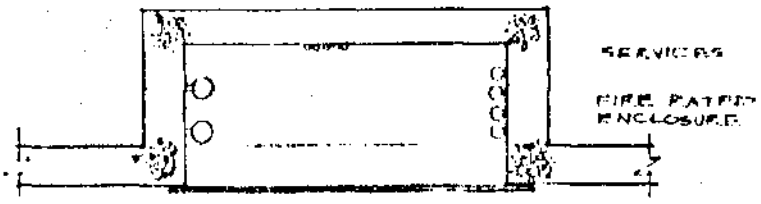
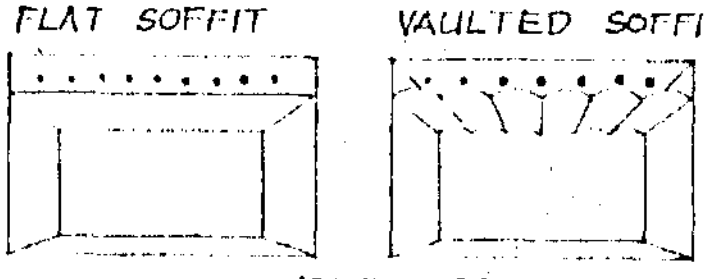
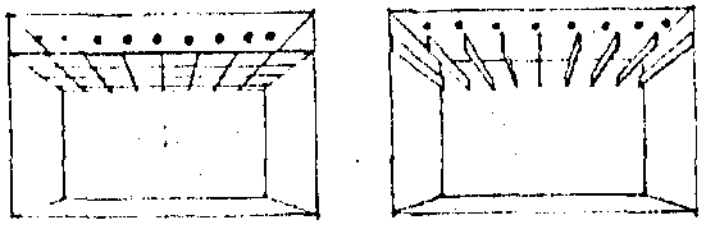


Fig 2.9.26 b EXTERNAL ACCESS DUCT



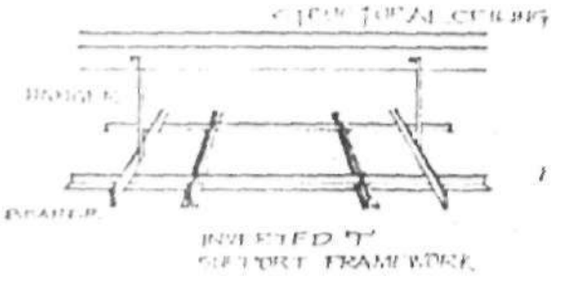
JOINTLESS

•USUALLY NOT EMPLOYED

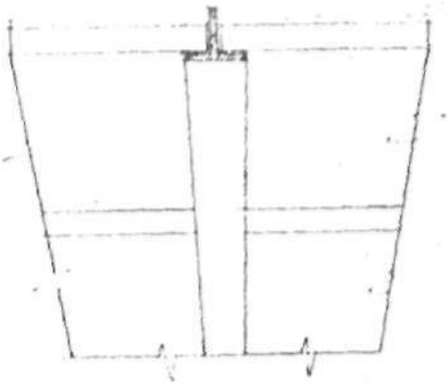


• USUALLY EMPLOYED

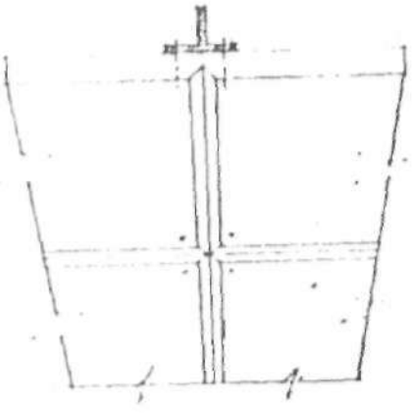
Fig 2.9.3. Various types of suspended ceilings.



A TYPICAL SUPPORT FRAMEWORK FOR A SUSPENDED CEILING



EXPOSED GRID SYSTEM



CONCEALED GRID SYSTEM

Fig 2.9.4

effect of the void on overall height of building must be appreciated. An alternative to the use of suspended ceilings which may also effect over all height of building is the raised floor detail.

Raised floors were originally developed to house the extensive cabling associated with conmputer installations. Deep cavity raised floors have a floor cavity of about 250mm high created by the use of jack posts supporting structural floor panels. In computer installation requiring controlled atmospheric conditions free from dust, the edges of the floor panels have to be provided with sealant material and the integrity of the seal is preserved around the perimeter of the room, usually by the use of flexible PVC skirtings dressed over the panels. Reinforcing beams are sometimes used to span the tops of the jack posts, thereby allowing larger floor panel to be used. Figure 2.8f shows a jack post detail.

An alternative to the deep cavity raised floor detail is the shallow cavity solutions. Such systems may be fabricated insitu or purpose made see figure 2.8f. If a shallow cavity raised floor is not to be used, skirting trunking or embedded trunking may be used, see figure 2.8g. Service ducts and other services ways which are routed around the building are potential means by which fire could spread. The building Regulations 1985 require the containment of fire by compartmentalising the structure of larger

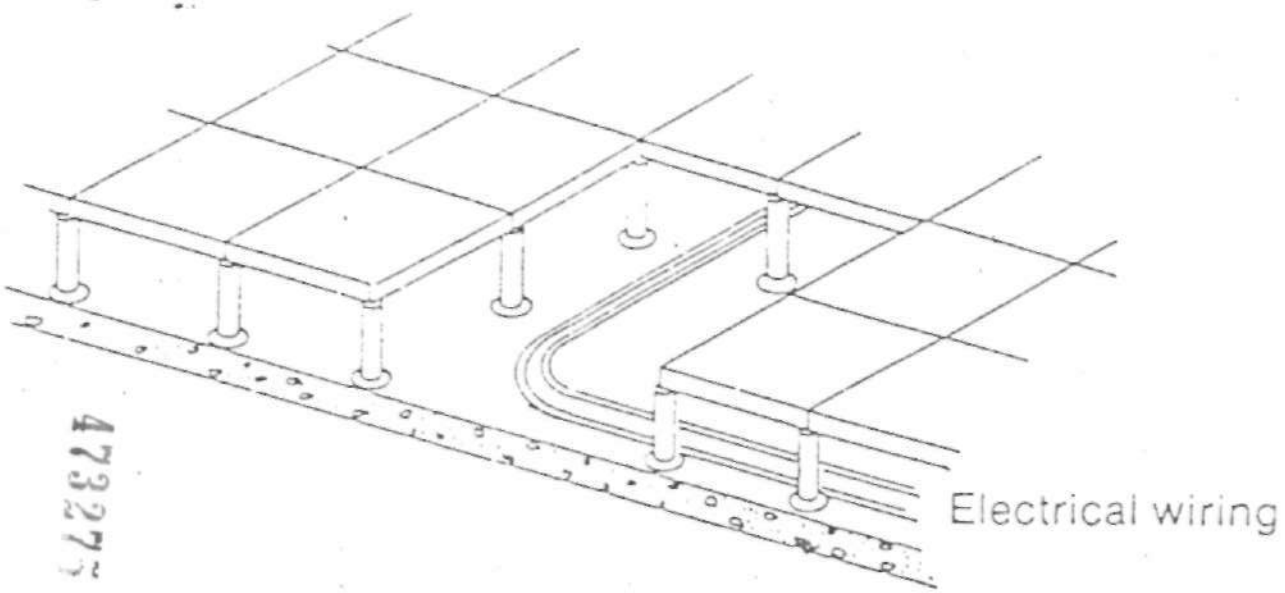
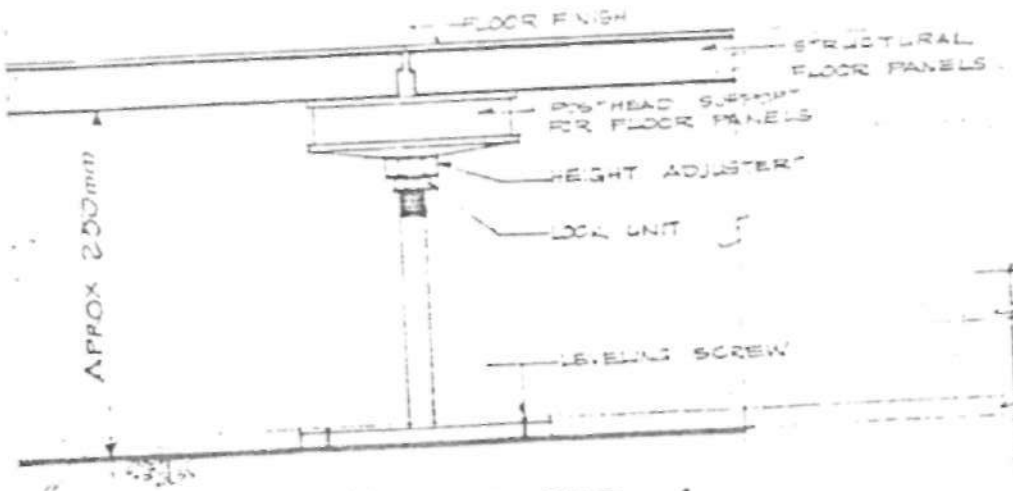


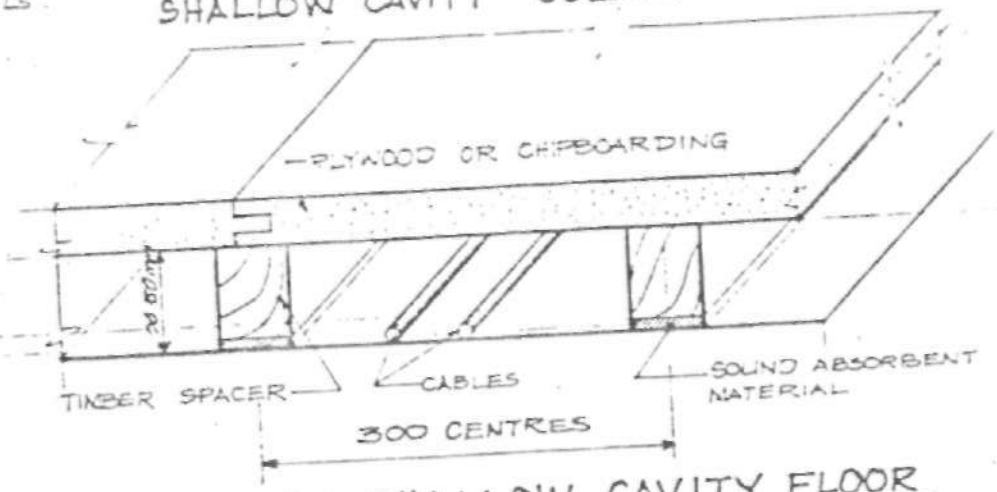
FIG 2.9.5 Fig ~~2.9.5~~ 2.5.2

A Raised floor.

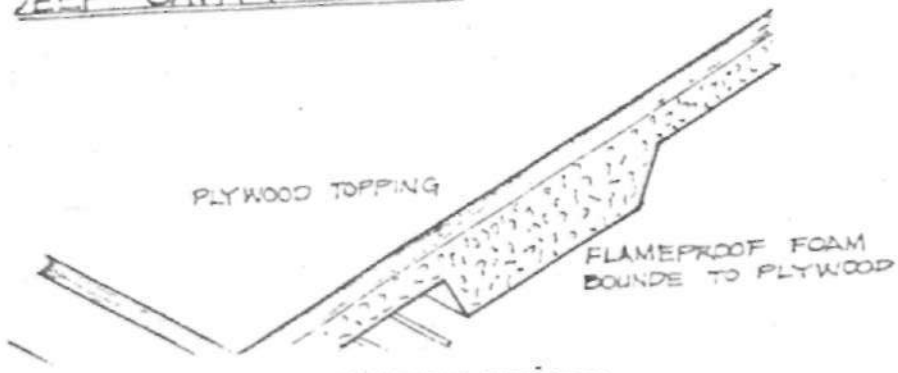


DETAIL OF JACKPOST FOR A DEEP CAVITY FLOOR

AN ALTERNATIVE TO THE DEEP CAVITY FLOOR IS THE SHALLOW CAVITY SOLUTION



DETAIL OF SHALLOW CAVITY FLOOR INSITU



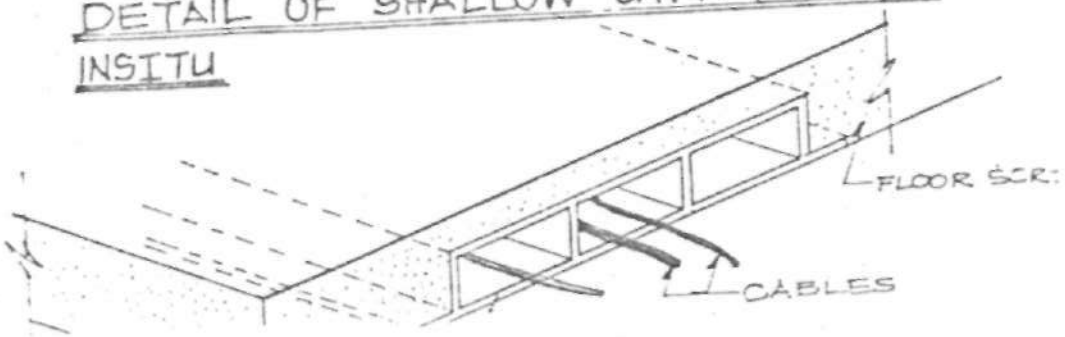
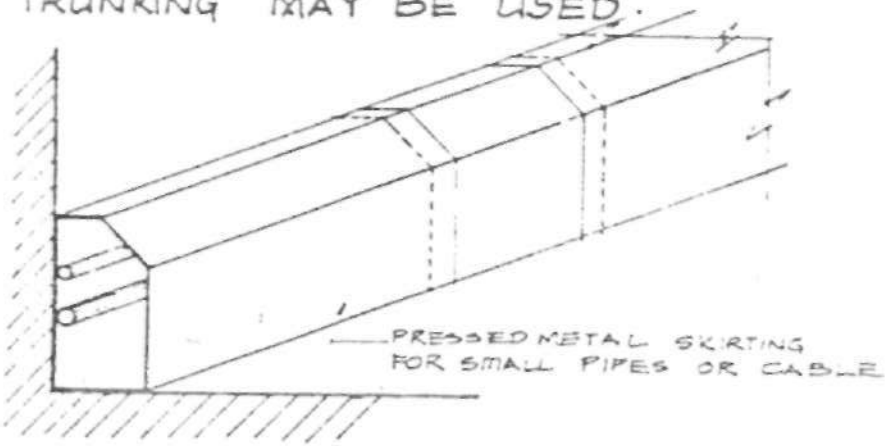
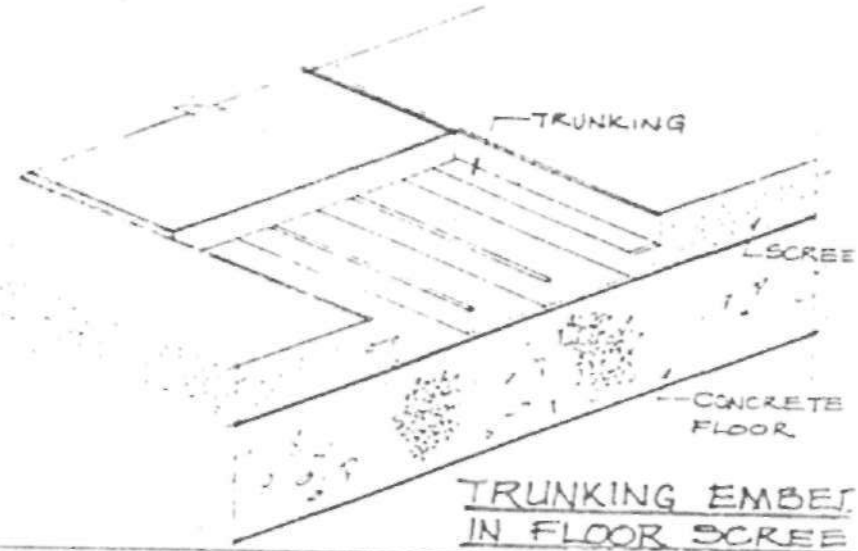


Figure 2.8.F 2.8.F3.2

TRUNKING: WHEN A SHALLOW CAVITY RAISED FLOOR IS NOT TO BE USED, SKIRTING OR EMBEDED TRUNKING MAY BE USED.



SKIRTING TRUNKING IN PRESS METAL



TRUNKING EMBED IN FLOOR SCREE

FIG 2.8.9

FIG 2.8.9

buildings, and in particular multistorey building. The maintenance of the integrity of compartment walls, compartment floors, separating walls and protected shafts is of considerable importance in convervance of services throughout a building.

2.9.3 SERVICE EQUIPMENT FOR EXTERIOR MAINTENANCE

The extent of maintenance to the edxterior fabric of a building will depend on a number of factors including:

- The geometry of the building - plan shape and height.
- The nature and arrangement of exterior materials.

Design shape will to an extent dictate the ease with which access is gained to the exterior fabric, and this will also determine the amount of exterior fabric to be maintained. The most complicated shapes will cause the most difficulty in accessing. Probably the most important factor will be the effect of shape on exterior perimeter length.

If the exterior of the building is classed into components of low maintenance and high maintenance needs, the location of these around the perimeter will have a marked effect on the type of equipment to be provided for cleaning and maintenance work.

EQUIPMENT

Different forms of equipment vary considerably in cost and

also in the rates of coverage that their deployment allow. A division may be made into permanent and temporary equipment.

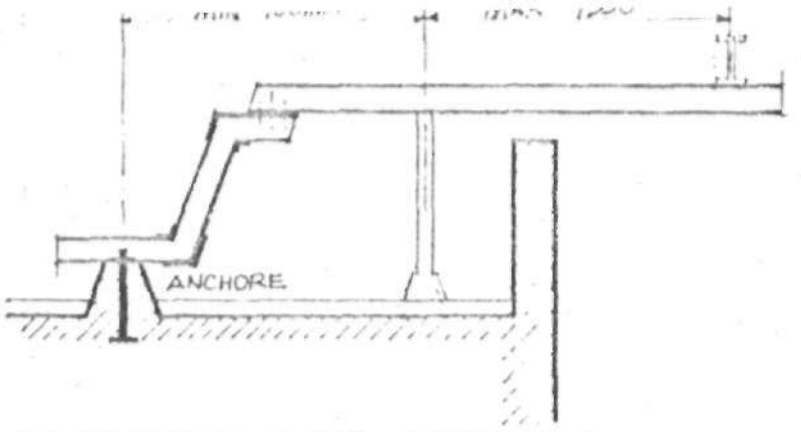
Temporary Equipment includes:

- staging (scaffolding)
- adjustable platforms
- temporary cradles.

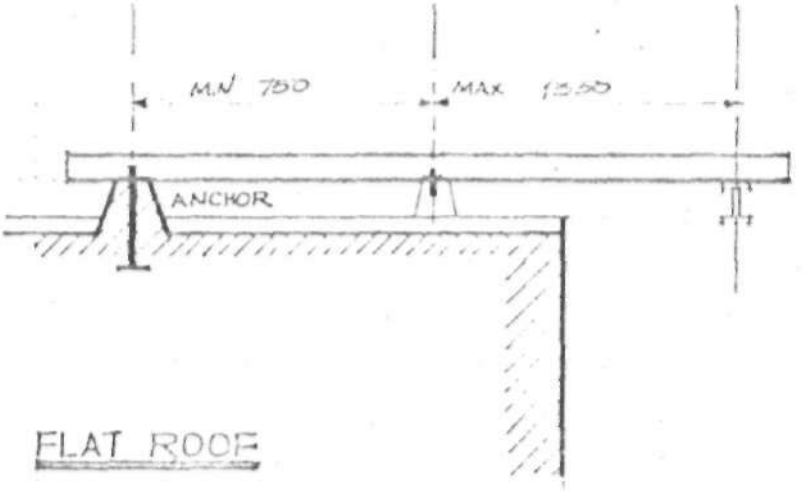
Ladders have limited reach and provide slow movements of the attendant operative. The term 'stagging' applies to various forms of temporary access scaffolding towers as outlined in BS 1139. These like the ladders, have a limited reach capacity as far as maintenance is concerned see figure 2.8h. One man suspension systems such as the bosons chair may be employed for small maintenance works. These details are temporarily hung over the edge of the roof in the same way as temporary cradles described later. These arrangements provide for reasonable vertical movements of one attendant, but horizontal movements can only be achieved by moving the suspen sion equipment.

Adjustasble platforms are usually vehicle-mounted and are hydraulically operated similar to the types used for maintaining road lighting. This system too, has limited reach but provide rapid coverage of the lower regions of the buildings.

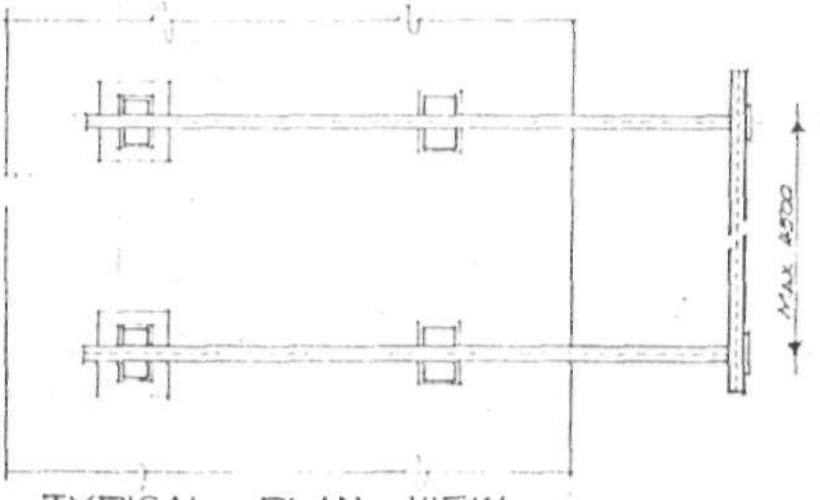
Temporary cradles are mostly in cleaning and maintenance



FLAT ROOF WITH PARAPET



FLAT ROOF

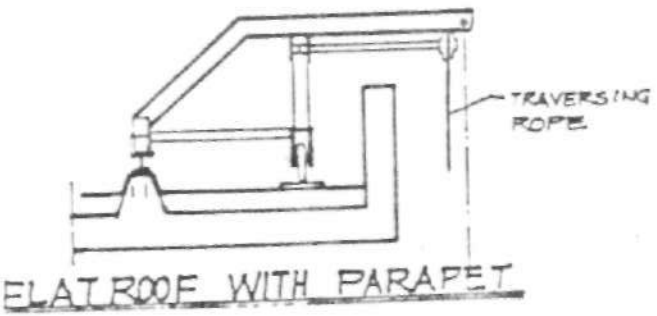


TYPICAL PLAN VIEW

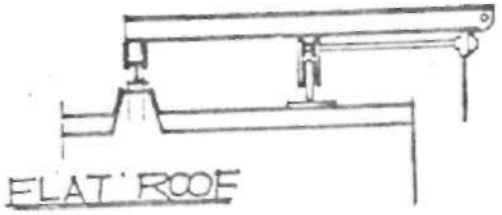


TEMPORARY
CRADLES FOR A SUSPENSION ARE USUALLY STEEL FRAMED WHILE CRADLES FOR PERMANENT SUSPENSION ARE USUALLY REINFORCED POLYESTER (FIBRE GLASS)

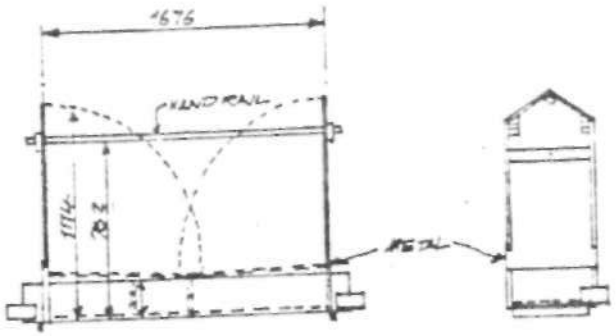
Fig 2.8

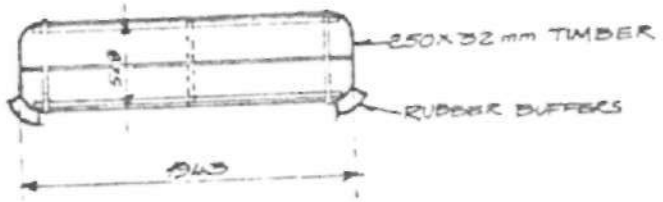


FLAT ROOF WITH PARAPET

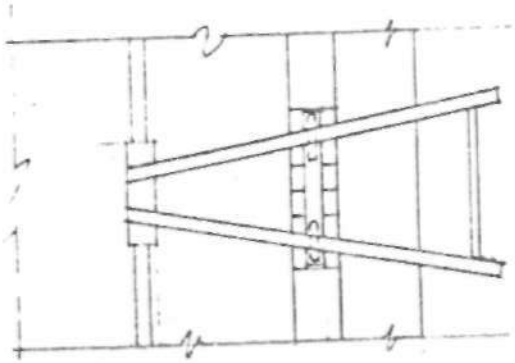


FLAT ROOF





TYPICAL STANDARD TIMBER CRADLE



TYPICAL PLAN VIEW

FIG 2.8.L

work, and are available in various sizes to suit the number of opepratives to be carried. Temporary cradles may be suspended from roof level by either a temporary cantilever arm or from fixed anchorages. Figure 2.8b shows the use of cantilevered cradle. An alternative to the fixed davit system is in the form of a moving davit. By having an operative located at roof level, the cradle may now achieve rapid movements horizontally as well as vertically across the face of the external walls.

Cradles for temporary suspension are usually of steel framed timber details, where cradles are to be permanently attached to suspension systems, they are usually of fibre glass which is to withstand the effects of weather.

Permanent forms of access equipment include "travelling ladders" and "power cradles". Travelling ladders are generally used to allow access to long runs of glazing which is vertical or inclined to the horizontal. The ladders, made of metal alloys to resist corrosion, are mounted on a track at the head and foot of the glazing, which provides support to both ends of the wheeled ladder. Movement of the travelling ladder is achieved by the operatives pulling themselves along.

Powered cradles provide the most efficient rates of coverage of all the external access methods. The cradles is permanently attached to a powered trolley at roof level which can be operated

from a control panel inside the cradle. Combinations of vertical and horizontal movements are now possible from the cradle. The powered cradle and trolley is the most expensive form of service equipment for maintaining the face of a building, but it is also the form which provides for the least attendant time. It should be appreciated that this type of access may be dictated by the design of the building, for example, where no-load bearing curtain walled facade is to be used.

CHAPTER THREE

3.0 THE CASE FOR A NATIONAL DATA BANK

3.1 PLANNING WITHOUT FACTS

The lack of adequate, reliable and timely statistical data has been a serious problem to planning, policy making and socio-economic research in Nigeria. In 1966, Mr Wolfang Stophler described his experience during the preparation of Nigeria's "First National Development Plan" (1962 - 1968) in a book which he aptly titled "Planning Without Facts." About fifteen years later in 1980, a mission of the "International Labour Organisation" (ILO) observed that:

> "....Policy making in Nigeria, given the present state of statistics, is like trying to run through a forest in the dark without a touch..."

A formidable task to say the least. Inspite of some of the efforts made by successive administrations to redress this situation, the "Nigerian Statistical System" (NSS) still cannot meet the demands and expectations of users of Nigerian Socio-economic data.

3.2 BACK GROUND OF THE NATIONAL DATA BANK

The data bank concept, at least in the national context, is essentially an ingredient of the "Civil Service Reforms" first introduced by "Decree 43 of 1988". These reforms were conceived to remedy a series of weaknesses in the civil service, one of the

most important of these being the general lack of data management and thus timely and reliable statistics. It is a well known fact that a great deal of data is generated from day to day in Civil Service agencies (and indeed in the rest of the public sector or else where) and exists in various media within these organisations, but for most part, such data is not avail- able for policy formulation, planning or implementa tion, which implies that to a larger or lesser extent, sectoral, ministerial and even national plans are made and executed without facts. This is because there is, as of now, no well organised institu-tional frame-work and operating procedures for selecting, capturing, processing and storing relevant statistics from the mass of data generated, and for facilitating rapid access and retrieval when required by authorised persons or agencies. The recognition of this short falls and the subsequent decision to correct the situation led to the formulation of the "Civil Service Reforms" and within this, the establishment in every ministry and extra-ministerial department, of a "Research and statistic Department" [RSD], one section of which is the data bank.

In response to the same high level concern about the sorry state of the "Nigerian Statistical System" (NSS), the "Office of Project Service" of the "United Nations Development Programme" commissioned "Phoenix Associates" (of Maryland U.S.A.) in 1984 to undertake a feasibility study to determine firstly, whether a

National Data Bank should be established and if so, with what resources. The report, which was submitted in March 1986 found a great need for such a Central Data Bank because of the lack of reliable and timely macro-economic and social statistic, and in view of the existence of several projects to strengthen micro-data in the "Federal Office of Statistics", "Federal Ministry of Finance" and the Federal Ministry for Budget and Planning. According to the report:

> "...The proposed National Data Bank (NDB) project will focus on the production of reliable and timely macro-economic data by establishing additional institutional capacity exclusively for this purpose... The NDB can and must succeed in being more than a processing and storage facility for data in order to satisfy the statistical needs of the major economic ministries for relevant, timely and reliable macro-economic data for their operations..."

It was also suggested that the NDB should play a major, if not leading role in the improvement of data source and methodologies used to provide micro as well as macro-data. Finally, the study emphasised the need for legislation to lend weight to the activities of the NDB, and to compel appropriate data producers to supply statistics to the NDB.

PROPOSED ARCHITECTURE OF THE NIGERIAN STATISTICAL SYSTEM

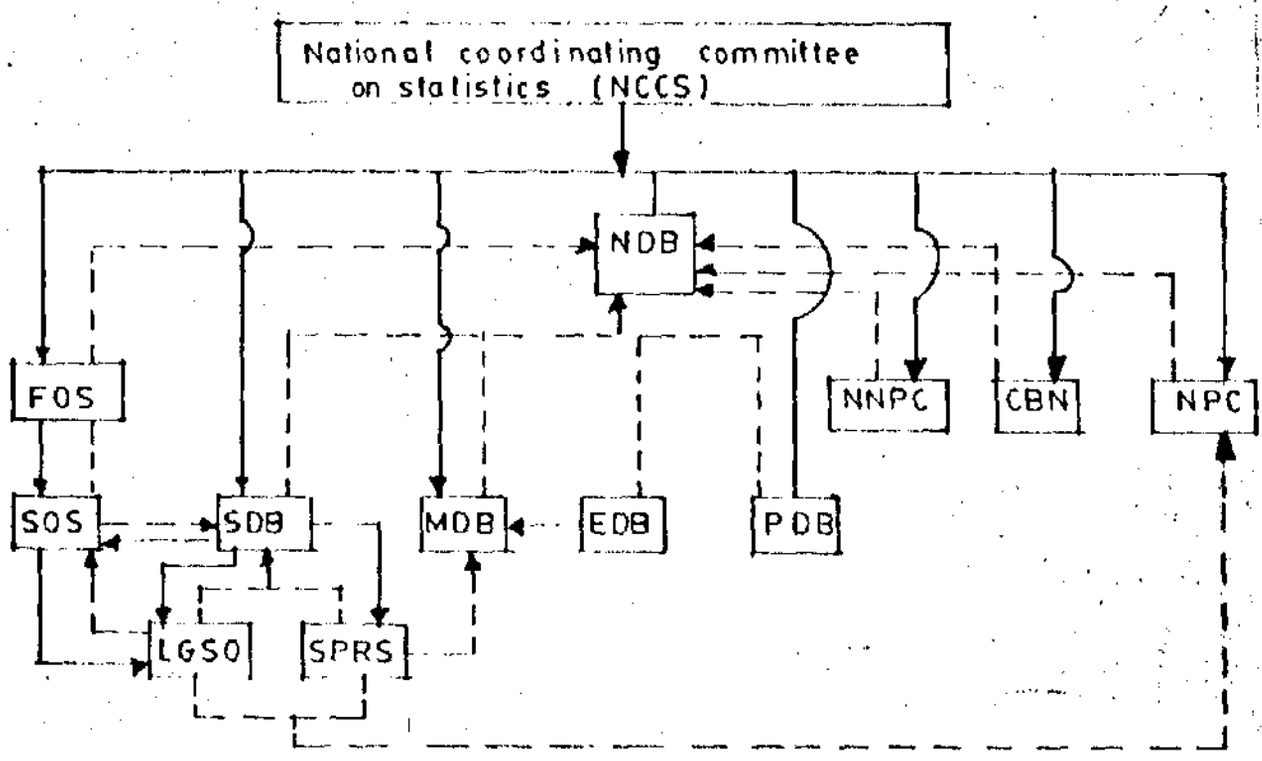


Fig 3.4.1.

To help correct the above weaknesses and to strengthen the "Nigerian Statistical System" (NSS), the "Council of Ministers". in August 1986 approved the establishment of the "National Data Bank", to be housed in the "Federal Ministry of National Planning" (later the Federal Ministry for Budget and Planning and now the National Planning Commission) and the creation of five sectorial Data Banks in the Federal Ministries of Agriculture, Water Resources and Rural Development, Industries, Science and Technology, Finance and finally Education. These sectorial Data Banks are now known as Ministerial Data Banks.

In November 1987, the Federal Government of Nigeria and the "United Nations Development Programme" (UNDP) officially signed the "Project Document" (PD) for the establishment of the "National Data Bank" with financial support from the UNDP and the project took off in February 1989 with the arrival of the "Project Leader" Mr. JAL Chettoe.

3.3 CONCEPTS AND DEFINITIONS

Database and data bank are key terms which I must now try to define. Mr. JAL Chettoe (Project Leader NDB) characterises a database as:

a. An organised, integrated collection of data
b. Providing a natural representation of the data and data relationships
c. Fulfilling the data needs of many applications and
d. Shared between a variety of users.

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While Dr. E. O. Ojameruaye (Economic Statistician - Consultant to NDB) defines a database as an organised set of basic data files which makes for selective retrieval and inter-linkages of data in response to specific need. Put simply, a database is a common pool of shared data while a data bank is a system that offers database facilities, for acquiring, storing, updating, processing and retrieving statisti cal data or other data related to a particular topic or collection of topics, for example, the student register of a University is a data bank of the stu dents, a railway timetable is a data bank of the movement of trains. In fact the daily spending of a family, if documented constitutes a data bank for the family. Topics can cover a wide range which may include Industry, Agri-culture, Trade,Communication, Transport and Defence sector. A data bank allows for the improved management of data by the use of computer technology in storing processing and ultimate retriev al when required by authorised persons in usable form, ensures security, confidentiality and privacy. It usually also incorporates a set of procedures to facilitate easy user - system dialogue by choosing and implementing an appropriate Data Base Management System (DBMS). Specifically a data bank is able to:

- store data in such a way that particular data could be linked with data derived from other sources or data derived from the same source for preceding periods, for the purpose of common processing,

The "Data Description Language" (DDL) allows for the definition of data files, the "Data Manipulation Language (DML) provides an interface between the application programme and the data base while query and report generation permit a user to access the data base through simple English-like statements (Natural Language Query) in order to retrieve and display information. Thus, in principle, data banks represent a user-concious and user - oriented approach to data collection, storage and dissemination. In this regard, a data bank may be a specific purpose outfit for a well defined user group (as in the data banks of the various oil companies) or a multi-purpose outfit serving the general public in analogy to the National Libraries. When a data bank deals with statistical data, it is termed a statistical data bank and if it contains macro-economic data or other data which are national in coverage, the data bank is said to be National as the "National Data Bank" is intended to be. The NDB being the apex data bank will receive, initially at least, economic and social statistics already aggregated to national or state level from sectorial data banks, state or regional data banks and other major data producers such as the "Federal Office of Statistics" (FOS), the "Central Bank of Nigeria" (CBN), the "National Population Commission" (NPC), the "Nigerian National Petroleum Corporation" (NNPC) and the Ministerial data banks of the Federal Ministries and Parastatals. Thus the NDB is not expected to generate its own primary data.

In contrast to the NDB, a central statistics office as the FOS was intended to have overall respon sibilities for the planning, design and execution of statistical programmes to provide the statistical information required by the main users of national statistics. This is accomplished either directly in a centralised statistical system (as was the case in the Union of Soviet Socialist Republic) or more commonly as in Nigeria, in a decentralised system exercising assigned authority or influence over the various federal and state producers of data.

A National Statistical system is defined as that system which includes all units in the country producing or using statistics. The output of this system is then known as official statistics.

The next paragraphs shall address the role and location of the NDB within the NSS and in particular, the organisational and functional relationship between the FOS and the NDB on one hand and the NDB and the Ministerial and Sectorial data banks on the other.

3.4.0 THE PLACE OF THE NATIONAL DATA BANK WITHIN THE NIGERIAN STATISTICAL SYSTEM

3.4.1 LOOKING OUT

In most countries of the world, there are National Statistical Offices (NSO) whose primary functions are to collect, publish and

distribute demographic, economic and social statistic. However, the scope of activities and nomenclature varies from country to country. In the United Kingdom, it is called "The Central Statistical Office"; in Sweden, "Statistic Sweden"; in India, the "Central Statistical Organisation" and in Nigeria, the "Federal Office of Statistics". In the "United States of America", there exists a very decentralised statistical system, but the "Bureau of the Census" (BUCEN), performs functions close to that of a NSO.

NSOs obtain their data from both primary and secondary sources. The primary sources include sur veys and censuses (usually country-wide) and the secondary data are mainly administrative, usually from government agencies. Although the data they handle are primarily for the purpose of governmental administration and planning, NSOs are generally multi-purpose statistical agencies since they produce a wide range of data for multifarious users, including government officials, researchers, private individuals and inter national organisations. The users of the data produced by NSOs are such an armophous group that NSOs cannot be specific-user-oriented. They therefore run the risk of churning out statistics which may no longer be relevant to the changing needs of the economy. Hence in recent years, many NSOs, the world over have established their own in-house data-banks aimed at satisfying identified categories of users. Indeed, the idea of data banks started sometime in the 1960s in

some advanced countries [Ojameruaye (1991)]. The need to establish data banks in the NSOs, arose when critical comments on possibilities of satisfying users demand for information were expressed [Coker (1990)]. However, these data banks were not usually tagged "National Data Banks". Some of these are briefly described below:

In Poland with a highly centralised statistical system, the Central Statistical Office (Glowny Urzad Statystyczny) has many data banks which are grouped into two types vis, the Central data banks and the Regional (Voivodship) data banks. The first group include the industrial data bank, the data bank on constru- ction and assembly enterprises and the financial data bank. Quoting Dr. Ojameruaye (1991):

> "The industrial data bank holds annual and quarterly data on 6,000 industrial enterprises, at establishment level, The annual data cover seven years of which five are recent consecutive years and two are base years. The quarterly data cover seven recent consecutive quarters, and information for earlier years is usually kept in archival files.... The regional data banks presently operate in a few regions and they contain files on micro - data ....."

In Sweden, "Statistics Sweden" has a data bank called the "SCBs" statistical Data base. This data bank facilitate the electronic dissemination of data by it.

The SCBs statistical Data base is connected to a system called "DAFA" which makes it possible for users in the public and private sectors to access the data base via over 20,000 terminals in banks, insurance companies, ministries, the parliament etc.

The "Central Statistical Office" of the United Kingdom (UK) also has a data bank called the "CSO Data bank", which constitutes the service which the CSO offers to users of macro-economic data who wish to use information in computer readable form. The "CSO Data bank" currently contains about 15,000 annual, quarterly and monthly macro-economic time series organised into a number of data sets (Ojameruaye). The 'CSO Data bank' is currently in magnetic tape form only, and does not offer on time service to the data bank, but there exist some private computer host bureau which offer this facility in the UK.

In some countries like India, Egypt and Iraq, national information centres similar to National data banks are located outside the NSOs, but such centres receive a significant part of their statistical data from their NSOs. The fact thus remains

that while it may be desirable to locate a national statistical data bank in the NSO, this need not be the case. Thus in a decentralised statistical system, an NSO can have its own in-house data bank while a "National Data Bank" independent of the NSO can be located else where to hold data from a wider variety of sources including the NSO. The existence of inter-national data banks that receive, store and disseminate data from a wide variety of sources further supports the case of a national data bank that is independent of the NSO. Examples of international data banks include PADIS-STAT of the "Economic Commission for Africa (ECA), The International Data base at the "Bureau of the Census" in the United States of America. EUROSTAT of the "European Economic Community" (EEC and data banks of the World Bank, "United Nations Statistical Office" and the "International Monetary Fund" (IMF).

3.4.2 THE NIGERIAN STATISTICAL SYSTEM [NSS]

A national statistical system is made up of all the statistical agencies or producers of statistics in the country. The term producers here embraces all agencies, both in the public and private sectors of the economy, which compile or collect data from administrative returns, and receive secondary data from other agencies, process these data further or simply store them for use by other agencies or individuals. Going by this definition; present Nigerian Statistical System (NSS) consists mainly of the following agencies:

- Federal Office of Statistics (FOS)
- Statistical units of the Central Bank of Nigeria (CBN)
- The National Population Commission (NPC)
- State Statistical units of parastatals such as "Customs and Excise Departments", "Nigerian Ports Authority", "National Electric Power Authority".
- National Universities Commission etc.
- Statistical Units of Federal and State ministries (i.e. the newly created Departments of Planning Research and Statistics (DPRS) as well as of the Local Governments.
- The newly established National Data Bank (NDB) and sectorial Data Banks.
- The statistical units of the organised private sector.

Presently, the dominant agencies are: The FOS, CBN, NNPC and the NPC. The FOS occupies the premier position in the NSS. The statistic act of 1957 which established the FOS defines its functions as follows:

(i) To collect, compile, analyse and publish statistical information relating to the commercial, industrial, agricultural, mining social, economic, and general activities and conditions of inhabitants of the Federation.

(ii) To collaborate with the departments of the government authorities in collections compilation analysis and publication of statistical records of administration and

departments of the Federation, the states and the local governments.

(iii) Generally to organise a coordinated scheme of social and economic statistics relating to the Federation"...

The establishment however of other statistical agencies and the inability of the FOS to adequately satisfy the needs of data users for timely, adequate and reliable data have greatly eroded its authority and premier position within the NSS. For instance, with the establishment of the CBN in 1959, the statistical unit of the CBN quickly took over the collection, collation and dissemination of financial (money and banking) statistics. Also owning to the inability of the FOS to produce timely and relevant data, the CBN has gone out of its way to collect, collate and disseminate statistical data relating to various aspects of the economy such as prices, manufacturing, public finance, agricultural production, energy production, foreign investments etc. Indeed the publications of the CBN have become a veritable source of the most current data on production, prices, external trade and balance of payments, etc on Nigeria.

The creation of the "National Population Commission" (NPC) under the 1979 constitution has further weakened the FOS. Under the constitution, the functions of the NPC are:

(i) To undertake periodical enumeration of population by sample surveys, census or through other means;

(ii) To establish and maintain a machinery for continuous and universal registration of births and deaths;

(iii) To advise the President on population problems;

(iv) To publish and provide information and data on population for the purpose of facilitating economic and development planning; and

(v) To appoint and train or arrange for the appointment and training of enumerators or other staff of the commission."

The functions of the NPC were further expanded under constitution amendment Decree 23 of 1989 to include the following:

(vi) To prepare and maintain a national delineation exercise for census and sample surveys; and

(vii) To collect, collate and publish data on migration statistics."

The above functions clearly infringe on those of the FOS under the 1957 Statistics Act.

The existence of "State Statistical Divisions" under all State governments of the Federation, over which the FOS has no control, has also weakened the FOS. Furthermore the civil service

reforms "Decree 43 of 1988" has effectively decentralised the NSS. The decree provided for the establishment of a "Department of Planning Research and Statistics" (DPRS) in every ministry and extra ministerial department. The DPRS is divided into two viz The "Planning Division" (PD) and the "Research and Statistics Division" (RSD). The RSD has three branches: Research, Statistics and Records branches. A data bank section is located in the Records branch. The statistics branch has two sections vis sectorial statistics and internal statistics. The sectorial statistics section is to routinely collect and process statistics relating to the sectors of society or areas of concern over which the ministry has jurisdiction. On the other hand, the internal statistics section is to routinely collect and process statistics concerning its personnel, finance physical resources, operations output etc. The records branch is subdivided into four sections; the data bank, the computer services, the Registry and the library sections. The Data bank section (or the ministerial Data bank - MDB) is to plan, design, maintain and manage the usage of the ministries data base. The MDB is to store information required by the ministry for the purpose of policy formulation, operations management and planning. The primary source of data to be stored in the MDB is from within the ministry. However it will also hold selected data from other MDBs, the NDB, State Data Banks (SDBs) and other specialised agencies like the FOS, CBN, research institutes and International organisations such as the ECA, EEC, UN, WORLD BANK, FAO, IMF, UNICEF, UNIDO, ILO etc.

Although the DPRSs are yet to fully take off in many ministries as envisaged by the decree, there is no doubt that the promulgation of the decree has effectively decentralised the NSS, so much so that FOS statisticians who were once posted to the various ministries had to transfer to the DPRS of those ministries (Ojameruaye 1991). As of now there is little or no interaction between the DPRS of most ministries and the FOS.

In addition to all the above points, statistics is on the concurrent list in the constitution, this implies that all tiers of government can establish their own independent statistical agencies. Further more some private organisations now collect, collate and disseminate statistical data in their areas of interest. For example, the Manufacturers Association of Nigeria (MAN) has for some time now been conducting surveys on the production activities of its members so also does the industrial Data Bank which has been established. The data produced now compete with data from the FOS and the CBN.

From the above arguments, it is clear that the NSS has become very decentralised, this being expedient, and it will be ill advised to recentralise it again. What is therefore required is an effective coordination of the system to ensure that its outputs are able to satisfy the data needs of users. This can be achieved by a well defined architectural relation ships in the NSS that is well coordinated by the NDB and legal backing through the

promulgation of an enabling decree.

3.4.3 AN ARCHITECTURE FOR THE NIGERIAN STATISTICAL SYSTEM

For any system to function effectively as an integral whole, its component parts must be well-coordinated to produce the desired output. A major problem of the NSS is the lack of proper coordination of the activities of the different data collection and dissemination agencies, thus the entire system is not adequately integrated to support government in the various spheres of planning and policy making.

Although the 1957 statistics ordinance charges the FOS with the responsibility of coordinating statistical activities and agencies throughout the country, the FOS has been ineffective in performing this function. In the late 1950s the Joint Planning Committee of the National Economic Council set up the standing committee on statistics. The committee was made up of members from the main statistical agencies and users of economic statistics. In 1969 another step was taken to coordinate the NSS with the establishment of the "National Advisory Committee on Statistics (NACS), which was charged with he responsi bility for considering and advising on any business relating to the development of efficient statistical services in the country. This committee included major producers and users of statistics but did

not include representatives of state governments and lacked the power to ensure that its decisions were properly executed together with other bureaucratic impedances the NACS has failed to make any substantial achievement since its establishment. There is now the need to establish a more effective body to coordinate the NSS which has become more decentralised. Thus a system is proposed with the National coordinating committee on statistics (NCCS) at the top to replace NACS. The NCCS shall coordinate the NSS to produce relevant and timely data to meet the needs of users.

The terms of reference of the NCCS should include the following:

1. To produce a forum for the major producers and users of socio-economic data to interact and review their activities with a view to ensuring cooperation, eliminating or preventing unnecessary duplication, reducing cost of data collection to the entire economy, and ensuring that the NSS adequately responds to user needs for data.
2. To set up standards and norms relating to the collection, processing and presentation of data on various subjects or areas, as well as the acquisition and use of information technology in the NSS; and
3. To share the responsibility for data collection among the various agencies and also to determine direction and form of data transfer among them.

KASHIM IBB

The NCCS should consist of the following members:

- The Secretary to the Federal Government
- The Director-General of the NDB
- The Sole Administrator or director of FOS
- The Director of Research of the CBN
- The General Manager of the Corporate Planning Department of the NNPC
- The Director General of NISER
- The Chairman or Director-General of NPC
- Directors of all State Data Banks
- The Directors in charge of DPRSs in all Federal Ministries
- A representative of the organised private sector
- Directors in charge of Statistics/Data Banks in all major Federal parastatals.
- Certain members of the legislative arm of government.

The NCCS should have powers to co-opt competent individuals as members from time to time as the need arises. It should have sub-committees to handle specific problems of the NSS.

Next in hierarchy should be the NDB. The rationale for this lies in the fact that the NDB shall receive and store selected data from all other data producers, compute derived indicators from

the received data, produce forecasts and disseminate data in various forms to a wide variety of users, particularly government policy makers. Eventually, major users will be linked on - line to the NDB data base.

Next to the NDB should be the four major data producers; the FOS, the CBN the NNPC and NPC.

The FOS as suggested by Dr. Ojamaruaye:

> "Should be made to focus its activities on conducting nation-wide surveys and censuses of various activities (except human population census and demographic surveys) and compiling national income accounts, input - output tables, flow-of-funds and social accounting maxtrise The compilation of external trade statistics from customs bills of entry should be transferred to the CBN and the compilation of public finance statistics according to economic and functional categories should be transferred to the Data Processing Unit of the office of Accountant-General of the Federation. The affected staff in the FOS should be transferred to the respective Agencies.

While the Central Bank of Nigeria should collate and disseminate data on the financial sector as well as external trade and balance of payments as well as external debt statistics.

Selected data from these data sets should be supplied to the NDB for storage, further processing and dissemination. The NPC should be responsible for all demographic statistics including human population censuses, demographic surveys, migration data as well as birth, death and marriage registration data. The NPC should also pass on selected demographic data to the NDB. The NNPC should continue to be responsible for petroleum statistics next in the hierarchy should be the Research and Statistics Division (RSDs and their Ministerial Data Banks) of the Federal Ministries, the Research and Statistics Division (RSD) of the extra-Ministerial Departments and Parastatals, the Statistical Units of the private sector organisations, State Offices of Statistics and State Data Banks. The last level in the structure are the Local Government
Statistics Offices (LGSOs) and the Research and Statistics Division of State Ministries.

The flow or transfer of data in this structure is basically upwards, however, all agencies are at liberty to obtain data from any other agency. To ensure the timeliness of data, it is necessary that data are transferred among agencies in whatever

form available immediately they are ready.

In order to ensure that the proposed structure functions effectively, a new statistics Act or Decree should be promulgated to replace the 1957 statistics Ordinance as it is now out of date. The new Decree should clearly specify the functions of all the agencies in the NSS and the flow of data amongst them.

3.4.4 LOCATION AND ORGANISATIONAL STRUCTURE OF THE N.D.B

i. Location of the NDB

There has been some controversies over the physical location and status of the NDB. One school of thought holds the view that the NDB should be taken over by the FOS while another school of thought believes that the NDB should be located in the FMBP (now National Planning Commission - NPC) as a sub-Division or as a separate department. A third school of thought believes that the NDB should be independent of both the FOS and the FMBP. The proposed architecture of the NSS presented in the preceding section is in support of the third option, thus, the NDB should be made an extra-Ministerial Department under the Presidency/ Cabinet Office.

I shall now present the case. Those who argue for the first school of thought usually refer to the NDB project document (PD) and the fact that many NSOs (National Statistics Offices) else where have data banks that are of a National character.

The NDB project Document state that:

"The National Data Bank project will be managed by the FOS which is an entity within the Federal Ministry of National Planning". But the Project Document is somehow ambiguous on this issue, for instance, the same document notes that;

> The wide-ranging statistical responsibilities of the FOS., however, will prevent it from focusing its efforts on the production of reliable and timely macro-economic data in the short run... The staff and the data processing facilities of the FOS are not geared to make timely estimates from partial returns and incomplete data by utilising expert assessments, statistic estimating techniques, and other methods which the proposed project will utilise.

How then can the FOS be expected to manage the NDB. The FOS can be strengthened to take on the role and since the reorganisation of FOS is still on going, the outcome cannot be preempted here. Paradoxically, the report of Phonix Associates which formed the basis of the NDB Project Document envisaged an autonomous NDB which would be the apex statistical agency in Nigeria. The report notes that;

> The FOS would also be among the major users of the NDB particularly if the NDB is successful in producing more timely and up-to-date estimates than those prepared by the corresponding updating efforts within the FOS.... Aside from being a major user of NDB data, the FOS may benefit from the operations of the NDB in other ways.

Somehow, it would appear that something happened in the time interval between the report and the project Document. Whatever the case is, one can argue that the recommendation by the Project Document cannot be regarded as final, there is need to reconsider this recommendation. The argument that National Data Banks in most other countries are part of the NSOs may be a necessary condition for those countries due to factors unique to their cases, and is not sufficient to make the NDB part of FOS. There are obvious advantages in locating a National Statistical Data Bank in a NSO., but these do not spoil the case for an independent National Data Bank especially in a decentralised National Statistical System that is trying to evolve into co-operative system. There exist some peculiar circumstance here in Nigeria which calls for an independent NDB. Firstly, if the NDB is made part of the FOS., it is very unlikely, that the enlarged FOS can have enough resources to enable the NDB achieve its objectives and

STATUS OF FOS PUBLICATIONS AS AT OCTOBER, 1990

Title	When first Published	Latest Edition
General		
- Digest of Statistics	1951	June 1987
- Annual Abstract of Statistics	1960	1988
- Facts and Figures about Nigeria	1964	1989
General Economic		
- National Consumer Survey (NISH)	1984	1984/85
Agricultural		
- Modern Holding of Agric.	1981	1981/82
- Rural Agric. Sample Survey (NISH)	1980/81	1984
Trade		
- Review of External Trade	1966	1987
- Nigeria Trade Summary		June 1988
- Statistical News - Merchandise Trade		Sept 1989
- Distribution Survey		1980
Industrial Data		
- Industrial Survey of Nigeria	1963	1983
- Survey of Building and Construction		1980
Prices		
- Consumer Price Indices	1965/66	June 1988
- Retail Prices of Selected Items		1988
- Statistical News - Consumer Price Index		Dec. 1989
Labour Data		
- Labour Force Survey (NISH)	1983	1983
- Statistical News - Labour Force		Sept 1989
Social Data		
- General Household Survey Report (NISH)	1980/81	1985
- The Nigerian Household Surveys (NISH)	1983	1983
- Social Statistics in Nigeria	1987	1985
- Health of Nigerians (NISH)	1983	1983
Others		
- User - Producer Seminar on Household Statistics (Proceedings) Vol. I and II	1986	1986
- Production and Uses of Statistics in Nigeria (workshop proceedings)	1983	1983

Source: Adedoyin, S. A. (1990: 8 - 9)

PLATE 1.

function well. The additional budgetary allocation to the FOS arising from the take-over is likely to be inadequate and may sometime be diverted but if the NDB is an autonomous department under the Presidency, it is likely to have more financial resources which will help to guarantee its efficiency. Secondly, in order to enjoy the cooperation of other data producers, it is necessary for the NDB to be independent so as not to be burdened with any inter-Ministerial wranglings that exist between the various Government Ministries in their attempt to get a larger share of the budgetary allocations.

Indeed if the NDB is to be truly "National" its ideal location should be the Presidency. Thirdly, making the NDB part of the FOS will significantly increase the scale of operation of the FOS given the role expected to be played by the NDB. In Nigeria, public enterprises easily suffer from "dis-economics of scale" as in the cases of the National Electric Power Authority (NEPA), Nigeria Telecommunication Limited (NITEL), Nigerian Railway Corporation (NRC), etc., have shown.

Fourthly, if the NDB is located in the FOS or FMBP., its growth is likely to be stunted. Although, the NDB is presently conceived to be a statistical data bank, the long-term vision for the NDB should be to transform it into a generalised data bank or what Professor Adamu has referred to as the National Economic Documentation and Information System (NEDIS). Infact, I

would go a step further to suggest that the generalised data bank should hold more than mere economic information, hence it should be referred to as the National Bureau of Research and Information Pseudonym. The National BRAIN. Thus, the National Bureau of Research and Information shall be a store house for a wide variety of statistical and non-statistical information.

Obviously, such an all-purpose data bank should be independent of both FOS and FMBP. Finally, as FOS still cannot compare with NSOs in many other countries including African countries such as Zimbabwe, Egypt and Tunisia for instance, in the area of data storage and processing [FOS does not use any modern data base management system (DBMS)] it is still not possible to obtain much of FOS data by the push of computer keys. Put simply, the FOS still does not have an in-house data bank in the strict meaning of the term.

In the area of data dissemination, the only mode of data dissemination by the FOS is still through its publications which are usually printed with considerable time lag. Plate [1] shows the status of FOS publications as at October, 1990. Clearly, the situa tion leaves much to be desired.

From the proposed architecture of the Nigerian Statistical System earlier proposed, the NDB should be independent of any Ministry and be made an extra-Ministerial Department under

the Presidency/Cabinet Office. It should be headed by a Director General who should report to the "Secretary to the Federal Government". It also follows that the NDB should be physically located at the Federal Capital. Having justified my suggestion that the NDB should be an independent organ, it is necessary to add that in order to ensure efficiency and effectiveness, the conditions of service in the NDB should compare to those of the Central Bank of Nigeria (CBN) or NNPC, given the high calibre of staff required for the smooth running of a National Data Bank.

ii. Organisational Structure

The organisational structure proposed here is a derivative of two structures, one proposed by the NDB project leader Mr. J. A. Chettoe and the other proposed by Dr. E. Ojameruaye (Economic Statistician, and Consultant to the NDB).

The NDB shall be headed by a Director General and shall have two divisions, viz; Administration and Finance Division and Data bank division each head by Assistant Directors GEneral (ADGs). The Data Bank Division shall in its own be divided into three professional departments, each headed by a Director. The departments are:

(a) Computer Services Department

(b) Statistical Services Department

(c) User Services Department

(a) The Computer Services Department

The computer services department should have at least three sections or units these are:

i. Computer Hardware Unit

Computer hardware unit which shall be responsible for the acquisition, installation and maintenance of all computer hardware for the N.B.B.

ii. The computer software/programming unit

Computer software/programming unit which shall be responsible for the acquisition installation and maintenance of all softwares as well as systems analysis and programming work.

iii. Data Base Administration Unit

The Database administration unit which shall be responsible for managing the data base.

(a) Statistical Services Department

The statistical services department should be divided into about four units, including:

i. Data Collection Unit

This unit should be responsible for collecting data from all data sources.

ii. Data Screening Unit

The Data Screening unit shall screen all received data to identify inconsistencies and effect possible corrections or reconciliation before entry into the data base.

iii. Data Entry Unit

The Data Entry unit should be responsible for data in-put into

the data base.

iv. Data Analysis Unit

The Data Analysis unit should be responsible for all types of data analysis, including the computation of derived indicators, the making of forecasts/projections, economic modelling, etc.

(c) The User Services Department

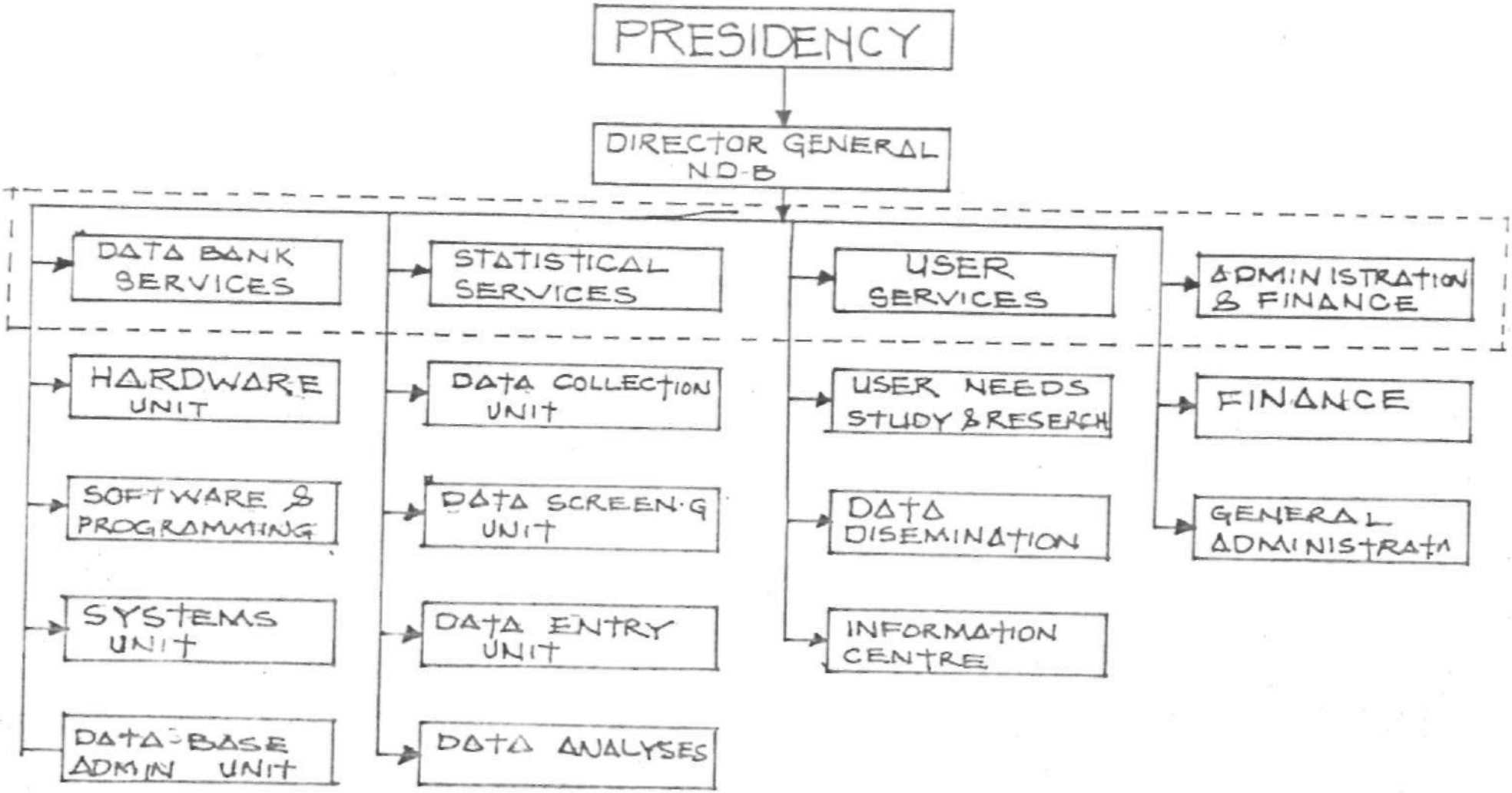
The User Services Department shall be divided into three units, viz; User needs study and research which shall be responsible for the periodic study of existing and potential users requirements and the production of N.D.B. publications.

i. Data Dissemination Unit

This unit shall be responsible for the dissemi- nation of the out-put, especially to priority, sub scribers or users of N.D.B. data.

(b) The Information Centre

This centre is the place where users and the general public can obtain N.D.B. data. The centre shall contain computer terminals from which the data base can be accessed. In addition it shall aft as the library of all N.D.B. publications and reports as well as house publications of other data producers Nation ally and Internationally. The Information Centre shall also be responsible for the conference centre and exhibition spaces and with time, the Information Centre shall be developed to hold a wide variety of non-statistical information too, such as registers or directories of the country's specialists, catalogue of



AN ORGANOGRAM FOR THE N.D.B

research activities, natural resources and raw materials.

Given the necessary institutional and financial support, the N.D.B. will greatly enhance the perform ance of the Nigerian Statistical System. When fully operational, the N.D.B. will receive selected data from all data from all data producers in the country. It will also receive International Statistics from other International data banks. The N.D.B. will thus, become the central repository in analogy to the "National Library of Nigeria" but it shall be more than a repository. Adequate mechanism shall be put in place to ensure that data are transferred to the N.D.B. even before they are published by producers.

Such data received will be screened and entered into the N.D.B. data base and data from same source and different sources will be linked, merged and transformed using algorithms to generate derived indicators for users. Ultimately, major users, particularly government policy makers in various locations will be able to access the N.D.B. data base on line through dial-up terminals or micro-computers.

CHAPTER FOUR

4.0 COMPUTER SYSTEMS MODELS AND CASE STUDIES

4.1 COMPONENTS OF COMPUTER SYSTEMS

Basically computers have some form of input-handling equipent that is connected directly to a central processing unit. This central processing unit is connected directly to an output device. Thus, although it may be only one machine, the computer is an interconnection of related machines. This group of interconnected machines is referred to as the computer system. A simplified and expanded diagram of the computer is shown in figures 3.1 and 3.2.

Components of a Computer System

Each component of a computer system is referred to as a subsystem. The major subsystem that make up a computer are:-

i) Primary Peripheral Devices

ii) Secondary Peripheral Devices

iii) Central Processing Unit

iv) Telecommunications Network

Primary Peripheral Devices

Primary peripheral device input data from it's source directly into the computer and output data in a form that is immediately usable. Peripherals in this category include Terminals, Printers, Graphic devices and Audio Devices.

a) Terminal

A terminal comprises of the Keyboard and the cathode ray tube (CRT). In some quarters they are referred to as Video Terminals.

The video terminal looks very much like a television set. Data being transmitted between the terminal and the computer are displayed on the Cathode ray tube. Results are also displayed in form of drawings, text or tabulation.

The terminal Keyboard is an arrangement of keys of numbers, alphabets and other special characters. To input data from a terminal, the operator strikes a Key and this sends an electronic impulse to the computer. The character of the Key struck is then displayed on the screen. Most Keyboards are standardised and quite similar in appearance. Letters are arranged in the same position as they are on any standard typewriter. Other characters, e.g. the decimal digits, may appear in different locations on different Keyboards.

The advantages of video terminals are speed, low cost and display capacity. Hundreds of characters can be displayed on the screen at one time as well as lines, graphs and curves. Teleprocessing - a system of remote processing of data - has been made possible and enhanced by the use of terminals.

b) Printers

Printers are perhaps the most important output devices, since they provide human readable hard copy of computer data. Almost

all computer systems require some type of printer that is fast and efficient.

Printers are broadly classified into Impact and Non-Impact printers.

Impact printers comprise of serial and line printers. The serial printers print one character at a time. Line printers, which print one line at a time are generally much faster and more expensive than serial printers. However the price of line printers is lessening because of their increased use on small computers.

c) Graphic Devices

Graphic devices include passive (providing output only) and Interactive uses. Passive graphic devices include plotters, display terminals with graphic output (but allowing no graphic input) computer output. Microfilm (COM) and strip-chart recorders. Interactive graphic devices are display terminals with both graphics input and output. Graphic input devices includes amongst others light pens and digitising pens.

d) Audio Devices

Audio output generally comes either from devices that store recorded words or phrases or from voice synthesizers. The stored word device is usually located at a computer accessed via touch-tone telephones. The user dials the computer and the computer responds over the phone with an audio message

KASHIM

retrieved from the stored-word device. The user can request specific functions and input numeric data through the Keys on the phone. The computer formulates the response and signals the audio response to play back words selected for the response. Since response is composed of individually recorded words, it tends to be choppy rather than a nice flowing sentence.

Secondary Peripheral Devices

Secondary peripheral devices store information in a form that can not be read by people. The most common use of secondary peripherals is as secondary memory in which the computer outputs information to the peripheral for storage and later retrieval. The storage medium used in many secondary peripherals is removable. Storage technologies used in this category of peripherals include Magnetic tape, Magnetic disks and Floppy disks.

Magnetic tape is a long (about 2400 ft) reel of a flexible plastic, about half an inch wide and coated with iron oxide. Information is recorded by magnetising little spots on the tape, allowing one bit of information to be recorded per spot. At high density, it is possible to store up to 800 characters per inch of the tape. This means that for an entire tape over 40 million characters can be recorded.

(b) Magnetic Disks

One problem with using tapes is that they must be accessed sequentially. If we are at the rear of the tape and need some information from the front, we must rewind the tape. Some problems we must be able to store large amounts or data and be able to access it randomly and quickly. This is where the magnetic disks becomes very useful.

A disk (Fig 3.35) is very similar to a long-phonograph record (about 700m diameter) but is made of flat, circular metallic plate coated with ferromagnetic material. It is usually used in a disk drive when it rotates at very high speeds (several thousand revolutions per minutes) at all times.

A read-write head is attached to an arm (like a phonograph needle) and can be positioned over part of the disk's surface. The surface of the disk is logically divided into tracks, each track being a concentric circle. There are typically 200 tracks per disk surface and 2 surfaces per disk (Top and Bottom).

In order to read or write from a specific location on the disk, the arm is moved to position the read-write head over the track. Transfer rate for disks range from 100,000 to 1,000,000 characters per second. Disks can store up to 200 million characters.

Floppy disks (Fig. 3.17) are small disks which have a flexible plastic base. Programs for micro-computers are stored on floppy disks in form of magnetic impulses. In the past, floppy disks were usually one sided. Technological advancement has led to the making of double-sided disks.

Smaller floppy disks, known as minifloppies are now available. The minifloppy is about 5 inches diameter. It has a storage capacity of over 300,000 bytes per side. The drive is also smaller and requires less power to operate.

Central Processing Unit

The most complex and powerful part of the computer is the central processing unit (CPU). The major functions of the CPU are:-

i) To control the overall operation of the computer and co-ordinate it's parts.

ii) To perform arithmetic calculations and make logical decisions.

iii) To store the programs and data being processed (Primary Storage).

The CPU can vary in size from a desk-top device to a tall cabinet. The CPU is composed of 3 basic unit, namely; control unit, primary storage unit and the Arithmetic and Logic unit.

a) Control Unit

The control unit is part of the CPU circuitry. It is designed to monitor and supervise the operation of the entire computer. It calls on the peripheral devices such as printers, tapes drives etc. The control unit provides a system for storing and remembering the instructions in programs and opens and closes circuits that feed data to and from the storage.

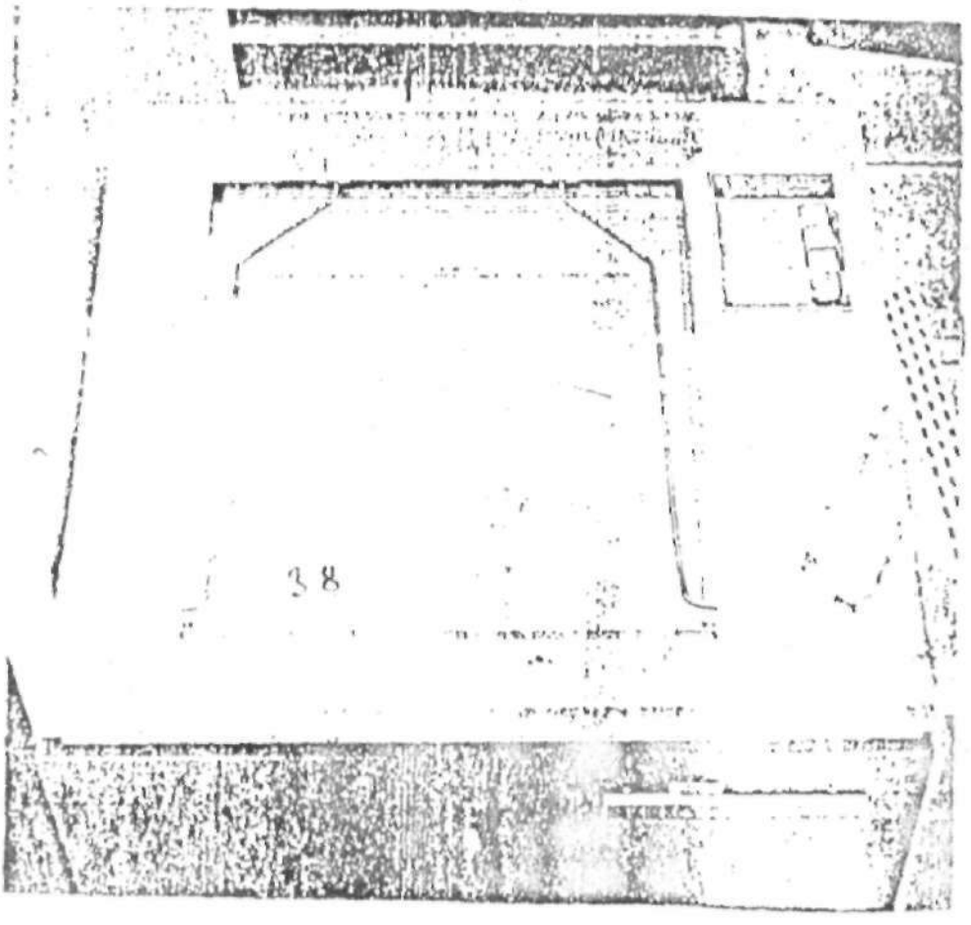
b) Arithmetic and Logic Unit

This section of the CPU is designed to perform mathematical calculations, compare numeric and non-numeric values, and make decisions. Both arithmetic and logical decisions can be made. For example, the computer can compare two values and branch to one of three circuits, or paths, depending on whether the value being tested is greater than, equal to, or less than another value.

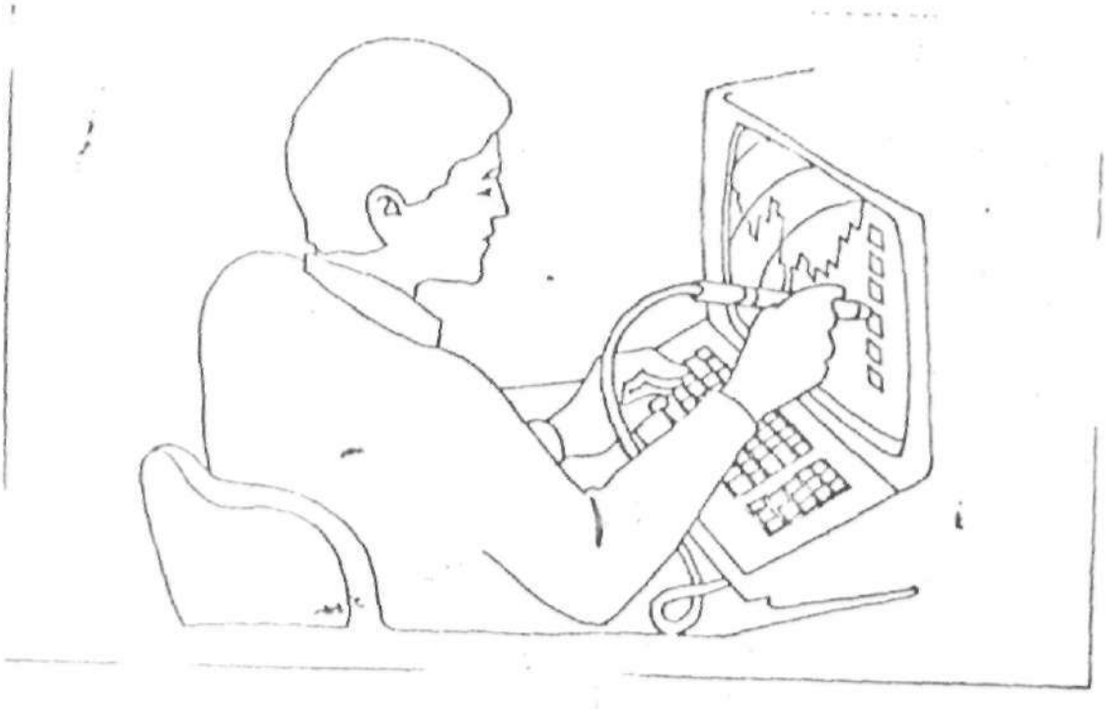
When arithmetic is to be performed, numbers are read into temporary holding stations called registers. Numbers from several registers can be added, subtracted or entered into complex calculations. After calculations are completed, data are either returned to computer storage or output.

c) Primary Storage

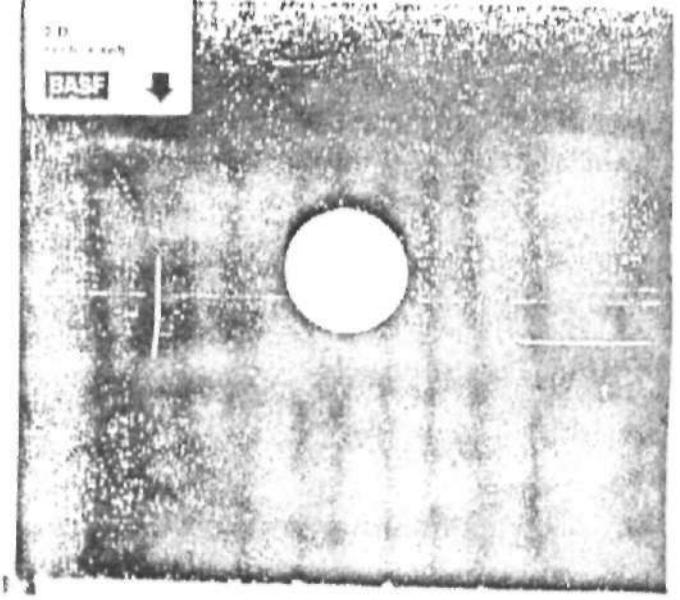
The primary storage, often called core storage, is another function of the CPU. This section of the CPU is composed of millions of magnetic storage devices.



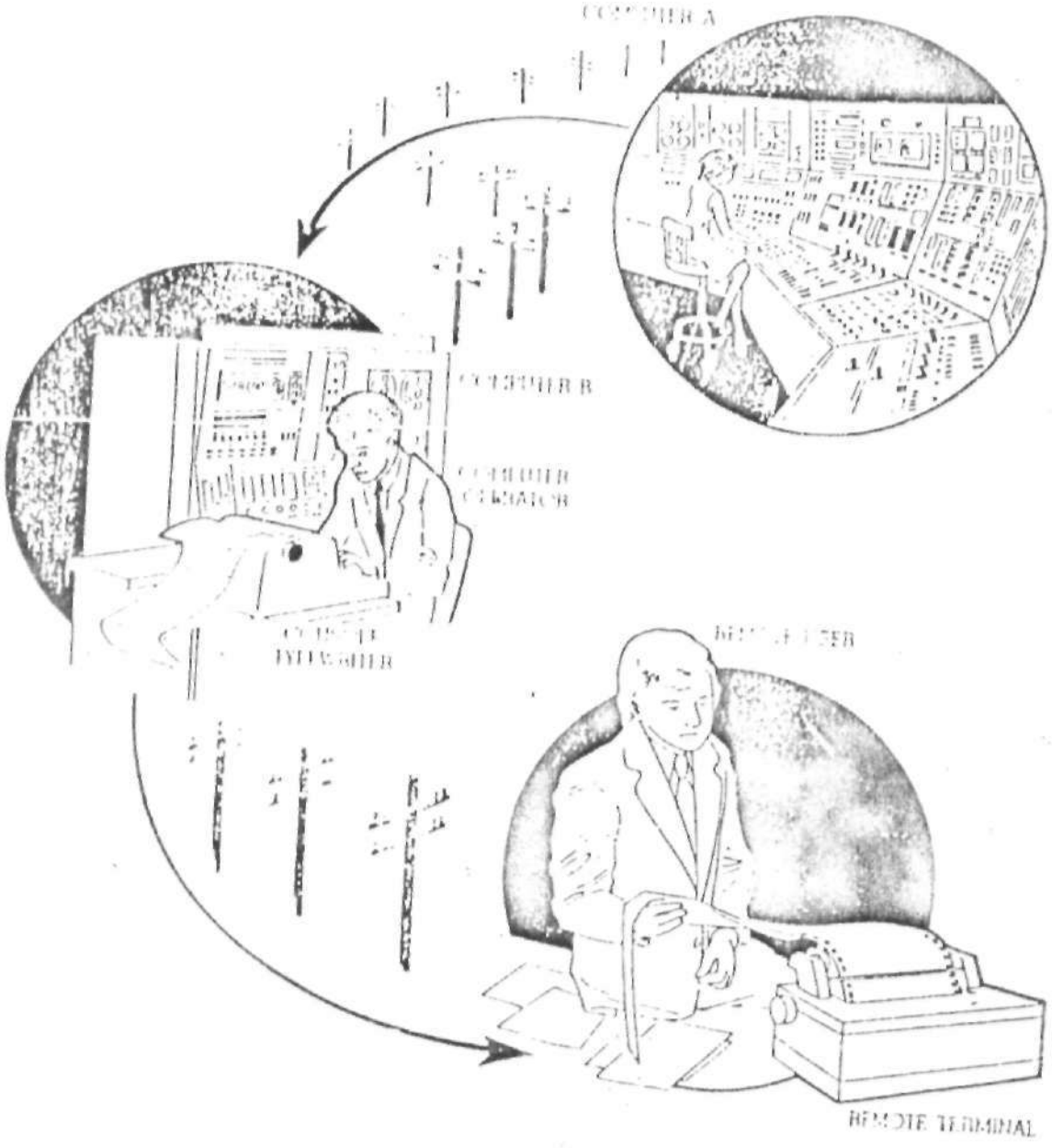
Electrostatic Printer/Plotter.



Use of Light Pen on CRT.



Floppy Disk



Telecommunication System.

Primary storage is a reusable, fast storage medium, directly accessible by the control unit. It's storage capacity varies from one computer to another, ranging from as few as 4,000 bytes to over several million bytes. Primary storage is most often used for storing data and programs that must be called in frequently, such as the programs under execution and the data being manipulated.

Telecommunication Systems

Telecommunications network vary in complexity and purpose from one computer to another. They are not always tangible devices such as a printer, but often are a network of telephone lines and microwave trans mission systems.

Telecommunications systems have two uses; First they enable two or more computers to be tied together into a unit, increasing the available CPU power and capacity. This is called a multi processing system. Secondly, they facilitate communication between the machine and it's users. They allow remote users access to the system, both to transmit data to they CPU and to receive data from it.

4.2 ORGANISATION AND OPERATION OF COMPUTER CENTRES

Preamble

A computer centre is part of an organisation which consists of a computer, associated peripheral equipment and a group of people trained to use the machines. These organisations may be

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banks, insurance companies, universities, government agencies etc. Some other computer centres are regarded as independ ent, since they are not affiliated to any organisation. Independent computers centres offer services to anyone and the process and services costs plus a reasonable profit are billed directly to the customer.

Selection of Equipment

The process of selecting equipment to be installed in any computer centre is a very complex one requiring a lot of professional thinking and consideration. In the world of today, there are a great many types and models of computers to choose from along with an over-whelming variety of peripheral equipment. The proper choice depends on an economic evaluation of the work to be done, and the amount of funds available.

Another important factor considered is that of maintenance. Spare parts of the equipment selected must be readily available. The customer must also make sure that maintenance work on the selected equipment can be carried out using the technological level of development available in his/her country.

Computer Centre Personnel and Staffing

The number and nature of the staff of a computer centre will depend on the size and purpose of the centre. There are, however, certain personnel patterns and titles which are more less

standardised.

Director

The Director is the head of the Centre. His responsi-bilities include organisation, personnel and administrative duties related to data processing. The Director develops the budget and determines the expenses of the centre with the assistance of the accounting staff. He is expected to oversee contracts with the computer vendors and must be familiar enough with both hardware and software to best determine the require-ments of the centre. The Director decides what equipment is acquired and how it will subsequently be used. He is also involved in the selection and in the training of his new staff.

In very large centres, the Director has an assistant or assistants who take over some of his duties and back him up in others.

Operation Staff

There are a number of standard positions in the operations staff of a computer centre. These titles may vary from one centre to another but the functions will always be needed. These positions include:-

(a) Scheduler

(b) Tape Librarian

(c) Machine Operator

a) Schedular

One of the most responsible jobs in the computer centre is that of scheduling the actual operations. The scheduler has the overall responsibility for planning the hour-by-hour activity of the Computer room, for logging in and logging out each job presented to the computer and for keeping track of the status of each job at all times. The scheduler must have considerable amount of skills to organise the sequence of the jobs so that:-

i) Maximum work is processed by the computer per unit time.

ii) Operations proceed smoothly with a minimum of panic and confusion.

iii) The relative priority of job is accommodated.

iv) Sequential operations are run in proper order.

In addition to the task of controlling the stream of work in the centre, the scheduler must arrange time for machine maintenance, training demonstrations and the maintenance of it's programming systems.

b) Tape Librarian

In a large centre, the tape library may contain thousands of reels of tape. There shall be one and probably several persons to keep track of these tapes, as well as of the disc packs. The Librarian must know the location and contents of all tapes and must follow a schedule to have them ready for the operator as soon as they are needed. Another function of the librarian is to see

the outdated and obsolete tapes are made available for new use.

c) Machine OPerator

As the title implies, a machine operator operates. Interestingly enough, the increasing complexity of the computers and peripheral machines has not caused a comparable increase in the complexity of operations because the complex parts of the operating job have been assigned to the computer programs. It is the duty of the machine operator to follow the schedule prepared for the computer and to run the computer jobs according to that schedule. Summarily, the duties of the operator are:

i) Sets the control switches on the computer and other various pieces of peripheral equipment need for a job.

ii) Selects and loads the input and output units with the various materials needed for running the program.

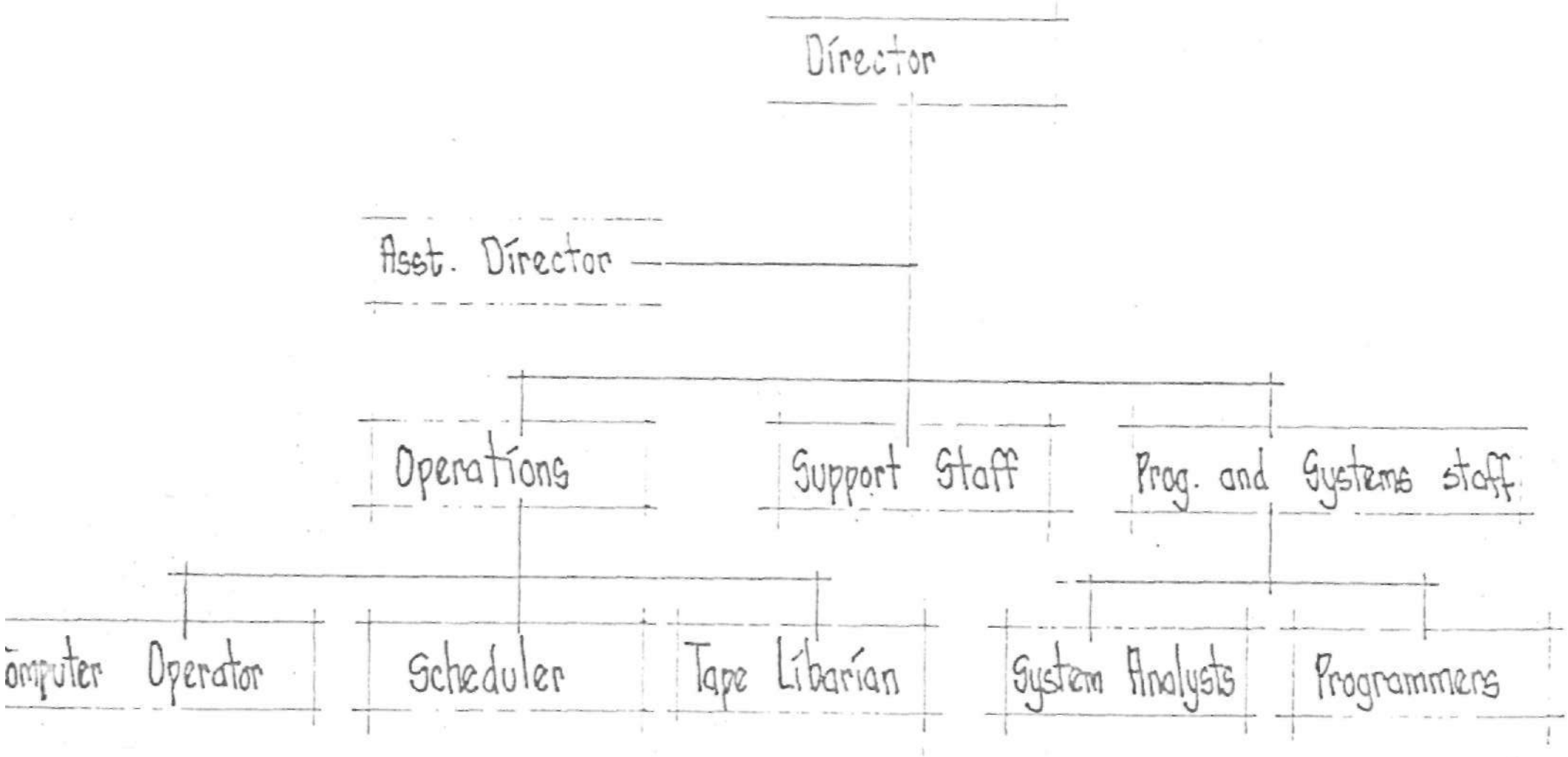
iii) Move switches in order to clear the system and begin operation of the equipment.

iv) Observes the machines and the control panel on the computer console for error light, for verification, for error messages printed out by the computer, and for equipment stoppage or faulty output.

v) Types commands into the computer console to correct such errors that may have been detected and to resume operations.

vi) Clears the unit at the end of a job run

vii) Review the schedule to determine next assignment.



Personnel Hierachy in Computer Centres.

Closed Shop

In Closed Shop operations, all jobs are programmed by the professional programming staff of the Computer Centre. In a service centre, their work is charged to a customer, just as machine time is charged. The Closed Shop operation has it's pros and cons.

Having programs done within the centre allows better control in quality of the programs and in their schedules. Mistakes are more readily detected and corrections effected. Closed Shop allows for better programs. Since a programs belongs to the centre in this type of operation, the centre is able to improve and update the original package if performance is poor.

On the other hand, the closed shop may lead to a situation where there are too few systems analysis and programmers, who may be overworked far beyond their capacity at one period and have very little to do at anaother. Because good programmers are in short supply, in a closed shop one may find these valuable men and women tired up for too long on one job.

Open Shop

In Open Shop, each customer must learn sufficient programming to do his own work. He generally uses a programming language (e.g. FORTRAN) to write his application. Since the user is aware

of his own problems he can produce his own programs simply and directly, by passing the process of explaining it all to a programmer.

The major disadvantage is that all user must be trained in use of the particular computer and language in order to get major benefits from the centre.

The open shop operates strictly as a data processing centre and provides only machine time. In this type of centre, the customer does his own programming and debugging and sends it to the computer to be processed.

Flow of Work in a Typical Computer Centre

In a smoothly functioning computer centre, there is a regular flow of users's jobs through the centre.

a) The user submits his request for machine time to the scheduler. The request is written on a special printed form on which the user gives the following information.
   i) His name, and date of request
   ii) Name of the Program
   iii) He gives, according to the code of the particular centre, the present location of the programs so that necessary tapes and other things can be gotten for the run.
   iv) The Scheduler fills in the time for the run on the basis of priority

v) Any other special instructions to the operator.

b) The Scheduler then checks the request card to make sure all is in order so that no machine time is wasted. If there is no problem, he schedules the work and lists the time for the run on the request form and on a master schedule.

c) Once the job is scheduled, it is set up for professing. The proper magnetic tapes and disc packs are collected and set aside for the run.

d) At the proper time, the material is brought to the computer prepared for processing.

e) The computer is run by the operator who records the processing time in the computer log when the run is completed.

f) The output is collected, identified and returned to the scheduler. The identification is made according to the request form which accompanies the material and actual machine time is listed for billing.

g) The scheduler then sees that the completed material is returned to the user as soon as possible.

4.3 IYA ABUBAKAR COMPUTER CENTRE, ZARIA

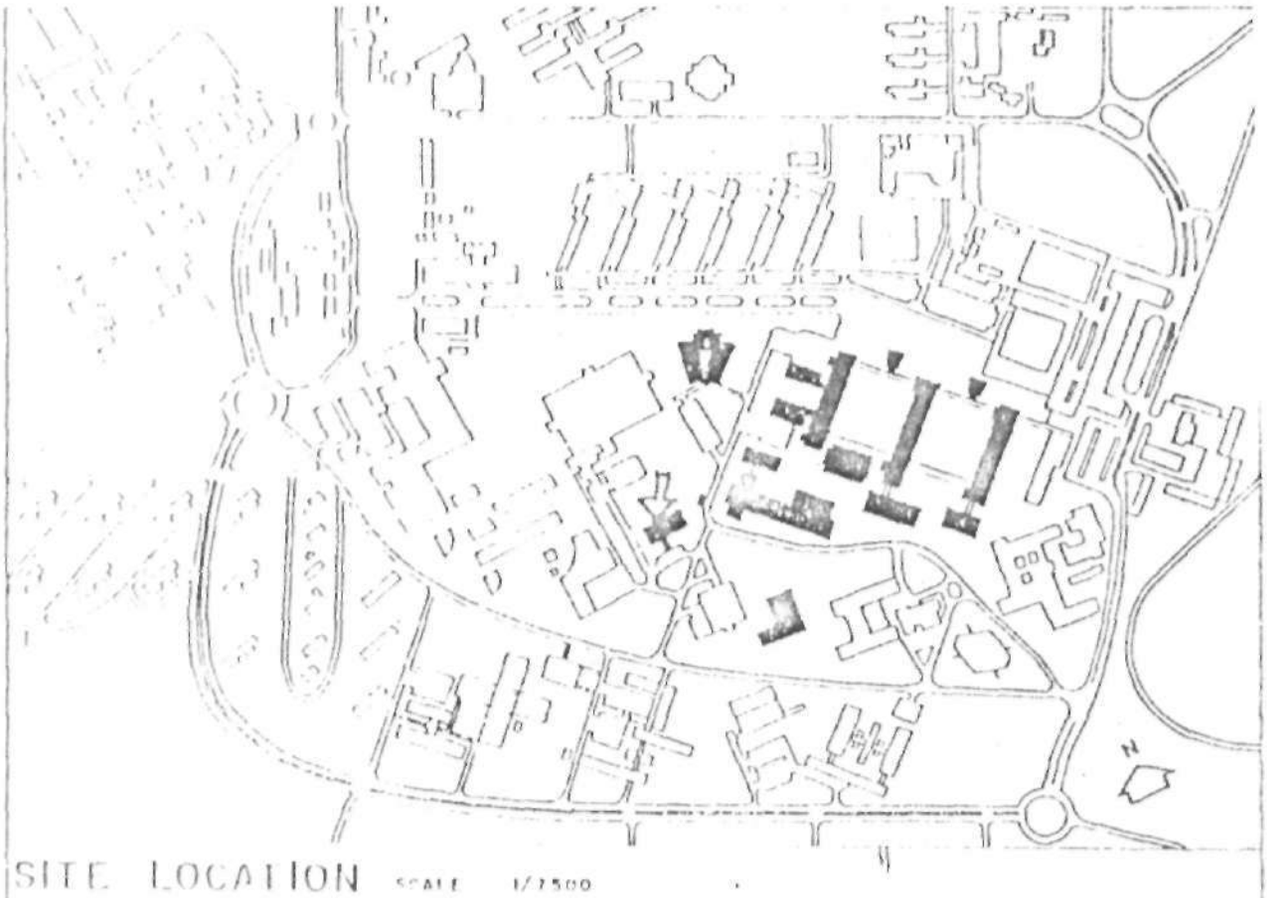
Client: Ahmadu Bello University, Zaria

Architect: Kola Bankole and Associate

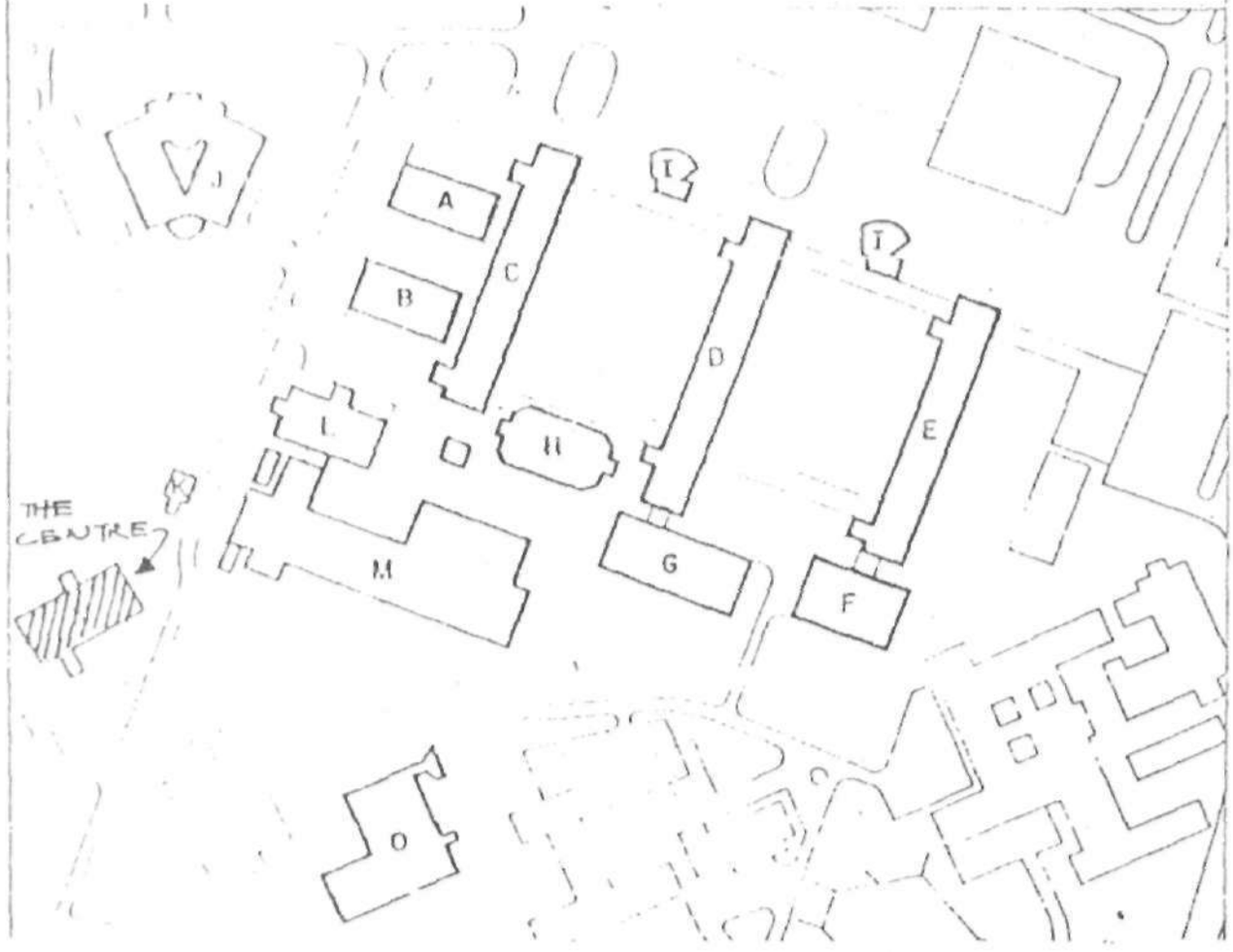
Year of Design: 1973

Location: The Iya Abubakar Computer Centre is located in the central area of the campus, directly south of the Kashim

KA... AHIM LIBRARY



SITE LOCATION SCALE 1/7500



location of A.B.U computer centre.

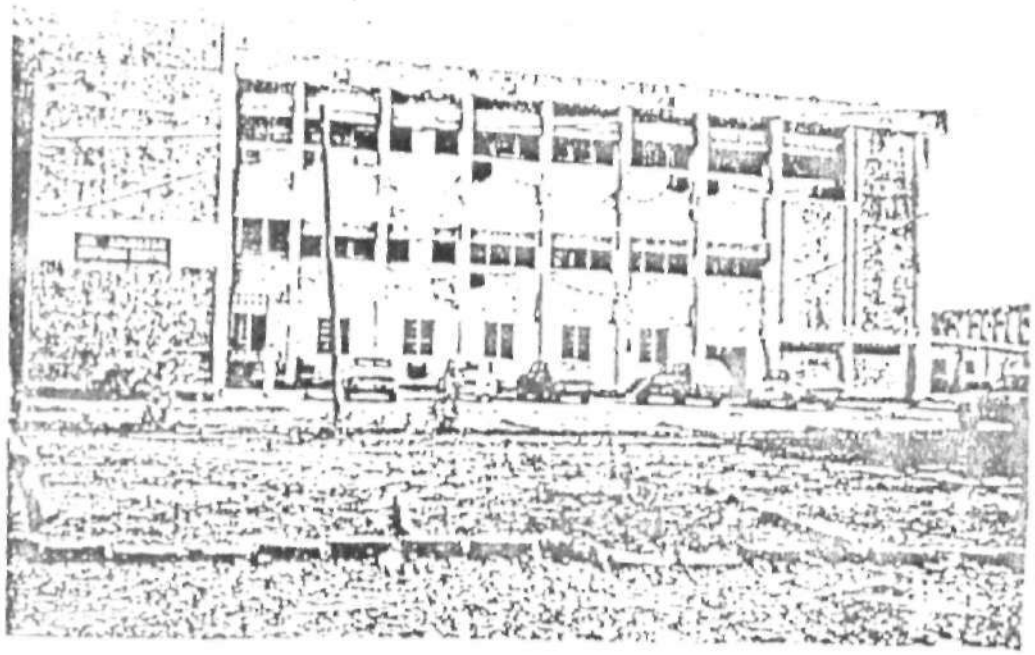
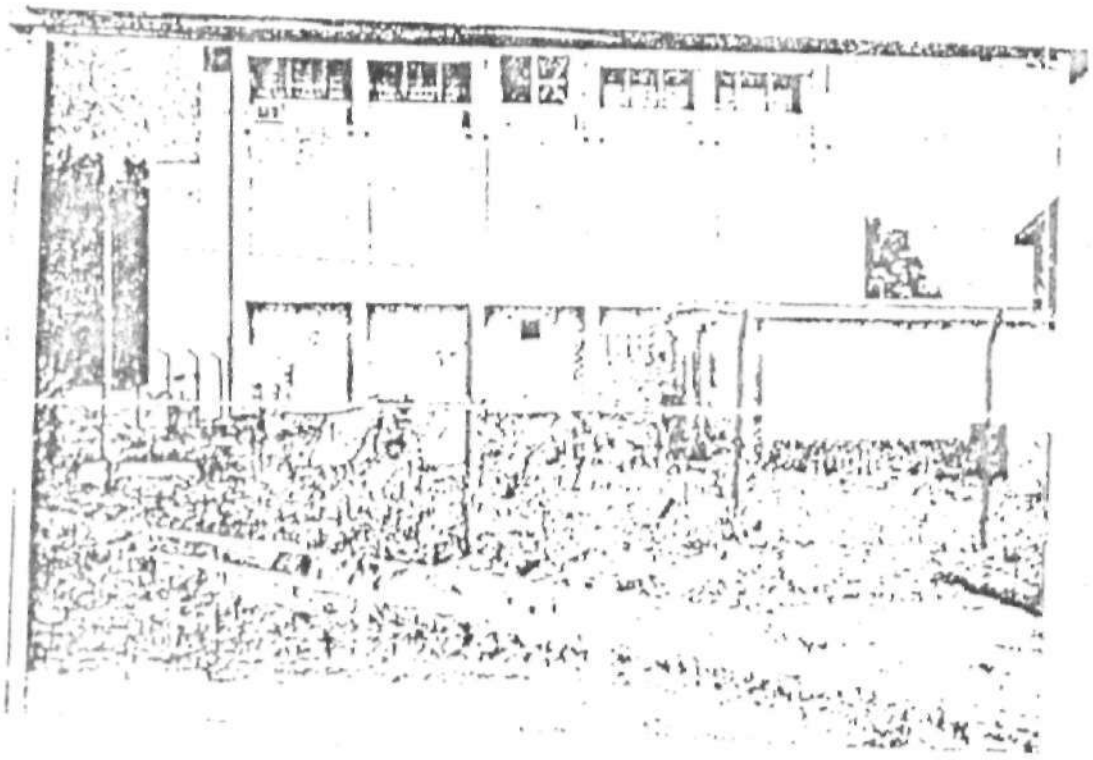
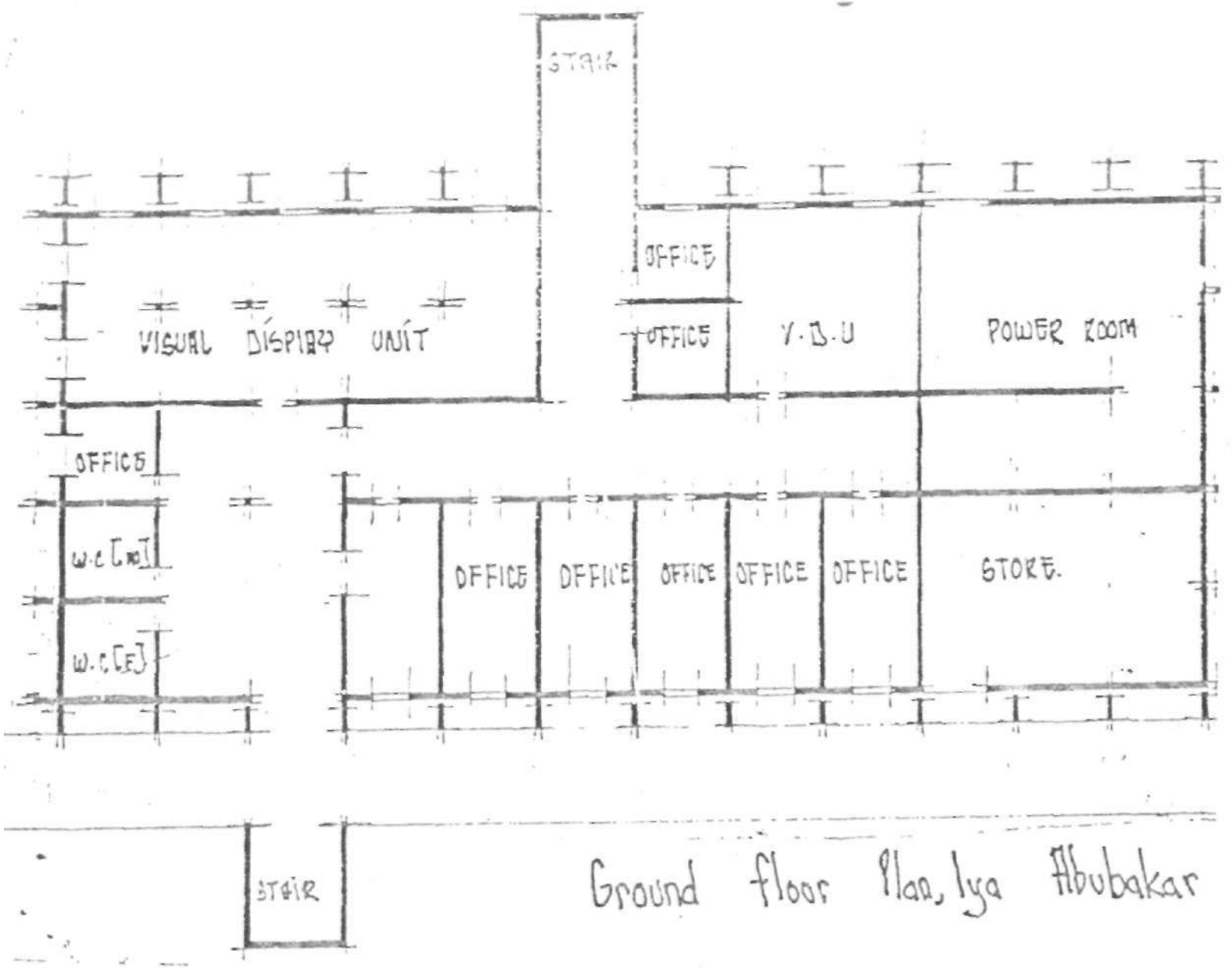


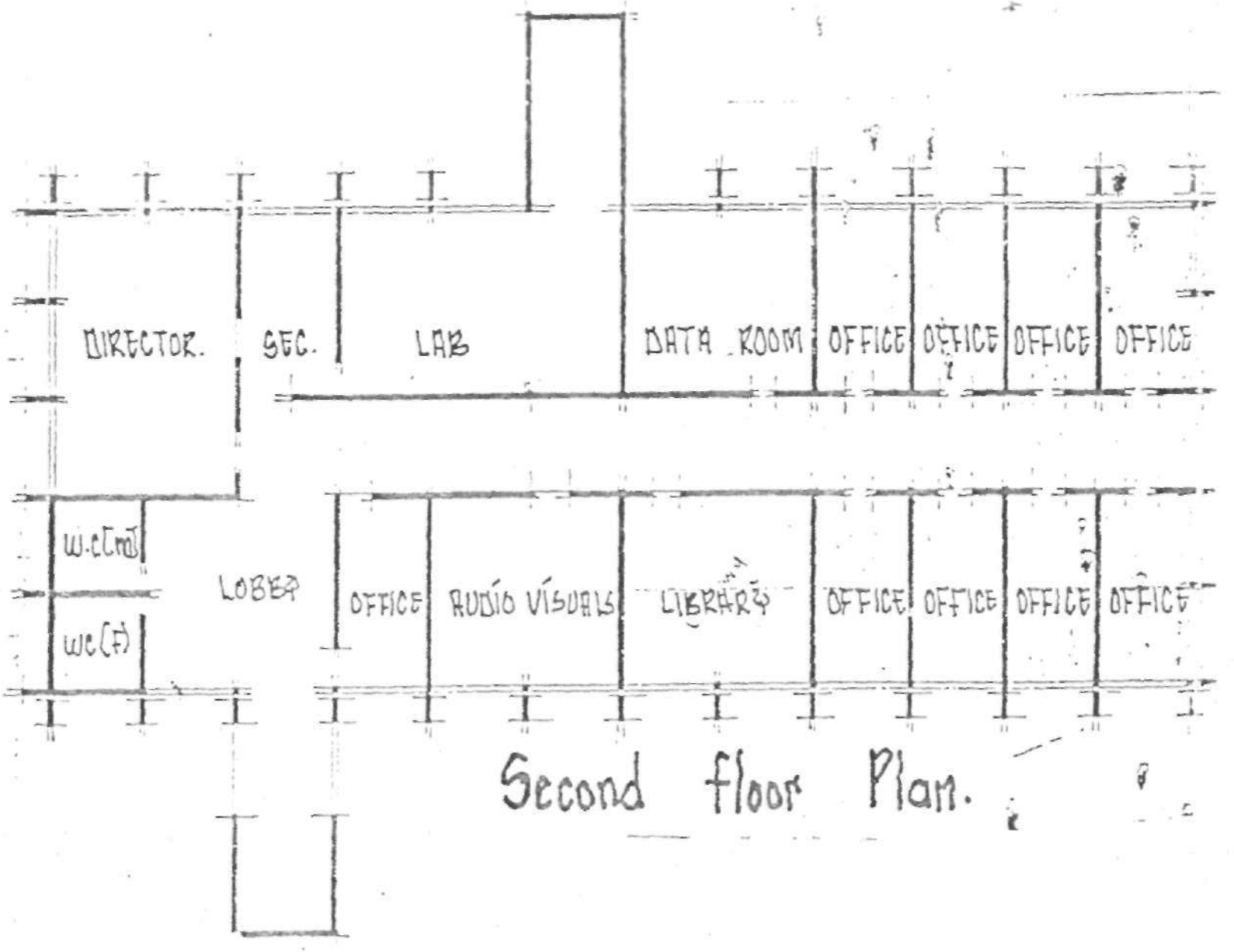
Fig Front Elevation



Right-Side Elevation.



Ground floor Plan, Iya Abubakar Computer centre.



Second floor Plan.

Ibrahim Library. On the eastern side of the centre lies is the Chemistry Department while on the Western end is the Industrial Design Department.

Equipment: The Computer Centre has completed the installation of a new system, the Cyber 932-II Main frame. Other peripheral equipment are:

(i) Printers (3 No)
(ii) Plotters
(iii) Disk and Tape Drives
(iv) Video Terminals
(v) Microcomputer
(vi) Audio-Visual Aids

Services Rendered

The Computer Centre primarily supports University Teaching and Research Programmes. It also offers training courses in various aspects of the computer Industry. Additionally, the centre renders consultancy services for various governmental and non-governmental organisations, in a bid to raise funds. Presently the Computer Centre is developing a Management Information System (MIS) for easier administration of the University.

Concept and Construction

The Computer Centre comprises of 3 floors: ground, first and

second floors. The ground floor houses the users visual display terminals and the uninterruptable power supply banks. The first floor comprise of the computer room and offices of the machine operations staff. The second floor is mainly for administration, accommodating the offices of the Director and other programming and system analysis staff.

The structural system of the centre is of columns and beams construction. External Reinforced Concrete (RC) columns are 600 x 225mm while the internal ones are 225 x 225mm. These columns are at 3.0m centre to centre. 225mm load - bearing blockwork and other non-load bearing partitions constitute the internal structure of the building.

The roofing system is made of long span aluminium sheets on mild steel purlings. 3 column spaces from the right of building is decked for the installation of water tank.

Structural columns provide vertical shading while luxaflex aluminium sunlouvres act as horizontal shading devices.

Merits

i) The separation of the airconditioning system of the Computer Room from that of the rest of the building is a commendable one. This is done by the use of 3 chillers installed right inside the Computer Room.

ii) Conscious effort to exclude dust from Computer Room. This

is manifested by the fully blank walls that make up the Computer Room.

iii) Installed raised floor enhances flexibility of wiring or networking the computer system.

iv) Antistatic PVC tiles are used for floor finish

v) Automatic fire detectors are installed along with automatic Halon Gas Extinguishing System.

vi) Inconvenient location of UPS battery back reduce hazards of toxic fumes from such batteries.

vii) Location of power conditioner in computer room

viii) Provision of manual carbondioxide extinguisher to complement the Halong Gas System.

ix) Door to Computer Room is a fire check door.

Demerits

i) Storage of inflammable materials within the Computer Room.

ii) Insufficient ducting spaces for connecting the mainframe to the terminals into the Centre.

iii) Untreated, combustible plywood is used for internal panelling of Computer Room.

iv) Lack of provision for tape Library in its design.

Comments

Baring the few design and specification problems identified, it is obvious that the architects of the Centre understand the intricacies of Computer Centre design. The fact that a completely

new installation (The Cyber 932-II Mainframe) has just been made with out any radical structural and non- structural changes testifies to the flexibility of the design.

4.4 UNIVERSITY OF BENIN COMPUTER CENTRE, BENIN

Client: University of Benin, Benin City

Architect: Physical Planning Unit, University of Benin

Year of Design: 1980

Location: The Centre is located almost opposite Student's Hostels Two and Three. It lies on the left hand side of the stretch of tarred road that connects the hostels to the University's Faculty of Arts and Social Sciences.

Equipment: The Centre makes use of the International Business Machines (IBM) prime Mainframe. Other association peripherals include:

i) Disk Drives

ii) Tape Units

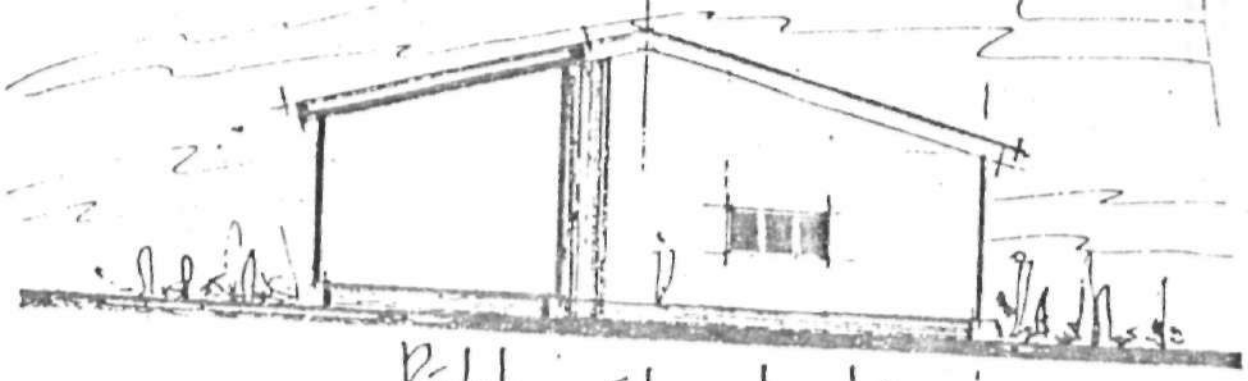
iii) Plotters and Printers

iv) Visual Display Terminals

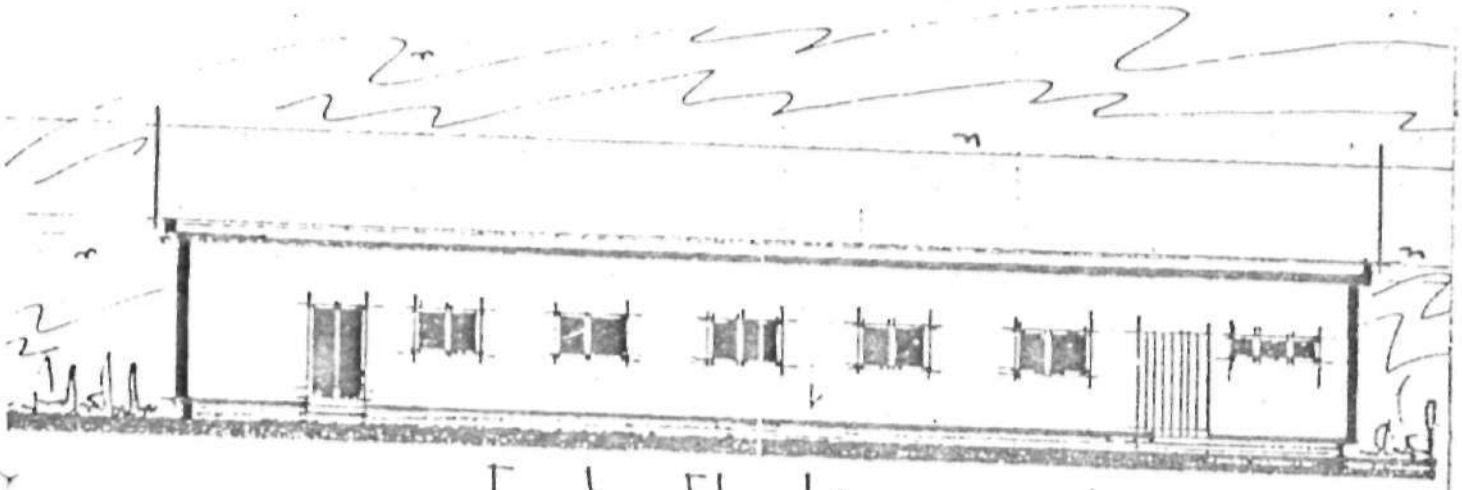
v) Micro-computers (These are located in the Computer Centre Annex at Sciences Building, Uniben).

<u>Services</u>

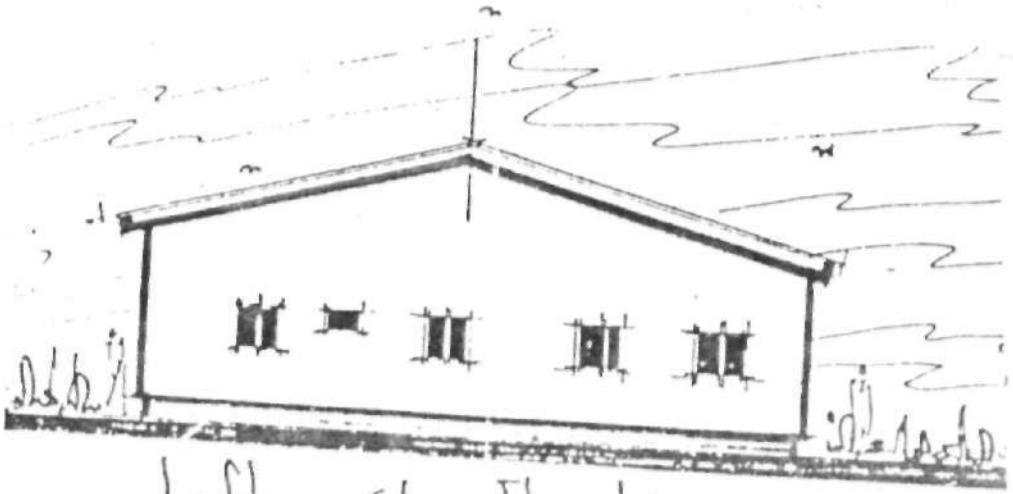
i) Consultancy Services for various organisation



Right side elevation

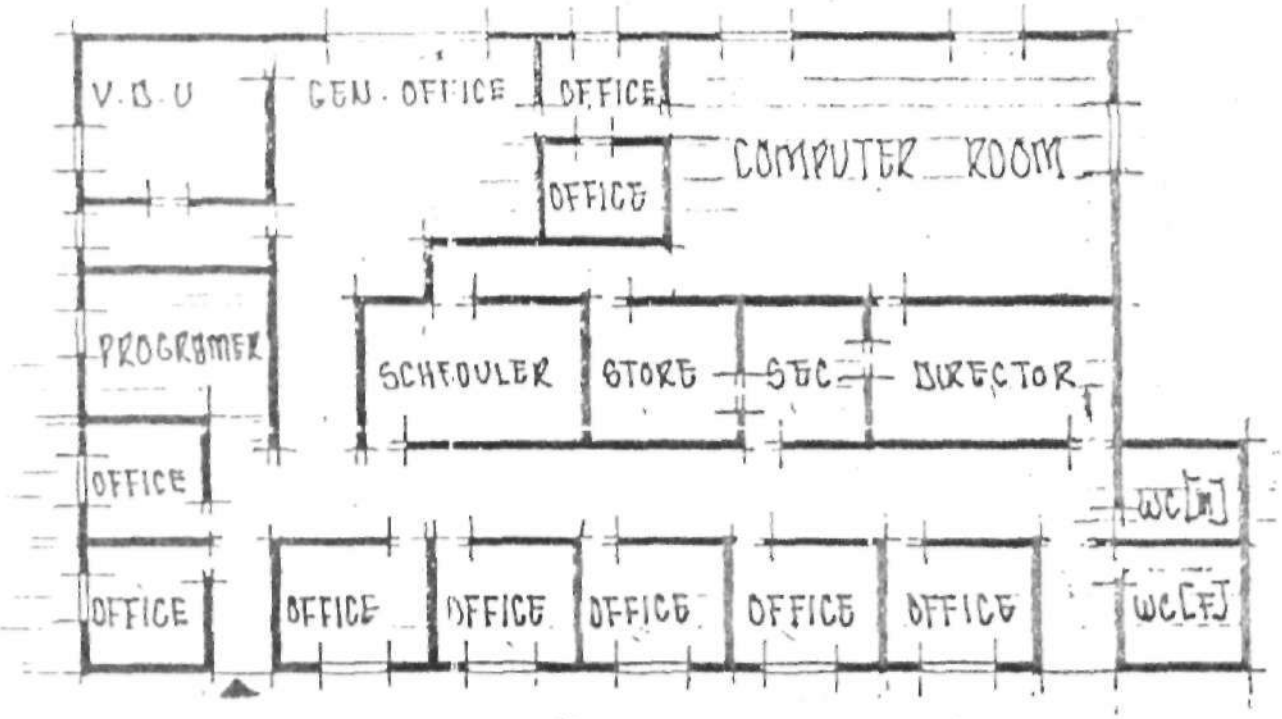


Front Elevation

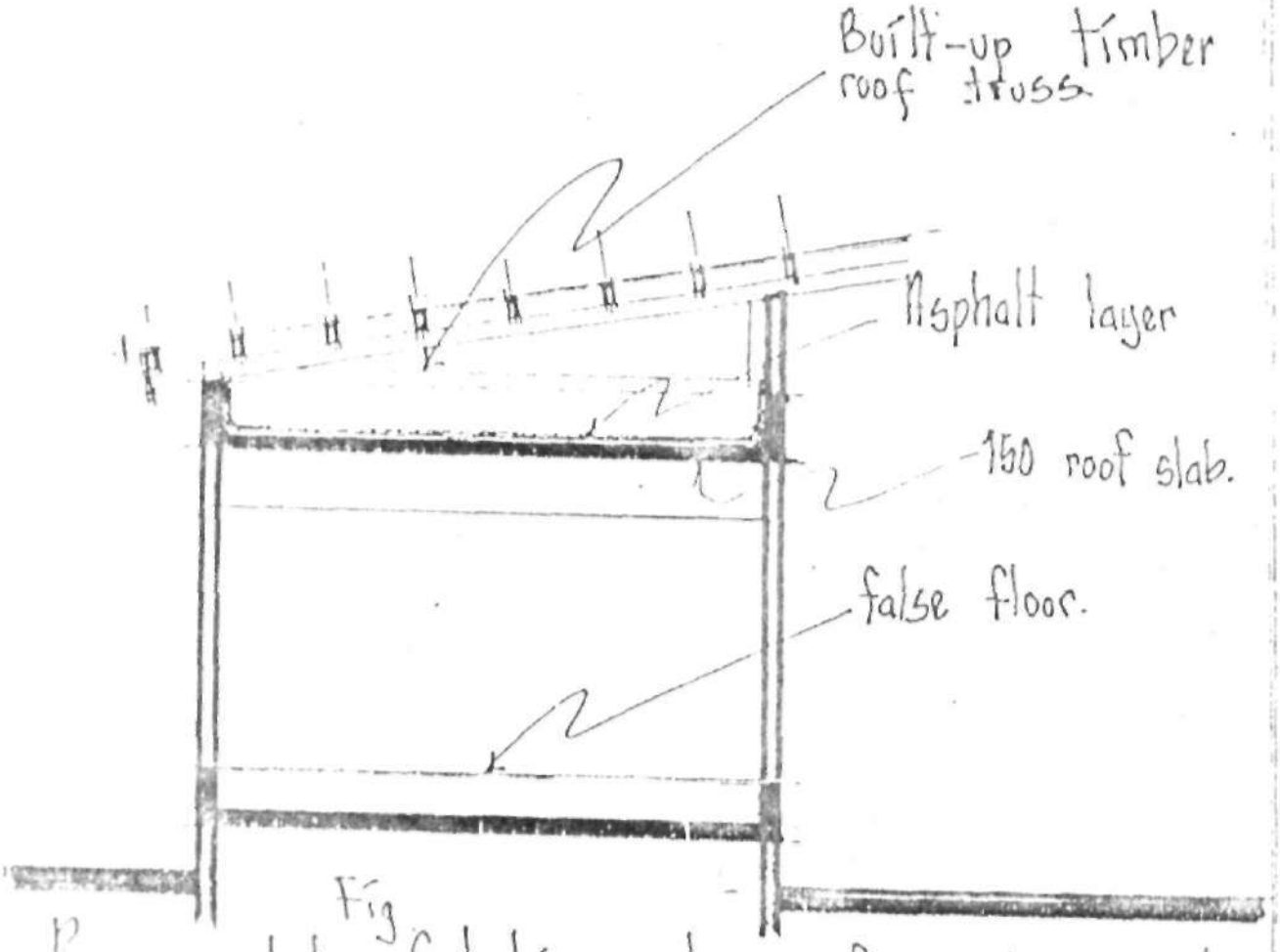


Left side Elevation

Fig Elevations, Uniben Computer Centre.



Floor Plan, Uniben computer centre



Fig

Recommended Solution to safeguard against emergency roof leakage.

ii) Computerisation of University Systems (Academics, Library, Bursary Records e.t.c)

iii) Training programs for computer personnel. Programmes include Certificate Course and 2 year Diploma in Data Processing.

Construction

The Computer Centre is a bungalow with 225mm external blockwork and 150mm internal blockwork partitions. Demountable partitions of timber construction are used in some areas of the building. The roofing system is a simple double pitch roof of timber and asbestos roofing sheets. Venetian blinds and curtains are used for sunshading since there is no structural provision for it.

Merits

i) Separate airconditioning system for computer room

ii) Raised floor enhances flexibility of network system

iii) Use of PVC tiles of finish floor panels

iv) Hazards from Battery bank fumes is avoided by it's location outside the building

v) Solid fire doors open into computer room.

Demerits

i) Computer Room is not effectively shielded from problems of rain, duct and heat gain. This is due to provision of

window opening on the outside wall of the computer room.

ii) Inadequate storage spaces encourages storage of inflammable materials within the computer room

iii) Only manual carbondioxide extinguishers are installed for fighting.

iv) The interior of the computer room is very untidy.

Comments

The University of Benin Computer Centre is likely to be faced with the problem of reducing dust level and heat gain from the surrounding via the window louvres on the perimeter wall of the computer room.

With simple roof construction, there is this risk of water destroying the equipment in event of a sudden roof pull-out as a result of high winds, or cracking of the roofing sheets. This problem could have been avoided by providing a reinforced concrete decking (finished with asphalt) over the (Fig.) Computer Room. Then the timber roof is built over it.

CHAPTER FIVE

5.0 THE DESIGN PROPOSAL

'National Data Bank Centre' is not a life project. It has been undertaken as a hypothetical academic exercise based on the Authors advised needs of the centre as agreed to by the staff of the centre. If the National Data Bank Centre is not to go through the process of moving at a much later and thus most inconvenient stage of its development. I believe that the National Data Bank should be provided with a permanent location and necessary physical facilities as soon as possible.

5.1 DESIGN DETERMINANTS

5.1.1 LOCATION ANALYSES

The choice of the Federal Capital Territory as the best location for the Centre is based on the following premise:

- Investigations have shown that above 72.1% of Computer Installations in the country are located in Lagos and 64% of these belong to the public sector. It therefore follows that with the movement of the seat of government to Abuja, all Federal Ministries and Parastatals will move to the F.C.T. with their Installations and thus it will be cheaper to liaise with these agencies.
- Centrality of the F. C. T. communication with the rest of the country will be more effective.
- Infrastructural facilities in Lagos are already over stretched

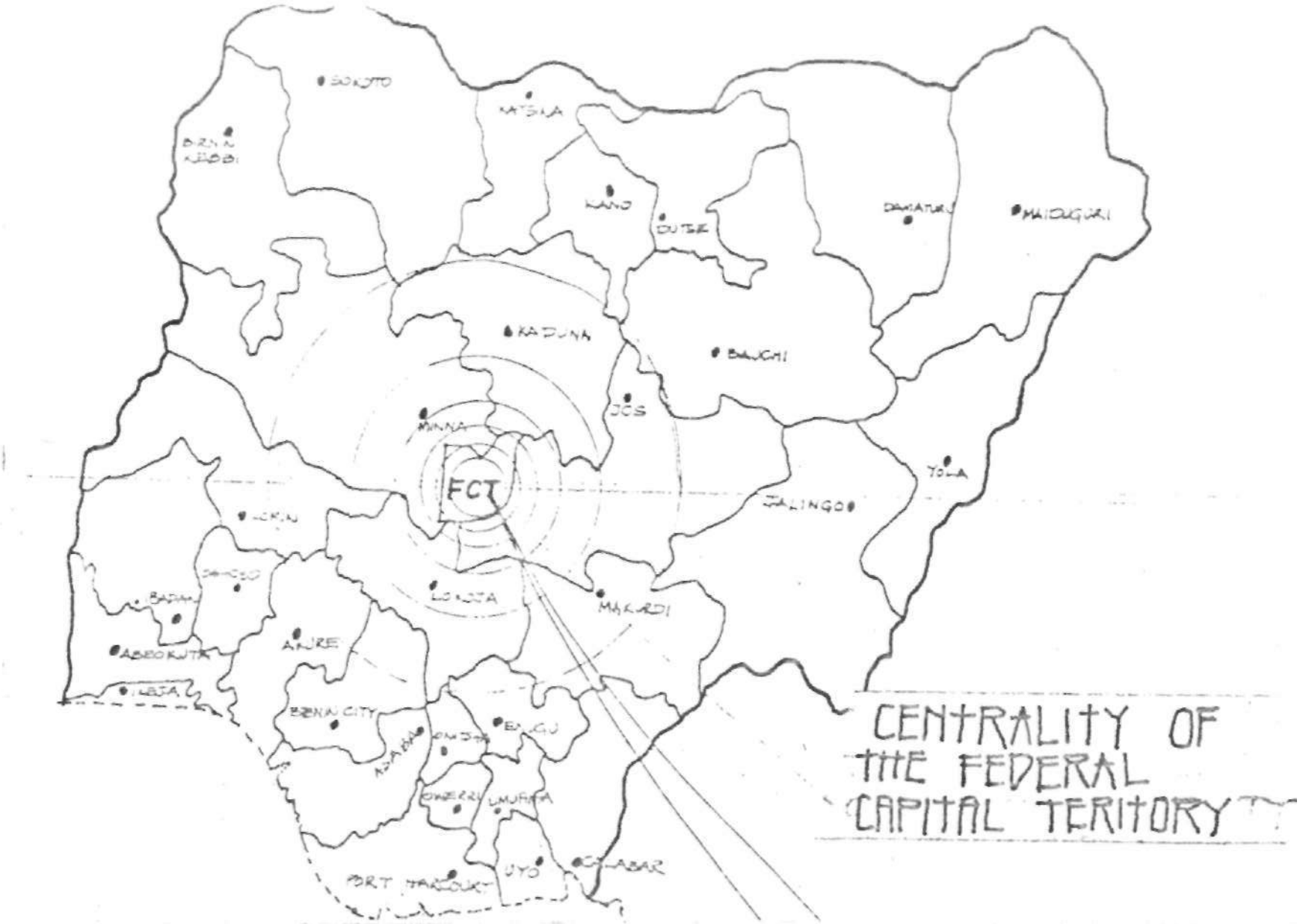
as it is, this being one of the arguments presented in the need for a new Federal Capital.

THE FEDERAL CAPITAL TERRITORY

The thought of a new Federal Capital City was conceived when it was clear that Lagos had become a seamless web because of its multiple role as a State and Federal Capital. Certain other perennial and sometimes chronic characteristics of Lagos contributed to the need to begin search for a new Federal Capital City. These characteristics include the traffic, housing and sanitation problems.

The initiative was taken by the Federal Military Government under the Late General Murtala Muhammed. A panel of experts headed by Honourable Mr. Justice A. T. Aguda was convened on 9 August, 1975. The panel was empowered to examine the dual role of Lagos as a State and Federal Capital. The panel was also empowered to recommend a suitable alternative location should it determine that the Federal Capital be moved from Lagos. After deliberations, the panel recommended the setting up of a new Federal Capital City at Abuja. This recommendation was accepted by Government.

The Federal Capital Territory is located in the geographical centre of the nation (Fig.8.1). It lies between latitude of 25°N - 9°20'N and longitude 6°45' and 7°39'. It occupies an area of 8,000 sq km. It is bounded to the north by Kaduna State, to the



CENTRALITY OF THE FEDERAL CAPITAL TERITORY

East by Plateau, to the South-West by Kogi State and to the West by Niger State. The Federal Capital territory is easily accessible from all parts of Nigeria and indeed the principal cities of Africa. It is presently linked to the rest of Nigeria by roads and Air transport. Plans are in the pipeline to also link the city by rail and provide navigational inland waterways through dredging of the River Niger from the Coast to Baro.

5.1.2 PHYSIOGRAPHY

The area is typified by gently undulating terrain interlaced by Riverine depressions. The central area consists of upland and plains with numerous inselbergs, wholebacks and other rocks outcrops.

5.1.3 GEOLOGY

The whole of the Federal Capital Territory is characterised by two main types of rocks. They are:

(i) Crystalline Rocks (Metamorphic and Igneous rocks of Precambrian age)

(ii) Sedimentary Rocks which are of cretaceous age.

Examples of particular rock types found in the area are the Migmatitie, Granite Gnesis and Biotite. All these are rocks of Medium to high strength which are expected to present a minimum of engineering problems for construction works.

5.1.4 SOILS AND VEGETATION

The soils are typically deep and well-drained. They can be

classified into ten complexes on the basis of material and texture. Vegetation is characterised by park Savannah. Riverine depressions are typically skirted by fringes of thickets and high trees. There are occasional patches of forest and heavily wooded areas.

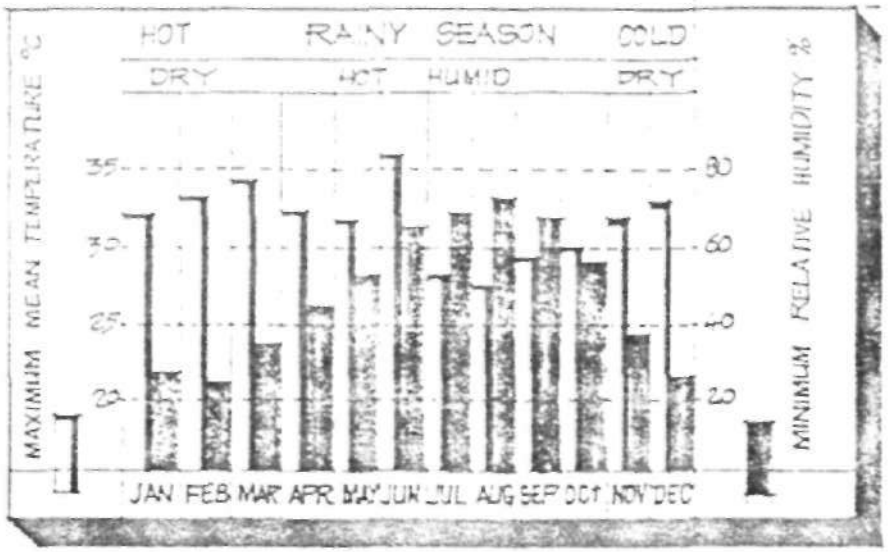
5.1.5 **CLIMATE**

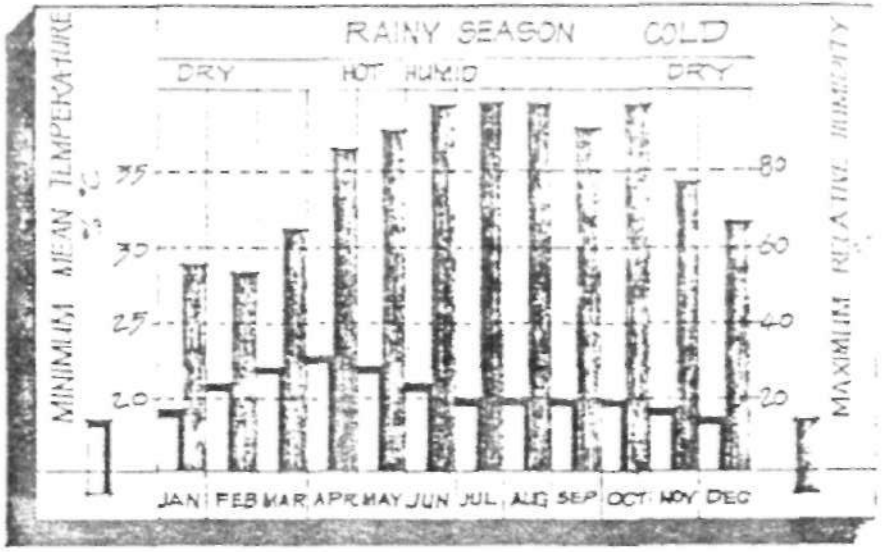
The weather charts have been prepared on the basis of climatic data collected from extrapolations of Airport meteo-rological station. They supply data relating to the following:

i) **Temperature**: Maximum mean temperature of ^{37}oC is experienced around June while minimum mean temperature of 16°C is experienced between December and January. It is however generally hot and humid all year round.

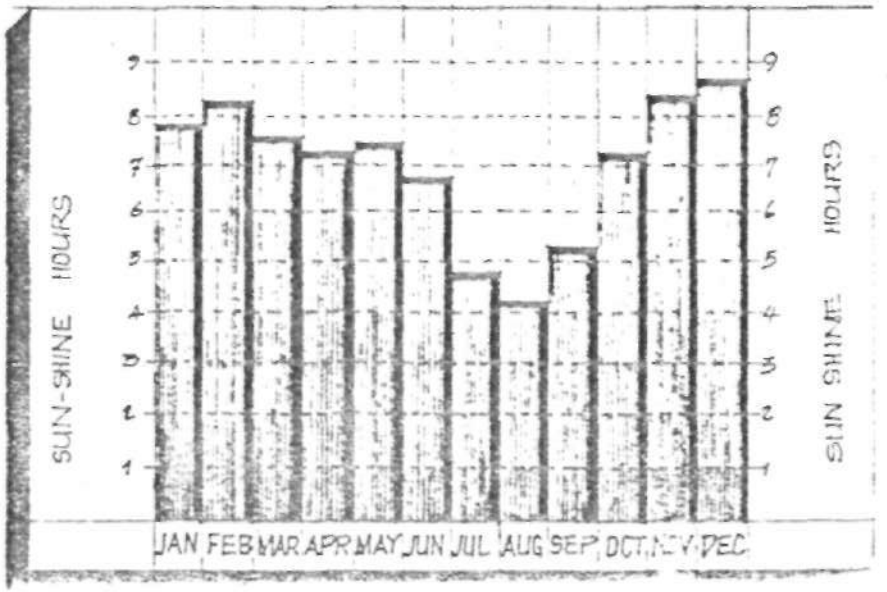
ii) **Relative Humidity**: This is recorded in percentages and reaches a maximum of 88% during the rainy season between June and August. Minimum humidity value of about 23% is recorded during the hot dry months between December and January. These extremes are not within the comfort zone, (30-70%).

iii) **Radiation**: This is expressed in terms of the number of hours corresponding to the monthly average for the period considered. It is t a maximum of 8-9 hours between December and February and at a minimum of 4-5 hours in August.









CLIMATIC DATA

iv) **Rainfall**: The amount of rainfall is measured in millimetres. For each month the average level of water collected over a period is recorded on the graph. Mean monthly rainfall is at a maximum of 16mm in September and falls to about 2.0mm in January.

v) **Prevailing winds**: The direction of the wind is shown by the monthly average of the number of times the wind has blown during the period under consideration. The harmattan wind blows from the Aso hills over Abuja creating stagnant air pockets during the dry season. The maritime winds blow in the other direc tion during the wet season. The Harmattan winds are laden with dust, and are cold and dry. The maritime winds are moisture laden with a cooling effect.

5.2 SITE LOCATION

As the proposal is not a life project, no site has been allocated to it on the "Abuja Master Plan". Discussions were thus held with officers of the "Urban Planning Department" of the "Federal Capital Develop ment Authority". After considering the roles of the proposed centre, its clients and sources of data and other factors, it was advised that the most suitable location for such a project would be the Science and Technology Complex known as Sheda Research Town.

SHEDA RESEARCH TOWN

Sheda Research Town Abuja abuts the Lokoja - Kaduna A2 Federal Highway, about thirty kilometres (30km) from Abuja International Airport and some twelve kilometres (12km) from Gwagwalada, the administrative headquarters of the Federal Capital Territory.

FUNCTION OF THE TOWN

i) To serve as a Centre for research and training, for the Federal Capital Territory, the Nation and scholars all over the world to meet and discuss.

ii) To supply the Federal Capital with most of its research needs, thereby providing job opportunities for its surrounding and her immigrants.

iii) To control and evaluate the distribution of people within the Federal Capital by inducing the distribution of economic activities.

iv) To supply the Federal Capital and the Nation with necessary data, research findings and figures needed for development planning.

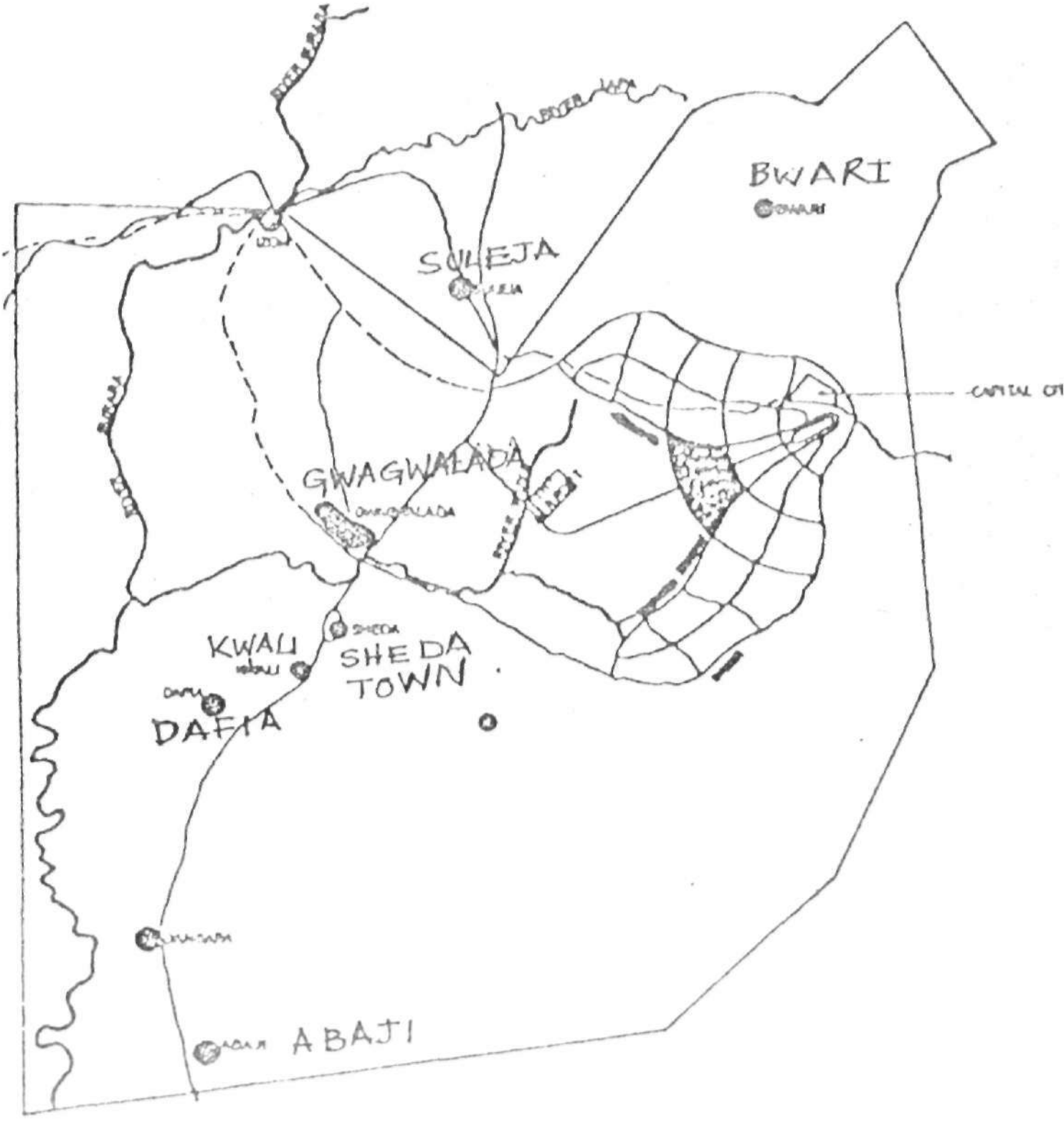
v) To prevent duality of function in Abuja by taking up the specialised activities like research.

CHOICE OF SITE

The master plan of Sheda Research Town was prepared by Niger Consultants in 1986. The Consultant prepared a comprehensive land

FEDERAL CAPITAL TERRITORY

SHOWING THE CAPITAL CITY & PROPOSED SATELLITE TOWNS.

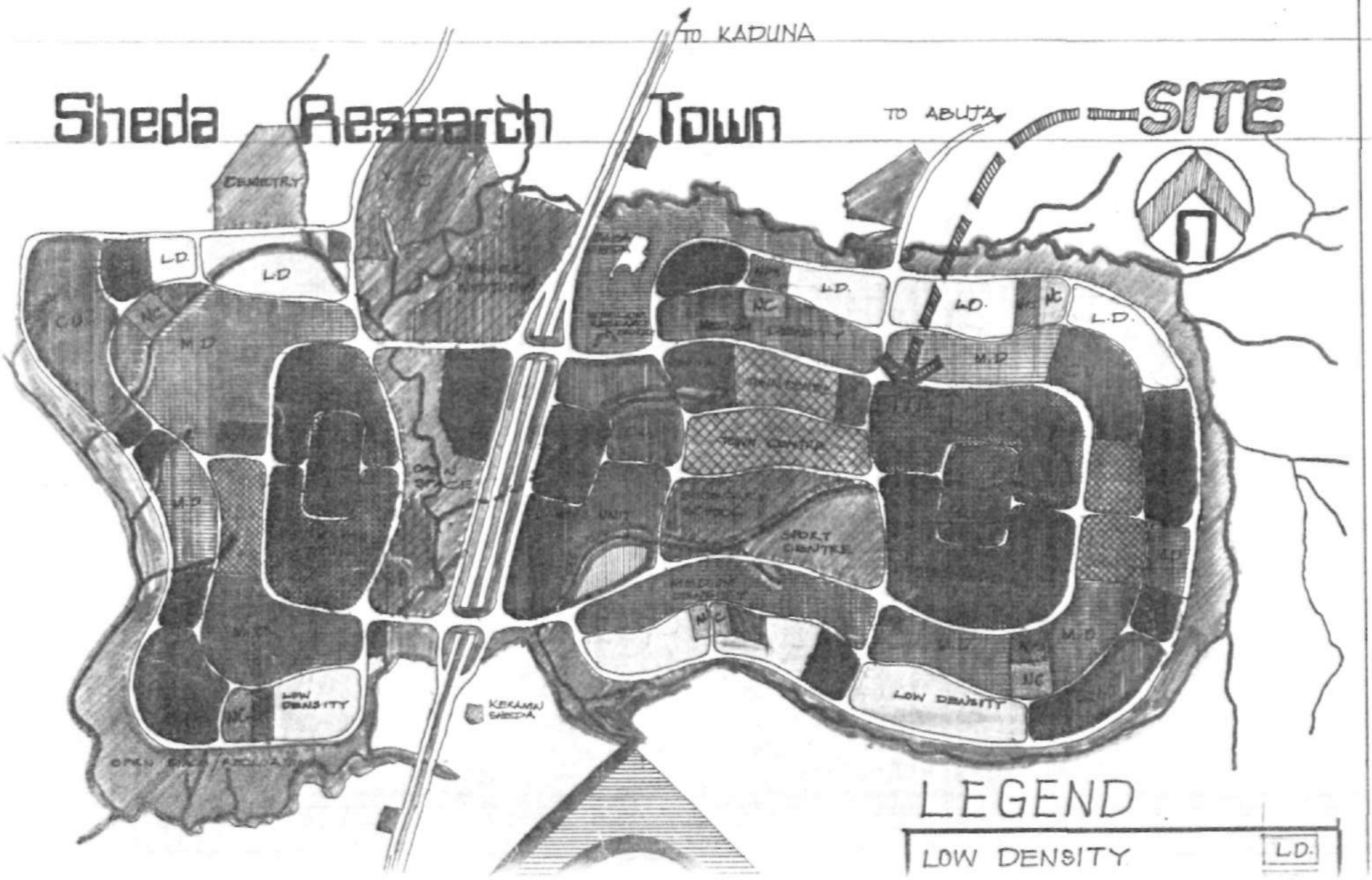


use plan which is expected to guide the authorities concerned in allocating sites to various research institutes and organisations.

For the project, two sites were advised (sites A and B in figure). Site A is on the western half while site B is on the eastern half of the town. When the sites were visited, site A was being clear by a bull dozer although no useful information could be gotten from the operator but this work suggests interest has already been vested in that site as such site B was chosen despite the fact that the road had not been completely worked, but work is progressing rapidly and it can be safely assumed that access will soon be fully established.

SITE SUITABILITY

1. Accessibility: The site is easily accessible as it abuts one of the towns major roads and easily located as it is close enough to the town centre.
2. Size: The site is large enough and will accommodate the project with adequate room for future expansion.
3. Infrastructural facilities: The master plan for Sheda Town indicates adequate provision for water supply, power supply drainage and telecommunication systems.
4. Essential Services: The site being close to the town centre is easily accessible to emergency support responses from police, fire stations, hotels and hospitals. The design proposal also provides for a fully


Sheda Research Town
TO KADUNA
TO ABUJA
SITE
CEMETRY
L.D.
L.D
L.D.
L.D.
L.D.
N.C.
N.C
N.C
M.D
M.D
M.D
M.D
TOWN CENTRE
SPORT CENTRE
LOW DENSITY
LOW DENSITY
KEKAMU SHEDA
LEGEND
LOW DENSITY
L.D.

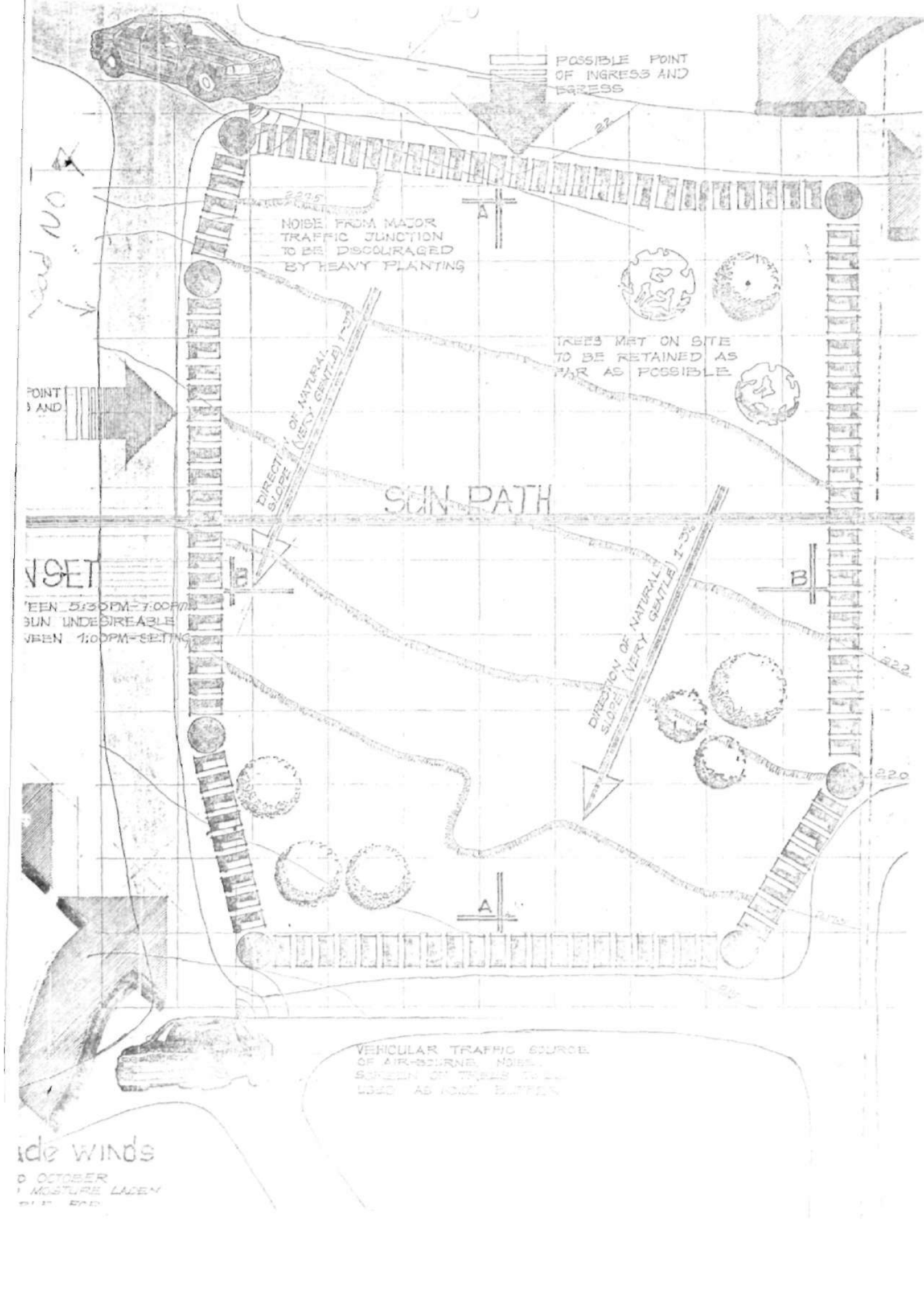
functional first aid unit.

5. Topography: The site has a gentle topography that makes development relatively easier.
6. Pollution: Sheda Research Town is at a safe distance from the administrative and industrial areas of the Federal Capital Territory.
7. Housing: Provision of housing for the various cadre of staff is already provided for by the Master Plan but guest units and accommodation is incorporated into the proposal for staff that may have to remain at work till late.

5.3.0 **SITE ANALYSIS**

The site is roughly rectangular with sides measuring about (500m x 300m) it is located on the eastern half of the town as bisected by the Lokoja Kaduna A2 road.

The site is bound on three sides by roads, on the fourth side, it shares a boundary with a neighbouring site. The predominant vegetational type is the Guinea Savannah type, and is characterised by tall grasses, shrubs and a scatering of trees (mostly the locust bean tree) which have adapted to the seasonal weather changes and man made disasters such as fires and bush clearing. Grasses grow upto two meters during the rains and the foliage of the trees can be dense as they are ever greens and this provide good shades.


POSSIBLE POINT OF INGRESS AND EGRESS
NOISE FROM MAJOR TRAFFIC JUNCTION TO BE DISCOURAGED BY HEAVY PLANTING
TREES MET ON SITE TO BE RETAINED AS F/R AS POSSIBLE
SUN PATH
DIRECTION OF NATURAL SLOPE (VERY GENTLE) 1-3%
A
B
VEHICULAR TRAFFIC SOURCE OF AIR-BORNE NOISE
SCREEN OF TREES TO BE USED AS NOISE BUFFER

The general area is characterised by relatively high temperatures during the greater part of the year, with maximum temperatures recorded during the months of March and April. During this months daily temperatures may rise to as much as 37°C. The minimum temperatures are recorded during the months of December and January, with temperatures dropping as low as 16°C. Relative humidity ranges between 20% in the dry season to over 80% during the rains, with the months of February record-ing the lowest and August recording the highest.

SOLUTIONS TO PROBLEMS

i) Noise from traffic: With roads on all but one of the sides, virtually all boundaries are potential noise sources, as such trees have to be planted to reduce such noise hazard and to act as dust trap in addition to increasing the aesthetic quality of the site.

ii) Heat gain: To combat problems of excessive heat gain and inconveniences caused by direct sun rays getting into the buildings; most of the openings of the complex will face the North - South axis.

iii) Dust: The NOrth - East trade wind is dust-laden and cold. While it lasts, most windows are usually closed.

LIBRARY

CHAPTER SIX

THE DESIGN

6.0 DESIGN PROPOSAL

6.1.1 The Need

The country's various statistics are either non-existent or scattered where they exist. Also crude means of date retrieval could frustrate a research even where date are available. The live and cry about unavailability of date in the country emanates from:

- Poor acquisition and dissemination arrangements
- Inability of standardise date
- Untimeliness of published date.

There is therefore, the need to house together; all available data as well as pooling computer services requirement of the public and private sector. In the other hand, pooling of statistical data will also ensure reliable data acquisition and retrieval.

A National Data Centre will therefore offer the following benefits:

- Provide up-to-date and retrievable statistical data to ensure a sound base for technological advancement.
- Eliminate underutilisation and proliferation of computer main frames in the public sector.
- Promote resource allocation and personnel deployment plan
- Help to eliminate excessive technological restraint.

6.12 Design Scope

The proposal is restricted to designing the central facilities of the "National Data Bank Centre" and does not involve the design of other physical facilities that may be required in support.

6.1.3 Design Goals

This proposals has as its ultimate goal the designing of an environment both internal and external that will enhance the started objectives of the centre and to achieve this goal the proposal aim to:

i) Provide a functional plan design that takes full cognizance of the operational structure of the National Data Bank Centre.

ii) Take best advantage of the National climate to provide a micro climate that is cool, dry and dust free and where national means.

iii) Provide a building that is aesthetically please, inviting while at the same time promoting confidence and strength by its share being.

iv) Design a building with services that are well integrated into the building fabric such that building services do not constitute an eye-sore even during service.

v) Lastly to provide a building that will continue to maintain all the above pleasing environment throughout the life of the

building.

6.2.0 Design Report

6.2.1 Central Facilities

The central facilities include the following facilities:

- Administration
- Computer Centre
- Information Centre
- Educational Instruction places
- Conference Centre
- Estate Workshop.

And detail sketch design has proposed for these but a sketch site layout has been produced to show the place of other support facilities such as accommodation for staff and trainees, and recreation facilities but not details sketch design has been produced for these.

6.2.2 Site Zoning

The facilities have been divided into four to correspond with public, semi public, semi private, and private zones.

The public zone has under it, the following facilities:

Conference Centre, the Information Centre, Active Recreation.

While the Computer Centre, Admin, Educational facilities, Estate Workshop and Staff Centre may be classified under the semi public zone, the semi private zones include the passive recreation areas while the accommodation both staff and trainees constitutes the private zone.

With the zoning as stated earlier, the conference centre has been isolated from the complex and is located on the left hand side as you enter the site with the active recreation fields on the right side of the access road. This relatively noisy areas are offered from the semi public zone by soft landscapes in the form of frees and greens. Next is the Information Centre, with the parking lot in between it and the Conference Centre.

The Information Centre is also on the left side of the road and has directly behind it is the Computer Centre/Admin tower, with the educational facility directly behind this and the centre directly to the right. The Estate Maintenance Workshop lies further to the right of this complex and is separate from it so as to keep away the likely noise from the workshop areas.

To the south of the site lies the club house (passive recreation) further south is the trainees living quarters while to the eastern edge of the site is the staff quarters.

6.3 Spatial Requirements

Anthropometics, prexemice, required furnishings and dimensional disciplines have been employed to help arrive at functional space allocation. The main aim of space allocation is to achieve the basic requirements of human comforts in such spaces. All other criteria serve as modifying factors for special situations. In determining the space distribution, a number of impor tant dimensional disciplines must be respected, coordinated and related by use of grids. The four kinds of grids are structural, constructional, servicing and planning grid (Fig.).

i) Structural Grid: This is the grid that regulates the placement of the main structural columns. This could cause some alterations to the schedule of accommodation hence the spaces quoted should be seen as optimum guides. A structural grid of 9m x 9m for the tower and 4.5 x 9m for most other facilities has been chosen for the design.

ii) Constructional Grid: This grid regulates the placement of window mullions and partitions. It also governs almost all the other grids to a very large extent.

iii) Service Grid: This grid governs the distribution of services throughout the structure. The services usually considered are the electricity sockets, points for telephones and

lighting fixtures.

iv) Planning Grid: This has to do with partitioning system when dealing with deep office space.

6.3.0 SCHEDULE OF ACCOMMODATION

6.3.1 Space Allocation

(Director General's Suite)

- Director General's Office 64m²
- Secretary 30m²
- Toilets .. ..
- Board Room 50m²
- Rest Room 30m²
- Waiting Room.. .. .. .. 30m²
- Admin/Technical .. .. ..
- Assistants 30m²
- Executive Secretary 30m²
- Secretary/Typists 30m²
- General Office 70m²

(Assistant Director General Admin and Finance)

- Assistant Director General Office 64m²
- Secretary 30m²
- Admin. Assistant .. .. ..
- Finance Assistant) 30m²
- General Offices 30m²
- Toilets .. ..

Administration

- Director of Admin. 4.2m²
- Committee room 30 persons
- Secretary 30m²
- Admin Unit 125m²
- Personnel UnitP 96m²
- Welfare and Public Relation Unit 96m²

Estate

- General Office 64m²
- Stores 32m²
- Toilets .. ..

Finance

- Director Budget/Finance .. 42m²
- Committee Room .. .. .. 30 persons
- Secretary 30m²
- Budget and Finance Units .. 96m²
- Auditor (internal) Unit .. 96m²
- Wages and Salaries 96m²
- Contracts and Services 96m²
- General Offices 32m²
- Store .. ..
- Toilets .. ..

Assistant Director General (Data Bank)

- Assistant Director General .. 64m²

- Secretary .. .. $30m^2$

- Admin. Secretary .. .. .. $30m^2$

- Technical Assist)

- General Office .. .. .. $30m^2$

- Store .. .. $30m^2$

- Toilets .. ..

Computer Services

- Director .. .. $42m^2$

- Secretary .. .. $30m^2$

- Committee Room for 30 persons

- General Office .. .. .. $60m^2$

- Store .. .. $30m^2$

- Toilet .. ..

Hardware

- Chief Engineer Officeh .. .. $30m^2$

- General Offices .. .. .. $90m^2$

- Offices for Engineers & Tech. $150m^2$

- Technicians .. .. .. $150m^2$

- Maintenance Lab/Workshop .. $450m^2$

- Store .. .. $30m^2$

Software

- Chief Analyst (Systems) .. $30m^2$

- Principal Analysts .. .. $60m^2$

- Principal Programmer .. .. $60m^2$

- Programmers .. .. $60m^2$

- Analysts .. .. $60m^2$

- General Offices .. .. .. $30m^2$

- Store .. .. $30m^2$

- Toilets .. ..

Data Base Management

- Chief Analyst .. .. .. $30m^2$

- Security Programmers .. .. $90m^2$

- Analysts .. .. $150m^2$

- Programmers General Offices $30m^2$

- General Offices .. .. .. $30m^2$

- Store .. .. $30m^2$

- Toilets .. .. $30m^2$

Statistical Services

- Director .. .. $42m^2$

- Secretary .. .. $30m^2$

- Committee Room for 20 persons

- General Office .. .. .. $32m^2$

- Store .. ..

- Toilets .. ..

- General Offices .. .. .. $64m^2$

- EDT (Electronic Data Transfer) $112m^2$

- General Offices .. .. .. $64m^2$

- Supervisors .. ..

- General Offices .. .. ..

- Store .. ..

- Toilets .. ..

KASHIM IBRAHIM LIB

- Supervisors .. .. (80)
- Terminal Scheduler/Control (60)
- Terminal Room individual cubicles for (10 cubicles) .. .. .. $90m^2$
- User Snack Bar/lounge .. .. $72m^2$

Computer Machine Room

- Computer Room .. .. .. $320m^2$
- Tape Library .. .. .. $200m^2$
- Digesters/Conditioners .. .. $80m^2$
- Operators .. .. $150m^2$
- Offices .. .. $150m^2$
- Technicians .. .. $60m^2$
- Exhibition Space (small exh.) $54m^2$
- Registry .. .. 54^2
- Principal Scheduler .. .. $30m^2$
- Schedulers .. .. $54m^2$
- General Staff .. .. .. $90m^2$
- Job Analyst .. .. $24m^2$
- Store .. .. $30m^2$
- Toilets .. ..

Library

- Control/Lending .. .. ..
- Journals .. ..
- Reserved .. ..

- General Reading/Book Stalk ..
- Audio Visual .. ..
- Terminal Room .. .. ..
- Chief Librarian .. .. ..
- Offices (General) .. .. ..
- Store .. ..
- Toilets .. ..

Conference Centre

- Auditorium to sit 500
- Exhibition Space (Large Exhibitions)
- Sectariat Offices .. .. ..
- Store .. ..
- Toilets .. ..

Training School

Educational Facility for 200 Students

- Class Rooms
- Lecture Theatre to sit 200
- 1 Laboratory
- 1 Seminar Room
- Store
- Toilets

Canteen

- To sit 250 men

Workshop

- General Maintenance
- Automobile Workshop
- Building Maintenance Workshop
- Central Store
- Toilets

Health Centre

- Director of Health
- Consulting Room
- Emergencies
- Pharmacy
- Store
- Toilets

6.4 DESIGN PROPER

The Centre has been divided into three blocks viz, the Conference Centre, which stands on its own in connected to the other facilities by a covered walk way. The other facilities apart from the Workshop has been grouped together for a homogenous complex, with the Informaation Centre (user services) infront raised on pillars to make for management staff car park underneath and going to two floor up, with the last floor of this facing the library directly behind this is the tower rising to 10 floors with management at the top most floors and the Computer Centre

occupying the first and second floors. The ground floor of this tower is occupied by the staff entrance security office, clinic, student affairs and department.

At the rear is the educational facilities this is advantageous in fact they are separated from the of fice, and the clients.

The decision to resort to high-rise despite availability of land was taken after considering some factors. Amongst which are the issue of cable manage ment. Horizontal spread of buildings naturally increases the length of cables needed to connect differ ent work stations to the computer room. So many cables will this be spead around the site. This increases the
risk of fire spread within the complex and also makes maintenance difficult.

These problems are considerably contaned in the high rise proposed as cables can be conveniently directed within properly integrated ducts that are readily accessible for maintenance work without necessarily becoming an eye sore.

The user services department is restricted to the first and second floors only with access to any other part of the centre being strictly under control. This arrangement makes it possible for the users to use terminals on this floor without interfering with other activities.

Ventilation

The adoption of single banking bays in most of the spaces (except for the computer centre) has made it possible to achieve

cross ventilation for most of the classes and offices in the high rise building. For this reasn I have not provided for a single station airconditioning service of the entire building instead split unit Air conditioning will be used for vital offices.

Installation standards dictate that the computer room must be artificially ventillated.

Cabling

The Computer and its peripherals are connected with wires located under the raised floor in the Computer Room. But connection from the point to terminals in other parts of the building shall be micro wave transmission.

Fire

The material (R.C.) used in the design meets accepted standards of a minimum of 2 hours fire resist ance. Various types of smoke and heat detectors are located at strategic location, also the high risk spaces has been so, located as to provide easy access for fire fighting.

Water Supply and Drainage

Sheda Town has been comprehensively designed and an effective water supply and waste water (sewers) net work has been proposed. The net work rooms quite close by and shall be tapped and pump assisted to storage reservours at the top of the tower block from where it can service the centre under gravity. Storm water from

the roofs shall be discharged through gutter through vertical pipes in ducts to ground level gutter from where they shall be directed to the public drains. Pool water shall be treted in local tanks before being directed to public sewers when eventually they are ready.

Power Supply

Sheda Town has also been provided with a compre hensive electricity supply concept in the waster plan. The N.D.B. shall be linked to this grid and an iuninte ruptible power supply system (UPS) shall be provided for the computersand terminals.

Construction

The structural sysytem comprises of reinforced concrete columns and beams. The colomns for the tower block are at 9.0m centre to centre. The floor constructions of the waffle grid construction thus reducing the range of the structural floor to a minimum roof construction for the tower in composite combining a regular monopitch on a R.C. decking simple double pitch is employed except for the lecture theatre and the conference centre. The centre is roof by a space frame construction utilising a shallow curvature. While the lecture theatre is roofed by a monopitch with steel griers.

KASHIM IBRAHIM LIBRARY

In this thesis I have established that the National Data Bank Centre is of high priority to technological development in the country but there remains the issue of cost. Although this may not be within the scope of this work a mention of it must be made. A brief discussion of the feasibility shall be my conclusion.

A CASE FOR THE FEASIBILITY/VIABILITY OF THE PROJECT

Economic Feasibility

This project will not be another white-elephant project which this country is noted for. This is because the project is relevant to and has relationship with all sectors of the economy and the total develop ment programmes of the country; needless to talk of the huge earnings and savings of foreign exchange that would accrue therefrom. The cost elements of investing in this project therefore cannot equal the economic benefits that would ensue.

Commercial Feasibility

The demand for the services of this centre would be enormous. Patronage will come from the public and private sectors of the economy. There is also the likelihood that some African countries will patronise the commercial services to be rendered by such a centre. This will be achieved with the creation of many service outlets in accordance with the operations planning and management study reports.

Technical Feasibility

Technical options abound to satisfy the require ments of Nigeria's National Data Bank. However, it is pertinent to point out here that the upgrading of facilities at the Federal Office of Statistics or at any other location in Lagos as National Data Centre should be regarded as adhoc, in view of the movement of the Federal Capital to Abuja. Also, the proliferation of data banks at the Agricultural Ministry, Technology Ministry, etc should not be the technical alternative to an articulated and well developed National Data Bank.

Financial Feasibility

FINANCE IS THE ANSWER. This project can be financed conveniently because of its high investment potentials to sponsors and lenders alike and thus:

- Minimise government's equity contribution by initiating credit sources which otherwise would @@not have been available to the government.
- Attract private investors to the project thereby enabling the government to divert some of her funds to other projects.
- Obtain financing flexibility.
- Obtain better loan terms without mortgaging the interest of the nation.
- Minimise cost of funds.

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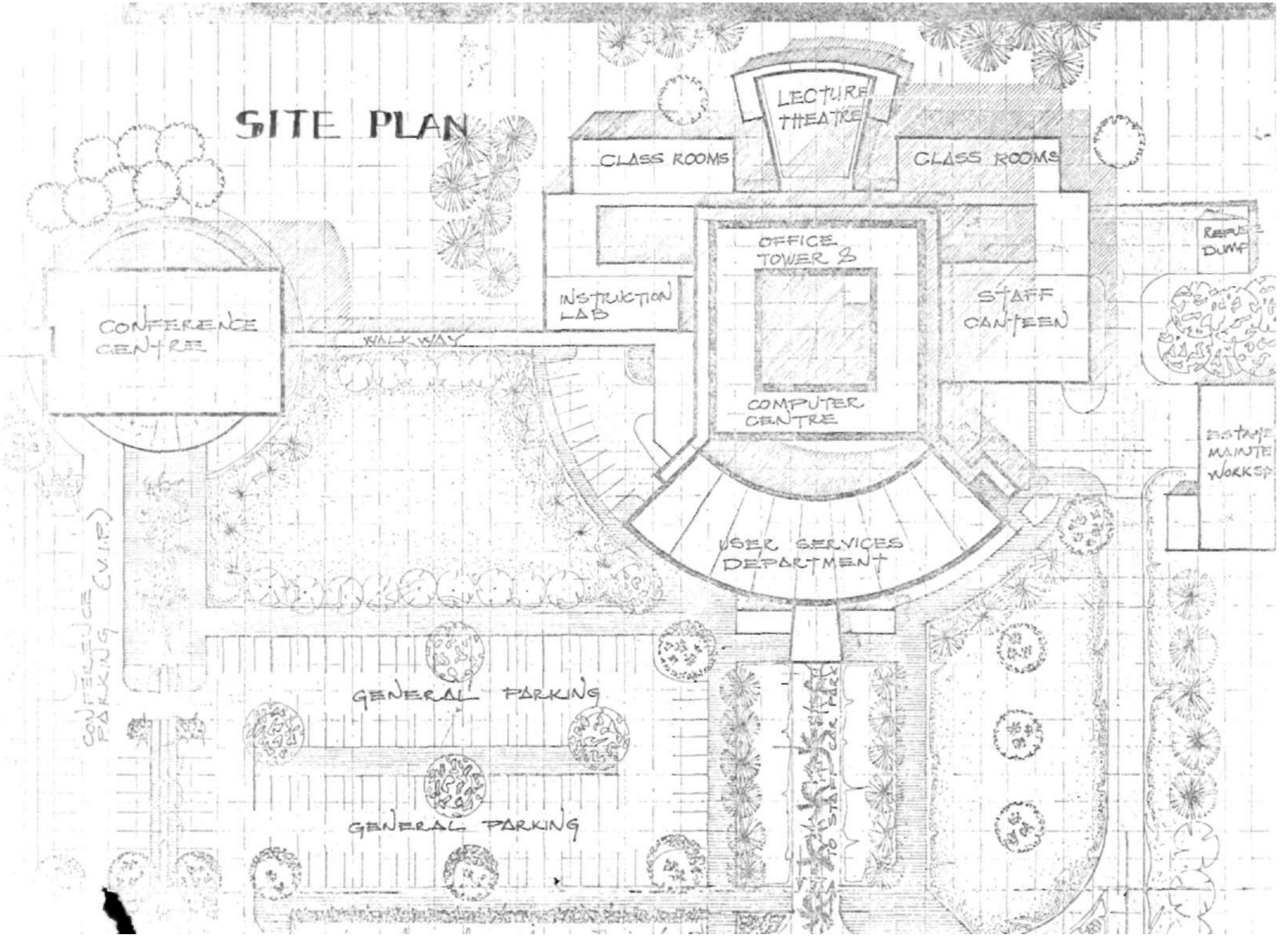
- Minimise cost of arranging the finance.

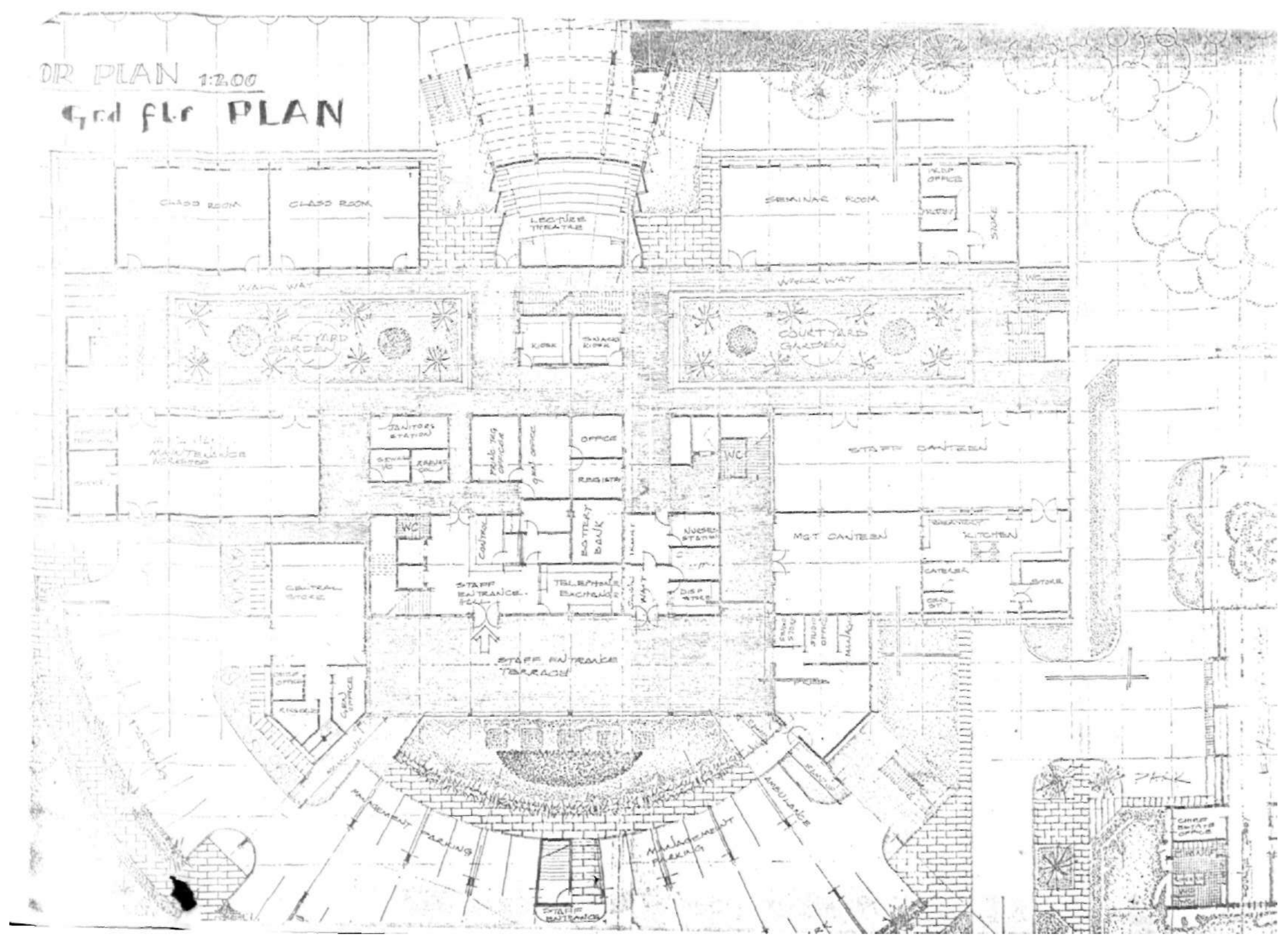
Not to talk of the United Nation Development Programmes (UNDP) interest in the project it is therefore the Authors belief that this project will certainly not be another white elephant project.

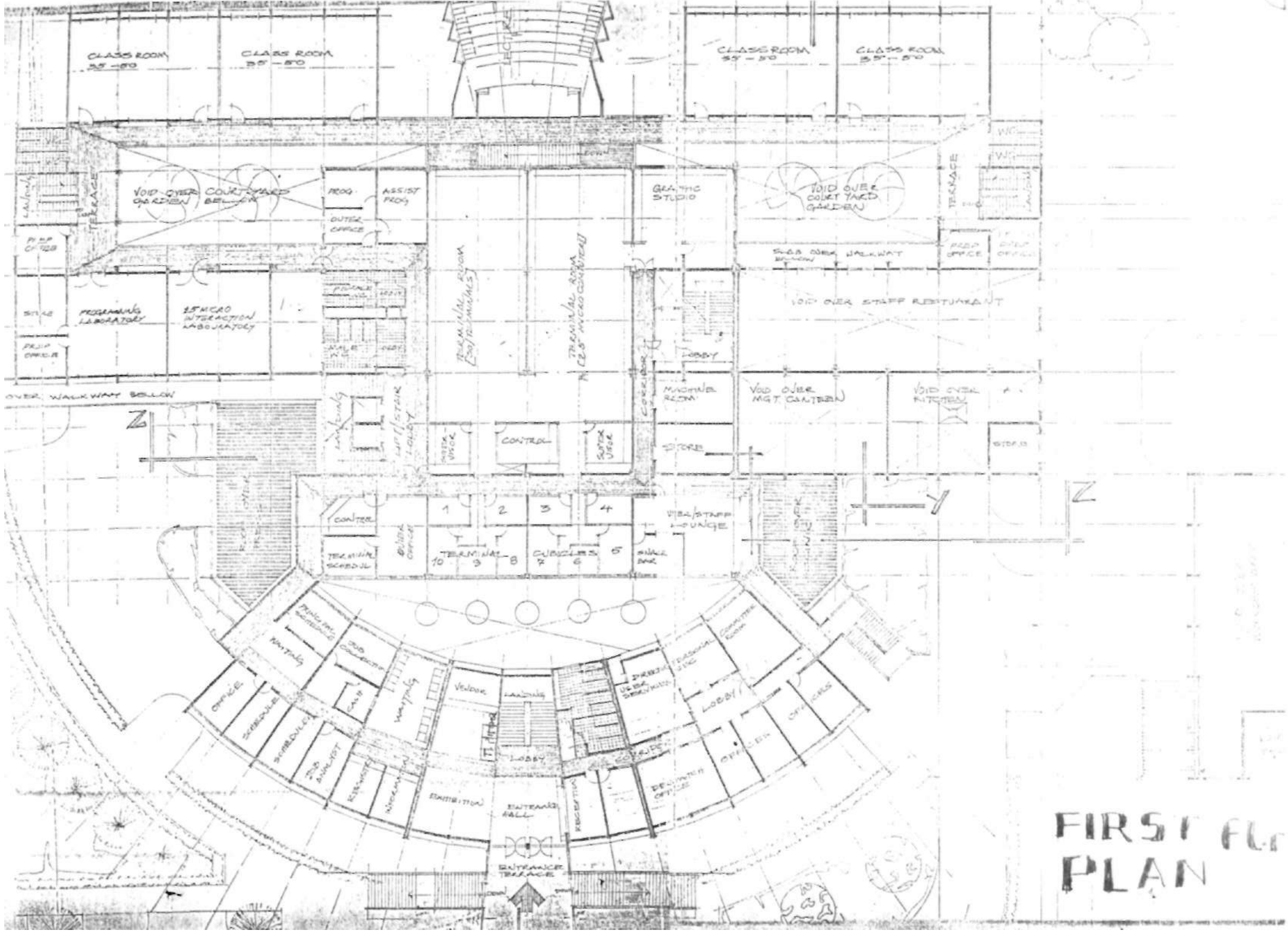
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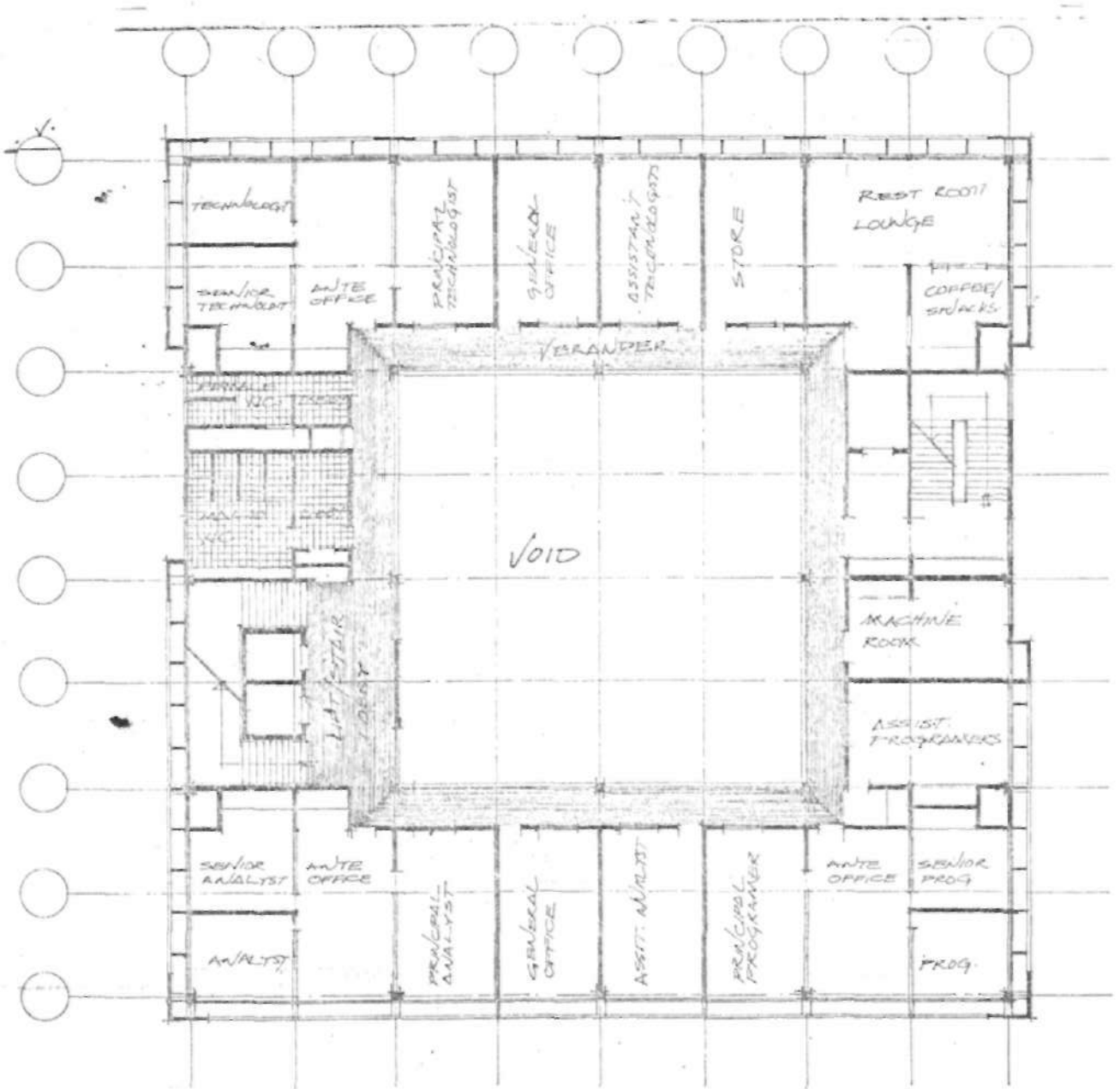
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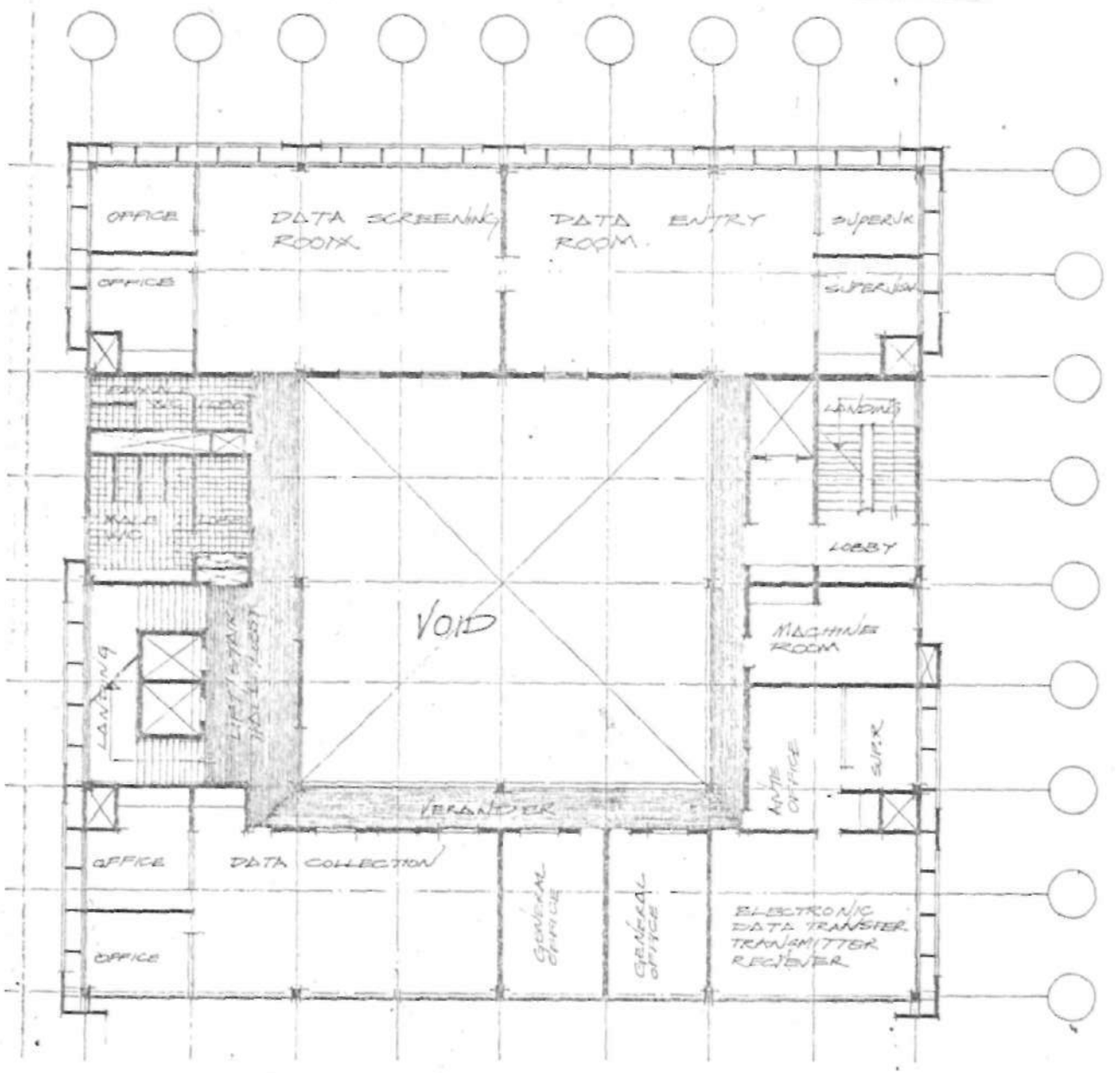

SITE PLAN
LECTURE THEATRE
CLASS ROOMS
CLASS ROOMS
OFFICE TOWER B
INSTRUCTION LAB
STAFF CANTEEN
REFUSE DUMP
CONFERENCE CENTRE
WALKWAY
COMPUTER CENTRE
ESTATE MAINTE WORKS
USER SERVICES DEPARTMENT
CONFERENCE PARKING (V.I.P.)
GENERAL PARKING
GENERAL PARKING


DR PLAN 1:200
Grd flr PLAN
CLASS ROOM
CLASS ROOM
LECTURE THEATRE
SEMINAR ROOM
HEAD OFFICE
SECRETARY
STORE
WALK WAY
WALK WAY
COURTYARD GARDEN
COURTYARD GARDEN
KIOSK
SNACK BAR
MAINTENANCE WORKSHOP
JANITORS STATION
SENIOR WO
RADIO CALL
PUBLIC HEALTH OFFICER
OFFICE
REGISTRY
WC
STAFF CANTEEN
MGT CANTEEN
KITCHEN
CATERER
STORE
CENTRAL STORE
CONTROL
BATTERY BANK
NURSES STATION
STAFF ENTRANCE
TELEPHONE EXCHANGE
DISPATCH
STAFF ENTRANCE TERRACE
PARK
CHIEF MEDICAL OFFICER
PERMANENT PARKING
AMBULANCE
STAFF ENTRANCE

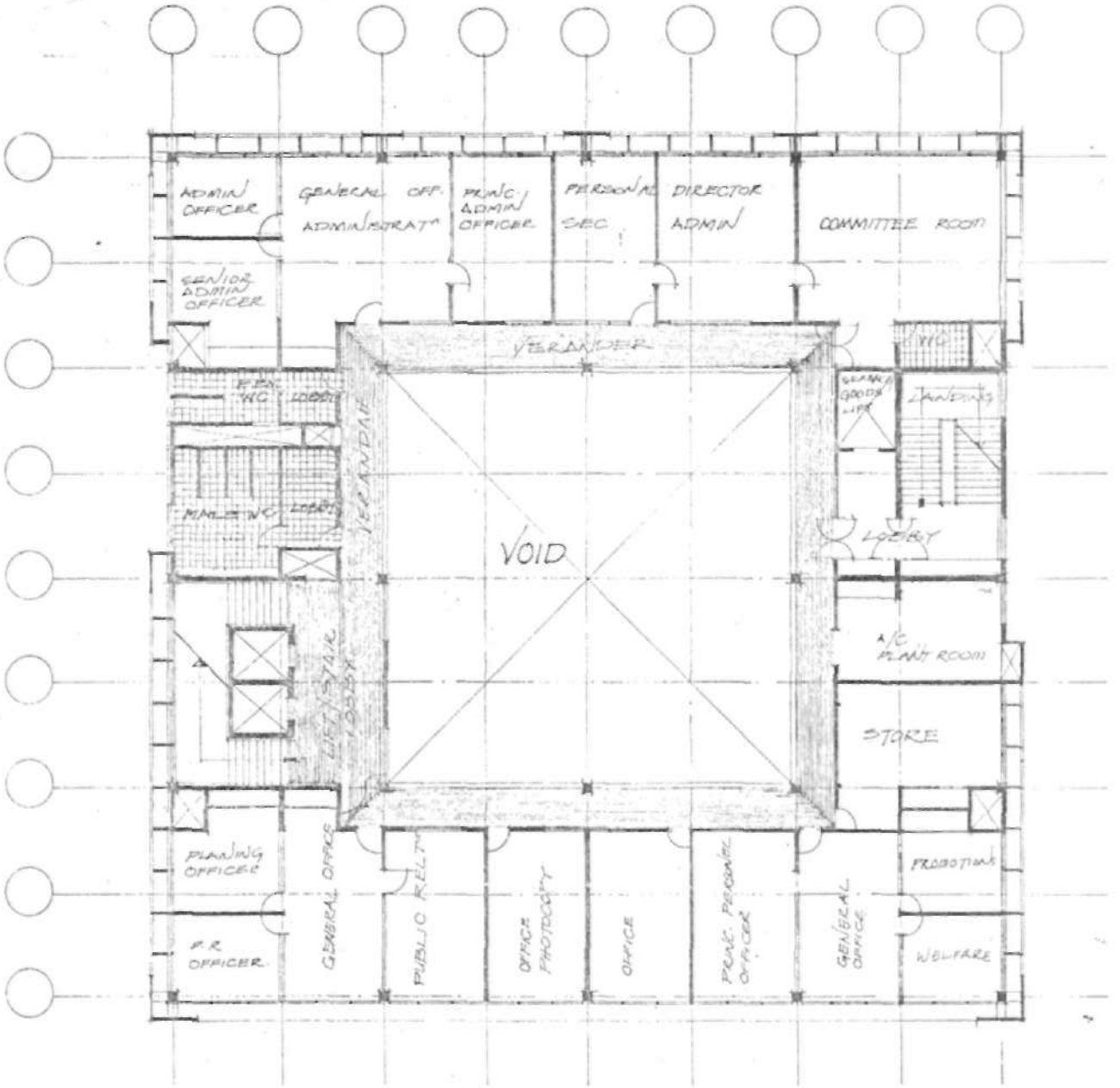

CLASS ROOM
CLASS ROOM
CLASS ROOM
CLASS ROOM
VOID OVER COURTYARD GARDEN
VOID OVER COURT YARD BELOW
TERRACE
PROG
ASSIST PROG
OUTER OFFICE
GRAPHIC STUDIO
VOID OVER COURT YARD GARDEN
TERRACE
PROG OFFICE
PROGRAMMING LABORATORY
MAN MACHINE INTERACTION LABORATORY
PROG OFFICE
VOID OVER WALKWAY
VOID OVER STAFF RESTAURANT
LOBBY
MACHINE ROOM
VOID OVER MGT CANTEEN
VOID OVER KITCHEN
STORE
CONTROL
CONTROL
1
2
3
4
VIEW/STAFF LOUNGE
TERMINAL
CUBICLES
5
6
7
8
9
10
WAITING
OFFICE
SCHEDULE
CAR
VESTIBULE
LOBBY
EXHIBITION
ENTRANCE HALL
ENTRANCE TERRACE
RECEPTION
LOBBY
OFFICES
COMMITTEE ROOM
FIRST FL
PLAN



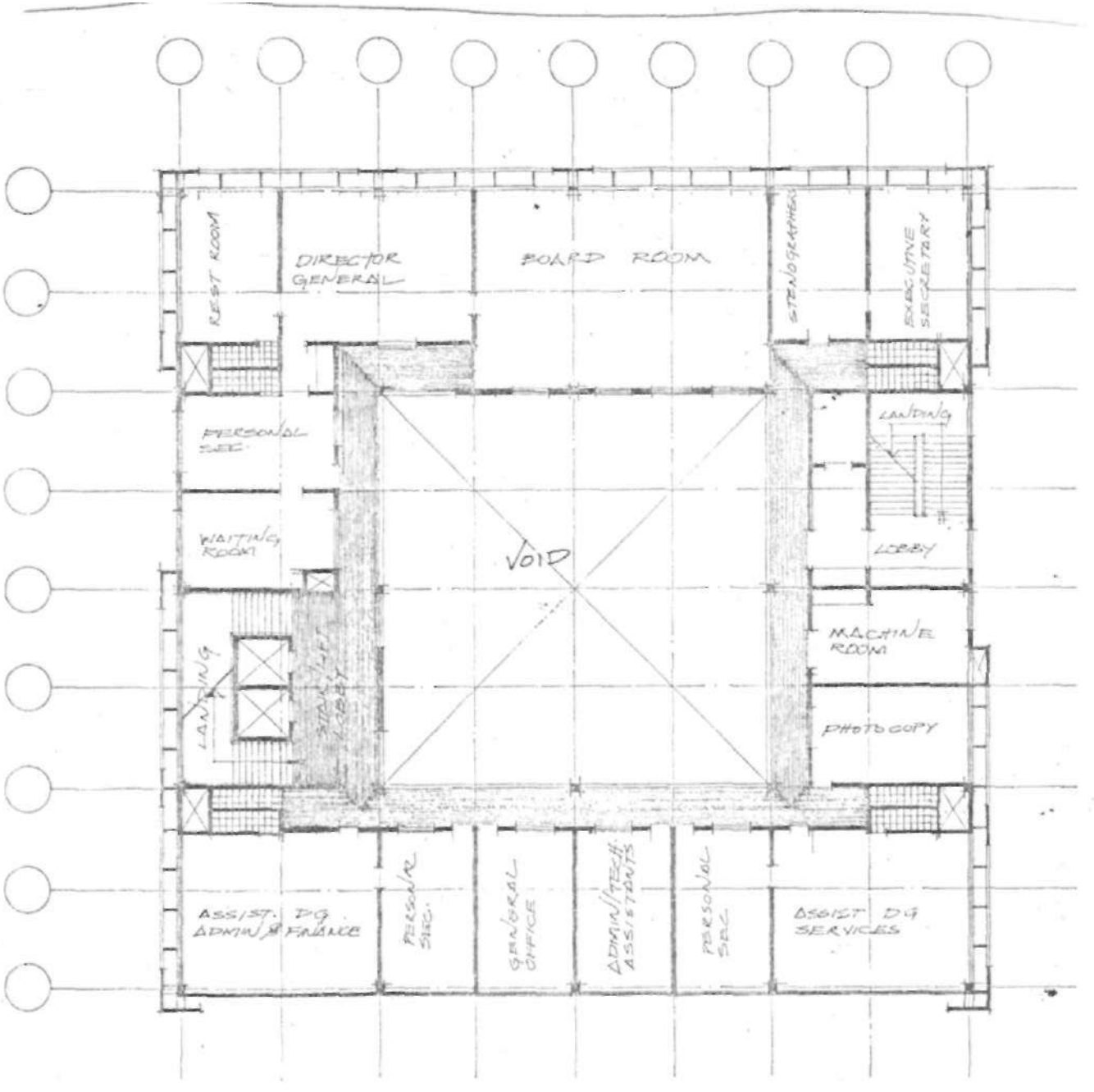
3rd FLOOR 1:200 SOFTWARE & PROGRAMING



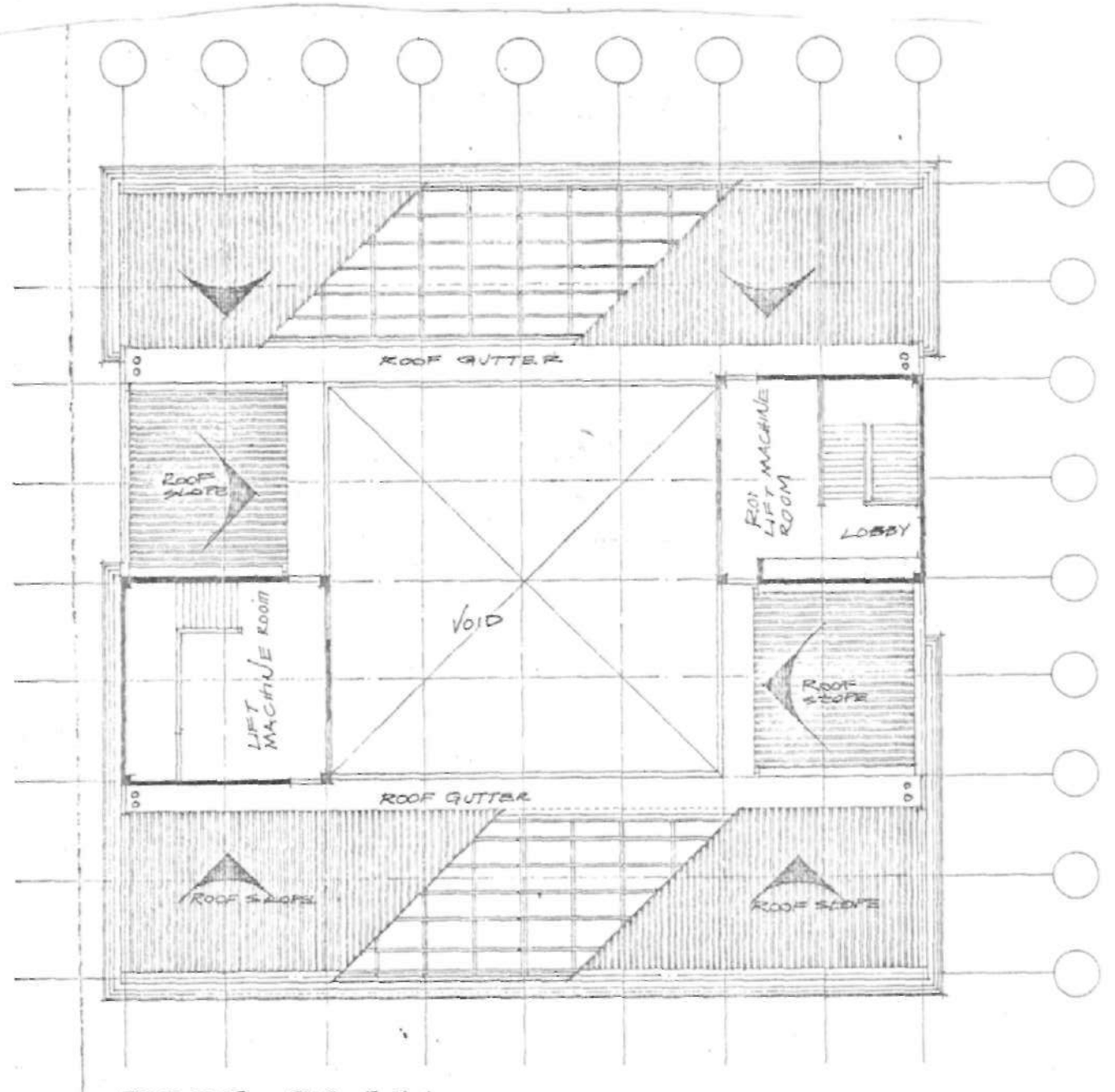
5 5th FLOOR 1:200 DATA COLLECTION, SCREEN & ENTRY



7th FLOOR 1:200 • ADMINISTRATION

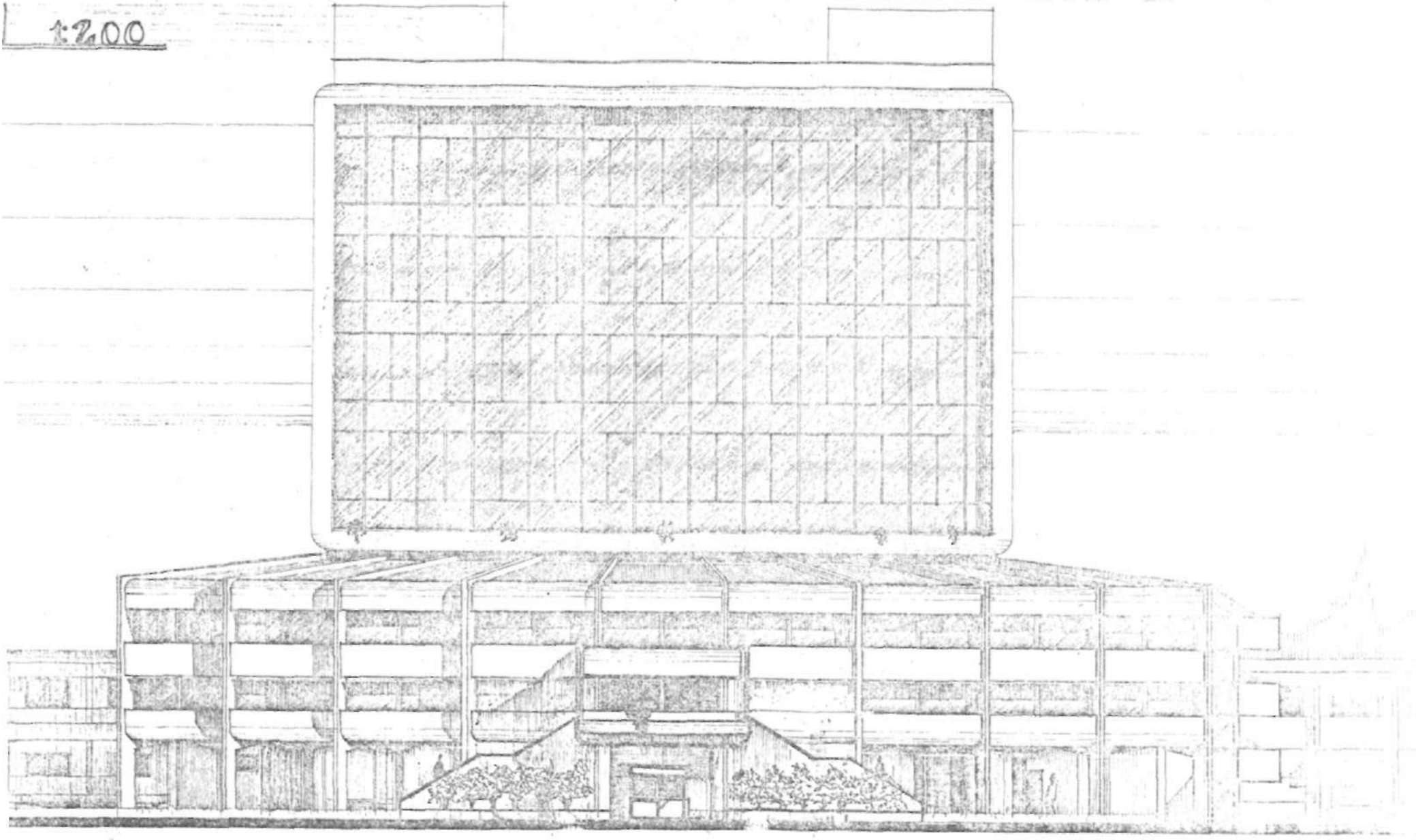


9th FLOOR 1:200 D.G's / BOARD ROOM



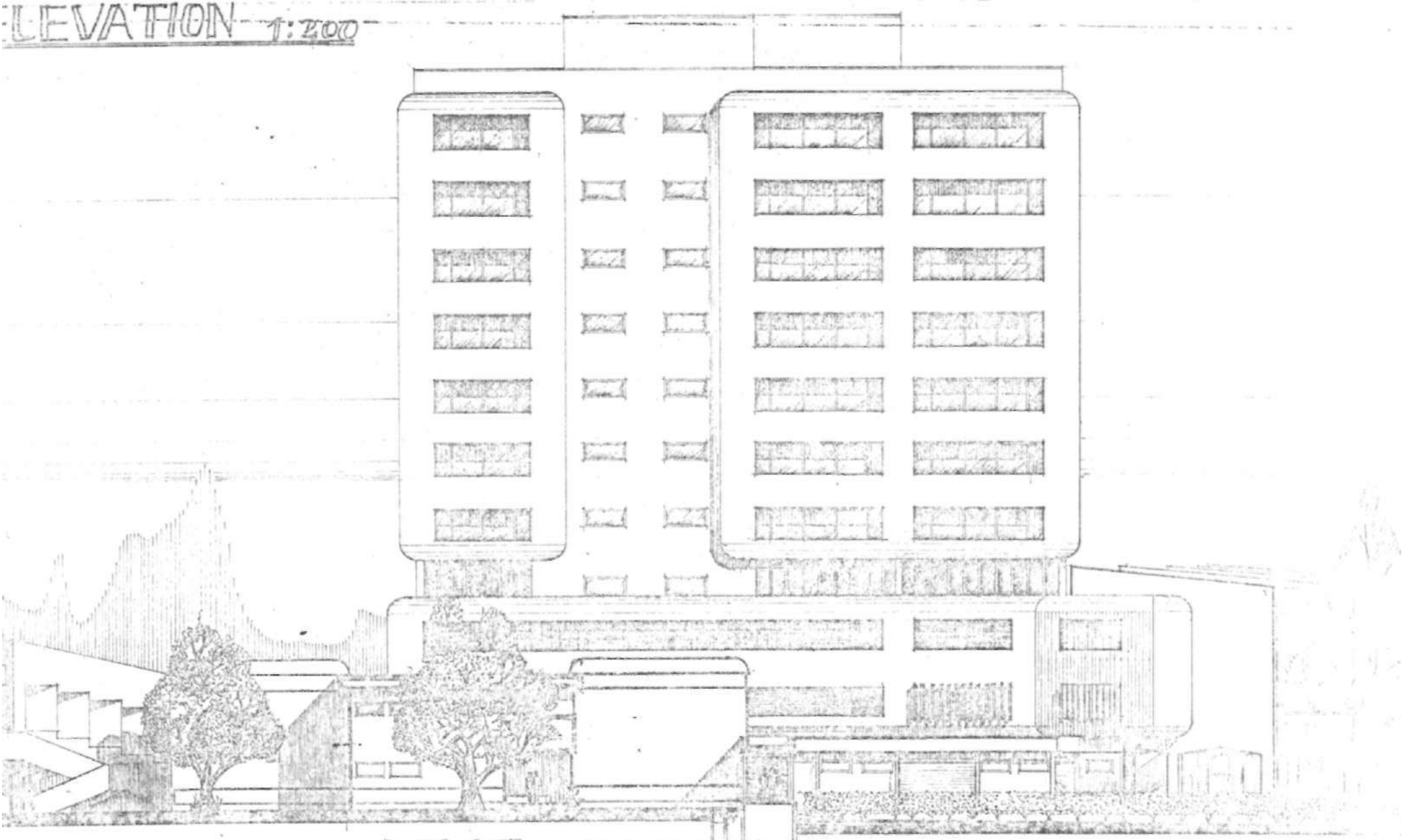
ROOF PLAN 1:200 ROOF & LIFT MACHINE ROOMS

1:200

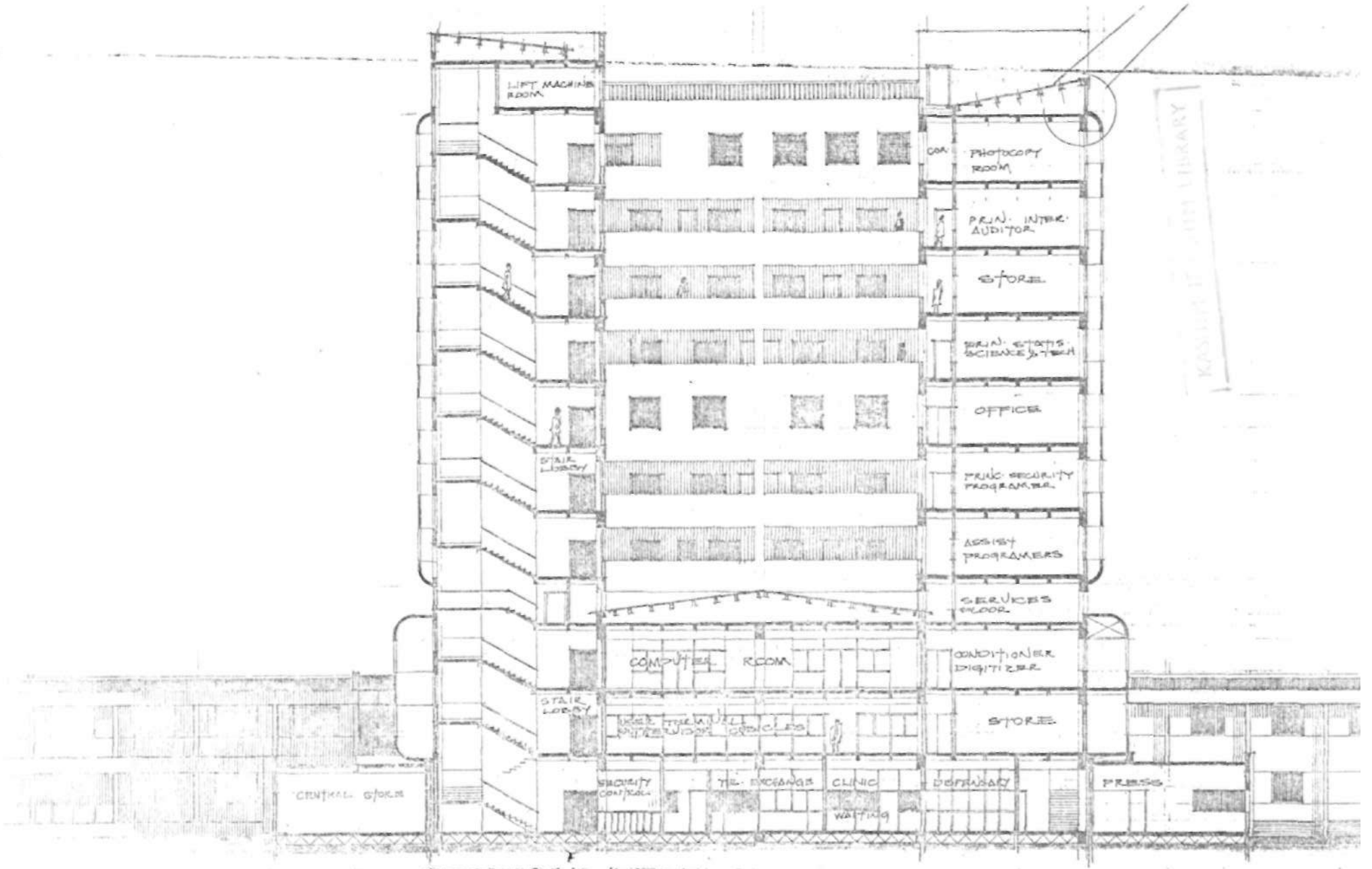


SOUT ELEVATION

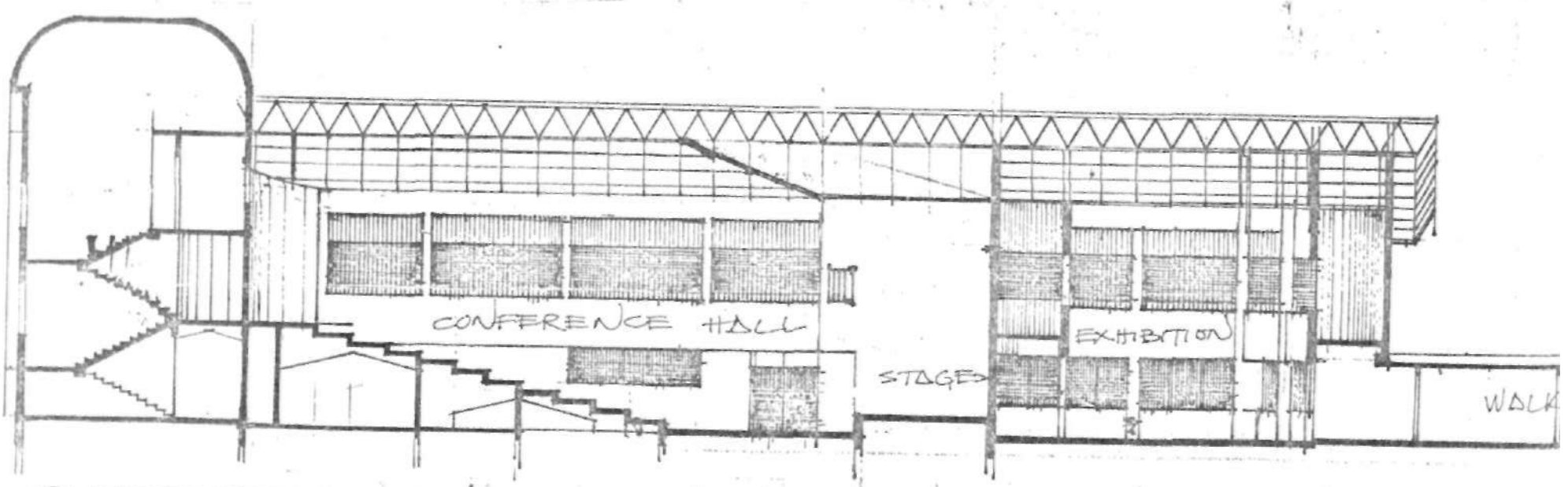
ELEVATION 1:200



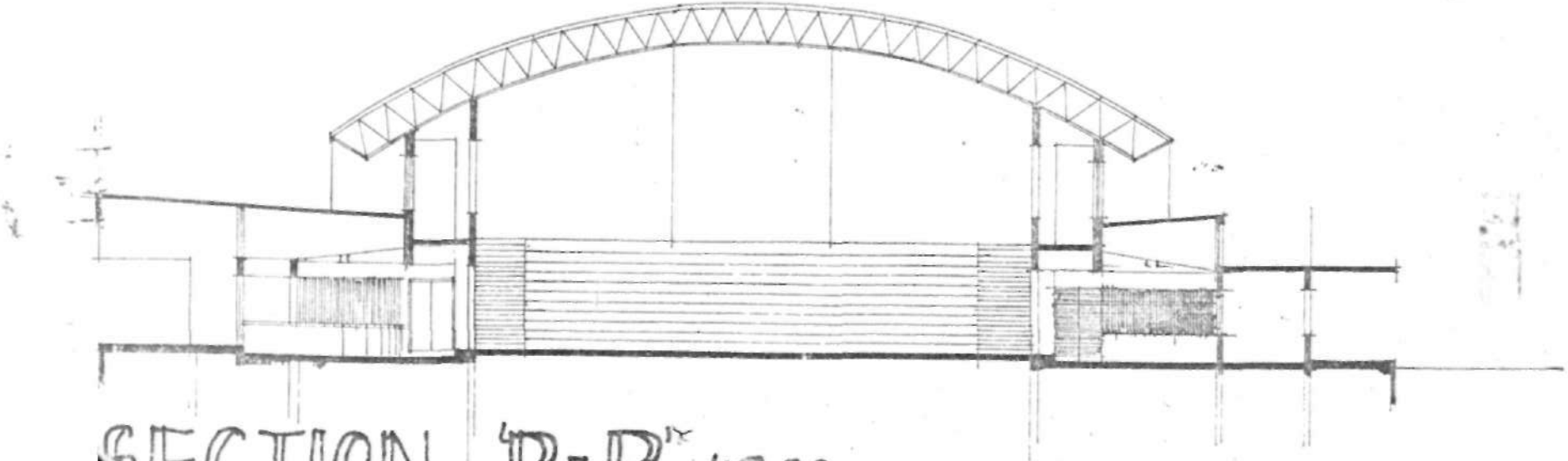
WEST ELEVATION



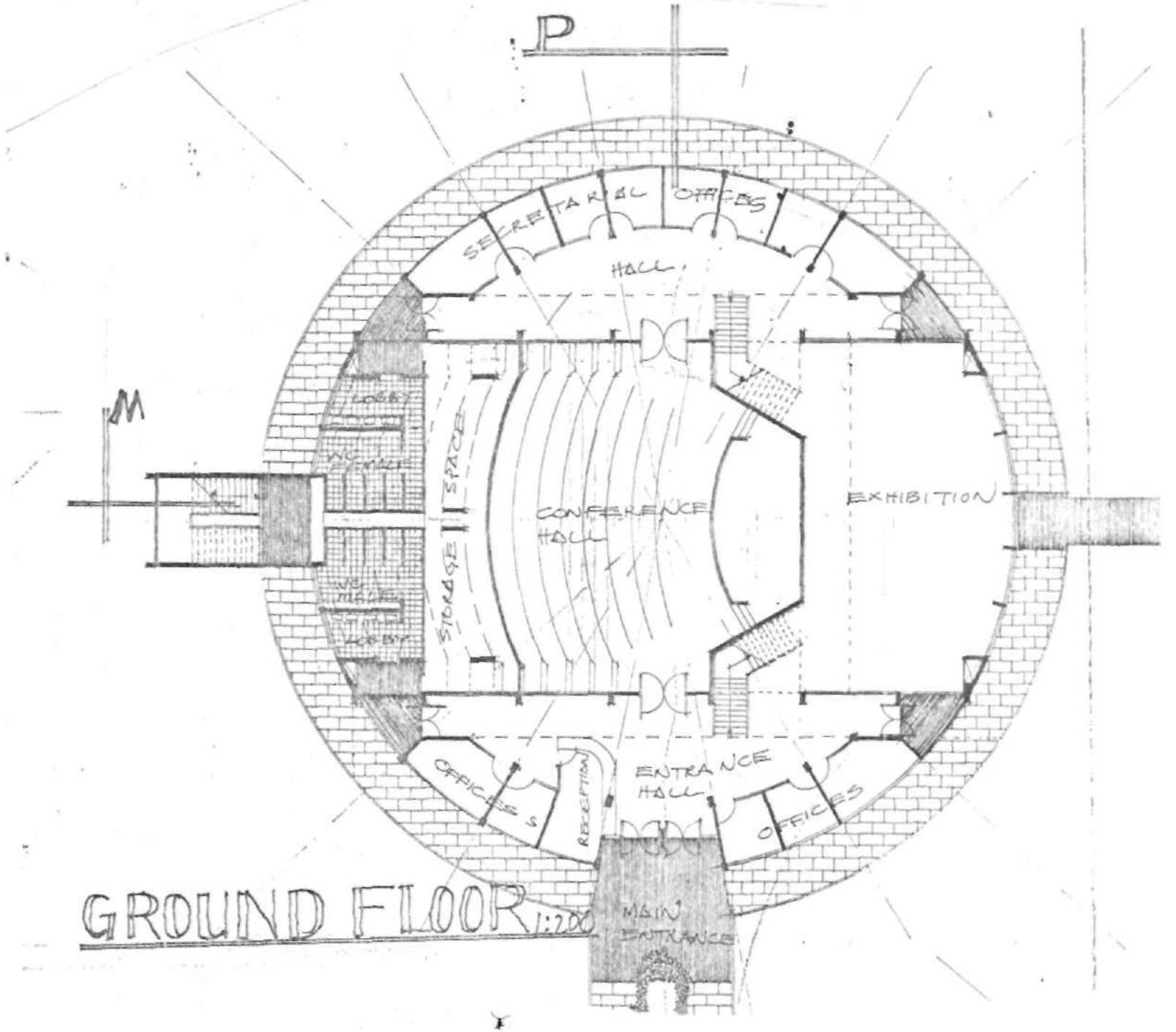
SECTION 'Y-Y 1:200



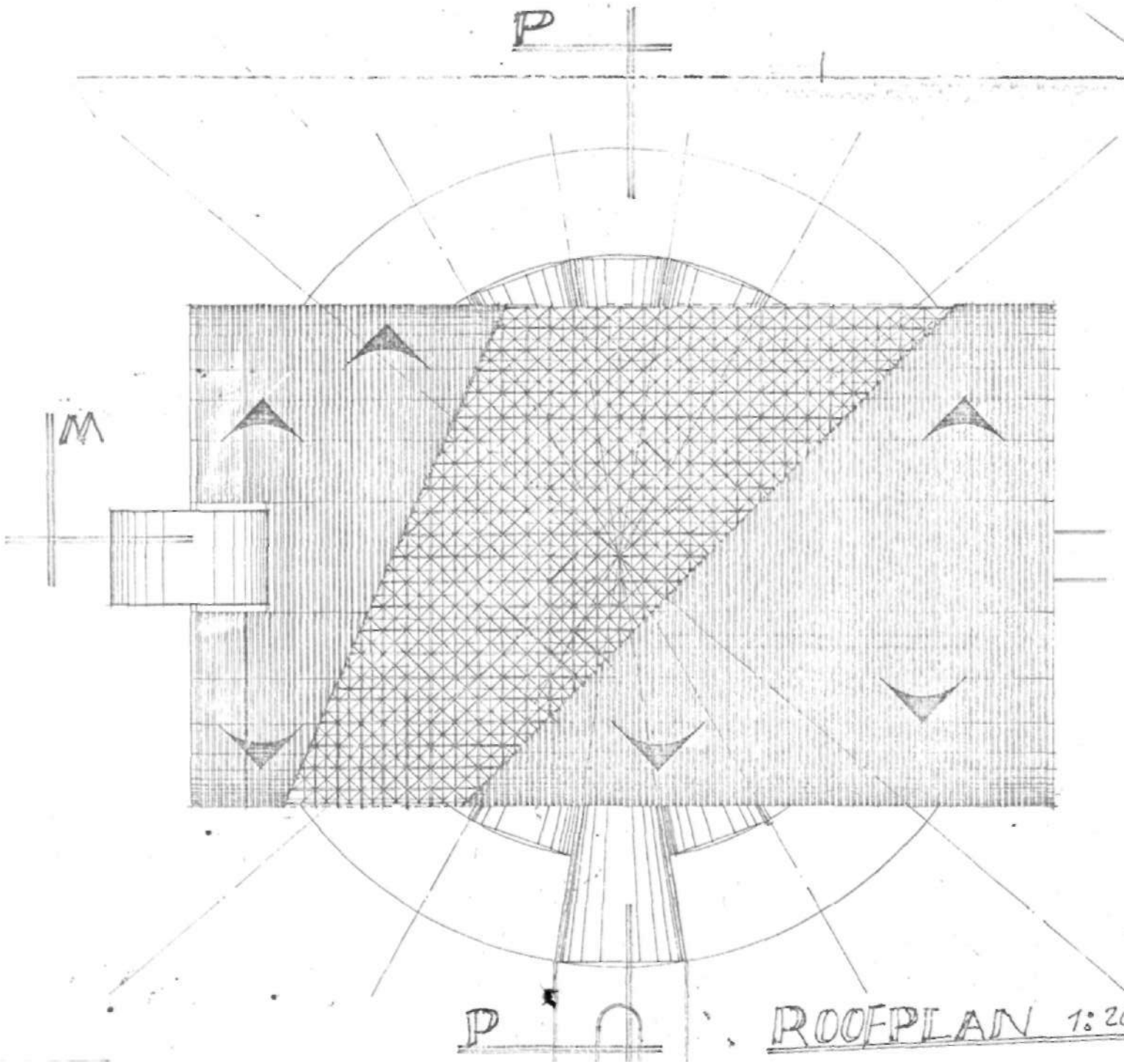
SECTION 'M-M' 1:200



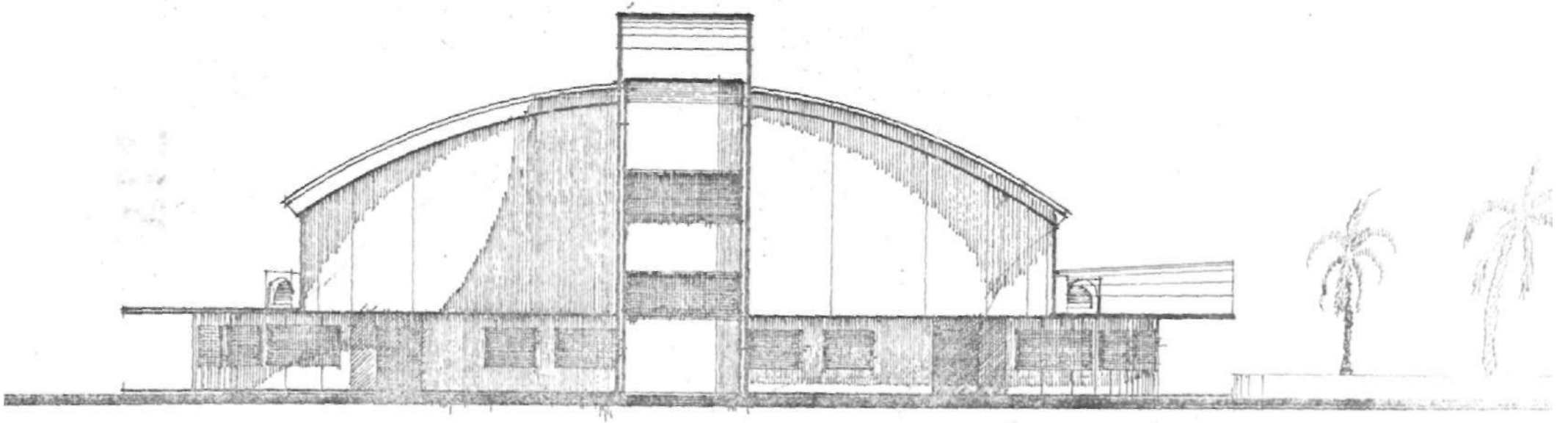
SECTION 'P-P' 1:200



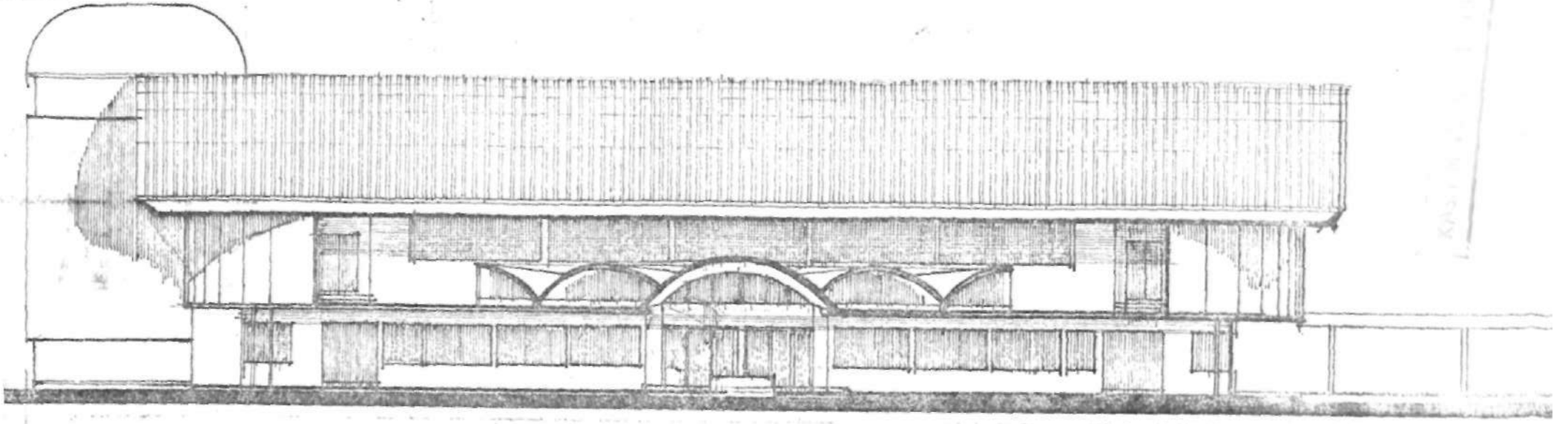
GROUND FLOOR 1:200



ROOFPLAN 1:200



EAST ELEVATION 1:200



SOUTH ELEVATION